

**স্কুল অব বিজনেস**  
**SCHOOL OF BUSINESS**  
বাংলাদেশ উন্মুক্ত বিশ্ববিদ্যালয়

**MBA 1304**  
*Microeconomics*

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# MBA 1304

## *Microeconomics*

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## Preface

This book is primarily developed for the MBA students of Bangladesh Open University. It is written in modular form and the lessons have been designed in a way so that learners can comprehend the concepts and theories of Microeconomics easily by their own.

The book has eleven units comprising 30 lessons. We do not claim it to be an original contribution. Rather it should be regarded as a text book of ideas from various renowned authors of Economics/Microeconomics. We have also quoted from different text books on Economics usually followed by post-graduate students. Our endeavour has been to present the lessons of the book in a very lucid manner so that a distant learner with average caliber can have a complete understanding of the concepts and theories of the course within the stipulated period of a semester.

Each unit is almost equivalent to one chapter of a conventional text book and divided into two to four lessons. Each of them starts with "unit highlights". In fact the lessons are like the lecture notes of a classroom teacher, each starts with "lesson objectives" and ends with "review questions". The review questions include essay type questions, multiple choice questions and some real life problems. Also some statements are included in the review questions, from which the students will identify the true ones. We hope that self learners will not find much difficulty in understanding the lessons by themselves and will not require any substantial help from the tutor.

We have added the real life problems/cases into the book from conventional text books Economics/Microeconomics by the renowned writers of western origin. We expect that our MBA students will relate the problems/cases with their own environment and analyse them independently or in group.

We are grateful to the honorable Vice Chancellor of BOU, Professor Dr. M. Farid Ahmed, who gave us the most needed support for the current print of the book. We are also thankful to Professor M. Aminul Islam, former Vice Chancellor, BOU, for his inspiration and support in writing the book. The Dean, School of Business, Bangladesh Open University, has made us indebted by extending his sincere cooperation regarding the official formalities concerned with writing and printing of this book. We also acknowledge with thanks the services of Md. Syful Islam, Assistant Professor, School of Business, BOU for editing the book. We also thankful to Sabiha Afrin, former Lecturer of Economics, School of Business, BOU for her effort during the second print of the book. Our thanks are also due to Mr. Md. Abdul Matin and Mohammed Wahiduzzaman Howlader, WPOs of the School of Business, for doing their very best to complete the task of desktop processing on time.

We shall feel rewarded for our labour if both general readers and self-learners find this book worthwhile and useful.

**Dr. Muhammad Sirajul Haque**  
**Mostafa Azad Kamal**

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# INTRODUCTION



## Highlights

- ❑ Nature and Methodology of Economics.
- ❑ Basic Economic Problems of a Society: What to Produce, How to Produce and For Whom to Produce.
- ❑ Different Economic Systems: Capitalism, Socialism, Mixed Economy.
- ❑ The Government and the Economy.

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## Unit 1

### Lesson 1: Nature and Methodology of Economics

#### Objectives

After studying this lesson, you will be able to:

- State the nature of Economics;
- Distinguish between inductive and deductive methods;
- State the format of an economic theory;
- Distinguish between positive and normative analysis; and
- Distinguish between Microeconomics and Macroeconomics.

#### Nature of Economics

Economics is a social science which deals with economic activities of people. People have unlimited wants, but the resources required to satisfy these wants are limited. Scarcity of resources in the presence of unlimited wants gives rise to all economic activities. If the resources were not scarce, there would not be any economic activity at all. With unlimited resources, a person could get as much as he would like to have without doing any work. Economics is rightly called the study of the allocation of resources for satisfying human wants.

Economics is rightly called the study of the allocation of resources for satisfying human wants.

Since people cannot satisfy all wants using limited resources, they have to choose the most and urgent ones from unlimited wants. A person may feel the wants for food, color television, and a host of other items, but he must meet his want for food before anything. The choice problem arises also because a resource has alternative uses. For example, a piece of land can be used for growing paddy in it, or it can be used for building a market on it or it can be put to any other use its owner thinks most profitable. Once its owner has put it to one use, it cannot be used for other purposes. The best use of a resource can be assured by utilizing it to meet the most urgent and important wants. The definition of Economics is based on the fundamental concepts of unlimited wants, limited resources, the choice problem, and alternative uses of resources. Professor L. Robbins refers to these concepts in his definition of Economics which says, "Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses."

The ideas put earlier can be clarified with specific examples. Any human activity related directly or indirectly to satisfaction of human wants is called an economic activity. Economic agents and institutions like households, consumers, production firms, banks, etc., participate in economic activities like production, exchange, consumption, etc. Each economic agent in the economy is presumed to be an independent decision making unit. Economics formalized the decision-making processes of different economic agents under different behavioral assumptions about different economic agents. Suppose, a hungry person has some money in her/his pocket. She/he can eat her/his lunch or buy a shirt with his money. Since he is hungry, he decides to eat lunch. We assume that the person wants to maximize his satisfaction by consuming a bundle of two or more commodities that she/he can buy with her/his money. Economics sets and

Any human activity related directly or indirectly to satisfaction of human wants is called an economic activity.

explains the decision-making process of a satiation (utility) maximizing consumer. In short, Economics provides the guidelines for making the best use of resources in every sphere of an economic person.

Study of Economics teaches a person five important things, viz., economic reasoning, economic terminology, economic insights, information about economic institutions, and economic policy options.

Let's be more specific. In addition to general applicability of economic principles mentioned earlier, the study of Economics teaches a person five important things, viz., economic reasoning, economic terminology, economic insights, information about economic institutions, and economic policy options. First, the study of Economics changes the attitude of person towards life. People trained in Economics analyze everything in terms of costs and benefits. They do something if the benefits of doing it exceeds its costs and don't do something if costs exceed benefits. Second, the study of Economics helps a man appreciate different economic terminologies like GDP, corporations, growth rate, money supply, etc. Third, the students of Economics gain insights about functioning of an economy, exchange rate fluctuations, etc. It is almost a miracle that an economy comprising hundreds of thousands economic agents with diversified and conflicting interests functions spontaneously and systematically without any chaos and anomaly. Fourth, Economics provides the appreciation about the roles of different economic institutions like corporations, government, and cultural norms in our lives. Finally, knowledge of Economics enables a person to appreciate the consequences of government economic policies like a rise in tax rate, a reduction in budget deficit, etc.

### **Methodology of Economics**

Economics experiments with human being who cannot be subjected to such controlled experiments.

Economics is a science in the sense that it employs scientific methods of acquiring and disseminating knowledge. There is, however, a sharp distinction between the methods of acquiring knowledge used in Economics and those used in natural sciences like physics, chemistry, etc. The natural sciences conduct controlled experiments with inanimate matters and animals in laboratories whereas Economics experiments with human being who cannot be subjected to such controlled experiments. Moreover, randomness is a latent feature of human behaviour. The science of Economics formalized the systematic pattern of economic behavior of a person, if any, notwithstanding the wide fluctuations in his behaviour. Nevertheless, Economics uses scientific methods of acquiring knowledge. Broadly speaking, there are two methods of gathering knowledge, viz., deductive and inductive methods. Our next task is to determine which of the two methods is used in Economics.

### **Deductive Versus Inductive Methods**

Deductive reasoning starts with general statements. To make inferences for particular observation in the form of singular statement the following example illustrates deductive reasoning :

Man is Mortal  
Rahim is a man.  
Rahim is Mortal

Most of the mathematical theorems are general statements, and working out the exercises following the theorems constitutes application of deductive reasoning. Much of scientific knowledge is, however, based on inductive reasoning.

Inductivism requires that knowledge be based on empirical evidence consisting of singular observations. Consider the following example of inductive reasoning :

- A man named Karim died.
- Another man named Rahim died
- Another man named Rahman died.
- ∴ Man is mortal.

For some times people thought that the inductive method was the appropriate method of acquiring scientific knowledge. Newton was thought to have arrived at the laws of Physics using the inductive methods. But, at the end of the nineteenth century, David Hume, a famous philosopher and friend of Adam Smith, observed that there is a problem in inductive method. No finite quantity of singular observations could ever prove that any given general statement is true. Suppose, you had the single observation that the sun rose in Dhaka on March 21, 2000. So, what is the proof that it will rise tomorrow? The entire universe might collapse or a major natural disaster might destroy the sun tonight. It is impossible to prove the truth of any knowledge on the basis empirical observations.

The economists are aware of the problem of induction and instead of proving the absolute truth of economic theory (knowledge), they use some acceptable measures of truth for evaluating their theories. The economic theories, though expressed in forms of general statements, are based on incomplete induction. They use deductive arguments and the criterion of logical consistency to derive conclusions for particular observations. The discrepancies between the predictions of the theories and the real observations are examined, and these theories are confirmed or refuted using the conventional measures of truth. This method of acquiring knowledge blending the deductive and inductive methods and using conventional criteria may be called the conventional method .

The economic theories are based on incomplete induction.

**The Format of Economic Theory**

The preceding paragraphs gave you some general ideas about the methodology of Economics. Let's now explain the specific format of an economic theory. An economic theory starts with a set of assertions or postulates, denoted  $A = \{A_1, A_2, \dots, A_n\}$ , concerning the behaviour of an economic agent. For example, the postulate may be that consumers maximize utility. The second part of a theory consists of a set of testable conditions denoted by  $C = \{C_1, C_2, C_3, \dots, C_n\}$ . The testable conditions must be observable. For example, if consumers maximize utility, they must buy a smaller quantity of a normal good when its price goes up. The increased price of the normal good is observable and hence constitutes the testable conditions of the theory. The third part of the theory comprises a set of events,  $E = \{E_1, E_2, \dots, E_n\}$ , predicted by the theory. In this example, the prediction is that the consumer will buy a smaller quantity of the normal good. By observing the quantities of normal good bought at different prices, we can examine whether the prediction of the theory is right. The logical structure of economic theory can be shown by the following arrow diagram:

$$A \rightarrow (C \rightarrow E)$$

It means that if A is true, then C implies E. In this example, if consumers maximize utility (A), then a rise in the price of a normal good (C) will lead to a

fall in the quantity of the normal good bought (E). If the prediction is found to be correct, then the theory is confirmed, not proved. If the prediction is wrong, then the theory is refuted. We mentioned earlier that we cannot prove the absolute truth or falseness of a theory. A useful theory must be refutable but is not refuted. Suppose, we have a theory saying that 'it will or will not rain tomorrow.' This theory cannot be refuted anyway and hence is not interesting at all. To be interesting, all theories must be refutable. An economic theory cannot be proved or disproved. An economic theory is confirmed if the prediction of the theory is true and refuted if the prediction is wrong.

### Positive Versus Normative Analysis

Normative analysis is concerned with value judgements about economic agents.

Positive analysis is concerned with the description of economic phenomena as these are. It analyzes organizations, functions and interactions of economic agents in the economy. It also deals with the nature and consequences of different economic policies. Normative analysis is concerned with value judgements about economic agents. Normative analysis discusses how an economic agent should behave, whereas positive analysis discusses how it behaves. Normative analysis suggests what policy a government should take, whereas positive analysis discusses the consequences of different policies. Suppose, for example, the government proposes enacting a law that determines the minimum wage for workers in ready-made garments industry in Bangladesh. Positive analysis deals with the following aspects of the minimum wage regulation:

- What will be the implications of minimum wage for employment level and price of garments?
- Who will be the beneficiaries and who will be the losers?
- What will be the net effect of minimum wage regulation for the economy as a whole?
- How will the efficiency and equity of the national economy be affected?

Normative analysis is concerned with the question of whether the government should implement the minimum wage act at all. It will take a host of economic and non-economic factors into consideration for making value judgments on this issue.

It should be noted that much of economic analysis are positive. A few topics in Economics, however, are normative in nature. Finally, we can think of another type of economic analysis, known as the art of Economics. It discusses the methods of applying the knowledge obtained in Positive Economics to achieve the goals determined in Normative Economics. Suppose, we have decided to achieve a particular type of distribution of income in the economy. Given the way the economy works, how can we obtain the specified pattern of distribution of income ? The art of Economics provides answers to this type of questions.

Microeconomics analyzes the decision-making processes of different economic agents under different behavioral assumptions.

### Microeconomics Versus Macroeconomics

Microeconomics deals with behavioral patterns of the smallest economic agents which make their decisions independently. It shows how allocation of resources, production of commodities, determination of price, etc., are affected by the independent decisions of the consumers, producers and other economic agents. Microeconomics analyzes the decision-making process of different economic

agents under different behavioral assumptions. For example, it deals with utility-maximizing behavior of a consumer, profit maximizing behavior of a competitive firm, revenue-maximizing behavior of an oligopolist, etc. Consumer, households, production firms, markets for products, markets for inputs are a few examples of microeconomic topics. Not only microeconomics discusses the behavior of the smallest independent decision units, but also discusses the interactions emerging among different economic agents.

Macroeconomics deals with aggregate variables facing an economy. Gross national product (GNP), aggregate employment level, the general price level, the growth rate of the economy, etc., are few examples of macroeconomic topics. The macroeconomic topics are quite distinct from the microeconomic topics. For example, Macroeconomics shows how the equilibrium levels of income and consumption of the economy are determined, whereas Microeconomics determines the utility maximizing levels of commodities of a consumer. Microeconomics discusses the determination of relative prices of the commodities and services and Macroeconomics discusses the determination of general price level in the economy.

Macroeconomics deals with aggregate variables facing an economy.

The assumptions of the two branches of Economics are, of course, different. Microeconomics assumes prices of other commodities and services to remain fixed when it explains the determination of price of one commodity. Macroeconomics, on the other hand, assumes that the relative prices have already been determined when it explains the determination of the general price level. In some cases, the boundaries of Microeconomics and Macroeconomics are overlapping. For example, one topic of Microeconomics is general equilibrium analysis which shows the simultaneous equilibrium of all consumers and production firms in the economy. On the other hand, Macroeconomics analyzes separately the determinants and functioning of bond market, labor market, etc.

Finally, we should note that the values of Macroeconomic variables are not equal to sums of values of microeconomic variables. The study of Macroeconomics will not be necessary and interesting if macroeconomic variables can be created by adding microeconomic variables. It can, however, be asserted that the two types of variables are quite distinct. Consider, for example, the case of transfer payments to a person, who wins a lottery award of forty lakh taka. There is no doubt that the income of the person has increased, but national income has not increased due to the increment in personal income. In other words, national income does not reflect the increment in personal income in this case.

The values of Macroeconomic variables are not equal to sums of values of microeconomic variables.

## Review Questions

- ***Essay-type Questions***

1. What is Economics? Is Economics a normative or positive science? Illustrate your answer.
2. Distinguish Microeconomics from Macroeconomics. What are the uses and limitations of Microeconomic theories?
3. How are economic theories formulated? What are their uses and limitations?

- ***True or False***

Which of the following statements are true?

- (a) An economic system is a social organism.
- (b) An economy is a coordinated system of production, consumption and distribution activities.
- (c) An economic system works through such institutions as households, farms, firms, factories, banks, schools, hospitals, government etc.
- (d) Price mechanism is a process through which prices are automatically determined.
- (e) Economics is rightly called the study of the allocation of resources for satisfying human wants.
- (f) Deductive reasoning starts with general statements.
- (g) Macroeconomics discusses the determination of general price level in the economy.
- (h) Normative analysis is concerned with value judgements about economic agents.

- ***Multiple Choice Questions***

1. The problem of choice between the various uses of resources arises because:
  - (a) resources are scarce
  - (b) resources have alternative uses
  - (c) resources are scarce and have alternative uses
  - (d) alternative uses have different productivity
  - (e) productivity of scarce resources varies in their alternative use and producers want to maximise their gains.

2. Microeconomics is the study of decision making behaviour of:
  - (a) a group of individuals
  - (b) an individual or a household
  - (c) society as a whole
  - (d) none of the above
  
3. Economics is:
  - (a) a positive science
  - (b) a normative science
  - (c) both a positive and a normative science
  - (d) neither a positive nor a normative science
  - (e) not a science
  
4. An economic theory is a statement of:
  - (a) economic facts
  - (b) economic tendencies
  - (c) realities of economic life
  - (d) none of the above
  
5. The validity of an economic theory is judged by its power:
  - (a) to explain an economic phenomenon
  - (b) to predict the course of an economic phenomenon
  - (c) to prove or disprove a hypothesis
  - (d) to reveal the economic laws
  
6. Economic theory is like a movie or stage play because:
  - (a) it draws attention to the important information bearing on making a decision or solving a problem
  - (b) it provides entertainment for both students and teachers
  - (c) it is a mystery to most people
  - (d) it has little economic value to society
  
7. Which of the following is not Macroeconomic variable:
  - (a) gross domestic product
  - (b) price level
  - (c) level of employment
  - (d) profit of a firm

## Lesson 2: The Basic Problems of an Economy

### Objectives

After studying this lesson, you will be able to:

- State the basic problems of an economy;
- Define opportunity cost and derive the production possibility curve;
- State the solutions of fundamental problems under alternative economic systems; and
- State the role of government in Economics.

### Basic Problems of an Economy

The problems of an economic society are, symbolically expressed by three question words, viz., what?, how? and for whom?

The central problems of an economic society is similar to the individual problems except for the fact that the problems now relate to the economy as a whole. The main problem is the scarcity of resources in the face of unlimited wants. The scarce resources have, however, alternative uses. The problems of an economic society are, symbolically expressed by three question words, viz., what?, how? and for whom? The problem of deciding the level of investment can be added to the above list. We discuss each of these problems systematically by turns.

#### The problem of Allocation of Resources: What?

The term 'what?' refers to the problem of allocating resources to the production of commodities and services. It is the problem of determining the commodities and services which will be produced. Related to this problem is the necessity of determining the quantities of selected commodities and services. Had the resource been not scarce, the necessity of selecting and determining the quantities of the commodities and services wouldn't have arisen? The concepts of opportunity cost and production possibility curve can be employed to explain the problem expressed by the word, 'what?'

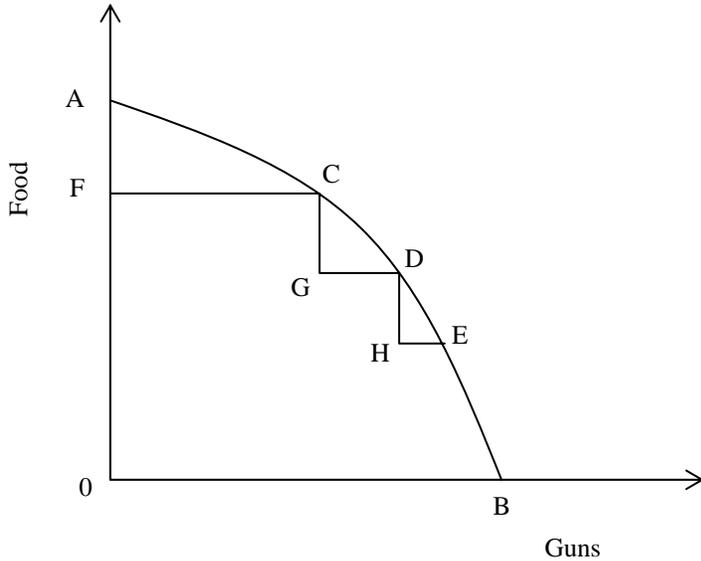
#### *Opportunity Cost and Production Possibility Curve*

Opportunity cost of undertaking an activity is the forgone benefit from the next-best activity.

Since the concept of opportunity cost is crucial in Economics. We intend to present a detailed analysis of the concept. Opportunity cost of undertaking an activity is the forgone benefit from the next-best activity. Though a resource has alternative uses, it cannot be put into more than one use at the same time. If the owner of a piece of land decides to build a house on it, the opportunity cost of the house will be the forgone benefit from its next-best use which is, say, growing paddy in it. The opportunity cost of reading this Economics text-book is the lost time that could be spent reading the Accounting text book.

The idea of opportunity cost can be explained with the help of an opportunity cost curve, alternatively known as *production possibility curve*. Suppose, a hypothetical economy can produce only two commodities, guns and paddy, by using all its resources. The production possibilities of the economy is shown in Figure-1.1. We measure the quantity of food in million metric tons along the vertical axis and the number of guns in millions along the horizontal axis. Initially, the economy is at point A producing OA quantity of food and no guns.

Perhaps both the people and the government of the economy express their dissatisfaction in having no guns and would like to produce FC guns by sacrificing AF quantity of food. In other words, the opportunity cost of FC guns is AF quantity of food. Some resources previously used in producing food were released and shifted to the production of guns. Consequently, the production of food fell when the economy stand to produce a small number of guns.



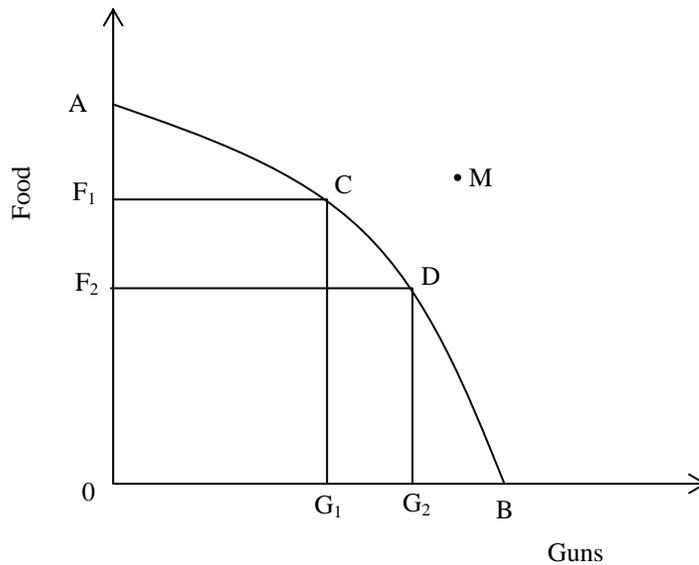
**Figure 1.1 : Production Possibility Curve**

Suppose the new military ruler of the country wants more guns. The economy moves to D from C gaining GD guns at the cost of GC tons of food. Similarly, to obtain HE additional units of guns, the economy has to sacrifice DH units of food. It can be easily seen that the amount of sacrifice of food for each extra unit of gun is rising gradually. In economic terminology, this phenomenon is known as increasing marginal opportunity cost or increasing marginal cost in brief. There is, of course, an economic explanation for increasing marginal cost. When the economy was producing a large amount of food and a small number of guns initially, some of the resources used in food production were indeed more suitable to gun production. The resources having comparative advantage in gun production were released for gun production when the economy started to produce more guns. As a result, the opportunity cost of producing guns was low initially. As the economy increased the production level of guns further, some of the resources having comparative advantage in food production had then to be shifted to gun production. Consequently, the opportunity cost of producing guns increased with increase level of gun production. Needless to say, the phenomenon of increasing marginal cost makes the production possibility curve concave to the origin.

It should be noted that the production possibility curve shows efficient production levels. At each point on the production possibility curve, the economy produces the two commodities as much as possible with given resources. Take, for example, the production level shown by H in Figure-1.1, which is clearly inefficient. Using the given resources, production level can be pushed to D which shows increased quantity of food with no change in the production level of guns.

Or, it can be shifted to E where production of guns increase, whereas production of food remains fixed. Production of both commodities will increase if the production shifts to any point between D and E.

Now that we have explained the concept of opportunity cost and illustrated the derivation of production possibility curve which entails opportunity cost. We can use the production possibility curve for explaining the problem denoted by the word 'what?'. The production possibility curve shows the different bundles of two commodities, food and gun, that can be produced utilizing all the available resources in the economy. For example, the country can produce the combination shown by C or the combination shown by D in Figure-1.2. Combination C signifies  $F_1$  tons of food and  $G_1$  units of guns. Similarly, combination D shows  $F_2$  tons of food and  $G_2$  units of guns.



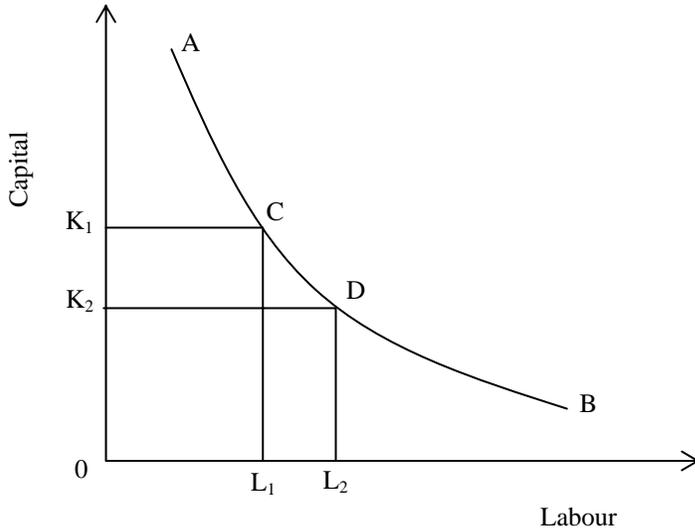
**Figure 1.2 : Production Possibility Curve**

Each point on the curve AB shows a specific combination of two commodities. The country chooses one and only one combination from the set of many combinations on the curve AB. It cannot choose more than one combination on the curve. Similarly, it cannot choose the point M, which it cannot produce with the given resources. It would not choose any point below the production possibility curve because production at such a point would entail inefficiency in production. The word 'what?' refers to the problem of choosing one specific combination of the two commodities from a large number of combinations lying on the efficient production frontier AB.

**The Problem of Selecting Method of Production: 'How?'**

The abbreviated question 'how?' refers to the problem of the choice of the method of producing the selected commodities. There are different methods of producing the predetermined quantities of a number of commodities and services. For example, there are labour intensive and capital intensive methods of production. Normally, production of a commodity or service requires all inputs of production. The quantities put in the production of a commodity may be changed, because, one input may be substituted another depending on the relative prices of

two inputs. Method of producing commodity is called labour intensive when more labour and less capital is used in the production process of that commodity. Input intensity of a commodity can also be defined in relative terms. Gun is said to be more capital intensive than food when the ratio of capital to labour in gun production is larger than the corresponding capital labour-ratio of food production. It should be noted that the method of production depends on technology of production and prevailing input price.



**Figure 1.3 : Production Possibility Curve**

Figure 1.3 explains the nature of the second problem denoted by the term 'how?'. Here, we introduce the concept of equal product curve, alternatively known as iso-quant. An equal product curve shows the different combinations of two inputs, which produce a given quantity of output. The curve AB in Figure 1.3 is an equal product curve. The vertical axis of Figure 1.3 measures capital and the horizontal axis measures labour. Combination C with  $OK_1$  units of capital and  $OL_1$  units of labour can produce as much of the commodity as the combination D with  $OK_2$  amount of capital and  $OL_2$  amount of labour can produce. Input allocation at C, however, implies a capital intensive method of production, because, at C production of the commodity requires more capital than labour. Similarly, combination D implies a labour intensive method of production. Each point on the curve AB implies a distinct capital labour ratio and hence a distinct production process of the commodity in question. The choice problem indicated by the word 'how?' refers to the problem of choosing one of several methods of production shown along different points of an equal product curve.

**The Problem of Distribution: 'For Whom?'**

The third problem of an economic society abbreviated by the phrase 'for whom?' refers to the problem of distribution of the produced commodities and services among the consumers. An economy may be endowed with many natural and non-natural resources so that it can produce a large volume of goods and services. The people of the economy might still face problems in meeting their wants for daily necessities if most of the produced commodities and services go to the consumption of a small section of the people. Most LDCs face the problems of

both inadequate resources and distribution of income. In Bangladesh, small proportion of population are rich, because, their fore fathers were rich and these people have much more than they would like to have. Majority of the people here live under the poverty line. The big question is: should we ignore it and endure with the existing distribution of income as happily as ever? We also face the problem of physically crippled and mentally retarded persons who are unable to work. Should these persons be left unprovided to starve to death? The central authority of an economy often faces these types of questions. The problem expressed by the phrase 'for whom?' refers to the problem of selecting a widely accepted criterion of distributing income among hundreds of millions of people living in the country.

### **Problem of Determining the Rate of Investment**

Capital is produced means of production.

The fourth problem of an economic system refers to the problem of determining the rate of investment for the economy. Investment increases the size of capital stock by adding new capital to the previously existing stock of capital. Capital is produced means of production. It is a kind of commodity used as input for producing more commodities in future. Investment comes from saving, which in turn is obtained by postponing present consumption. We need higher levels of investment to attain higher growth rates of the economy in future. Future consumption levels of people will be higher if the economy grows at a higher rate. In other words, there is a trade-off between present and future consumption levels. A little sacrifice at present may make our lives much more comfortable in future. The central authority of an economy has to determine the amount of present sacrifice in the form of investment for attaining higher growth rate of the economy in future.

### **Solutions of the Fundamental Problems Under Alternative Economic Systems**

#### ***Socialist and other Centrally Planned Economics***

In socialist and other centrally planned economies, the answers to the fundamental questions are dictated by central authority under the Government. Usually, a planning commission under close supervision of the Government takes decisions about the nature and production targets of different commodities and services. In doing so, the planning commission usually makes use of the vast wealth of data on consumers' tastes, preferences, and demand and supply conditions prevailing in the country. In allocating resources, the central planners give more emphasis to those commodities and services which, they believe, are socially beneficial. The central planners choose the method of production which is, according to them, ideally good for the country. In distributing the produced commodities, the central planners use the criterion of "to each according to her/his need" as determined by them. The central planners again determine the rate of investment for the economy.

A market for a commodity is the collection of consumers and suppliers for that commodity.

#### ***Capitalist Economy***

In a capitalist economic system, answers to the four fundamental questions are provided through the operation of the market mechanism in the economy. A market for a commodity is the collection of consumers and suppliers for that commodity, who interact among themselves for exchanges. The participants of

the market need not be concentrated in one place. They may be widely scattered all over the whole country or beyond the national geographic boundaries. Operation of the market economy presupposes fulfilment of three conditions. **First**, people are assumed to enjoy unfettered freedom in making decisions about economic activities like consumption, production, etc. This psychological view is often referred to as individualism, which ensures that only individuals make decisions without being influenced by any authority and by any other pressure group. **Second**, in a market economy every economic agent is supposed to be a maximizer. For example, a consumer tries to maximize her/his satisfaction by consuming commodities and services. The producer tries to maximize her/his net profit which is equal to total revenue minus total cost. In a capitalist economy, everybody is motivated by her/his self-interest. The attempt to augment self-interest by everybody in the economy leads to discipline and integration among the diversified economic activities of different economic agents in society. **Third**, market economy can work properly only when private property rights are well defined and defended by the government. Private property rights include unfettered control over an asset or the right to do something without encroaching on others' rights.

In a market economy every economic agent is supposed to be a maximizer.

Let's now explain how a market economy provides answers to the four fundamental questions. In a market economy, price is determined at the point where aggregate demand equals aggregate supply. Price acts as signal in the market economy. It is said that consumers are sovereign in a market economy. It is the consumer who determines the allocation of resources to different commodities and services. They decide which commodities and services will be produced in the economy. Their preferences are expressed through prices. If consumers' demand for a commodity increases, the market price of that commodity goes up. Since producers are profit maximizers, increased price of a commodity acts as a signal to the producers for increasing production of that commodity. Thus, the message of consumers' preferences is conveyed to the producers through the price system. Quantity of the selected commodity is also determined through the price system. Producers must produce that level of output at which demand is equal to supply. If the producers produce more than the equilibrium quantity, they will not be able to sell all output. If they produce less than the equilibrium quantity, they will not be able to meet all the demand from the consumers.

We now illustrate how market mechanism determines the method of production. Since a producer's ultimate objective is to maximize her/his profit, she/he will always use the cheapest method of production. A method of production will be the least expensive method if it uses the cheap inputs more than the dear inputs. An input is cheaper when its relative abundance in a country makes its price lower. Thus, market determines how commodities and services should be produced.

Distribution of the produced goods and services also takes place through the market mechanism. Every economic agent has a dual role in a market economy: she/he is a consumer and a supplier of productive input at the same time. By supplying the inputs, she/he earns income which she/he spends on consumption. A person's purchasing power will be higher if the price of the input supplied by her/him increases due to increased demand for that input. A person's income will be lower if there is less demand for her/his input. A person's income is,

Every economic agent has a dual role in a market economy: she/he is a consumer and a supplier of productive input at the same time.

therefore, dependent on the price and quantity of input sold by her/him. The price and quantity of input sold are determined by market forces. A person's income will also be higher if she/he inherits a large volume of wealth and income from her/his forefathers. A person with higher income will consume more commodities and services than another person with lower income. Thus, the question who consumes the produced commodities is also determined by the market mechanism, because, the price of input is also determined by market forces.

Finally, the rate of investment in a capitalist economic system is also determined by the market. People's attitude toward investment depends on the rate of interest and a host of other factors. The rate of interest and other determinants of investment are determined by forces of demand and supply prevailing in a capital market. The capital market integrates the demand for and supply of loanable funds in an economy through different financial institutions like banks, stock markets, etc. Thus, the market mechanism also determines the rate investment in the economy.

### ***Mixed Economy***

Market economies having both private and public ownerships may be called mixed economic systems.

It should be noted that pure capitalism is rare in real world. In most of the capitalist countries of the world, governments have means of controlling the markets, though answers to the fundamental question are sought through market mechanism. Private ownership of some key sectors of the economy are replaced by state ownership. In USA, anti-trust laws are in vogue to check and curb the emergence of monopoly powers. Market economies having both private and public ownerships may be called mixed economic systems. We have a mixed economic system in Bangladesh where some enterprises are owned and managed by the state.

### **The Role of Government**

The role of government in economic affairs of the state is pervasive in socialist and other centrally planned economies. As mentioned earlier, a planning commission under close supervision of the government determines the answers to four fundamental problems of an economy. The proponents of market economy discourage any intervention in free functioning of market mechanism. They would like to restrict the role of the state to maintenance of law and order in society so that economic forces and agents can work undisturbed. The non-interventionist view of the role of the state is now held in abeyance. Especially, the theory of demand management put forward by the great economist John Maynard Keynes brought the government to the forefront as the most important economic institution for devising and implementing different economic policies. The intervention of government in economic affairs of the state is sought from another perspective also. It has been theoretically and empirically proved that market economy performs better than any other economic system in providing answers to three fundamental questions with the exception of the answer to the problem of distribution. The superior performance of the market economy is contingent on fulfilment of some conditions. Moreover, the market economy can achieve the desire goal of efficiency if the market structure is competitive. There are a few cases where market economy cannot work. The major problem is that market structure is not competitive for most of the commodities and services. In

such a dismal situation about the efficiency of market economy, the government has a significant role in facilitating and encouraging unhindered functioning of market economy. The government can use different kinds of policy tools to correct market failures. Only then the market economy can function properly. Despite the importance of government interventions, theoretical controversies about the role of the government in economic affairs are still on. In reality, however, most governments of capitalist economic systems frame and implement economic policies to achieve economic goals.

The government can use different kinds of policy tools to correct market failures.

## Review Questions

### • *Essay-type Questions*

1. What is economy? What are the basic problems of an economic system?
2. What is price mechanism? How does it solve the central problems of an economy?
3. What are the basic economic problems? Explain as to how they arise due to the scarcity of resources.
4. What are the features of a mixed capitalist economic system? Does price mechanism help in solving the problems of allocation of resources in such an economy in the most efficient way?
5. How are the central problems of an economy solved in a capitalist economy?
6. What are the three economic questions that must be answered by every society?
7. (a) What role do market prices play in answering the first two of the three economic questions?  
(b) What determines how much of the output of the private sector a person can claim?
8. Suppose there is a sudden cutoff of oil from the Middle East, as occurred in the early 1970s. Trace the effects of this disruption in a market economy.
9. (a) What is the main argument used to justify a centrally planned economy?  
(b) What are the main problems of this economy?
10. Suppose your instructor announces during the first class that everyone, regardless of performance on exams, will receive a C in the course. How would you react? Now compare the analogy to the entire economy.

### • *True or False*

Which of the following statements are true?

- (a) Price mechanism allocates resources between competing industries in the most efficient way.
- (b) Market mechanism is a self-propelled system which determines what to produce, how to produce and for whom to produce.
- (c) In modern economics, consumer is sovereign.
- (d) All is well with the free enterprise economics.
- (e) The idea of opportunity cost can be explained with the help of production possibility curve.
- (f) The main problem of an economy is the scarcity of resources in the face of unlimited wants.

- (g) Any point below the production possibility curve would entail inefficiency in production.
- (h) Market economy can achieve the desired goal of efficiency if the market structure is competitive.

• ***Multiple Choice Questions***

1. Which of the following topic(s) is (are) included in the study of microeconomics?
  - (a) how consumers maximize utility
  - (b) how producers maximize profits
  - (c) how prices are established
  - (d) all of the above
2. Economics exists:
  - (a) to provide employment for economists
  - (b) to provide intellectual stimulus for students and teachers
  - (c) because human wants exceed the resources available to satisfy these wants
  - (d) because the ability to produce exceeds the ability to purchase, thereby causing employment
3. Which of the following involve making an economic decision?
  - (a) how to allocate one's income across a variety of alternatives
  - (b) the allocation of study time between economics and other courses
  - (c) deciding whether to attend a basketball game or go to a movie
  - (d) all of the above
4. Which of the following is not one of the three economic questions that every society must answer?
  - (a) what and how much of each good should be produced?
  - (b) how much employment and inflation to have?
  - (c) how should each good be produced?
  - (d) for whom should the output be produced?
5. In the private sector of a market economy, which of the following provides the information and the incentives to act on it in regard to what and how much of each good should be produced?
  - (a) the government
  - (b) prices
  - (c) farmers
  - (e) taxes

6. In the private sector of a market economy, prices are established by:
  - (a) the government
  - (b) markets
  - (c) sellers
  - (d) the central planning committee
7. Markets are made up of:
  - (a) buyers
  - (b) sellers
  - (c) members of the FBCCI
  - (d) a and b
8. In a market economy, goods and services are produced for those people who have:
  - (a) the greatest political influence
  - (b) the money to purchase them
  - (c) the greatest need
  - (d) ration coupons
9. In the private sector of a market economy, ..... determines how much of each good a person can consume. Most societies have enacted policies or programs enabling their low-income people to increase their consumption of ..... :
  - (a) the government; necessities
  - (b) income; necessities
  - (c) the government; luxuries
  - (f) income; luxuries
10. Which of the following is not a public good?
  - (a) military
  - (b) food
  - (c) streets and highways
  - (d) police and fire protection
11. In centrally planned economies, resources are allocated to alternate uses by ..... This system has turned out to be ..... efficient than the process employed by market economies
  - (a) relative prices; more
  - (b) the government; more
  - (c) relative prices; less
  - (d) the government; less

12. Centrally planned (Communist or Socialist) economies have fallen out of favor throughout the world because of:
- (a) restriction on personal freedom
  - (b) inability to achieve acceptable economic growth
  - (c) high-level corruption among members of the ruling class (the government bureaucracy)
  - (d) all of the above
13. The basic problems of an economy arises due to:
- (a) scarcity of resources
  - (b) unlimited human wants
  - (c) maximising behaviour of the people
  - (d) desire to satisfy endless wants with limited resources
14. In a free enterprise economy, perfect competition ensures:
- (a) capacity output
  - (b) maximum social welfare
  - (c) efficient allocation of resources
  - (d) all of the above
15. Economic system in Bangladesh is:
- (a) capitatist
  - (b) planned
  - (c) mixed
  - (d) none of the above

# DEMAND AND SUPPLY



## Highlights

- ❑ Law of Demand
- ❑ Individual Demand Curve
- ❑ Market Demand Curve
- ❑ Law of Supply
- ❑ Individual Supply Curve
- ❑ Market Supply
- ❑ Market Equilibrium and Disequilibrium

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## Unit 2

### Lesson-1 : Theory of Demand

#### Objectives

After studying this lesson, you will be able to:

- Define opportunity cost, money price and relative price;
- Define the concept of demand;
- Explain the main influences on demand;
- Explain law of demand;
- Draw demand curve from demand schedule; and
- Describe the relation between individual and market demand.

#### Opportunity Cost and Price

We know that the resources are limited compared to our wants. Since our wants are unlimited, we cannot satisfy all of our wants due to resource constraint. So we have to make choices. And in making choices, we are confronted by opportunity costs. The opportunity cost of an action is the best alternative forgone. If the opportunity cost of a good or service increases, people look for less costly substitutes – which is called the principle of substitution – and decrease their purchases of the more costly item.

The opportunity cost of an action is the best alternative forgone.

The number of notes and coins that must be given up in exchange for a commodity is called its money price. For example, if Tk. 5.00 is to be paid for getting a cup of tea, then Tk. 5.00 is the money price of a cup of tea. Similarly, if Tk. 1.00 is to be paid for having a banana then Tk. 1.00 is the money price of a banana. Now think, if you have Tk. 5.00 in your pocket, how can you spend this money? You can buy a cup of tea or 5 pieces of banana. If you buy a cup of tea, then you have to forgo 5 pieces of banana. Here, the opportunity cost of a cup of tea is five pieces of banana. To calculate the opportunity cost of a cup of tea we can use the following formula:

$$\text{Opportunity cost of a cup of tea} = \frac{\text{Money price of a cup of tea } (P_t)}{\text{Money price of a banana } (P_b)} = \frac{P_t}{P_b}$$

The ratio mentioned above (i.e.,  $P_t/P_b$ ) is called relative price. So, a relative price is an opportunity cost. In the above example, we have seen that the relative price or the opportunity cost of a cup of tea is expressed in terms of the pieces of banana. However, this is not the normal way to express the relative price. The normal way of expressing a relative price is in terms of a *basket* of all goods and services rather than in terms of one particular good or service. That is, we divide the money price of a good by money price of a *basket* of all goods that must be given up to buy it (called a *price index*):

$$\text{Opportunity cost of a cup of tea} = \frac{\text{Money price of a cup of tea } (P_t)}{\text{Money price of all other goods } (P_{\text{others}})} = \frac{P_t}{P_{\text{others}}}$$

Therefore, the resulting relative price tells us the opportunity cost of an item in terms of how much of the *basket* of all goods must be given up to buy it.

Throughout this book, we will mean *price* as *relative price*.

### Wants

Wants are always unlimited.

Wants are the unlimited desires or wishes that people have for goods and services. Every person wants to get more and more of goods and services. A person who has a bicycle likes to get a motorcycle. When he/she gets a motorcycle, she/he wants to have a private car and so on. Wants are always unlimited. In these circumstances, a question arises: can people meet all of their wants? The answer is NO. Why? Because, resources are limited.

### Need

Need for a commodity refers to the necessity of the commodity to sustain life. For example, if you tell your friend that you need three tickets for watching a movie if the price is Tk. 30.00 per ticket, it would be easy for your friend to disagree with your statement. She/he could argue that you did not need any movie tickets because watching movie was not necessary to sustain life. But if you say that you want three movie tickets, then it's all right - it cannot be disputed. You can rightly say that you need a glass of water to quench your thirst. In this lesson, we are concerned with *wants*, not *needs* because demand reflects only *wants*.

### Demand

The affordable wants are considered as demand.

You have seen earlier that all of our wants cannot be satisfied due to the limited availability of resources. Only a few number of wants are affordable. Demand reflects the decision about which wants are to satisfy. That is, the affordable wants are considered as demand. So we will say the consumer has demand for commodity X if (if and only if) the following things are true:

- The consumer has want for commodity X, i.e., commodity X has the ability to meet the desire of the consumer.
- The consumer is willing to have it.
- The consumer has sufficient purchasing power to buy the commodity.

### Quantity Demanded

The quantity demanded of a good or service is the amount that people are willing and able to purchase at each price in a series of possible prices during a specified period of time. Three important things are to be noticed when someone thinks about *quantity demanded*:

- Quantity demanded is a desired quantity - not necessarily the same amount as the people actually bought. Quantity demanded may be a different amount than people actually succeed in purchasing. If sufficient quantities are not available, the amount people wish to purchase may exceed the amount they actually do purchase. To avoid confusion, we could use quantity demanded to refer to desired purchase and quantity exchanged to refer to actual purchase.
- The word "Desired" does not refer to idle dreams or future possibilities but to effective demands - that is, to the amounts people are willing to buy given the price they must pay for the commodity. For persons willing to spend Tk. 500 this year on a commodity whose price is Tk. 100 per unit, the quantity demanded is 5 units even though they would prefer to consume much more if only they did not have to pay for it.
- Quantity demanded refers to a continuous flow of purchase. It must, therefore, be expressed as so much per period of time: 1 thousand bananas per day, 7 thousand per week, or 100 thousand per year. If you were told, for example, that the quantity of computers demanded (at current prices) in Bangladesh was 50,000, this would mean nothing. Because you were not told the period of time involved.

### Demand versus Quantity Demanded

Demand refers to the relationship between price and quantity. When we think about the whole demand curve (shown in figure 2.1), we think of demand - the relationship between price and quantity - for the commodity. However, quantity demanded refers to a particular quantity or point on the demand curve. Thus, when we think of a particular quantity, we can avoid confusion by calling it *quantity demanded* rather than *demand*.

Quantity demanded refers to a particular quantity or point on the demand curve.

### Determinants of Quantity Demanded

The amount of any particular commodity or service that consumers plan to buy depends on many factors. The main ones are:

**The commodity's own price:** The amount of a commodity the people will be willing to buy depends mainly on the commodity's own price. If price of the commodity is low, people desire to buy more; if price is high, then people wish to buy less.

**The prices of related goods:** The quantity of a commodity that a consumer plans to buy depends in part on the prices of related goods and services that fall into two categories: substitutes and complements.

A *substitute* is a good that can be used in place of another good. For example, rice substitutes for wheat, sugar substitutes for saccharin, beef substitutes for chicken, mustard oil substitutes for soabain oil, etc. More similarly, burger has many substitutes - hotdog, pizza, sandwich, etc. If the price of one of the substitutes increases, people economize its use and buy more burger. For example, if the price of hotdog rises, more burgers are bought - the demand for burger increases.

A **complement** is a good that is used in conjunction with another good. Some examples of complements are burger and French fries, snacks and drinks, noodles and sauce, running shoes and jogging pants, cements and sand, etc. If the price of french fries increases, people will buy fewer burgers. If the price of cement increases, people will buy less sand. Thus if the price of the complement increases, the demand for a commodity decreases.

When income increases, consumers buy more of most of the goods.

**Income:** Other things remaining the same, when income increases, consumers buy more of most of the goods, and when income decreases, they buy less of most of the goods.

**Tastes:** Tastes are an individual's attitudes towards goods and services. For example, a pop music fanatic has a much greater taste for tapes than does a tune-deaf workaholic. As a consequence, even if they have the same incomes, their demand for tapes will be very different.

**Population:** If the population of the country increases, the quantity demanded of a good increases even though the price of the commodity remains unchanged.

**Other unrelated goods:** If price of a good decreases, you will get more money to spend on books or any other goods or services. On the other hand, if other unrelated goods are not available, then you will have more money to spend on the commodity.

**Expectations :** Expectations have influence on consumer decisions. If someone expects that the price of Sony TV will be decreased within the next few days, she/he will be reluctant to buy a TV set at the moment. If you think that you are going to get a personal computer with more facilities and same price after a few days, would you decide to buy a computer at this moment? Certainly not.

Therefore, due to the expectations about future price, quality, etc. of a product, the demand for the product varies.

Now, think yourself. What is the most important determinant of quantity demanded? Certainly, *own price* of the commodity. Let's know about the relationship between price and demand.

### **Relationship between Price and Quantity Demanded: The Law of Demand**

You have learnt about the determinants of quantity demanded in the above section. Now, if we like to see the influences on the quantity demanded of the commodity's own price, how do we do that? The basic hypothesis is that we have to assume all the determining variables other than commodity's own price are constant.

A basic economic hypothesis about the relationship between price and quantity demanded is:

"Other things remaining the same, the higher the price of a commodity, the smaller the quantity demanded and the lower the price of a commodity, the higher the quantity demanded." Economists call this relationship the **Law of demand**. Here, *other things* indicate the determining factors of quantity demanded other than commodity's own price (see in the table below).

<b>Determining factors of quantity demanded</b>	
Commodity's own price	
Prices of related goods Average income of the consumers Tastes Prices of unrelated goods Expectations about future price Population	} Other things

**On What Basis Does the Price-Demand Relationship (or the Law of Demand) Rest?**

There are several levels of analysis on which to argue the case:

**First**, our common sense says that people ordinarily do buy more of a product at a low price than they do at a high price. A high price discourages consumers from buying, and a low price encourages them to buy. Businesses, for example, Bata, Arong, etc. declare "Sale" sometimes in the year. At that time the products are sold at low prices. Lots of people gather in the sales centers. Within a short period their inventories are exhausted. This is a concrete evidence which makes our belief in the law of demand consistent.

A high price discourages consumers from buying, and a low price encourages them to buy.

**Second**, after a given period of time each buyer of a product will get less satisfaction or utility from each successive unit of a product. The second piece of "biscuit" will yield less satisfaction to the consumer than the first one and the third will still add less satisfaction or utility than the second. As consumption is subject to diminishing marginal utility (see Lesson-2 of Unit-4) - consuming successive units of a particular product yields less and less additional satisfaction, consumers will agree to buy additional units of the product if its price is reduced.

**Third**, the law of demand also can be explained in terms of income and substitution effects. The *substitution effect* indicates that at a lower price of a good, other things remaining the same, the consumers get the incentive to substitute the cheaper good for goods relatively expensive. Consumers tend to substitute cheap products for dear products.

The *income effect* suggests that, at a lower price, other things remaining the same, a consumer can afford more of the good without giving up other goods. In other words, a decline in the price of a product will increase the purchasing power of the consumer enabling her/him to buy more of the product than before. A higher price will have the higher opposite effect. For example, a decline in the price of beef will increase the purchasing power of consumer enabling her/him to buy more beef (the income effect). At a lower price, beef is more attractive and is substituted for mutton, chicken, and fish (the substitution effect). The income and substitution effects combine to make consumers able and willing to buy more of a product at a lower price than at a higher price.

A higher price will have the higher opposite effect.

For detail about the income and substitution effects, see Lesson-3 of Unit-4.

## How Can the Relationship between Quantity Demanded and Price be Portrayed?

Two methods are usually used to do that:

### *First Method: Demand schedule*

This is a numerical tabulation showing the quantity that is demanded at selected prices. Table 2.1 shows a hypothetical demand schedule for biscuits. It lists the quantity of biscuits that would be demanded at various prices on the assumption that average households income is fixed at Tk. 1000.00, and other factors like tastes, expectations, prices of other related goods, etc. do not change. The table gives the quantities demanded for five selected prices, but actually there is a separate quantity that would be demanded at each possible price.

**Table 2.1: Demand schedule for biscuits (hypothetical data)**

	Price per Kg (Tk.)	Quantity demanded (Kg per week)
	$P_t$	$Q_t$
A	10	100
B	15	80
C	20	60
D	30	40
E	60	20

In Table 2.1, we see that as the price of biscuit increases, the quantity demanded for biscuits decreases. That is, there is an inverse relationship between the quantity demanded for biscuit and its own price.

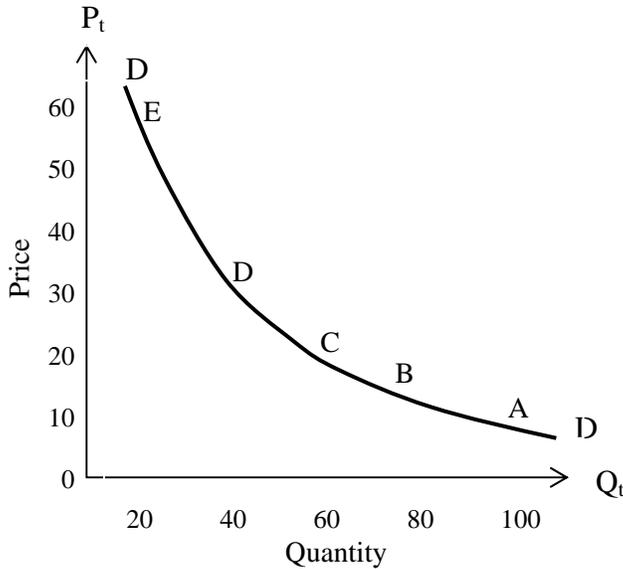
### *Second method: Demand curve or willingness and ability to pay curve*

The relationship between quantity demanded and price can be shown by drawing a graph. If we plot the information given in Table 2.1 in a graph, we get demand curve. Figure 2.1 shows a demand curve which represents the points corresponding to price-quantity pairs of table 2.1.

In Figure 2.1, DD is the demand curve for biscuit. Each point on the DD curve refers to the quantity demanded for biscuit at a particular price. We see that as price of biscuit rises the quantity demanded for biscuit decreases along the DD curve.

### **Properties of a Demand Curve**

- Demand Curve shows the relationship between quantity demanded of a good and its own price assuming that other things remain the same.



**Figure 2.1: Demand Curve for Biscuit**

- Normally, demand curves are downward sloping i.e. the relationship between quantity demanded and price is inverse. The law of demand - people buy more at a low price than at a high price - is reflected in the downward slope of the demand curve.
- The term *demand* refers to the entire relationship between price and quantity. However, a single point on a demand curve refers to the quantity demanded at a particular price. For example, at point C in Figure 2.1, we see that 60 Kg. of biscuits is demanded at a price of Tk. 20.00 per Kg.
- The *slope* of the demand curve changes if the pattern of the relationship between price and quantity demanded changes.
- The *position* of a demand curve changes if the ceteris paribus assumption is violated, i.e., if *other things* such as tastes, income, price of related goods, expectation, etc. change.

A single point on a demand curve refers to the quantity demanded at a particular price.

### What is the Advantage of Graphing the Demand Schedule ?

We see both Table 2.1 and Figure 2.1 contain exactly the same data and reflect the same relationship between price and quantity demanded. However, an added advantage lies with graphing that we can represent clearly a given relationship - in this case the law of demand - more simply than if we relied on tabular or verbal presentation. A single curve on a graph, if understood, is simpler to state and manipulate than tables and lengthy verbal descriptions. Especially, in economic analysis, graphs are invaluable tools. They permit clear expression and handling of complex relationships.

### Change in the Quantity Demanded Vs. Change in Demand

From the above discussion, you have learnt that *quantity demanded* refers to a particular point on a demand curve, whereas *demand* refers to the entire relationship between price and quantity as shown by the whole demand curve. Therefore, if the own price of a commodity changes (i.e., rises/falls), the quantity

demand of that commodity changes along the demand curve; the position of the demand curve does not change. This is called the *movement along the demand curve* (see Figure 2.3). On the other hand, if factors other than price (i.e., tastes, income, population, expectation, etc.) change, the demand changes, which is reflected by the change in the location of the demand curve, i.e., the demand curve *shifts* (see Figure 2.2 below). Hence, the determinants other than the commodity's own price are called *demand shifters*. The chart below shows the reasons and consequence of the change in the quantity demanded and the change in demand for a commodity:

**Chart 2.1: Consequences of the changes in the determinants of quantity demanded**

Possible causes		Consequences		
		Change in quantity demanded	Change in demand	What happens with the demand curve?
Own price	Rise	Decreases		Downward movement along the demand curve
	fall	increases		Upward movement along the demand curve
Price of substitute	Rise		Increase	Outward shift of the demand curve
	fall		decrease	Inward shift of the demand curve
Price of complement	Rise		Decrease	Inward shift of the demand curve
	fall		Increase	Outward shift of the demand curve
Income	Increase		Increase	Outward shift of the demand curve
	decrease		decrease	Inward shift of the demand curve
Population	Increase		Increase	Outward shift of the demand curve
	decrease		decrease	Inward shift of the demand curve
Expectation about future price	Rise		Decrease	Inward shift of the demand curve
	fall		Increase	Outward shift of the demand curve
Taste	Increase		Increase	Outward shift of the demand curve
	decrease		decrease	Inward shift of the demand curve

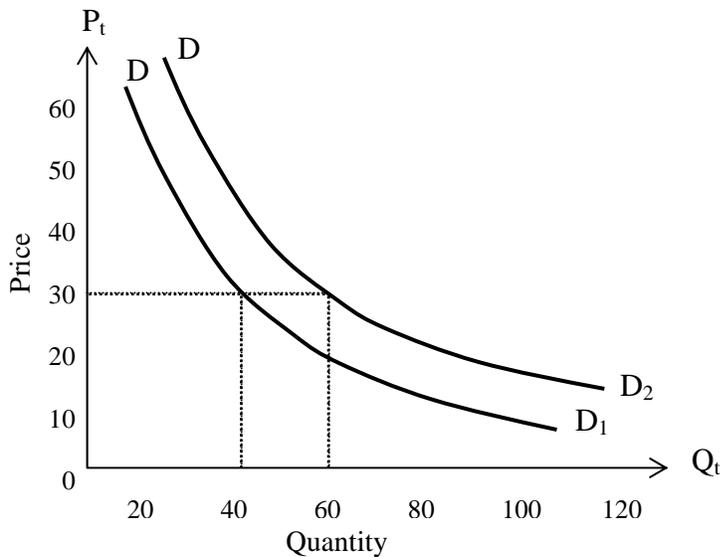
If the factors other than commodity's own price change, the demand does change and the demand curve shifts.

Therefore, if the own price of a commodity changes, the quantity demanded changes but demand doesn't change i.e. the demand curve doesn't shift. However, if the factors other than commodity's own price change, the demand does change and the demand curve shifts. Since the demand curve shifts, at any price the quantity demanded will also be different from the previous amount. For example, if the average income of the people increases by 10%, price remaining same, the demand for biscuits will be more than before. Table 2.2 shows the change in demand.

**Table 2.2: Changes in Demand (hypothetical data)**

Price (Tk. per Kg.)	Quantity demanded (Kg. per week) Average household income = Tk. 1,000	Quantity demanded (Kg. Per week) Average household income = Tk. 1,500
10	100	110
15	80	90
20	60	70
30	40	50
60	20	30

In Column 2 of Table 2.2, the quantity of biscuits demanded at different prices are shown (same as Table 2.1). But in Column-3, the quantity demanded for biscuits is higher than before at each price, though the prices are the same. What's the reason? Because the average income level has been increased. People are now willing to buy more of the commodity (since biscuit is a normal good; for detail see Lesson-3 of Unit-3) because their purchasing power is now higher than



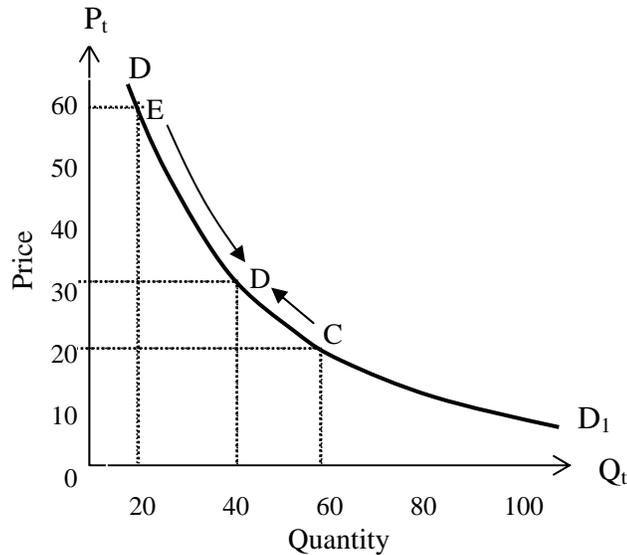
**Figure 2.2: Shift of the demand curve**

before. Graphically, the change in demand is shown by the outward shift of the demand curve, from DD<sub>1</sub> to DD<sub>2</sub> in Figure 2.2.

In Figure 2.2, the initial location of the demand curve was DD<sub>1</sub>. Due to the increase in income, the demand curve has been shifted to the right, from DD<sub>1</sub> to DD<sub>2</sub>. Conversely, due to a decrease in average household income, the demand curve shifts to the left from the initial position. Notice that due to change in income, people now buy more amount of biscuit at the same price. At price of Tk. 30.00, people now buy 60 Kg. biscuits which is 20 Kg. higher than the initial purchase (40 Kg.).

Similarly, if any other determinant (except the commodity's own price) of demand is changed, the demand will be changed causing the demand curve to shift. For detail please see Chart 2.1.

When the own price of the commodity changes, the quantity demanded of the commodity is changed and thus a *movement along the demand curve* occurs. For



**Figure 2.3: movement along the demand curve**

The arrows on the demand curve represent the movements along the demand curve.

example, along the demand curve  $DD_1$  in Figure 2.3, a rise in the price of biscuit produces a decrease in the quantity demanded of biscuit and fall in the price produces an increase in the quantity demanded of biscuit. The arrows on the demand curve represent the movements along the demand curve. Due to the fall in the price of biscuit from Tk. 60.00 to Tk. 30.00, the quantity demanded has been increased by 20 Kg., from 20 Kg. to 40 Kg. This situation is shown by the movement from point E to point D along the  $DD_1$  curve. Conversely, in the case of a rise in price, the consumer moves from point C to point D. In this case, point C is assumed to be the initial point.

Therefore, when any determinant of demand other than commodity's own price changes which increases the quantity people plan to buy, then demand curve shifts rightward (from  $DD_1$  to  $DD_2$  in Figure 2.2) and demand increases. Conversely, if any determinant of demand other than its own price changes that reduces the quantity people plan to buy, the demand curve shifts leftward and demand decreases. On the other hand, if the commodity's own price changes, the quantity demanded changes and the consumer moves from one point to another point along the same demand curve.

### Exceptions to the Law of Demand

The law of demand does not apply to the following cases:

- **Expectations regarding future prices.** When consumers expect a continuous increase in the price of a durable commodity, they buy more of it despite the increase in its price. They do so with a view to avoiding the pinch of a still higher price in future. Similarly, when consumers anticipate a considerable decrease in the price in future, they postpone their purchases and wait for the price to fall to the expected level rather than buy the

commodity when its price initially falls. Such decisions of the consumers are contrary to the law of demand.

- **Prestigious Goods.** The law does not apply to the commodities which serve as a status symbol, enhance social prestige or display wealth and richness, e.g., gold, precious stones, rare paintings and antiques, etc. Rich people buy such goods mainly because their prices are high.
- **Giffen Goods.** An exception to this law is also the classic case of Giffen Goods named after Robert Giffen (1837-1910). A Giffen Good does not mean any specific commodity. It may be any commodity much cheaper than its substitutes, consumed mostly by the poor households claiming a large part of their incomes. If price of such a good increases (price of its substitute remaining constant), its demand increases instead of decreasing. For instance, let us suppose that the monthly minimum consumption of foodgrains by a poor household includes 20 kg. of wheat (an inferior good) at the rate of Tk. 10 per kg. and 5 kg. of flour (a superior good) at Tk. 20.00 per kg. It spends a fixed amount of Tk. 300.00 on these items. Now, if price of wheat increases to Tk 13 per kg., the household will be forced to reduce the consumption of flour by 3 kg. and increase that of wheat by the same quantity in order to meet its minimum monthly consumption requirement within Tk. 300.00. Obviously, the household's demand for wheat increases from 20 to 23 kg. per month despite increase in its price.

They do so with a view to avoiding the pinch of a still higher price in future.

If price of such a good increases its demand increases instead of decreasing.

**Individual and Market Demand**

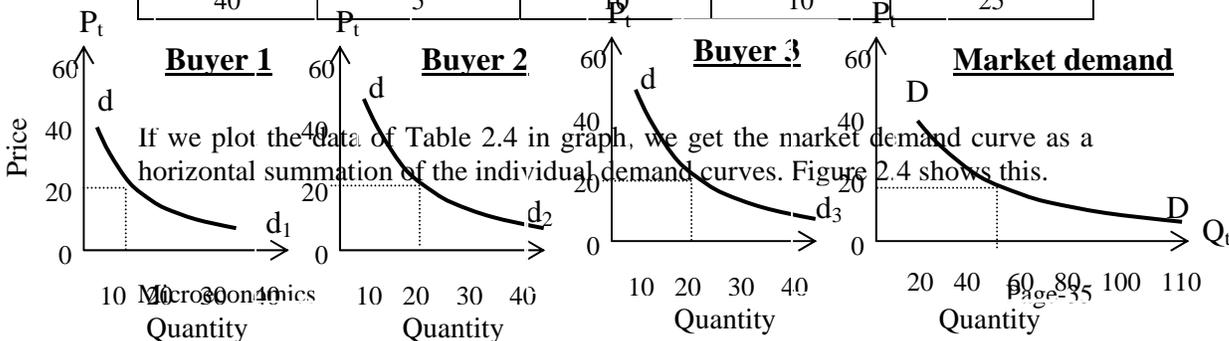
In the previous sections, we have discussed the things related to the individual demand curve and that time we have assumed just one consumer. Certainly, the choices by individuals are the basis of the theory of demand. But the market demand is of primary interest to managers.

Fortunately, the transition from the individual to the market demand schedule is possible. Market demand curve can easily be derived by summing the quantity demanded by each consumer at various prices. The aggregation process is not more difficult than simple arithmetic. If there are just three consumers in the market, it would be easy to determine the total quantities demanded (or market demand) at each price. This is shown in Table 2.4.

Market demand curve can easily be derived by summing the quantity demanded by each consumer at various prices.

**Table 2.4 : Market demand for biscuit, three buyers (hypothetical data)**

Price (Tk.. per Kg)	Quantity demanded			Total quantity Demanded/ Market demand (Kg. per week)
	First buyer (Kg. per week)	Second buyer (Kg. per week)	Third buyer (Kg. per week)	
10	30	35	35	110
15	25	25	25	75
20	15	20	20	55
30	10	15	15	40
40	5	10	10	25



**Figure 2.4: Market demand curve derived from the individual demand curves**

In Figure 2.4, market demand curve is drawn from the individual demand curves. In the figure, we see that at price Tk. 20.00, the demand for biscuit from buyer 1, buyer 2, and buyer 3 are 15 Kg., 20 Kg., and 20 Kg. per week respectively. The market demand at this price is 55 Kg. (=15 + 20 + 20). Similarly, we can see that at each price, the market demand for biscuit is the summation of the quantity demanded by individual buyers at that price.

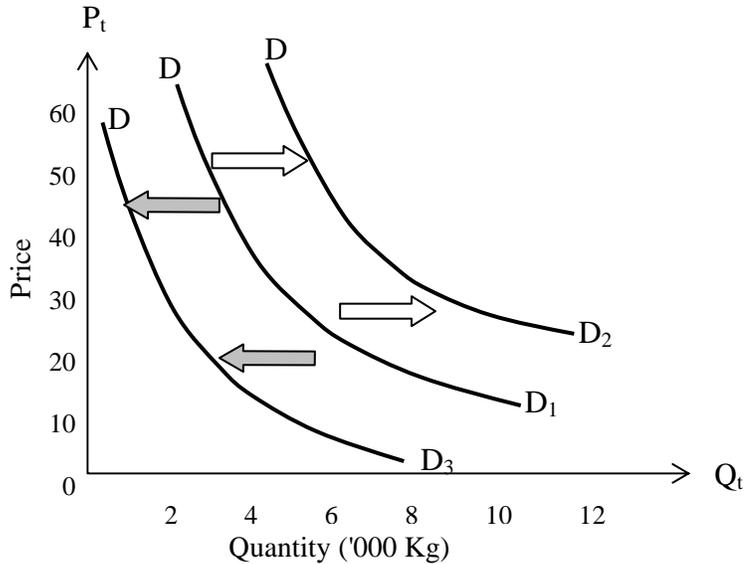
**What Happens With the Derivation of the Market Demand Curve if More Than Three Buyers are in the Market?**

Competition, of course, entails many more than three buyers in the market. So - to avoid a lengthy aggregation process - suppose there are 100 buyers of biscuit in the market, each of whom chooses to buy the same amount at each of the various prices as our original consumer does. Thus we can determine total or market demand by multiplying the quantity-demanded data of Table 2.1 by 100, as in Table 2.5. Curve DD<sub>1</sub> in Figure 2.5 indicates this market demand curve for the 100 buyers.

**Table 2.5: Market demand for biscuits, 100 buyers (hypothetical data)**

Price per Kg (Tk.) P <sub>t</sub>	Quantity demanded (Kg. per week) Q <sub>t</sub>	Number of buyers in the market	Total quantity demanded/market demand (‘000 Kg. per week)
10	100	× 100	= 10
15	80	× 100	= 8
20	60	× 100	= 6
30	40	× 100	= 4
60	20	× 100	= 2

Points on the DD<sub>1</sub> curve represents the price-quantity data of Table 2.5. In the figure we see that as the price of biscuit falls the market demand for biscuit increases because all the individuals are now buying more biscuits than before. Lower price induced the buyers to buy more.



**Figure 2.5: Market demand for biscuit, 100 buyers.**

Let's now know the determinants of market demand.

### **Determinants of Market Demand**

The basic determinants of market demand are:

- The tastes or preferences of consumers,
- The number of consumers in the market,
- The money incomes of the consumers,
- Prices of related goods, and
- Consumer expectations about future prices and incomes.

### **Changes in Market Demand**

If any of the determinants mentioned above is changed, the market demand for biscuit changes. As a result, the market demand curve shifts. For example, if the money income of the consumers increases, the market demand for biscuit increases and thus the market demand curve shifts rightward, from  $DD_1$  to  $DD_2$  in Figure 2.5. In the case of a decrease in consumers' money income, the market demand curve shifts leftward, from  $DD_1$  to  $DD_3$  in Figure 2.5.

If any of the determinants mentioned above is changed, the market demand for biscuit changes.

## Review Questions

### • *Essay-type questions*

1. (a) What is demand? How does it differ from need, want and desire?  
(b) Distinguish between demand and quantity demanded.
2. State the law of demand and show it through a demand schedule and a demand curve. what are exceptions to the law of demand?
3. Explain demand schedule, demand curve and demand function. Derive curve from the demand function  $Q=50-10 P$ .
4. (a) What is implied by the downwardsloping characteristic of a demand curve?  
(b) Is a downward demand curve consistent with the utility-maximizing rule? Explain.
5. (a) Define an increase in demand. A decrease.  
(b) Illustrate each on a diagram.
6. (a) What factors are held constant when drawing a given demand curve?  
(b) What happens when one or more of these factors change?  
(c) How does increase in income, other factors remaining the same, affect the demand for necessities, comforts and luxuries?
7. (a) What is market demand?  
(b) What are the determinants of market demand?
8. State whether the following changes increase or decrease the current demand for new American-made cars, and explain why. Also illustrate each on a diagram.  
(a) An increase in the price of Japanese cars.  
(b) A decrease in money incomes.  
(c) Consumers expect lower U.S car prices in the future.

### • *True or False*

Which of the following statements are true?

- (a) The demand for a commodity is inversely related to the price of its substitutes.
- (b) When income increases, the demand for essential goods increases more than proportionately.
- (c) The desire for a commodity is backed by ability and willingness to pay is demand.
- (d) The law of demand states the relationship between the quantity demanded and price of a commodity, consumers income, price of the related goods and advertisement.

- (e) An individual demand curve marks the upper limits of his/her intentions to buy a commodity at different prices.
- (f) A market demand curve represents the maximum quantity that an individual would be willing to buy at different prices.
- (g) The income-effect on demand for an inferior good is negative.
- (h) Demand for car and price of petrol are inversely related.
- (i) Most demand functions are of the form  $D=a+b.p$

• **Multiple Choice Questions**

1. Demand is:
  - (a) a negative relationship between price and quantity
  - (b) a positive relationship between units consumed and marginal utility
  - (c) the number of units purchased per time period
  - (d) the number of units that a person would like to purchase per time period.
2. A demand curve is -----sloping line on a diagram having----- on the vertical axis and ----- on the horizontal axis.
  - (a) a downward; quantity; price
  - (b) a downward; price; quantity
  - (c) an upward; quantity; price
  - (d) an upward; price; quantity
3. The market demand for a product is obtained by adding the – at each –.
  - (a) prices paid; quantity
  - (b) prices paid; income level
  - (c) quantities demanded; price
  - (d) quantities demanded; income level
4. An increase in demand means that consumers will purchase a – quantity at a given price, or will pay a – price for a given quantity.
  - (a) larger; higher
  - (b) larger; lower
  - (c) smaller; higher
  - (d) smaller; lower

5. Price of Japanese cars will cause the demand for U.S.-made cars to – thereby – the quantity of U.S.-made cars demanded at a given price..
  - (a) decrease; increasing
  - (b) increase; increasing
  - (c) decrease; decreasing
  - (d) increase; decreasing
  
6. When people suffer a decrease in income because of unemployment, the demand for new cars can be expected to –, causing a(n) – in their quantity demanded at a given price.
  - (a) decrease; increase
  - (b) increase; increase
  - (c) decrease; decrease
  - (d) increase; decrease
  
7. If people expect the price of single-family homes to – in the near future because of expected inflation, the current demand for homes will causing a (n) – in the number of homes purchased.
  - (a) increase; decrease
  - (b) decrease; decrease
  - (c) increase; increase
  - (d) decrease; increase
  
8. If airplane and bus transportation are substitutes in consumption, a decrease in airline fares will cause the demand for bus transport to ..... which, in turn, will cause bus fares to ..... and bus quantities to .....
  - (a) increase; increase; increase
  - (b) decrease; decrease; decrease
  - (c) increase; decrease; increase
  - (d) decrease; increase; decrease
  
9. If gasoline and automobiles are complements in consumption, a decrease in the price of gasoline will ..... the demand for automobiles, causing auto prices to ..... and quantities to .....
  - (a) increase; increase; increase
  - (b) decrease; decrease; decrease
  - (c) increase; decrease; increase
  - (d) decrease; increase; decrease

10. Prewashed jeans have become popular among young people. This change in tastes caused the demand for this product to ..... and its price to .....
- (a) increase; decrease
  - (b) increase; increase
  - (c) decrease; decrease
  - (d) decrease; increase

• **Problem 2.1**

*Read the following news-story carefully and then answer the questions under it.*

**CDs Displace LPs**

*Recording industry association of America.* CDs knocked LPs off the shelf. In 1984, more than 200 million long-playing vinyl discs (LPs) had fewer than 6 million compact discs (CDs) were sold. Today, the numbers are widely reversed: in 1992 over 300 million CDs and fewer than 2 million LPs were sold.

The steep drop in the price of CD players explains the switch. In 1984 a CD player sold for nearly \$1,000. In 1992 CD players could be found as little

as \$150. During those some years the price of a CD declined from an average of \$12 to only \$9. Industry observers foresee the LP becoming the dinosaur of the record industry when the price of a CD drops to \$5 or less.

**Source:** Bradley R. Schiller, *The Economy Today* (sixth edition), p-433, 1994, McGRAW-HILL, INC.

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**Questions:**

- (a) What is the relationship between CD players and CDs?
- (b) What happened to the price of CD players?
- (c) How was the demand for CDs affected by the drop in the price of CD players?
- (d) How are LPs and CDs related?
- (e) What happened to the price of CDs?
- (f) What happened to the demand for LPs due to the change in the price of CDs?
- (g) Was there any change in the position of the demand curves of CDs and LPs?

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**Hints:** CD players and CDs are *complementary* goods: the lower price of CD players increased the demand for CDs. By contrast, LPs and CDs are *substitutes*; lower CD prices caused the demand for LPs to decline (shift to the left).

## Lesson -2: Theory of Supply

### Objectives

After studying this lesson, you will be able to:

- Define the concept of supply;
- Explain the law of supply;
- Describe supply schedule;
- Draw supply curve from supply schedule;
- Describe the relationship between individual and market supply curve;
- Tell the determinants of supply; and
- Explain the difference between quantity supplied and supply.

### What is Supply?

The amount the firms are willing to sell.

Supply is a schedule which shows the amounts of a product a producer is willing and able to produce and make available for sale at each price in a series of possible prices during a specified period. The amount the firms are willing to sell (desired sales) may not be the same as the amount they succeed in selling. Desired sales may not be equal to the actual sales.

Since desired purchases do not have to equal desired sales, different terms (quantity demanded and quantity supplied) are needed to describe the two separate amounts. But, as the quantity actually purchased must be the same amount as the quantity actually sold, both can be described by a single term *quantity exchanged*.

### Determinants of Quantity Supplied

How much of a commodity will firms be willing to produce and offer for sale? It depends on a number of factors. The main ones are:

**The price of the commodity:** If the price of the commodity is higher, firms will produce and sell more amount of the commodity and vice versa.

**The price of other goods produced:** The supply of a commodity is influenced by the prices of the other goods produced. For example, a piece of high land can produce either potato or wheat in winter season. So, these two commodities are substituted in production. If the price of potato increases, the supply of wheat will be lower. People will use their land more in producing potatoes. Therefore, an increase in the price of the *substitute in production* lowers the supply of the commodity. Commodities can also be complements in production. **Complements in production** arise when two things are, of necessity, produced together. For example, cattle produce beef and cowhide. An increase in the price of any one of these by products of cattle increases the supply of the other.

**Prices of factors of production:** The prices of factors of production used to produce a commodity do influence its supply. For example, an increase in the prices of the labour and the capital equipment used to produce audio-cassettes

increase the cost of producing audio-cassettes; so the supply of audio-cassettes decrease.

**The goals of the firm:** Normally, the firm is assumed to have the single goal of profit maximization. Firms might, however, have other goals either in addition to or as substitutes for profit maximization. If the firm worries about risk, it will pursue safer lines of activity even though they promise lower probable profits. If the firm values size, it may produce and sell more than the profit-maximizing quantities. If it worries about its image in society, it may avoid highly profitable activities (such as the production of opium) when there is major public disapproval. However, as long as the firm prefers more profits to less, it will respond to changes in the possibilities of alternative lines of actions. A change in the emphasis that firms give to other goals will change the willingness to supply the quantity at given price and hence, the level of profitability will be changed.

**Expected Future Price:** Assume that the price of paddy will rise just after 4 months. What will happen with the supply of paddy presently? Since paddy can be stored for couple of months and the return from selling paddy will be higher than it is in the present, producers will offer a smaller quantity of paddy for sale now. So, the current supply of paddy decreases. Here producers substitute over time. Similarly, if the price of paddy is expected to fall in the future, the return from selling it at present is high relative to what is expected. So, again producers substitute over time. They offer more paddy for sale before its price is expected to fall, so the current supply of paddy increases.

**The state of technology:** Invention of new technologies that enable the producers to produce their commodity at lower cost (use of less factors of production or cheaper factors of production), which increases their profits at any given price of the commodity, and they increase supply. For example, the invention of transistors and silicon chips has revolutionized production in television, high-fidelity equipment, computers, and guidance-control systems.

**Number of suppliers:** Other things remaining the same, the larger the number of firms supplying a commodity, the larger the supply of the commodity.

**Taxes and subsidies:** Producers treat most taxes as costs. Therefore, an increase in sales or property taxes will increase costs and reduce supply. On the other hand, subsidies are reverse of taxes. If the government subsidizes the production of a good, it in effect lowers cost and increases supply.

Let's now look at the relationship between commodity's own price and the quantity supplied.

### **The Relationship between Price and Quantity Supplied: Law of Supply**

In the previous section, you have learnt the determinants of quantity supplied. If all other factors remain constant, there exists a relationship between commodity's own price and quantity supplied. This relationship is called the *law of supply*.

The law of supply simply states:

Others things remaining the same, the higher the price of a commodity, the higher the quantity supplied and vice versa.

An increase in sales or property taxes will increase costs and reduce supply.

The opportunity cost of the commodity increases as the quantity produced increases.

**Why does the higher price lead to greater quantity supplied?**

It is because of increasing opportunity cost. The opportunity cost of the commodity increases as the quantity produced increases. So, if the price of commodity is high, only then producers are willing to incur the higher opportunity cost and increase production.

**Does supply always increase with the rise in price?**

NO. For detail please see price elasticity of supply in Lesson-2 of Unit-3.

**How can the relationship between quantity supplied and price be portrayed?**

Two methods are usually used to do that:

***First Method: Supply schedule***

This is a numerical tabulation showing the quantity that is supplied at selected prices. Table 2.1 is a hypothetical supply schedule of biscuits. It lists the quantity of biscuits that would be supplied at various prices on the assumption that all the factors influencing supply other than price do not change. The table gives the quantities supplied for five selected prices, but actually there is a separate quantity that would be supplied at each possible price.

**Table 2.6: Supply schedule of biscuits (hypothetical data)**

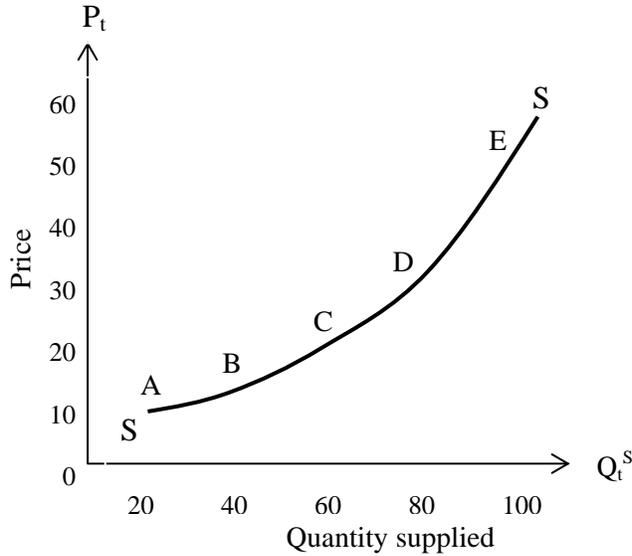
	Price per Kg. (Tk.)	Quantity supplied (Kg. per week)
	$P_t$	$Q_t^s$
A	10	20
B	15	40
C	20	60
D	30	80
E	60	100

In Table 2.6, we see that as the price of biscuit increases, the quantity supplied of biscuits increases. That is, there is a positive relationship between the quantity supplied of biscuits and its own price.

***Second method: Supply curve***

The relationship between quantity supplied and price can be shown by drawing a graph. If we plot the information given in Table 2.6 in a graph, we get the supply curve. Figure 2.6 shows a supply curve which represents the points corresponding to price-quantity pairs of Table 2.6.

In Figure 2.6, SS is the supply curve of biscuit. Each point on the SS curve refers to the quantity supplied of biscuit at a particular price. We see that as price of biscuit rises, the quantity supplied of biscuit increases along the SS curve.



**Figure 2.6: Supply curve of biscuit**

### Properties of a Supply Curve

- Supply curve shows the relationship between quantity supplied of a good and its own price assuming that other things remain the same.
- Normally, supply curves are upward sloping i.e. the relationship between quantity supplied and price is direct. The law of supply - producers supply more at a high price than at a low price - is reflected in the upward slope of the supply curve.
- The term *supply* refers to the entire relationship between price and quantity. However, a single point on a supply curve refers to the quantity supplied at a particular price. For example, at point C in Figure 2.6, we see that 60 Kg. of biscuits are supplied at a price of Tk. 20.00 per Kg.
- The *slope* of the supply curve changes if the pattern of the relationship between price and quantity supplied changes.
- The *position* of a supply curve changes if the ceteris paribus assumption is violated, i.e., if *other things* such as price of other goods produced, prices of factors of production, the goals of the firm, expected future price, the state of technology, number of suppliers, taxes and subsidies, etc. change.

A single point on a supply curve refers to the quantity supplied at a particular price.

### Supply versus Quantity Supplied

We have seen in the previous lesson that there is a difference between the concepts *demand* and *quantity demanded*. Similarly, to avoid confusion, we should know the difference between *supply* and *quantity supplied*.

Supply refers to the entire relationship between quantity supplied and price while a single point on the supply curve refers to the quantity supplied at that price.

### Change in the Quantity Supplied versus Change in Supply

From the above discussion, you have learnt that *quantity supplied* refers to a particular point on a supply curve whereas *supply* refers to the entire

*Supply* refers to the entire relationship between price and quantity as shown by the whole supply curve.

relationship between price and quantity as shown by the whole supply curve. Therefore, if the own price of a commodity changes (i.e., rises/falls), the quantity supplied of that commodity changes along the supply curve; the position of the supply curve does not change. This is called the *movement along the supply curve* (see Figure 2.8). On the other hand, if factors other than price (i.e., price of other goods produced, prices of factors of production, the goals of the firm, expected future price, the state of technology, number of suppliers, taxes and subsidies, etc.) change, supply changes, which is reflected by the change in the location of the supply curve, i.e., the supply curve *shifts* (see Figure 2.7 below). Hence, the determinants other than the commodity's own price are called *supply shifters*. The chart below shows the reasons and consequence of the change in the quantity supplied and the change in supply of a commodity:

**Chart 2.2: Consequences of the changes in the determinants of quantity supplied**

Possible causes		Consequences		
		Change in quantity supplied	Change in supply	What happens with the supply curve?
Own price	Rise	Increases		Upward movement along the supply curve
	Fall	Decreases		Downward movement along the supply curve
Price of substitute in production	Rise		Decrease	Leftward shift of the supply curve
	Fall		Increase	Rightward shift of the supply curve
Price of complement in production	Rise		Increase	Rightward shift of the supply curve
	Fall		Decrease	Leftward shift of the supply curve
Price of factors of production	Rise		Decrease	Leftward shift of the supply curve
	Fall		Increase	Rightward shift of the supply curve
Expected future price	Increase		Decrease	Leftward shift of the supply curve
	Decrease		Increase	Rightward shift of the supply curve
State of technology	New invention		Increase	Rightward shift of the demand curve
	Backward trend		Decrease	Leftward shift of the demand curve
Taxes	Rise		Decrease	Leftward shift of the supply curve
	Fall		Increase	Rightward shift of the supply curve
Subsidies	Increase		Increase	Rightward shift of the supply curve
	Decrease		Decrease	Leftward shift of the supply curve
Number of suppliers	Increase		Increase	Rightward shift of the demand curve
	Decrease		decrease	Leftward shift of the demand curve

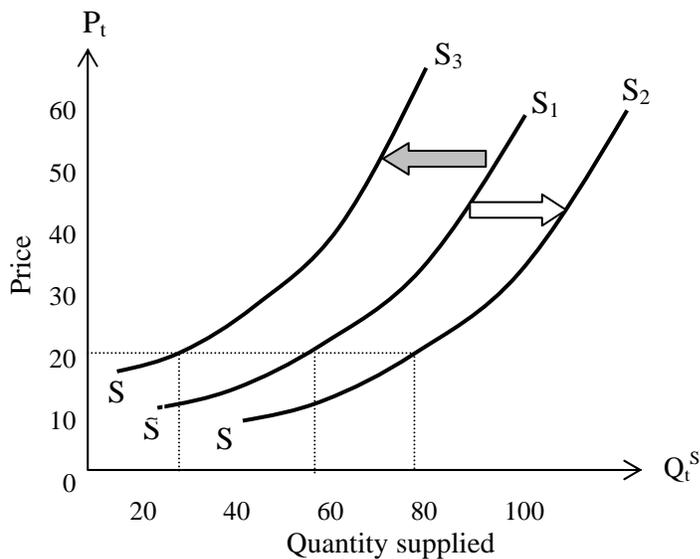
Therefore, if the own price of a commodity changes, the quantity supplied changes but supply doesn't changes i.e. the supply curve doesn't shift. However, if the factors other than the commodity's own price changes, then supply does change and the supply curve shifts. Since the supply curve shifts, at any price the quantity supplied will also be different from the previous amount. For example, if

the government initiates subsidy to biscuit production, price remaining the same, the quantity supplied will be more than before. Table 2.7 shows the change in supply.

**Table 2.7: Changes in supply (hypothetical data)**

Price (Tk. per Kg.)	Quantity supplied (Kg. per week) Without subsidy	Quantity supplied (Kg. per week) With subsidy of Tk.2 per Kg.
10	20	40
15	40	50
20	60	70
30	80	90
60	100	110

In Column-2 of Table 2.7, the quantity of biscuits supplied at different prices are shown (same as Table 2.6). But in Column-3, the quantity supplied of biscuits is higher than before at each price, through the prices are the same. What's the reason? As subsidy is provided with biscuit production, it lowers the cost of producing biscuit. As a result, bakers are now willing to produce more biscuits because producing biscuit is now more profitable than before. Graphically, the



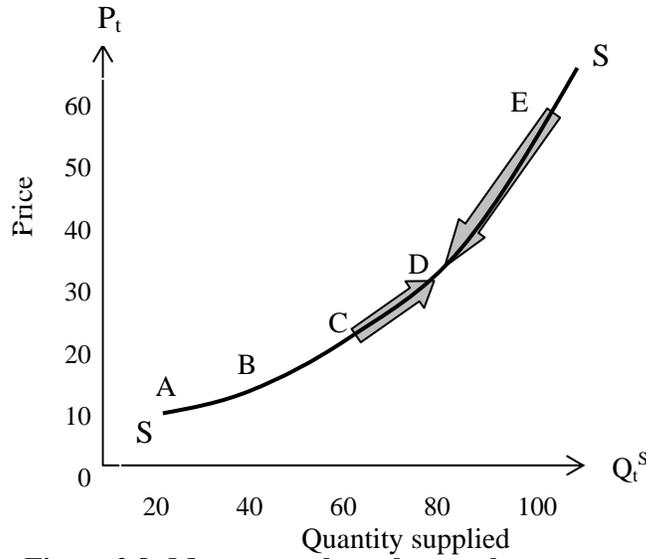
**Figure 2.7: Shift of the supply curve**

change in supply is shown by the rightward shift of the supply curve, from SS<sub>1</sub> to SS<sub>2</sub> in Figure 2.7.

In Figure 2.7, the initial location of the supply curve was SS<sub>1</sub>. Due to the initiation of subsidy to biscuit production, the supply curve has been shifted to the right, from SS<sub>1</sub> to SS<sub>2</sub>. Conversely, due to the imposition of taxes, the supply curve shifts to the left from the initial position, from SS<sub>1</sub> to SS<sub>3</sub>. Notice that due to the initiation of subsidy, more biscuits come out in the market at the same price. At price of Tk. 20.00, bakers now supply 70 Kg. biscuit which is 10 Kg. higher than the initial supply (60 Kg.).

Similarly, if any other determinant (except the commodity's own price) of supply is changed, then supply will be changed causing the supply curve to shift. For detail please see Chart 2.2.

When the own price of the commodity changes, the quantity supplied of the commodity is changed and thus a *movement along the supply curve* occurs. For example, along the supply curve SS in Figure 2.8, a rise in the price of biscuit produces an increase in the quantity supplied of biscuit and fall in the price produces an decrease in the quantity supplied of biscuit. The arrows on the



**Figure 2.8: Movement along the supply curve**

supply curve represent the movements along the supply curve. Due to the fall in the price of biscuit from Tk. 60.00 to Tk. 30.00, the quantity supplied has been decreased by 20 Kg., from 100 Kg. to 80 Kg. This situation is shown by the movement from Point E to Point D along the SS curve. Conversely, in the case of rise in price, the producer moves from Point C to Point D. In this case, Point C is assumed to be the initial point.

Therefore, when any determinant of supply other than commodity's own price changes which increases the quantity supplied, then supply curve shifts rightward (from  $SS_1$  to  $SS_2$  in Figure 2.7) and supply increases. Conversely, if any determinant of supply other than its own price changes that reduces the quantity people plan to buy, the supply curve shifts leftward and supply decreases. On the other hand, if the commodity's own price changes, the quantity supplied changes and the consumer moves from one point to another point along the same supply curve.

### Market Supply

By adding up the quantity each supplier is willing and able to offer at every price, we can get the market supply. In brief, the market supply is just the summary of the supply intention of all producers. Assume that there are 100

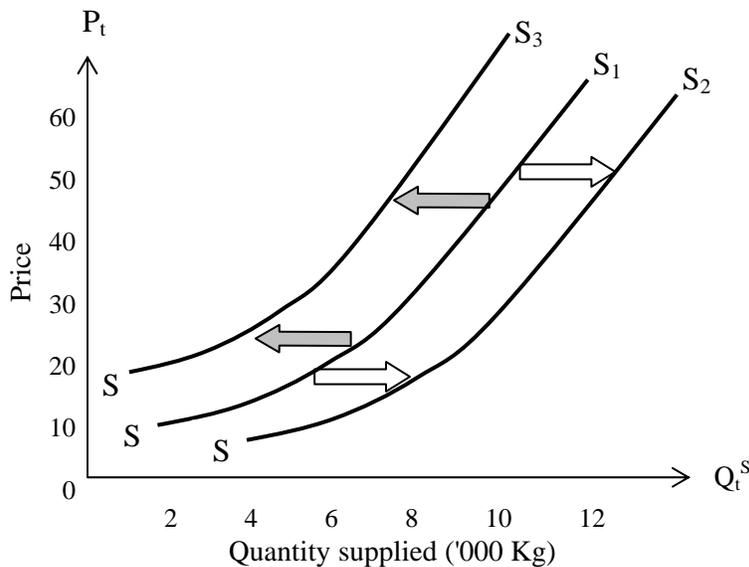
The market supply is just the summary of the supply intention of all producers.

sellers in the market having the same supply schedules. So, the market supply schedule can be found as in Table 2-8.

**Table 2.8: Market supply of biscuit, 100 sellers (hypothetical data)**

Price per Kg (Tk.) $P_t$	Quantity supplied (Kg per week) $Q_t^S$	Number of sellers In the market	Total quantity supplied/market supply ('000 Kg per week)
10	20	$\times 100$	= 2
15	40	$\times 100$	= 4
20	60	$\times 100$	= 6
30	80	$\times 100$	= 8
60	100	$\times 100$	= 10

In Figure 2.9,  $SS_1$  is the market supply of biscuit. As the price of biscuit



**Figure 2.9: Market supply of biscuit, 100 sellers.**

increases, the market supply of biscuit increases because all the bakers are now producing more biscuits than before. Lower price induces the buyers to buy more.

Let's now know the determinants of market supply.

**Determinants of Market Supply**

The basic determinants of market supply are:

- Price of other goods produced,
- Prices of factors of production,
- The goals of the firm,
- Expected future price,
- The state of technology,

- Number of suppliers,
- Taxes and subsidies, etc.

### **Changes in Market Supply**

If any of the determinants mentioned above is changed, the market supply of biscuit changes. As a result, the market supply curve shifts. For example, if the subsidy to biscuit production is initiated, the market supply of biscuit increases and thus the market supply curve shifts rightward, from  $SS_1$  to  $SS_2$  in Figure 2.9. In the case of an imposition of tax on biscuit production, the market supply curve shifts leftward, from  $SS_1$  to  $SS_3$  in Figure 2.9.

## Review Questions

### • *Essay-type Questions*

1. (a) What is supply?  
(b) Distinguish between supply and quantity supplied.  
(c) What are the determinants of supply?
2. (a) What is the law of supply?  
(b) Explain the law of supply through a supply schedule and a supply curve.  
(c) Why does a supply curve slope upward to the right?  
(d) What factors cause a rightward shift of the supply curve?
3. Explain supply schedule, supply curve and supply function. Derive the supply curve from the supply function  $Q=30 + 5P$ .
4. (a) Define an increase in supply. A decrease.  
(b) Illustrate each on a diagram.
5. (a) What factors are held constant when drawing a given supply curve?  
(b) What happens when one or more of these factors change?
6. (a) What is market supply?  
(b) What are the determinants of market supply?

### • *True or False*

Which of the following statements are true?

- (a) Decrease in input prices causes a leftward shift in the supply curve.
- (b) There cannot be a market without a place.
- (c) A straight line supply function is of the form  $P=Q/b$
- (d) The supply of a commodity is inversely related to the price of its substitutes.
- (e) The law of supply states the relationship between the quantity supplied and price of a commodity.
- (f) An individual supply curve marks the upper limits of her/his intentions to sell a commodity at different prices.
- (h) A market supply curve represents the maximum quantity that a producer would be willing to sell at different prices.

• **Multiple Choice Questions**

1. Supply is a —relationship between price and —:
  - (a) negative; quantity
  - (b) positive; quantity
  - (c) negative; profits
  - (d) positive; profits
2. A supply curve is -----sloping line on a diagram having----- on the vertical axis and ----- on the horizontal axis :
  - (a) a downward; quantity; price
  - (b) a downward; price; quantity
  - (c) an upward; quantity; price
  - (d) an upward; price; quantity
3. The market supply for a product is obtained by adding the —at each —:
  - (a) prices paid; quantity
  - (b) prices paid; income level
  - (c) quantities supplied; price
  - (d) quantities supplied; income level
4. An increase in supply means that producers will sell a —quantity at a given price, or will demand a —price for a given quantity :
  - (a) larger; higher
  - (b) larger; lower
  - (c) smaller; higher
  - (d) smaller; lower
5. An improvement in the technology of producing personal computers will lead to ..... in the supply of computers and ..... in their prices :
  - (a) a decrease; an increase
  - (b) a decrease; a decrease
  - (c) an increase; an increase
  - (d) an increase; a decrease
6. Energy is an important input in the production of automobiles. An increase in the price of energy would ..... the supply of autos and ..... their prices :
  - (a) increase; increase
  - (b) increase; decrease
  - (c) decrease; increase
  - (d) decrease; decrease

• **Problem 2.2**

***Read the following news-story carefully and then answer the questions under it.***

**THE GULF WAR AND OIL PRICES**

In July 1990 the price of oil in world markets sank to \$13 per barrel. This low price was hurting Iraq, which had limited production capacity and badly needed the revenue from oil exports.

After repeated pleas to Kuwait to curtail its oil production. Shortly thereafter, the United States and other countries attacked Iraq, effectively cutting off its oil production and exports as well. The loss of both Kuwaiti and Iraqi oil production reduced the world's oil supply by 4 million barrels a day and sent oil prices

soaring. In a matter of weeks the price of oil jumped from \$13 a barrel to over \$40 a barrel . The price of oil later fell when Saudi Arabia and other countries increased their oil production and the Iraqis were forced to retreat from Kuwait.

**Source:** Bradley R. Schiller, The Economy Today (sixth edition), p-66, 1994, McGRAW-HILL, INC.

**Questions:**

- (a) What happened with the number of sellers?
- (b) What happened with the position of the supply curve?
- (c) What happened with the price of oil? Explain graphically.

**Hints:** The market supply curve shifts when a determinant of supply changes. In this case, a reduction in the number of sellers shifted the supply curve leftward (reduced market supply).

## Lesson-3: Price Determination: Equilibrium of Demand and Supply

### Objectives

After studying this lesson, you will be able to:

- Explain the process of price determination in a market;
- Explain the concepts of equilibrium and disequilibrium in market; and
- Describe the difference among equilibrium price, demand price and supply price.

### Introduction

In last two lessons, demand and supply have been considered separately. You learnt from the previous lessons how demand and supply respond to the change in price and other determinants.

Moreover, you learnt that demand schedule/curve shows the quantities people desire and are able to buy at different prices. But one question was not solved: can the consumers always buy the quantity exactly they desire at any price? The answer is 'No'. Then why do they fail to meet their desire, i.e., what makes the difference between desired and actual purchase?

Supply schedule/curve shows the quantity of goods producers desire and able to supply at different prices.

Similarly, the supply schedule/curve shows the quantity of goods producers desire and able to supply at different prices. But the question arises: can the producers always sell the amount exactly they desire to sell? The answer is again 'No'. So, why do they fail to meet their desire, e.g., what makes the difference between desired and actual sale?

So, in the case of demand as well as supply, the desired quantity is not always identical to the actual quantity. The reason is: the amount of goods people want to buy at a given price, the suppliers do not want to supply exactly that amount at the same price; in other words, the amount of goods the suppliers desire to supply at a given price is not the same as the amount the consumers are interested to buy at that price.

But what is the price at which the desired and actual quantities become identical, i.e., at what price the suppliers will supply exactly the same amount of goods that the consumers desire to buy - no goods will be unsold? There will be no excess demand or excess supply in the market. In this lesson, we will discuss how and when this golden situation comes.

### Price Determination

In a free market, here price is treated as a regulator.

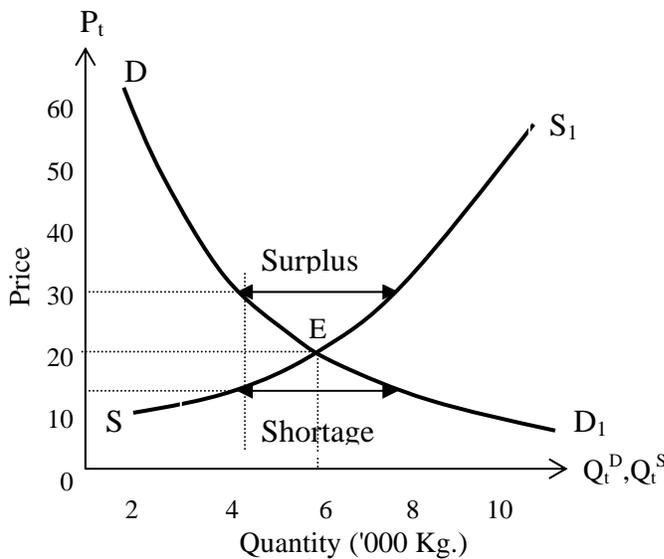
In a free market, where no outside forces other than commodity's own price are considered to influence supply decisions and buying decisions, adjustments in price coordinate the devices of buyers and sellers. Here price is treated as a regulator. The price of a good regulates the quantities demanded and supplied. If the price is too high, the quantity supplied exceeds the quantity demanded. If the price is too low, the quantity demanded exceeds the quantity supplied. There is one price, and only one price, at which the quantity demanded equals the quantity supplied - that price is called equilibrium price (or market price).

### What is "Equilibrium"?

*Equilibrium* is a situation in which the opposing forces are in balance. So, equilibrium in market occurs when the price is such that the opposing forces of the plans of buyers and sellers balance each other, e.g., in equilibrium situation, the price is such that the quantity demanded equals quantity supplied - there is no surplus or shortage. That's why, the equilibrium price is called the *market-clearing price*.

Now, let's see graphically, how the market-clearing price or equilibrium price is established. Figure 2.10 shows the equilibrium that occurs at the intersection of market demand and market supply curves. In the figure, Point E is the equilibrium point. The equilibrium price is Tk. 20.00 and the equilibrium quantity is 6,000 Kg. of biscuits.

Equilibrium occurs at the intersection of market demand and market supply curves.



**Figure 2.10: Equilibrium in market**

At point E, the market demand curve intersects market supply curve. Hence, there is no surplus or shortage at this point. At any price level other than Tk. 20.00, the market is in disequilibrium. We see that at the price of Tk. 30.00, market supply of biscuit exceeds market demand by 4,000 Kg. - there is an excess supply or surplus in the market. Similarly, at price of Tk. 10.00, market demand for biscuit exceeds market supply by 4,000 Kg. - there is an excess demand or shortage in the market. But the disequilibrium situations are not long-lived. They disappear through market mechanism. In the case of excess demand, the producers want to supply less than the buyers' desire. The tendency for buyers to offer, and sellers to ask for, higher prices creates upward pressure on price. Price rises till the equilibrium occurs again.

Similarly, in the case of excess supply in market, e.g., the producers want to supply more than the consumers' or buyers' desire, the tendency for buyers to offer, and sellers to ask for, lower prices creates a downward pressure on price. Price falls till the equilibrium occurs again. Table 2.9 below summarizes these events:

**Table 2.9: Equilibrium in the market**

Price (Tk. per Kg.)	Quantity supplied (‘000 Kg. Per week)		Quantity demanded (‘000 Kg. Per week)
	$Q_t^S$		
10	2	Excess demand/market shortage ( $Q_t^S < Q_t^D$ )	10
15	4		8
<b>20</b>	<b>6</b>	<b>Equilibrium (<math>Q_t^S = Q_t^D</math>)</b>	<b>6</b>
30	8	Excess supply/market surplus ( $Q_t^S > Q_t^D$ )	4
60	10		2

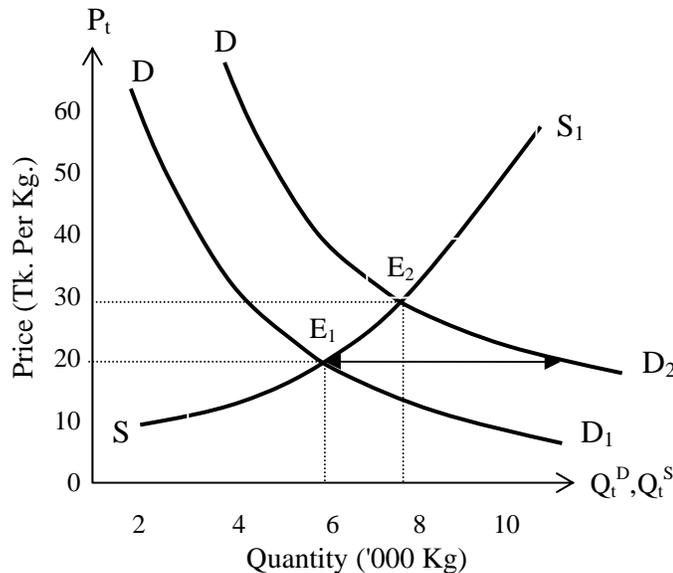
At the equilibrium point, demand price equals supply price.

**Market Price, Demand Price and Supply Price**

The price at which demand equals supply is called *market price*. On the other hand, the price consumers are willing to pay for a specific amount of commodity is called *demand price*. Similarly, the price suppliers are willing to charge for supplying a specific amount of commodity is called *supply price*. In Figure 2.10, at the 4000<sup>th</sup> Kg. of the commodity, the demand price is Tk. 30 per Kg. and the supply price is Tk. 15 per Kg. Only at the equilibrium point, demand price equals supply price (Tk. 20 per Kg.).

**What Happens With the Equilibrium Situation When Supply or Demand Changes?**

We learnt from the previous lessons that when the determinants of quantity supplied other than commodity's own price change, then supply curve shifts, and when the determinants of quantity demanded other than commodity's own price change, the demand curve shifts. Let's first consider the effect of a change in demand on the equilibrium position. Figure 2. 11 shows the effects of a change in

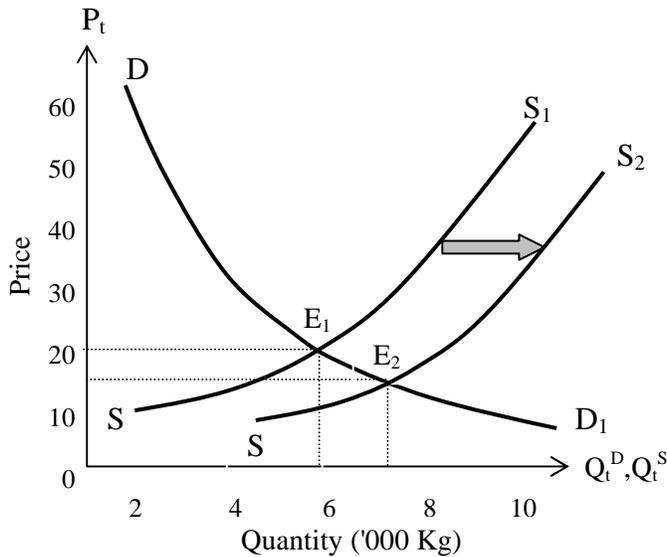


**Figure 2.11: The effects of a change in Demand**

demand on the equilibrium price and quantity. The figure shows that the original

equilibrium price is Tk. 20.00 per Kg. of biscuit, and the quantity is 6,000 Kg. biscuit a week. When demand increases, the demand curve shifts rightwards, from  $DD_1$  to  $DD_2$  in Figure 2.11. The equilibrium price rises to Tk.30.00 a Kg. of biscuit and the equilibrium quantity increases to 8,000 Kg. of biscuit, which corresponds to the new equilibrium Point  $E_2$ . The effects will be reverse if demand decreases, i.e., the demand curve shifts leftward.

On the other hand, if the supply curve shifts rightward, then equilibrium price of the commodity decreases and the equilibrium quantity increases as in Figure 2.12. The effect will be reverse if the supply curve shifts leftward.



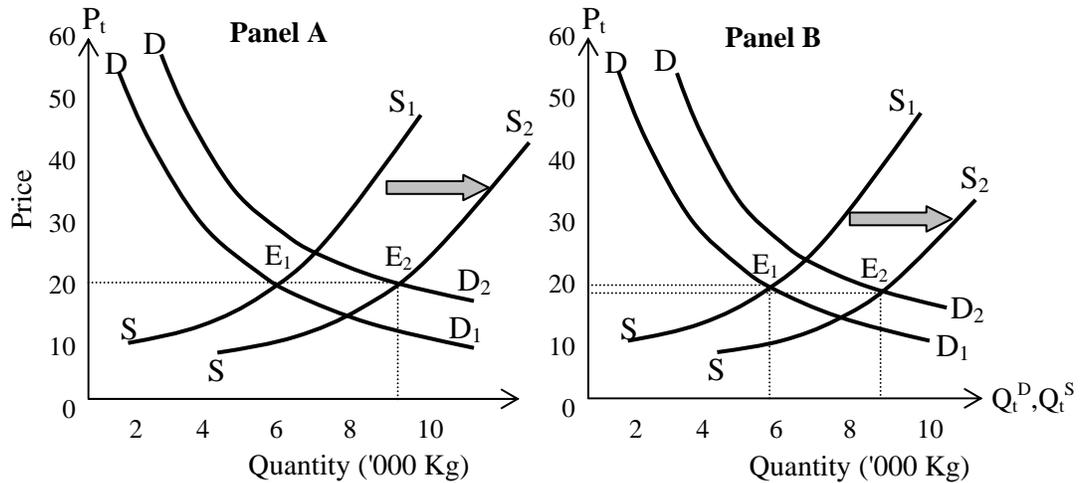
**Figure 2.12: Effect of a change in supply on equilibrium position**

In Figure 2.12, we see that due to the rightward shift of the supply curve, new equilibrium position has been established at Point  $E_2$ . At  $E_2$ , the price of the commodity is lower and the quantity exchanged is higher than those at the initial equilibrium point  $E_1$ .

In the cases described by Figure 2.11 and Figure 2.12, only demand curve or supply curve was assumed to be shifted. There we haven't explained the case where both supply and demand curves shifts simultaneously.

**What Will Happen If Both Demand Curve and Supply Curve Shift?**

If they shift in the same direction and same extent, the equilibrium price will not be changed, but the equilibrium quantity will be changed as in Panel A of Figure 2.13.



**Figure 2.13: Effect of a change in both supply and demand**

In Figure 2.13, we see that the supply curve has been shifted rightward from SS<sub>1</sub> to SS<sub>2</sub> and at the same time, the demand curve has been shifted outward from DD<sub>1</sub> to DD<sub>2</sub>. The extent of change in both demand and supply is the same. We see that at the new equilibrium point E<sub>2</sub>, the equilibrium price is the same as that at the initial equilibrium Point E<sub>1</sub>, but the quantity exchanged has been increased. If the extent of change in both demand and supply is not the same, both equilibrium price and quantity exchanged are changed. Panel B of Figure 2.13 shows that.

Similarly, we can see what happens to the equilibrium price and quantity when supply and demand change in opposite directions.

## Review Questions

### • *Essay-Type Questions*

1. (a) Define equilibrium price.  
 (b) If actual price is above the equilibrium, what will force it down?  
 (c) If actual price is below the equilibrium, what will force it up?
2. (a) Plot the corresponding demand and supply curves from the figures below, showing equilibrium price and quantity.

Price	Quantity Demanded	Quantity Supplied
\$100	10	50
80	20	40
60	30	30
40	40	20
20	50	10

- (b) If price was \$100, would there be a surplus or a shortage? How much?
- (c) If price was \$20, would there be a surplus or a shortage? How much?
3. State how the stipulated changes in each of the following demand shifters would change the equilibrium price and quantity of new US cars? Assume all other shifters remain constant except the one under consideration:
  - (a) An increase in money income of the car-buying public. Assume new cars are a superior good.
  - (b) A decrease in the price of foreign cars, a substitute for US cars.
  - (c) Consumers expect less unemployment in the near future.
  - (d) Consumers tastes shift in the direction of European styling.
  - (e) Population increases.
4. State how the stipulated changes in the following supply shifters change the equilibrium price and quantities of personal computers. Assume all other shifters remain constant except the one under consideration:
  - (a) A decrease in the price of typewriters - an alternative product that can be produced.
  - (b) A decrease in the price of silicon chips.
  - (c) Producers expect prices to be lower next year.
  - (d) Advances are made in electronics technology.
  - (e) There is a decrease in the number of manufacturers of this product.
5. (a) Is it possible for the equilibrium price of a good or service to change Without a change in the equilibrium quantity exchanged in the market? Explain.  
 (b) Is it possible for the equilibrium quantity of a good or service to changes without a change in the equilibrium market price? Explain.

6. (a) Trace the short-run and long-run effects on price and quantity in the new automobile market of a sudden decrease in demand for new cars.
- (b) Trace the short-run and long-run effects in the coffee market of a freeze in Brazil that kills many coffee trees.

• ***True or False***

Which of the following statements are true?

- (a) At the point of equilibrium, there is no excess demand.
- (a) At the point of equilibrium, there is no excess supply.
- (b) Equilibrium price is called market-clearing price.
- (c) Demand price always equals supply price.
- (d) Market price, demand price and supply price cannot be equal.
- (e) If demand increases, then equilibrium price increases.

• ***Multiple Choice Questions***

1. If actual price is above the equilibrium price, there will be a ..... and price will ..... :
  - (a) shortage; increase
  - (b) surplus; increase
  - (c) shortage; decrease
  - (d) surplus; decrease
2. If actual price is below the market equilibrium, there will be a ..... and price will ..... :
  - (a) shortage; increase
  - (b) surplus; increase
  - (c) shortage; decrease
  - (d) surplus; decrease
3. An increase in money income will ..... the demand for a superior good, causing its price to ..... and quantity to ..... :
  - (a) increase; increase; increase
  - (b) increase; decrease; decrease
  - (c) decrease; increase; increase
  - (d) decrease; decrease; decrease
4. If people expect the price of gold to increase in the near future, the current demand for gold can be expected to ....., causing its current price to ..... :
  - (a) increase; remain unchanged
  - (b) decrease; decrease
  - (c) increase; increase
  - (d) decrease; remain unchanged
5. Consider a company that can produce both word processors and typewriters. A decrease in the demand for typewriters can be expected to

- ..... the price of typewriters and ..... the supply of word processors :
- (a) decrease; increase
  - (b) increase; increase
  - (c) decrease; decrease
  - (d) increase; decrease
6. A mining company that has large stocks of copper on hand is observed to increase its sales. From this we might infer that the company expects the future price of copper to ..... :
- (a) decrease
  - (b) increase
  - (c) remain unchanged
7. During times of inflation, demand ..... and supply ....., causing prices to increase and quantity to .....
- (a) increases; decreases; either increase or decrease
  - (b) increases; decreases; increase
  - (c) decreases; increases; either increase or decrease
  - (d) decreases; increases; decrease
8. During the summer, strawberry prices tend to be lower than in the winter months. This can be explained by ..... during this summer. This can be explained by ..... during the summer :
- (a) a decrease in demand; a decrease in supply
  - (b) an increase in supply; an increase in demand
  - (c) a decrease in supply; a decrease in demand
  - (d) an increase in demand; an increase in supply
9. It is possible for the price of a good to increase without observing a change in its quantity. This can be explained by ..... in demand coupled with ..... in supply :
- (a) a decrease; an increase
  - (b) a decrease; a decrease
  - (c) an increase; an increase
  - (d) an increase; a decrease
10. It is possible for the quantity of a good to increase without observing a change in price. This can be explained by ..... in demand coupled with ..... in supply :
- (a) a decrease; an increase
  - (b) a decrease; a decrease
  - (c) an increase; an increase
  - (d) an increase; a decrease

• **Problem 2.3**

*Read the following news-story carefully and then answer the questions under it.*

**THE HIGH PRICE OF MARIJUANA**

*In late 1990 and early 1991 the US Drug Enforcement Agency reported that the price of marijuana reached historic highs.*

At the start of this decade the price of a “lid” (an ounce) of marijuana ranged from \$200 to \$400 in the United States. In comparison an ounce of gold was selling for \$370.

Simple supply and demand explains this “refer madness.” On the demand side marijuana is by far the nation’s most commonly used illegal drug. It is estimated that about one-third of all American adults - some 66 million people - have used pot at least once during their lives. However, the demand for marijuana is declining. In 1979 over 35 percent of all young adults (age 18-25) used pot at least once a month. By 1990 this figure had declined to less than 13 percent. Stated differently, over 22 million people smoked marijuana in 1979 compared to slightly over 10 million in 1990.

Other things the same, a declining demand should mean lower, not higher, pot prices.

But other things have not been the same. For a variety of reasons substantial reductions in marijuana supply have occurred. First, law enforcement in Mexico - a major exporter of pot to the United States - has improved. Second, many pot producers have shifted their resources to alternative drugs. In particular, Colombia’s incredibly profitable cocaine industry has expanded and attracted resources from marijuana. It is also cheaper and easier to smuggle small quantities of cocaine compared to bulky truck-and plane-loads of marijuana. Third, the interdiction of pot smugglers has improved; less marijuana is coming over our borders. Finally, within the United States efforts to apprehend marijuana growers and destroy their crops have been increasingly effective.

**Source:** Microeconomics by campbell R. McConnel and Staneley L. Brue, page 63, 12<sup>th</sup> edition, McGraw-Hill, Inc.

**Questions:**

- (a) What happened with the supply of marijuana?
- (b) What happened with the position of the supply curve?
- (c) What happened with the demand for marijuana?
- (d) What happened with the position of the demand curve of marijuana?
- (e) What happened with the price of pot? Explain it graphically.

**Hints:** Supply has fallen much more dramatically than has demand.

# ELASTICITIES OF DEMAND AND SUPPLY



## **Highlights**

- ❑ Price Elasticity of Demand
- ❑ Point and Arc Elasticity
- ❑ Determinants of Price Elasticity of Demand
- ❑ Income Elasticity of Demand
- ❑ Determinants of Income Elasticity of Demand
- ❑ Cross Elasticity of Demand and Its Determinants
- ❑ Elasticity of Supply and Its Determinants

School of Business

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### Unit-3

#### Lesson -1: Elasticity of Demand

##### Objectives

After Studying this lesson, you will be able to:

- Define the concept of elasticity;
- Describe the techniques of measuring elasticity; and
- Explain the elasticity of demand.

##### What Is Elasticity?

Elasticity is the ratio which measures the responsiveness or sensitiveness of a dependent variable to the changes in any of the independent variables. Specifically, the term *elasticity* refers to the percentage change in dependent variable divided by the percentage change in independent variable. That is,

If  $Y = f(X)$ , i.e.,  $Y$  depends on  $X$ , then the elasticity of  $Y$  with respect to  $X$  is

$$\text{Elasticity} = \frac{\text{Percentage change in dependent variable}}{\text{Percentage change in the independent variable}}$$

as follows:

$$\text{Elasticity of } Y = \frac{\text{Percentage change in } Y}{\text{Percentage change in } X} = \frac{\% \Delta Y}{\% \Delta X}$$

If  $Y = f(X_1, X_2, \dots, X_n)$ , then we can calculate elasticity of  $Y$  with respect all  $X$ 's, which is called *total elasticity*, as follows:

$$\text{Elasticity of } Y = \frac{\text{Percentage change in } Y}{\text{Percentage change in } X} = \frac{\% \Delta Y}{\% \Delta X_1} + \frac{\% \Delta Y}{\% \Delta X_2} + \dots + \frac{\% \Delta Y}{\% \Delta X_n}$$

$$\text{Elasticity of } Y \text{ with respect to } X_1 = \frac{\text{Percentage change in } Y}{\text{Percentage change in } X_1} = \frac{\% \Delta Y}{\% \Delta X_1}$$

or we can calculate the elasticity of  $Y$  with respect to each of the  $X$ 's, which is called *partial elasticity*, as follows:

$$\text{Elasticity of } Y \text{ with respect to } X_2 = \frac{\text{Percentage change in } Y}{\text{Percentage change in } X_2} = \frac{\% \Delta Y}{\% \Delta X_2}$$

$$\text{Elasticity of } Y \text{ with respect to } X_n = \frac{\text{Percentage change in } Y}{\text{Percentage change in } X_n} = \frac{\% \Delta Y}{\% \Delta X_n}$$

Now let's think about the elasticity of demand.

## Elasticity of Demand

The elasticity of demand is the measure of responsiveness of demand for a commodity to the changes in any of its determinants.

The elasticity of demand is the measure of responsiveness of demand for a commodity to the changes in any of its determinants. We studied in the previous lessons that the determinants of demand are the commodity's own price, income, price of related goods (substitutes and complements), and consumers expectations regarding future price, i.e.,

$$Q^D = f(P^X, M, P^Y, P^Z, \text{etc.})$$

Here,  $Q_X^D$  = Quantity demanded of commodity X

$P_X$  = Price of commodity X

M = Money income of the consumer

$P_Y$  = Price of the substitute, X and Y are substitutes to each other

$P_Z$  = Price of the complement, X and Z are complements to each other

Therefore, we can calculate the elasticity of demand with respect to each of the determinants. When we calculate the responsiveness of demand to the change in commodity's own price, then we call it *price elasticity of demand*. If we calculate the elasticity of demand with respect to the change in consumer's money income, we call it *income elasticity of demand*. If we calculate the elasticity of demand with respect to the change in the price of any related goods (substitutes or complements), we call it *cross elasticity of demand*.

Now let's start with *price elasticity of demand*.

### Price Elasticity of Demand

If the price of a commodity changes, then do consumers change their attitude in buying that commodity?

The answer may be one of the following three:

- They do not change their attitude;
- They slightly change their attitude;
- They change their attitude drastically.

Response of consumers to a change in price is measured by the price elasticity of demand.

How much consumers respond to the price changes is measured by price elasticity of demand. In other words, the response of consumers to a change in price is measured by the price elasticity of demand. Specifically, the price elasticity of demand refers to the percentage change in quantity

demanded divided by the percentage change in price. That is, the price elasticity of demand,

$$E_p^D = \frac{\text{percentage change in quantity demanded of X}}{\text{percentage change in price of X}} = \frac{\% \Delta Q_x^D}{\% \Delta P_x}$$

Here,  $Q_x$  = Quantity demanded for commodity X

$P_x$  = Price of commodity X

$\% \Delta P_x$  denotes percentage change in price which is calculated by dividing the change in price by the original price and  $\% \Delta Q_x^D$  denotes percentage change in quantity demanded which is calculated by dividing the change in quantity by the original quantity. That is:

$$\% \Delta P_x = \frac{\Delta P_x}{P_x^O} \times 100, \text{ where } P_x^O = \text{Original Price}$$

$$\text{and } \% \Delta Q_x^D = \frac{\Delta Q_x}{Q_x^O} \times 100, \text{ where } Q_x^O = \text{Original Quantity}$$

Thus, our formula restated :

$$E_p^D = \frac{\Delta Q_x / Q_x^O}{\Delta P_x / P_x^O} = \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{P_x^O}{Q_x^O}$$

As we know from the demand law that one of the changes ( $\Delta Q_x$  or  $\Delta P_x$ ) in the elasticity formula will be negative. As a result, the sign of the elasticity coefficient will be negative. For convenience, we ignore the sign of the elasticity formula.

At the moment, some questions may arise in your mind:

**(a) Why are percentages used rather than absolute amounts in measuring consumer responsiveness?**

The answer is two fold:

- If we use absolute changes, our impression of buyer responsiveness will be arbitrarily affected by the choice of units. For example, the price of product X falls from Tk. 5 to Tk. 3, and consumers increase their purchases from 70 to 100 Kg., it appears that consumers are quite sensitive to price changes, and, therefore, that demand is elastic. After all, a price change of 'two' has caused a change in the amount demanded of 'thirty'. But by changing the monetary unit from taka to paisa, we find a price change of 'two hundred' causes a quantity change of 'forty', giving the impression of inelasticity. Using percentage changes avoids this problem. The given price decline is 33 per cent whether measured in term of taka (Tk. 2 / Tk. 5) or paisa (200 p / 500 p). Therefore, elasticity is a *unit-free* measure.

- The other reason for using percentage is that we can more meaningfully compare consumer responsiveness to changes in the prices of different products. It makes little sense to compare the effects on quantity demanded of a Tk. 1 increase in the price of a Tk. 10,000 washing machine with a Tk. 1 increase in the price of a Tk. 1 shaving blade. Here the price of washing machine is rising by .0001 per cent while the blade price is up by 100 per cent! If the price of both products were increased by 1 percent - Tk. 100 for the washing machine and 1 p for the blade - we would obtain a sensible comparison of consumer sensitivity to the price changes.

***(b) Why should we ignore the 'minus sign' in the price elasticity of demand formula?***

We know from the downward sloping demand curve that price and quantity demanded are inversely related (demand law). This means that the price elasticity coefficient of demand will always yield a negative number. For example, if price declines, then quantity demanded will increase. This means that the numerator in our formula will be positive and denominator negative, yielding a negative coefficient. Conversely, for an increase in price, the coefficient will also be negative.

This negative sign is usually ignored and it is simply presented the *absolute value* of the elasticity coefficient.

This negative sign is usually ignored and it is simply presented the *absolute value* of the elasticity coefficient to avoid an ambiguity which might otherwise arise. It can be confusing to say that an elasticity coefficient of '- 4' is greater than one of '- 2', this possible confusion is avoided when we say a coefficient of 4 indicates greater elasticity than one of 2. Hence, we ignore the minus sign in the coefficient of price elasticity of demand and merely show the absolute value. However, the noted ambiguity does not arise with supply because price and quantity are positively related.

***(b) Does elasticity coefficient give the same message as the slope of demand curve gives?***

Certainly not. Slope depends on the units in which we measure the price and quantities. This is why, if we want to compare two demand curves, we can't do that simply by their slopes. Also, we often need to compare the demand curves for different goods and services. For example, when deciding by how much to change the tax rates, the government needs to compare the demand for oil and the demand for tobacco. Which is more responsive to price? Which can be taxed at an even higher rate without decreasing the tax revenue? Comparing the slope of the demand curve for oil with the slope of the demand curve for tobacco has no meaning because oil is measured in gallons and tobacco in pounds- completely unrelated units.

In this case, for meaningful comparison, we should have a measure of responsiveness that is independent of the units of measurement of prices and quantities. Elasticity is such a measure.

On the other hand, at every point on a straight line demand curve, the slope is the same. But the elasticity coefficient varies from one point to another point on the straight line demand curve.

(d) *Is elasticity of demand the ratio of percentage changes or proportionate changes?*

Elasticity is the ratio of the percentage change in the quantity demanded to the percentage change in the price. It is also, equivalently, the proportionate change in the quantity demanded by the proportionate change in the price. This can be shown as follows:

$$\text{Percentage change in quantity demanded} = \% \Delta Q = \frac{\Delta Q}{Q} \times 100$$

$$\text{Percentage change in price} = \% \Delta P = \frac{\Delta P}{P} \times 100$$

$$\text{Proportionate change in quantity demanded} = \frac{\Delta Q}{Q}$$

$$\text{Proportionate change in price} = \frac{\Delta P}{P}$$

Now, the formula of elasticity of demand is:

$$\begin{aligned} E_p^D &= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} \\ &= \frac{\% \Delta Q}{\% \Delta P} \\ &= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} \\ &= \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\text{Proportionate change in quantity demanded}}{\text{Proportionate change in price}} \end{aligned}$$

Therefore, elasticity is the ratio of percentage changes, which ultimately stands as a ratio of proportionate changes after the cancellation of the 100s.

### Approaches to Computing Price Elasticity : Point versus Arc Elasticity

Point elasticity can be used to evaluate the effect of infinitesimally small change in price or to compute the price elasticity at a particular price.

There are two approaches to computing price elasticities: *point* and *arc* elasticities. What approach we will choose depends on the available data and the intended use. For analyzing the effect of discrete (i.e., measurable) change in price, arc elasticity is appropriate. For example, a price increase from Tk. 5.00 to Tk. 6.00 could be evaluated by computing the arc elasticity. In practice, most elasticity computations involve the *arc method*.

On the other hand, *point elasticity* can be used to evaluate the effect of infinitesimally small change in price or to compute the price elasticity at a particular price. Point elasticities are important in theoretical Economics.

Now let's know about arc and point elasticities in detail.

#### Arc Elasticity

The formula used to computing arc elasticity is:

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

$$E_p = \frac{\Delta Q_x / Q_x^o}{\Delta P_x / P_x^o} = \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{P_x^o}{Q_x^o}$$

Graphically, arc elasticity is the measure of elasticity of demand between two finite points on a demand curve. For example, in Figure 3.1, the measure of elasticity between points A and B is arc elasticity.

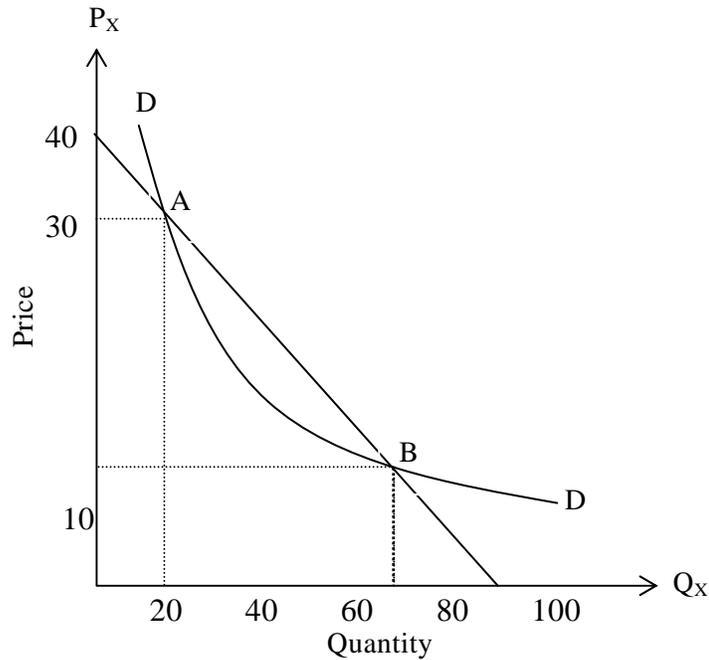


Figure 3.1 : Arc elasticity

Let's assume that the original price and quantity (at Point A) are Tk. 30 and 20 units respectively. If we move from Point A to B along the demand curve DD, price will fall and consequently, the quantity demanded will be increased. That is:

$$\Delta P_x = 30 - 10 = 20$$

$$\Delta Q_x = 20 - 70 = -50$$

Therefore, the elasticity between Point A and B (moving from A to B) will be as follows:

$$\begin{aligned} E_P^D &= \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{P_x^o}{Q_x^o} \\ &= \frac{-50}{20} \cdot \frac{30}{20} = 3.75 \end{aligned}$$

The elasticity coefficient 3.75 indicates that as a result of a 1 percent decrease in the price of X the demand for the commodity X is increased by 3.75 per cent.

We have seen that the elasticity coefficient 3.75 indicates the elasticity of the portion of the demand curve between Points A and B. Is this result true for either direction or change in price? That means, will we get the same elasticity coefficient (3.75) if we start from Point B to A on the demand curve? Let's check it.

Original price and quantity at Point B are  $P_x^o = 10$  and  $Q_x^o = 80$  respectively.

$$\Delta P_x = 30 - 10 = 20, \Delta Q_x = 20 - 70 = -50$$

Now, putting the values into the elasticity formula, we get elasticity between Point B and A as:

$$\begin{aligned} E_P^D &= \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{P_x^o}{Q_x^o} \\ &= \frac{-50}{20} \cdot \frac{10}{70} \\ &= \frac{5}{-14} = -.35 \end{aligned}$$

Therefore, the elasticity coefficient computed for the same portion of the demanded curve varies in respect to the direction of the change in price, which indicates a serious problem with computation of the elasticity coefficient using the above formula.

To resolve this problem, economists suggested some modifications in the elasticity formula :

**Using lower values of price and quantity demanded:** By using lower values of price and quantity demanded instead of their original values ( $P_x^o, Q_x^o$ ) the problem arising due to the change in the direction of price change may be avoided. The formula will be:

$$E_P^D = \frac{\Delta P_x}{\Delta Q_x} \cdot \frac{P_x^l}{Q_x^l} \dots\dots\dots(1)$$

Where  $l$  denotes lower values.

From our example, for measuring elasticity between Points A and B in Figure 3.1, we find  $P_x^l=10$  (lower one of the two prices),  $Q_x^l= 20$  (the lower one of the two quantities),  $\Delta P_x = 20$ ,  $\Delta Q_x = 50$ .

By substituting these values in Equation (1), we get:

$$E_P^D = \frac{-50}{20} \times \frac{10}{20} = -1.25$$

This method, however, violates the rule of computing percentage change, because, the choice of the lower values of P and Q is arbitrary. Thus this method is devoid of any logic.

**Using average value of price and quantity:** In this method, the average of the upper and lower values of P and Q are used. The formula then stands as:

$$\begin{aligned} E_P &= \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{(P_x^u + P_x^l)/2}{(Q_x^l + Q_x^u)/2} \\ &= \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{P_x^{ave}}{Q_x^{ave}} \\ &= \frac{\Delta Q_x}{\Delta P_x} \cdot \frac{P_x^u + P_x^l}{Q_x^l + Q_x^u} \dots\dots\dots(2) \end{aligned}$$

Where u, l are upper and lower values respectively. 2's are cancelled by each other. 'Ave' means 'average'.

Putting the values from our example of Figure 3.1 into Equation 2 we get:

$$E_p^D = \frac{50}{-20} \cdot \frac{30+10}{20+70} = -\frac{50 \cdot 40}{20 \cdot 90} = \frac{10}{9} = 1.11$$

This method measures the elasticity at the mid-point of the chord that connects the Points A and B on the demand curve defined by the initial and new price levels (Figure 3.1).

The elasticity coefficient just computed (1.11) is not true for the whole range of price-quantity combinations between Points A and B (see Figure 3.1). It does not resolve the problem that arises due to the change in the direction of the price. It gives only the mean of the elasticities between the two points.

However, this method is widely used, conventionally, to calculate arc elasticity.

It should be clear that this measure of the arc elasticity is an approximation of the true elasticity of the section AB of the demand curve, which is used when we know only the two Points A and B from the demand curve, but not the intermediate ones. Clearly the more convex to the origin the demand curve, the poorer the linear approximation attained by the arc elasticity formula.

**Point Elasticity**

If the changes in price are infinitesimally small, we use the point elasticity of demand as a measure of the responsiveness of demand. The point elasticity of demand is defined as the percentage change in the quantity demanded resulting from an infinitesimally small change in prices. Symbolically, we may write the formula of point elasticity as follows:

$$E_p = \frac{dQ_x}{Q_x} \bigg/ \frac{dP_x}{P_x}$$

$$= \frac{dQ_x}{dP_x} \cdot \frac{P_x}{Q_x} \dots\dots\dots (3)$$

In this formula, the first part,  $\frac{dQ_x}{dP_x}$  is reciprocal of the slope of the demand curve. So, the slope is the part of the elasticity formula. But it is not the only part : The ratio  $P_x/Q_x$  is invalid as well.

Example: Suppose, a linear demand curve is:

$$Q_x = b_0 - b_1 P_x$$

By differentiating we get,

$\frac{dQ_x}{dP_x} = -b_1$  . Substituting this value into the elasticity formula (Equation-3), we obtain:

$$E_p = b_1 \cdot \frac{P_x}{Q_x}$$

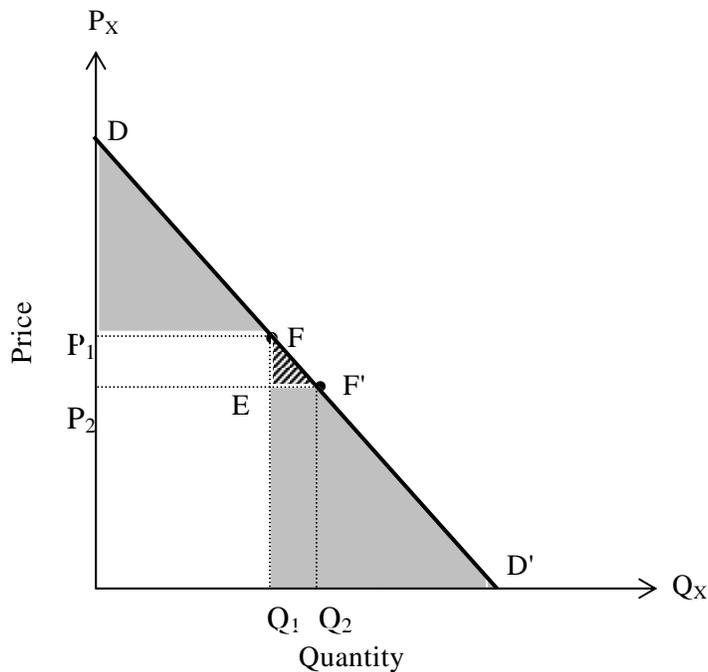
The elasticity changes at the various points of the linear demand curve.

which implies that the elasticity changes at the various points of the linear demand curve (why?). In this case, since the changes are very small, the directions of price changes do not affect the elasticity coefficient. If we calculate elasticity considering either direction of price changes, the result will be almost the same.

Graphically, the point elasticity of a linear demand curve is shown by the ratio of the segments of the line to the right and to the left of the particular point. That means:

$$E_p = \frac{\text{Right or lower part of the particular point}}{\text{Left or upper part of the particular point}}$$

For example, in Figure 3.2, the elasticity of the linear demand curve DD' at Point F is the ratio  $\frac{FD'}{FD}$



**Figure 3.2 : Point elasticity**

***Proof :***

From Figure 3.2 we see that

$$\Delta P = P_1 P_2 = EF$$

$$\Delta Q = Q_1 Q_2 = EF'$$

If changes in P and Q are considered as infinitesimally small, then  $\Delta P \Rightarrow dP$  and  $\Delta Q \Rightarrow dQ$ . Thus, substituting in the formula for the point elasticity, we obtain

$$E_p = \frac{dQ}{dP} \cdot \frac{P}{Q} = \frac{Q_1 Q_2}{P_1 P_2} \cdot \frac{OP_1}{OQ_1} = \frac{EF'}{EF} \cdot \frac{OP_1}{OQ_1}$$

From the figure we can also see that the triangles FEF' and FQ<sub>1</sub>D' are similar (because each corresponding angle is equal). Hence,

$$\frac{EF'}{EF} = \frac{Q_1 D'}{FQ_1} = \frac{Q_1 D'}{OP_1}$$

Thus

$$E_p = \frac{Q_1 D'}{OP_1} \cdot \frac{OP_1}{OQ_1} = \frac{Q_1 D'}{OQ_1}$$

Furthermore, the triangle DP<sub>1</sub>F and FQ<sub>1</sub>D' are similar, so that

$$\frac{Q_1 D'}{OP_1} = \frac{P_1 F}{FD} = \frac{OQ_1}{FD}$$

Rearranging we obtain

$$\frac{Q_1 D'}{OQ_1} = \frac{FD'}{FD}$$

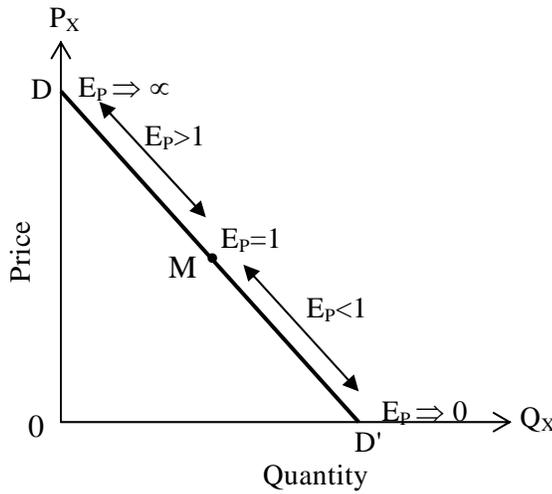
Thus the price elasticity at Point F is:

$$E_p = \frac{Q_1 D'}{OQ_1} = \frac{FD'}{FD}$$

### ***Elasticities at different points on a demand curve***

According to the graphical measurement of point elasticity, we can easily identify the elasticity coefficients at different points on a demand curve. Let's first deal with the linear demand curve.

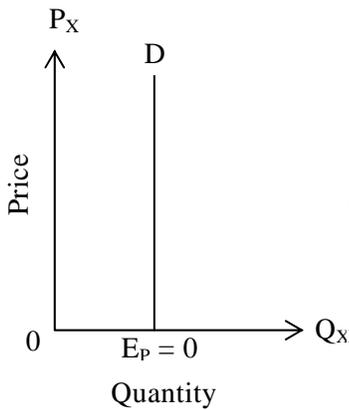
**Point elasticities of a linear demand curve:** See the Figure 3.3. DD' is a straight-line or linear demand curve.



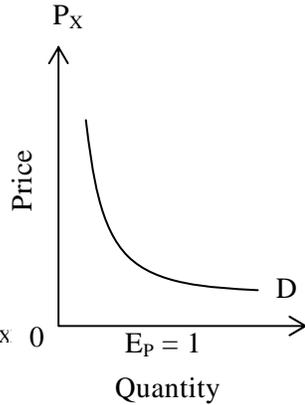
**Figure 3.3 : Point elasticities at point on a straight line**

At mid-point, M, of the demand curve the  $E_p = 1$ . At any point right of M the  $E_p < 1$  and at any point left of M the  $E_p > 1$ . At Point D the  $E_p \Rightarrow \infty$ , while at Point D' the  $E_p \Rightarrow 0$ . So, the range of values of the elasticity are:  $0 \leq E_p \leq \infty$ . Let's now know the explanation of different elasticity coefficients and about the shape of the corresponding demand curves presented as below:

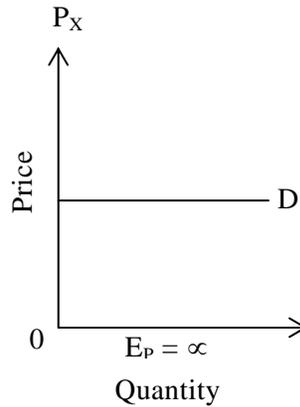
Elasticity coefficients	Explanation	Shape of the demand curve
$E_p = 0$	Demand is perfectly inelastic	Vertical (Figure 3.4)
$E_p = 1$	Demand is unitary elastic	Rectangular hyperbolic (Figure 3.5)
$E_p \Rightarrow \infty$	Demand is perfectly elastic	Horizontal (Figure 3.6)
$0 < E_p < 1$	Demand is inelastic	
$1 < E_p < \infty$	Demand is elastic	



**Figure 3.4**



**Figure 3.5**



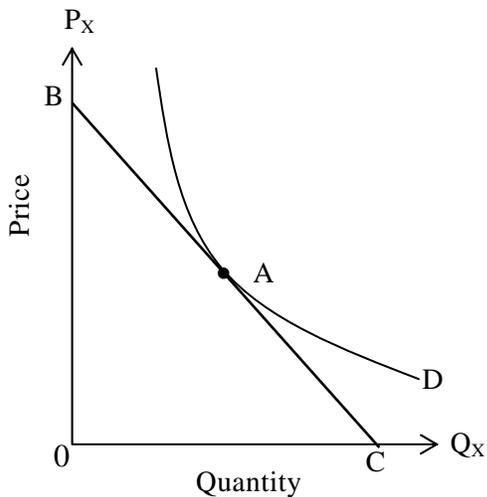
**Figure 3.6**

**Point elasticities of a non-linear demand curve:** The elasticity at a point (say A) on a non-linear demand curve can be computed in the following way:

*First*, draw a tangent to the demand curve at Point A.

*Second*, divide the segment of the tangent to the right of A by the segment to the left of A. Then you will get the elasticity coefficient of the demand curve at Point A.

This is shown in Figure 3.7.



**Figure 3.7 : Point elasticity of a non-linear demand curve**

At Point A the  $E_p = AC/AB$ . Similarly, we can find the elasticity at any other point on the demand curve.

### Determinants of Price Elasticity of Demand

The price elasticity of demanded is influenced by all the determinants of demand.

What factors make demand for a commodity more elastic or less elastic? Why are people price-sensitive ( $e > 1$ ) with some goods and not ( $e < 1$ ) with others? To find answers to these questions, we have to go back to the demand curve itself. The elasticity of demand is computed between points on a given demand curve. Hence, the price elasticity of demanded is influenced by all the determinants of demand. Anyway, there are no iron-clad generalizations concerning determinants of the elasticity of demand. The following factors, however, are worth noting:

**Nature of the Goods (Luxuries versus Necessities):** Necessities such as food stuff are price inelastic, meaning they are not very responsive to change in prices. For example, the quantity of rice demanded does not decline much when the price of rice rises. This happens because people do not reduce their consumption of rice even if the price is very high. People cannot live without rice. Therefore, rise in price cannot influence the demand for necessities very much.

Luxury goods are very responsive to changes in prices.

In contrast, any luxury good such as air conditioner, decoration item, etc. are price elastic, meaning they are very responsive to changes in prices. People can postpone the consumption of luxury goods when their prices rise.

**Availability of Close Substitutes:** This is a critical determinant of price elasticity of demand. If consumers can easily get a good substitute Y for a product X, they will switch readily to Y if the price of X rises. Thus the closer the substitutes for X that are available, the more elastic its demand will be. For example, the demand for a particular brand of toothpaste is quite elastic; because another brand will work just as well. If the price of Close-Up toothpaste rises, people will switch readily to any other brands such as Pepsodent, Colgate, etc. Here an important thing should be remembered that availability of close substitutes depend on how narrowly or broadly the commodity is defined. If we define a commodity narrowly (such as Close-Up toothpaste), many substitutes are available for that commodity. So, the elasticity of demand for that commodity is high. On the other hand, if the commodity is broadly defined (such as toothpaste), no many substitutes for that commodity are available and thus the elasticity of the demand for that commodity is low. Similarly, the elasticity of demand for meat in general is low, but the elasticity of demand for beef, lamb, or chicken is high. The elasticity of demand for personal computers is low, but the elasticity of demand for a Compaq, Dell, Intel or IBM is high.

Elasticity of demand for narrowly defined commodity is high.

Therefore, the demand for narrowly defined commodity is more elastic than the demand for more broadly defined commodities.

**Fraction of the Income Absorbed:** Other things remaining the same, the higher the proportion of income spent on a good, the more elastic the demand for it. If only a small fraction of income is spent on a good, then a change in

its price has little impact on the consumer's overall budget. In contrast, even a small rise in the price of a good that commands a large part of a consumer's budget induces the consumer to make a radical reappraisal of expenditures.

For example, think about the elasticity of demand for textbooks and chewing gum. If price of textbooks doubles (rises by 100%), there will be a big decrease in the quantity of textbooks bought. Thus, students will share and photocopy the textbook instead of buying new ones. If the price of chewing gum doubles, also a 100% increase, there will be no change in the quantity of gum demanded. Why is the difference? Because textbooks take a large proportion of the budget, while gum takes only a tiny portion.

Evidence (1989) shows that in, Tanzania, a poor African nation where average income is 3.3% of that in the United States and where 62% of income is spent on food, the price elasticity of demand for food is 0.77. In contrast, in the United States, where 12 percent of income is spent on food, the elasticity of demand for food is 0.12.

**Time:** The demand for many products is more elastic in the long run than in the short run. When the price of a product rises, it takes time to find and experiment with other products to see if they are acceptable. Consumers may not immediately reduce their purchases very much when the price of chicken rises by 10 percent, but in time they may shift to beef or fish. Therefore, since consumers do not reduce the demand for a commodity (for example, chicken) immediately after the rise in its price, the demand for that commodity is inelastic in the short run. But if the price of chicken remains high for a long time, then consumers switch to any convenient (or less costly) substitutes for chicken (for example, beef, fish, etc.), which makes the demand for chicken elastic in the long run.

The demand for many products is more elastic in the long run than in the short run.

**Alternative uses of a commodity:** The more the alternative uses of a commodity, the highly elastic is the demand for it. For example, if the price of milk falls, the demand for milk will increase more than the proportionate fall in its price, because milk can be used in different purposes such as in making curds, ghees, butter, sweets, etc. Therefore, the demand for milk is highly elastic.

The more the alternative uses of a commodity, the highly elastic is the demand for it.

## Price Elasticity and Total Revenue

We have learnt from the previous sections that price elasticity is a measure of the responsiveness of demand or consumer's buying plan to a change in price. But why should one need to know the elasticity of demand? What things depend upon the elasticity of demand? There are a number of purposes in which elasticity is used as a guide. For example, if a firm wants to know the impact of the price of its product on its revenue, then price elasticity of demanded provides a simple guide to the answer.

If demand for the firm's product is elastic, a rise in price will decrease total revenue. If the demand is exactly unit elastic, a rise in price will have total revenue unaffected. If demand is inelastic ( $e_p < 1$ ), a rise in price will raise total revenue. The opposite will be true when price falls.

Therefore, only rise or fall in price cannot tell us anything about the change in revenue. This happens, because, total revenue (or expenditure, since the expenditure of the buyers are exactly the same thing as the revenue of the seller) equals price times quantity demanded,  $P \times Q$ , and a fall in price has two opposing effects on  $P \times Q$ . **First effect:** Since the price has fallen, people now have to spend less money on each unit of good, which decreases the revenue. **Second effect:** Since price has fallen, people now buy more units of the goods than before, which increases revenue.

The net consequence for total revenue depends on the elasticity. If price goes down by 10% and quantity demanded increases by 10% (a case of unit elasticity), the two effects just cancel out :  $P \times Q$  (= total revenue) remains constant. On the other hand, if price goes down 10% and quantity demanded rises 15% (a case of elastic demand),  $P \times Q$  increases. Finally, if a 10% price fall leads to a 5% rise in quantity demanded (an inelastic case),  $P \times Q$  decreases.

If a decrease in price results in an increase in total revenue, the demand is elastic.

In the previous paragraphs, we have learnt that if the demand is unit elastic, a decrease in price will result in an increase in total revenue. We can say the same thing in a different way. If a decrease in price results in an increase in total revenue, the demand is elastic - this can be named as *total revenue test*.

By employing this test we can most easily infer whether demand is elastic or inelastic. In this test, we have to observe what happens to total revenue - total expenditures from the buyer's view point - when the product price changes.

Let's check the elasticities of some demand curves by employing the total-revenue test.

### ***Total-Revenue Test***

If the total revenue increases with the fall in price, the demand is elastic.

If price falls, total revenue may increase or decrease or remain constant. Same results may come out in the case of a rise in price. If the total revenue increases with the fall in price, the demand is elastic. If total revenue decreases, the demand is inelastic. If total revenue does change, the demand is unitary elastic. We can see these things symbolically as follows:

#### **In the case of fall in price**

If  $TR^{\text{end}} - TR^{\text{start}} < 0$ , then demand is inelastic

If  $TR^{\text{end}} - TR^{\text{start}} > 0$ , then demand is elastic

If  $TR^{\text{end}} - TR^{\text{start}} = 0$ , then demand is unitary elastic.

Here,  $TR^{\text{end}}$  = End value of total revenue, i.e., TR after the change in price;

$TR^{\text{start}}$  = Start value of total revenue, i.e., TR before the change in price.

**In the case of rise in price**

If  $TR^{end} - TR^{start} < 0$ , then demand is elastic.

If  $TR^{end} - TR^{start} > 0$ , then demand is inelastic.

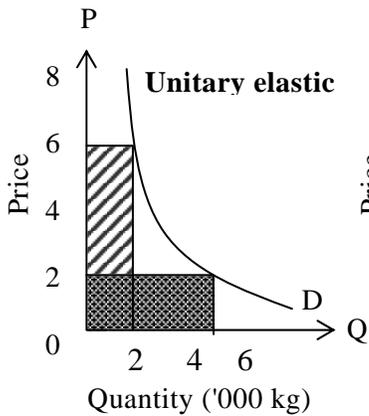
If  $TR^{end} - TR^{start} = 0$ , then demand is unitary elastic.

Some examples are given below:

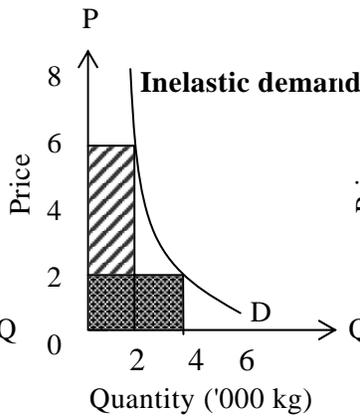
**Case 1: Price falls, total revenue increases**

	Price (Tk.) P	Quantity ('000 Kg) Q	Total revenue (TR) P×Q	Net effect ( $TR^{end} - TR^{start}$ )	Description	Demand
Start	6	2	12	+4	Quantity demanded changes by a larger percentage than does price	Elastic
End	2	8	16			

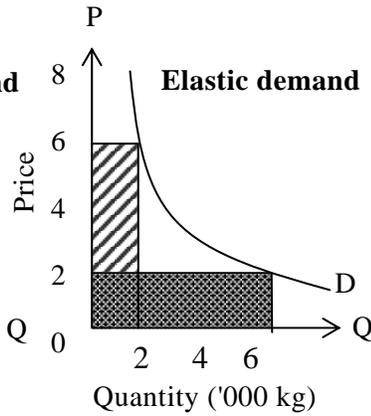
Graphically, *Case-1* is shown in Figure 3.9.



**Figure 3.7**



**Figure 3.8**



**Figure 3.9**

**Case 2: Price falls, total revenue decreases**

	Price (Tk.) P	Quantity ('000 Kg) Q	Total revenue (TR) P×Q	Net effect (TR <sup>end</sup> - TR <sup>start</sup> )	Description	Demand
Start	6	2	12	- 4	Quantity demanded changes by a smaller percentage than does price	Inelastic
End	2	4	8			

Graphically, *Case-2* is shown in Figure 3.8.

**Case 3: Price falls, total revenue unchanged**

	Price (Tk.) P	Quantity ('000 Kg) Q	Total revenue (TR) P×Q	Net effect (TR <sup>end</sup> - TR <sup>start</sup> )	Description	Demand
Start	6	2	12	0	Quantity demanded changes by the same percentage than does price	Unitary elastic
End	2	6	12			

Graphically, *Case-3* is shown in Figure 3.7.

**Relationship Between Price Elasticity and Marginal Revenue**

The marginal revenue is related to the price elasticity of demand with the formula

$$MR = P \left( 1 - \frac{1}{e_p} \right)$$

This is a crucial relationship for the theory of pricing.

**Proof:**

We know, total revenue  $TR = P.Q$

By differentiating  $TR = P.Q$  with respect to  $P$ , marginal revenue (MR) can be obtained as presented below:

$$\begin{aligned}
 MR &= \frac{\partial}{\partial Q}(P.Q) \\
 &= P \frac{\partial Q}{\partial Q} + Q \frac{\partial P}{\partial Q} \\
 &= P + Q \frac{\partial P}{\partial Q} \\
 \therefore MR &= P \left[ 1 + \frac{Q}{P} \cdot \frac{\partial P}{\partial Q} \right] \\
 &= P \left[ 1 + \frac{1}{\frac{P}{Q} \cdot \frac{\partial Q}{\partial P}} \right]
 \end{aligned}$$

Since  $-\frac{P}{Q} \cdot \frac{\partial Q}{\partial P} = e$ , we get by substituting

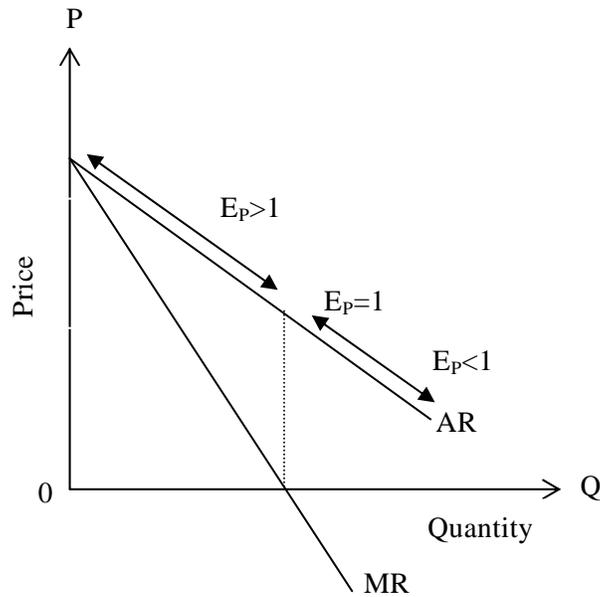
$$\begin{aligned}
 &= P \left[ 1 - \frac{1}{e} \right] \\
 \therefore MR &= P \left[ 1 - \frac{1}{e} \right] \dots\dots\dots (4)
 \end{aligned}$$

From this relationship, it can be concluded that:

If demand is unitary elastic ( $E_p = 1$ ), the marginal revenue is zero, i.e., the total revenue-curve reaches its maximum point.

If demand is elastic ( $E_p > 1$ ), marginal revenue is positive, i.e., total-revenue is increasing, and has not reached its maximum.

If demand is inelastic ( $E_p < 1$ ), marginal revenue is negative, i.e., total-revenue is decreasing.



**Figure 3.10: Price elasticity and marginal revenue**

In Figure 3.10, it is shown that the point of unitary elasticity corresponds to the point where the marginal revenue curve crosses the quantity axis. That is, marginal revenue is zero where demand is unitary elastic.

The figure also shows that marginal revenue is positive where demand is elastic, and negative where demand is inelastic.

The elasticities of demand with respect to income, is called income elasticity.

In the previous paragraphs, we learnt about price elasticity of demand. However, we know there are some other factors which influence our buying plans. Among the *other factors*, the prices of other goods and income are important. We can calculate an elasticity of demand for each of these other factors as well as for own price. Let's now know the elasticities of demand with respect to income, which is called *income elasticity*, and with respect to the prices of related goods, which is called *cross elasticity* of demand.

### **Income Elasticity of Demand**

We know from *Lesson 1* of *Unit 2* about the impact of income changes on demand for a good. Now we will know how the demand for a particular good changes as income grows? The answer depends on the income elasticity of demand for the good. The income elasticity of demand is a measure of the responsiveness of demand to a change in income, other things remaining the same. It is calculated by using the following formula :

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

As price elasticity, income elasticity can be expressed in either arc or point terms. *Arc income elasticity* is used when relatively long changes in income are considered and is defined as:

$$E_Y = \frac{\Delta Q_X}{\Delta Y} \cdot \frac{Y^{\text{ave}}}{Q_X^{\text{ave}}}$$

Where  $\Delta Y = Y^0 - Y^1$

$$\Delta Q_X = Y_X^0 - Y_X^1$$

$$E_Y = \frac{\Delta Q_X}{\Delta Y} \cdot \frac{Y' + Y''}{Q_X' + Q_X''}$$

$$Q_X^{\text{ave}} = \frac{Q_X' + Q_X''}{2}$$

$$Y^{\text{ave}} = \frac{Y' + Y''}{2}$$

$Q'$  = Initial quantity

$Q''$  = Changed quantity

$Y'$  = Initial income

$Y''$  = Changed income

On the other hand, if the change in income is small or if income elasticity at a particular income level is to be determined, a *point elasticity* is appropriate.

In this case,

$$\text{Lim}_{\Delta Y \rightarrow 0} \frac{\Delta Q_X}{\Delta Y} \approx \frac{dQ_X}{dY}$$

So, the income elasticity formula stands as follows:

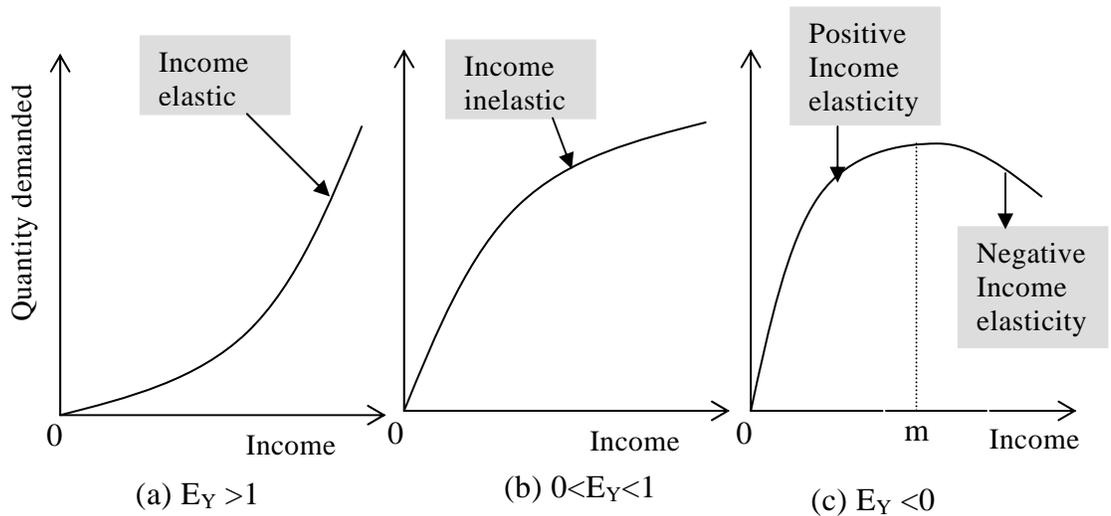
$$E_Y = \frac{dQ_X}{dY} \cdot \frac{Y}{Q_X}$$

### Nature of the Commodity and Income Elasticity

Income elasticity of demand can be positive or negative and falls into the following interesting ranges:

Absolute value of elasticity coefficient	Terminology	Description	Nature of the commodity	Example
Greater than 1 ( $E_Y > 1$ )	Elastic demand	Quantity demanded changes by a larger percentage than does income	Normal	International travel, jewelry, works of arts, etc.
Between zero and 1 ( $0 < E_Y < 1$ )	Inelastic demand	Quantity demanded changes by a smaller percentage than does income	Normal	Food, clothing, furniture, newspaper, and magazines
Less than 0 ( $E_Y < 0$ )	Inelastic demand	Quantity demanded changes in opposite direction of the income change	Inferior	Potatoes, rice, etc.

The three cases cited above can be illustrated by diagrams. Figure 3.11 does it.



**Figure 3.11: Income elasticity of demand**

Part (a) shows an income elasticity that is greater than 1, i.e., as income increases, quantity demanded increases, but the quantity demanded increases faster than income.

Part (b) shows an income elasticity of demand that is between zero and 1. In this case, the quantity demanded increases as income increases, but income increases faster than the quantity demanded.

Part (c) shows an income elasticity of demand that eventually becomes negative. In this case, the quantity demanded increases as income increases until it reaches a maximum at income **m**. After that point, as income continues to increase, the quantity demanded declines. Up to the income **m**, the income elasticity of demand is positive but less than 1. After income **m**, the income elasticity of demand is negative.

The low-income people normally buy bicycles, potatoes, and rice. Up to a level of income, they increase buying of these commodities as income increases. But as income goes above the Point **m**, consumers replace these goods with superior alternatives. For example, a motorcycle replaces a bicycle; fruit, vegetables and meat begin to appear in a diet that was heavy in rice or potato.

### **Determinants of Income Elasticity**

The income elasticity of demand for different categories of goods may, however, vary from household to household and from time to time. The main factors that determine the income elasticity of demand are:

**The nature of the need that the commodity covers:** The percentage of income spent on necessities (for example, food, clothing, etc.) declines as income increases (see Engel's law).

**The initial level of income of a country:** A TV set is a luxury in an underdeveloped, poor country while it is a necessity in a country with high per capita income.

**The time period:** Time period is one of the determining factors of elasticity, because, consumption patterns adjust with time-lag to changes in income.

### **Uses of Income Elasticity**

Some important uses of income elasticity of demand are as follows:

**Estimating Future demand:** If the rate of increase in income and income elasticity of demand are known, then income elasticity can be used to estimate the future demand.

**Defining the nature of goods:** The goods whose income elasticity is positive for all levels of income are termed as *normal goods*. On the other hand, the goods for which income-elasticity is negative, beyond a certain level of income, are termed as *inferior goods*.

### **Engel's Law**

Ernst Engel, a German statistician, proposed this law in the nineteenth century.

**Main theme of the Law:** The percentage of income spent on food decreases as incomes increase, i.e., the income elasticity of demand for food is less than unity and greater than zero ( $0 < E_Y < 1$ ).

To conclude this expenditure pattern, Engel studied the consumption patterns of a large number of households. Later, many other researchers have been confirmed his findings repeatedly.

**Implication of Engel's Law:** During the period of economic prosperity, farmers may not prosper as much as people in other occupations. The reason is that if expenditures on food do not keep pace with increase in gross domestic product, farm incomes may not increase as rapidly as incomes in general. However, this tendency has partially offset by the rapid increase in farm productivity in the recent years.

### **Cross Elasticity of Demand**

We already talked about the response of demand for a commodity to its own price and also to consumers income. Now, we will discuss the responsiveness of quantity demanded for a commodity to the prices of related commodities (substitutes and complement).

When we measure the responsiveness of demand of a commodity to the price of its substitutes or complements, then we call it *cross elasticity of demand*. Symbolically, we have

$$E_{xy} = \frac{dQ_x}{Q_x} \bigg/ \frac{dP_y}{P_y} = \frac{dQ_x}{dP_y} \cdot \frac{P_y}{Q_x}$$

Here X and Y are related goods.

If X and Y are complementary goods, the sign of the cross-elasticity is negative. If X and Y are substitutes, the sign is positive.

The higher the value of the cross-elasticity the stronger will be the degree of substitutability or complementarity of X and Y.

### **Determinants of Cross Elasticity**

**Nature of the commodities relative to their uses:** The main determinant of cross elasticity is the nature of the commodities relative to their uses. If two commodities can satisfy equally well the same need, the cross elasticity is high, and vice versa.

### Use of Cross Elasticity

- The cross elasticity is used for the definition of the firms which form an industry.
- It is used in defining whether producers in similar products are in competition with each other. *Econo ball pen* and *Writer ball pen* have a high cross elasticity of demand. The producer of Econo ball pen is thus in competition with the producer of Writer ball pen. If the Econo ball pen company raises its price, it will lose substantial sales to the Writer ball pen producer. Men's shoes and women's shoes have low cross elasticity. Thus a producer of men's shoes is not in close competition with a producer of women's shoes. If the former raises its price, it will not lose many sales to the latter.

## Review Questions

- *Essay-type Questions*

1. (a) Explain the following concepts separately
    - (i) Price-elasticity of demand
    - (ii) Income-elasticity of demand
    - (iii) Price-elasticity of supply
    - (iv) Cross elasticity of demand
  - (b) What are the uses of these concepts of elasticity in the analysis of the market.
2. (a) Explain the concepts of arc and point elasticities of a demand curve for a commodity.
  - (b) What is the problem in using the arc elasticity? How can this problem be resolved?
  - (c) How is the point elasticity on curvilinear demand curve measured?
3. Prove the following:

  - (a) Two parallel straight line demand curves have unequal price elasticities at the same price.
  - (b) Two intersecting straight line demand curves have different elasticities at the point of intersection.
4. Explain the concept of price elasticity of demand and the relationship between price elasticity, average revenue and marginal revenue.
5. (i) What are the determinants of price elasticity of demand?
  - (ii) Prove that in the case of two straight line demand curves, with the same point of origin on the price axis, at any given point, elasticity is the same inspite of their different slopes.
6. (a) What does price elasticity of demand measure?
  - (b) If two straight line demand curves intersect each other, which of them will have higher elasticity of demand at point of intersection?
  - (c) Explain cross elasticity of demand and income elasticity of demand.

7. Suppose a demand schedule is given as follows:

Price (Tk.)	100	80	60	40	20	0
Quantity	100	200	300	400	500	600

- Work out the elasticity for the fall in price from Tk. 80 to Tk. 60
- Calculate the elasticity for the increase in the price from Tk. 60 to Tk. 80.
- Why is the elasticity coefficient in (a) different from that in (b)?

• **True or False**

Which of the following statements are true?

- When percentage change in price is greater than the percentage change in quantity demanded,  $e > 1$ .
- The coefficient of the price-elasticity of a demand curve between any two points remains the same irrespective of whether price falls or rises.
- The slope of a demand curve measure its elasticity.
- The slope of demand curve multiplied by  $P/Q$  measures the elasticity of demand.
- Two parallel straight line demand curves have the same elasticity at a given price.
- Two intersecting straight line demand curves have the same elasticity at the point of their intersection.
- Two straight line demand curves originating at the same point on the price axis have the same elasticity at a given price.
- When income increases, the expenditure on essential goods increases more than proportionately.
- The demand for a commodity increases when the price of its substitute increase.
- The greater the cross elasticity, the closer the substitute.
- The price elasticity of the supply of a commodity is always negative.
- The income elasticity of the demand for luxury goods always positive.
- If price elasticity is less than one and price rises, the total expenditure decreases.
- If price elasticity is equal to one, the total revenue increases or decreases with the increase or decrease in the price.

• ***Multiple Choice Questions***

1. Price elasticity is what?
  - (a) Ratio of change in demand to the change in price
  - (b) Ratio of change in price to the change in demand
  - (c) Ratio of % change in demand to % change in price
  - (d) None of the above
2. Which of the following gives the measure of elasticity?
  - (a)  $(\Delta Q / \Delta P) (P/Q)$
  - (b)  $(\Delta P / \Delta Q) (P/Q)$
  - (c)  $(\Delta Q / \Delta P) (Q/P)$
3. Price of a commodity falls and its demand increases so that elasticity is estimated to be 1.25. Suppose price increases back to its old level. Will the elasticity for increase in price be.
  - (a) the same
  - (b) less than 1.25
  - (c) higher than 1.25
4. At a given price, two parallel demand curves have
  - (a) the same points elasticity
  - (b) a different point elasticity
5. Two intersecting demand curves have at the point of their intersection
  - (a) the same elasticity
  - (b) a different elasticity
6. A less-than-zero income elasticity indicates that with an increase in income, consumption of a product
  - (a) turns negative
  - (b) increases
  - (c) decreases
  - (d) remains constant

## Lesson-2: Elasticity of Supply

### Objectives

After studying this lesson, you will be able to:

- Explain the elasticity of supply; and
- Determinants of elasticity of supply.

### Introduction

We normally know that if price rises, the supply of the product will be increased. But if we like to know how much supply will be increased with the rise in price, we have to know how responsive of the quantity supplied is to the price of the good. That is, we need to know the elasticity of supply.

The concept of elasticity relates to supply as well as to demand just as elasticity of demand measures the response of quantity demanded to changes in any of its determinants. So, elasticity of supply measures the response of quantity supplied to changes in any of its determinants.

In this section, we only discuss the influence of the commodity's own price on supply - that is, price elasticity of supply.

### Price Elasticity of Supply

The price elasticity of supply measures the responsiveness of the quantity supplied of a commodity to a change in its price. The formula used to calculate the price elasticity of supply is:

$$E_p^S = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}} = \frac{\% \Delta Q_X^S}{\% \Delta P_X}$$

$$= \frac{\Delta Q_X^S / Q_X^{ave}}{\Delta P_X / P_X^{ave}} = \frac{\Delta Q_X^S}{\Delta P_X} \cdot \frac{P_X^{ave}}{Q_X^{ave}}$$

Note that the formula for measuring price elasticity of supply is similar to the formula used in measuring price elasticity of demand. In this formula, the only alternation is the substitution of *percentage change in quantity supplied* for *percentage change in quantity demanded*. As in the elasticity of demand formula, the mid-point of the changes in quantity supplied and price are used in calculation. The sign of the coefficient of the elasticity of supply is always positive because the supply curves are positively sloped - that is, direct relation exists between price and quantity supplied.

### Magnitude of the Price Elasticity of Supply

There are two extreme cases of price elasticity of supply :

- If the quantity supplied is fixed regardless of the price, the supply curve is vertical and the elasticity of supply is zero. Supply is perfectly inelastic.

Elasticity of supply measures the response of quantity supplied to changes in any of its determinants.

The sign of the coefficient of the elasticity of supply is always positive.

Vertical supply curve is perfectly inelastic.

This would be the case, for example, if suppliers produce a given quantity and dump it on the market for whatever it would bring.

- If there is a price at which suppliers are willing to sell any quantity demanded, the supply curve is horizontal and the elasticity of supply is infinite. Supply is perfectly elastic.
- If the percentage increase in quantity supplied exceeds the percentage increase in the price, the elasticity of supply is greater than 1 but less than infinity. Supply is elastic.
- If the percentage increase in the quantity supplied is less than the percentage increase in the price the elasticity of supply is less than 1 but greater than zero. Supply is inelastic.

### Determinants of Price Elasticity of Supply

In the previous section, we have learnt that the magnitude of the price elasticity of supply varies from zero to infinity. Now we will know, what things determine the magnitude of the price elasticity of supply? The following factors are the main determinants:

**Factor substitution possibilities:** If any goods or services are produced by using unique or rare factors of production, these goods or services have low elasticity of supply. For example, Banaroshi Shari of Mirpur is produced by a unique type of labour. No other factor of production can be substituted for this labour. For this reason, even if the demand for this item increases, it is almost impossible to increase the production of this item. So, the supply curve of Banaroshi Shari of Mirpur is almost vertical and its elasticity is about zero.

At the other extent, if any goods and services are produced by using factors of production that are more common and that can be calculated to a wide variety of alternative tasks. Such items have a high elasticity of supply. For example, wheat can be grown on land that is almost equally good for growing paddy. So it is just as easy to grow wheat as corn, and the opportunity cost of wheat in terms of forgone paddy is almost constant. As a result, the supply curve of wheat is almost horizontal and its elasticity is very large.

When a good is produced in many different countries the supply of the good is highly elastic.

Similarly, when a good is produced in many different countries (for example, sugar and beef), the supply of the good is highly elastic.

**Cost of production:** Supply elasticity depends to a great extent on how costs behave as output is varied. If costs of production rises rapidly as output rises, then the stimulus to expand production in response to a price rises will quickly be choked off by increases in cost. In this case, supply will tend to be rather inelastic. If, however, cost rises only slowly as production increases, a rise in price that raises profits will bring forth a large increase in quantity supplied before the rise in costs puts a halt to the expansion in output. In this case, supply will tend to be rather elastic.

**Time frame of the supply decisions:** There are three time frames of supply -

- Momentary Supply
- Short-run Supply
- Long-run Supply

**Momentary Supply:** When the price of a good rises or falls, the momentary supply curve shows the response of the quantity supplied immediately following a price change. Response of momentary supply to price changes varies on the basis of the nature of the production of the commodities. For example, agricultural products such as fruits, vegetables, etc. cannot be produced overnight. The planting decisions of these products is made earlier. In the case of some agricultural goods, for example, oranges, planting decision have to be made many years in advance of the crop being available. Therefore, in these cases, the momentary supply is perfectly inelastic - that is, the supply cannot be changed immediately even if the price rise is very high.

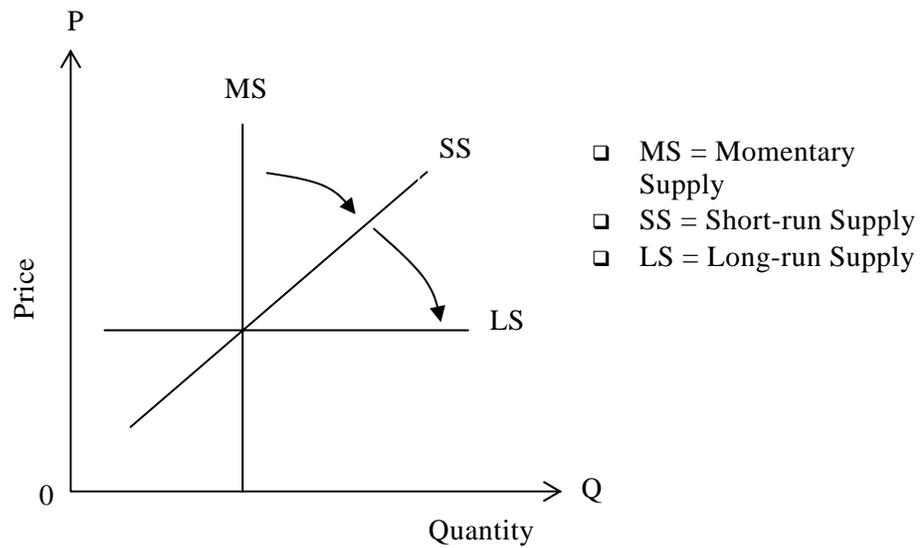
The momentary supply is perfectly inelastic.

There are some other items such as pen, doll, etc., which have an elastic momentary supply. When demand for pen increases then the producers can increase their production overnight.

**The long run supply:** The long-run supply curve shows the response of the quantity supplied to change in price after all the desired resource adjustments; individual firms can expand (or contract) their plant capacities, and new firms can enter (or existing firms can leave) the industry. In the case of oranges, the long run is the time it takes new plantings to grow to full maturity-about 15 years. In some cases, the long-run adjustment occurs only after a completely new production plant has been built and workers have been trained to operate it - typically a process that might take several years.

**Short run supply:** The short-run supply curve shows how the quantity supplied responds to a price change when only some of the technologically possible adjustments to production have been made. The adjustment that is usually made is in the amount of labour employed. To increase output in the short-run, firms work their labour force overtime and perhaps hire additional workers. To decrease their output in the short-run, firms lay off works or reduce their hours of work. Except these, firm can make additional adjustment - training additional workers or buying additional tools and other equipments.

In Figure 3-12, the momentary supply curve, MS, is perfectly inelastic-the



**Figure 3.12: Momentary, short-run and long-run supply**

supply fixed at all price levels. As time passes, the quantity supplied becomes more responsive to price and is shown by the short-term supply curve, SS. As yet more firm passes, the supply curve becomes the long-run supply curve LS which is the most elastic of the three supply curves.

## Review Questions

- **Essay-type Questions**

1. What is price elasticity of supply? How is it measured?
2. Describe the determinants of price elasticity of supply.
3. Tell something about the elasticity of momentary, short run and long run supply curves.

- **True or False**

Which of the following statements are true?

- (a) When percentage change in price is greater than the percentage change in quantity supplied,  $e > 1$ .
- (b) The coefficient of the price-elasticity of a supply curve between any two points remains the same irrespective of whether price falls or rises.
- (c) The slope of a supply curve measure its elasticity.
- (d) The slope of supply curve multiplied by  $P/Q$  measures the elasticity of supply.
- (e) Two parallel straight line supply curves have the same elasticity at a given price.

- **Multiple Choice Questions**

1. Elasticity of supply is defined as the ..... change in ..... for each ..... change in .....:
  - (a) unit; quantity; dollar; price
  - (b) dollar; price; unit; quantity
  - (c) percent; price; one percent; price
  - (d) percent; quantity; one percent; price
2. Compute the elasticity of supply from the following information:

	Price	Quantity
Initial situation	Tk. 20	1,000
New situation	25	1,500

- (a) .50
- (b) .25
- (c) 2
- (d) 1.25

3. If the elasticity of supply of a product is .75, a 10 percent change in the price of the item will bring forth a ..... percent change in quantity supplied:
  - (a) .75
  - (b) 7.5
  - (c) 75
  - (d) 750
  
4. Elasticity of supply of a product will be higher the ..... the availability of substitute inputs that can be drawn from other uses, and ..... the time has elapsed after the price change for adjustment to take place:
  - (a) greater; shorter
  - (b) smaller; shorter
  - (c) greater; longer
  - (d) smaller; longer
  
5. Which of the following would cause a change in supply?
  - (a) increase in product price
  - (b) decrease in product price
  - (c) increase in the price of an alternative good
  - (d) a and b
  
6. Which of the following would cause an increase in the supply of cookies?
  - (a) increase in the price of cookies
  - (b) increase in the price of inputs
  - (c) decrease in the price of doughnuts, an alternative good that can be produced
  - (d) increase in the wage rate

• **Problem**

*Read the following news-story carefully and then answer the questions under it.*

**Raising the D.C. Gas Tax: A Lesson in Elasticity**

Like many local governments, the District of Columbia is perennially short of revenues. In an effort to raise additional revenue, Mayor Marion Barry of Washington, D.C., decided in early 1980 to increase the city's tax on gasoline. On August 6, 1980, the city government raised the gas tax to 18 cents per gallon, from the previous level of only 10 cents per gallon. The higher tax raised the retail price of gasoline by 8 cents, to \$ 1.60 per gallon.

The mayor and city council thought the higher gas tax would be an easy way to increase city revenue. The difference of a few pennies a gallon would hardly be noticed, they reasoned, since gasoline prices were already so high. Furthermore, much of the increased tax would be paid by tourists and suburbanites rather than city residents (i.e., voters). Finally, a few pennies a gallon would generate lots of revenue, since District gas stations were then selling 16 million gallons a month.

The D.C. Department of Finance and Revenue knew about the law of demand. But it thought the reduction in quantity demanded (gasoline sales) would be very small in relation to the gas-tax increase. Economists had consistently estimated the price elasticity of demand for gasoline to be very low.

Unfortunately, the District's projections were grossly in error. In August 1980, gasoline sales in the nation's capital fell from 16 million gallons per month to only 11 million. Ten gas stations closed down, and more than 300 service-station workers were laid off.

The price elasticity of demand for D.C. gasoline turned out to be much higher than the city had thought. How did the city make such a mistake? Evidently the leaders forgot about the price and availability of other goods. True, the price elasticity for gasoline is generally quite low. But there are readily available substitutes for D.C. gasoline. By driving just another mile or so, a motorist can buy gasoline in Virginia or Maryland. When the price of D.C. gasoline went up, motorists responded by doing just that. The ready availability of cheaper gasoline in Maryland and Virginia doomed the hopes of the D.C. government for increased revenues.

**Source:** Bradley R. Schiller, *The Economy Today* (sixth edition), p-426, 1994, McGRAW-HILL, INC.

**Questions:**

1. What attempt had been taken by the City Mayor?
2. What did the D.C. Department of Finance and Revenue think about the change in quantity demanded of gasoline in relation to the gas-tax increase?
3. What was the wrong in the projection about gasoline sales?
4. What happened ultimately with the demand for gasoline?
5. What were the available substitutes for D.C. gasoline?
6. What do you think about the price elasticity of supply of gasoline?

**Hints:** If demand is price-elastic, a price increase will lead to a disproportionate drop in unit sales. In this case, the ready availability of substitutes made demand highly price-elastic.

# CONSUMER BEHAVIOUR



## Highlights

- ❑ Definition of Utility
- ❑ Different Approaches to the Measurement of Utility
- ❑ Total and Marginal Utility
- ❑ Law of Diminishing Marginal Utility
- ❑ Law of Equi-marginal Utility
- ❑ Indifference Curves and Budget Line
- ❑ Theory of Revealed Preference

School of Business

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## Unit-4

### Lesson-1: Introduction

#### Objectives

After studying this lesson, you will be able to:

- Explain what does consumer behaviour mean?
- Define the concept of utility; and
- Say about the measurability of utility.

#### Introduction

We discussed the concept of demand and the law of demand in the previous unit. There we saw that demand has an important effect on the price of a good. But we didn't analyze what exactly shapes a person's demand? In this unit, we will examine the household or consumer behaviour and its influence on demand. In this regard, we will try to find the answers to the following questions: How does a consumer decide how much of the commodity she/he should buy at a given price? Why she/he buys more of some commodities when their prices fall? Why she/he doesn't change his consumption of some items even if their prices go up? Why the prices of some items are so out of proportion to their total benefits? Lesson-1 of this unit will discuss some important concepts used in the analysis of consumer behaviour, Lesson-2 and Lesson-3 will discuss cardinalist approach and ordinalist approaches to consumer behaviour respectively. Let's take the lessons sequentially.

#### The Consumer

Commonly, we think that a *consumer* is one who consumes or uses a commodity. Here, it doesn't matter whether the consumer is a qualified or an unqualified person. However, in Economics, the term *consumer* refers to a person or entity with the following qualifications:

**Rational behaviour:** The consumer is a rational being. She/he tries to spend her/his money income so as to derive the greatest amount of satisfaction, or utility, from it. Consumers want to maximize the total utility.

**Clear-cut preferences:** The consumer has rather clear-cut preferences for different goods and services that are available in the market. She/he can guess about the utility she/he will get from the consumption of the additional units of various products what might purchase.

**Budget constraint:** The consumer has limited money income. Because a consumer supplies limited amounts of human and property resources to businesses, the money income received will be limited.

**Perfect competition:** Perfect competition exists on the demand and supply side of the market, i.e. the product prices are not affected by the amount of specific goods which the individual consumer buys.

## What Is Meant by Consumer Behaviour?

As a consumer, we have to take several decisions on the goods and services we consume in our daily life. For example, we have to decide: whether we should take tea or coffee in the morning, whether we should carry lunch packet or eat in the office canteen, whether we should buy or rent a house, etc. The way a consumer takes decisions on such problems is called **consumer's decision-making behaviour** or, in brief, **consumer behaviour**.

Economists constructed a theory of consumer behaviour based on the hypothesis that how each consumer spends income between the goods depends on her/his likes or dislikes - her/his preferences. Consumers are willing to pay more for the good that is expected to give them additional satisfaction or pleasure. If the oral sensation of mango juice at the cricket matches really turns you on, you are likely to be willing to pay more prices for it. If you don't have great taste or desire for mango juice, you are not likely to pay more money for it. Consumers always want to allocate their spending among the goods and services in the way that yields the greatest amount of satisfaction, or pleasure. Economists use the term **utility** to refer the expected pleasure, or satisfaction, obtained from the goods and services.

## What Is Utility?

The notion of *utility* was first introduced to social thought by the British philosopher, Jeremy Bentham, in the 18<sup>th</sup> century. Later William Stanley Jevons introduced it to Economics in the 19<sup>th</sup> century.

In its economic meaning, the term *utility* refers to the benefit or satisfaction or pleasure a person gets from the consumption of a commodity or service. In abstract sense, *utility* is the power of a commodity to satisfy human want, i.e. *utility* is want-satisfying power. A commodity is likely to have utility if it can satisfy a want. For example, rice has the power to satisfy hunger; water quenches our thirst; books fulfil our desire for having knowledge, and so on.

## Characteristics of Utility

The following characteristics of the concept of utility must be emphasized:

**Utility and usefulness are not synonymous:** Usefulness is not necessary for a commodity to satisfy one's want. An useless commodity may yield substantial utility. For example, Paintings by Picasso may be useless in a functional sense and yet be of tremendous utility to art connoisseurs.

**Utility is a subjective notion:** The utility of a specific product varies widely from person to person. All persons need not derive utility from all commodities. For example, non-drinkers do not derive any utility from wine, but alcoholic people derive great utility from wine; non-smokers do not get utility from cigarettes, but smokers derive utility from smoking; strict vegetarians do not derive any utility from beef and chicken, but non-vegetarians get utility from beef and chicken; eyeglasses have no utility to a person having 20-20 vision, but great utility to someone who is extremely far- or near-sighted; and so on.

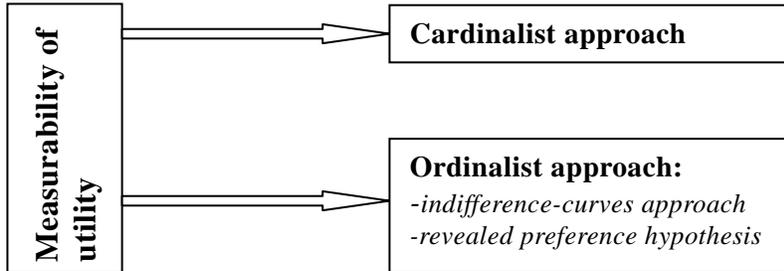
**Utility is ethically neutral:** Utility is neutral between good and bad and between useful and harmful. For example, opium is bad and harmful, but it

The utility of a specific product varies widely from person to person.

yields utility to the people who takes it. Utility is free from moral values. It is not subject to social desirability of consuming a good.

### Measurability of Utility

As you have learnt at the beginning of this lesson, the consumer is a rational being. Given her/his income and the market prices of the various commodities, he plans her/his income so as to attain the highest possible



satisfaction or utility - this is the *axiom of utility maximization*. In order to attain this objective the consumer must be able to compare the utility of the various baskets of goods which he/she can buy with her/his income. To compare utilities we need to know whether utility can be measured or not. Economists have different views on this point. There are two basic approaches to the problem: the *cardinalist approach* and the *ordinalist approach*:

The cardinalist school held the views that utility can be measured. But how can it be measured? What units can it be measured in? Various suggestions have been made for the measurement of the utility. Some economists have suggested that utility can be measured in *monetary units* while others suggested the measurement of utility in subjective units, called *utils*.

The cardinalist school held the views that utility can be measured.

On the contrary, the ordinalist school postulated that utility is not measurable, but is an ordinal magnitude. The consumer need not know the units of utility she/he gets from the commodities to make her/his choice. It is sufficient for him if he is able to rank the various baskets of goods according to the satisfaction that each bundle gives him.

In this lesson, we are not going to discuss the approaches to the analysis of consumer behaviour, i.e., the cardinalist approach and the ordinalist approach, in detail. We will thoroughly examine them in the following lessons.

## Review Questions

- **Essay-type Questions**

1. What is meant by the term 'consumer'? Write down the characteristics of a consumer.
2. What is utility? Is it measurable? Describe different approaches to the measurement of utility.

- **True or False**

Which of the following statements are true?

- (a) In Economics, a consumer is one who consumes or uses a commodity.
- (b) Economists use the term utility to refer the expected pleasure, or satisfaction, obtained from the goods and services.
- (c) An useless commodity may yield substantial utility.
- (d) The cardinalist school held the views that utility can be measured.

- **Multiple Choice Questions**

1. In Economics, consumer is:
  - (a) Only a person
  - (b) only an entity
  - (c) a person or entity
  - (d) None of the above
2. Economists use the term 'Utility' to refer:
  - (a) the expected pleasure from the goods and services
  - (b) satisfaction from the goods and services
  - (c) a or b
  - (d) None of the above
3. In cardinalist approach, Utility is:
  - (a) not measurable
  - (b) rankable
  - (c) measurable
  - (d) None of the above
4. The unit of utility is:
  - (a) util
  - (b) Taka
  - (c) Kg.
  - (d) None of the above

## Lesson-2: The Cardinal Utility Approach

### Objectives

After studying this lesson, you will be able to:

- Explain how utility is measured cardinally or quantitatively;
- Define the concepts of marginal and total utility;
- Describe the law of diminishing marginal utility;
- Explain the law of equimarginal utility;
- Derive the demand curve using the concept of marginal utility; and
- Explain the concept of consumer surplus.

### Introduction

Classical and neo-classical economists including Gossen (1854) of Germany, William Stanley Jevons (1871) of England, Leon Walras (1874) of France and Karl Menger of Austria held views that utility is quantitatively or cardinally measurable entity. It can be measured like any other entities, such as temperature, height, weight, and length. But what exactly is utility and in what units can we measure it? Starting with the answer to this question, this lesson will discuss the different concepts of utility, such as marginal utility, total utility, and the concept of consumer surplus.

### How Can We Measure Utility?

Utility is an abstract concept. It cannot be observed or touched anyway. That's why, the measuring units of this entity are arbitrary. Just like temperature, utility can be measured in arbitrary units. Let's know how temperature is measured, that will help us understand how the measurability of utility in arbitrary units is justifiable:

Utility is an abstract concept.

*Temperature is an abstract concept. We cannot observe it - only we can feel it. However, we can observe water turning to steam if it is hot enough or turning to ice if it is cold enough. And we can construct an instrument, called thermometer, that can help us predict when such changes will occur. The scale on the thermometer is what we call temperature. But the units in which we measure temperature are arbitrary. For example, we can accurately predict that when a Celsius thermometer shows a temperature of 0, water will turn to ice. But the units of measurement do not matter because this same event also occurs when a Fahrenheit thermometer shows a temperature of 32°.*

In the above example, we have seen that temperature helps us to make predictions about physical phenomena. In the same way utility helps us make predictions about consumption choices. However, utility theory is not as precise as the theory that helps us to predict when water will turn to ice or steam.

From the above discussion, one thing is now clear to us that utility is measurable, though it is not so precise as other measurements. But it is still unclear how to measure utility, i.e. in what units we can measure the utility we get from the consumption of a commodity?

About a hundred years ago, economists thought utility as an indicator of the pleasure a person gets from the consumption of some set of goods, and they thought that utility could be measured directly in some psychological units called *utils*, after somehow reading the consumer's mind. But it was an impossible task to guess the satisfaction one gets from consuming a commodity. Can you say how many utils did you get from the last cricket match you saw at the Bangabandhu National Stadium? Probably your answer is NO, because you have no idea what util is. The same thing would happen to anyone else.

But if you are asked: how many Shingara would you give up to get the ticket to watch that cricket match? Now you can answer this question confidently - for example, five Shingaras. Remember that still you don't know how many utils you got from watching the cricket match. But you do know that your satisfaction from the cricket match is more than the satisfaction from a piece of Shingara. In this case, Shingaras, rather than utils, become the unit of measurement. We can say that the utility you derived from the cricket match is five Singagas. Actually, this indirect way of measuring utility is the basis of the cardinalist theory of consumer behaviour. In the early twentieth century, economists used this indirect way of measuring utility to analyze the consumer behaviour.

We can measure utility derived from a commodity in terms of any other commodity.

We can measure utility derived from a commodity (like a ticket for watching cricket match) in terms of any other commodity (such as Shingara, Samucha, money, etc.) we are willing to give up for it. In our discussion, we will use the commodity which is the simplest and commonly used as a medium of exchange- that is, MONEY- to measure utility.

Thus we can define the utility of a commodity to a consumer as the amount of money she/he is willing to give up for it. For example, suppose Modhu decides to buy one Chicken Patty by Tk. 10.00, she will not buy any Chicken Patty if the price is higher than 10.00 taka. Then the utility of one piece of Chicken Patty is Tk. 10.00 - the maximum amount of money she is willing to pay to have it. If she wants to buy five pieces of Chicken Patty and is willing to pay Tk.30.00 at a maximum, then the *total utility* of five pieces of Chicken Patty to her is Tk. 30.00. Here one thing is noticeable that though Modhu is willing to pay Tk. 10.00 for one piece of Chicken Patty, she is willing to spend Tk. 30.00 only - not Tk. 50.00 = 5 @Tk. 10.00 - for five pieces of Chicken Patty. This happens because she is willing to pay less for each additional piece of Chicken Patty, which indicates that she gets lower utility from additional unit. The utility derived from an additional piece of Chicken Patty is called *marginal utility*. Marginal utility and Total utility are two related concepts. Let's now see how these concepts are related.

### **Total and Marginal Utility**

Total utility refers to the amount of satisfaction from consumer's entire consumption of a commodity. In the example cited earlier, the utilities Modhu derives from the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> pieces of Chicken Patty are Tk. 10.00, Tk. 9.00, Tk. 7.00, Tk. 4.00 and Tk. 0.00 respectively. Therefore, the total

utility derived from five pieces of Chicken Patty is Tk.30.00 = Tk. 10.00 + Tk. 9.00 + Tk. 7.00 + Tk. 4.00 + Tk. 0.00.

On the contrary, marginal utility is the amount of utility a consumer derives from consuming the last, i.e. marginal, unit of a commodity. In other words, marginal utility can be defined as the amount of utility a consumer derives from the consumption of an additional unit of the commodity. Marginal utility can also be defined as the change in the total utility resulting from the change in the consumption - that is:

$$MR = \Delta TU / \Delta C$$

Here, MR = marginal utility,  $\Delta TU$  = change in total utility and  $\Delta C$  = change in consumption.

Recall our example of Chicken Patty consumption. Modhu gets the utility of Tk.10.00 from the first piece of Chicken Patty. When she takes the second one, she gets the utility of Tk. 9.00. This additional utility is called marginal utility. When she takes the third one, her marginal utility becomes Tk. 7.00. For the fifth one, she is not willing to pay any money, i.e., the marginal utility is zero.

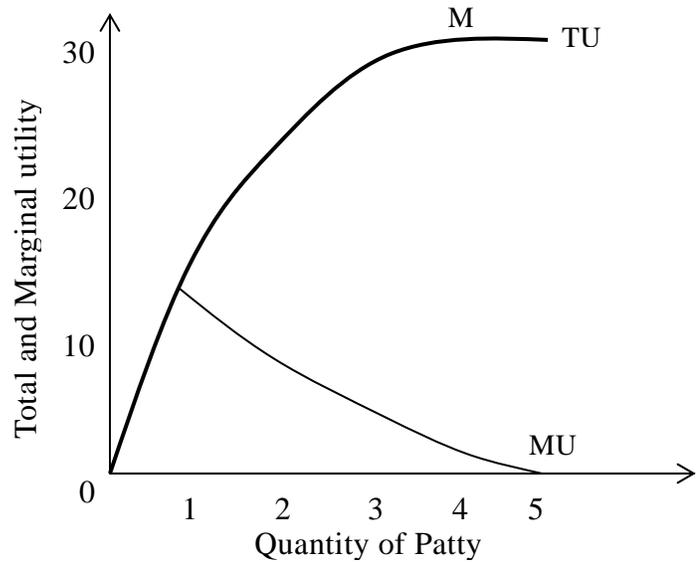
Table 4.1 helps clarify the distinction between marginal and total utility and shows how the two are related. First two columns show how much total utility Modhu derives from various quantities of Chicken Patty. For example, one Chicken Patty is worth Tk.10.00 to her, two Chicken Patties are worth Tk.19.00, in total, to her and so on.

**Table 4.1: Total and Marginal Utility**

Quantity of Chicken Patties	Total Utility (TU) ( in taka)	Marginal Utility (MU) ( in taka)
0	00	
1	10	10 (=10-00)
2	19	09 (=19-10)
3	<b>26</b>	07 (=26-19)
4	30	04 (=30-26)
5	30	00 (=30-30)

Marginal utility can also be defined as the change in the total utility resulting from the change in the consumption.

The marginal utility is the difference between any two successive total utility figures, which is shown in the third column of the Table 4.1. For example, if Modhu already consumed three pieces of Chicken Patty which are worth Tk.26.00 to her, consumption of an extra piece of Chicken Patty makes her total utility Tk.30.00. Thus her marginal utility is the difference between the two, i.e., Tk.4.00 (= Tk. 30.00 - Tk. 26.00). If we plot the data of Table 4.1 into the graph, we get total and marginal utility curves. Figure 4.1 portrayed the total utility and the marginal utility curves in the same plot area.



**Figure 4.1: Total and marginal utility curves**

In Figure 4.1, the TU curve indicates the total utility Modhu derives from Chicken Patties at different consumption levels. We see that the total utility curve is upward up to a level of consumption (Point M), which means that the more patties Modhu consumes, the more total utility she gets up to a certain level of consumption. Notice that the total utility curve is rising but at a diminishing rate (Why?- see the *law of diminishing marginal utility*). We see the MU (Marginal Utility) curve lying just under the TU curve in the same plot area. The downward sloping MU curve tells us that as she incases her consumption, the amount of utility Modhu gets from each extra piece of Patty decreases.

Therefore, if we summarize the message given in Figure 4.1, we get the following characteristics of total and marginal utility, which tells us how total and marginal utility are related:

- Up to a certain level of consumption, total utility increases as the consumption increases.
- Marginal utility is decreasing with the increase in consumption.
- Total utility increases till marginal utility is positive, but at a diminishing rate.
- When marginal utility becomes *zero*, then total utility is the maximum.
- Total utility decreases if marginal utility becomes negative.

Total utility increases till marginal utility is positive.

- The area under the marginal utility curve indicates the total utility derived from various pieces of Patty.

In the previous discussion, we have learnt that marginal utility diminishes as the consumer increases her consumption of Chicken Patty - this very nature of marginal utility is described by the *law of diminishing marginal utility*. Let's know the law in detail.

### **The Law of Diminishing Marginal Utility**

This law is the main instrument used in the cardinal utility analysis of the consumer behaviour. It explains why the demand curve of a specific commodity is downward sloping? It also explains the elasticity of demand for a product. Except these, there are many other applications of this law in our everyday life.

#### ***Main theme of the law***

The additional units of a specific commodity are worth less and less to a consumer as more of the commodity she/he consumes. In other words, marginal utility of a specific commodity declines as more of it is consumed.

#### ***Assumptions***

The assumptions upon which this law is based are as follows:

**Given time period:** Units of the commodity are consumed in a given time period. The time period must be appropriate. If you drink ten cans of cold drinks during the whole day, the idea of diminishing marginal utility will not hold. However, if you are asked to drink all of the cans in two hours of time, then the idea of diminishing marginal utility makes sense.

**Continual consumption:** The units of the commodity are consumed continually, but the time interval between the consumption of two units of the commodity must be appropriately short.

**Normal behaviour of the consumer:** The mental condition of the consumer remains normal during the period of consumption of the commodity. She/he has a hierarchy of uses to which she/he will put a particular commodity. All of these uses are valuable, but some are more valuable than others.

**Standard units of the commodity:** The units of the commodity must be standard, i.e., a can of cold drinks, a glass of juice, a cone of ice-cream, a cup of tea, a pair of shoes, etc. If the units are excessively small or large, the law may not hold.

**Consumption of other commodities is given:** During the consumption of the commodity, the consumption of all other commodities remains constant.

#### ***Logic behind the law***

Our wants are unlimited. However, the want for a specific commodity is not unlimited - we can meet it. How? Simply think of your personal desire to have a specific commodity. Do you want more and more of a specific

commodity? Are you willing to spend the same amount of money for each unit of it? Will you consume endless quantities of the commodity if you can afford it? The answer to all of the questions is NO, because, the thrill diminishes with the consumption of each unit of the commodity. Even people who love sea-fish (for example, Rupchanda or pomfret), i.e. get great utility from it, and can afford it, don't eat endless quantities of it, presumably because, satisfaction from each piece of fish diminishes as the consumption increases. The first piece of fish may bring sensual gratification, but the second or third piece is likely to bring a stomach ache. If we express this change in perceptions in terms of utility, we find that the marginal utility derived from the first piece of Rupchanda (pomfret) fish is higher than the marginal utility derived from the second piece, i.e. the marginal utility from each extra piece of Rupchanda fish diminishes as the consumption of it increases.

The behaviour of the sea-fish connoisseurs is not abnormal. Generally speaking, as we consume more and more of a commodity, even the most favorite one, we become bored with it and our satisfaction from additional units of it diminishes. Indeed, this phenomenon of diminishing is so nearly universal that economists have fashioned a law around it which is called the *law of diminishing utility*.

Note that this law does not say that we won't like the third or fourth piece of a commodity; it just says we won't like them as much as the ones we have already consumed.

#### ***Numerical and graphical illustration of the law***

Recall the hypothetical data in Table 4.1. In the table, we see that as the consumption of Chicken Patty increases, the total utility increases, but at a decreasing rate, which indicates that the additional or marginal utility derived from each extra piece of Chicken Patty diminishes with the increase in consumption. This is shown in the third column of the table.

Graphically, the law of diminishing marginal utility has been illustrated in Figure 4.1. The downward sloping MU curve in the figure indicates that the marginal utility derived from each extra piece of Chicken Patty diminishes as the consumption of it increases.

#### ***Exceptions of the law***

The law of diminishing marginal utility is plausible for most consumers and for most commodities. However, like most laws, it has some exceptions. There are some commodities particularly significant to some people. The more of those commodities they get, the more they want. For example, the need for second glass of alcohol is higher than the need for the first glass to an alcoholic, the need for additional stamps do not diminish to a stamp collector, the desire to have more rare paintings doesn't diminish to a painting connoisseur, the need for more gold doesn't dwindle to women, and the want for money doesn't diminish to anybody. In these cases, the marginal utility increases rather than decreases. Economists, however, generally treat such

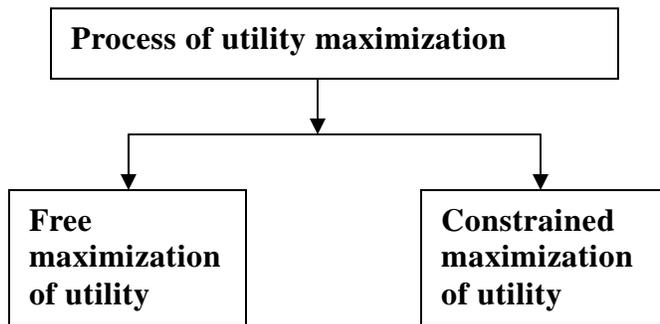
cases of *increasing marginal utility* as anomalies. For most goods and most people, marginal utility probably diminishes as consumption increases.

**Consumer Equilibrium: Utility-Maximizing Rule**

We have learnt from the previous discussion that as we consume more and more of a commodity the total utility increases at a decreasing rate, which implies that the marginal utility is diminishing with the increase in consumption. There we didn't consider any constraints which prohibit us from having the quantity of the commodity as much as we like. Now, ask yourself whether you are actually free to consume any amount of the commodity you like. Undoubtedly, your answer is NO. Then try to guess what the constraints are. You will easily find that the two main constraints are: our income, which is limited and the price of the commodity. So, how much of a commodity we can buy depends on our income and the price of the commodity.

As we consume more and more of a commodity the total utility increases at a decreasing rate.

Now, let's think about utility-maximization. What rule should be followed to identify the amount of a commodity or a combination of different commodities which yields maximum total utility to the consumer? The answer to this question depends upon the factors we will consider in the process. If we don't consider any constraint, such as income and price of the commodity, then the process of utility maximization is called free maximization of utility. If we consider the constraints, then the process is called constrained maximization of utility.



We will confine ourselves to *constrained maximization of utility* which corresponds to the concept of consumer's equilibrium.

**What Is Consumer Equilibrium?**

A consumer equilibrium is a situation in which a consumer has allocated her/his income in the way that, given the prices of goods and services, maximizes her/his total utility.

The definition of consumer equilibrium tells us that the analysis of consumer equilibrium refers to constrained maximization of utility. Now, let's sequentially know the tools to be used, assumptions to be made, and the rule should be followed in the analysis.

### ***The Tools Used in the Analysis***

The concepts of *marginal utility*, consumer's *income*, and the *prices* of the goods and services are used as tools in the equilibrium analysis. The income of the consumer and prices are assumed to be given in the analysis. Marginal utility is considered as the adjusting variable in the analysis.

### ***Assumptions***

The analysis of consumer equilibrium is based on the following assumptions:

**Rationality:** The consumer is rational. He aims at the maximisation of her/his utility from the goods and services he consumes.

**Limited money income:** The consumer's income is limited. Keeping this in mind, she/he has to choose the items which yield her/him maximum satisfaction or utility.

**Cardinal utility:** Utility of each commodity is measurable in terms of the amount of money the consumer is prepared to pay for that commodity.

**Constant marginal utility of money:** The essential feature of a standard unit of measurement is that it must be constant. Since money is used as the measuring-rod for utility in this analysis, the marginal utility of money must be constant as income increases (or decreases). If the marginal utility of money changes as income increases (or decreases), the measuring-rod for utility becomes like an elastic ruler, inappropriate for measurement.

**Diminishing marginal utility:** The utility derived from successive units, i.e., marginal utility, of a commodity diminishes as the consumer acquires the larger quantities of it. This is the *law of diminishing marginal utility*.

**Additivity of utility:** The utility derived from various commodities can be added. If there are n commodities in the bundle with quantities  $x_1, x_2, x_3, x_4, \dots, x_n$ , the total utility is

$$U = f(x_1, x_2, x_3, \dots, x_n)$$

In very early version of the theory of consumer behaviour it was assumed that the total utility is additive,

$$U = U_1(x_1) + U_2(x_2) + \dots + U_n(x_n)$$

This assumption had been dropped in the later version of the cardinal theory. Additivity implies independent utilities of the various commodities in the bundle, which is totally unrealistic and unnecessary in the cardinal theory.

### ***Utility-maximizing rule: One commodity case***

If the consumer consumes only one commodity, then what quantities of the commodity will she/he buy to maximize her/his satisfaction, i.e., when does the consumer reach her/his equilibrium position?

To answer the above question, we first need to know when does a consumer decide to buy a unit of a commodity. Every consumer compares her/his *gain* to be derived from the commodity with the *price* of that commodity (to him) before buying each unit of the commodity. Here, *gain* means *marginal utility* and *price* indicates the *marginal cost* of the commodity to the consumer. A consumer decides to buy a unit of the commodity when the net gain from the commodity is positive, i.e., the marginal utility from the commodity exceeds its price. More specifically, a consumer decides to buy a unit of a commodity if the amount of money ( price of the commodity) she/he *has to pay* is less than the amount of money she/he is *willing to pay* (= marginal utility) for it. Recall the example of Chicken Patty ( Table 4.1), the first piece of Chicken Patty is worth Tk.10 to Modhu, i.e., she is willing to pay Tk.10.00 at a maximum for having the first piece of Patty, which means that the marginal utility Modhu gets from it is Tk.10.00. If the price of Patty is less than Tk.10.00, only then she will buy it.

Therefore, a consumer decides to buy a commodity when her/his net gain from that commodity is positive, i.e., marginal utility is greater than the price of that commodity (symbolically,  $MU > P$ ). Now let's know, how much quantities she/he will buy to maximize her/his utility? The rule to be followed in maximizing utility is that: the consumer's money income should be spent in a way so that her/his marginal utility from the commodity equals its price. We shall call this the *utility-maximizing rule*.

**Utility-maximization rule:  $MU = P$**

So, according to this rule, the consumer will continue to buy a commodity until *marginal utility* from the commodity equals the *price* of the commodity. At the moment the above condition (i.e.,  $MU = P$ ) is fulfilled, the net total utility from the commodity becomes the maximum and the consumer will then reach her/his equilibrium position.

**Numerical and graphical illustration:** Look at the following table. It shows the marginal utilities Modhu derives from various pieces of Chicken Patty. It also shows the difference between magical utility and the price of the commodity. The last column of the table shows the net total utility the consumer derives from the commodity.

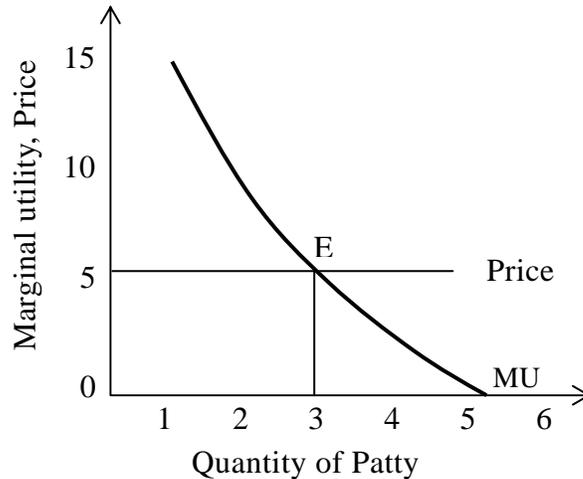
**Table 4.2: Utility-maximizing quantity of Chicken Patty**

Quantity	Total utility ( in taka)	Marginal Utility (MU) ( in taka)	Price of the commodity(P) (in taka)	Net utility gained (MU-P)	Net total utility $\Sigma(MU-P)$
0	00				
1	15	15 (=10-00)	05	+10	10
2	24	09 (=24-15)	05	+4	14
<b>3</b>	<b>29</b>	<b>05 (=29-24)</b>	<b>05</b>	<b>00</b>	<b>14</b>
4	31	02 (=31-29)	05	-3	11
5	31	00 (=31-31)	05	-5	6

In Table 4.2, we see that the marginal utility of the first piece of Patty is Tk.15.00, i.e., for the first piece of Chicken Patty Modhu is willing to pay Tk.15.00, whereas she has to pay only Tk.5.00 (the price of the commodity) for it. Here her net gain or utility is Tk. 10.00. Since her net gain is positive, she will buy more of the commodity. If she buys the second one, her net gain will be Tk.4.00 which is lower than the gain from the first piece. It happens because of diminishing marginal utility. Though the net gain from each piece decreases as she increases her consumption, the net total gain or net total utility is still increasing. If she buys the third piece of Patty, her net gain becomes *zero*. Then her net total utility from the commodity becomes the maximum. At this point, she will stop buying anymore. Here, Modhu reaches her equilibrium position. Therefore, in this case, the equilibrium quantity of Chicken Patty is 3.

Why Modhu stops her purchase at third piece of Patty? See the last column of Table 4.2. If she buy any more piece of Patty, the net gain from that piece will be negative which will lower the net total utility. That's why, she will not go after the third unit of Patty.

Diagrammatically, the consumer reaches equilibrium at such a point where marginal utility curve intersects the price line. We can get the marginal utility curve by plotting the marginal utility data of Table 4.2 against the quantity of Patty consumed as follows:



**Figure 4.2: Consumer equilibrium - one commodity case**

In Figure 4.2, MU curve indicates marginal utilities at different levels of quantity. We see that at Point E, the MU curve intersects the price line, i.e., at Point E,  $MU=P$ . So, the profit-maximizing rule is satisfied at Point E. Therefore, Point E is the equilibrium point of Modhu. She buys three pieces of Patty which yield her maximum satisfaction. Any point to the right of or left of E gives her lower net total utility. That's why she will not buy more or less than three pieces of Patty anyway. What happens if the price of Patty increases? If the price of Patty increases, the equilibrium of the consumer will be deteriorated, i.e.,  $MU < P$ . To regain the equilibrium, the consumer should decrease her consumption, which will increase her marginal utility from Patty.

This process will continue till marginal utility equals the price, i.e., she regains her equilibrium.

In the discussion above, we have learnt how a consumer reaches her/his equilibrium in the case of consuming a single commodity. Actually, this kind of analysis is O.K. only for theoretical interest. In real life situation, we see that every consumer has to allocate her/his money income among a number of goods and services. Therefore, it is essential to know how a consumer allocates her/his income among different commodities so that her/his satisfaction from the commodities becomes the maximum. Let's now see how a consumer reaches her/his equilibrium in the case of consuming more than one commodity.

***Utility-maximizing rule: The general case***

If the consumer consumes more than one commodity, then the rule to be followed in maximizing satisfaction is that the consumer's money income should be allocated so that the last unit of money spent on each product purchased yields the same amount of extra (marginal) utility. Symbolically, the utility-maximizing rule can be illustrated as follows:

$$MU_x / P_x = MU_y / P_y = \dots\dots\dots = MU_N / P_N$$

Here,  $MU_x$ ,  $MU_y$ ,  $\dots\dots\dots$ ,  $MU_N$  are the marginal utilities of commodity-X, commodity-Y,  $\dots\dots\dots$ , commodity-N respectively.  $P_x$ ,  $P_y$ ,  $\dots\dots\dots$ ,  $P_N$ , are the prices of X, Y,  $\dots\dots\dots$ , N commodities respectively. The ratio between marginal utility and price of the commodity indicates the marginal utility per unit of money spent on that commodity. For example,

$$\frac{MU_x}{P_x} = \text{Marginal utility per taka spent on commodity-X}$$

$$\frac{MU_y}{P_y} = \text{Marginal utility per taka spent on commodity-Y}$$

$$\frac{MU_N}{P_N} = \text{Marginal utility per taka spent on commodity-N}$$

Therefore, to maximize utility, we should try to allocate our income in a way so that marginal utility per taka spent on each commodity becomes equal. This rule is called as the ***law of equi-marginal utility***.

Let's use the above formula to find Modhu's utility-maximization allocation of her income. Assume that Modhu consumes only two commodities: Chicken Patty and Shingara. Now we have to identify the combination of these two commodities which yields her maximum satisfaction. Modhu, to maximize utility, should allocate all of her money income so that the following condition is fulfilled:

$$\frac{MU_{Patty}}{P_{Patty}} = \frac{MU_{Shingara}}{P_{Shingara}}$$

If the marginal utility per taka spent on Patty exceeds the marginal utility per taka spent on Shingara (i.e., the left-side ratio is greater than the right-side ratio in the above condition), she will be in disequilibrium. Then she can regain equilibrium by increasing the consumption of Patty. She will continue to consume Patty till the marginal utility per taka spent on it again becomes equal to the marginal utility per taka spent on Shingara.

Conversely, if the marginal utility per taka spent on Patty is less than the marginal utility per taka spent on Shingara (i.e., the left-side ratio is lower than the right-side ratio in the above condition), she will also be in disequilibrium. She can regain the equilibrium by decreasing the consumption of Patty. Decrease in the consumption highers the marginal utility, which makes the ratio between the marginal utility and price of the commodity high. She will continue to consume Patty less till the marginal utility per taka spent on it again becomes equal to the marginal utility per taka spent on Shingara.

**Numerical and diagrammatic illustration:** Table 4.3 below shows Modhu's marginal utilities from different quantities of Patty and Shingara. The table also shows her marginal utility per taka spent on Patty and Shingara.

**Table 4.3: Utility-maximizing combination of Patty & Shingara**

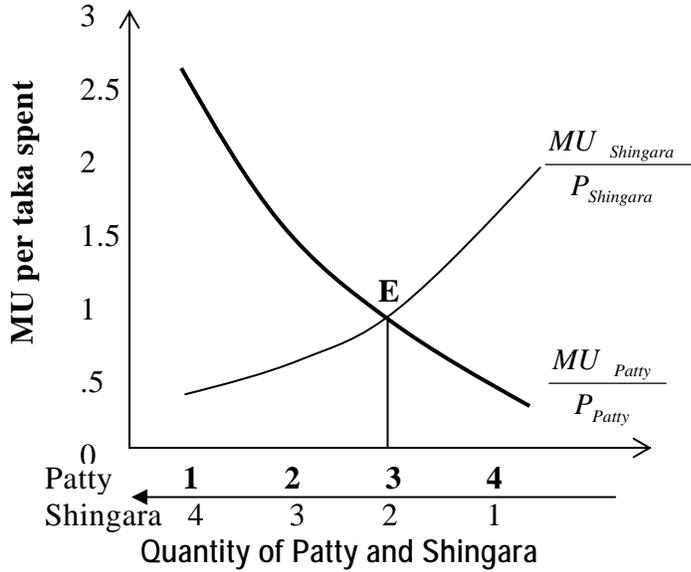
Chicken Patty (Tk. 5.00 each)			Shingara (Tk. 4.00 each)		
Quantity	Marginal utility ( in taka)	Marginal utility per taka spent ( $MU_{Patty} \div P_{Patty}$ )	Quantity	Marginal utility ( in taka)	Marginal utility Per taka spent ( $MU_{Shingara} \div P_{Shingara}$ )
0			0		
1	15	3	1	08	2
2	9	1.8	<b>2</b>	<b>04</b>	<b>1</b>
<b>3</b>	<b>5</b>	<b>1</b>	3	03	.75
4	2	0.4	4	02	.5

In Table 4.3, we see that utility-maximizing combination of Patty and Shingara to Modhu is *{3 pieces of Patty, 2 pieces of Shingara}*, because at this combination marginal utility per taka spent on Patty equals the marginal utility per taka spent on Shingara - that is,

$$\frac{MU_{Patty}}{P_{Patty}} = \frac{MU_{Shingara}}{P_{Shingara}} = 1$$

Therefore, Modhu reaches her equilibrium when she consumes *three* pieces of Patty and *two* pieces of Shingara. Any other combinations cannot give her maximum satisfaction, then she is in disequilibrium. Figure 4.3 illustrates the equilibrium and disequilibrium of the consumer.

In Figure 4.3, the bold line indicates the marginal utility per taka spent on Patty whereas the normal line indicates the marginal utility per taka spent on

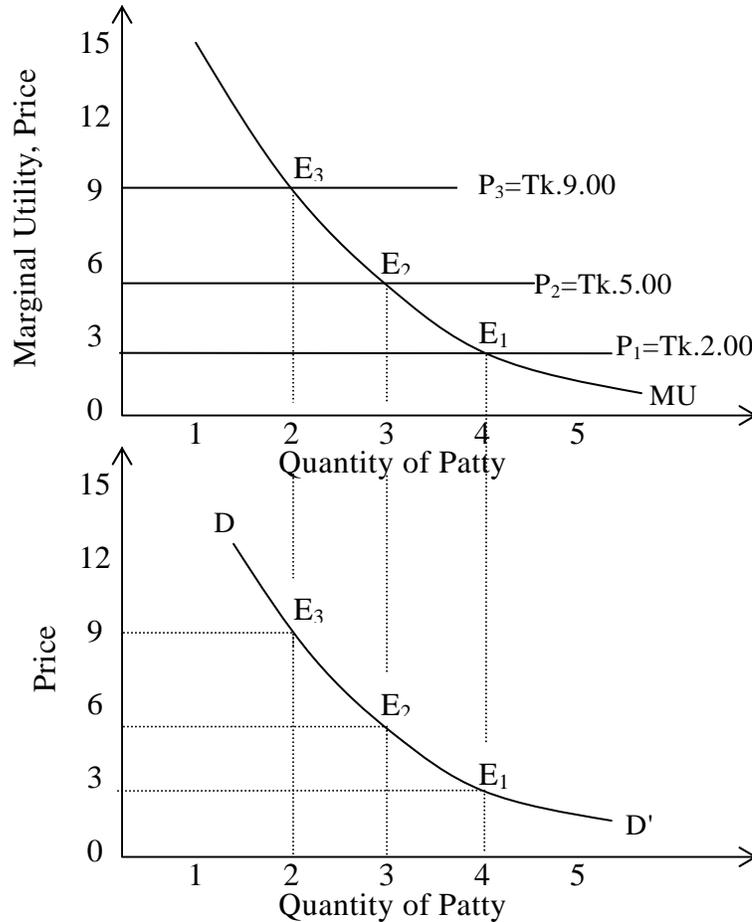


**Figure 4.3: Utility-maximizing combination of Patty & Shingara**

Shingara. The direction of the bold line is from left to right, whereas the direction of the normal line is from right to left. Coming from opposite direction, the two lines intersect each other at Point E. At E, the utility-maximizing condition is satisfied. Therefore, E is the equilibrium point of Modhu and the utility-maximizing combination is {3 pieces of Patty and 2 pieces of Shingara}. Any points to the left or to the right of E do not satisfy the utility-maximizing condition. For example, if Modhu decides to consume 2 pieces of Patty and 3 pieces of Shingara, then her marginal utility per taka spent on Patty exceeds the marginal utility per taka spent on Shingara. In this case, she loses some amount of net utility, which lowers her net total utility gain. At this stage, she is not in equilibrium, because she can increase her net total utility by moving to another combination. To regain her equilibrium, she has to adjust her consumption until the marginal utility per taka spent on Patty equals the marginal utility per taka spent on Shingara. By consuming one more piece of Patty and reducing the consumption of one piece of Shingara, she can get more net utility and she regains her equilibrium position.

### Derivation of the Demand Curve from Utility-maximizing Rule

We have seen at the end of the discussion of consumer's equilibrium (one commodity case) that when price of Patty increases, then the equilibrium of the consumer has been disturbed and to regain the equilibrium she has to increase her consumption of Patty. This process of regaining the equilibrium position indicates a relationship between the price of Patty and the quantity of Patty to be consumed, which is visualized by the demand curve. Figure 4.4 shows this.



**Figure 4.4: Derivation of the demand curve**

In the upper part of Figure 4.4, we see that when the price is  $P_1$  then the equilibrium point of the consumer is  $E_1$ . At Point  $E_1$ , the consumer consumes 4 pieces of Patty. If price rises to  $P_2$ , then  $MU < \text{new Price}(P_2)$ . To restore the equilibrium position, the consumer has to reduce her consumption of Patty, which will increase her marginal utility. This process will continue till she reaches her equilibrium again. Similarly, if the price of Patty rises again to  $P_3$ , the consumer's equilibrium again has been disturbed. To regain the equilibrium she will decrease her consumption of Patty till  $MU$  equals  $P_3$ . Thus, we find an inverse relationship between the price of Patty and its quantity to be consumed. It is also true in the case of fall in price.

If we plot the quantities of Patty to be consumed against different price levels as discussed above, we get a downward sloping demand curve of Patty. The lower part of Figure 4.4 shows that.

In the lower part of Figure 4.4, the DD' curve indicates the demand curve of Chicken Patty. We see that along the DD' curve the consumer moves from right to left as price rises, i.e., the consumption of Patty decreases as its price rises. And, in the case of a fall in price, she moves from left to right on the DD' curve.

In the discussion above, we have seen that the derivation of the demand curve is based on the utility-maximizing rule (one commodity case). The demand curve can also be derived from the utility-maximizing rule (general case). In that case, the consumption of only one commodity is considered to vary. The consumption of all other commodities is assumed to be given.

The demand curve can also be derived from the utility-maximizing rule.

### Implication of Marginal Utility Theory

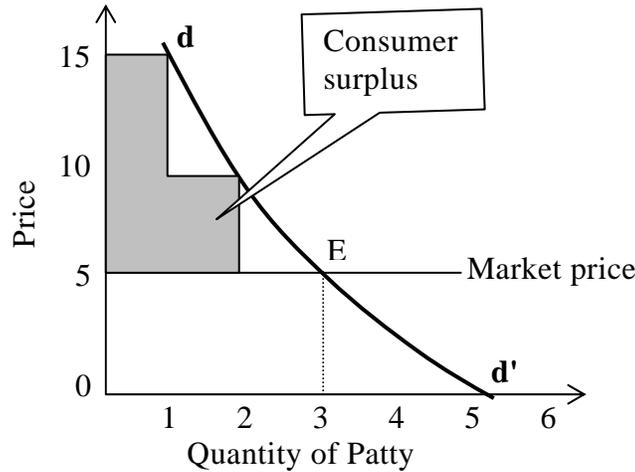
We always try to maximize our net gain from the consumption of a commodity. For this, we love bargains when we buy a commodity. We place a higher total value on the commodity we buy than the amount it costs us. That is, we try to pay less than the amount of money we would be willing to pay for it. Here, two things should be clarified: **first**, the amount of money we are willing to pay; **second**, the amount of money we actually have to pay for it. The first one indicates the *value* we place on a commodity - the maximum amount of money that we would be willing to pay for the commodity. While the second one indicates the *price* of the commodity. Therefore, when we buy a commodity, there is almost always a 'difference' between the value of the commodity (i.e., the maximum amount of money we would be willing to pay for it) and its price (i.e., the amount of money we have to pay for it). Let's know how this difference is described in Economics.

### Consumer surplus

**Definition:** The difference between the value of the commodity and its price is called consumer surplus. When a person buys any chosen quantity of a commodity at a given price, diminishing marginal utility guarantees that she/he always attains some consumer surplus. Why? Let's see this.

**Calculating consumer surplus:** Look at Figure 4.5(A). This figure illustrates the consumer surplus of an individual consumer dd' is Modhu's demand curve for chicken Patty when she has Tk.30.00 to spend. If Modhu consumes only one piece of Patty, she would be willing to pay Tk. 10.00 for it. If she consumes two pieces of Patty, she would be willing to pay Tk.10.00 for the first one and Tk.9.00 for the second one. Accordingly, she would be willing to pay Tk.6.00 for the third one, Tk.4.00 for the fourth one, and so on. However, she is lucky enough that the market price of Patty is Tk.4.00 each, i.e., she has to pay only Tk.4.00 to get a piece of Patty. So, up to the third piece she has to pay less than she would be willing to pay. For the first four pieces of Patty, Modhu is willing to pay Tk.29 in total (= Tk.10 + Tk.9.00 + Tk.6.00 + Tk.4.00 ), i.e., the value she places on the Chicken Patty is Tk.29.00. But she actually pays Tk.16.00 (= Tk.4.00 × 4 ) for buying them. So, the extra value

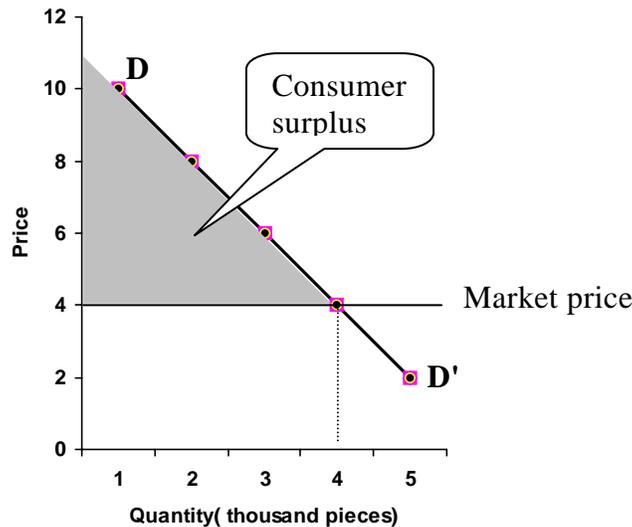
she receives from buying four pieces of Patty is Tk.13 (=Tk.29 - Tk.16). This extra value is Modhu's consumer surplus. From the consumption of four



**Figure 4.5(A): Consumer surplus of Modhu**

pieces of Patty she gets Tk.13 worth of value in excess of what she has to spend to consume them. In Figure 4.5(A), the shaded area under the **dd'** curve indicates the consumer surplus of Modhu.

Now let's see how the consumer surplus of all the consumers in a market is calculated. Figure 4.5(B) illustrates the consumer surplus of a market as a whole. Suppose that there are one thousand consumers in the Patty market. They are similar, but not identical, to Modhu. **DD'** is the market demand curve for Patty.



**Figure 4.5(B): Consumer surplus of the entire market**

The market price of Patty is Tk.4.00 each. The consumer surplus for the market as a whole is Tk.14,000.00, which is shown by the area of the shaded triangle under the **DD'** curve. The area of the shaded triangle is calculated as below:

The base of the triangle = 4 thousands of Patty.

The height of the triangle = Tk.11.00 - Tk.4.00 = Tk.7.00 a piece of Patty

Therefore, the area of the triangle is:

$$\begin{aligned} & \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times 4000 \times 7 \\ &= \text{Tk.14000.00} \end{aligned}$$

### ***The Paradox of Value: Water - Diamond Paradox***

The early economists, including Adam Smith, have been puzzled by a paradox that the market often valued necessary commodities such as water, which is essential to life itself, much lower than it valued such luxuries as diamonds which are merely decorative and have little practical value compared to water. This is called Water - Diamond paradox. In the paradox, we see that market prices apparently cannot reflect or measure the usefulness of commodities. How can this paradox be resolved?

Adam Smith tried to solve this paradox. But he failed. Until the theory of marginal utility had been developed no one could give a satisfactory answer.

We can solve this puzzle simply by considering two things: **First**, the supplies of the commodities. It will help us identify the distinction between *total* and *marginal* utility of the commodities and know about their prices. **Second**, the *utility-maximizing rule* of the consumer. It will help us understand that total utility is not relevant to price of the commodity, rather marginal utility is relevant to price of the commodity.

The supplies of the two commodities are very much different. Water is plentiful. As a consequence its price is very low, and we, therefore, consume large quantities of it. We use so much water that the utility from the last unit of water - water's marginal utility - is very low. For example, by water we wash our clothes, wash our dishes, bathe ourselves, make ice cubes, and irrigate our gardens. However, total utility we get from water is enormous. On the other hand, diamonds have a small total utility relative to water. But they are rare and costly to mine, cut, and polish. That's why, their supply is restricted and they are available only at a high price. People buy, therefore, only a few diamonds, which make the marginal utility of diamond very large.

Utility-maximizing rule states that a consumer should purchase any commodity until the ratio of its marginal utility to price is the same as that for all other commodities. That is, the consumer will get maximum total utility if she/he allocates her/his income among the different commodities such as X, Y, ....., N in a way that satisfies the following condition:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} = \dots = \frac{MU_N}{P_N}$$

This equality of marginal utilities per dollar spent holds true for water and diamonds: Water has a low price and a low marginal utility. Diamonds have a high price and a high marginal utility. When a high marginal utility of diamonds is divided by the high price of diamonds, the result is a number that equals the low marginal utility of water divided by the low price of water. The marginal utility per dollar spent is the same for diamonds as for water.

Therefore, the *total utility* that we derive from water is very much higher than that we derive from diamond, but it doesn't have relevance to the price, rather *marginal utility* is relevant to price of a commodity. Society would gladly give up all of the diamonds in the world if that would be necessary to obtain all of the water in the world. But society would rather have an additional diamond than an additional gallon of water, given the abundant stock of water available.

## Review Questions

- *Essay-type Questions*

1. (a) What is marginal utility?  
 (b) What is the law of diminishing marginal utility?  
 (c) What evidence is there to suggest that diminishing marginal utility exists?  
 (d) Calculate the marginal utilities of additional glasses of orange juice from the following figures:

Number of Glasses	Total Utility
0	0
1	100
2	190
3	200
4	150

2. Suppose you are in the market for a new bicycle. A salesperson shows you a new 10-speed model for \$249. You say the bicycle is nice but you cannot afford such an expensive model. What do you really mean when you say you cannot afford this item? Surely you could fine \$249 in either your savings or a small loan?
3. "The more the marrier" contradicts the law of diminishing marginal utility. True or false? Explain.
4. The marginal utility of a steak and a fish dinner for an individual is given below. Under the following prices, is the individual maximizing utility for a given expenditure? Why or why not?

	MU	Price
Steak dinner	100	\$10
Fish dinner	75	5

5. Let's say that the combination of food that maximizes your satisfaction for lunch consists of one cheeseburger, one slice of apply pie, and one cup of coffee. According to the marginal-utility-over-price approach to making consumer decisions, you should continue to consume this mix of foods for lunch the rest of your life. True or false? Explain.
6. It is a common practice in restaurants for customers to be given as much coffee as they desire free of charge when they purchase a meal. Under these circumstances, what is the marginal utility of the last cup of coffee; that is, what should be the marginal utility of the last unit consumed of goods received 'free'.

7. Graphically explain the law of equi-marginal utility.
8. What is consumer surplus? Explain it graphically.

• ***True or False***

Which of the following statements are true?

- (a) Utility is an inherent quality of commodity.
- (b) Utility is an absolute concept.
- (c) A consumer is in equilibrium when per rupee MU from all the goods he/she consumes is the same.
- (d) The total utility is maximum when  $MU=0$ .
- (e) The total utility falls when  $MU<0$ .
- (f) At equilibrium, price =MU.
- (g) At equilibrium, MU derived from all goods consumed by a consumer is the same even if price is different.
- (h) Any point on the MU-curve can be a point of equilibrium.
- (i) Marginal utility of money does not remain constant.

• ***Multiple Choice Questions***

1. Utility means the same thing as:
  - (a) money.
  - (b) usefulness.
  - (c) taste.
  - (d) satisfaction.
2. In Economics, the marginal unit refers to the:
  - (a) unit of lowest quality.
  - (b) the last unit added or first unit subtracted
  - (c) the unit having the highest price.
  - (d) the unit having the lowest price.
3. Marginal utility is the satisfaction received from the:
  - (a) last unit of a good or service consumed.
  - (b) average unit of a good or service consumed.
  - (c) total units of a good or service consumed.
  - (d) poorest quality unit consumed.

4. If the law of diminishing marginal utility did not exist we should observe people:
- (a) spending the same proportion of their income on each good.
  - (b) spending the same dollar value of each good.
  - (c) spending all of their income on one good.
  - (d) buying the same quantity of each good.
5. The MU/P ratio tells us:
- (a) the utils per dollar received from the marginal unit of this good.
  - (b) the dollar per util spent on this good.
  - (c) the dollars required to purchase an extra unit of the good.
  - (d) the income required to maximize satisfaction.
6. Answer the question below the following table:

Units	Total Utility of A	Total Utility of B
0	0	0
1	100	50
2	180	70
3	200	65

The marginal utility added by the third unit of good A is — and the marginal utility added by the third unit of good B is — .

- (a) 200; 65
  - (b) 20; 65
  - (c) 200; 5
  - (d) 20; 5
7. The decision to purchase a more expensive item over one that is less expensive is:
- (a) irrational because a wise consumer always buys the lowest-priced item.
  - (b) irrational because a person's income will go farther if the lowest-priced items are purchased.
  - (c) rational if the MU/P ratio is higher for the more expensive item.
  - (d) rational if the MU/P ratio is lower for the more expensive item.

8. In comparing two items, the one having the — should be purchased.
  - (a) highest MU/P
  - (b) lowest MU/P
  - (c) highest MU/P
  - (d) lowest P
  
9. The rule for maximizing utility from a given amount of money is to:
  - (a) equalize the MUs of all items available for consumption.
  - (b) equalize the MU per dollar of all items available for consumption.
  - (c) equalize the amount spent on each item available for consumption.
  - (d) equalize units consumed of each items available for consumption.
  
10. Suppose you are in the market for a new bicycle. A salesperson shows you a nice ten-speed model for \$289. you say the bicycle is very nice but you cannot afford such an expensive model. What do you really mean when you say you cannot afford somethink like this?
  - (a) The MU per dollar of the item is negative.
  - (b) The MU per dollar of the item is less than the MU per dollar of cheaper alternatives.
  - (c) It is impossible to get a hold of \$289.
  - (d) The MU per dollar is greater than the MU per dollar of cheaper alternatives.
  
11. A "good buy" is an item whose MU per dollar is — the MU per dollar of other things we can spend our money on.
  - (a) greater than
  - (b) less than
  - (c) equal to
  
12. If people really try to maximize utility, given their income, how does one explain gift-giving and charity, where people give without expecting to receive somethink in return?
  - (a) People are irrational.
  - (b) People really do not try to maximize utility
  - (c) People receive utility from giving.
  - (d) People who give have MU/p ratios that equal zero.

## Lesson-3: Ordinal Utility Theory - Indifference Curve

### Objectives

After studying this lesson, you will be able to:

- Describe the basic difference between the ordinalist theory and cardinalist theory;
- Explain the indifference curve;
- Explain the budget line;
- Explain the equilibrium position of the consumer; and
- Derive the demand curve from the indifference curve analysis.

### Introduction

At the end of the previous lesson, we learnt that there are some basic weaknesses in the cardinalist approach. The main weakness in the cardinalist approach is the assumption of cardinal utility. In the cardinalist approach, the taste or satisfaction or utility derived from the consumption of a commodity can be measured objectively. In Table 4.1, we saw that the marginal utility Modhu got from the first piece of Patty was Tk. 10.00, while the second piece of Patty had the marginal utility of Tk.9.00. Now, the question is: can we really be so specific about our tastes? Is it reasonable to say that you got the marginal utility of Tk.10.00 from the consumption of the first can of Virgin? Should we calculate a psychological entity, like *utility*, arithmetically?

The main weakness in the cardinalist approach is the assumption of cardinal utility.

Till early twentieth century, the above questions were left unanswered. In 1906, Vilfredo Pareto first opposed the idea of cardinal utility and initiated the idea of ordinal utility to consumer behaviour analysis. Later Eugene E. Slutsky, W.E. Johnson, A.L. Bowley, John R. Hicks, and R.G.D. Allen systematically developed the ordinal utility theory as a powerful tool of consumer behaviour analysis. There are several theories which are based on the concept of ordinal utility. For example, the indifference curve analysis, theory of revealed preference, etc.

This lesson presents the indifference curve analysis of consumer behaviour. Let's first know something about the concept of *ordinal utility*.

### The Concept of Ordinal Utility

The word *ordinal* is synonymous to the word *rank*. We know that rank is not a quantity, rather it indicates the position of something in a group in terms of magnitude or satisfaction or any other attributes. For example, if you are asked to express your preference among three commodities such as Patty, Shingara and Orange, you may express your best favour to Orange, less favour to Shingara and very low favour to Patty, i.e., the ranking of your preference according to the satisfaction of each commodity is:

<u>Commodities</u>	<u>Ranks</u>
Patty	3
Shingara	2
Orange	1

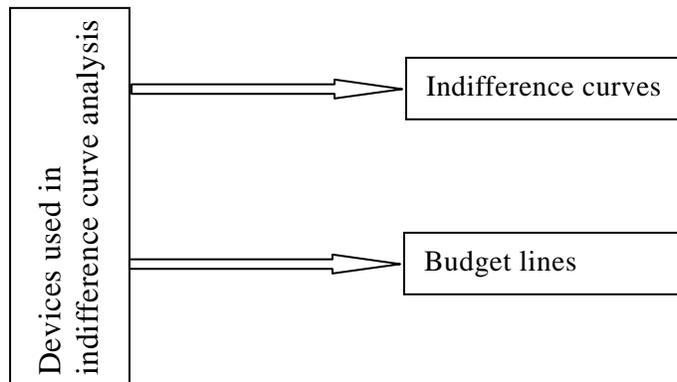
Therefore, the **ordinal utility** is the expression of the consumer's preference for one commodity over another or one basket of goods over another, but not a numerical figure of utility derived from different commodities or baskets. In this case, it is assumed that the utility derived from the consumption of various commodities cannot be measured in quantities, but the consumer can rank her/his preferences according to the satisfaction of each commodity or basket. For example, you can say that you prefer Orange to Shingara, but it is extremely doubtful if you say that the utility you will receive from Orange and Shingara is Tk.10.00 and Tk.5.00 respectively.

So *ordinal utility analysis* is a more advanced explanation of consumer behaviour than *cardinal utility analysis*.

Let's now discuss *indifference curve analysis* which is based on the ordinal utility concept.

### Indifference Curve Analysis

Two geometric devices are used in this analysis: **indifference curves** and **budget lines**. Both of them are the locus of various combinations of two commodities. However, the first one is concerned with those combinations from which the consumer gets same satisfaction or she/he is indifferent among them, while the second one is concerned with such combinations or bundles which she/he can afford by spending the same amount of money.



Let's first discuss the assumptions underlying the indifference curve analysis. Later, we will discuss *indifference curves* and *budget lines* in detail.

### Assumptions

The indifference curve analysis of consumer's behaviour is based on the following assumptions:

**Rationality:** The consumer is rational - she/he aims at the maximization of her/his utility, given her/his income and market prices. She/he has full knowledge of all relevant information.

**Ordinal utility:** The consumer can rank her/his preferences according to the satisfaction of each basket. She/he doesn't need to care the arithmetic

calculation of utility or satisfaction. Only ordinal measurement of utility is required.

**Diminishing marginal rate of substitution:** The slope of the indifference curve is called the marginal rate of substitution of the commodities. The indifference curve analysis is based on the axiom of diminishing marginal rate of substitution.

**Total utility depends on the quantities consumed:** The total utility depends on the quantities of the commodities consumed. That is,

$$U = f(q_1, q_1, \dots, q_x, q_y, \dots, q_n)$$

**Consistency of choice:** The consumer is consistent in her/his choice, which means if the consumer once chooses Bundle A over Bundle B, she/he will not choose B over A in another period if both bundles are available to her/him. Symbolically, the assumption of consistency may be written as follows:

$$\text{If } A > B, \text{ then } B \not> A$$

**Transitivity of choice:** Consumer's choices are characterized by transitivity, i.e., if Bundle A is preferred to B, and B is preferred to C, then Bundle A is preferred to C. Symbolically,

$$\text{If } A > B, \text{ and } B > C, \text{ then } A > C$$

**Non-satiation:** The consumer is assumed never to be satiated with goods. That's why, the more of each goods the bundle contains the more it is preferred to the consumer. She/he always prefers the bundle which contains the larger quantity of the commodities.

### Indifference curve: What the Consumer Prefers

An indifference curve is the locus of points which indicates various combinations of two commodities that yield the same level of satisfaction or utility to the consumer. So, the indifference curve embody subjective information about consumer preferences for two commodities.

Table 4.4 shows an indifference schedule and Figure 4.6 shows the indifference curve which is derived by plotting the hypothetical data in Table 4.4.

**Indifference schedule:** Let us assume that a consumer named Modhu is indifferent between the various combinations of orange and Patty. In Table 4.4, some combinations of Orange and Patty are presented. These combinations yield her equal satisfaction. Table 4.4 is, thus, called an indifference schedule.

**Table 4.4: Indifference schedule (hypothetical data)**

Combinations	Units of Orange	Units of Patty
a	12	2
b	7	4
c	4	6
d	2	8
e	1	10

In Table 4.4, five combinations of Orange and Patty have been shown. Combination-a contains 12 pieces of Orange and 2 pieces of Patty, combination-b contains 7 pieces of Orange and 4 pieces of Patty, combination-c contains 4 pieces of Orange and 6 pieces of Patty, and so on. We see that the quantity figures are not the same in all the combinations. If a combination contains more Oranges, it has to contain less Patty. This is necessary, because all the combinations should yield the consumer the same satisfaction. Note that as the combinations include more of Patty, the quantity of Oranges in the combinations becomes lower. That means, the consumer has to give up Oranges for getting more Patties to keep her satisfaction same. So, there is a substitution between the two commodities. But what is about the rate of substitution? Does she always give up or substitute the same amount of Oranges for every extra piece of Patty? Look at Table 4.4. When Modhu moves from combination-a to combination-b, she substitutes 2 pieces of Patty for 5 pieces of Orange; if she moves further, i.e., from combination-b to combination-c, she substitutes same amount of Patty (2 pieces of Patty) for 3 pieces of Orange; and so on. Therefore, the rate of substitution of each extra piece of Patty (marginal rate of substitution) diminishes. This is shown in Table 4.5.

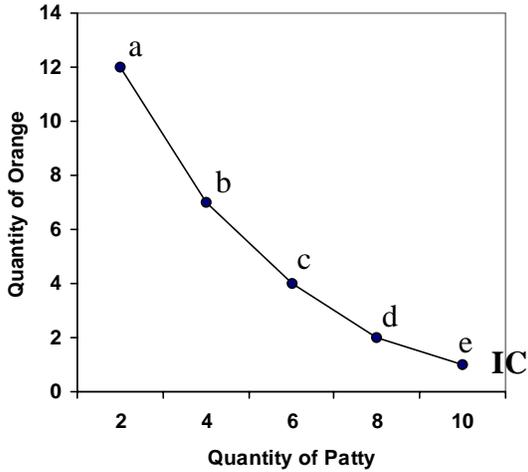
**Table 4.5: Marginal rate of substitution (hypothetical data)**

Combinations	Units of Orange	Change in the quantity of Orange ( $\Delta Q_{orange}$ )	Units of Patty	Change in the quantity of Patty ( $\Delta Q_{Patty}$ )	Marginal rate of substitution $\Delta Q_{orange} \div \Delta Q_{Patty}$
a	12		2		
b	7	5 (=12-7)	4	2 (= 4-2)	2.5
c	4	3 (= 7-4)	6	2 (= 6-4)	1.5
d	2	2 (= 4-2)	8	2 (= 8-6)	1.0
e	1	1 (= 2-1)	10	2 (= 10-8)	0.5

In Table 4.5, it is shown that for every extra 2 pieces of Patty the consumer is not willing to give up the same quantity of Oranges - her willingness to giving up Oranges becomes lower as she gets more of Patty. This means, her attraction toward Patty reduces as she gets more of it. Column-6 of the table shows the diminishing marginal rate of substitution of Patty for Orange.

**Indifference curve:** Plotting the data given in Table 4.4 we get the indifferent curve of the consumer. Figure 4.6 shows it.

In the above figure, IC indicates the indifference curve. Any point on the indifference curve indicates a combination of two commodities - Orange and Patty. At all the points the consumer is indifferent, i.e., throughout this curve the consumer's utility or satisfaction is the same. That's why, indifference



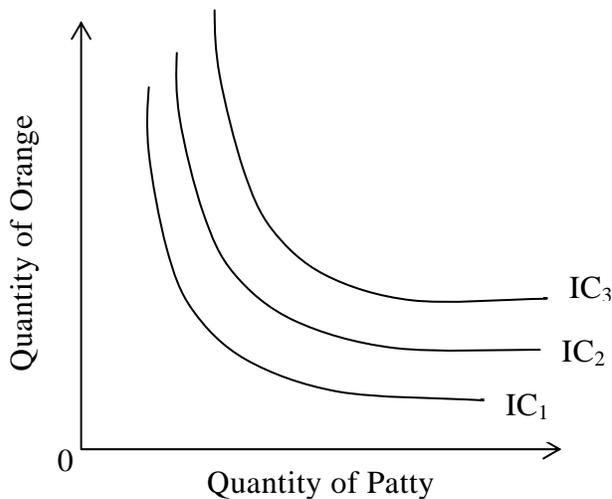
**Figure 4.6: Indifference curve of Modhu**

curve is also called *Iso-utility* or *Equal-utility* curve.

**Indifference map**

An indifference map is the collection of all indifference curves which rank the preferences of the consumer. As we move out from the origin each successive indifference curve entails a higher level of utility. That means, combinations of goods lying on a higher indifference curve yield higher level of satisfaction and are preferred. Figure 4.7 shows an *indifference map*.

Combinations of goods lying on a higher indifference curve yield higher level of satisfaction.



**Figure 4.7: Indifference map**

Figure 4.7 depicts a partial indifference map, because only three indifference curves are shown here. Like  $IC_1$ ,  $IC_2$  and  $IC_3$  there may be many other indifference curves in the indifference plane. The area between the two axes is called *indifference plane*.

### ***Properties of the indifference curve***

The indifference curve has the following basic properties:

**Downward sloping:** The indifference curve is downward sloping, which implies that: the two commodities can be substituted for each other; and if quantity of one commodity decreases, quantity of the other commodity must increase if the consumer has to stay at the same level of satisfaction. Technically, the slope of the indifference curve is called the ***Marginal Rate of Substitution (MRS)***, because it shows the rate, at the margin, at which the consumer will substitute one good for the other to remain equally satisfied.

**Convex to the origin:** Downward slope is the necessary, not sufficient, property of the indifference curve. As viewed from the origin, a downward sloping curve can be concave (bowed outward) or convex (bowed inward). The indifference curve is convex to the origin, which means that slope of the indifference curve, the marginal rate of substitution, diminishes as we move down the curve. The diminishing slope of the indifference curve means the willingness to substitute one commodity (orange) for the other (Patty) diminishes as one moves down the curve.

**Indifference curves do not intersect nor be tangent to one another:** By definition, we know that along an indifference curve the consumer's satisfaction remains the same. If indifference curves intersect, the point of their intersection would imply two different levels of satisfaction, which is impossible.

**Upper indifference curves represent higher level of satisfaction than the lower ones:** The further away from the origin an indifference curve lies, the higher the level of utility it denotes. Bundles of commodities on an upper indifference contain a larger quantity of one or both of the commodities than the lower indifference curve. Thus bundles of commodities on a higher indifference curve are more preferred by the rational consumer.

### **Budget Line: What the Consumer Can Afford**

In the previous section, we learnt that an indifference curve shows such combinations of commodities from which the consumer gets the same level of satisfaction. In that case, we haven't considered any constraint. Is the consumer able to consume any combination she/he prefers? Certainly the answer is NO. Why? Because her/his income is limited. Thus which bundle or combination of the commodities the consumer can afford depends on her/his income and the prices of the commodities.

A ***budget line*** shows such combinations of two commodities which the consumer can afford, given her/his money income and prices of the commodities. Table 4.6 shows the combinations of Orange and Patty which

the consumer can purchase when her/his money income is Tk.36.00, price of Orange is Tk.3.00 and price of Patty is Tk.4.00.

**Table 4.6: Combinations of Orange and Patty attainable with an income of Tk.36.00 (hypothetical data)**

Combinations	Quantity of Orange (price = Tk.3.00)	Quantity of Patty (price = Tk.4.00)	Expenditure on Orange (in taka)	Expenditure on Patty (in taka)	Total Expenditure (in taka)
a	12	0	$3 \times 12 = 36$	$4 \times 0 = 0$	$36 + 0 = 36$
b	8	3	$3 \times 8 = 24$	$4 \times 3 = 12$	$24 + 12 = 36$
c	4	6	$3 \times 4 = 12$	$4 \times 6 = 24$	$12 + 24 = 36$
d	0	9	$3 \times 0 = 0$	$4 \times 9 = 36$	$0 + 36 = 36$

In the table above, four combinations are shown such as *combination-a*{12 pieces of Orange and 0 piece of Patty}, *combination-b*{ 8 pieces of Orange and 3 pieces of Patty}, *combination-c*{ 4 pieces of Orange and 6 pieces of Patty} and *combination-d*{0 piece of Orange and 9 pieces of Patty}. Each of the combinations can be purchased with Tk.36.00 of money income.

Algebraically, we can write the **income constraint**, in the case of two commodities, as follows:

$$P_{or} \times Q_{or} + P_{pa} \times Q_{pa} = M \dots\dots\dots(4.1)$$

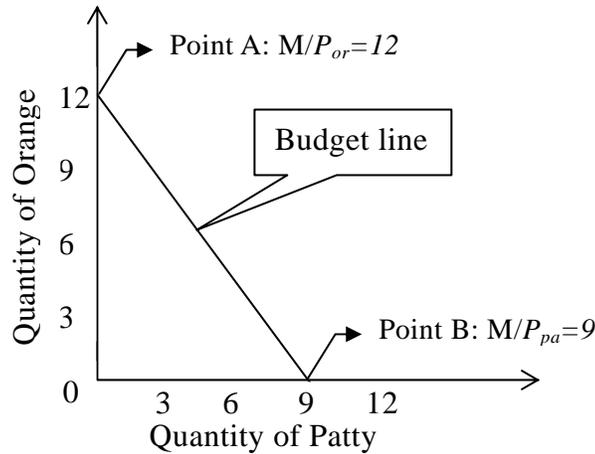
Here,  $P_{or}$  = Price of Orange;  $Q_{or}$  = Quantity of Orange;  $P_{pa}$  = price of Patty;  $Q_{pa}$  = Quantity of Orange; and M = Money income.

Solving the above equation (4.1) for  $Q_{pa}$ , we derive:

$$Q_{pa} = \frac{1}{P_{pa}} M - \frac{P_{or}}{P_{pa}} Q_{or} \dots\dots\dots(4.2)$$

Equation (4.2) is called **budget equation**.

Assigning successive values to  $Q_{or}$  ( M,  $P_{or}$  and  $P_{pa}$  remain the same), we may find the corresponding values of  $Q_{pa}$ . Thus, if  $Q_{or} = 0$  (that is, if the consumer spends all her/his income on Patty), then the consumer can buy  $M/P_{pa}$  units of Patty. Similarly, if  $Q_{pa} = 0$  ( that is, if the consumer spends all her/his income on Orange), then the consumer can buy  $M/P_{or}$  units of Orange. These results are shown in Figure 4.8 by Points A and B. If we join these points with a line, we obtain the **budget line**. Budget line is also called as **price line**. In the above figure, AB is the budget line. Any point on or under the budget line indicates the combination of Orange and Patty which is affordable to the consumer, but the points on the north-east area of the budget line indicate such combinations which are out of the purchasing capacity of the consumer. Thus the south-west area of the budget line is **feasibility area** and the north-east area of the budget line is **non-feasibility area**. We can geometrically calculate the slope of the budget line as follows:



**Figure 4.8: Budget line (representing the data in table 4.1)**

$$\frac{OA}{OB} = \frac{M / P_{or}}{M / P_{pa}} = \frac{P_{pa}}{P_{or}}$$

So, we can draw the budget line easily if we know the prices of the commodities and the money income of the consumer. Let's consider the prices and money income assumed in Table 4.6. We find:

$P_{or}$  = price of Orange = Tk.3.00

$P_{pa}$  = price of Patty = Tk.4.00

$M$  = Money income of the consumer = Tk.36.00

Therefore,  $M/P_{or} = 36/3 = 12$  units of Orange  
 $M/P_{pa} = 36/4 = 9$  units of Patty

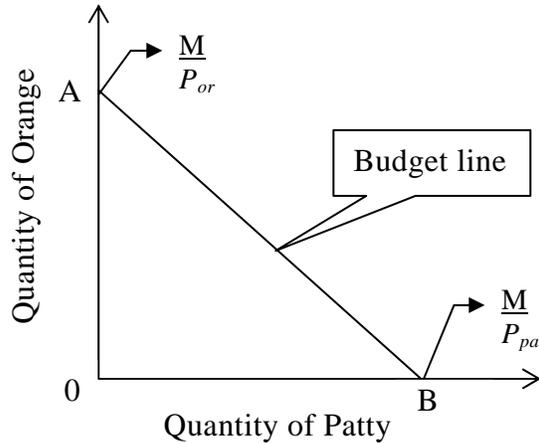
These two results are shown in Figure 4.8 by Points A and B. If we join these points with a line, we obtain the budget line, AB. Points on the budget line represents the combinations of Orange and Patty which can be purchased with Tk.36.00. All the combinations in Table 4.6 fall on the budget line. Thus, without plotting the data in Table 4.6 budget line can be derived if we have the information about the prices of the commodities and the money income of the consumer.

***Properties of budget line***

Budget line have the following basic properties:

**Downward sloping:** Budget line is downward sloping, which implies that: the two commodities can be substituted for each other; and if quantity of one commodity decreases, quantity of other commodity must increase if the

consumer has to spend all of her/his money income. Technically, the slope of the budget line is the ratio of the prices of the commodities:  $P_{pa}/P_{or}$ .

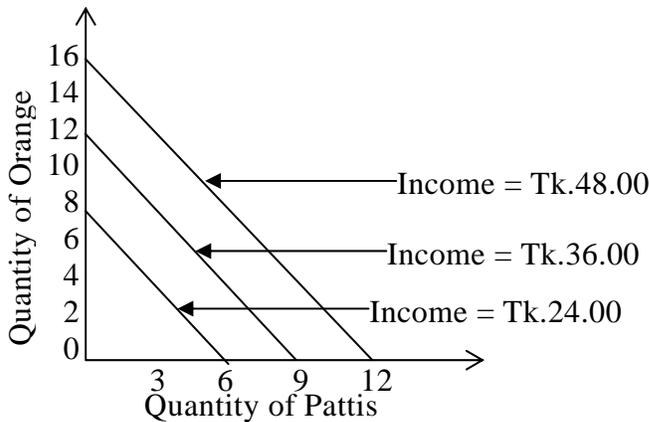


**Figure 4.9: Slope of the budget line:  $P_{pa}/P_{or} < 0$**

**Position of the budget line:** Position of the budget line is determined by two types of data: the prices of the commodities and consumer's disposable income.

**Income change:** If the income of the consumer increases, the budget line shifts outward parallelly. The reason is simply that say, 33 per cent increase in available income, if entirely spent on two goods in question, would permit the consumer to purchase exactly 33 per cent more of either commodities. Conversely, if the income decreases by 33 per cent, then the consumer's purchase of either goods is decreased by 33 per cent. In this case, the budget line shifts inward parallelly. Figure 4.10 shows both the cases.

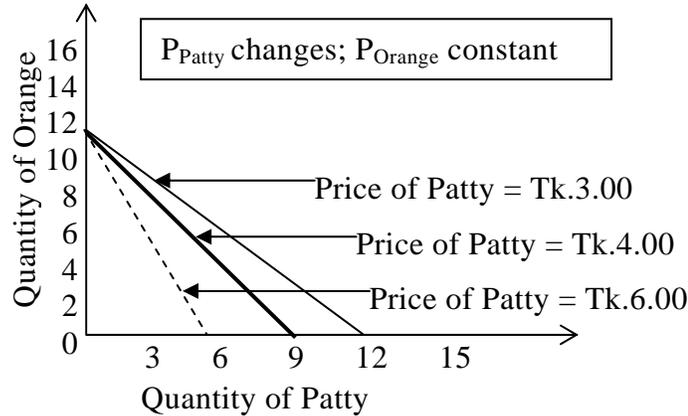
If the income of the consumer increases, the budget line shifts outward parallelly.



**Figure 4.10: The effect of income changes on the budget line**

**Price change:** If the price of one or both of the commodities is changed, the budget line will swing. To explain the nature of the swing we can consider the following cases:

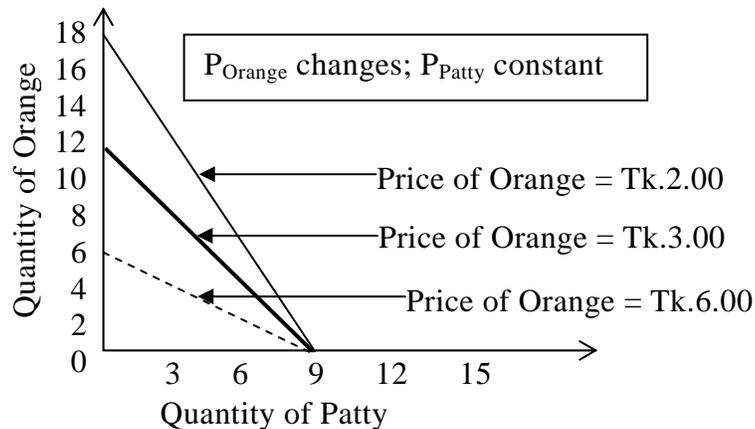
**Case-1: Price of only one commodity changes.** If the price of only one commodity changes, one end of the budget line swings away from the initial position. For example, in Figure 4.11(A), the initial position of the budget line is indicated by the bold line. The initial prices of Orange and Patty are Tk.3.00 and Tk.4.00 respectively. Now, if the price of Patty rises to Tk.4.00



**Figure 4.11(A): The effect of price changes on the budget line.**

while the price of Orange remains fixed, the end of the budget line on the Patty axis (i.e., horizontal axis) swings toward the origin. This is shown by the *dotted line* in Figure 4.11(A). But in the case of fall in the price of Patty (from Tk.4.00 to Tk.3.00), the effect will be reverse. The *right most budget line* in Figure 4.11(A) shows that. Similarly, we can see the effect of the changes in the price of Orange assuming that the price of Patty is fixed. Figure 4.11(B) shows that.

In Figure 4.11(B), The bold line indicates the initial position of the budget line, when the prices of Orange and Patty are Tk.3.00 and Tk.4.00

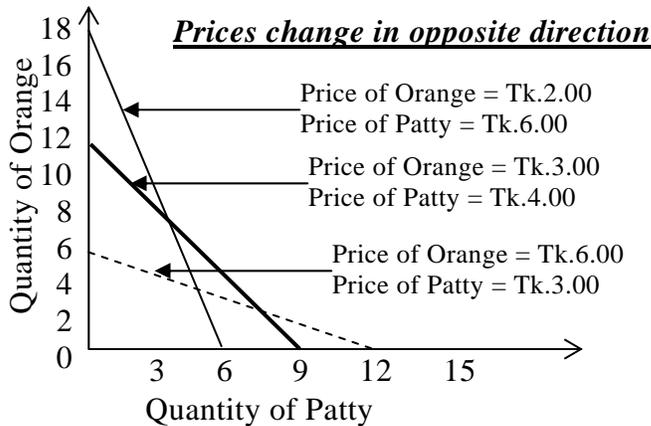


**Figure 4.11(B): The effect of price changes on the budget line**

respectively. If the price of Orange rises, the price of Patty remaining the same, the end of the budget line on the Orange axis (vertical axis) swings inward, which is shown by the *dotted line* in Figure 4.11(B). But in the case of a fall in the price of Orange, the effect will be reverse, i.e., the upper end of the budget line swings outward, which is shown by the right most line in Figure 4.11(B).

In conclusion, we can say that if the price of a particular commodity changes, the respective end of the budget line swings. If price falls, it swings outward and if price rises, it swings inward.

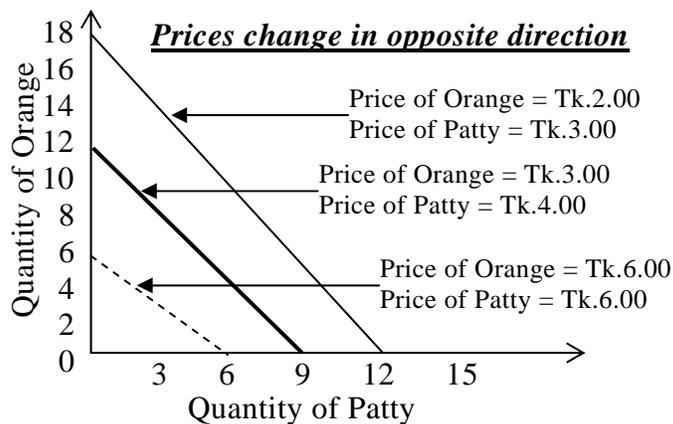
**Case-2: Price of both commodities change.** If the prices of both commodities are changed simultaneously, then it becomes more complex to discuss their effect on budget line. However, keeping the effect of individual price changes on the budget line in mind, we can see how the budget line shifts or rotates. If the prices change in opposite direction, the budget line rotate as in Figure



**Figure 4.11(C): The effect of price changes on the budget line**

4.11(C). For example, if the price of Orange falls and the price of Patty rises simultaneously, the budget line will rotate clockwise, which is shown by the steepest line in Figure 4.11(C). On the other hand, if the price of Orange rises and the price of Patty falls, then the budget line rotate anti-clockwise, which is shown by the dotted line in Figure 4.11(C). The bold line in the figure indicates the initial position of the budget line.

If the prices change in the same direction, the budget line shifts. Figure

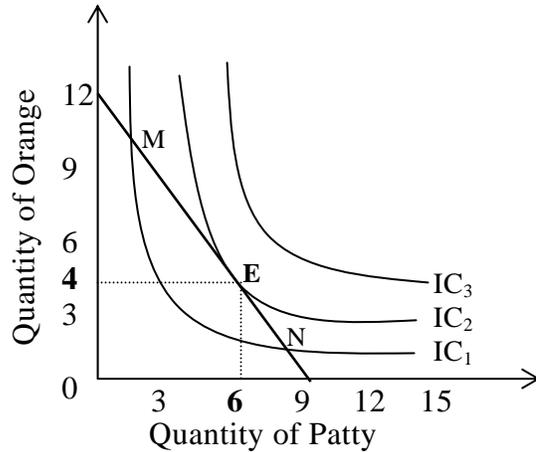


**Figure 4.11(D): The effect of price changes on the budget line**

4.11(D) shows it. For example, if both prices fall, the budget line shifts outward (steepest line in the figure), while the rise in both prices cause the budget line shift inward entirely (dotted line in the figure).

### Equilibrium of the Consumer: Best Affordable Combination

We have learnt about indifference curve and the budget line in the previous sections. Now we will try to discover the combination which lies on both the budget line and the highest attainable indifference curve. To do this, we have to bring the budget line and the indifference curves together as in Figure 4.12.



**Figure 4.12: Consumer's equilibrium: Best affordable combination**

In Figure 4.12, the budget line intersects the IC<sub>1</sub> curve at Points M and N. It also touches the IC<sub>2</sub> curve at Point E. At all these three points, the consumer on her/his budget line, i.e., she/he can buy any of the combinations indicated by these points. But what is the best affordable combination - the combination which yields the consumer maximum satisfaction? Look at the Figure 4.12. Points M and N are on IC<sub>1</sub> curve which indicates lower satisfaction, whereas Point E lies on IC<sub>2</sub> which is the highest attainable indifference curve. Thus, E is best affordable point to the consumer, i.e., E is the equilibrium point of the consumer and the equilibrium combination of Orange and Patty is { 4 units of Orange and 6 units of Patty }.

Therefore, the equilibrium of the consumer is achieved at the point where the budget line touches an indifference curve, i.e., at the equilibrium point the slope of the budget line equals the slope of the indifference curve:

$$\frac{P_{pa}}{P_{or}} = MRS_{pa,or}$$

Any other points may be affordable to the consumer, but they lie on lower indifference curves.

Now let's see what happens to the equilibrium if consumer's income or price of any commodity or prices of both commodities are changed.

#### ***Effect of a change in income: Income effect***

The effect of a change in income is called the ***income effect***. To examine how the change in income affects the consumption of the consumer, we have to assume that the prices of the commodities are constant.

If the income of the consumer falls, the consumption of both commodities decreases and if income rises, the effect will be the reverse. It is true in the

case of *normal goods*. However, in the case of *inferior goods*, the consumption of the commodities decreases as the income of the consumer rises. The rate of decrease in consumption may be moderate or very high. If the rate is very high, then the commodity is called *Giffen good*.

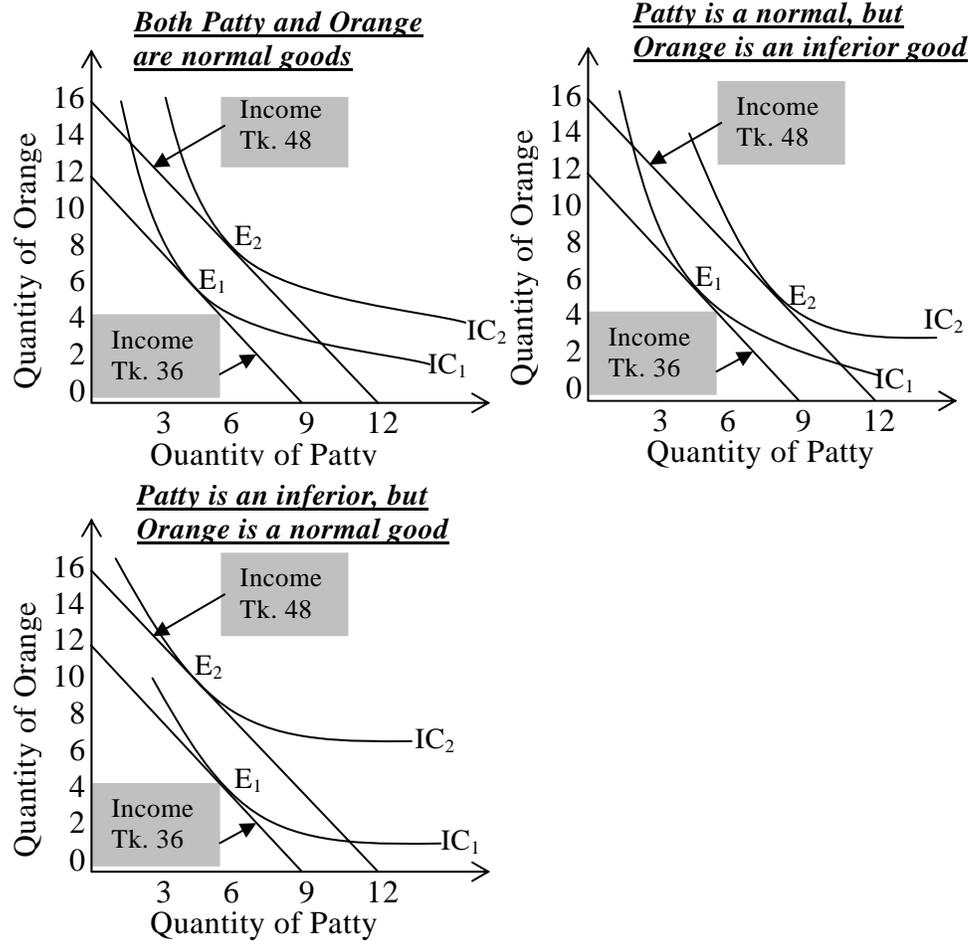
Direction of change in income	Change in consumption	Nature of the commodity
Rises	Increases	Normal good
	Decreases	Inferior good - if the rate of decrease is moderate
		<i>Giffen</i> * good - if the rate of decrease is very high
Falls	Decreases	Normal good
	Increases	Inferior good - if the rate of increase is moderate
		<i>Giffen</i> good - if the rate of increase is very high
* <i>Giffen</i> goods are one kind of inferior goods. These goods are very rare in practice.		

Now let's see, graphically, how the change in income affects the consumption of the commodities. Figure 4.13 shows the effect of income change on consumption of Patty and Orange. Initial income of the consumer was Tk. 36.00 and the prices of Patty and Orange are Tk. 4.00 and Tk. 3.00 respectively, which is indicated by the lower budget line. The upper budget line indicates higher income (Tk. 48.00), the prices remain constant. These information are the same for all three pictures. However, three pictures illustrate three separate cases.

The first picture depicts the effect of income change when two commodities are normal. In that case, consumption of both Patty and Orange increases as the income of the consumer rises.

In the second picture we see that as income rises, the consumption of Patty increases, but the consumption of Orange decreases. Here, Patty is normal, but Orange is inferior good.

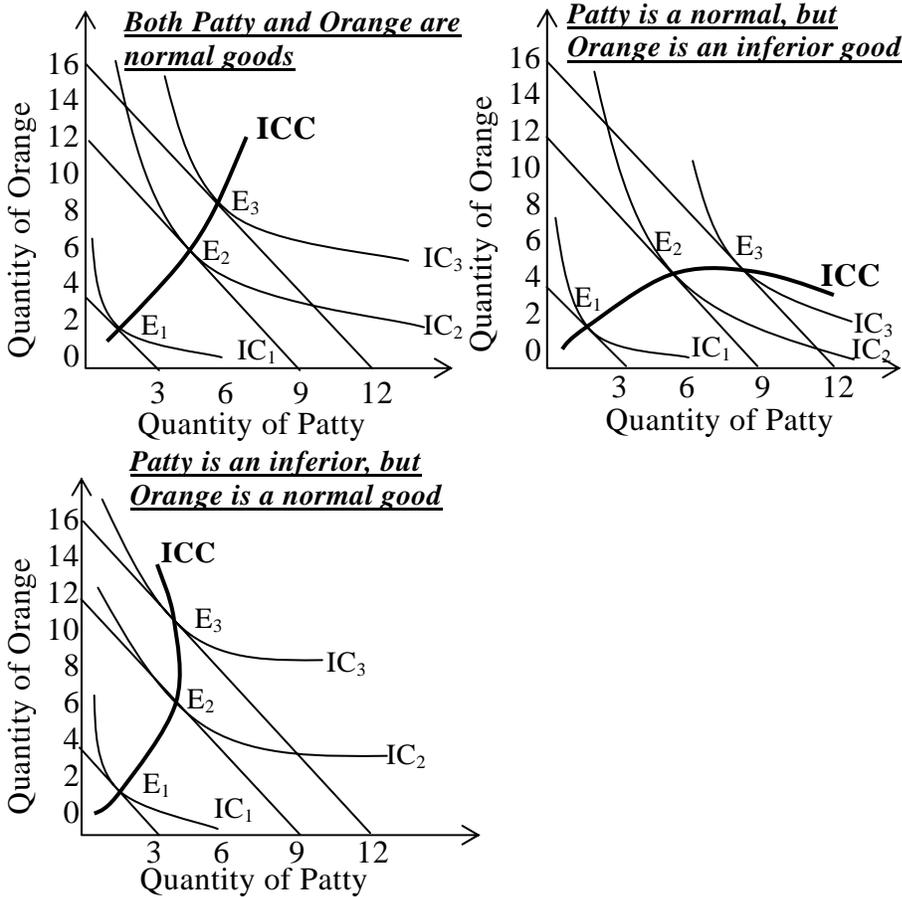
The third picture shows that the consumption of Patty decreases as income rises, but the consumption of Orange increases with the rise in income. Here, Patty is inferior good and Orange is normal good.



**Figure 4.13: The effect of income changes on consumption**

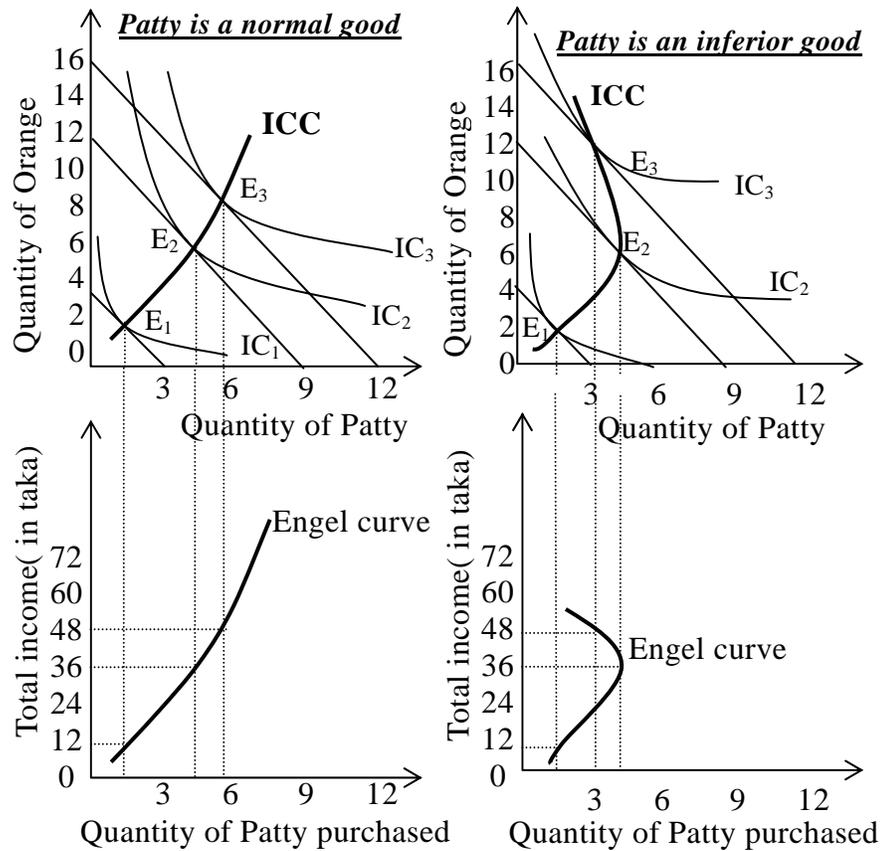
Similarly, we can see the effect of a fall in income on the consumption of commodities.

**Income Consumption Curve (ICC):** If the income of the consumer increases successively, the budget line will shift and the consumer will move to new equilibrium points. By joining all the successive equilibrium points, we get a curve which is called *income consumption curve*. Figure 4.14 shows this. In Figure 4.14, we see that the shape of the ICC depends on the nature of the commodities.



**Figure 4.14: Income Consumption Curve**

**Engel curves:** The German Statistician, Ernst Engel (1821 - 1896), made a pioneer study of relationship between consumer's income and the quantity purchased of a commodity. The graphical presentation of that relationship is called the *Engel curve*. After hearing the definition, it should be borne in mind that an *Engel curve* is different from an *income consumption curve*. Of course, they are not identical. While income consumption curve shows the relationship between consumer's income and the quantity consumed of a commodity, Engel curve shows the relationship between money income and the money expenditure on a particular commodity. But income consumption curve does provide some information which are necessary to draw the Engel curve. Figure 4.15 shows this.



**Figure 4.15: Derivation of Engel Curve**

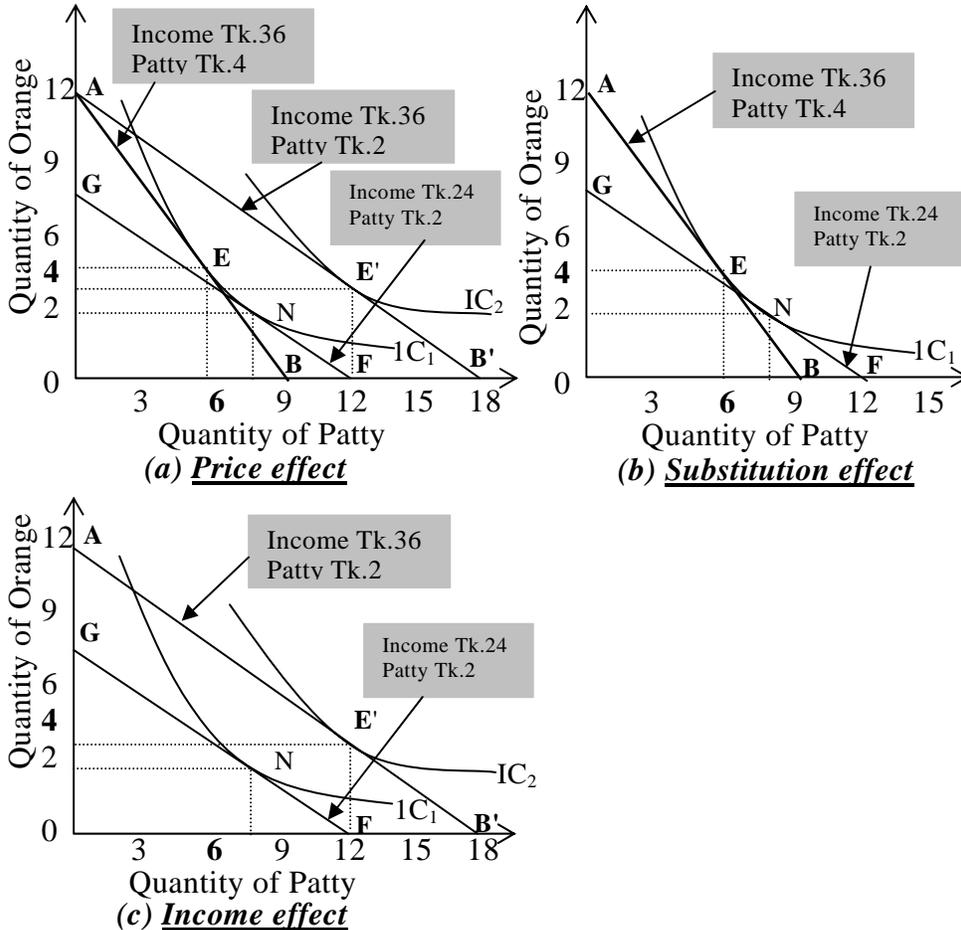
In Figure 4.15, we see that in the case of normal good, Engel curve is upward sloping. But as the income of the consumer increases, the purchase of Patty is increasing at a diminishing rate. This is true only for food items. Right part of the figure shows the Engel curve for an inferior good. We see that the Engel curve of an inferior good is backward bending.

***Effect of a change in price: Price effect***

We have discussed the effect of a change in income in the previous section. Then we have assumed prices of the commodities and taste to be constant. Now we will know how changes in price affect the consumption of a consumer. To do this, we would assume that the income of the consumer, her/his taste and preference, and price of one of the two commodities remain constant. Suppose that the price of Orange remains constant and Patty is a normal good.

Now think what actually happens with a change (say, a fall) in the price of Patty? First, the real income (i.e., the purchasing power of money income) of the consumer ( $M/P_{Patty}$ ) increases and thus the consumption of Patty increases, which is called the **income effect** of a price change. Second, since Patty is now relatively cheap, the consumer buys more of Patty and less of Orange, i.e., she/he substitutes Patty for Orange - this is known as the **substitution effect** of a price change. Therefore, the total price effect has two components:

*Income effect and substitution effect.* The magnitude of the price effect is the net outcome of these two effects. Let's now see how the price effect can be described graphically, by isolating the substitution effect and income effect. Figure 4.16 shows it.



**Figure 4.16: Price effect, income effect and substitution effect**

In Figure 4.16(a), AB is the initial position of the budget line. The initial prices of Patty and Orange are Tk.4.00 and Tk.3.00 respectively. And the money income of the consumer is Tk.36.00. E is the initial equilibrium point. Now, a fall in the price of Patty, given the price of Orange and consumer's money income, will cause the right end of the budget line to swing outward. In Figure 4.16(a), budget line rotates from AB to AB' when the price of Patty falls to Tk.2.00. The new equilibrium Point, E', is then established. If we compare two equilibrium points, we find that with a fall in the price of Patty, the consumer consumes more of Patty than before. The effect of the fall in price on consumption shown in Figure 4.16(a) can be described by breaking into two effects: the substitution effect in Figure 4.16(b) and the income effect in Figure 4.16(c).

**Substitution effect:** The substitution effect is the effect of a change in price on the quantities consumed when the consumer (hypothetically) remains

indifferent between the original and the new combinations of goods consumed. Figure 4.16(b) illustrates the substitution effect. When the price of Patty falls from Tk. 4.00 to Tk. 2.00, let's suppose (hypothetically) that the consumer's income decreases to Tk. 24.00. What's special about Tk. 24.00? It is the income that is just enough, at the new price of Patty, to keep the consumer's best affordable point on the same indifference curve as her/his original consumption Point E. This variation of income is called as **compensating variation**. In this situation, the budget line of the consumer is GF. GF is called as **compensated budget line**. With the new price of Patty and the new smaller income, consumer's best affordable point is N on indifference curve IC<sub>1</sub>. The move from E to N is the substitution effect of the price change. The substitution effect of the fall in the price of Patty is an increase in the consumption of Patty from 6 pieces to 8 pieces and a decrease in the consumption of orange. The direction or the sign of the substitution effect is always the same (i.e., negative): when the relative price of a good falls, the consumer substitutes more of that good for the other good.

**Income effect:** To calculate the income effect, we supposed a decrease in the income of the consumer. An amount of Tk. 12.00 has been cut from the consumer's income, move from AB' to GF, just to keep her/him on the same indifference curve. Now let's give the consumer her/his Tk. 12.00 back. The Tk.12.00 increase in income shifts the consumer's budget line outward, as shown in Figure 4.16(c). The slope of the budget line doesn't change because both prices remain constant. This change in the budget line is similar to the one illustrated in the first part of Figure 4.13, where we studied the effect of a change in income on consumption. As the consumer's budget line shifts outward, her/his consumption possibilities expand, and her/his best affordable point becomes E' on indifference curve IC<sub>2</sub>. The move from N to E' is the income effect of the price change. Thus, the income effect of the fall in the price of Patty is an increase in the consumption of Patty from 8 pieces to 12 pieces and also an increase in the consumption of orange from 2 pieces to 3 pieces. Since consumption of both Patty and Orange increase with a rise in income, they are normal goods.

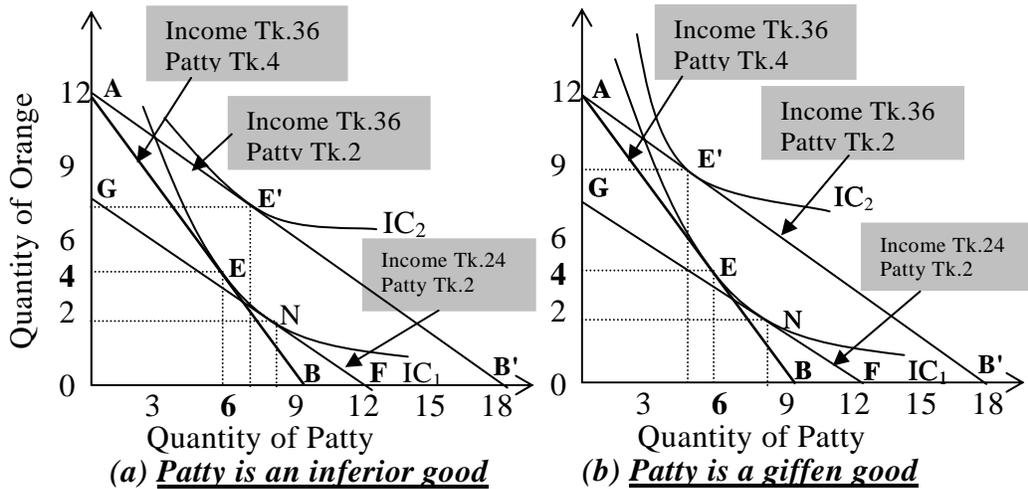
If we summarise the above discussion, we get:

<b>Substitution effect (Point N to E')</b>		<b>Income effect (Point N to E')</b>	
Change in the consumption of Orange	Change in the consumption of Patty	Change in the consumption of Orange	Change in the consumption of Patty
-2 (=2-4)	+2 (=8-6)	+1 (=3-2)	+4 (=12-8)

Therefore, the price effect of a fall in the price of Patty is the increase in the consumption of Patty by 6 [= (+2) + (+4) ] pieces of Patty. For Orange, the substitution effect and the income effect work in opposite direction with the result that the consumer decreases her/his consumption of Orange by 1 [= (-2) + (+1)] piece.

The example that we have just studied is that of a change in the price of a normal good. The effect of a change in price of an inferior good is different.

Recall the second part of Figure 4.13 which illustrated the effect of an increase in consumer's income on the consumption of an inferior good. There we saw that for an inferior good, the income effect is negative. That is, the consumption of an inferior good decreases as income increases. Thus, for an inferior good, the lower price doesn't always lead to an increase in the consumption. The lower price has a substitution effect that increases the quantity consumed, at the same time it also has a negative income effect that reduces the demand for the inferior good. Thus, the price effect depends on how much the income effect offsets the substitution effect. If the income effect is stronger than the substitution effect, then the consumption increases as price falls and *vice versa*. Figure 4.17 shows this.

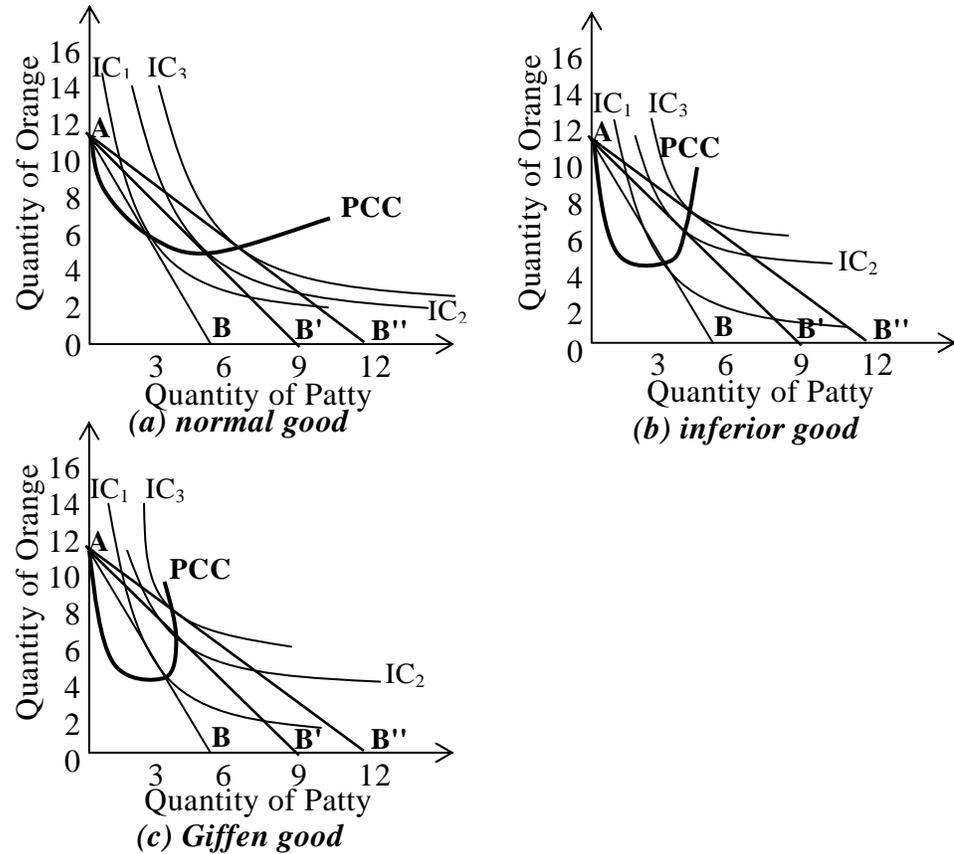


**Figure 4.17: Price effect, income effect and substitution effect: inferior good**

In Figure 4.17(a), we see that the substitution effect is  $+2 (= 8-6)$  pieces of Patty and the income effect is  $-1 (= 7-8)$  piece of Patty. Thus the income effect cannot fully offset the substitution effect. That is, the total price effect is positive. Still the law of demand does hold. But for Giffen good, one kind of inferior good, the income effect is strong enough to offset the substitution effect. In that case, the total price effect is negative. That is, the law of demand does not hold. Figure 4.17(b) illustrates this case.

Giffen good is one kind of inferior good.

**Price Consumption Curve (PCC):** If the price of Patty falls successively, the budget line rotates anti-clockwise and we move to new equilibrium points. Joining all the successive equilibrium points we get a curve which is called *price consumption curve* or *PCC*. Figure 4.18 shows it.



**Figure 4.18: Price consumption curve**

The initial budget line is AB, the income of the consumer is Tk. 36.00, the price of Patty is Tk. 6.00 and the price of Orange is Tk. 3.00. Now if the price of Patty falls and consumer's income and the price of Orange remain constant, budget line will rotate outward. When the price of Patty falls to Tk. 4.00, the AB budget line rotates to AB'. A further fall in the price of Patty make the budget line rotate to AB". In Figure 4.18, we see that AB budget line touches the indifference curve IC<sub>1</sub>, AB' touches IC<sub>2</sub> and AB" touches IC<sub>3</sub>. The points of tangencies are the equilibrium points of the consumer. If we join these points by a line, we get *price consumption curve* or *PCC*.

The price consumption curve depends on the nature of the commodity.

The shape of the *price consumption curve* depends on the nature of the commodity. In the figure we see that the shapes of PCC are different for normal, inferior and giffen goods.

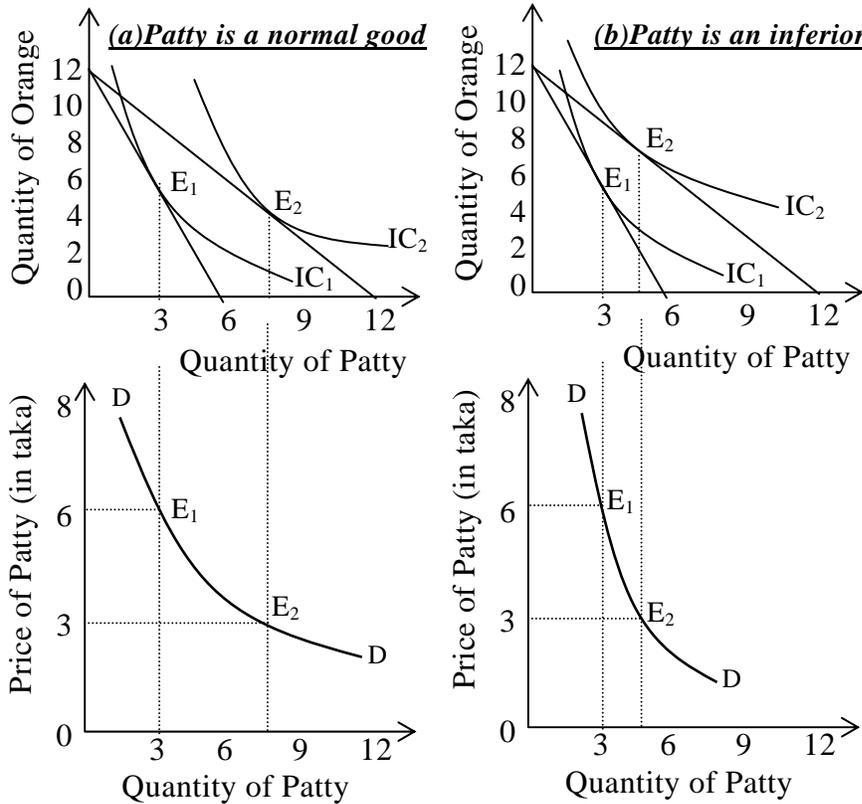
***Price effect and the demand curve***

We have discussed the effect of a fall in the price of Patty in the previous section. Now let's see how the demand curve for Patty is derived from a budget line and indifferent curves.

Suppose that the price of Patty falls from Tk. 4.00 to Tk. 2.00. We have already seen how a change in price (Fig. 4.11) affects the budget line. With a lower price of Patty, the budget line rotates outward and becomes flatter. New equilibrium, has been achieved. At new equilibrium position, the consumer

consumes more of Patty than before. If we plot the quantities of Patty demanded at initial and new prices, we get a downward sloping demand curve. Figure 4.19 shows this.

In Figure 4.19(a), the derivation of the demand curve of Patty is shown. Here, Patty is assumed to be a normal good. In the lower part of the figure, DD is the demand curve for Patty which is downward. On the other hand, Figure 4.19(b) shows the derivation of the demand curve of Patty, when Patty is



**Figure 4.19: Derivation of the Demand Curve**

assumed to be an inferior good. In this case, the demand curve DD is downward, but much more steep than the normal demand curve. If Patty is assumed to be a Giffen good, the demand curve would be upward. For a Giffen good, the quantity demanded decreases as the price of the commodity falls, which is a violation of the *Law of demand*.

## Review Questions

### • *Essay-type Questions*

1. Explain the concept of ordinal utility. What are the assumptions in ordering consumer preference?
2. What is an indifference curve? What are the main properties of indifference curve? What will be the shape of indifference curve if one of the two goods is a free commodity?
3. Why are the indifference curves convex to the point of origin?
4. What is marginal rate of substitution? Why does the MRS diminish along the indifference curve?
5. Draw indifference curves for the following pairs of products and explain why you have drawn them in a certain shape:
  - (a) paper and pencils.
  - (b) pens and pencils.
6. How do you depict the indifference preference map for (a) good and a bad, (b) a bad and a bad?
7. What is the shape of an indifference curve between a good and another good over same range of consumption and a bad thereafter.
8. Suppose there are two commodities each of which cause a reduction in total utility beyond a certain rate of consumption. What would be the shape of a typical indifference curve?
9. What is the shape of indifference curve when one of the two good is a normal good and the other a neutral?
10. Explain, using indifference curves, the equilibrium of a consumer. Show how the consumer's equilibrium is affected when there is a rise in his money income.
11. Distinguish between (a) price line and price-consumption curve, and (b) budget line and income-consumption curve. Show graphically the shape of a PCC and ICC assuming one of the goods to be a Giffen good.
12. Show graphically the total price effects on the demand for a commodity with the help of indifference curve technique.
13. (I) Illustrate the derivation of demand curve with the help of price consumption curve in case (a) normal goods and (b) Giffen goods.
14. Show with the help of indifference curves that price effect is a combination of income and substitution effects.
15. Derive a demand curve with the help of indifference curves.
16. What is the difference between the price consumption curve and the conventional demand curve? Derive a demand curve with the help of price consumption curve.

• **True or False**

Which of the following statements are true?

- (a) Indifference curve was invented by (i) Edgeworth, (ii) Hicks (iii) Marshall, or (iv) Slutsky?
- (b) Each point on an indifference curve shows (i) different combinations of goods and different utility, (ii) the same combinations and the same utility, (iii) different combinations and the same utility, or (iv) none of the options?
- (c) Along the indifference curve, the marginal rate of substitution between two goods (i) decreases, (ii) increases, or (iii) remains constant?
- (d) The marginal rate of substitution between two normal goods is (i) always positive or (ii) always negative?
- (e) The marginal rate of substitution is (i) equal to (ii) greater than, or (iii) less than the slope of the indifference curve?
- (f) The indifference curves for two normal goods are always (i) convex to origin, (ii) concave to origin, or (iii) neither convex nor concave?
- (g) The two indifference curves (i) do not intersect, (ii) can intersect but cannot be tangent (iii) cannot intersect but can be tangent?
- (h) A consumer, consuming two commodities X and Y, is in equilibrium when (i)  $MU_x/MU_y = P_y/P_x$  (ii)  $MU_x/MU_y = P_x/P_y$ , (iii)  $MU_y/MU_x = P_x/P_y$ , or (iv) none of these?
- (i) In case of an inferior good, income-consumption curve (ICC) can be (1) backward bending, (2) upward sloping, (3) downward bending, or (4) none of these?
- (j) The slopes of the indifference curve and the budget line are (i) equal on all points, (ii) not equal at any point, or (iii) equal only at the point of tangency?
- (k) An inferior good is one whose consumption (i) increases (ii) decreases, or (iii) remains constant, when income of the consumer increases?
- (l) The income effect on the consumption of an inferior good is (i) positive, (ii) negative, or (iii) neutral?

• **Multiple Choice Questions**

1. An indifference curve is a line showing various combinations of two goods that:
  - (a) cost a given amount.
  - (b) can be produced from a given amount of resources.
  - (c) can be produced from the same resources.
  - (d) yield a given amount of utility.

2. The shape of an indifference curve :
  - (a) is determined by how much each item costs.
  - (b) is the same for all people for a given pair of goods.
  - (c) is determined by a person's tastes.
  - (d) is the same for all possible pairs of goods for a given person.
3. For every pair of goods, there are — indifference curves:
  - (a) two
  - (b) an infinite number of
  - (c) three
  - (d) several
4. A higher level of satisfaction is shown by :
  - (a) points higher up on an indifference curve.
  - (b) indifference curves closer to the origin.
  - (c) indifference curves farther away from the origin.
  - (d) points lower down on an indifference curve.
5. An indifference curve for two goods that are imperfect substitutes will be :
  - (a) L-shaped.
  - (b) concave to the origin.
  - (c) convex to the origin.
  - (d) a straight downward-sloping line.
6. An indifference curve that is convex to the origin means that :
  - (a) it takes more and more money to purchase successive units of the abundant good.
  - (b) it takes less and less money to purchase successive units of the abundant good.
  - (c) it takes more and more units of the abundant good to substitute for each successive unit given up of the scarce good.
  - (d) it takes fewer and fewer units of the abundant good to substitute for each successive unit given up of the scarce successive unit given up of the scarce good.
7. MRS decreases along an indifference curve because:
  - (a) MU decreases when stock of a good increases.
  - (b) two goods are not perfect substitutes.
  - (c) consumer's capacity and willingness to sacrifice a good with the decrease in the stock of a good.
  - (d) Strike the odd point out.

8. A budget line is a line showing various combinations of two goods that:
  - (a) cost a given amount
  - (b) can be produced from a given amount of resources.
  - (c) can be produced from the same resource.
  - (d) yield a given amount of utility.
9. Engel curves show the relationship between:
  - (a) commodity and money
  - (b) income and consumption expenditure.
  - (c) income and capital expenditure.
  - (d) price and demand for Giffen goods.
10. In case of inferior goods:
  - (a) demand increases with increase in income
  - (b) demand decreases with decrease in income
  - (c) demand increases with increase in income
  - (d) demand remains unaffected by the change in income?
11. In case of Giffen goods, income and substitution effects:
  - (a) work in the same direction.
  - (b) work in opposite directions.
  - (c) move in uncertain directions.
  - (d) can't be said.

## Lesson-4: The Revealed Preference Theory

### Objectives

After studying this lesson, you will be able to:

- ◆ Define the term revealed preference;
- ◆ Explain the revealed preference axiom;
- ◆ Examine the income and substitution effect; and
- ◆ Derive the demand by using the revealed preference theory.

### Introduction

The revealed preference theory is considered as a major breakthrough in the theory of demand, because it has made possible the establishment of the law of demand directly from the *revealed preference axioms* without using indifference curves and most of their restrictive assumptions. In this theory, it is needed to record only the behaviour of the consumer that is observed in the market, i.e., what baskets the consumer actually buys from the market at different prices. The revealed preference theory has the capacity to establish the existence and the convexity of the indifference curves.

Let's start with the assumptions on which the theory of revealed preference is based. Then we will discuss the revealed preference axiom. Finally, we will examine the derivation of the *law of demand* can be established by the revealed preference axiom.

### Assumptions

The revealed preference theory is based on the following assumptions:

**Rationality:** The consumer is rational. She/he prefers bundles of goods that include more quantities of the commodities.

**Consistency:** The consumer behaves consistently. That is, if she/he chooses Bundle A in a situation in which Bundle B is also available to her/him, she/he will not choose B in any other situation in which A is also available. Symbolically,

$$\text{if } A \succ B, \text{ then } B \not\succeq A$$

**Transitivity:** If in any particular situation  $A \succ B$  and  $B \succ C$ , then  $A \succ C$ .

**Price incentives:** Given the collection of goods, the consumer can be induced to buy a particular collection by providing him sufficient price incentives.

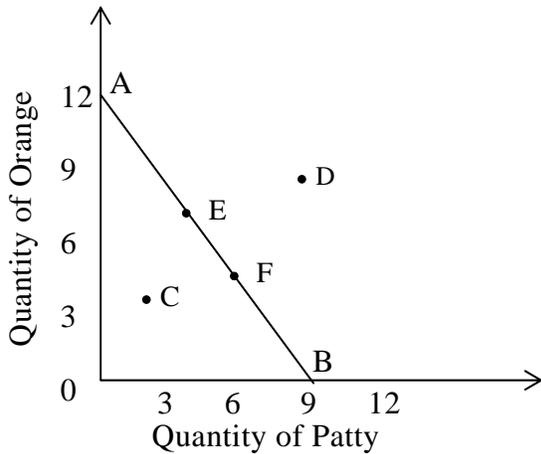
### Revealed Preference Axiom

Suppose that two or more bundles of two commodities are available to a consumer. The bundles cost the same amount of money and lie on the same budget line. In this situation, what will the consumer do? Certainly, she/he will express her/his attraction to a particular bundle. That means, the chosen bundle is revealed to be preferred among all other alternative bundles

available under the budget constraint. The chosen bundle maximizes the utility of the consumer.

Therefore, *if the consumer chooses Bundle A rather than Bundle B, she/he reveals her/his preference for basket A*, given that A and B are equally expensive. If the consumer prefers Bundle A to B because A is less expensive than B, then the preference for A cannot be said to have been revealed because the consumer might regret not having been able to buy Bundle B. Let's now see the revealed preference axiom graphically. Figure 4.20 illustrates the revealed preference axiom.

In Figure 4.20, the consumer's budget line is AB. The points like E, F, etc. lying on the budget line indicate different combinations of Patty and Orange. If the consumer chooses a particular combination, say one represented by Point F on the budget line, it



**Figure 4.20: Revealed preference**

implies that she/he prefers F to any other point on the budget line, say Point E. That is, the consumer reveals her/his preference for F rather than E. Any point below the budget line, like Point C, represents a smaller and cheaper bundle of Patty and Orange and hence is not revealed to F. Similarly, any point above the budget line, like Point D, represents a larger and more expensive bundle of commodities than indicated by Point F. Therefore, it cannot be inferior to F.

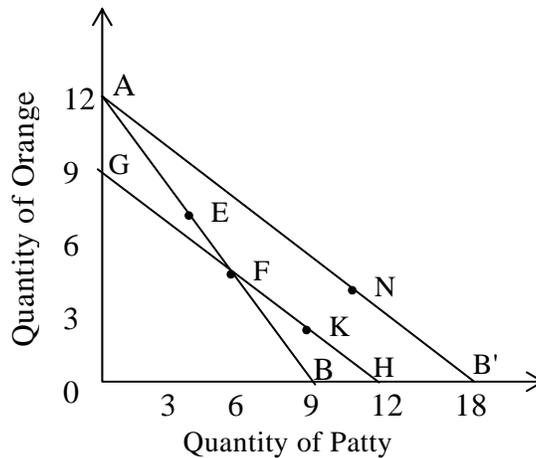
**Price Effect and the Derivation of the Demand Curve**

We discussed the effect of a change in price on consumer's behaviour in the previous lesson. There we saw that the price effect is the net outcome of two effects: income effect and substitution effect. We also saw how the demand curve is derived. We discussed them on the basis of indifference curve and budget line. This lesson is going to discuss the same matters on the basis of revealed preference axiom. Let's now start with the effect of a change in price of a particular commodity on consumer's behaviour. Then we will see how the revealed preference axiom establishes the law of demand.

**Price effect**

Let us suppose that consumer's initial budget line is AB ( income is Tk. 36.00, prices are Patty Tk.4.00 and Orange Tk.3.00) in Figure 4.21 and the consumer reveals preference for Bundle F. Now if the price of Patty falls to Tk. 3.00, the budget line AB in Figure 4.21 rotates to AB'. So the consumer is able to buy any bundle on the new budget line. Bundles on the new budget line include a larger quantity of Patty. In the new budget situation, the consumer chooses the Point N on the AB'. That is, the consumer reveals her/his preference for Bundle N. Consumer's movement from Point F to Point N is the result of the fall in the price of Patty. The effect of price fall on consumer's behaviour can be described by breaking into two effects: *income effect* and *substitution effect*. To see this let's go by the following steps:

Firstly, we make a 'compensating variation' of income, which consists in the reduction of income so that the consumer has just enough income to enable him to continue purchasing the Bundle F if she/he so wishes. The compensating variation is shown in Figure 4.21 by a parallel shift of the new budget line so that the *compensated* budget line GH passes through F. Since the Bundle F is still available to her/him, the consumer will not choose any bundle to the left of F on the segment GF, because her/his choice would be



**Figure 4.21: Compensating variation**

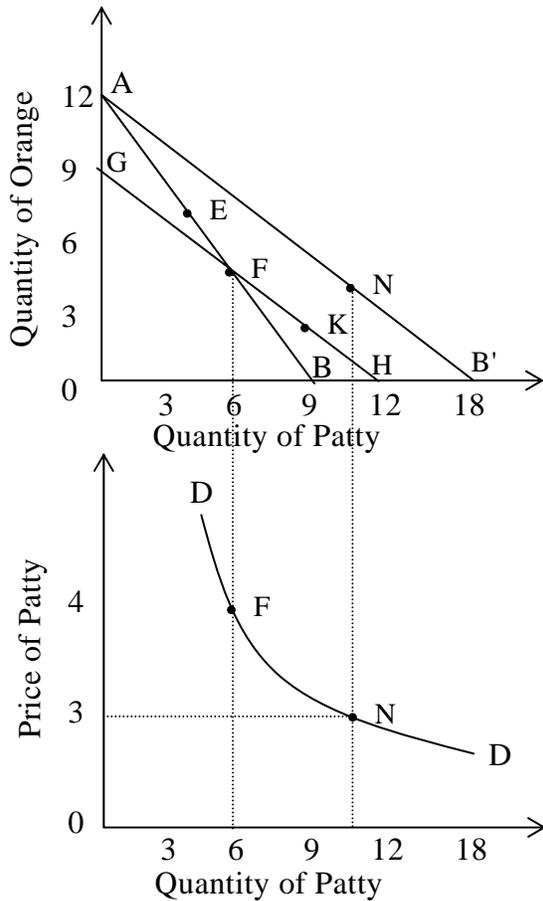
inconsistent, given that in the original situation all the bundles on GF were revealed inferior to F. Hence the consumer will either continue to buy F or she/he will choose a bundle on the segment FH, such as K, which contains a larger quantity of Patty. If the consumer continues to buy F, then the substitution effect of price fall is *zero*. If she/he moves from F to K, then the substitution effect is 3 (=9-6) pieces of Patty.

Secondly, if we remove the (fictitious) reduction in income and allow the consumer to move on the new budget line AB', she/he will choose a bundle, such as N, to the right of K (if Patty is a normal good). The new revealed equilibrium position, N, includes a larger quantity of Patty. Thus the income effect of the fall in price is 2 (=11-9).

Therefore, the total price effect = substitution effect + the income effect =  $3+2 = 5$  pieces of Patty, which indicates that the purchase of Patty increases as its price falls. Thus the revealed preference axiom and implied consistency of choice open a direct way to the derivation of the demand curve: as price falls, more of Patty is purchased. Figure 4.22 shows this.

***Derivation of the demand curve***

We have seen that when the price of Patty was Tk. 4.00, then the consumer revealed her/his preference for the Bundle F which includes 6 pieces of Patty. When the price of Patty falls to Tk. 3.00, then the consumer chose Bundle N (which includes 12 pieces of Patty) on the new budget line AB'. If we plot the amounts of Patty the consumer buys at two different prices, we get Points F and N. Then joining the Points F and N, we get the demand curve of the consumer. DD in the lower part of Figure 4.22 is the demand curve of the consumer.



**Figure 4.22: The derivation of the demand curve**

## Review Questions

- **Essay-type Questions**

1. What is the basic postulate of the Revealed Preference Theory? In what way is this theory an advancement over the cardinal and ordinal approaches to the consumption theory?
2. Carefully state the assumptions of the Revealed Preference Theory and explain how the law of demand is derived from these assumptions.
3. Using the Revealed Preference axiom, explain the decomposition of income and substitutes effects of a fall price of a commodity.

- **True or False**

Which of the following statements are true?

- (a) In revealed preference theory indifference curves are not used.
- (b) Revealed preference theory uses less assumptions than indifference curve analysis does.
- (c) The revealed preference theory is an advancement over the cardinal and ordinal approaches to consumer behaviour.
- (d) In revealed preference theory more than two bundles are revealed.

- **Multiple Choice Questions**

1. Revealed preference theory is:
  - (a) a cardinal utility approach.
  - (b) an ordinal utility approach.
  - (c) none of the above.
2. In revealed preference theory, consumer reveals her/his preference on:
  - (a) one bundle of commodities.
  - (b) two bundles of commodities.
  - (c) three bundles of commodities.
  - (d) four bundles of commodities.

# PRODUCTION, COST AND SUPPLY



5

## **Highlights**

- ❑ Defining the Concept of Production
- ❑ Total, Marginal and Average Product Curves
- ❑ Short-run and Long-run Product Curves
- ❑ Total, Marginal Cost and Average Cost Curves
- ❑ Short-run and Long-run Cost Curves
- ❑ Laws of Returns

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## Unit-5

### Lesson 1: Concepts Related to Production

#### Objectives

After studying this lesson, you will be able to:

- State the meaning of production in Economics;
- State the nature of short-run and long-run production functions;
- Define equal product curve and state its characteristics;
- State how the least cost combination of factors is obtained; and
- Show returns to scale with the help of equal product curves.

#### Meaning of Production

In popular language, the term *production* is used to mean creation of a new commodity or a service. In Economics, production means creation of new utility. The law of indestructibility of matters in physics states that human beings cannot create or destroy matters. She/he can only change the shape of matters so that these transformed matters satisfy human wants. In other words, a human being creates new utility by rendering her/his services. Suppose a person gets a piece of wood, free of cost, from her/his friend. As long as the piece of wood lies unused in his courtyard, it will not be a production activity. The person hires a carpenter who puts her/his services on the piece of wood to change it to an item of furniture.

In Economics, production means creation of new utility.

The carpenter creates new utility by changing the piece of the wood to the shape of a furniture item. Thus, the carpenter produces a commodity which satisfies human wants. There are four factors of production - land, labour, capital, and entrepreneur. The owners of land, labour, and capital and the entrepreneur get rent, wages, interest income and profit respectively as their remunerations. The entrepreneur organizes the production activities. She/he buys a piece of land, hires the workers and borrow the necessary capital from the financial institutions for investing in her/his production firm. Her/his ultimate objective is to maximize her/his profit which can be defined as the difference between total revenue and total cost. A production firm generally consists of a few production plants; each production plant in turn consists of one production unit with one big furnace, machinery and equipments. The collection of all firms producing one commodity is called an industry. For example, the sugar industry in Bangladesh consists of all production firms engaged in producing sugar.

#### Production Function

A production function is a technical relationship between the inputs of production and output of the firm; the relationship is such that the level of output depends on the levels of inputs used, not vice versa. A production function is traditionally expressed by the following equation:

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

where,

Q = the level of output

f = the symbol of relationship, which is determined by the production engineers.

K = the amount of capital

L = the amount of labour

A production function may be a short run or a long run production function depending on the period of time. In a short run production function, at least one input of production cannot be changed. In a long run production function, all inputs of production can be changed. Short run does not specify a specific period of time; it depends on the nature of the commodity in question. It may be six months for one commodity and one year for another commodity, etc. The inputs of production consists of raw materials that a particular firm buys to use in the production process and the inputs may be the commodities produced by other firms.

### **The Short-run Production Function**

In the case of short run production function, at least one input cannot be changed. For example, the firm owner increases her/his production level by hiring more labour and by buying more raw materials if the demand for her/his commodity increases in the short run. She/he cannot add a new production plant in the short run, because it takes some time to erect a new building, to buy machinery and other fixed inputs in the short run. Even if she/he can add another production unit, she/he would not do so, because the increase in the demand for his commodity may be very much transitory. Whatever be the cause, some factors of production would remain fixed in the short run.

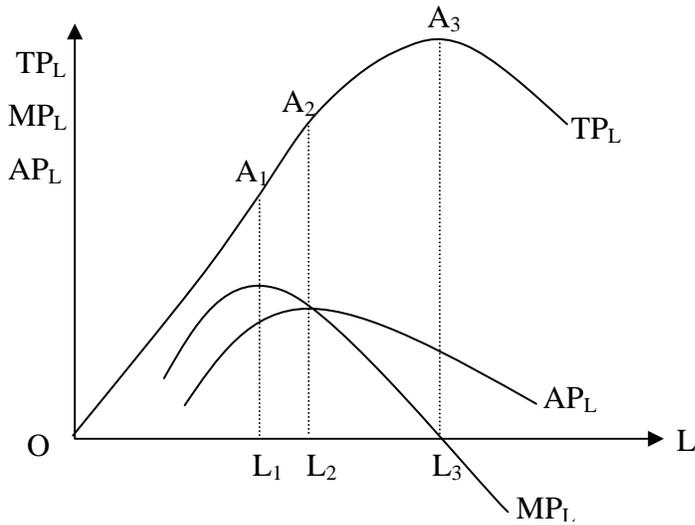
Symbolically, a short run production function can be expressed as follows:

$$Y = f(K^0, L)$$

Where,

$K^0$  means fixed level of capital.

Suppose there are two factors of production, capital (K) and labour (L). Also suppose capital is fixed in the short run. We are interested to examine how total, average, and marginal product curves would be affected if we keep increasing the level of labour input. The following diagram shows the behaviour of total, average, and marginal product curves in the short run.



**Figure 5.1: Total, average and marginal product curve in the short-run**

In Figure 5.1, we measure productivity along the vertical axis, and quantity of labour along the horizontal axis. The TP curve in the diagram shows how total product behaves if we increase the quantity of labour keeping the quantity of other factors fixed in the short run. It is evident that total product increases at an increasing rate initially. It starts increasing at a decreasing rate after point  $L_1$  along the horizontal axis and after  $A_1$  along the TP curve. Total product becomes the maximum when  $OL_3$  amount of labour is used. Then it starts diminishing. Marginal product increases as long as total product increases at an increasing rate. Marginal product becomes the maximum at the inflection point where total product starts increasing at a decreasing rate. Marginal product becomes zero when total product is the maximum. Marginal product remains negative as long as total product diminishes. Average product increases initially upto point  $L_2$  along the horizontal axis and upto point  $A_2$  along the TP curve. It begins to fall after  $OL_2$  amount of labour. It should be noted that average product can never be zero or negative.

Marginal product becomes zero when total product is the maximum.

### Law of Variable Proportions

Depending on the nature of various product curves, the economists have divided the diagram in Figure 5.1 into three parts on the basis of quantity of labour used in the production process. These three regions are  $O-L_2$ ,  $L_2-L_3$ ,  $L_3$  - infinite. The first region is called the region of increasing returns, because marginal productivity of the variable input increases here. The producer will not stop here. The second region,  $L_2-L_3$ , is known as the region of diminishing returns, because marginal productivity diminishes in this region. The entrepreneurs find that increased doses of labour applied to a fixed quantity of other inputs result in decreasing amount of marginal products. Diminishing returns are frequently found in agricultural production functions. The second stage is also called the economic stage, because the entrepreneur produces at some point in this stage. The point of production, of course, depends on the prices of the two inputs, the variable input and the fixed input. For example, the producer will produce at  $OL_2$

Increased doses of labour applied to a fixed quantity of other inputs result in decreasing amount of marginal products.

if the fixed input is free but the variable input is not free. Similarly, the producer will produce at  $OL_3$  if the variable input is free but the fixed input is not free. She/he will produce at some point in the second stage if both the inputs are not free. The third stage is called the stage of negative returns. The producer will not produce in this stage, because the marginal product of the variable input is negative here. In this case, the producer can increase her/his total product by withdrawing labour from production process. Some economists call this the stage of disguised unemployment. Labour used at this stage seems to be employed but their employment decreases total output rather than increasing it. Total product in the short run is also called returns to variable proportions. The ratio of variable input to fixed inputs changes when quantity of variable input increases with the quantity of other factors remaining the same.

**The Long Run Production Function**

In a long run production function, all factors are variable. The factors, however, can be varied in two ways. We can vary all factors of production proportionately so that the initial ratio of the two inputs remains constant. Alternatively, the two inputs can be varied by changing the initial ratio between them. Let us examine how total product changes when we increase all factors of production at the same rate. Total product and the inputs may increase at the same rate. This is the case of constant returns to scale. Total product may increase at a rate higher than the rate at which the inputs increase. This is the case of increasing returns to scale. Finally, the rate of increment of total output may be less than the rate of increment of inputs. That is the case of decreasing returns to scale. The following table illustrates the three cases of returns to scale clearly.

Total product may increase at a rate higher than the rate at which the inputs increase.

Step	Capital K	Labour L	Capital-labour ratio K/L	Total output
1	10	20	$10/20 = \frac{1}{2}$	100
2	20	40	$20/40 = \frac{1}{2}$	300
3	40	80	$40/80 = \frac{1}{2}$	600
4	80	160	$80/160 = \frac{1}{2}$	1000

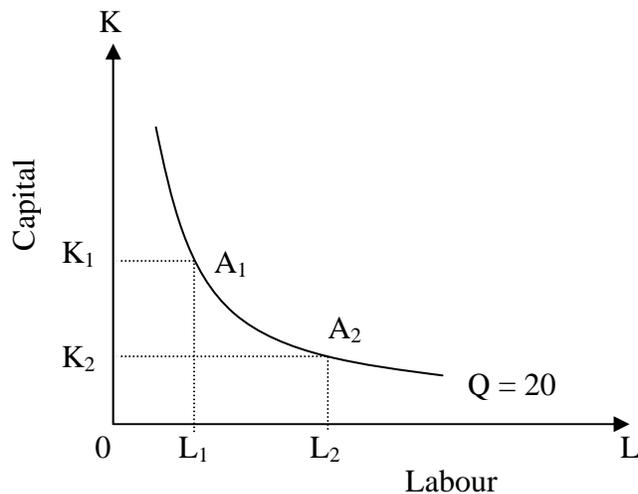
It is evident from the table that we change all factors of production keeping the ratio of capital (K) to labour (L) always equal to half. From step 1 to step 2, we double both the factors, capital and labour. Total product however, becomes more than double. It is a case of increasing returns to scale. From step 2 to step 3, total output and the two inputs increase at the same rate - all double in step 3. We have constant returns to scale here. From step 3 to step 4, total product becomes less than double though the inputs double in step 4. The final case shows decreasing returns to scale. It should be noted that production functions showing any kind of returns to scale are known as homogeneous production functions. We must use equal product curves in order to show returns to scale diagrammatically. At the end of this lesson returns to scale will be shown by equal product curves.

## Equal Product Curves and Budget Lines

### Equal Product Curve

An equal product curve is the locus of different combinations of two inputs that can produce a give level of output. It should be noted that an equal product curve is very much similar to an indifference curve. An indifference curve consists of different combinations of two commodities. An indifference curve represents the same level of satisfaction at all points on it; an equal product curve shows the same level of output at all points on it. There is one difference between two: the given level of satisfaction cannot be quantified in the case of indifference curve whereas the given level of output can be quantified in the case of an equal product curve. The following figure shows an equal product curve.

An indifference curve consists of different combinations of two commodities.



**Figure 5.2: Equal product curve**

In Figure 5.2, we measure quantity of capital (K) along the vertical axis and the quantity of labour (L) along the horizontal axis.  $Q = 20$  is an equal product curve showing the different combinations of two inputs capable of producing 20 units of output. For example, both combination  $A_1$  with  $OK_1$  units of capital and  $OL_1$  units of labour and combination  $A_2$  with  $OK_2$  units of capital and  $OL_2$  units of labour can produce 20 units of output. The other points on  $Q = 20$  are also capable of producing 20 units of output.

#### *Characteristics of Equal Product Curve*

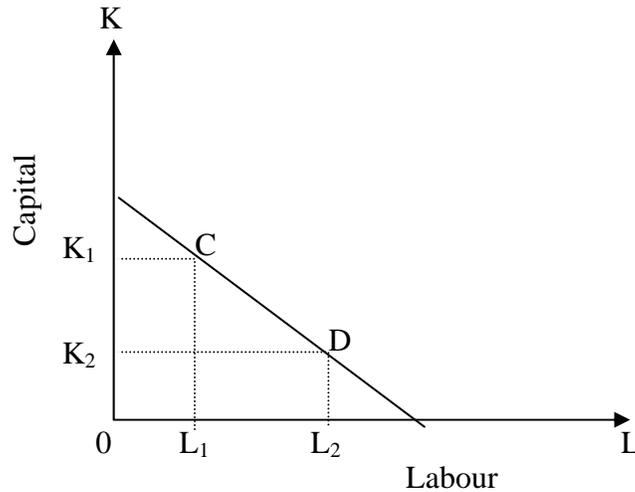
Equal product curves possess characteristics similar to those of indifference curves. These are cited below:

- ❑ Equal product curves are downward sloping;
- ❑ Equal product curves are convex to the origin;
- ❑ Two equal product curves cannot intersect each other; and
- ❑ A higher level of equal product curve indicates higher level of output.

Let's now discuss the concept of budget line in production analysis.

### Budget Line or Iso-Cost Line

A budget line in production analysis shows the different combinations of two inputs that a firm owner can buy with a given amount of money and given prices of two inputs. Figure 5.3 shows a budget line with capital measured along the vertical axis and labour along the horizontal axis.



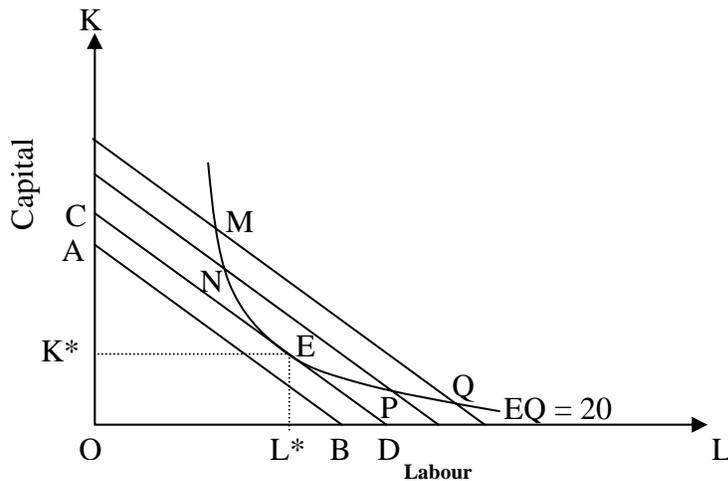
**Figure 5.3: Budget line or Iso-Cost Line**

The combination C with  $OK_1$  of capital of  $OL_1$  of labour costs as much as the combination D with  $OK_2$  of capital and  $OL_2$  of labour. All other points on the budget line cause the firm owner to spend the same amount of money.

### Least Cost Combination of Factors

The ultimate objective of a firm owner is to maximize her/his profit. This can be done in two steps. First, the entrepreneur minimizes the cost of producing a given level of output. Second, she/he maximizes the total revenue by selling her/his product. The following analysis explains how a producer minimizes the cost of producing a given level of output when the prices of two inputs are given. Figure 5.4 illustrates the minimization problem.

The producer wants to minimize the costs of producing 20 units of output shown by the equal product curve  $Q = 20$ . The producer can obtain 20 units of output by producing at points M, N, P and Q, because these points are located on her/his equal product curve  $Q = 20$ . The producer, however, will not produce at M, N, P and Q, because these points lie on higher budget lines. A higher budget line means higher level of cost. Her/his cost of producing 20 units of output will be minimum at point E at which the budget line is tangent with the equal product curve. At point E the entrepreneur uses the least cost combination of  $K^*$  units of capital and  $L^*$  units of labour.



**Figure 5.4: Least-cost combination of factors**

Her/his minimum cost is given by the budget line CD. She/he would like to go to budget line AB, but she/he cannot produce 20 units of output by going to budget line AB. Thus, geometric condition for minimum cost is that at the least cost combination, the equal product curve must be tangent with the budget line. We can formalize the necessary and sufficient conditions for cost minimization as follows:

The equal product curve must be tangent with the budget line.

***Necessary Condition:***

$$P_L/P_K = MP_L/MP_K$$

Where,

$P_L$  = Price of labour input

$P_K$  = Price of capital input

$MP_L$  = Marginal productivity of labour

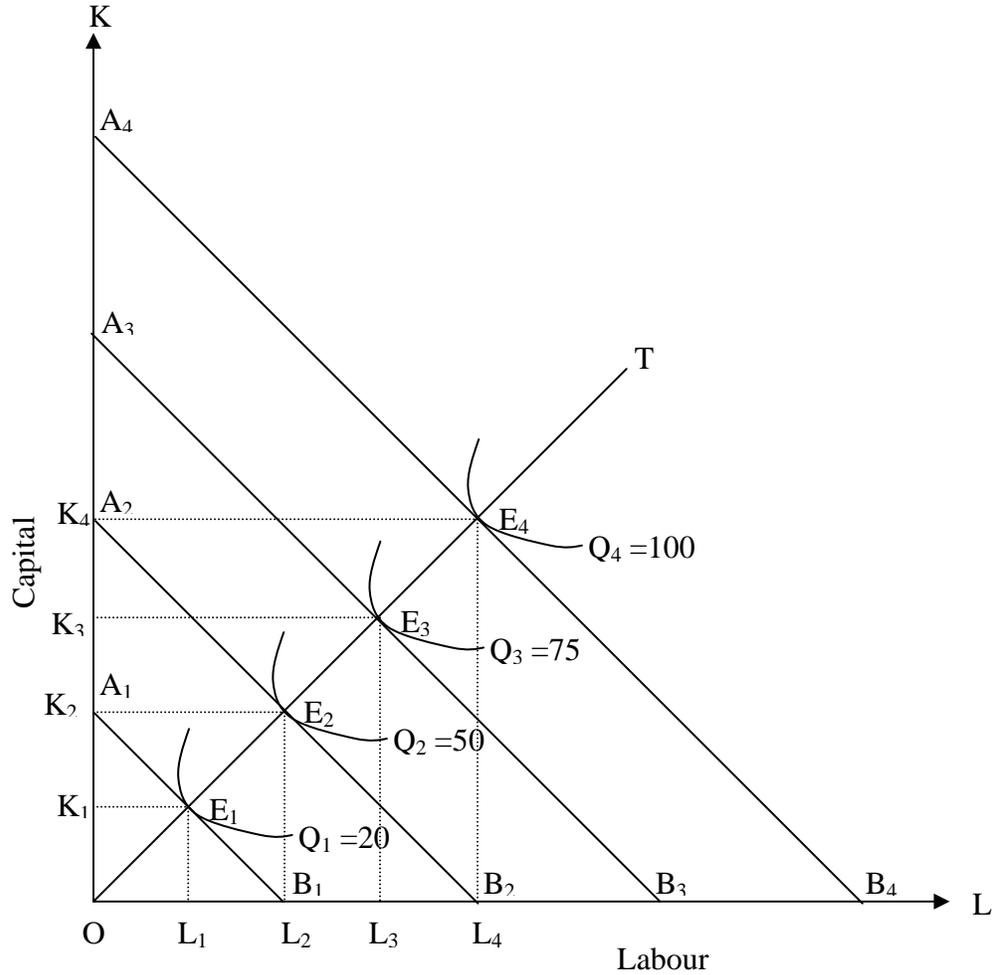
$MP_K$  = Marginal productivity of capital

***Sufficient Condition:***

At the least cost combination, the equal product curve must be convex to the origin.

**Equal Product Curves and Returns to Scale**

We can illustrate the concepts of returns to scale with the help of least cost combinations of factors. Figure 5.5 explains three kinds of returns to scale.



**Figure 5.5: Returns to scale**

We measure capital along the vertical axis and labour, along the horizontal axis. In Figure 5.5, we have four budget lines  $A_1B_1$ ,  $A_2B_2$ ,  $A_3B_3$  and  $A_4B_4$  which result from increased budgets of the entrepreneur with prices of two inputs remaining the same. We also notice four least cost combinations of factors in the diagram. These are  $E_1$ ,  $E_2$ ,  $E_3$  and  $E_4$ . By joining the least cost combinations, we get a curve like  $OT$  in Figure 5.5. This curve is called the *expansion path*, because it shows the inputs utilization levels when an entrepreneur wants to expand its production levels keeping the inputs ratio the same. It should be noted that the expansion path is a straight line in the case of a homogeneous production function. It is evident from Figure 5.5 that the following distances have the same length in the diagram.

$$OE_1 = E_1E_2 = E_2E_3 = E_3E_4$$

This implies that if the producer doubles both the inputs, she/he comes to the least cost combination  $E_2$  from the earlier least cost combination  $E_1$ . The level of output, however, more than doubles at  $E_2$  because  $E_2$  is on the equal product curve  $Q_2$  showing 50 units of output. At  $E_1$ , the producer used to produce 20 units

of output. In other words, the movement from  $E_1$  to  $E_2$  shows *increasing returns to scale* if the two inputs are doubled and as a result the increase in output is the same as the initial output, the situation is called constant returns to scale. In Figure 5.5, movement from  $E_2$  to  $E_3$  indicates constant returns to scale to the producer. Similarly, if the inputs are doubled and as a result the increase in total output is 1.5 times of the initial output, the situation is called decreasing returns to scale, the movement from  $E_3$  to  $E_4$  in Figure 5.5 indicates decreasing returns to scale.

## Review questions

### • *Essay-type Questions*

1. Explain the relationship between the average cost and marginal cost curves.
2. Explain the behaviour of cost curves in short run. Show the relationship between marginal cost, average variable cost, average total cost.
3. Suppose a cost function is given as  $C = 135 + 75Q - 15Q^2 + Q^3$ . There are a cost schedule showing total cost, marginal cost, marginal cost, average cost and average variable cost. Draw the cost curves on the basis of cost data obtained from the cost function.
4.
  - (a) What is production?
  - (b) In each of the following activities, identify what is being produced and the major inputs:
    - (1) Baking a cake
    - (2) Attending college
    - (3) Eating
    - (4) Sleeping
5.
  - (a) What is production function? Distinguish between short run and long run production functions.
  - (b) Write down the characteristics of equal product curves.
  - (c) What is budget line or iso-cost curve?
  - (d) Explain the least cost combination of factors.
6. What is expansion path? Explain it graphically.
7. What is marginal physical product of labor? In what units  $MP_L$  is measured in production of:
  - (a) Wheat
  - (b) Haircuts
  - (c) Houses
  - (d) Dental services

### • *True or False*

Which of the following are true?

- (a) Production means creation of new utility.
- (b) There are four factors of production - land, labour, capital, and entrepreneur.
- (c) A production function is a technical relationship between the inputs of production and output of the firm.
- (d) In a long run production function, all inputs of production can be changed.
- (e) Marginal product becomes zero when total product is the maximum.

- (f) Diminishing returns are rarely found in agricultural production functions.
- (g) Production functions showing any kind of returns to scale are known as homogeneous production functions.
- (h) All the points on the budget line cause the firm owner to spend the same amount of money.
- (i) At the least cost combination, the equal product curve doesn't need to be convex to the origin.

• ***Multiple Choice Questions***

1. Production means:
  - (a) destroying utility
  - (b) creating utility
  - (c) increasing the quantity of a commodity
  - (d) none of the above
2. In short run production function, all factors of production are:
  - (a) fixed
  - (b) variable
  - (c) decreasing
  - (d) none of the above
3. In long run production function, all factors of production are:
  - (e) fixed
  - (f) variable
  - (g) decreasing
  - (h) none of the above
4. Marginal physical product (MPP) is the ..... of output obtained by adding one more ..... of an input:
  - (a) dollars; dollar
  - (b) units; unit
  - (c) dollars; unit
  - (d) units; dollar
5. If a student's score on an exam increases from 86 to 90 points when the hours of study are increased from 10 to 12, the marginal physical product of study time is .....
  - (a) 2 hours per point
  - (b) 2 points per hour
  - (c) 4 hours per point
  - (d) 4 points per hour

6. The marginal physical product of labor in the production of cookies is given in terms of .....
  - (a) hours of labor
  - (b) dollars of labor
  - (c) number of cookies
  - (d) dollars of cookies
7. Total output reaches its maximum when MPP:
  - (a) reaches zero
  - (b) reaches its maximum
  - (c) reaches its minimum
  - (d) is negative
8. According to the cost-minimizing rule, the cost of producing a given level of output will be minimized when:
  - (a) the MPPs of all inputs are equal
  - (b) the MPPs of all inputs are at a maximum
  - (c) the input price/MPP ratios are equal
  - (d) the input price/MPP ratios are at a minimum
9. In the long run all costs are .....
  - (a) fixed
  - (b) variable
  - (c) implicit
  - (d) explicit

## Lesson-2: Short-run and Long-run Cost Curves

### Objectives

After studying this lesson, you will be able to:

- Derive the different short-run cost curves;
- State the nature of different short-run average cost curves;
- Derive the different long-run cost curves; and
- State the nature of different long-run cost curves.

### Derivation of Short-Run Cost Curves

A firm owner has to incur costs when she/he undertakes production activities. She/he has to pay rent to the landowner, wages to the labour, and interest to the owner of capital. In other words, she/he has to buy her/his raw materials to be used in the production process. The nature of cost of production depends on two things, viz., (a) the physical conditions of production and the input prices and (b) the period of time.

In the production analysis, we defined short run as a period of time in which certain types of inputs cannot be changed regardless of the level of output. At least one input must be fixed in the short run. The usage of the variable inputs, however, can be changed in the short run. In the long run, on the other hand, all inputs can be varied to obtain the minimum cost of production. The amount of money spent for fixed inputs are short-run fixed cost. The various fixed inputs have unit prices. The fixed explicit cost is simply the sum of unit prices multiplied by the fixed number of units used. In the short run, implicit costs are also fixed. Thus, it is an element of fixed cost. Total fixed cost (TFC) is the sum of the short-run explicit fixed cost and the implicit cost incurred by an entrepreneur. Variable inputs in the short run give rise to variable cost. The entrepreneur has to increase the usage of the variable inputs if she/he wants to increase her/his output level in the short run. As a result, total variable cost (TVC) increases when output level increases. If there is zero output, no units of the variable input need to be employed. Variable cost is zero and total cost is equal to fixed cost at the zero level of output. Total variable cost is the sum of the amounts spent for each of the variable inputs used. The short-run total cost (STC) is the sum of total variable cost and total fixed cost. It is shown by the following equation:

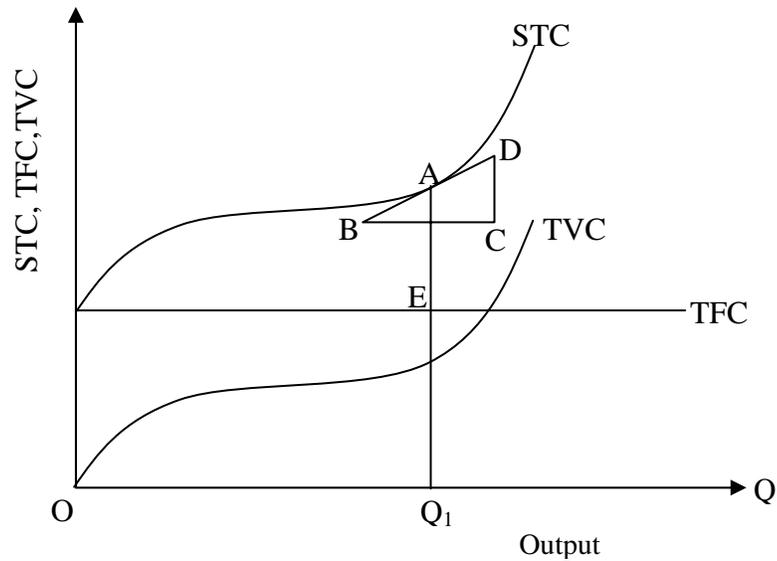
$$STC = TFC + TVC$$

An explanation of different types of the short-run cost curves is given in Figure 5.6.

In Figure 5.6, we measure output level along the horizontal axis and different types of cost along the vertical axis. The horizontal line marked TFC shows that total fixed cost does not depend on the level of output; it is fixed at all levels of output. The curve STC shows how short-run total cost increases with the level of output. The gap between short-run total cost (STC) and total fixed cost (TFC) measures the total variable cost (TVC) of production. It can easily be seen from

The fixed explicit cost is simply the sum of unit prices multiplied by the fixed number of units used.

the figure that both STC and TVC increase at a decreasing rate initially when output level increases, and then both increase at an



**Figure 5.6: Different types of short-run cost curves**

here that the shape of STC derives from the shape of the short-run total product curve; the shape of STC is just the opposite of the shape of the short-run total product curve. We know that the short-run total product curve increases at an increasing rate and then it increases at a decreasing rate.

If we divide short-run total cost (STC), total variable cost (TVC), and total fixed cost (TFC) by the level of output, we obtain short-run average total cost SATC, short-run average variable cost (SAVC) and short run average fixed cost (SAFC) respectively. The relations are shown below:

$$SATC = STC/Q$$

$$SAVC = TVC/Q$$

$$SAFC = TFC/Q$$

$$\therefore SATC = STC/Q = (TVC+TFC)/Q = TVC/Q + TFC/Q = SAVC + SAFC$$

Short-run marginal cost is defined as the change in short-run total cost due to one unit change in output.

$$SMC = \Delta STC / \Delta Q = \Delta TVC / \Delta Q$$

Alternatively, the average cost curves can be derived geometrically from the STC and TFC curves. First, we find the values of SAC, SAVC, SAFC, and SMC at a particular level of output like  $Q_1$  along the horizontal axis. Then we find these values at all levels of output. Finally, by plotting these values, we get the different types of average cost curves. For example, we are interested in finding the values of SAC, SAVC, SAFC, and SMC at output level  $Q_1$  in Figure 5.6. SATC at  $Q_1$  is found by dividing total cost,  $Q_1A$ , by the level of output,  $Q_1$ . SAFC is equal to total fixed cost,  $Q_1 E$ , divided by the level of output,  $Q_1$ .

Finally, SMC is calculated as the value of the slope of the tangent at point A, which is equal to DC divided by BC.

### Nature of Short-run Average Cost Curves

Short-run average total cost SATC is the sum of short-run average fixed cost (SAFC) and short-run average variable cost (SAVC).

$$\text{SATC} = \text{SAFC} + \text{SAVC}$$

SAFC declines continuously when the level of output increases, because the quotient  $\text{TFC}/Q$  falls continuously with increasing units of output. SAFC is a rectangular hyperbola approaching both axes asymptotically. SAVC is normally U-shaped, falling initially as output level increases. It reaches a minimum value at a certain level of output and starts rising after that.

### Why is Short-run Average Variable Cost Curve (SAVC) U-shaped?

There are two explanations for the U-shape of SAVC:

**First**, SAVC is related to average productivity of the variable input in the short run. We know that SAVC is equal to TVC divided by Q:

$$\text{SAVC} = \text{TVC}/Q$$

But TVC is nothing but the of product price of the variable input and quantity of the variable input. Assuming labour to be our variable input, we can write SAVC as follows:

$$\text{SAVC} = \text{TVC}/Q = P_L L/Q = P_L/(Q/L) = P_L/AP_L$$

Where,

$P_L$  = Price of labour

$L$  = Quantity of labour

$Q$  = Output level

$AP_L = Q/L$  = Average productivity of labour

SAVC is found to be the reciprocal of average productivity of labour if we assume that price of labour does not depend on the level of employment. We know that the average productivity curve is inverted U-shaped in the short run. Hence the SAVC curve is U-shaped in the short run.

**Second**, in the short run certain inputs are fixed. Each fixed input needs a certain number of labour force for its optimum utilization. We assume that the number of labour force applied to each fixed input in the short run increases gradually starting from zero. Initially, a small number of labour input is applied to the fixed input. Average productivity is, therefore, low and short run average variable cost is high at the initial stage. Average productivity of labour starts rising as the number of labour input increases. As a result, SAVC starts falling. As the number of variable input, labour, keeps increasing, average productivity of labour becomes maximum when the fixed inputs are put to optimum their utilization. Corresponding to this point of labour employment, SAVC becomes the minimum. If we increase the number of labour force beyond the optimum utilization point, average and marginal productivity of labour start falling due to mismanagement and chaotic conditions prevailing in the firm. Consequently,

Average productivity of labour starts rising as the number of labour input increases.

SAVC starts rising after the optimum utilization points of the fixed inputs. This ends the explanation of the U-shape of SAVC.

**Why Is Short-run Average Total Cost Curve (SATC) U-shaped?**

The shape of short run average total cost SATC curve depends on the shapes of SAFC and SAVC. Initially SATC falls because both SAFC and SAVC fall initially. SATC continues to fall even when SAVC starts rising after its minimum point. This happens, because the rate of fall of SAFC is greater than the rate of rise of SAVC. After some units of output, the rate of rise of SAVC becomes greater than the rate of fall of SAFC.

From that point, rise in SAVC offsets the fall in SAFC. As a result, SATC starts rising with the increase in the level of output.

The preceding discussion explains why SATC is also U-shaped. Like SATC, short-run marginal cost (SMC) curve is also U-shaped. SMC derives its shape from the shape of short-run marginal productivity curve. The following equation shows how SMC and marginal productivity (MP<sub>L</sub>) are related to each other.

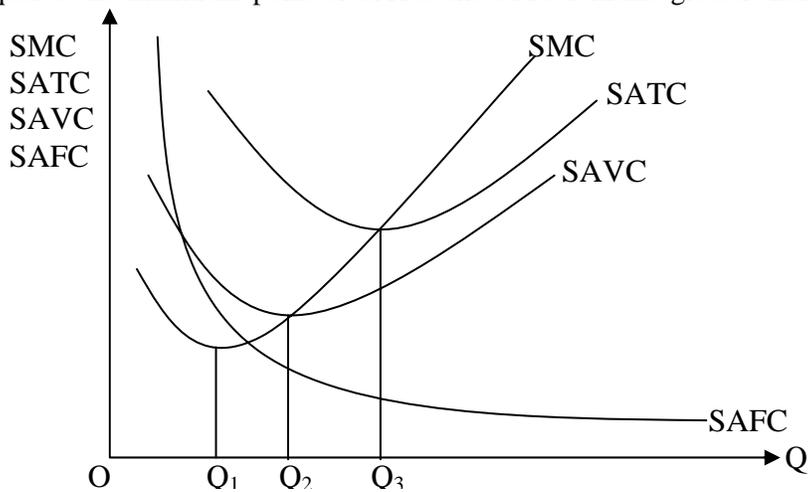
$$SMC = \Delta STC / \Delta Q = \Delta(L \cdot P_L) / \Delta Q = P_L / (\Delta Q / \Delta L) = P_L / MP_L$$

If we assume P<sub>L</sub> to be fixed regardless of the level of employment, we find SMC to be the reciprocal of MP<sub>L</sub>. Since MP<sub>L</sub> curve is inverted U-shaped, SMC curve will be U-shaped.

Now let's explain how short-run marginal cost (SMC) curve is related to SAFC, SAVC and SATC curves.

**Relationship Among Short-run Average Cost Curves**

It should be noted that SMC has no relationship with TFC and hence with SAFC. SMC is less than SAVC as long as SAVC continues to fall in the initial stage. SMC equals SAVC at the minimum point of SAVC. SMC is greater than SAVC as long as SAVC continues to rise. Similar relationship holds between SMC and SATC. SMC is less than SATC as long as SATC decreases, the two become equal at the minimum point of SATC and SMC remains greater than SATC as



**Figure 5.7: Short-run average cost curves**

long as SATC increases. Figure 5.7 shows the different types of short-run average cost curves.

In the Figure 5.7, we measure different types of costs along the vertical axis and the level of output along the horizontal axis. It is evident from the Figure 5.7 that SAFC declines continuously and becomes asymptotic to the horizontal axis as the level of output increases. SAFC is also measured by the gap between SATC and SAVC. The gap is very large initially and narrows down as SAVC becomes asymptotic to SATC as  $Q$  increases. SAVC declines initially and becomes minimum at  $Q_2$  level of output. It begins to rise after  $Q_2$ . The SATC curve falls initially to its minimum at output level  $Q_3$ , and it starts rising after that. Both the SATC and SAVC curves are U-shaped for reasons discussed earlier, The SMC curve is also U-shaped, falling initially to  $Q_1$  level of output and then starts rising. The SMC curve cuts the SAVC and SAC curves at their minimum points corresponding to  $Q_2$  and  $Q_3$  levels of output, respectively.

**Derivation of Long-run Cost Curves**

In the long run, all inputs are variable The firm can increase its output level by changing production plants in the long run. There is no fixed input and hence no fixed cost in the long run. Hence the long-run total cost curve starts from the origin indicating that total cost is zero when output is zero. Moreover, it can be shown that the long-run total cost curve is an envelope of the short-run total cost curves, the firm owner faces a new short run total cost (STC) curve when she/he changes production plant, she/he can reduce total cost of production by changing production plants and STCs.

The long-run total cost curve starts from the origin indicating that total cost is zero when output is zero.

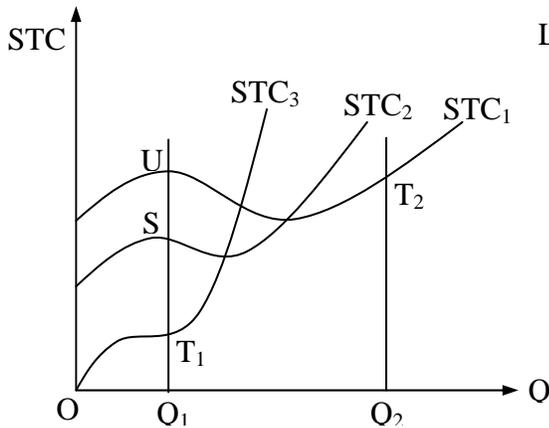


Figure 5.8

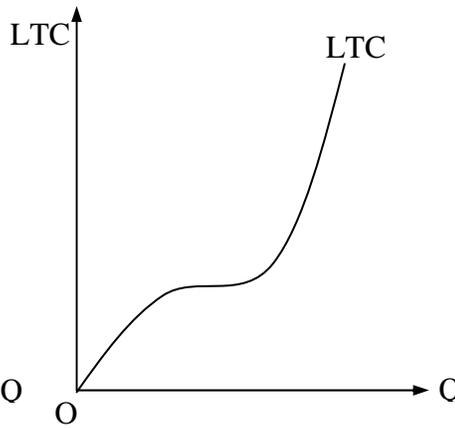
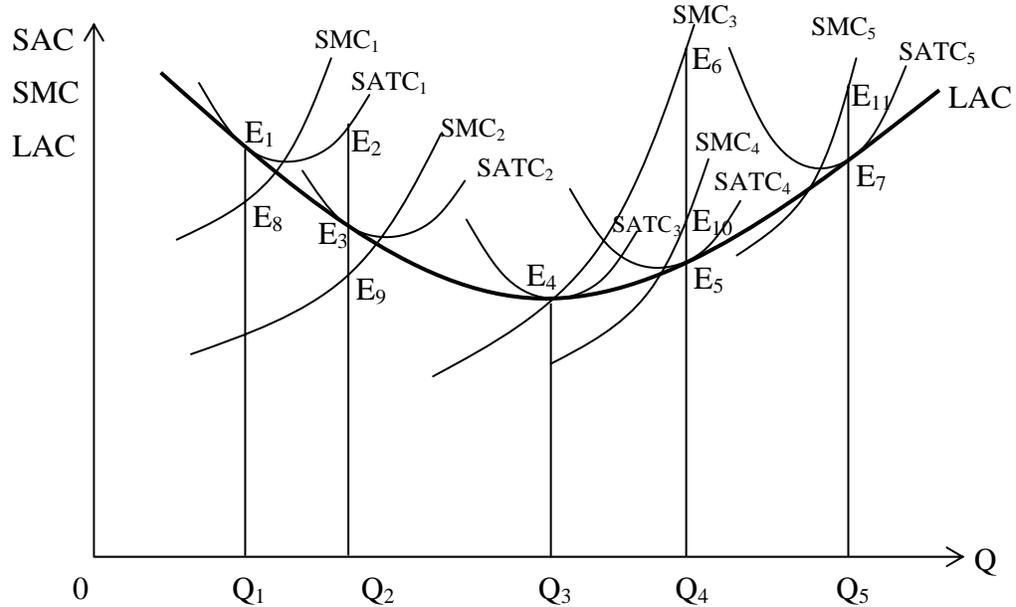


Figure 5.9

In Figure 5.8, we showed three STC curves for three plants. If the entrepreneur wants to produce  $Q_1$  level of output, she/he can use one of the three production plants. Her/his total cost of production is  $Q_1U$  with plant-1,  $Q_1 S$  with plant-2 and  $Q_1 T$  with plant-3. Her/his minimum total cost is  $Q_1T_1$  with plant-3. By joining minimum cost points like  $T_1$  and  $T_2$ , we obtain the long-run total cost curve (LTC) which starts from the origin as shown in Figure 5.9. Like STC, LTC also increases at a decreasing rate initially and then it increases at an increasing rate.

### Derivation of Long-Run Average and Marginal Cost Curves

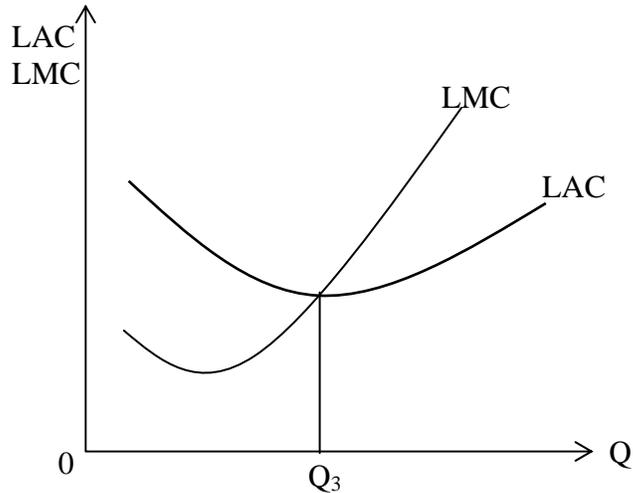
It can be shown that long-run average cost (LAC) curve is also an envelope of short-run average cost (SAC) curves. It is true, because, the producer can lower the average cost of production by changing production plants in the long run. Figure-5.10 shows the derivation of LAC from a number of SATC curves.



**Figure 5.10: Derivation of long-run average cost curve (LAC)**

In Figure 5.10, we measure short-run costs along the vertical axis and level of output along the horizontal axis. In this diagram, we show five short-run average total cost (SATC) curves, each representing one production plant. The SATC curves have been numbered according to the number of production plants. Suppose the producer produces  $Q_1$  level of output with production plant-1. The producer wants to increase his production level to  $Q_2$ , which he can produce using his old plant-1 or using the new plant-2. Her/his average cost of production is  $Q_2E_2$  in plant-1 and  $Q_2E_3$  in plant-2. Her/his will use plant-2 since his average cost of producing  $Q_2$  level of output is lower in plant-2 ( $Q_2E_3 < Q_2E_2$ ). Similarly, she/he will produce  $Q_3$  level of output using plant-3. Her/his average cost of production of  $Q_4$  level of output will be lower if she/he uses plant-4 instead using plant-3 ( $Q_4E_5 < Q_4E_6$ ). She/he will use plant-5 for producing  $Q_5$  level of output. By joining the points of minimum average cost like  $E_1$ ,  $E_3$ ,  $E_4$ ,  $E_5$  and  $E_7$ , we get the long-run average cost (LAC) curve. It is easily seen that the long-run average cost of production will be minimum if the producer produces  $Q_3$  level of output using plant-3. The plant giving rise to long-run minimum average cost is known as the optimum plant, which is plant-3 in Figure 5.10. We also notice that LAC is tangent to the SATC curves in their falling portions to the left of the optimum plant. LAC is tangent to the SATC curves in their rising portions to the right of the optimum plant. At the long run minimum cost level of output  $Q_3$ , the LAC curve is tangent to the SATC curve at its minimum point. It should be noted here that like SATC, LAC curve is also U-shaped, though it is flatter than the SATC

curve. Unlike the LAC curve, the long-run marginal cost curve is not the envelope of the short-run marginal cost (SMC) curves. We know that there is a short-run marginal cost curve corresponding to each short-run average cost curve. We find the short-run marginal cost of each level of output produced in the long run. We obtain the long run marginal cost (LMC) curve by joining the points showing short-run marginal cost of producing the different levels of output in the long run. For example, the short-run marginal cost is  $Q_1E_8$  for  $Q_1$ ,  $Q_2E_9$  for



**Figure 5.11: Long-run average and marginal cost curves**

$Q_2$ ,  $Q_3E_4$  for  $Q_3$ ,  $Q_4E_{10}$  for  $Q_4$  and  $Q_5E_{11}$  for  $Q_5$  level of output. We obtain the LMC curve by joining the points like  $E_8$ ,  $E_9$ ,  $E_4$ ,  $E_{10}$  and  $E_{11}$ . In Figure 5.11, we show both the LAC and LMC curves derived in Figure 5.10.

We observe that LMC is less than LAC as long as LAC continues to fall. LMC is equal to LAC at the minimum point of LAC curve LMC is greater than LAC as long as LAC continues to rise.

## Review Questions

- ***Essay-type Questions***

1. Derive different short run cost curves? Is there any relation among them?
2. Explain the different nature of short run cost curves.
3. Derive the long run cost curves and explain their natures.
4. How is the long run average cost curve derived from the short run average cost curves? The long run average cost curve joins the minimum points on the short run average cost curves. Do you agree?
5. How are internal and external economies related to long run average cost curves?

- ***True or False***

Which of the following statements are true?

- (a) The nature of cost of production depends on two things, viz., (i) the physical conditions of production and the input prices and (ii) the period of time.
- (b) SMC derives its shape from the shape of short-run marginal productivity curve.
- (c) There is no fixed input and hence no fixed cost in the long run.
- (d) The long-run total cost curve starts from the origin indicating that total cost is zero when output is zero.
- (e) Variable cost is zero and total cost is equal to fixed cost at the zero level of output.

- ***Multiple Choice Questions***

1. Opportunity cost equals:
  - (a) market factor price less actual earning
  - (b) actual price plus economic rent
  - (c) actual earnings less economic rent
  - (d) earnings from the best use of the factor
2. Economic rent equals:
  - (a) actual earnings less opportunity cost
  - (b) earnings expected from the second best use
  - (c) market rent less contractual rent

3. In a perfectly competitive market, the economic rent is:
  - (a) equals to zero
  - (b) greater than zero
  - (c) less than zero
4. In case of a linear cost function of the form  $C = a + bQ$ :
  - (a) AC remains constant
  - (b) AC decreases continuously
  - (c) AC increases with increases in output
  - (d) AC first increases and then increases
5. When MC increases beyond its minimum:
  - (a) AC increases
  - (b) AC decreases
  - (c) AC remains constant
  - (d) AC first decrease and then increases
6. What is the general sequence:
  - (a) economies of scale begin when diseconomies end
  - (b) diseconomies begin where economies end
  - (c) diseconomies end where economies begin
  - (d) economies and diseconomies go together
7. Given the cost function as  $C = 20 + 2Q + Q^2$ , and  $P = 22$ , the profit is maximum when output is:
  - (a) 20
  - (b) 10
  - (c) 8
  - (d) 5
8. Which of the following activities would be characterized as productive?
  - (a) sleeping
  - (b) eating
  - (c) studying
  - (d) all of the above

9. All production utilizes ..... to produce .....
- (a) money; sales
  - (b) inputs; sales
  - (c) money; output
  - (d) inputs; output
10. Inputs which cannot be varied in quantity to change the level of output are called ....., whereas those that can be changed in quantity are .....
- (a) fixed; variable
  - (b) variable; fixed
  - (c) monetary; nonmonetary
  - (d) nonmonetary; monetary
11. A production function shows:
- (a) the inputs required to produce a certain output
  - (b) the output forthcoming from a given level of inputs
  - (c) the amount of profit that can be obtained from a specific level of output
  - (d) a and b

## Lesson-3 : Laws of Returns

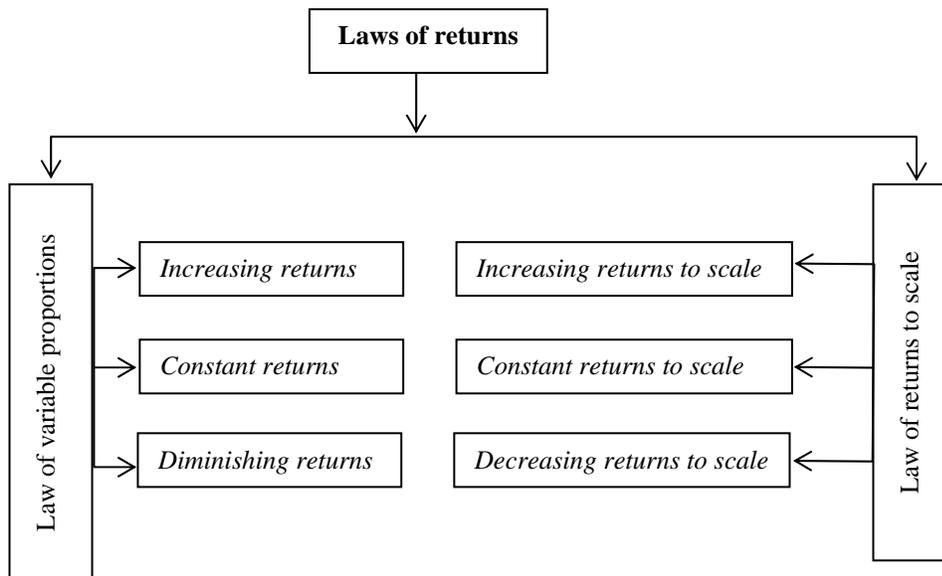
### Objectives

After studying this lesson, you will be able to:

- Explain returns to variable proportions;
- Explain returns to scale; and
- Compare laws of variable proportions with returns to scale.

### Introduction

In Lesson-1 of this unit, we discussed the basic concepts and tools of analysis used in the exposition of production theory. There we briefly explained the returns to variable proportions and the returns to scale. The laws related to the returns to variable proportions and the returns to scale are called the *laws of returns*. In this lesson, we will discuss the laws in detail. There are two kinds of laws of returns:



Let's discuss the laws of variable proportions first.

### Law of Variable Proportions: Production With One Variable Factor

The laws of returns associated with 'one variable input' are called the Laws of Variable Proportions. It is a short-run phenomenon.

In Lesson-1 of this unit, you learnt that Production is a function of both capital and labour. It is, however, possible for a firm to increase production by holding capital constant and employing more and more of labour. This is actually true in the short run, because the supply of capital is inelastic in the short-run.

When production is carried out with capital as a fixed factor and labour as a variable factor, or when more and more of labour is used with a fixed amount of capital, capital-labour proportions change. The change in factor proportions

It is possible for a firm to increase production by holding capital constant and employing more and more of labour.

causes a change in output at a certain rate. The relationship between the changing factor proportions and the output is generalised in the forms of certain laws of production which are called the *laws of variable proportions*.

**Main theme of the law**

The *law of variable proportions* can be stated as follows:

*If more and more of a variable input is applied to a fixed input, the total output initially increases at an increasing rate, but beyond a certain level of output, it increases at a diminishing rate. More precisely, if some factors are held constant and more and more units of a variable factor are employed, the marginal product of the variable factor initially increases, then decreases and eventually turns negative.*

Therefore, the law of variable proportions refers to three regions of production: increasing returns, diminishing returns and negative returns. These are discussed below with a table and also with figure.

**Three regions of production**

Table 5.1 presents the three regions of production. The regions of production are also shown by three regions indicated in Figure 5.12. In Region-1, marginal productivity of labour ( $MP_L$ ) continues to increase making total product ( $TP_L$ ) increase at an increasing rate. In Region-2,  $MP_L$  starts falling so that TP increases at a decreasing rate. In Region-3,  $MP_L$  becomes negative and  $TP_L$  starts falling. The reasons for increasing, diminishing and negative returns are given below.

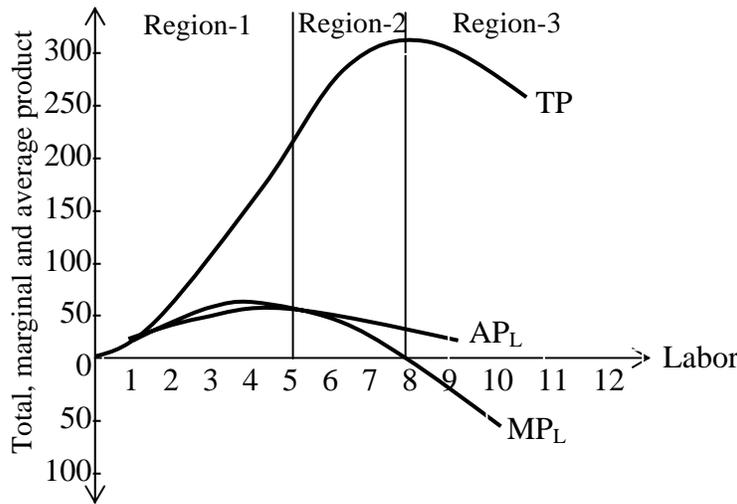
**Table 5.1: Increasing, diminishing and negative returns**

No. of workers (N)	Total product (TP) (tonnes)	Marginal product ( $MP_L$ ) (tonnes) $TP_n - TP_{n-1}$	Average product ( $AP_L$ ) (tonnes) $TP/N$	Region
1	25	25	25	1
2	68	43	34	
3	117	49	39	
4	172	55	43	
5	220	48	44	2
6	258	38	43	
7	287	29	41	
8	288	1	36	
9	252	(-) 36	28	3
10	190	(-) 62	19	

**Region-1: Increasing returns**

The increasing returns to one variable factor is depicted by the Region-1 of Figure 5.12. We see that the portion of the TP curve in Region-1 is growing at an increasing rate, i.e., the slope of the TP curve, marginal product, in Region-1 is increasing. The reason is as follows:

Given the production technology, the size of the capital, the fixed factor, is given.



**Figure 5.12: Total, marginal and average product curve**

It is indivisible. Therefore, a certain minimum labour is required to make the optimum use of the capital. If a smaller number of workers are used, capital remains underutilised. This under-utilisation of the fixed factor, capital, causes the firm come out with returns at an increasing rate as it increases the employment of the variable factor, labour. Let us suppose that optimum capital-labour combination is 1:5. That is, one unit of capital is optimally used with 5 workers. Under this condition, if less than 5 workers are employed, the plant or machine would remain under-utilised. When more and more workers are added, utilisation of machine increases and also the productivity of additional workers. Another reason for increase in labour productivity is that, employment of additional workers leads to advantages of division of labour, until optimum capital-labour combination is reached.

When more and more workers are added, utilisation of machine increases and also the productivity of additional workers.

***Region -2: Diminishing Returns***

Once the optimum capital-labour ratio is reached employment of additional workers will amount to substitution of capital with labour. But technically, one factor can substitute another only to a limited extent. In other words, there is a limit to which one input can be substituted for another. That is, the elasticity of substitution between inputs is not infinite. Hence, to replace the same amount of capital and to achieve the labour productivity at the optimum level of capital-labour combination, more and more workers will have to be employed. As a result, capital/labour ratio decreases. It means worker gets less and less capital to work with. As a result, marginal productivity of labour decreases.

***Region - 3: Negative Returns***

The negative marginal return is only a theoretical possibility. As shown in Figure 5.12, in Region-3 production begins when marginal productivity of labour turns negative. At this region, total production begins to fall. The reasons for  $MP_L$  becoming negative are both technical and managerial.

- *Technical reasons:* As mentioned earlier, employing more labour beyond the optimum capital-labour combination means substituting another. In our case here, this limit is given by  $MP_L = 0$ . Any addition of labour beyond this limit leads to overcrowding, lower availability of tools and equipments which causes fall in total production. Besides, use of more and more labour results in excessive exploitation of capital. This reduces its contribution to production. For example, use of excessive labour on a piece of land reduces its fertility. That is why, the law of diminishing returns is more applicable to agriculture.
- *Managerial reasons:* Overcrowding gives labour an opportunity to shift work responsibility to others. Instead of cooperating with each other, they come in each other' way. With excess labour, it becomes increasingly difficult to fix accountability. Labour can therefore avoid the work.

### The Laws of Returns to Scale

When all the inputs are proportionately increased, the scale of production, the size of the firm increases.

In the previous paragraphs, we discussed production with one variable input (labour), holding the other input (capital) constant. Here we will discuss input-output relationships under the condition that all the inputs (labour and capital) are proportionately and simultaneously changed. When all the inputs are proportionately increased, the scale of production, the size of the firm increases. The laws that pertain to the input-output relationships under the condition of changing scale of production are called the Laws of Returns of Scale. The laws of returns to scale are a long-term phenomenon.

In the long run, supplies of both labour and capital are elastic. Therefore, the firms can employ more of both labour and capital to increase their production. In this section, the question that we will answer is: how does total output behave when all the inputs are proportionately changed?

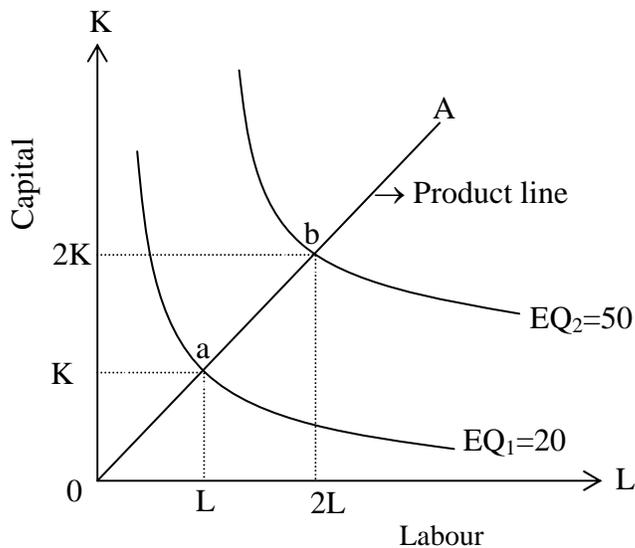
When all the inputs are proportionately increased, there are technically three possible ways in which total output may increase. For example, if all the inputs are doubled, the resulting output may more than double, double and grow less than double. This kind of output behaviour gives three kinds of returns to scale as given below:

Initial input combination	Initial output level	Changed input combination	Changed output	Returns to scale
K + L	20	2K + 2L	50	Increasing returns to scale
K + L	20	2K + 2L	40	Constant returns to scale
K + L	20	2K + 2L	30	Decreasing returns to scale

- If increase in output is more than proportional to the increase in inputs, it means increasing return to scale.
- If increase in output is proportional to increase in inputs, it gives constant returns to scale.
- If increase in output is less than proportional to the increase in inputs, it gives decreasing returns to scale.

### ***Increasing Returns to Scale***

As stated above, the law of increasing returns to scale implies that output increases more than proportionately to the increase in inputs. For example, when inputs increase by 50% output increases by more than 50%; when inputs are increased by 100%; output increases by more than 100% and so on. This kind of returns to change in scale is illustrated in Figure 5.13. Isoquants  $EQ_1$  and  $EQ_2$  represent two different levels of production, 20 units, 50 units respectively. Product line OA show the relationship between inputs and output. For instance, movement from point  $a$  to  $b$  denotes doubling the inputs, labour and capital. As Figure 5.13 shows, input combination increases from  $K + L$  to  $2K + 2L$ . The movement from  $a$  to  $b$  also indicates increase in output from 20 units to 50 units. This means that when inputs are doubled output has more than doubled. This reveals increasing returns to scale.



**Figure 5.13: Increasing returns to scale**

### ***The Causes of Increasing Returns to Scale***

The returns to scale increase because of Economies of Scale. There are at least three kinds of economies of scale that make plausible reasons for increasing returns to scale.

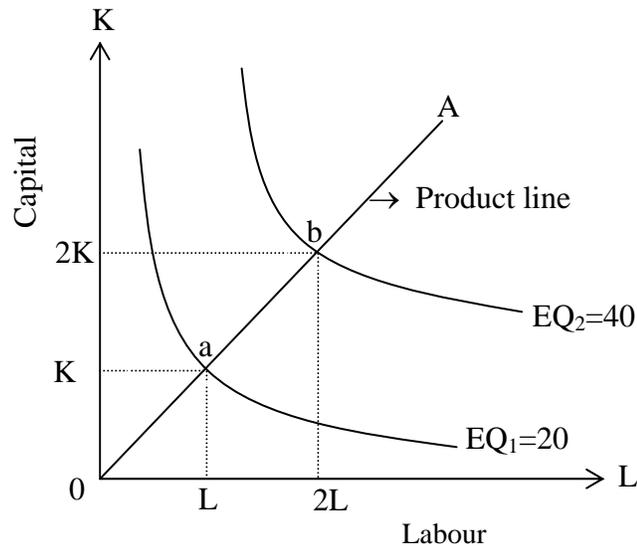
- **Technical and Managerial Indivisibilities:** Certain inputs, particularly mechanical equipments and managerial skills, used in the process of production are available in a given size. Such inputs cannot be divided into small sizes to suit the small scale of production. For example, half a tractor cannot be used; one third of a water pump cannot be used. Similarly, half of a manager cannot be employed, if part-time employment is not acceptable. Because of their indivisibility, such factors have to be employed in a minimum quantity even if scale of production is much less than their capacity output. Therefore, when scale of production is increased by increasing all inputs, the productivity of indivisible factors increases exponentially. This results in increasing returns to scale.
- **Higher Degree of Specialisation:** Another factor causing increasing returns to scale is higher degree of specialisation of both labour and machinery, which becomes possible with increase in scale of production. The use of

specialised labour and machinery increases productivity per unit of inputs. Their cumulative effects contribute to the increasing returns to scale. Besides, managerial specialisation contributes a great deal in increasing production.

- *Dimensional Relations:* Increasing returns to scale is also a matter of dimensional relations. For example, when the size of a room ( $12' \times 10' = 120$  sq. ft.) is doubled to  $24' \times 20'$ , the area of the room is more than doubled, i.e.,  $24' \times 20' = 480$  sq. ft. When diameter of a pipe is doubled, the flow of water is more than doubled. Following this dimensional relationship, when the labour and capital are doubled, the output is more than doubled over some level of output.

**Constant Returns to Scale**

When change in output is proportional to the change in inputs, it shows constant returns to scale. Constant returns to scale has been illustrated in Figure 5.14. The lines OA is product line indicating two hypothetical techniques of production. The isoquants,  $EQ_1= 20$  and  $EQ_2=40$  indicate the two different levels of output. In the figure, the movement from point a to b indicates doubling both the inputs. That is, K increases to  $2K$  and L increases to  $2L$ . When inputs are doubled, output is also doubled, i.e., output increases from 20 to 40. This kind of relationship between inputs and output exhibits the constant returns to scale.



**Figure 5.14: Constant returns to scale**

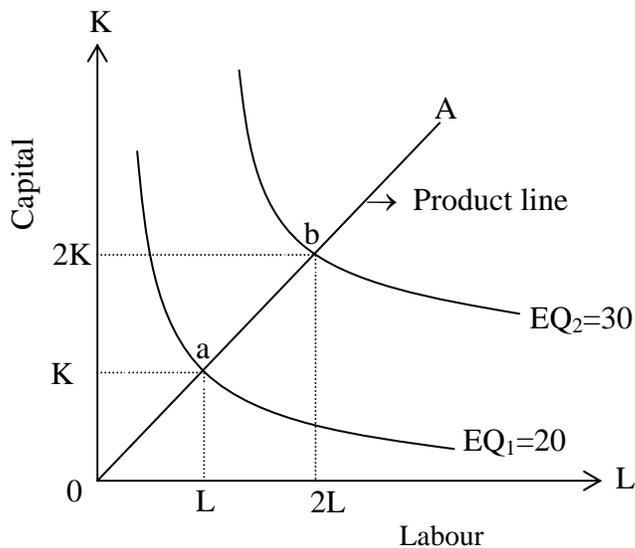
The diseconomies arise mainly because of decreasing efficiency of management and scarcity of certain inputs.

The constant returns to scale are also attributable to the limits of the economies of scale. With the expansion in the scale of production, economies arise from such factors as indivisibility of certain factors, greater possibility of specialisation of capital and labour, use of labour-saving techniques of production, etc. But there is a limit to the economies of scale. When economies of scale disappear and diseconomies are yet to begin, the returns to scale becomes constant. The diseconomies arise mainly because of decreasing efficiency of management and scarcity of certain inputs.

The constant returns to scale are said to occur also in productive activities in which factors of production are perfectly divisible.

### ***Decreasing Returns of Scale***

The firms are faced with decreasing returns to scale when a proportionate increase in inputs,  $K$  and  $L$ , leads to a less than the proportional rise in the output. That is, when inputs are doubled, output is less than doubled and so on. The decreasing returns to scale have been illustrated in Figure 5.15. As the Figure shows, when inputs,  $K$  and  $L$ , are doubled, i.e., increased from  $K+L$  to  $2K+2L$ , the output increases from 20 to 30 units, which is less than the proportionate increase. The movement from point  $a$  to  $b$  indicates doubling both the inputs. But output is less than doubled.



**Figure 5.15: Decreasing returns to scale**

### ***Causes of Decreasing Returns to Scale***

The decreasing returns to scale are attributed to the following two things:

- *Managerial diseconomies*: The most important factor causing diminishing returns to scale is 'the diminishing return to management', i.e., managerial diseconomies. As the size of the firm expands, managerial efficiency decreases.
- *Limitedness of the natural resources*: Another factor responsible for decreasing returns to scale is the limitedness or exhaustibility of the natural resources. For example, doubling of coal-mining plants may not double the coal output because of limited of coal deposits or difficult accessibility to coal deposits. Similarly, doubling the fishing fleet may not double the fish output because the availability of fish may decrease when fishing is carried out on an increasing scale.

### **Comparison between the Law of Variable Proportions and Returns to Scale**

The basic difference between the law of returns to a variable factor and the law of returns to scale lies in the assumptions and conditions on which these laws are based.

- The law of returns to a variable factor allows only one input to vary, holding all other inputs constant, whereas in the case of the law of returns to scale all the inputs are variable.
- The law of returns to a variable factor is a short run phenomenon, because, supply of capital in the short run is inelastic. On the contrary, the law of returns to scale is a long run phenomenon, because, supply of all the inputs in the long run is elastic and more and more of their quantities can be employed.

## Review Questions

### • *Essay-type Questions*

1. What is meant by the laws of returns? Why is this law associated with one variable input?
2. What is the law of diminishing returns? Why it is called the law of variable proportions?
3. Discuss the law of variable proportions. What are the causes of diminishing returns?
4. Draw diagrams to show firms's average product, marginal product and total product curves in the short period. How do these curves depict the law of variable proportions?
5. State and explain returns to scale using suitable iso-product diagrams.
6. Show returns to scale with the help of iso-product map.
7. Show increasing, constant and diminishing returns to scale with the help of isoproduct diagrams.
8. Distinguish between the law of variable proportions and returns to scale. Enumerate the factors that cause decreasing returns to scale.

### • *True or False*

Which of the following statements are true?

- (a) The law of returns to a variable factor is a short run phenomenon.
- (b) The constant returns to scale are also attributable to the limits of the economies of scale.
- (c) Increasing returns to scale implies that output increases more than proportionately to the increase in inputs.
- (d) The law of diminishing returns is more applicable to agriculture.
- (e) As the size of the firm expands, managerial efficiency decreases.

### • *Multiple Choice Questions*

1. Laws of variable proportions are associated with the returns to:
  - (a) change in the variable input
  - (b) change in all the inputs
  - (c) change in returns to scale
  - (d) None of the above
2. The law of diminishing returns implies that:
  - (a) quantity of an input is decreasing
  - (b) quantity of an input is increasing

- (c) quantity of output is decreasing
  - (d) None of the above
3. The law of diminishing returns comes into force because of:
- (a) indivisibility of variable input
  - (b) indivisibility of fixed factors
  - (c) indivisibility of both variable and fixed factors
  - (d) indivisibility of products
4. Laws of returns to scale apply only when there is:
- (a) proportionate change inputs
  - (b) proportionate and simultaneous change in inputs
  - (c) more than proportionate change in inputs
  - (d) more than proportionate change in output
5. The laws of variable proportions and the laws of returns to scale:
- (a) are compatible
  - (b) are incompatible
  - (c) are compatible only under conditions

# PERFECT COMPETITION



## Highlights

- Characteristics of Perfect Competition
- AR & MR Curves in Perfect Competition
- Equilibrium of a Competitive Firm
- Supply Curve of Firm and Industry

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## Unit-6

### Lesson 1: Characteristics of Perfect Competition, AR & MR Curves in Perfect Competition

#### Objectives

After studying this lesson, you will be able to:

- State the characteristics of perfect competition;
- Describe the shapes of average revenue and marginal revenue curves of a firm; and
- Describe the shapes of average revenue and marginal revenue curves of an industry.

#### Introduction

A firm owner, popularly known as factory owner, may have different motives when she/ he organizes production activities. For example, she/he may be interested in increasing her/his social status as an industrialist. In Economics, however, profit maximization is identified as the sole motive for undertaking production activities. Profit is the difference between total revenue and total cost of production, both depending on the nature of market. Total revenue is equal to the product of price of the commodity and quantity of the commodity sold. The price which a seller can charge its buyers for his commodity depends on the nature of market. Total cost of production depends, among others, on the prices of inputs of production which in turn are determined by the forces of input market. Total cost of production also depends on the productivity of inputs. The important point is that profit of an entrepreneur depends on the nature of both product market and input market. A study of market structure is, therefore, important to realize the price and output determination process. Economists conceptualize two broad categories of market structures: perfect competition and imperfect competition. In this unit, we undertake the study of the ideal form of market structure which is called perfect competition.

Profit is the difference between total revenue and total cost of production.

#### Characteristics of Perfect Competition

The economists' concept of perfect competition is quite opposite of the businessmen's concept of competition. Businessmen would describe the market for tooth paste as highly competitive indicating the rigorous competition among the few brands of tooth paste in the market. This type of market is quite distinct from what the economist calls perfect competition. The concept of perfect competition in Economics is entirely impersonal. The economists always refer to large number of buyers and sellers in perfect competition so that no one seller or no one buyer can exert a perceptible influence on the market price. The market price is determined at the level where aggregate demand from all consumers of the product just equals the aggregate supply of the product from all sellers. Perfect competition is better known as the market of price takers as opposed to the market of price makers. Both the buyers and sellers in perfect competition are price takers. A price taker is a firm or consumer who sells or buys at the given price. If the price of Aman rice is Tk. 16 per Kg. the next door grocer charges the

No one seller or no one buyer can exert a perceptible influence on the market price.

same price of Tk. 16 for each Kilogram of Aman rice sold when the consumer buys 100 Kg. or 1000 Kg. The seller does not give any kind of price rebate whatever be the volume of the sale.

We now turn to a systematic description of the characteristics of perfect competition. It should be noted at this point that all the characteristics of perfect competition ensure price-taking behaviour of firms and buyers.

**Large number of buyers and sellers:** Presence of many buyers and sellers in the market is the most important feature of perfect competition. Because of a large number of buyers and sellers, each buyer buys and each seller sells a very small fraction of total output sold in the market. Consequently, no single seller or no single buyer can exert a perceptible effect on price. Not only the buyers and the sellers are many in number, but also they are widely scattered all over the country so that they find it difficult to organize themselves into groups. By forming groups or associations, the buyers as a group can claim price rebate. Similarly, the sellers can raise the price of the product by forming guilds of sellers. Because of multiplicity of numbers and lack of concerted pressure, no single seller or no single buyer can exert a perceptible effect on the price of the product. If a seller charges a higher price than her/his rivals, she/he loses customers. Though a seller cannot sell at a price higher than the market price, why cannot he sell at a lower price? He cannot sell at lower price because by doing so he incurs unnecessary loss - he can sell all of his product at the market price.

If a seller charges a higher price than her/his rivals, she/he loses customers.

**Homogeneous product:** All the firms in perfect competition produce and sell identical product. Product of one firm cannot be distinguished from the product of another firm. If the product of one firm can be differentiated from the product of other firms by any means, the said firm may have some fixed customers who will be willing to pay even a higher price for their preferred product. Since the product in perfect competition is homogeneous the question of paying a different price for the product of any firm does not arise .

**No barriers to entry or exit:** Perfectly competitive firms face no barriers in moving into and leaving the industry in three senses. Industry is a collection of all firms producing a homogeneous product. A firm is production unit comprising one or more production plants which is independent in decision making.

First, firms from other industries or new firms can enter into the industry if existing firms make supernormal profit. Similarly, some of the losing firms may leave the industry in the long run. Second, barriers to entry might arise due to economic reasons. New firms may be prevented from entering into an industry due to the existence of patent laws and other legal barriers. Economies of scale enjoyed by large firms prevent other firms from entering into the industry because entry of new firms would cause average cost of production to rise and to drive away the small firms. Cost of providing funds may be high for new firms due to imperfections in the capital markets. These kinds of economic barriers may restrict entry or exit of firms. Third, barriers to entry or exit might arise from immobility of some specific factors of production or when the resources are owned by one firm. It is assumed that such immobility of factors of production or sole ownership of resources does not exist in perfect competition.

Some of the losing firms may leave the industry in the long run.

**Complete information:** The consumers, producers and resource-owners are assumed to possess perfect knowledge about prices and quality of the

commodities and inputs. An ignorant consumer may buy the product at a price higher than the market price. Similarly, the unaware input-supplier may be offered a lower price than the market price of input. The profit maximizing entrepreneur must be fully knowledgeable about both the prices of output and input.

### **The Average Revenue (AR) and Marginal Revenue (MR) Curves of a Competitive Firm**

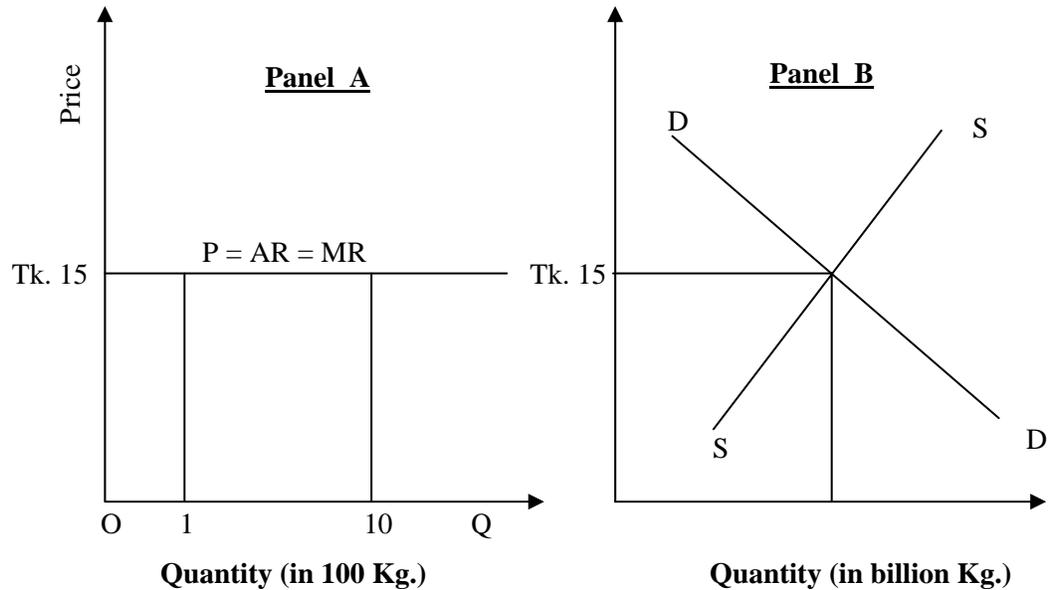
The total income or total revenue (TR) of a firm is equal to the product of the price of the commodity and the number of units sold:  $TR = P \times q$ . Conversely, the average income or average revenue (AR) is calculated by dividing total revenue by the quantity of output sold:  $AR = TR/q$ . Another related concept is marginal revenue which is defined as the change in total revenue resulting from one unit change in output. For a better understanding of profit maximizing behaviour of a competitive firm, we need to examine what happens to total revenue (TR) when quantity of output sold increases. The curve showing the relationship between total revenue and the quantity of output sold is known as total revenue curve. Similarly, the average revenue curve shows the relationship between AR and Q. Marginal revenue curve shows how marginal revenue changes when quantity of output increases. Our next discussion focusses on the shapes of the TR, AR and MR curves of a competitive firm.

Marginal revenue is defined as the change in total revenue resulting from one unit change in output.

It was mentioned earlier that a competitive firm is a price-taker. Its perception is that it can sell any quantity of output at the given market price. This perception arises, because, the maximum amount of output that an individual firm can produce and sell in the market using all of its production capacity constitutes a very small fraction of aggregate output produced and sold in the market. Consequently, the firm cannot exert any influence on the market price. The following example clarifies this point:

Suppose, the amount of total annual sale of Pajam rice in Bangladesh at a price of Tk. 15 per kg. is ten thousand million kg. A grocer or a farmer cannot charge a price higher than Tk. 15 per kg. for this brand of rice when a buyer buys 100 kg. or 1000 kg. or any other quantity the farmer can sell. The individual firm charges the same price of Tk. 15 for any quantity of the product it can sell. In other words, price or AR of the firm remains fixed at Tk. 15 when quantity of output of sold increases. As a result, the AR curve of a competitive firm becomes a horizontal line at the given market price. Panel A of Figure-6.1 shows the AR curve of a hypothetical competitive firm. In this diagram, price or AR is measured along the vertical axis and quantity sold along the horizontal axis. It can be seen from panel A of the Figure-6.1 that the price of the commodity is Tk. 15 if the firm sells 100 kg or 1000 kg or any other quantity the firm can produce using 100% of production capacity. One question still remains to be answered: How is the market price of Tk. 15 determined? The answer is given in panel B of Figure 6.1. The units of measurements in both the panels of Figure 6.1 are the same along the vertical axes but the units are not, however, the same along the horizontal axes.

The units are 100 kg. of rice along the horizontal axis of panel A and one billion kg. of rice along the horizontal axis of panel B. The DD and SS curves are aggregate demand curve for and aggregate supply curve of the product respectively. It is shown in Panel B that the market price of Tk. 15 is determined at the intersection point of the aggregate demand and supply curves. We can conclude that the price determined in the market gives the horizontal price or AR curves of the firm.

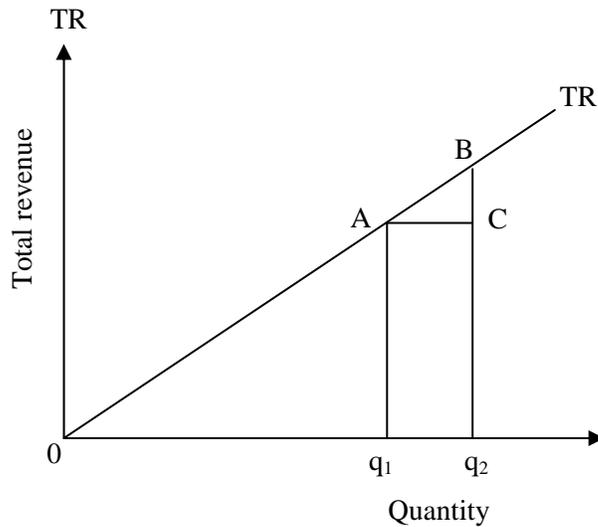


**Figure 6.1: AR and MR Curves of a Competitive Firm**

Having determined the shape of the AR curve, we now turn to the discussion of the shape of the MR curve of a competitive firm. Marginal revenue is the change in total revenue brought about by sale of one additional unit of output. Since a competitive firm sells all units of output at the same price, the additional total revenue from the sale of one extra unit becomes equal to price. If the firm sells 100 units of output at a price of Tk. 15, the 101th unit is also sold at the same price of Tk. 15. So that the additional revenue from the sale of that last unit of output also becomes Tk. 15. In other words, the MR curve of the firm coincides with the price curve or the AR curve of the firm. This is why the horizontal AR curve in panel A of Figure 6.1 has been labelled as the  $P = AR = MR$  curve.

The competitive firm can sell any quantity of its output at a constant price.

Finally, we discuss the nature of the total revenue (TR) curve of a competitive firm. Since the competitive firm can sell any quantity of its output at a constant price, its total revenue will increase at a constant rate with the increase in the level of output. The result is that the total revenue curve will be a straight line starting from the origin as shown in Figure 6.2.



**Figure 6.2: TR curve of a competitive firm**

In the figure we measure TR along the vertical axis and quantity of output along the horizontal axis. The shape of the total revenue curve is important because it gives values of AR and MR at a particular level of output of the firm. Average revenue at a particular level of output is given by the slope value of a straight line joining the origin and the point at which a vertical line drawn upward from that particular level of output intersects the TR curve. For example, AR at  $q_2$  is given by the slope of the line segment OB:  $AR = Bq_2 / Oq_2$ . To find MR between two levels of output, we draw two vertical lines from the two levels of output to determine the points at which these vertical lines intersect the TR curve. The slope value of the line segment between these two intersection points gives the MR value. For example, MR between  $q_1$  and  $q_2$  in Figure 6.2 is given by the slope value of line segment AB :  $BC/AC$ .

Since line segment AB is a portion of line segment OB in Figure 6.2, both the line segments will have the same slope value. We come back to the previous conclusion: for a competitive firm both the AR and MR curves coincide with each other.

## Review Questions

### • *Essay-type Questions*

1. (a) What is a perfectly competitive firm?  
(b) What are the two characteristics that give rise to such a firm?
2. (a) What is the shape of the demand curve facing a perfectly competitive firm?  
(b) What is implied by such a demand curve?
3. What are the characteristics of perfect competition? Under what market conditions a firm is a price taker?
4. Write a short note on AR and MR curves of a competitive firm.

### • *True or False*

Which of the following statements are true?

- (a) A firm is a price-taker under perfect competition.
- (b) The economists' concept of perfect competition is quite opposite of the businessmen's concept of competition.
- (c) The concept of perfect competition in Economics is entirely impersonal.
- (d) All the firms in perfect competition produce and sell differentiated product.
- (e) Industry is a collection of all firms producing a homogenous product.
- (f) The profit maximizing entrepreneur must be fully knowledgeable about both the prices of output and input.
- (g) The curve showing the relationship between total revenue and the quantity of output sold is known as total revenue curve.
- (h) The demand curve faced by a competitive firm is horizontal.

### • *Multiple Choice Questions*

1. A perfectly competitive firm is defined as one which has no control over:
  - (a) its costs
  - (b) its output
  - (c) its profits
  - (d) the price of its product
2. A perfectly competitive firm has no control over the price it receives for its product because:
  - (a) it sells a small share of the market
  - (b) it sells a homogeneous product
  - (c) it cannot earn a pure profit
  - (d) a and b

3. The industry comprised of perfectly competitive firms is:
  - (a) education
  - (b) agriculture
  - (c) medical care
  - (d) retail trade
4. The demand facing a perfectly competitive firm is:
  - (a) perfectly elastic
  - (b) perfectly inelastic
  - (c) upward sloping
  - (d) downward sloping
5. The demand curve facing a perfectly competitive firm tells the firm that the market will take any quantity the firm is willing to produce at the — price.
  - (a) profit-maximizing
  - (b) cost-minimizing
  - (c) market
  - (d) profit-minimizing
6. The demand facing a perfectly competitive firm corresponds on the vertical axis to:
  - (a) the market price
  - (b) the profit-maximizing price
  - (c) the cost-minimizing price
  - (d) the profit-minimizing price
7. Which of the following demand curves is not downward sloping?
  - (a) demand facing the perfectly competitive firm
  - (b) demand for the product of a perfectly
  - (c) demand by an individual consumer for the product produced by a perfectly competitive firm

## Lesson-2: Equilibrium of a Competitive Firm

### Objectives

After studying this lesson, you will be able to:

- State when a competitive firm operates and when it shuts down in the short run ;
- Explain the profit maximizing conditions of a firm;
- State how a competitive firm determines its equilibrium level of output in the short run; and
- State how a competitive firm determines its profit and shut-down point in the short run.

### Short-run Equilibrium of a Competitive Firm

We need to make one additional assumption about the competitive firms and explain one definition before we illustrate the profit-maximizing behaviour of a firm. We assume that all firms in the industry face identical cost conditions so that the short-run and long-run cost curves are the same for all firms. As mentioned earlier, the goal of a competitive firm is to maximize its profit. A firm is said to reach its equilibrium when it maximizes its profit. The term 'equilibrium', often used in physical sciences, refers to a static position of a matter when opposite forces balance each other. A production firm also has no tendency to change its profit maximizing level of output.

The goal of a competitive firm is to maximize its profit.

A competitive firm makes changes in the level of output until it obtains maximum profit. Since at least one input of production is fixed in the short run, changes in the level of output can be brought about by varying the level of its variable inputs. The firm has to make two decisions in the short run:

- *Under what conditions, is it profitable for the firm to continue its production activities?*
- *If the firm decides to operate, how much output will it produce to maximize its profit?*

The first question is pertinent because in the short run the firm may face market price which is less than short run average variable cost (SAVC) at all levels of output. It implied that the market price is less than minimum average variable cost:  $P < \text{minimum SAVC}$ . Obviously, the firm incurs a loss which is equal to average fixed cost plus a fraction of SAVC. Total loss of the firm equals total fixed cost plus a portion of total variable cost if the firm continues to produce where as total loss equals total fixed cost (TFC) if the firm shuts down. Since the firm's total loss is less if it shuts down than it operates, it is reasonable to shut down when the market price goes below minimum AVC. Conversely, if the market price is greater than the minimum SAVC but less than short-run average total cost (SATC), at some levels of output price will be greater than SAVC. Then total loss of the firm will be less than TFC if the firm operates and greater than TFC if it stops producing. Therefore, a price lying between SATC and the minimum AVC pays the firm to stay in the production process, though it incurs a loss in the short run.

Once a firm has decided to keep its production line busy in the short run, its next task is to decide the profit maximizing level of output when  $P > SATC$  at all levels of output and to decide the loss minimizing level of output when the minimum  $SAVC < P < SATC$ . The profit maximizing or loss minimizing level of output is known as equilibrium level of output since the firm cannot do better by producing any other quantity of output.

### Deciding the Short-run Equilibrium Level of Output

The competitive firm is a price-taker. Moreover, it cannot change the quantity of at least one input in the short run. It can only make changes in the level of output by changing the quantities of the variable inputs until the equilibrium level of output is determined. Suppose, at the initial output level of the firm, market price is greater than  $SATC$  so that it can make super normal profit. But the firm is not satisfied with the present level of profit - it wants more profit by increasing its output level. The firm makes a decision rule for itself to follow. It will increase its output by one unit each time if it can earn profit by doing so. It will stop increasing its output level when profit is zero or negative. The firm starts increasing its output level by one unit and finds that the addition to total revenue, known as marginal revenue ( $MR$ ), is greater than the change in total cost, known as marginal cost ( $MC$ ). The firm makes super normal profit from such a move and is tempted to increase the level of output further. With the increase in the level of output,  $MC$  decreases initially and then it increases whereas  $MR$  always remains the same. In the process of increasing its output level by one unit each time, the firm-owner notices that her/his  $MC$  is gradually increasing to the level  $MR$ . The firm, however, earns supernormal profit as long as  $MR$  remains greater than  $MC$  and the firm's total profit keeps increasing at that time. In the process, the firm reaches a level of output where  $MC$  equals  $MR$ , profit disappears, and total profit becomes the maximum. Further increase in the level of output will cause  $MC$  to be greater than  $MR$  yielding negative profit and reducing total profit of the firm. Total profit of the firm thus becomes the maximum when the following two conditions are satisfied:

Necessary Condition:  $MR = SMC$

Sufficient Condition:  $MC$  increases at the level of output where  $MR = SMC$ .

The above conditions of profit maximization are universal and applicable in all market structures. Since in perfect competition  $P = AR = MR$ , the necessary condition can be rewritten as

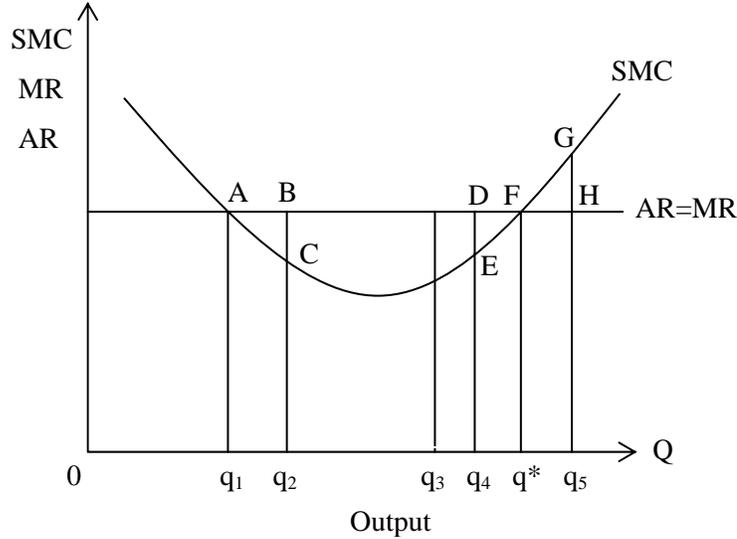
$$P = AR = MR = SMC$$

In the preceding paragraphs, we have analyzed the economic reasoning underlying the profit maximizing conditions of a competitive firm. Application of these conditions to determine the profit maximizing or loss minimizing quantity of output of a competitive firm can be illustrated with the help of three devices : (i) the graphical method with  $MR$  and  $MC$  curves; (ii) the tabular method; and (iii) the graphical method with  $TR$  and  $TC$  curves.

The firm earns supernormal profit as long as  $MR$  remains greater than  $MC$ .

### The Graphical Method with MR and MC curves

The graphical method of determining the profit maximizing level of output with the help of MR and MC curves has been shown in Figure 6.3 with MR and MC measured along the vertical axis and quantity of output along the horizontal axis.



**Figure 6.3: Profit maximization with MR and MC curves**

Suppose, the market price of the commodity is  $P_0$  which the firm accepts as fixed. The horizontal line at price  $P_0$  is virtually the  $AR = MR$  curve of the firm. The SMC curve shows the nature of short-run marginal cost of the firm. Suppose, the firm's initial production level is  $q_3$ . If the firm decides to increase its output level to  $q_4$ , its MR becomes  $q_4D$  but its MC equals  $q_4E$  so that MR exceeds MC. The firm makes supernormal profit of Tk. DE from the last unit of output and its total profit increases. The firm increases its sale by one unit again to increase its total profit further. The process of increasing output level continues until the firm produces output level  $q^*$  where  $MR = MC$ . The firm earns no profit from the last unit and total profit turns out to be maximum at  $q^*$ . If the firm increases output to  $q_5$ , its MR falls short of MC.  $q_5H < q_5G$ . Profit becomes negative for the last unit of output sold and the firm's total profit decreases from the maximum level. If the initial output level were  $q_5$ , the firm would reduce it  $q^*$ , which is the profit maximizing level of output in the figure. It is easily seen that at  $q^*$ , MR equals MC and MC is increasing in the neighbourhood. At  $q_1$ ,  $MR = MC$  but  $q_1$  is not the profit maximizing level of output. An increase in the quantity of output from  $q_1$  to  $q_2$  leads to a fall in marginal cost from  $q_1A$  to  $q_2B$  when MR remains fixed at the previous level of  $q_1A$ , i.e.,  $q_1A = q_2B$ . Since the firm can make a profit of Tk. BC by increasing its sale level from  $q_1$  to  $q_2$ ,  $q_1$  cannot qualify as the profit maximizing level of output. It is thus shown that  $MR = MC$  is only the necessary condition, not the sufficient condition, of profit maximization. The sufficient condition requires that the MC curve be increasing in the neighborhood of output level where  $MR = MC$ .

### The Tabular Method

The process of determining the profit maximizing level of output can also be explained with the help of a table similar to that given below. The first column of

the table shows the units of output. It is evident from the first column that the sale of the product is increasing by one unit each time. The price of the product, which is also MR of the firm, is assumed to be Tk. 25 for all units of output as shown in the second column. In the third column, we show MC which falls from an initial high level and then starts rising from a minimum level. The fourth column gives the amount of marginal profit obtained from successive marginal units of output. Satisfaction of necessary condition of profit maximization,  $MR = MC$ , yields zero profit for the marginal unit at the equilibrium point. Only the units before the marginal unit yield positive profits. Though we notice zero profit for the second and 6th units, the second unit cannot be the equilibrium output level. If output level is increased by one additional unit to 3 units, marginal cost decreases to Tk. 20 when MR remains at Tk. 25 so that the third unit brings profit of Tk. 5.

**Table 6.1: Profit maximizing level of output of a competitive firm**

Unit of output	P=AR=MR (Tk.)	MC(Tk.)	Marginal Profit (Tk.)	Total profit (Tk.)
1st	25	31	-6	-6
2nd	25	25	0	-6
3rd	25	20	5	-1
4th	25	18	7	6
5th	25	23	2	8
6th	25	25	0	8
7th	25	34	-9	-1
8th	25	40	-15	-16

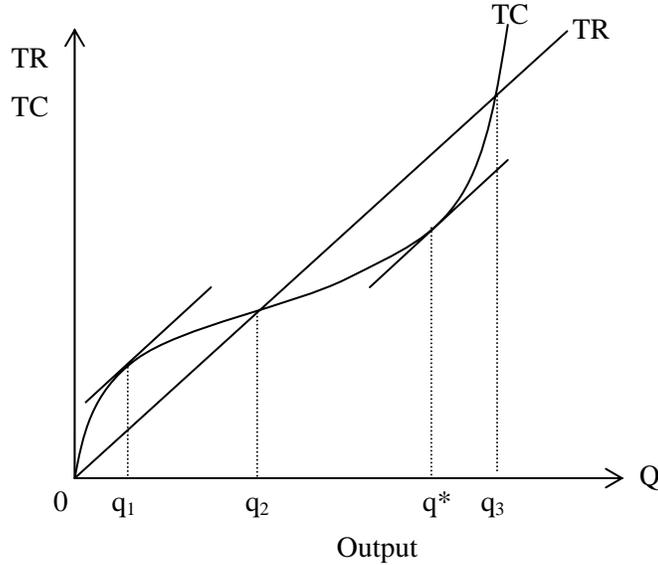
Similarly, a profit of Tk. 7 can be earned from the 4th unit. The firm will increase its output level as long as it can earn a positive profit from sale of the last unit of output. At the sixth unit of output, MR equals MC yielding zero profit. It can be easily seen from Table 6.1 that profit becomes negative for output level beyond the sixth unit. Sixth unit of output becomes the profit maximizing level of output where  $MR = MC$ . Moreover, MC is found to increase in the neighbourhood of the sixth unit of output. The fifth column of the table gives the amount of total profit which is calculated by adding the marginal profits of previous units to the marginal profit of the current unit. The maximum profit in this table is found to be Tk. 8 at the sixth unit of output.

### The Graphical Method With TR and TC Curves

Another method of determining the equilibrium level of output uses the total revenue and total cost curves. Figure-6.4 illustrates the use of these curves for finding the profit maximizing level of output. The vertical axis measures TC and TR in taka and the horizontal axis measures the level of output Q. The TR curve shows the changing pattern of total revenue of a competitive firm and the TC curve shows the changing pattern of short-run total cost of a firm when output level increases. Profit is the difference between TR and TC so that the gap between these two curves measures total profit at different output levels. We observe that profit is negative upto  $q_2$ , positive between  $q_2$  and  $q_3$  and again

negative after  $q_3$  level of output. The maximum profit is obtained at output level  $q^*$ .

At  $q^*$ , a tangent drawn on the TC curve becomes parallel to the TR curve indicating that the slope of the TC curve, which is MC, equals the slope of the



**Figure 6.4: Profit maximization with TR and TC curves**

TR curve, which is MR. Once again, we find that MR equals MC at the profit maximizing level of output. Moreover, the TC curve is found to be upward sloping and convex to the origin. The mathematical implication of upward sloping and convex to the origin TC curve is that MC is positive and rising in the neighborhood of equilibrium level of output. The slopes of the TC and TR curves, which are MC and MR values respectively, are also found to be equal at  $q_1$ , but this level of output maximizes loss, not profit. At  $q_1$ , the necessary condition of profit maximization is satisfied, but the sufficient condition is not satisfied.

**Determining Profit and the Shut-down Point.**

In the preceding analysis, our primary concern was related to determination of the profit maximizing level of output. We discussed three equivalent methods of doing that and showed how to find the maximum profit in each of three cases. Here, we demonstrate another method of determining total profit with the help of short-run average total cost (SATC) and short-run average variable cost (SAVC) curves. Before doing that we must distinguish between the economists' definition of profit and the accountants' definition of profit. As we know, total profit is the difference between total revenue and total cost. The economists incorporate the opportunity cost of the entrepreneur as an item of total cost. The entrepreneur's opportunity cost is the nominal value of all financial and fringe benefits she/he could earn in her/his next best occupation. Instead of engaging himself full-time in organizing and managing the current firm, the entrepreneur could work elsewhere in different capacities and earn some income as remuneration for her/his work in his next best occupation. She/he forgoes this income when she/he takes over as the entrepreneur of the current firm and the forgone income thus becomes the opportunity cost of her/his current occupation. The accountants do not include this opportunity cost in total cost of the firm whereas the economists

Total profit is the difference between total revenue and total cost.

take this items of cost into consideration. According to the economists, the firm is said to earn normal profit when total revenue equals total cost inclusive of entrepreneur's opportunity cost. The firm earns supernormal profit if total revenue exceeds total cost and incurs loss if total revenue becomes less than total cost. A firm finds its short-run equilibrium level of output where the two conditions of profit maximization are satisfied. At the equilibrium output level, the firm may find itself in one of the five situations of profit. It may earn supernormal profit. or normal profit. It may also incur loss which may be less than, equal to, or greater than total fixed cost. The five situations of profit are demonstrated in five panels of Figure-6.5.

The firm is said to earn normal profit when total revenue equals total cost.

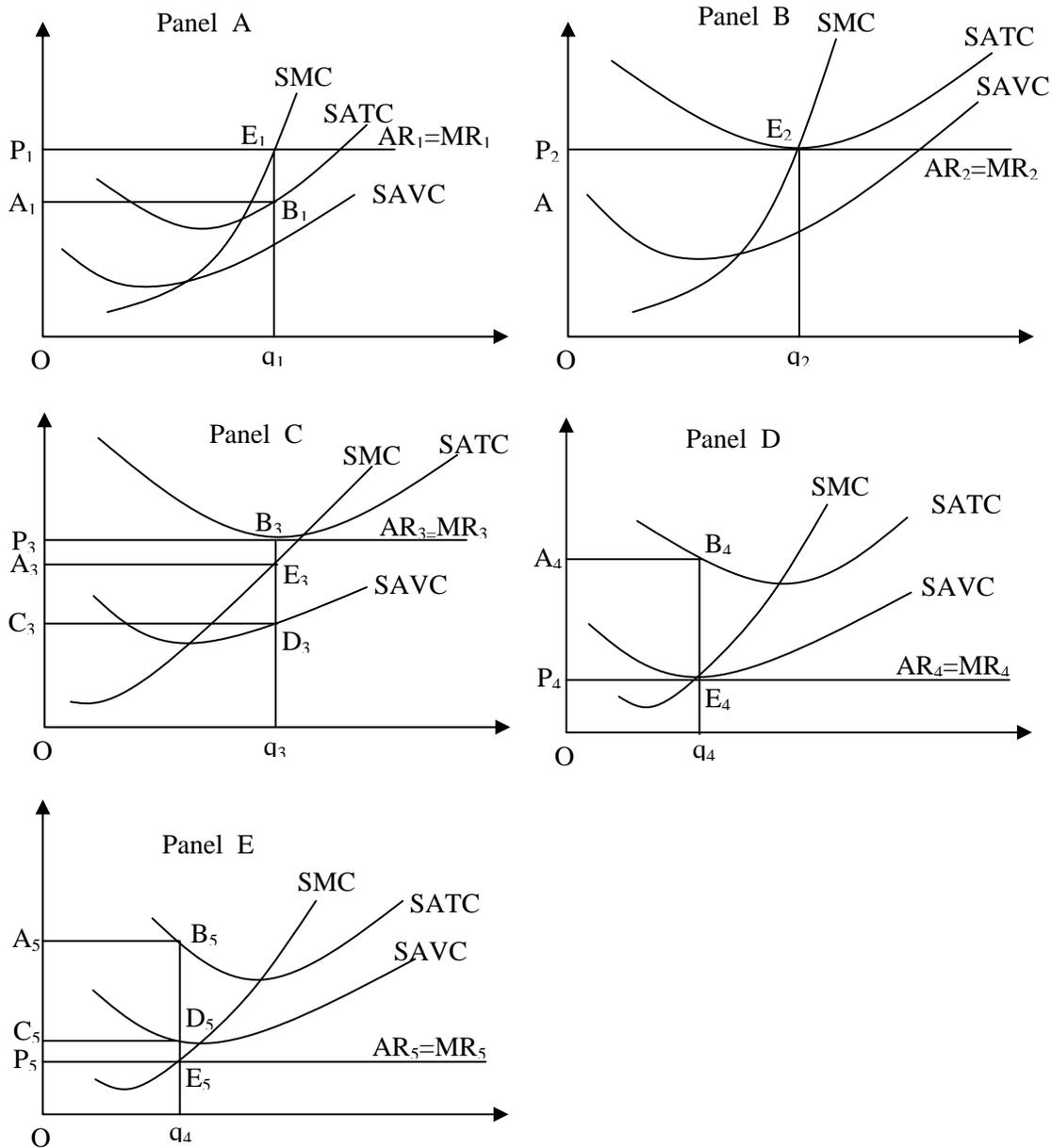


Figure 6.5: Five situations of profit

In each panel, we determine the equilibrium level of output of the competitive firm using the two conditions of profit maximization, viz, (i)  $MR = MC$ ; (ii)  $MC$  is increasing.

In Panel A, equilibrium output is  $q_1$  at which per unit profit is  $E_1B_1$ . Total profit at equilibrium output level is  $E_1B_1A_1P_1$ . Suppose, the market price falls to  $p_2$  in panel B. The two conditions of profit maximization are satisfied at  $E_2$  where price equals SATC yielding normal profit to the firm. If market price goes down further to  $p_3$  in panel C, equilibrium output becomes  $q_3$  corresponding to equilibrium point  $E_3$ . The firm, however, incurs loss at  $E_3$ , because, price  $q_3E_3$  falls short of short-run average total cost  $q_3B_3$ . Per unit loss is  $B_3E_3$  and total loss is  $B_3E_3A_3P_3$ . We know that the gap between the SATC and SAVC curves gives a measure of SAFC which is  $B_3D_3$  at equilibrium level of output. Multiplying  $B_3D_3$  by quantity of equilibrium output  $q_3$ , we get total fixed cost equal to area  $C_3D_3B_3P_3$  which is greater than total loss  $B_3E_3P_3A_3$ . Since the firm's operating loss  $B_3E_3P_3A_3$  is less than the shut-down loss, which is equal to total fixed cost  $C_3D_3B_3P_3$ , the firm keeps its production activities running. In Panel D, the market price falls to the level of the minimum SAVC the firm incurs loss equal to total fixed cost  $P_4E_4B_4A_4$  at equilibrium output  $q_4$ . The firm's total loss remains the same when it keeps operating it or it shuts down. In panel E, the market price of the commodity dips down further and goes below the minimum SAVC to  $P_5$ . Equilibrium output now becomes  $q_5$  corresponding to equilibrium point  $E_5$ . The firm's total loss  $P_5E_5B_5A_5$  will be greater than total fixed cost  $C_5D_5B_5A_5$  if the firm continues its production activities but this loss will be equal to total fixed cost if it shuts down. The firm will, of course, shut down in such a situation.

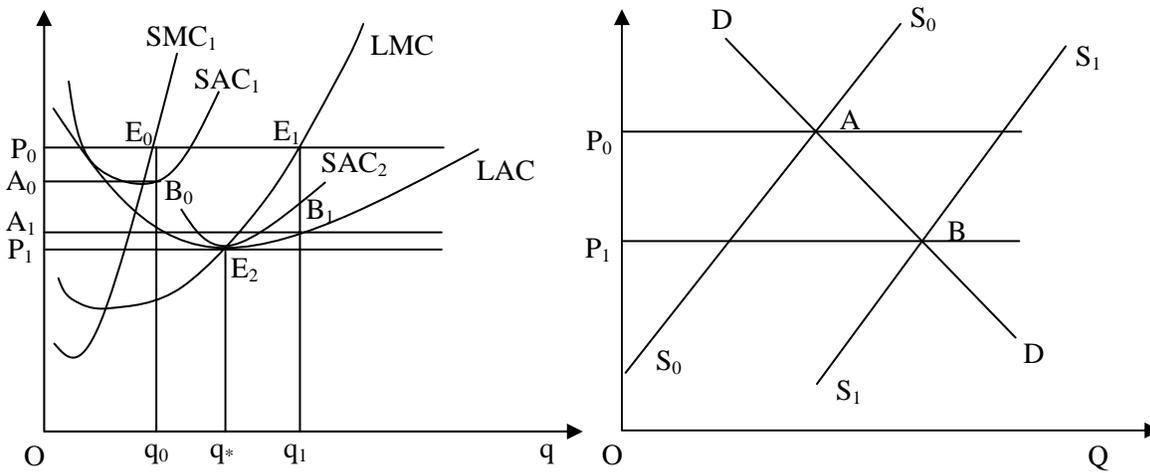
### The Long-Run Equilibrium of a Competitive Firm

In the long run, a competitive firm can change all inputs of production. Moreover, new firms can enter and old firms can exit the industry. A firm keeps changing the plant of production in the long run until the average cost of production becomes the minimum. In other words, the firm makes movements along the long-run average cost LAC and the long-run marginal cost LMC curves. We have already discussed the nature of long-run average cost curve and long run marginal cost curve in Lesson-2 of Unit-4. These curves are used in determining the long-run equilibrium of the firm. We explain the long-run equilibrium of a competitive firm in Figure 6.6 which has two panels. As in previous figures, the vertical axes of the two panels measure production costs and price using the same unit of measurement. The horizontal axis measures the level of output in both panels, but unit of output level is much higher in panel B. We use small-letter  $q$  for the firm's output level in panel A and capital-letter  $Q$  for the industry output level in panel B. We have drawn the cost curves of a typical firm in panel A and the demand and short-run supply curves of the industry in panel B. Suppose, the initial market price is  $P_o$ , which is determined at the intersection point of the market demand curve  $D_oD_o$  and the initial short-run supply curve of the industry  $S_oS_o$ . The typical firm accepts the market price  $P_o$  as given and accordingly determines its equilibrium output level  $q_o$  corresponding to equilibrium point  $E_o$ . The firm makes supernormal profit equal to the area  $A_oB_oE_oP_o$  in the short-run. Since we are considering the long-run equilibrium of the firm, we must take into account two types of market forces that work here.

In long-run, a firm can earn only normal profit.

First, the typical firm will be tempted to increase its output level by increasing its plant size and start producing at  $q_1$  corresponding to equilibrium point  $E_1$ , where the LMC curve intersects the  $MR = \text{Price}$  line. The supernormal profit of the firm increases from area  $A_0B_0E_0P_0$  to  $A_1B_1E_1P_0$ . Remember that the adjustment of output is made along the LAC curve. Figure 6.6 demonstrates the behaviour of a typical firm. If all firms behave in the same way under identical cost conditions, all firms of the industry increase their output levels causing the short-run supply curve to shift upward. Observing the supernormal profit earned by each of the existing firms in the industry new firms will enter into the industry with a view to making supernormal profit. Increased production by each of the old firms and new firms will shift the short-run supply curve to the right until it shifts to  $S_1S_1$ . The new equilibrium for the industry as a whole is attained at the new

intersection Point B yielding a new market price  $P_1$ . An important feature of this



**Figure 6.6: Long-run equilibrium of a firm**

new price is that a horizontal line at price level  $P_1$  must be tangent with the LAC curve at its minimum point. The typical firm accepts the new price level  $P_1$  as given and determines its new profit maximizing level of output  $q^*$  which yields normal profit for the firm. It is not a mere coincidence that the equilibrium point occurs at the minimum point of LAC. The market sets and monitors a few forces in the long run to ensure the following features of long-run equilibrium of the firm:

- (i) Each firm of the industry determines its equilibrium level of output according to the two conditions of equilibrium.
  - (a)  $MR = SMC = LMC$ .
  - (b) Both SMC and LMC will be increasing.
- (ii) The Price line in the long-run equilibrium of the firm will be tangent to the LAC curve at its minimum point so that each firm earns only normal profit. This condition ensures that there will be no tendency for the new firms to enter into and for the old firms to leave the industry.

- (iii) At the long-run equilibrium of the firm, market price will be determined such that the total demand from all consumers for the commodity will just be equal to the total supply of the commodity.

In Figure 6.6, these three conditions are met if the typical firm and hence each firm produces the output level  $q^*$  at the minimum point of the LAC curve and uses the optimum plant with the short-run average cost curve  $SAC_2$ . Here, the long-run price level  $P_1$  is equal to the minimum LAC.

## Review Questions

- **Essay-type Questions**

1. Explain the short run equilibrium of a competitive firm. When would a competitive firm close down its business in the short run?
2. Show how under the condition of perfect competition in the long run, the price of a commodity equal to its average and marginal cost.
3. Write a short note on the relationship between firm's short run cost curves and supply curve.
4. Explain the long run equilibrium of a competitive firm. Does a competitive firm incur loss in the long run?

- **True or False**

Which of the following statements are true?

- (a) Under perfect competition, a firm fixes its price where its  $AR = MR$ .
- (b) In a perfectly competitive industry, a firm is in equilibrium in the short run only when its  $AC = AR = MR = MC$ .
- (c) The short run supply curve has a negative slope.
- (d) A firm reaches its shut-down point when price goes below its AC.
- (e) In the long run, a firm is in equilibrium when its  $AR = MR = LAC = LMC$ .

- **Multiple Choice Questions**

1. The profit-maximizing quantity of output by a perfectly competitive firm corresponds to the point where ..... equals .....
  - (a) MC; ATC
  - (b) market price; ATC
  - (c) market price; MC
  - (d) MC; AVC
2. If market price exceeds ATC at the profit-maximizing level of output, ..... will be experienced:
  - (a) normal profits
  - (b) losses
  - (c) pure profits
3. If market price is less than ATC at the profit-maximizing level of output, ..... will be experienced:
  - (a) normal profits
  - (b) losses
  - (c) pure profits

4. A perfectly competitive firm will earn normal profits if price equals:
  - (a) MC
  - (b) AVC
  - (c)  $MC = ATC$
  - (d)  $MC = ATC = AVC$
  
5. A perfectly competitive firm may incur losses because:
  - (a) it is badly managed
  - (b) its owner-operator may have a high opportunity cost
  - (c) market price is low
  - (d) all of the above
  
6. In the short run, output:
  - (a) cannot be changed
  - (b) can be changed by changing variable inputs
  - (c) can be changed by changing fixed inputs
  - (d) can be changed by changing all inputs
  
7. In the long run, ..... inputs are variable
  - (a) no
  - (b) the firm's own
  - (c) purchased
  - (d) all
  
8. In the short run, the existence of pure profits leads to ....., ..... and .....
  - (a) entry of firms; decreased supply; higher prices
  - (b) entry of firms; increased supply; lower price
  - (c) exit of firms; increased supply; lower prices
  
9. In reference to question 8, the adjustment squeezed out:
  - (a) losses
  - (b) pure profits
  - (c) normal profits
  - (d) 18.
  
10. Perfect competition maximizes the value of output to society because each firm attempts to maximize profits by producing that level of output corresponding to the point where product price equals:
  - (a) MC
  - (b) TC
  - (c) AVC

11. Which of the following features are absent in pure competition?
- (a) Large number of buyers and sellers
  - (b) Free entry and free exit
  - (c) Perfect knowledge
  - (d) Perfect mobility
  - (e) Absence of collusion
12. For a firm, the 'shut-down' point falls:
- (a) anywhere below SAC
  - (b) where  $SMC = SAVC = P$
  - (c) where  $SMC = SAV$
  - (d) where  $SAV = SAVC$
  - (a) 24.
13. Under perfect competition, firms are in equilibrium in the long run, when:
- (a)  $P = SMC = SAC$
  - (b)  $SMC = SAC = AR = MR$
  - (c)  $LAC = LMC = AR = MR$
  - (d)  $AR = MR$  but  $LMC > LAC$

## Lesson-3: Supply Curve of Firm and Industry

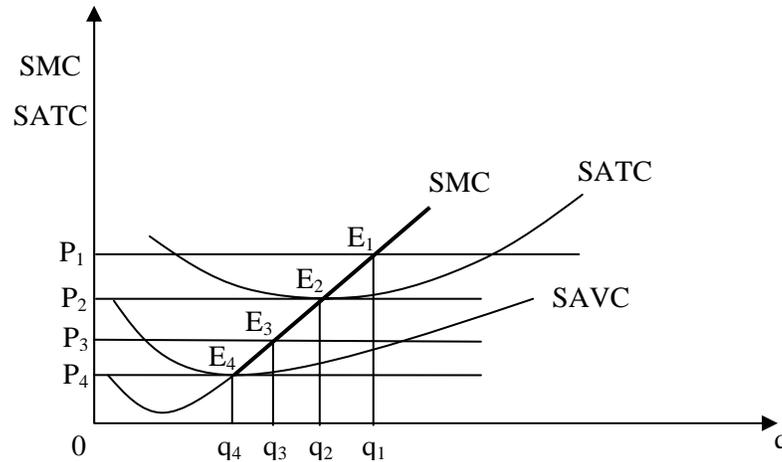
### Objectives

After studying this lesson, you will be able to:

- State how the short-run supply curve of a competitive firm is derived;
- State how the short-run supply curve of an industry is derived;
- State how a competitive firm determines its equilibrium level of output in the long-run; and
- State how the long-run supply curves of the industry under different cost conditions are derived.

### The Short Run Supply Curve of a Competitive Firm

The supply curve of a firm shows the quantity of output supplied at each price level. A supply curve is the graphical presentation of a supply function expressing how quantity supplied of a commodity depends directly on the price of the commodity. We found earlier that the firm in the short run determines its equilibrium level of output according to two conditions of equilibrium. We explain the process of deriving the short-run supply curve of a competitive firm with the help of Figure 6.7. We have drawn the SATC, SMC, and SAVC curves in the figure. At initial price level  $P_1$ , the firm's equilibrium level of output is  $q_1$  corresponding to equilibrium point  $E_1$ . We can interpret  $E_1$  as a point of the firm's supply curve, because, it shows that the firm produces and supplies  $q_1$  at price  $P_1$ .



**Figure 6.7: Short-run supply curve of a firm**

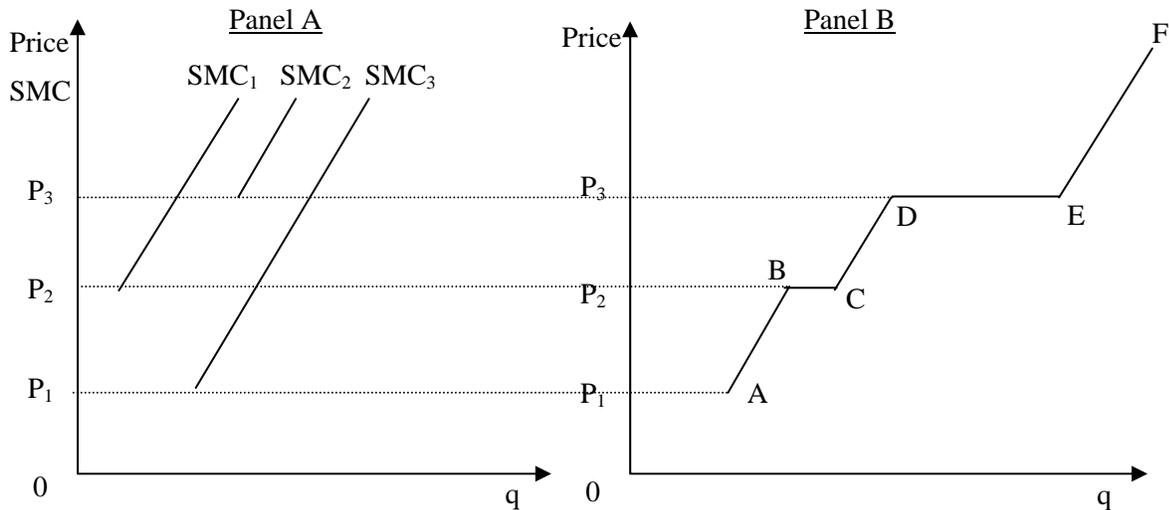
Since  $E_1$  is a point of the SMC curve it seems that this point of the SMC curve also turns out to be one point of the firm's supply curve. Suppose the market price of the commodity goes down to  $P_2$  at which the equilibrium point is  $E_2$  and equilibrium output is  $q_2$ . The firm earns normal profit here. The equilibrium point  $E_2$ , another point of the SMC curve, qualifies as a second point of the firm's supply curve since it shows that the firm supplies  $q_2$  at price  $P_2$ . At price  $P_3$ , the firm's equilibrium level of output is  $q_3$  corresponding to equilibrium point  $E_3$ . At  $E_3$ , the firm incurs loss, though this loss is less than total fixed cost. Since the

firm keeps operating in the short run, in such a situation, point  $E_3$  of the SMC curve becomes a point of the supply curve. We know that the competitive firm continues its production activities in the short run as long as the market price of the commodity happens to be equal to or greater than the minimum SAVC. Corresponding to each price at or above the minimum SAVC level, we get an equilibrium point on the SMC curve which qualifies as a point of the firm's supply curve. All points of the SMC curve above the minimum SAVC thus become the points of the firm's supply curve. In other words, the portion of the SMC curve above the minimum SAVC (bold portion of SMC curve) becomes virtually the short-run supply curve of the competitive firm.

### The Short-Run Supply Curve of the Industry

The short-run supply curve of the industry can be derived by adding horizontally the short-run supply curves of all firms of the industry. Earlier we assumed identical cost conditions of all firms. Multiplying the quantity supplied by one firm at each price by the number of firms gives the industry supply. The shapes of the supply curves of the firm and the industry are identical, though the units of measurement of the output level in both cases are different. When the cost conditions of the firms are different, we must add the supply curves of the firms horizontally to obtain the industry supply curve. Assume for simplicity that there are three firms in the industry. We illustrate the derivation of short-run industry supply curve in Figure 6.8. In panel A of Figure 6.8, we show the short-run marginal cost curve of the three firms because segments of these SMC curve turn

The shapes of the supply curves of the firm and the industry are identical.



**Figure 6.8: Short-run supply curve of industry**

out to be the short-run supply curves of the firms. But we have shown those segments of these SMC curves which lie above the minimum SAVC of the corresponding firms.

The horizontal summation of these three SMC curves gives rise to the short-run supply curve of the industry in panel B. It should be noted here that the units of measurements along the vertical and horizontal axes are the same in both panels. It can be seen from panel A that no supply comes out until price rises to  $P_1$  at which firm 3 starts supplying. Since only firm 3 supplies at price levels between

$P_1$  and  $P_2$ , the short-run supply curve of the industry in panel B gives the short-run supply curve of firm 3 along this range of market prices. At price level  $P_2$ , firm-1 joins firm 3 in supplying the commodity and the industry supply curve is obtained by adding the supply curves of firm-3 and firm-1 horizontally between price levels  $P_2$  and  $P_3$ . At price  $P_3$ , firm-2 joins the other two firms to supply the commodity and from price level  $P_3$  upwards the short-run supply curve of the industry is obtained by adding horizontally the short-run supply curves of the three firms. It can be observed from the Figure that the segment AB of the industry supply curve is identical in position and shape to  $SMC_3$  between price levels  $P_1$  and  $P_2$ . The segment DC is the horizontal summation of  $SMC_1$  and  $SMC_3$  between price levels  $P_2$  and  $P_3$ . The segment EF is the horizontal summation of the three curves  $SMC_1$ ,  $SMC_2$  and  $SMC_3$ . Thus, we derive the short-run supply curve of the industry labelled SRS in panel B of Figure 6.8. We find some kinks and discontinuity in the short-run supply curve of the industry because of differences in cost conditions of the firms.

### Long-Run Supply Curve of the Firm

The long-run equilibrium of the firm is attained at the minimum point of LAC.

It is not possible to derive the long-run supply curve of the competitive firm for the simple reason that the intersection points of the horizontal price lines and the LMC curve do not qualify as the long-run equilibrium points of the firm. The long-run equilibrium of the firm is attained at the minimum point of LAC at which the LMC curve intersects the LAC curve (see Lesson-2 of this unit). The minimum point of the LAC curve, however, does not change directly due to changes in price level, though it may change due to other reasons. It means that there is no relationship between price and long-run output level of the firm. Hence there is no long-run supply curve of the firm.

### Long-Run Supply Curve of the Industry

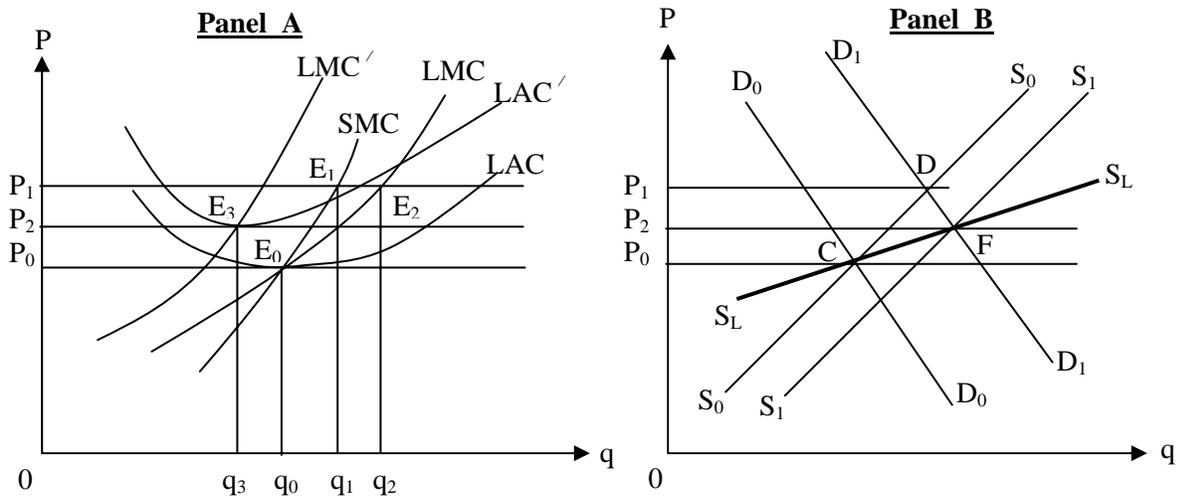
New firms may enter into and old firms may leave the industry in the long run.

It is possible to derive the long-run supply curve of the industry, though it is not the horizontal summation of long-run equilibrium output levels of the firms. The problem is that the number of firms in the industry may be different at different phases of long-run adjustment process of the firms. New firms may enter into and old firms may leave the industry in the long run. Moreover, the minimum point of the LAC curve may also change due to changes in input prices and in technological levels of the firms. Consideration of these facts and others make it difficult to derive the long-run supply curve of the industry by adding horizontally the long-run equilibrium output levels of the firms. There is an alternative method of deriving the long-run supply curve of the industry. The important point to consider is the effect of increased demand for inputs of production in the long run. The increased demand for inputs may cause the input prices to rise or to remain fixed or to fall. Total cost of production increases, remains constant and decreases when input price rise, remain constant and fall respectively. We can obtain three types of industry supply curves in the long run depending on the nature of change of input prices brought about by increased demand for inputs. Let's now consider the case of increasing input price first.

**The Long-Run Supply Curve of Increasing Cost Industry**

We explain the process of deriving the supply curve of increasing cost industry with the help of Figure 6.9, which has two panels. The vertical axes of the two panels measure price and costs using the same unit of measurement. The horizontal axes measure the levels of output, though the unit of output in panel B is much higher than that in panel A. In panel A, we see the initial long-run equilibrium point of a typical firm at point  $E_0$ . At the given market price  $P_0$ , the firm is producing  $q_0$  output in the long-run equilibrium at the minimum point of LAC. Panel B shows how the initial price level  $P_0$  was determined at C, the point indicating equality between aggregate demand and aggregate supply of industry. Obviously, point C qualifies as the initial point of the long-run supply curve of the industry. Suppose, the aggregate demand curve shifts upward from  $D_0D_0$  to  $D_1D_1$  due to some reason, say for example, due to a 10% decrease in proportional income tax rate. Immediately the price level rises to  $P_1$  from  $P_0$ . The representative firm takes the new price level as given and adjusts in the short run by producing  $q_1$  at which the new price level  $P_1$  equals its SMC. It can be seen that the firm is making supernormal profit since the new price level is higher than the short-run average total cost SATC. In the long run, the firm expands its plant size to make more profit. It wants to produce output  $q_2$  corresponding to point  $E_2$ , where  $P_1$  equals LMC. But, the opportunity to make more profit soon disappears for two reasons. First, the continuance of supernormal profit would entice new firms to enter into the industry so that the aggregate output of the industry increases by a large amount. If all or some of the inputs of production are skilled and limited in supply, excess demand for these inputs will cause the input prices to rise. The effect of increased input price manifests in upward shift of the LAC

In the long run, the firm expands its plant size to make more profit.



**Figure 6.9: Long-run supply curve of increasing cost industry.**

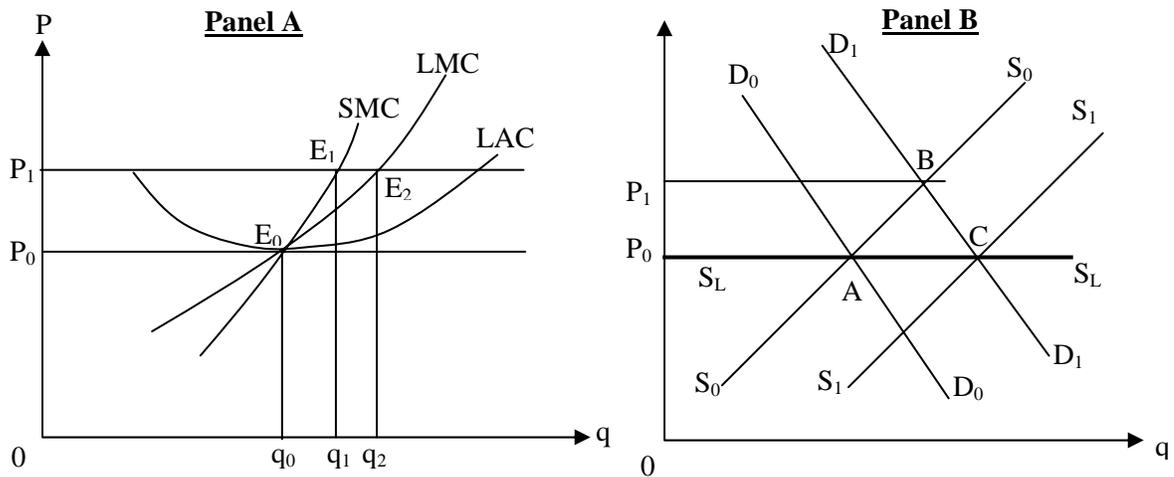
and LMC curves to LAC' and LMC' respectively. Two opposite forces now set in operation. The increased aggregate output of the industry puts a downward pressure on the price level which, however, cannot go back to the previous level, since the LAC curve has shifted to LAC'. The increased input prices would push the commodity price upward. The net result is that the entry of new firms will shift the short-run supply curve to  $S_1S_1$  which intersects the new demand curve

$D_1D_1$  at point F to determine the new market price  $P_2$ . Each firm of the industry accepts the new price level  $P_2$  as given and produces output  $q_3$  corresponding to equilibrium point  $E_3$  at the minimum point of new long-run average cost curve  $LAC'$ . In panel B of Figure 6.9, the new industry equilibrium point F qualifies as another point of the long-run supply curve. Joining points C and F and expanding the line segment between C and F in both directions, we get the curve  $S_L S_L$  which is the long-run supply curve of the increasing cost industry. We find that the long-run supply curve of an increasing cost industry is upward sloping.

**The Long-Run Supply Curve of a Constant Cost Industry**

The process of deriving the long-run supply curve of a constant cost industry is similar to that of deriving the long-run supply curve of an increasing cost industry. The process is illustrated with the help of Figure 6.10 which mimics Figure 6.9 in most respects. In panel A,  $E_0$  shows the long-run equilibrium of the representative firm corresponding to market price  $P_0$  determined at the intersection point of initial aggregate demand curve  $D_0D_0$  and initial aggregate supply curve  $S_0S_0$ . An increase in aggregate demand shown by the shift of the demand curve from  $D_0D_0$  to  $D_1D_1$  causes the market price to rise immediately to  $P_1$ . The new price level changes the profit maximizing level of output of the firm to  $q_1$  corresponding to new equilibrium point  $E_1$  at which  $P_1$  equals  $SMC$ . Each firm in the industry makes supernormal profit which attracts new firms into the industry. Moreover, each of the existing firms is also motivated to expand its plant size for increasing output level to  $q_2$  corresponding to point  $E_2$  where  $P_1$  equals  $LMC$ . Unlike the increased demand for inputs in an increasing cost industry, the increased demand for inputs here does not lead to increased input prices and costs of production do not change. Consequently, the long-run cost curves  $LAC$  and  $LMC$  do not shift upward. Expanded production by the old firms

Each firm in the industry makes supernormal profit which attracts new firms into the industry.



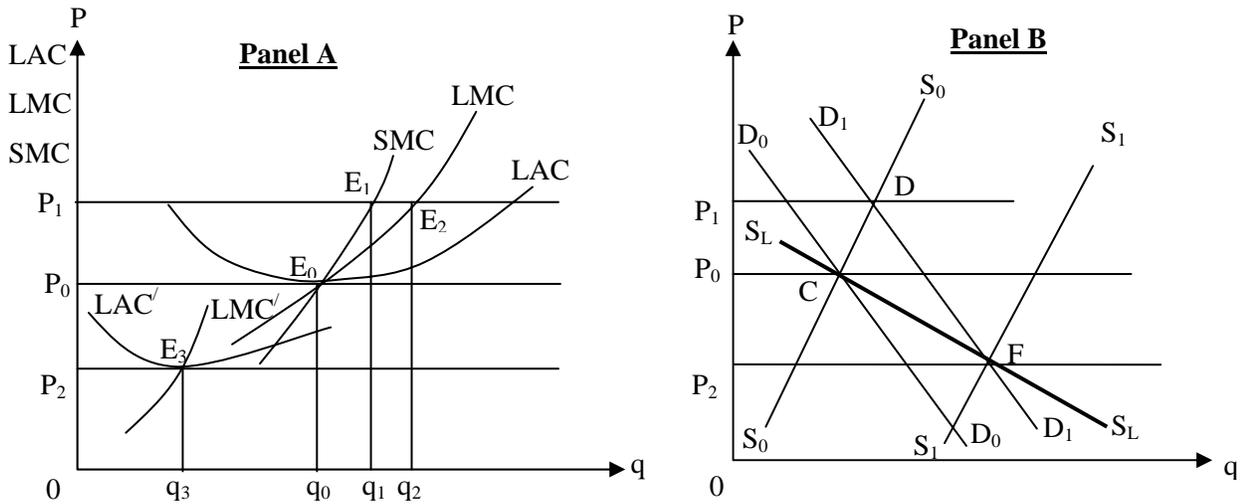
**Figure 6.10: Long-run supply curve of constant cost industry**

and extra production by new firms push the short-run supply curve to the right to lower the market price. The process of falling market prices continues until the price comes back to its previous level where supernormal profit earned by each firm disappears ultimately. In other words, the whole process comes to an end

when short-run supply curve shift to  $S_1S_1$  which intersects the new demand curve  $D_1D_1$  at C. Joining the points A and C and extending the line segment between A and C in both directions, we obtain the horizontal line  $S_L S_L$  which is the long-run supply curve of a constant cost industry. The long-run supply curve of a constant cost industry is found to be a horizontal line at the initial price level.

**The Long-Run Supply Curve of Decreasing Cost Industry**

Derivation of long-run supply curve of decreasing cost industry is based on arguments very much similar to those used in increasing cost industry. The difference between the two cases lies in the effect of increased demand for inputs on the input prices. The supply curve of an increasing cost industry is based on



**Figure 6.11: Long-run supply curve of decreasing cost industry**

the assumption that the increased demand for inputs leads to increased input price and hence to increased cost of production. The supply curve of a decreasing cost industry is derived by assuming that the increased demand for inputs of production causes the input prices to fall so that cost of production decreases when the level of output increases. Figure 6.11 shows how the long-run supply curve of a decreasing cost industry is derived.

The initial output of the firm is  $q_0$  corresponding to initial long-run equilibrium point  $E_0$  shown in panel A. In panel B, the initial aggregate demand curve  $D_0D_0$  intersects the initial aggregate supply curve  $S_0S_0$  at C to determine the initial market price  $P_0$  which the firm accepts as given and produces at  $E_0$  in panel A. Point C is a point of the long-run supply curve of the industry. Market price goes up to  $P_1$  when demand increases to  $D_1D_1$ . The firm takes the new market price as given and produces output  $q_1$  corresponding to point  $E_1$  where  $P_1$  intersects the SMC curve of the firm. The firm makes supernormal profit at  $E_1$ , which attracts new firms into the industry. The old firms are also tempted to produce more at  $E_2$ , where  $P_1$  intersects the LMC curve by increasing their plant size. The increased production from the new and old firms leads to increased demand for inputs of production. It is here assumed that the increased demand for inputs leads to decreased input prices. Such a situation may arise when economies of scale in the production of inputs lower costs of production of inputs and hence

The increased production from the new and old firms leads to increased demand for inputs of production.

The increased production by the new and old firms and the decreased input prices put downward pressure on the market price of the commodity.

prices of inputs when more inputs are produced. The decreased input prices cause the long-run average cost of the firm to shift down to  $LAC'$ . The long-run marginal cost curve also shifts down to  $LMC'$ . The increased production by the new and old firms and the decreased input prices put downward pressure on the market price of the commodity. As a result, the short-run supply curve of the industry increases by a large amount. It is shown by a downward shift of the short-run supply curve of the industry to  $S_1S_1$ . The new aggregate demand curve of the industry  $D_1D_1$  intersects the new short-run supply curve of the industry  $S_1S_1$  at F to form the new market price  $P_2$ . The firm adjusts its long-run equilibrium level of output at the new market prices  $P_2$  by producing output  $q_3$  corresponding to equilibrium point  $E_3$ , the minimum point of  $LAC'$ . We obtain the long-run supply curve of a decreasing cost industry by joining the two industry equilibrium points C and F and extending the line segment between these two points in both directions. The downward sloping curve labelled  $S_L S_L$  becomes the long-run supply curve of a decreasing cost industry.

## Review Questions

- **Essay-type Questions**

1. How is the short run supply curve of a competitive firm derived?
2. How is the short run supply curve of an industry derived?
3. How is the long run supply curve of a firm derived?
4. State how are the long run supply curves of an industry under different cost conditions derived?

- **True or False**

Which of the following statements are true?

- (a) The short run supply curve of competitive firm has a negative slope.
- (b) Industry supply curve is a horizontal summation of its firm's supply curves.
- (c) An industry is in equilibrium in the short run when market is cleared.
- (d) Industry supply curve has a positive slope under decreasing cost conditions.
- (e) The portion of the SMC curve above the minimum SAVC becomes virtually the short-run supply curve of the competitive firm.
- (f) The long-run supply curve of constant cost industry is found to be a horizontal line at the initial price level.

- **Multiple Choice Questions**

1. Short run supply curve of a competitive firm is:
  - (a) SAVC curve
  - (a) SMC curve
  - (b) SAC curve
  - (c) The portion of the SMC curve above the minimum SAVC
2. Short run industry supply curve is:
  - (a) vertical summation of the short run supply curves
  - (b) horizontal summation of the short run supply curves
  - (c) horizontal summation of the SAC curves
  - (d) horizontal summation of the SAVC curves
3. Long run supply curve of a competitive firm is:
  - (a) Long run average cost curve of the firm
  - (b) LMC curve of the firm
  - (c) Summation of the short run supply curves
  - (d) Doesn't exist

4. An industry may be of three kinds :
  - (a) depending on cost conditions
  - (b) depending on scale of production
  - (c) depending on items to be produced
  - (d) none of the above
  
5. Long run supply curve of an increasing cost industry is:
  - (a) horizontal
  - (b) downward sloping
  - (c) upward sloping
  - (d) none of the above
  
6. Long run supply curve of an constant cost industry is:
  - (e) horizontal
  - (f) downward sloping
  - (g) upward sloping
  - (h) none of the above
  
7. Long run supply curve of an decreasing cost industry is:
  - (i) horizontal
  - (j) downward sloping
  - (k) upward sloping
  - (l) none of the above

• **Problem**

*Read the following news-story carefully and then answer the questions under it:*

**Apple's Morning After: Lost of Competition**

Apple Computer Inc.'s \$96.8 million initial public offering on Dec. 12 added another chapter to the company's textbook success story. In just four years, the Cupertino (Calif.) concern has evolved from a garage workshop to a leading force in the fast-moving market for personal computers, with annual sales topping \$100 million. But as the fanfare of the public offering recedes, Apple faces an onslaught of new high-powered competitors.

Within the next year as many as a dozen large companies are expected to join the battle offering personal computers costing less than \$10,000. International Business Machines,

Xerox, and Digital Equipment are all working on personal computers in their laboratories, and each is opening a string of company-owned retail stores as a possible means of distribution... Meanwhile, at least eight Japanese companies— including Nippon Electronic, Casio, and Sharp — have introduced personal computers. And some are preparing to come to the U.S. market. "Looking out a few years, the competition will be very rough," notes George p. Elling, industry analyst at Bear, Sterns & Co...

**Source:** December 29, 1980, issue of *Business week*, , copyright © 1980 by Mc Graw-Hill, Inc..

**Questions:**

- (a) What is about the profit of Apple Computer Inc.?
- (b) What did lure the other firms to enter the industry?
- (c) What happened with the price of the personal computers as new firms entered?
- (d) Was there any improvement with the personal computers as new firms entered into?
- (e) What is your comment on this news-story?

**Hints:** The existence of economic profits lures more firms to enter into an industry. As firms enter, price falls and the product improves.

# MONOPOLY



## Highlights

- Nature of Monopoly
- AR & MR curve in Monopoly Market
- Equilibrium of a Monopolist
- Multiplant & Price Discriminating Monopolists
- Comparison between Monopoly and Perfect Competition
- Measures of Monopoly Power
- Regulating the Monopoly.

School of Business

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## Unit-7

### Lesson 1: Nature of Monopoly Market and AR and MR Curves in Monopoly Market

#### Objectives

After studying this lesson, you will be able to state :

- The characteristics of a monopoly market;
- Why a monopoly market endures;
- The shapes of the AR and MR curves under monopoly market; and
- Relationship between AR, MR and price elasticity in a monopoly market.

#### Nature of Monopoly Market

In a monopoly market, only one producer sells a homogeneous commodity to all buyers in the market. Moreover, no substitute goods for the commodity of the monopolist are available in the market. The above definition of monopoly market brings out two basic ingredients: sole ownership of industry of the commodity in absence of substitute goods. Both these criteria need further qualification. There are examples of commodity markets each of which has a single seller but substitutes for each commodity are readily available in the market. For example, one can consider Bangladesh Telegraph and Telephone (T&T) Board as a monopoly for telephone services in the country. But in Bangladesh people use other devices of communication like FAX, e-mail, courier service, etc., for fast and ensured passage of information. These devices of communication serve as substitutes for telephone services, though these are not perfect substitutes. Since it is very difficult to find a commodity without substitutes, pure monopoly market as defined above is rare in the real world. Though each commodity must face competition from its substitutes, the degree of substitutability varies among different pairs of commodities. Two commodities may be close substitutes as in case of two tooth-paste brands or these commodities may be distant substitutes like electric bulb and candle when used for lighting rooms. Alternatively, the same two commodities, electric bulb and candle may be close substitutes when used for lighting. The degree of substitutability is also dependent on time. A commodity might not have close substitutes at present, but such substitutes may eventually be developed in future in response to higher price of the commodity charged by the monopolist. It is, therefore, the degree of substitutability rather than availability of substitutes which should be used as a criterion in the definition of monopoly market. Lack of precise measurement of degree of substitutability between two commodities may give rise to subjectivity and value judgements in the process of defining monopoly market in reality. The second element about ownership of production enterprise can also be changed. Two or more producers can form a monopoly market if they merge together to form a joint firm and act in concert to take price and output decisions like a monopolist.

It is very difficult to find a commodity without substitutes.

Now that we have defined a monopoly market, the next question that arises is why does a monopoly market endure once it has been created? The answer is simple: A monopoly market exists because barriers to entry into market prevents

other firms from entering and competing with the monopolist. These barriers to entry can take different forms.

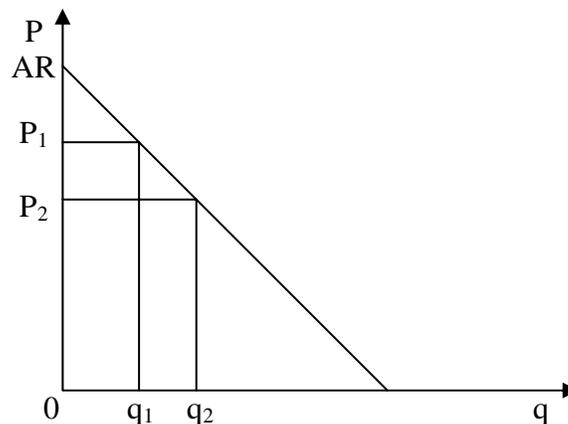
Sometimes a firm might have sole ownership of an important input to a product, which makes the firm the only producer and seller of the product. The barriers may be created by legal authorities. In some cases, the government permits only one firm the right to produce and sell a commodity or service. The license to run a restaurant in a railway station is an example of a local monopoly created by legal authority. Another legal monopoly is patent which is legal protection of an innovation given out to a firm or a person for the time, energy and merit expended on the innovation. A patent allows the patent holder to be a monopoly in using the innovation. Patent is given to encourage research and development activities. New firms cannot attain the level of technological progress profitably utilized by the monopolist. Lack of advanced technology works as a barrier to entry. Barriers to entry are also created by natural monopolist. A natural monopolist enjoys economies of scale in the form of falling average and marginal costs with increase in the level of output. These economies of scale disappear if monopoly is abolished and two more firms share the market. As a result, the monopolist can drive away the potential competitors. Natural monopolies occur in the case of production enterprises with very large amount of overhead costs compared to minimal variable cost.

New firms cannot attain the level of technological progress profitably utilized by the monopolist.

### Nature of AR and MR Curves

Since there is one producer in monopoly market, the monopolist has enough power to exert control over price or output. She/he is not a price taker like the competitive firm; rather she/he is a price-maker. She/he can set the price of the commodity at any level she/he likes. She/he can charge a higher price or she/he can be satisfied with a low price. Though the monopolist can set the price, she/he cannot set simultaneously the quantity she/he will sell at the predetermined price. The consumers are sovereign and it is to the consumers to decide how much output to demand and consume at the given price. Normally the consumers are supposed to be guided by the principle of equimarginal utility which requires that marginal utility per taka spent on each commodity be equal. Other things remaining the same, consumers demand and consume more at a low price and less at a higher price. The monopolist cannot force the consumers to buy more at a high price. Ultimately the monopolist finds that she/he can sell more if she/he

Though the monopolist can set the price, she/he cannot set simultaneously the quantity she/he will sell at the predetermined price.



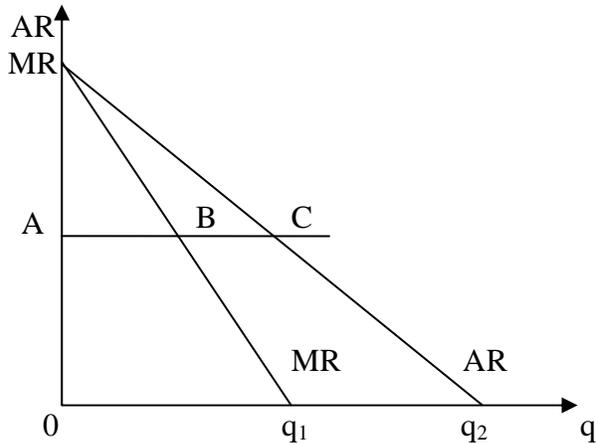
**Figure 7.1: AR curve of the monopolist**

sets a low price and can sell less if she/he sets a high price. Alternatively, the monopolist can set the amount of her/his sale and leave the price to be determined by the consumers' preferences. This time, the monopolist observes that the consumers are willing to pay a lower price at a higher level of sale and a higher price at a lower level of sale. This means that the average revenue curve of the monopolist, which is demand curve of the consumers, is a downward sloping curve. A typical AR curve of the monopolist is shown in Figure-7.1 with AR or price measured along the vertical axis and quantity sold or quantity demanded along the horizontal axis.

The consumers are willing to pay a lower price at a higher level of sale and a higher price at a lower level of sale.

As it can be seen from the Figure, the monopolist can sell  $q_1$  if she/he sets the price at  $P_1$  and  $q_2$  if she/he sets the price at  $P_2$ . The final result is that the AR or price always falls with increase in the level of output sold.

Let's now discuss the shape of the MR curve in a monopoly market. In the case of perfect competition the firm can sell any amount of the commodity within its capacity at a constant price. As a result, price equals marginal revenue for a competitive firm. The monopolist has to reduce the price level if she/he wants to sell one extra unit. If she/he didn't want to sell the extra unit, she/he could get the higher price for all previous units. Now that she/he sells one more unit, she/he gets a lower price for all previous units as well as for the extra unit. The change in total revenue from the sale of last unit or MR of the monopolist will be less than the price of the last unit because she/he is getting a lower price on each of the previous units. In fact, MR will be equal to price of the last unit minus the total loss due to a low price on all previous units. It means that when AR falls with the increase in output sold, MR becomes less than AR at all levels of output except at the starting point. We state an additional result without proving that the



**Figure 7.2: AR and MR curve of the monopolist**

MR curve always lies at mid point between the price axis and the straight line AR curve.

Figure 7.2 shows the positions of the AR and MR curves of a monopolist. It shows that the MR curve lies below the AR curve at all levels of output between O and  $q_1$ . After output  $q_1$ , MR, however, becomes negative whereas AR becomes negative after output  $q_2$ . Draw a horizontal line that intersects the MR and AR curves from point A on the vertical axis. It can be seen that  $AB = BC$ , which shows that the MR curve lies halfway between the price axis and the AR curve. The nature of the AR and MR curves and the relationship between them can also be explained with the help of a table. Table 7.1 shows the values of  $AR = Price$ ,  $TR$  and  $MR$  for a hypothetical commodity of a monopolist.

**Table 7.1: Relationship among AR, MR and TR**

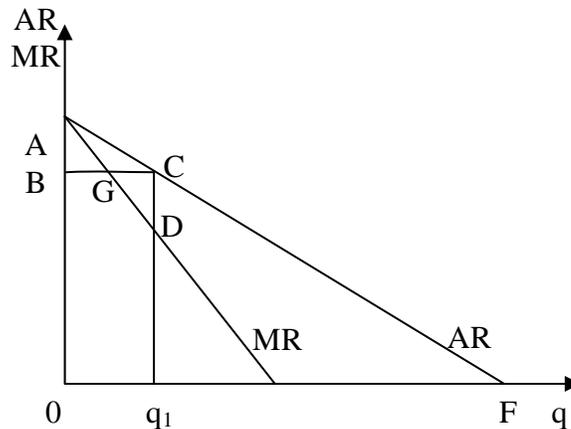
AR = Price	Output = q	TR = AR.q	MR= $\Delta TR/\Delta q$
40	10	400	
38	11	418	18
36	12	432	14
34	13	442	10
32	14	448	6

As we can see from Table 7.1, the monopolist's initial sale is 10 units of output at price of Tk. 40 yielding a total revenue of Tk. 400. To sell one more unit of the commodity, the monopolist has to lower the price from Tk. 40 to Tk. 38. Total revenue now stands at Tk. 418 giving a marginal revenue of Tk. 18. We find that marginal revenue is less than price Tk. 38 at which 11 units were sold. The monopolist lost Tk. 2 (Tk. 40 - Tk. 38) on each of the previous 10 units so that her/his total loss on previous units amounts to Tk. 20 (10 × Tk. 2). Deducting the loss of Tk. 20 from the price of Tk. 38 for the last unit, we get the marginal revenue of Tk. 18 (Tk. 38 - Tk. 20). We notice from the table that MR is less than AR = Price at all levels of output starting from the 11th unit. For example, at 13 units of output, AR is Tk. 34, whereas MR is Tk. 10. Here, both the AR and MR values are found to decrease with the increase in the quantity of output. Moreover, the rate of decrease of MR is Tk. 4 which is two times Tk. 2, the rate of decrease of AR. This is not a mere coincidence. The values of AR and q in Table-7.1 have been chosen such that these values correspond to a straight line downward sloping AR curve. In the case of linear AR curve, the rate of fall of MR is always double the rate of fall of AR. We can summarize the results on the shapes of the AR and MR curves in a monopoly market as follows:

- (i) Both the AR and MR curves are downward sloping;
- (ii) The MR curve falls at a faster rate than the AR curve; and
- (iii) In the case of a straight line AR curve, the rate of decrease of the MR curve is always double the rate of decrease of the AR curve.

**Relationship Among AR, MR and Price Elasticity**

We derive an equation that shows how AR, MR and price elasticity of demand are related with each other. Figure 7.3 is used for this purpose.



**Figure 7.3: Relationship among AR, MR and price**

We have drawn linear AR and MR curves in the diagram. As mentioned earlier, the MR curve corresponding to a linear AR curve always lies halfway between the vertical axis and the AR curve. Hence  $BG = CG$ . Consider triangles  $\Delta ABG$  and  $\Delta CDG$ . We find the following equalities:

$\angle ABG = \angle DCG$  (Right Angles).

$\angle AGB = \angle CGD$  (Opposite Angles)

$BG = CG$

Thus  $\Delta ABG = \Delta CDG$

$\therefore AB = CD$

Now  $\Delta ABC$  and  $\Delta Cq_1F$  are similar triangles.

$$\therefore \frac{FC}{AC} = \frac{q_1C}{AB} = \frac{q_1C}{CD}$$

But  $\frac{FC}{AC} = E_p$

where  $E_p$  is the absolute value of price elasticity of demand.

We get,

$$E_p = \frac{q_1C}{CD} = \frac{q_1C}{q_1C - q_1D} [\because CD = q_1C - q_1D]$$

But

$q_1C = AR$  or price (p) at  $q_1$

$q_1D = MR$  at  $q_1$

Therefore,  $E_p = \frac{AR}{AR - MR}$

Rearranging we get,

$$MR = AR \left(1 - \frac{1}{E_p}\right)$$

From the above equation, we get the following results:

$MR = 0$  when  $E_p = 1$

$MR > 0$  when  $E_p > 1$

$MR < 0$  when  $E_p < 1$

## Review Questions

### • *Essay-type Questions*

1. (a) How does an imperfectly competitive firm differ from one that is perfectly competitive?  
(b) If an imperfectly competitive firm wishes to increase quantity sold, what must it do to price?
2. What is monopoly and how does its definition depend on how the industry is defined?
3. Bangladesh Railway is generally given exclusive right to provide rail transportation service throughout the country. Is Bangladesh Railway a monopolist? Explain.
4. (a) What is marginal revenue (MR) and why is MR less than price for a firm facing a downward-sloping demand curve?  
(b) Draw a demand curve facing a monopoly firm and its corresponding marginal revenue curve. Do the same for a perfectly competitive firm.
5. Explain the sources of monopoly?

### • *True or False*

Which of the following statements are true?

- (a) The slope of MR curve is twice that of AR curve.
- (b) The MR curve faced by a monopolist is upward sloping.
- (c) The monopolist has to reduce the price level if she/he wants to sell one extra unit.
- (d) Two or more producers can form a monopoly market if they merge together to form a joint firm and act in concert to take price and output decisions like a monopolist.
- (e) The monopolist cannot force the consumers to buy more at a high price.

### • *Multiple Choice Questions*

1. An monopoly firm is one that exercises ..... control over the price of its product:
  - a. no
  - b. some
  - c. complete
2. An monopoly firm has control over the price it receives for its product because only it sells a .....product.
  - a. undifferentiated
  - b. differentiated

3. The distinguishing characteristic of all imperfectly competitive firms is that they face a ..... demand curve:
  - a. perfectly elastic
  - b. perfectly inelastic
  - c. upward-sloping
  - d. downward-sloping
4. If an monopoly firm wishes to raise the price of its product, it must:
  - a. increase its quantity sold
  - b. decrease its quantity sold
  - c. suffer a reduction in profits
  - d. obtain permission from the Price Control Commission
5. If a monopoly firm wishes to increase its sales, it must:
  - a. decrease its price
  - b. increase its price
  - c. suffer a reduction
  - d. obtain permission from the government.
6. Pure monopoly exists where there is (are) ..... firms(s) in the market:
  - a. zero
  - b. two
  - c. one
  - d. many
7. In order for a monopoly to exits, entry into the market must be .....  
The most effective method of accomplishing this is .....:
  - a. open; licensing
  - b. blocked; licensing
  - c. open; collusion
  - d. blocked; collusion
8. Marginal revenue for an imperfectly competitive firm is ..... than price. For a perfectly competitive firm, it is ..... price:
  - a. Less than; equal to
  - b. equal to; less than
  - c. less than; greater than
  - d. greater than; less than

## Lesson 2: Price and Output Determination Under Monopoly: Equilibrium of Monopolist

### Objectives

After studying this lesson, you will be able to learn:

- Determination of profit maximizing levels' of output and price in the short run;
- Determination of profit maximizing levels of output and price in the long run;
- Why a monopolist does not have a supply curve; and
- The rule of thumb for pricing in monopoly.

### Short-Run Equilibrium of a Monopolist

Like a firm owner in perfect competition, a monopolist undertakes production activities with the sole objective of maximizing profit. The conditions of profit maximization here are the same as in perfect competition:

**Necessary condition:**  $MR = SMC$

**Sufficient condition:** SMC increases in the neighbourhood of equilibrium point

The intuitive explanation is simple. Total profit will increase as long as the addition to total revenue (MR) is greater than the addition to total cost (SMC) when the firm increases its output level by one unit at each step. In other words, total profit increases as long as MR remains greater than SMC. The SMC curve initially falls and then rises with increase in the level of output whereas the MR curve is downward sloping in monopoly market. It means that the monopolist will face a level of output where SMC equals MR. At this level of output, marginal profit is zero and total profit is the maximum. If the monopolist increases her/his output level by one unit beyond the profit maximizing level, MC becomes greater than MR yielding negative marginal profit and making total profit less than the maximum.

The monopolist will face a level of output where SMC equals MR.

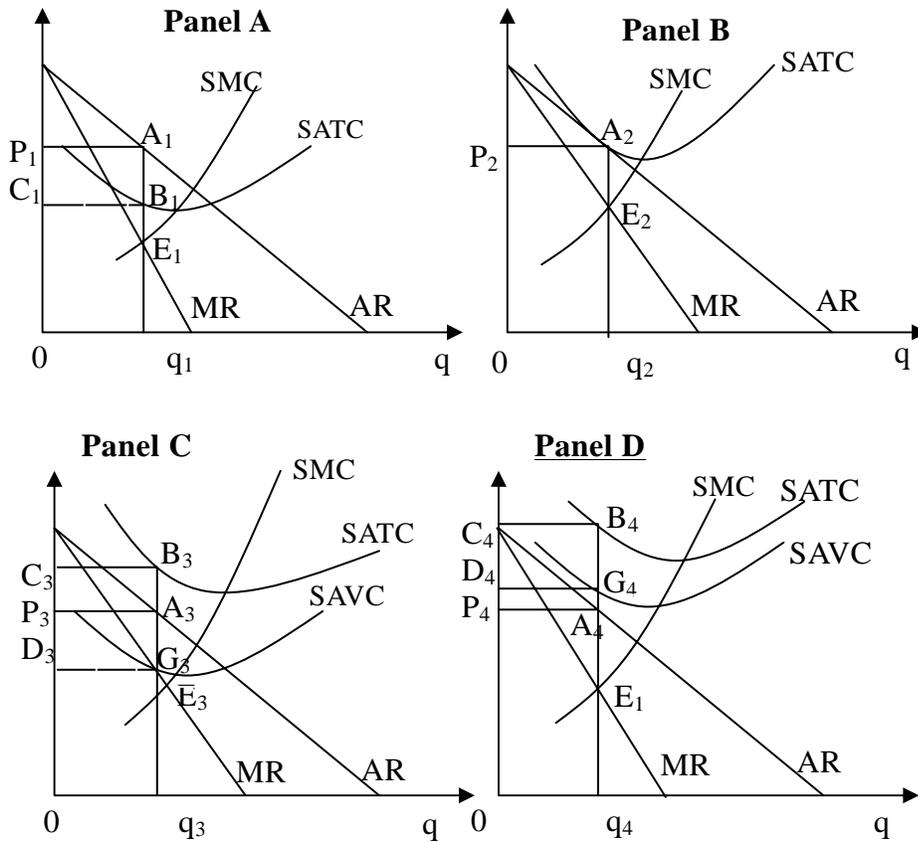
The preceding discussion shows how the profit maximizing conditions developed earlier in the context of perfect competition remain valid in the case of monopoly. There is, however, one difference between the monopoly and competitive equilibrium points, with regard to the price level at equilibrium point. Since price or AR is greater than MR in monopoly market, price will be higher than both MR and MC at the monopoly equilibrium. The extended condition of profit maximization in monopoly market can then be rewritten as  $Price > MR = SMC$ .

In monopoly, the question of entry and exit of firms does not arise in the long run.

In perfect competition, price equalled SMC at the equilibrium level of output. We now turn to graphical presentation of short-run equilibrium of the monopolist. In monopoly, the question of entry and exit of firms does not arise in the long run. The monopolist changes its output and price levels by changing its plant size in the long run. Since the monopolist cannot change the plant size in the short run, she/he can bring changes in her/ his output level by changing the variable inputs of production. Figure 7.4 shows that the monopolist can face any of the four situations of profit in the short run. These four situations have been depicted in four panels of Figure 7.4. The vertical axis in each of the four panel measures short-run costs, price and MR, whereas the horizontal axis measures output level.

In each panel, the equilibrium output is determined corresponding to the point where the SMC curve intersects the MR curve. A vertical line drawn from the equilibrium point to the output axis determines the profit maximizing level of output. The vertical line is then extended upward to the AR curve to find the price level at the equilibrium level of output. The point at which the vertical line intersects the SATC curve is also located and the difference between the AR and SATC curves is taken as a measure of profit per unit of output. Multiplying the profit per unit of output by the equilibrium level of output gives the maximum total profit.

In panel A, the equilibrium point is  $E_1$  which determines the equilibrium output  $q_1$ . Price is  $q_1 A_1$  or  $P_1$  and average cost is  $q_1 B_1$  so that profit per unit of output becomes  $A_1 B_1$  and total profit becomes  $P_1 A_1 B_1 C_1$ . In panel B, equilibrium output is  $q_2$  corresponding to equilibrium point  $E_2$ . Both AR and SATC here are equal to  $q_2 A_2$  yielding normal profit for the monopolist. In Panel C, equilibrium output is  $q_3$  at which price  $q_3 A_3$  is less than average cost (SATC)  $q_3 B_3$ .



**Figure 7.4: Four situations of profit in monopolist's short-run equilibrium**

The monopolist incurs a loss of  $B_3 A_3$  per unit of output and her/his total loss is  $P_3 A_3 B_3 C_3$ . Since the monopolist's total loss is less than her/his total fixed cost  $D_3 G_3 B_3 C_3$ , it means the portion  $D_3 G_3 A_3 P_3$  of his total fixed cost is being covered in the short run. Since the monopolist's loss becomes less when she/he runs the production firm than when she/he shuts down, it pays the monopolist to keep the firm open in the short run. In panel D of the figure, the loss minimizing level of output  $q_4$  dictates a price level of  $q_4 A_4$  which is even less than short run average

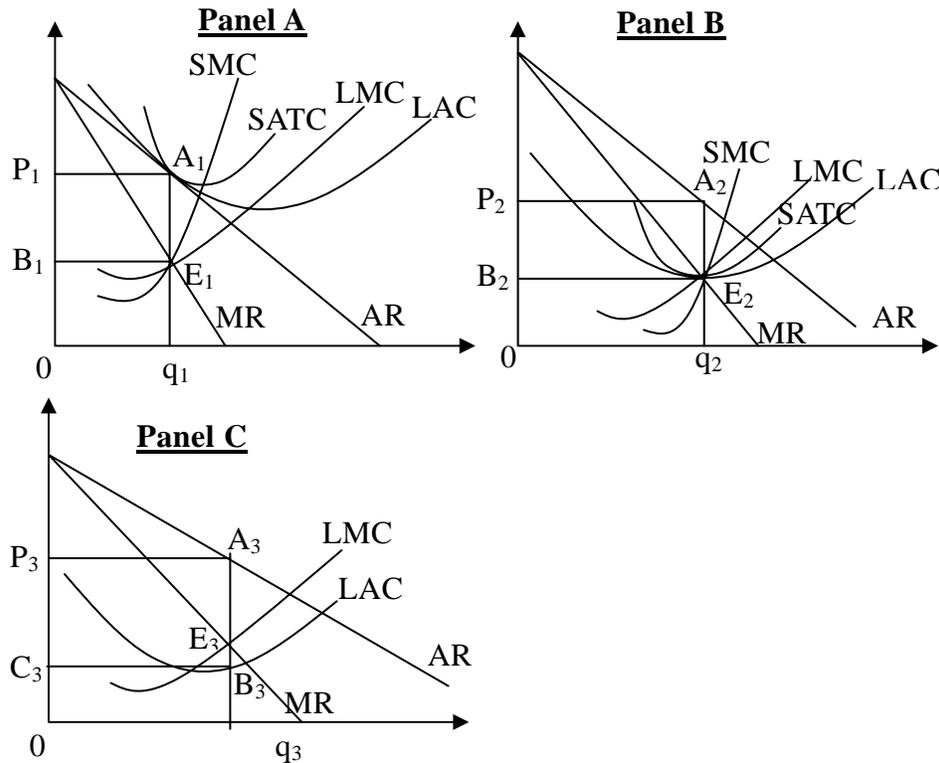
variable cost (SAVC) of  $q_4G_4$ . The monopolist's total loss will be equal to total fixed cost when it shuts down and it will be more than total fixed cost when it operates. Since the monopolist's total loss becomes more when it operates than when it shuts down, he would certainly shut down her/his plant in a situation depicted in panel D.

**Long-Run Equilibrium of the Monopolist**

In the long-run, the monopolist can change her/his plant in order to increase her/his profit. The monopolist does not run with any risk of losing profit due to entry of firms in the long-run. Different types of barriers to entry successfully prevent new firms from entering the monopoly market.

Depending on the nature of demand and cost conditions, the monopolist may make supernormal profit or normal profit.

The monopolist tries to maximize her/his profit lying within the constraints of given demand and cost conditions. Her/his choice of output and price levels change when these constraints change. Depending on the nature of demand and cost conditions, the monopolist may make supernormal profit or normal profit, but she/he will never incur a loss in the long run. At the worst situation, the monopolist may quit the production process in the long run. Unlike the competitive firm, in the long run, the monopolist may not produce at the minimum point of LAC. The monopolist may produce at the optimum plant or at less than optimum plant or at more than the optimum plant. The long run equilibrium of the monopolist is attained when the following two conditions are met:



**Figure 7.5: Long-run equilibrium of monopolist**

**Necessary condition:**  $SMC = LMC = MR < Price$

**Sufficient condition:** LMC and hence SMC increases at the neighbourhood

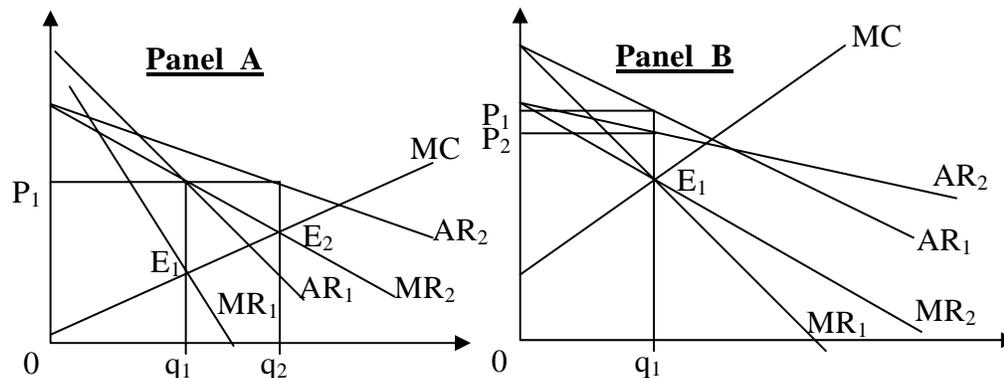
The long-run equilibrium of the monopolist can be characterized by one of the three probable situations shown in three panels of Figure 7.5.

In Panel A, the equilibrium point  $E_1$  gives rise to equilibrium output  $q_1$ . At equilibrium level of output, both price and long-run average cost are equal to  $q_1A_1$  so that the monopolist earns only normal profit. The monopolist is, however, producing at less than the optimum plant in the long run. In panel B, the conditions of profit maximization are met at point  $E_2$  which is also the minimum point of LAC. The firm is producing at the optimum plant in the long-run. At equilibrium output  $q_2$ , price  $q_2A_2$  is found to be greater than long-run average cost  $q_2E_2$  so that the monopolist earns supernormal profit equal to the area  $B_2E_2A_2P_2$ . In panel C, profit maximizing level of output is  $q_3$  corresponding to long-run equilibrium point  $E_3$ . It is easily seen that the equilibrium output  $q_3$  is produced by using a plant larger than the optimum plant. At  $q_3$ , price is  $q_3A_3$  and long-run average cost is  $q_3B_3$  yielding a total profit equal to area  $C_3B_3A_3P_3$ . Examination of the three diagrams in Figure 7.5 reveals two facts about the monopolist. First, a monopolist in the long-run equilibrium may use or may not use the optimum plant of production. Second, in the long-run, the monopolist may earn normal profit or supernormal profit, but she/he will never incur loss.

**The Monopolist Does Not Have a Supply Curve**

In perfect competitions, the firm is a price taker. The competitive firm tries to maximize its profit by adjusting its output level to given price level which is determined at the intersection point of the industry demand and supply curves. When the price level changes due to changes in demand and supply conditions, the competitive firm also changes its output level to obtain maximum profit in the changed situation. There is thus a relationship between price and quantity supplied by a competitive firm, which is shown by the firm's supply curve. The monopolist is a price maker. He can set one of the price and output levels and leave another to be determined by the consumers' preferences. When demand conditions change, her/his profit maximizing level of output may be different, but the price level may remain the same as before. Alternatively, shifts in demand curves may lead to change in price with no change in output. Finally, changes in demand may lead to changes in both price and output. In other words, there is lack of a definite relationship between price and output of a monopolist. Figure-7.6 shows how shifts in AR and MR curves give rise to the same price with

The monopolist is a price maker.



**Figure 7.6: Effects of changes in demand conditions**

change in output or to the same output with change in price. In panel A, the initial average revenue and marginal revenue curves are  $AR_1$  and  $MR_1$  respectively. With the straight line marginal cost curve  $MC$ , the initial equilibrium point is  $E_1$ , which gives rise to equilibrium output  $q_1$  and equilibrium price  $P_1$ . Suppose the AR curve shifts to  $AR_2$  with the corresponding change of the MR curve to  $MR_2$ .

The new equilibrium point  $E_2$  leads to a different equilibrium output level  $q_2$ , but the price level remains the same as before at  $P_1$ . In panel B<sub>1</sub>, the initial average revenue and marginal revenue curves  $AR_1$  and  $MR_1$  give rise to output level  $q_1$  and price level  $p_1$  corresponding to equilibrium point  $E_1$ . The equilibrium point remained the same after change in AR and MR curves to  $AR_2$  and  $MR_2$  respectively. Profit minimizing level of output remained the same as before at  $q_1$ , but the price level changed to  $P_2$ . Changes in demand conditions lead to changes in price with output remaining the same. These results support the view that the monopolist does not have a supply curve.

### **Rule of Thumb for Pricing in Monopoly**

We derived the profit maximizing conditions for a monopolist. The two conditions are as follows:

- (i)  $MR = SMC$
- (ii)  $SMC$  increases in the neighbourhood of equilibrium point.

Most managers of production firms are not familiar with the concept of marginal revenue and they might have information on marginal cost over a limited range of output. We would like to translate the profit maximizing conditions of a monopolist into a rule of thumb that can easily be applied in everyday decision making process. We use the equation on the relationship between price and marginal revenue derived in the last section:

$$MR = AR \left(1 - \frac{1}{E_p}\right)$$

Since in equilibrium  $MR = SMC$ , the above equation can be rewritten as

$$SMC = AR \left(1 - \frac{1}{E_p}\right)$$

Rearranging and writing  $p$  for AR and MC for SMC, we get,

$$\frac{P - MC}{P} = \frac{1}{E_p}$$

The left-hand side of the above equation shows price as a mark-up over the marginal cost as a percentage of price.

The profit maximizing level of price in a monopoly market can be regarded as a process of mark-up pricing. The right hand side of the equation, however, sets a limit on mark-up pricing by the monopolist. The mark-up of price over marginal cost as a percentage of price is equal to the inverse of price elasticity of demand. The percentage of mark-up pricing increases with decreases in price elasticity of demand. Equivalently, the equation can be rearranged to give.

$$P = \frac{MC}{1 - \frac{1}{E_p}}$$

In perfect competition, price elasticity of demand is equal to infinity for a firm ( $E_p = \infty$ ). Hence, we get price equal to marginal cost ( $P = MC$ ) at the equilibrium level of output. In monopoly, the AR curve is downward sloping so that price elasticity of demand is less than infinity ( $E_p < \infty$ ). In that case price becomes equal to some multiple of marginal cost. In other words, price becomes greater than marginal cost ( $P > MC$ ) in a monopoly market.

## Review Questions

- **Essay-type Questions**

1. Explain the equilibrium of a monopoly firm in the short run. Is monopoly price always higher than the competitive price?
2. Explain the equilibrium of a monopoly firm in the long run.
3. How is pricing under monopoly different from that under perfect competition? Can a monopoly firm fix any price for its product?
4. A monopoly firm may earn normal or abnormal profits or may even incur losses in the short run. Do you agree with this statement. Give reasons for your answer.
5. Why is monopoly considered socially undesirable?
6. Unlike a firm under perfect competition, a monopolist does not have a supply curve. Discuss.
7. Compare monopoly and perfect competition with regard to the following:  
price
  - (i) output
  - (ii) welfare
  - (iii) relationship between MC and price

- **True or False**

Which of the following statements are true?

- (a) A monopolist can charge any price to maximise his profits.
- (b) A monopoly firm can fix its price any where along the demand curve.
- (c) If monopoly's  $MC = 0$ , it fixes its price where  $e = 0$ .
- (d) A monopolist is in equilibrium where  $MC = MR$ .
- (e) A necessary condition of monopoly's long run equilibrium is  $AC = AR = MC = MR$ .
- (f) A monopolist produces always less than its optimum capacity.
- (g) There is no unique relationship between price and supply under monopoly.
- (h) Equilibrium price of a monopolist is always higher than that of a competitive firm.

• **Multiple Choice Questions**

1. The profit-maximizing price charged by a monopoly firm corresponds to the point where:
  - a.  $MC = \text{demand}$
  - b.  $ATC = \text{demand}$
  - c. the profit-maximizing quantity equals demand
  - d. the profit-maximizing quantity equals supply.
  
2. A monopoly will earn a pure profit if price is ....., and will incur a loss if price is .....:
  - a. less than  $MC$ ; greater than  $MC$
  - b. greater than  $MC$ ; less than  $MC$
  - c. less than  $ATC$ ; greater than  $ATC$
  - d. greater than  $ATC$ ; less than  $ATC$
  
3. Suppose a monopoly firm faces a downward sloping demand curve (given by a straight line) where  $e = 1$ . What is value of  $MR$ ?
  - a.  $MR > 1$
  - b.  $MR = 0$ , or
  - c.  $MR < 0$ ?
  
4. Suppose monopoly firm facing a demand curve with negative slope has its price at Rs. 100 where  $e = 1$ , then:
  - a.  $MR = \text{Tk. } 50$
  - b.  $MR = \text{Tk. } 100$
  - c.  $MR = \text{Tk. } 0$
  - d.  $MR = \text{Tk. } 200$
  
5. A monopoly firm is in equilibrium where:
  - a.  $AR = AC$
  - b.  $AR > AC$
  - c.  $MR > MC <$
  - d.  $MR = MC$

6. Under monopoly, supply curve has:
  - a. a positive slope
  - b. a negative slope
  - c. a slope = 0
  - d. None of the above
  
7. If MC of a monopoly firm at its equilibrium is Tk. 5 and elasticity of its demand equals -2, then:
  - a.  $P = 5$
  - b.  $P = 10$
  - c.  $P = 15$
  - d.  $P = 50$
  
8. The socially optimum price for a monopoly corresponds to the point where:
  - a.  $MC = demand$
  - b.  $ATC = demand$
  - c. the profit-maximizing quantity equals demand
  - d. the profit-maximizing quantity equals supply.

### Lesson 3: Multiplant and Price Discriminating Monopolists

#### Objectives

After studying this lesson, you will be able to learn:

- How a multiplant monopolist makes price and output decisions; and
- How a price discriminating monopolist makes price and output decisions.

#### The Multiplant Monopolist

A monopolist may own two or more plants whose production costs differ due to differences in location, access to inputs of production and a host of other factors. The production plants have different marginal and average cost curves, though these plants produce the same commodity. Since the commodity is identical for all production plants, these plants face identical demand conditions with identical AR and MR curves. The multiplant monopolist wants to determine the profit maximizing levels of output and price. It can be done in two steps. First, production, will take place in both plants whatever be the total production. Total product would be divided between two plants by equalizing marginal costs of production in two plants. Total cost of production can be reduced through reallocation of total output in two plants until marginal costs are equal. For example, if marginal cost of production in Plant-1 is greater than that in Plant-2, the monopolist can lower total cost by shifting output from Plant-1 to Plant-2. Second, not only the marginal costs should be equal in two plants, but also these marginal costs should be equal to marginal revenue. If marginal revenue remains greater than marginal cost in each plant, increasing output in each plant leads to a larger level of profit. Therefore, the levels of marginal cost in the two plants should be made equal to marginal revenue for maximizing profit of the multiplant monopolist. Figure 7.7 illustrates the process of profit maximization of a multiplant monopolist.

The multiplant monopolist wants to determine the profit maximizing levels of output and price.

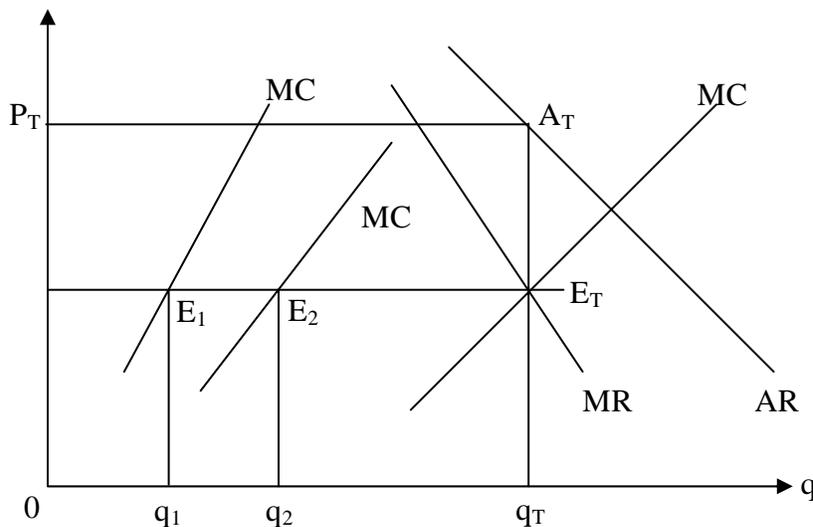


Figure 7.7: Equilibrium of a multiplant monopolist

$MC_1$  and  $MC_2$  are the marginal cost curves of Plant-1 and Plant-2 respectively. These two marginal cost curves are summed horizontally to derive the aggregate marginal cost curve  $MC_T$ . Demand conditions in the market are given by the average revenue curve AR whose marginal revenue curve is MR. Profit maximizing level of aggregate output is  $q_T$  corresponding to equilibrium point  $E_T$  where the MR curve intersects the aggregate marginal cost curve  $MC_T$ . A horizontal line drawn between the equilibrium point  $E_T$  and the vertical axis intersects the  $MC_1$  and  $MC_2$  curves at  $E_1$  and  $E_2$  respectively. The intersection points  $E_1$  and  $E_2$  determine the output levels produced by Plant-1 and Plant-2. Output level for Plant-1 is  $q_1$  and for Plant-2 is  $q_2$ . It should be noted that aggregate output  $q_T$  determines AR and MR of the firm. For example, price of the product of the multiplant monopolist is found to be  $P_T$ , or  $q_T A_T$ . The profit maximizing conditions of multiplant monopolist are:

**Necessary Condition:**  $MC_1 = MC_2 = MC_T = MR$

**Sufficient Condition:** The aggregate marginal cost curve  $MC_T$  must be increasing in the neighbourhood of the equilibrium point.

### The Price Discriminating Monopolist

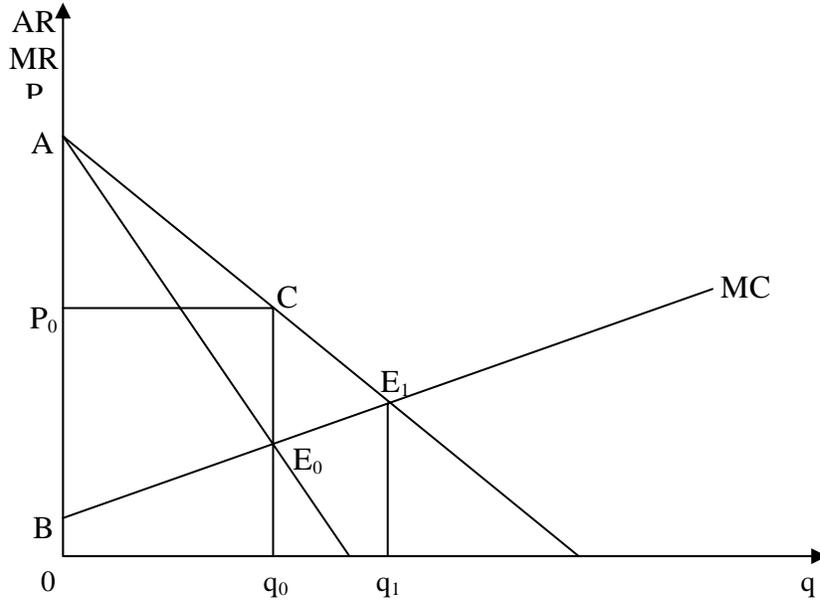
The practice of charging different prices for the same product to different customers or groups of customers is known as price discrimination. Price discrimination can take three forms depending on the grouping criterion applied for charging different prices. These forms are first, second and third degree price discriminations.

#### *First Degree Price Discrimination*

First degree price discrimination takes place when the firm can charge each consumer the maximum price he is willing to pay for the product. Here we assume that the firm sells one unit of the product to each of many customers and each customer pays a price equal to his marginal utility from the product. Since marginal utility for a commodity is not the same for all consumers, it means that different consumers are paying different prices for one unit of the same commodity. The firm can capture all consumer surplus from the consumers by using this kind of pricing. We will explain next why this happens. We know that a monopolist faces a downward sloping demand curve for his products. A particular point on the demand curve shows the quantity of output that the monopolist can sell at the price given by the point. The price at the point is equal to the marginal utility of the consumer located at that point, whom we call the marginal consumer. Though the consumers before the marginal consumer are getting the product at the same price, they were willing to pay prices higher than the current price since their marginal utilities from the commodity were higher. In other words, the consumers before the marginal consumer can enjoy consumer surplus because all units of output upto the marginal unit are sold at a time at a price equal to marginal utility of the marginal consumer. We call this method of selling some units of the commodity at a time the bulk-method. If instead of using the bulk-method, the firm-owner could sell his product by one unit at each step to one customer, he could charge a price equal to the marginal utility of the consumer. In such a case, price would be different for each consumer, the person with high marginal utility for the product paying a high price and so on. Since

A monopolist faces a downward sloping demand curve for his products.

each unit of the product is being sold at a different price, price will be equal to incremental revenue or MR of the monopolist. In other words, the AR curve of



**Figure 7.8: First-degree price discrimination**

the monopolist turns out to be the MR curve under first degree price discrimination. In the case of bulk-selling, the monopolist has to lower the price if he wants to increase his current sale level. For example, suppose the monopolist sold 20 units of the commodity at a price of Tk. 20 previously. Now he sells 22 units at a price of Tk. 19 so that his MR now becomes Tk. 9. We notice that here  $MR < AR$ , because the monopolist has to accept the lower price of Tk. 19 for the extra 2 units as well as for the previous 20 units. Figure 7.8 explains price and output determination under first degree price discrimination. In this diagram, we have drawn the down ward sloping AR and MR curves and the upward sloping MC curve of the monopolist. The normal monopolist maximizes profit at output  $q_0$  and price  $P_0$ . Total profit of the monopolist is the sum of all marginal profit for output levels upto  $q_0$  units. Marginal profit measured by the difference between the MR and MC curves is the highest for the first unit and zero for the last unit, the  $q_0$ th unit, of the commodity sold. Total profit here is given by the area of the triangle  $\Delta ABE_0$ . Suppose the monopolist has all the information and capability to practise first-degree price discrimination here and decides to do it. As explained earlier, the AR curve of the monopolist now becomes the MR curve, but the MC curve remains the same. Profit maximizing level of output is now  $q_1$  where the MC curve intersects the AR curve. Marginal profit of the first degree price-discriminating monopolist is measured by the difference between the AR curve and the MC curve. Maximum profit of the price-discriminating monopolist can be obtained by summing the marginal profit for all output levels upto the  $q_1$ th unit where marginal profit is zero. In other words, it is equal to the area of the triangle  $\Delta ABE_1$ . It can be easily seen that both output and profit of the monopolist increases under first degree price discrimination.

Total profit of the monopolist is the sum of all marginal profit for output levels upto the equilibrium level of output.

It is almost impossible to charge every customer a price equal to his reservation

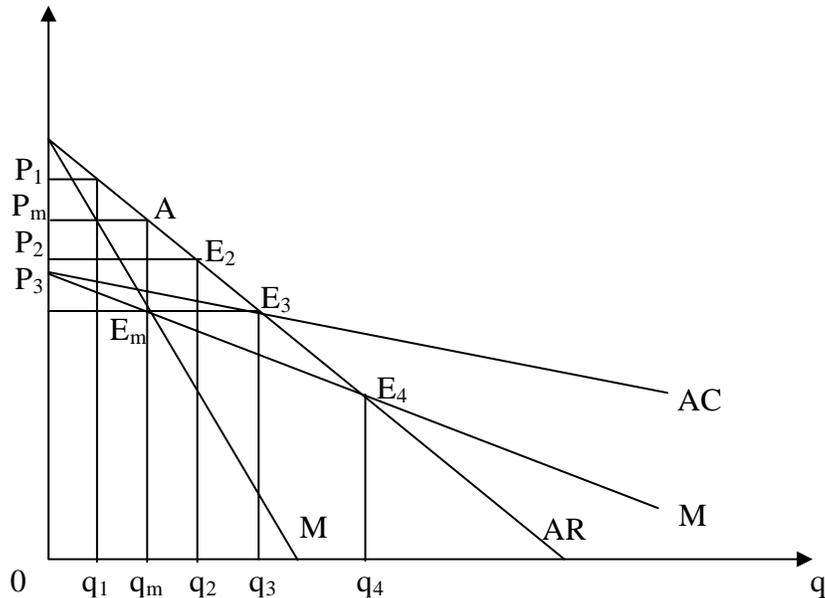
price. The customers are not willing to reveal their reservation prices for the commodity - after all doing so will hurt their interests. Though first degree price discrimination is not possible, imperfect first degree price-discrimination may be applied if the firms are professionals like doctors, lawyers and accountants, who are well-informed about the ability and willingness to pay of their clients. Doctors can charge allow a lower fee to low income patients and a higher fee to upper-income or better measured patients. An accountant who completed the income tax return for his client is better informed about the ability to pay of his client.

**Second Degree Price Discrimination**

The monopolist charges different prices for different output ranges under second degree price discrimination. For example, the monopolist can set a price of Tk. 10 for output units between the 1st and the 10th, Tk. 9 for units between the 11th unit and the 20th unit and Tk. 8 for units beyond the 21st unit. In Bangladesh, for example, the PDB charges different prices for different quantities of electricity consumed. Per Kilowatt-hour price of electricity up to 100 Kilowatt-hours is different from the same for more than 100 kilowatt-hours. This type of pricing policy is called second-degree price discrimination which is widely practised in industries enjoying economies of scale. In natural monopolies where both average cost and marginal cost decline with increase in the level of production, profit maximizing level of price may lead to a smaller quantity of output. In such a case, the level of output can be increased to reap the benefits of economies of scale in the form of falling average and marginal costs and second degree price discrimination can be applied to sell the increased level of output.

In natural monopolies where both average cost and marginal cost decline with increase in the level of production.

We demonstrate the application of second degree price discrimination in Figure 7.9. As we notice, the AC and MC curves are declining throughout the entire range of output. With downward sloping AR and MR curves, which are flatter than the AC and MC curves, the equilibrium point is  $E_m$  where the MC curve intersects the MR curve. Profit maximizing levels of output and price corresponding to equilibrium point  $E_m$  are  $q_n$  and  $P_n$  respectively. Since price is



**Figure 7.9: Second-degree price discrimination**

greater than marginal cost at the equilibrium level of output ( $q_m A > q_m E_m$ ), the government attempts to regulate the monopoly by setting the price  $q_4 E_4$  where price equals MC. Such a price, however, may not be acceptable to the monopolist because price is less than average cost AC at  $q_4$ . If the government insists on the price  $q_4 E_4$ , the monopolist goes out of business. Alternatively, the government can fix the price  $q_3 E_3$  corresponding to point  $E_3$  where price equals average cost. Such a price may be acceptable to the monopolist because he is at least breaking even at this price. At  $E_3$ , the output level is  $q_3$  which the society can afford to produce at most through price regulation. The agony of price regulation can be avoided altogether instead of charging the profit maximizing level of price  $P_m$  to each of the consumers, the monopolist divides the  $q_3$  level of output into three blocks, viz,  $0-q_1$ ,  $q_1-q_2$  and  $q_2-q_3$ . He then charges the higher price  $p_1$  to all customers in the first block, the medium price  $P_2$  to all consumers in the second block and the lowest price  $P_3$  to all consumers in the third block. Since the lowest price of the monopolist under second degree price discrimination is equal to the regulated price  $q_3 E_3$ , the government would not be willing to regulate the monopolist.

### ***Third Degree Price Discrimination***

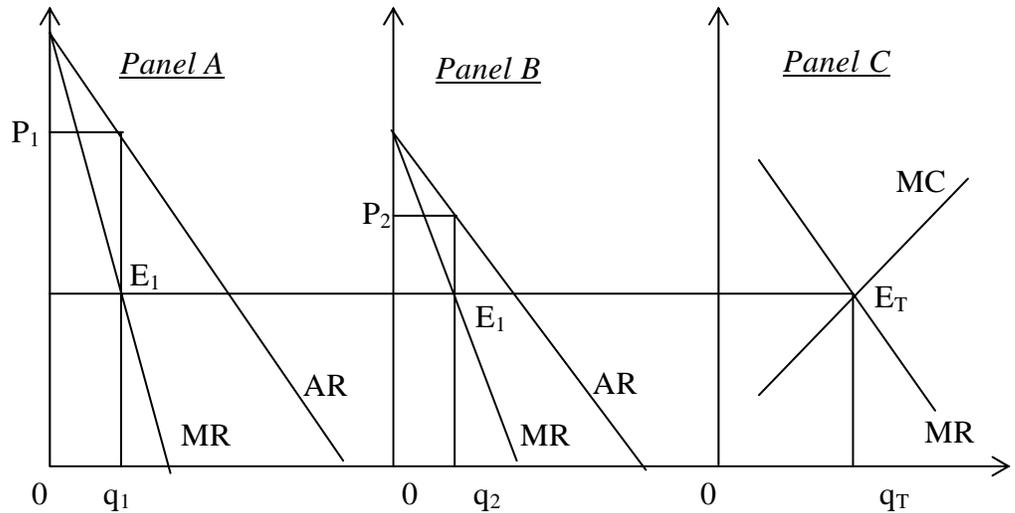
In third degree price discrimination, the monopolist divides the market for his commodity into two or more sub-markets with a different value of price elasticity of demand in each sub-market and then charges different prices in different sub-markets. The market is divided using some criteria of classification which ensures that price elasticities of demand would be different in different **sub**-markets. Whatever be the basis of classification, three prerequisites must be met for successful practicing of third degree price discrimination. First, the consumers should be identifiable for the purpose of being classified into different sub-markets. Second, the cost of buying the commodity at a low price in one sub-market and selling it at a higher price in another sub-market should be higher than the increased profit from doing so. The cost of reselling the commodity may be high due to high transport cost or physical impossibility of reselling or any other reasons. For example, a doctor charges a low fee to a poor patient and a higher fee to a solvent patient. Now it is almost impossible for the poor patient to buy the doctor's service cheap and sell it dear to another patient. These prerequisites require that the price elasticities of demand be different in different sub-markets. Let's explain how price and output decisions are made under third degree price discrimination with the help of Figure 7.10, which has three panels.

The consumers should be identifiable for the purpose of being classified into different sub-markets.

In Panel A,  $AR_1$  and  $MR_1$  are the average revenue and marginal revenue curves of the first sub-market. The average revenue and the marginal revenue curves in the second sub-market are  $AR_2$  and  $MR_2$ . We add the  $MR_1$  and  $MR_2$  curves horizontally to derive the aggregate MR curve,  $MR_T$  of the monopolist in panel C. No matter how much output the monopolist produces, this output should be divided into two sub-markets by equalizing the MR values. If the MR values are not equal in the two sub-markets, total revenue can be increased by a reallocation of total output. If for example,  $MR_1$  remains greater than  $MR_2$ , total revenue can be increased by shifting output from the second sub-market to the first sub-market. Not only the MR values should be made equal in two sub-markets, but also these MR values should be equal to marginal cost. In panel C, the equilibrium point of the monopolist is  $E_T$  where the marginal cost curve MC intersects the aggregate marginal revenue curve  $MR_T$ . The equilibrium level of

aggregate output is found to be  $q_T$  corresponding to equilibrium point  $E_T$ .

We draw a horizontal line from equilibrium point  $E_T$  to the vertical exits of panel C and extend it to panel B and Panel A. The horizontal line intersects the  $MR_1$



**Figure 7.10: Third-degree price discrimination**

and  $MR_2$  curves at points  $E_1$  and  $E_2$  respectively. These intersection points determine output levels of the first and second sub-market which are  $q_1$  and  $q_2$  respectively. By drawing vertical line to the curve from the intersection point on the MR curve in each sub-market, we find the price level to be  $P_1$  in the first sub-market and  $P_2$  in the second sub-market. We can formalize the conditions of profit maximization under third degree price discrimination as follows:

**Necessary Condition:**  $MR_1 = MR_2 = MR_T = MC$ .

**Sufficient Condition:** The MC curve must be increasing in the neighbourhood of the equilibrium point.

It is found that price level is high in the sub-market with inelastic demand curve and lower in sub-market with elastic demand curve.

## Review Questions

- **Essay-type Questions**

1. What is a multiplant monopolist? How a multiplant monopolist make price and output decisions?
2. What is price discrimination? Explain and distinguish between the first, second and the third degree of price discrimination.
3. What are pre-requisites of price discrimination? How does a discriminating monopolist allocate his output in different markets to charge different prices?
4. What are the necessary conditions of price discrimination under monopoly? Show how a profit maximising discriminating monopolist distributes his output in two markets and charge different prices?

- **True or False**

Which of the following statements are true?

- (a) Price discrimination is possible only when demand curves are identical in two markets.
- (b) The practice of charging different prices for the same product to different customers or groups of customers is known as price discrimination.
- (c) First degree price discrimination takes place when the firm can charge each consumer the maximum price he is willing to pay for the product.
- (d) A monopolist may own two or more plants whose production costs differ due to differences in location.

- **Multiple Choice Questions**

1. Multiplant monopolist may own:
  - (a) at best two plants
  - (b) at least three plants
  - (c) at least four plants
  - (d) at least two plants
2. The necessary condition of profit maximization under third degree price discrimination is:
  - a)  $MR_1 = MR_2 = MR_T = MC$
  - b)  $MR_1 = MC$
  - c)  $MR = MC$
  - d)  $MR_2 = MC$

3. The practice of charging .....prices for the .....product to .....customers or groups of customers is known as price discrimination:
  - a) different; same; different
  - b) same ; same; different
  - c) different; different; same
4. The profit maximizing conditions of multiplant monopolist are:
  - a)  $MC_1 = MR$
  - b)  $MC_1 = MR$
  - c)  $MC_1 = MC_2 = MC_T = MR$
5. The monopolist charges .....prices for .....output ranges under .....degree price discrimination:
  - a) different; different; second
  - b) ifferent; same; second
  - c) different; different; first

### Lesson 4: Monopoly Power, Regulating the Monopoly and the Comparison Between Competitive and Monopoly Markets.

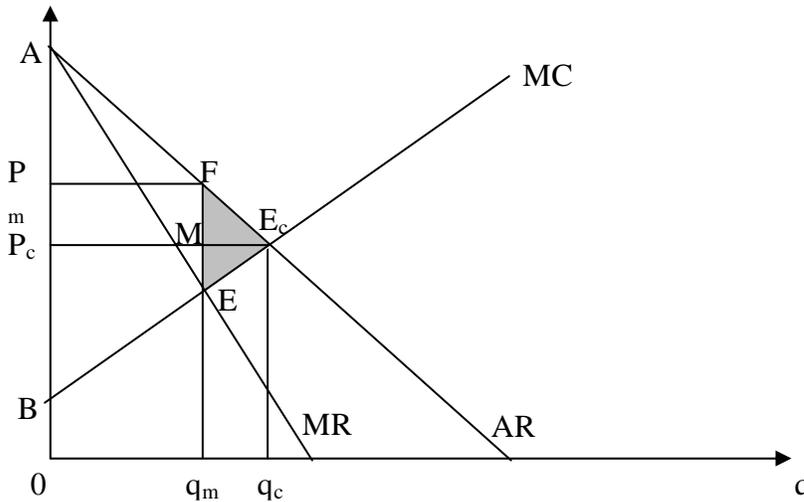
#### Objectives

After studying this lesson, you will be able to:

- Compare between competitive and monopoly markets;
- State the measures of monopoly power; and
- State how the monopoly can be regulated.

#### Comparison Between Competitive and Monopoly Markets

Here we compare the monopoly market with the competitive market and note its implications for social welfare of the country. We use Figure 7.11 for this comparison. In the figure the AR and MR curves represent the average



**Figure 7.11: Comparison between competitive and monopoly market**

revenue and marginal revenue curves of the industry when we take the case of perfect Competition. Alternatively, the AR and MR curves represent the average revenue and marginal revenue curves of the monopolist. Suppose, initially, the market was competitive. Since in competitive equilibrium price equal marginal cost, the Point  $E_c$  in Figure 7.11 represents the competitive equilibrium yielding competitive output  $q_c$  and the competitive price  $P_c$ . Under perfect competition, consumer's surplus is equal to the area of the triangle  $\Delta AP_cE_c$  and producer's surplus is equal to the area of the triangle  $\Delta BE_cP_c$ . Now suppose the competitive market turns into monopoly market for reasons not mentioned here. The equilibrium Point under monopoly market becomes  $E_m$  where the MC curves intersects the MR curve. Monopoly output and price are  $q_m$  and  $P_m$  respectively. As we can see in the figure, the immediate effect of the transformation of the competitive market into the monopoly market is a reduction in output and a rise in price. Consumer's surplus decreases by an amount equal to the area of the

trapezium  $P_m P_c E_c F$  of which the amount represented by the area of rectangle  $P_m P_c M F$  goes to the monopolist in the form of higher price. There is a redistribution of income from the consumers to the monopolist. the rectangle  $P_m P_c M F$  is a portion of the loss of consumer's surplus compensated by the gain to the monopolist, but the loss shown by the area of the triangle  $F M E_c$  is not compensated. Due to reduction in output, the producer loses total revenue equal to the area of the rectangle  $q_m M E_c q_c$  of which the area of the trapezium  $q_m E_m E_c q_c$  represents savings in total cost of the producer. The area of the triangle  $M E_m E_c$  is not compensated by savings in cost. Total loss of the economy which cannot be compensated by any gain due to the emergence of a monopoly market is equal to the area of the triangle  $F E_m E_c$ , which is known as the **dead weight loss** of the monopoly. It is the presence of this deadweight loss of monopoly which instigates most of the public opinions against monopoly. Even most economists publicly claim their dislike for monopoly markets and would like the monopoly markets to be regulated by the government authorities.

### Measures of Monopoly Power

Earlier we derived rule of thumb followed in monopoly pricing. Pricing at the maximum profit was shown to be equivalent to mark-up pricing where the mark-up is the difference between price and marginal cost. This mark-up expressed as a percentage of price is equal to the inverse of absolute value of price elasticity of demand. The ratio of mark-up to price was used as a measure of monopoly power by economist *Ababa Lerner* in 1934 and is called **Lerner's degree of monopoly power**:

$$L = (P - MC) / P = (1 / E_p)$$

Where  $E_p$  is the absolute Value of price elasticity of firm's demand. In the case of perfect competition, price equals marginal cost making the measure of monopoly power  $L$  zero. Equivalently, substitution of an infinite value of  $E_p$  for a competitive firm makes  $L$  zero.

Two other measures of monopoly power frequently used are the **concentration ratio** and the **Herfindahl index**. The concentration ratio expresses total output of the top firms of the industry as the percentage of the total industry output. There may be many concentration ratio depending on how many top firms are being considered for calculating these ratio. The most commonly used concentration ratio is four-firm concentration ratio which considers output of the top four firms of the industry for calculating the concentration ratio. The market is a monopolistically competitive market for a concentration ratio of less than 40%, an oligopoly market for concentration ratio between 40% and 60% and a monopoly market for concentration ratio greater than 60%. One problem with concentration ratio is that it shows the share of four firms' output in total industry output without giving any information about share of each firm. The Herfindahl index is calculated by summing the squares of all firms, percentage shares in total industry output. The US Department of Justice considers a Herfindahl index of less than 1000 as an evidence of competitiveness of an industry. An industry having a Herfindahl index greater than 1000 is deemed to possess monopoly power.

The Herfindahl index is calculated by summing the squares of all firms, percentage shares in total industry output.

### Regulation of Monopoly

A lower level of output sold at a higher price is the undesired effect of a monopoly market. A monopoly market also gives rise to deadweight loss to society as well as a redistribution of income in favour of the monopolist. The harmful effects of monopoly necessitates regulation of monopolies taking the long-run equilibrium of the competitive firm as a benchmark. The three features of long-run equilibrium of a firm under perfect competition are as follows:

1. Price equals marginal cost eliminating monopoly power,
2. The firm earns normal profit eliminating supernormal profit
3. The firm produces at the minimum LAC eliminating excess capacity.

A monopoly market also gives rise to deadweight loss to society as well as a redistribution of income in favour of the monopolist.

Regulation of monopolies can take different forms depending on the relative positions of the demand and cost conditions of the monopolist. It also depends on which of the two desired features of the competitive equilibrium the authority wants to achieve through the regulation of monopolies. We select three specific situations of relative positions of the demand and cost conditions of the monopolist and examine how the desired features of the competitive equilibrium can be attained. The three specific situations are as follows:

1. The AR curve intersects the MRC curve above the AC curve.
2. The AR curve intersects the MC curve below the AC curve.
3. The case of natural monopoly where both the AC and MC curves are downward sloping.

#### First Case: The intersection point of the AR and MC curves lies above AC.

We illustrate the first situation with the help of Figure 7.12  $E_m$  is the equilibrium point of the profit maximizing monopolist whose output and price are  $q_m$  and  $P_m$  respectively. Since  $AR > AC$  at the equilibrium output  $q_m$ , the monopolist is earning supernormal profit. The regulatory agency of the government can fix the

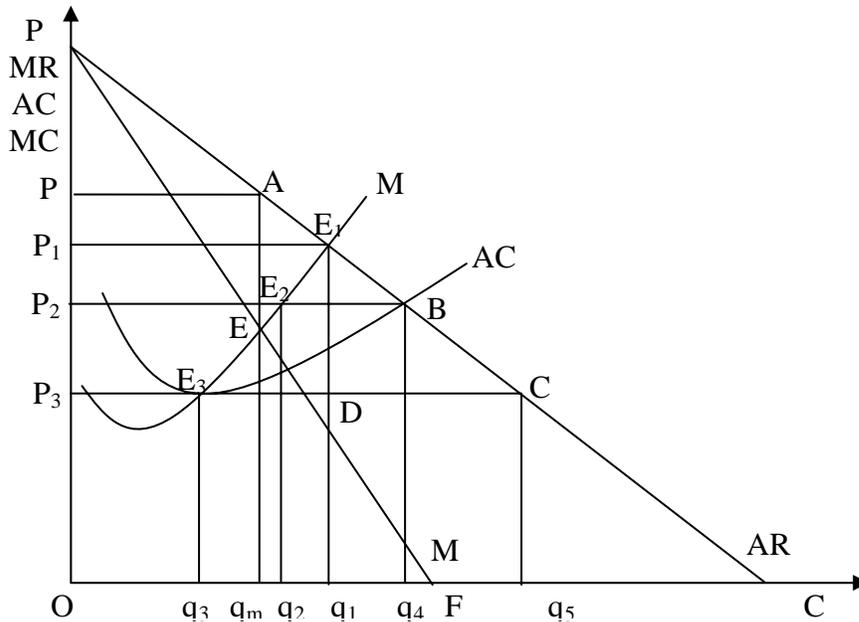
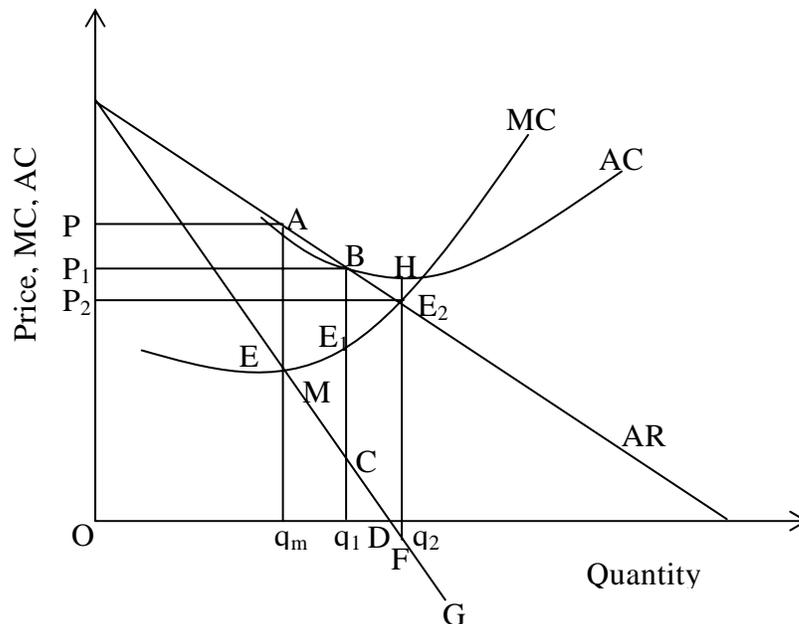


Figure 7.12: Regulation of monopoly

price at  $p_1$  corresponding to Point  $E_1$  on the AR curve where price equals marginal cost. The effective marginal revenue curve then becomes  $P_1E_1DF$  with the discontinuous portion between E and D. The effective marginal revenue curve intersects the MC curve at  $E_1$ , which determines the output  $q_1$ . Though the monopolist is still earning supernormal profit at the regulated price  $P_1$ , monopoly power has been reduced to zero from the initial level of  $AEm/P_m$ . If the regulatory agent wants to eliminate supernormal profit, it can set the price  $P_2$  corresponding to the Point where price equals average cost. The horizontal straight line  $P_2E_2B$  then becomes a portion of the effective marginal revenue curve which intersects the MC curve at  $E_2$ . The equilibrium output is  $q_2$  corresponding to the Point  $E_2$ . Since the regulated price  $P_2$  is equal to MC at  $E_2$ , monopoly power is still zero, but supernormal profit has not been eliminated altogether. Moreover, an excess demand for the commodity by an amount  $q_2q_4$  develops at the regulated price  $p_2$ . If price is regulated at further low levels, supernormal profit decreases and excess demand for the commodity increases. If price is regulated at  $P_3$ , equilibrium occurs at  $E_3$ , the minimum Point of the average cost curve AC. Both the monopoly power and supernormal profit of the firm disappear at equilibrium output  $q_3$ , but excess demand for the commodity increases to the level of  $q_3q_5$ . If price is set below  $P_3$ , the level of minimum average cost, the monopolist cannot break even and goes out of business. Regulation of monopoly should be handled cautiously because excess demand for the commodity develops when price is set below the level which eliminates monopoly power. There will be a tendency in the market to evade such price regulations and the cost of monitoring price regulation may indeed be very high.

If price is regulated at further low levels, supernormal profit decreases and excess demand for the commodity increases.

**Second Case : The intersection Point of the AR and MC curves lies below AC**



**Figure 7.13: Regulation of monopoly**

The situation mentioned above has been depicted in Figure 7.13. The price and output levels of profit maximizing monopolist are found to be  $q_m$  and  $p_m$  respectively given by the equilibrium Point  $E_m$ . Since at the equilibrium level of output  $AR > AC$ , the monopolist is making supernormal profit if the regulatory

agency aims at abolishing supernormal profit here, it will set the price at  $p_1$  corresponding to the Point B where average revenue equals average cost. At the regulated price  $p_1$ , the marginal revenue becomes  $p_1BE_1C$ DFG of which the portion  $E_1C$  is discontinuous. The MC curve intersects the new marginal revenue curve at  $E_1$ , which determines the equilibrium output  $q_1$ . The equilibrium price level  $P_1$  is now equal to average cost  $q_1B$  yielding normal profit for the monopolist. Since at the equilibrium output  $q_1$ , marginal cost  $q_1E_1$  is less than price  $q_1B$ , monopoly power still exists though it has been reduced from the earlier level. The price level can also be fixed at  $p_2$  corresponding to Point  $E_2$  where marginal cost equals price. The effective marginal revenue curve now becomes  $p_2E_2q_2FG$  which intersects the MC curve at  $E_2$ . The equilibrium output and price levels are now  $q_2$  and  $p_2$  respectively. Though the monopoly power has been eliminated at the regulated price  $p_2$ , price is less than average cost by an amount  $E_2H$  at output level  $q_2$ . The monopolist incurs a loss and goes out of business in the long-run if he is not supported financially by giving subsidies.

**Third Case: Regulation of Natural Monopolies**

The process of regulating natural monopolies has been explained with the help of Figure 7.9 in the context of second degree price discrimination discussed in Lesson-3 of this unit. It was shown in Figure 7.9 that regulating price at the level where average cost equals price could be a feasible method of controlling natural monopolies.

We analyzed the mechanism of regulating monopoly under different demand and cost conditions. It is almost impossible to achieve the twin goals of eliminating both monopoly power and supernormal profit through price regulation. Suppose, cost of production is low so that the intersection point of the average revenue and marginal cost curves lies above the average cost curve. Fixing price at less than the competitive level of price being equal to marginal cost ( $P = MC$ ) results in excess demand for the commodity. The excess demand would put upward pressure on the price jeopardizing the ultimate objective of price regulation. Implementing and monitoring such price controls may be very much expensive. When cost of production is high so that the intersection point of the average revenue and marginal cost curves lies below the average cost curve, fixing price at the competitive level results in loss for the firm in the long run. Operating firms in such a situation necessitates the provision of subsidy. Controlling a monopoly through price ceiling and then subsidizing it to compensate for the loss may seem paradoxical to the lay public. Instead the firm may be brought under state ownership. Even the transfer of ownership may not solve the problem of price being less than average cost under marginal cost pricing. Giving subsidy to the state-owned firm may worsen the problem by creating wide spread corruption and inefficiency in production and management. As a result, the amount of subsidy increases gradually and the economy gets trapped into an irreversible culture of subsidy. Even a private firm may suffer from the same problem, though the problem is not acute in this case. The method of subsidizing the private and the state-owned firms cannot be justified on efficiency grounds. Another method of avoiding the undesirable effects of monopoly is to resist the formation of monopoly through anti-trust laws. Further, the existing monopolies can be disintegrated and broken down into small-scale enterprises by passing laws.

The intersection point of the average revenue and marginal cost curves lies below the average cost curve.

## Review Questions

- **Essay-type Questions**

1. (a) Compare the profit-maximizing price and quantity for a monopoly with the values in a monopoly with the values in a perfectly competitive industry. Assume the same marginal cost and demand for both.  
(b) In attempting to maximize profits, do owners of a monopoly act differently than owners of perfectly competitive firms? Explain.
2. How is pricing under monopoly different from that under perfect competition? Can a monopoly firm fix any price for its product?
3. Explain the equilibrium of a monopoly firm in the short run. Is monopoly price always higher than the competitive price?
4. What is monopoly power? How it can be measured?
5. Why is it needed to regulate monopoly? Describe different cases of regulating monopolies.
6. Compare monopoly and perfect competition with regard to the following:
  - (a) price
  - (b) output
  - (c) welfare
  - (d) relationship between MC and price

- **True or False**

Which of the following statements are True?

- (a) A monopoly market gives rise to deadweight loss to society as well as a redistribution of income in favour of the monopolist.
- (b) This mark-up expressed as a percentage of price is equal to the inverse of absolute value of price elasticity of demand.
- (c) Total loss of the economy which cannot be compensated by any gain due to the emergence of a monopoly market is known as the dead weight loss of the monopoly.
- (d) Monopolist may incur loss and go out of business in the long-run.
- (e) The concentration ratio expresses total output of the top firms of the industry as the percentage of the total industry output.

• **Multiple Choice Questions**

1. The most precise measure of monopoly power is the  $(P-MC)/P$ . The value of this is ..... for perfect competition and ..... as the market moves toward pure monopoly:
  - a. one; increases
  - b. one; decreases
  - c. zero; increases
  - d. zero; decreases
2. Lerner's degree of monopoly power:
  - a.  $L = (P-MC)/P = (1/E_p)$
  - b.  $L = (MR-MC)/P$
  - c.  $L = (MR-MC)/MR$
3. The Herfindahl index is used to measure:
  - a. consumers' living standard
  - b. elasticity
  - c. monopoly power
  - d. price discrimination
4. Anti-trust laws are used:
  - a. to resist the formation of monopoly
  - b. to encourage monopolists
  - c. to discourage competition
  - d. to discourage consumption
5. Quantity produced in perfect competition is ..... than.....monopoly:
  - a. less; that
  - b. less; that of
  - c. larger; that of
  - d. larger; the

- **Problem**

*Read and analyse the following news-story carefully*

**Foxy Soviets Pelt the West**

***Sable Monopoly Traps Hard Currency, Coats Capitalists***

LENINGRAD-Crown sable from the eastern Siberian region of Barguzin, star of the Soviet fur collection, went on sale just as a deep freeze gripped this former imperial city.

It was a good day to sell furs and on that day late last month, the first in the 99th Leningrad fur auction, the Soviet Union collected a cool \$30 million from merchants of high fashion gathered from around the capitalist world.

Fur is one of the Soviet Union's best known consumer goods exports. It is also bait for a country eager to trap hard currency: last year, the Soviet Union earned \$100 million in fur sales.

In the case of sable, the Soviet Union has something on one else has — in capitalist lingo, a monopoly.

Ivan the Terrible is said to have made the sale of live sables abroad a crime punishable by death. Peter the Great on his travels in the West is said to have carried along trunks of sable skins to use as currency.

In the best-selling novel Gorky park, popular among fur traders, it was the Soviet sable monopoly that was the key to the tangled tale of murderous intrigue.

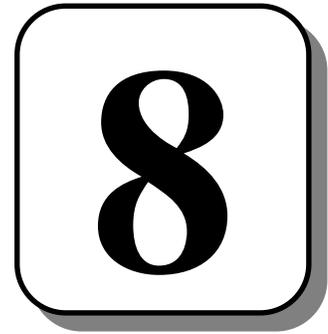
There is another story, origin and veracity unknown, that an American once traded a rare North American species to the Soviets in exchange for two live Russian sables — only to find when he got home that they had been sterilized.

-Celestine Bohlen

**Source:** *The Washington Post*, February 5, 1985,p.A10.© 1985, The Washington Post.

**Hints:** To ward off potential competition, a monopoly must erect barriers to entry. By not letting live sables leave the country, Russia maintained on sable furs.

# MONOPOLISTIC COMPETITION AND OLIGOPOLY



## **Highlights**

- ❑ Equilibrium of Monopolistically Competitive Firm
- ❑ Excess Capacity in Monopolistic Competition
- ❑ Comparison between Perfect Competition and Monopolistic Competition
- ❑ Comparison between Monopoly and Monopolistic Competition
- ❑ Characteristics of Oligopoly
- ❑ Nash Equilibrium
- ❑ Price and Output Determination in Oligopoly Under Different Models

School of Business

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## Unit-8

### *Lesson 1: Monopolistic Competition*

#### Objectives

After studying this lesson, you will be able to:

- State the characteristics of monopolistic competition;
- Explain the short-run equilibrium of a monopolistically competitive firm;
- Explain the long-run equilibrium of a monopolistically competitive firm;
- Explain the concept of excess capacity that arises in monopolistic competition;
- Compare monopolistic competition with perfect competition and monopoly; and
- Explain the nature of profit maximizing level of selling cost.

#### Characteristics of Monopolistic Competition

Monopolistic competition is characterized by many firms selling differentiated products to the buyers. The number of sellers in monopolistic competition is large but not so large as to make each firm a price-taker as in perfect competition. Since there are many sellers in monopolistic competition, a single firm does not take into account the reactions of its rivals when it makes output and pricing decisions. The rivals are not likely to take any retaliatory action because the pricing and output decision of a particular firm will have a very negligible effect on their price and output levels. Most often such effects go unnoticed and unassessed so that the rivals don't show any reactions. There is, of course, one reason for a firm's being price-maker in monopolistic competition. The monopolistically competitive firms sell differentiated products in the market. Each firm's product is made different from the similar products of other firms for attracting customers. All the monopolistically competitive firms producing and selling similar but differentiated products comprise what may be called a product group. Product differentiation can be real or fancied, but its effectiveness in stimulating the sale level depends on the perception of the customers about the superiority and peculiarity of the product. The perception of product differentiation can be created using different techniques and a few familiar techniques of product differentiation in making differences in the quality and quantity of the product, brand names and packages, salesmanship and post-sale customer services. Since the commodities are similar though not homogeneous, they are close substitutes for each other. Cross elasticity of demand for any pair of these commodities is very high. Product differentiation leads to attachment of some customers to the product of a firm. The physical traits and the external appearance of the product match with the preferences of these consumers who are rather willing to pay a high price for the commodity than going for some other products. The association between customers and the product enables the monopolistically competitive firm to exert some influence on the price and quantity of the product. In other words, the firm possesses some monopoly power for the product and the average revenue curve of the firm slopes downward to the

The monopolistically competitive firms sell differentiated products in the market.

Product differentiation leads to attachment of some customers to the product of a firm.

right. Though the demand curves for both the monopolist and monopolistically competitive firm are downward sloping, they differ in values of price elasticity of demand. The presence of a large number of close substitutes for the product of a monopolistically competitive firm makes its demand curve highly elastic - more elastic than the demand curve of the monopolist. The monopolistically competitive firm has policy instruments other than price to choose for maximizing its profit. Sometimes a firm under monopolistic competition is reluctant to engage in price wars because such price changes may lead to reduced sale or reduced revenue. Instead it can increase its profit by making changes in the variety of the product. It keeps changing the variety of the product until it selects the best product which brings the maximum profit at a given price. Similarly, the firm can increase its profit by spending some money on advertising while keeping the price and variety of the product fixed. The advertisement expenditures known as selling costs help a firm hold on to its old customers as well as attract new customers and other customers from its rivals. The firm chooses the profit maximizing level of selling costs while the variety and price of the product are kept fixed. Finally, the firms in monopolistic competition can leave or exit the group in the long run. This feature of monopolistic competition is identical with that of perfect competition. It is said that monopolistic competition contains elements of both perfect competition and monopoly. The competitive elements are the presence of a large number of sellers in the market and the independence to enter or leave the group in the long run. The monopoly element stems from the privilege of creating product differentiation which make the demand curve of the monopolistically competitive firms downward sloping. To sum up, there are four essential features of monopolistic competition:

The firms in monopolistic competition can leave or exit the group in the long run.

1. Many Sellers;
2. Differentiated products;
3. Multiple policy variables viz. price, product and selling cost; and
4. Free Entry or exit.

### **Short-Run Equilibrium of a Monopolistically Competitive Firm**

As in other market structure, the goal of a firm in monopolistic competition is to maximize its profit. The profit maximizing conditions are also the same as in other market forms:

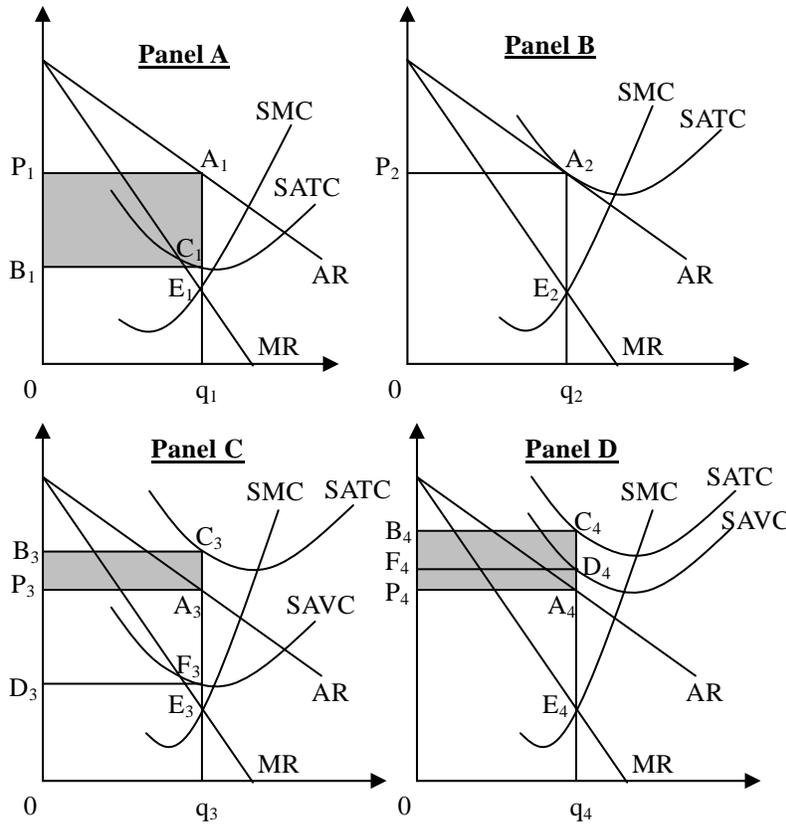
**Necessary condition:**  $MR=SMC$

**Sufficient condition:** SMC increases in the neighbourhood of equilibrium

In monopolistic competitive market a firm shuts down in the short-run if its total loss exceeds total fixed cost.

Since the profit maximizing and entry conditions are the same as in perfect competition, the short-run equilibrium of a monopolistically competitive firm is identical with that of a perfectly competitive firm with regard to profit. In other words, the firm under monopolistic competition may earn normal profit, or it may earn supernormal profit or it may incur loss in the short run. The firm shuts down in the short-run if its total loss exceeds total fixed cost. Figure 8.1 shows the four positions of short-run equilibrium of a firm under monopolistic competition. There are four panels in Figure 8.1, Panel A shows the short-run equilibrium point  $E_1$  at which output and price are  $q_1$  and  $P_1$

respectively. The firm makes a supernormal profit equal to area  $P_1B_1C_1A_1$ . In panel B, the equilibrium point is  $E_2$  which gives rise to output  $q_2$  and price  $P_2$ . Here the firm earns normal profit. In Panel C, corresponding to equilibrium point  $E_3$ , output is  $q_3$  and price is  $P_3$ . The firm here incurs a loss equal to area  $A_3C_3B_3P_3$  which is, however, less than total fixed cost  $D_3F_3C_3B_3$ . In panel D, the equilibrium point  $E_4$  shows a total loss equal to area  $P_4A_4C_4B_4$  which is greater than total fixed cost  $F_4D_4C_4B_4$ . The firm shuts down in a situation depicted by Panel D of Figure 8.1.



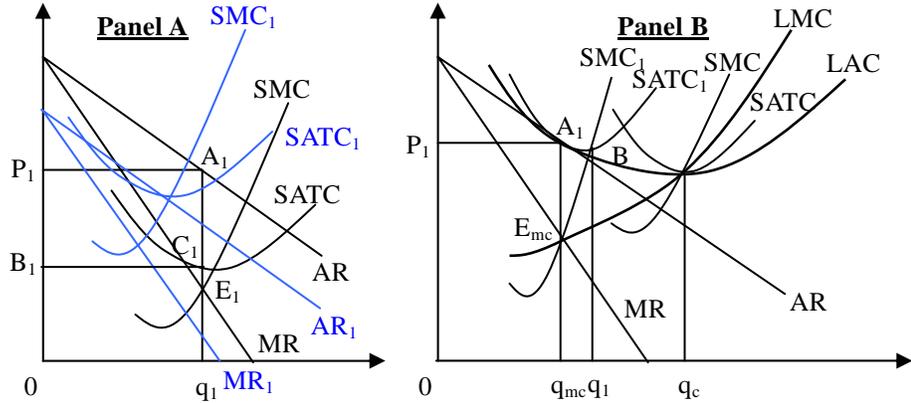
**Figure 8.1: Short-Run Equilibrium of Monopolistically competitive firm**

**Long-Run Equilibrium of Monopolistically Competitive firm**

In monopolistic competition, firms can enter or leave the group in the long run. This feature of monopolistic competition makes it impossible for a firm to earn supernormal profit and incur loss in the long run. The long run equilibrium of a monopolistically competitive firm is characterized by the presence of normal profit. To see why it is so, we consider the case of a firm which makes supernormal profit in the short run as shown by Panel A of Figure 8.2. We assume identical cost and demand conditions of all firms in the group, though their products are differentiated. Since each of the firms in the group is making supernormal profit equal to the area  $B_1C_1A_1P_1$  in Panel A, new firms will enter the group and produce similar but differentiated products. As a result, the share of each firm in total output of the group will fall as shown by the leftward shift of the AR and MR curves in Panel A. The

The long run equilibrium of a monopolistically competitive firm is characterized by the presence of normal profit.

falling share of each firm will reduce the level of supernormal profit and in an attempt to regain the previous level of supernormal profit, the firm will improve the variety of the product. Such improvement and innovations entail some expense which cause the AC and MC curves to shift to the right. This process of shifting the demand and cost curves will continue until the demand curve becomes tangent to the average cost curve at the falling portion of the average cost curve. Supernormal profit will be totally eliminated and in the



**Figure 8.2 : Long run equilibrium of a firm in monopolistic competition**

long run each monopolistically competitive firm will only earn normal profit. Similarly, if each firm incurs loss in the short run, some firms will leave the group enabling some of the existing firms to earn normal profit. It should be noted that the firm will also try to minimize its cost of production in the long run by changing the production plant. In other words, each firm will be producing at some point on the long run average cost curve. We can summarize the following features of long-run equilibrium of a monopolistically competitive firm:

**Necessary condition:**  $MR = LMC = SMC$

- Sufficient condition:**
- (i)  $LMC$  increases in the neighbourhood of equilibrium point.
  - (ii)  $LAC = AR$

In Panel B of Figure 8.2, we show the long run equilibrium of the firm under monopolistic competition. At equilibrium point  $E_{mc}$ ,  $LMC$  equals  $MR$ . Equilibrium output level is  $q_{mc}$  at which the  $LAC$  curve is tangent to  $AR$ . Since at  $q_{mc}$ ,  $LAC$  equals  $AR$ , the firm earns only normal profit.

**Excess Capacity in Monopolistic Competition**

The long run equilibrium of a monopolistically competitive firm is characterized by excess capacity.

It is alleged that the long run equilibrium of a monopolistically competitive firm is characterized by excess capacity. It can be seen in Panel B of Figure 8.2 that at the long-run equilibrium of the firm, the  $AR$  curve is tangent with the  $LAC$  curve at its falling portion to the left of minimum  $LAC$ . Unlike the perfectly competitive firm, the firm in monopolistic competition is not minimizing long run average cost in the long-run equilibrium. In other words, the firm is not utilizing its resources efficiently and is not taking advantage of economies of scale to reduce the cost of production when it could do so. In

Panel B of Figure 8.2, this excess capacity is given by the range of output  $q_c - q_{mc}$ . This excess capacity is composed to two components:

$$q_c - q_{mc} = q_1 - q_{mc} + q_c - q_1$$

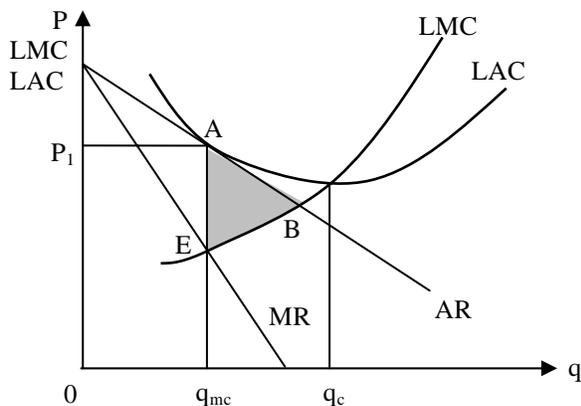
At output  $q_{mc}$ , the firm used the production plant with the short-run average cost curve  $SATC_1$ . The firm is producing at point A which is on the falling portion of  $SATC_1$  and is not producing at B which is the minimum point of  $SATC_1$ . The firm could use the lowest cost plant with the short-run average cost curve  $SATC$  instead of using the plant with  $SATC_1$ . The output range  $q_c - q_1$  then shows the portion of excess capacity that results due to the failure of the firm to use the lowest cost plant in the long run.

From the preceding discussion, the presence of excess capacity seems to be a measure of inefficiency of monopolistically competitive market. Professor Chamberlin, one of the two pioneers of the theory of monopolistic competition, opined that excess capacity reflects cost of product diversity provided by monopolistic competition. He held the view that the consumers benefit from having the opportunity to choose from a number of similar but differentiated products. There are many brands of a commodity with different quality, style and appearance. The benefits from this opportunity may well outweigh the cost of the opportunity measured by excess capacity.

The presence of excess capacity seems to be a measure of inefficiency of monopolistically competitive market.

### Comparison Between Perfect Competition and Monopolistic Competition

Here we compare the long-run equilibrium of a monopolistically competitive firm with that of a perfectly competitive firm. We use Figure 8.3 for this purpose. In both the markets, the entry or exit of firms in the long run drives the supernormal profit to zero. As we can see from Figure 8.3, the long-run



**Figure 8.3: Perfect competition versus monopolistic competition**

equilibrium of a competitive firm occurs at the minimum point of long-run average cost curve whereas the long-run equilibrium of a firm under monopolistic competition occurs to the left of the minimum point. The output segment  $q_c - q_{mc}$  measures excess capacity in monopolistic competition. In long-run equilibrium of a monopolistically competitive firm price exceeds marginal cost. It means that the firm enjoys some monopoly power and the

In long-run equilibrium of a monopolistically competitive firm price exceeds marginal cost.

consumers value the benefits of additional output more than the cost of additional output. By restricting output to  $q_{mc}$ , the monopolistically competitive firm is depriving the consumers of this additional net benefit shown by the shaded area AEB in Figure 8.3. This is, in fact, the **deadweight loss** that results from the monopoly power of the monopolistically competitive firm.

### Comparison Between Monopoly and Monopolistic Competition

We can also compare the long-run equilibrium of a monopolist with that of a firm in monopolistic competition. The two equilibrium points are different with regard to nature of profit. A monopolist may earn supernormal or normal profit whereas a monopolistically competitive firm can earn only normal profit at the long-run equilibrium output level. The size of production plant may also be different in two market structures. A firm in monopolistic competition uses a plant smaller than the optimum plant in the long-run. A monopolist, on the other hand, may use the optimum plant or any other plant which can be smaller than or lesser than the optimum plant. The consumers are adversely affected in the two markets since price exceeds long run marginal cost in both cases.

A firm in monopolistic competition uses a plant smaller than the optimum plant in the long-run.

Advertising expenditure or selling cost is a tool to choose for maximizing his profit.

### Deciding the Profit Maximizing Level of Advertising Expenditure

As we said earlier, the monopolistic competition has other policy tools than price to choose for maximizing his profit. One such tool is advertising expenditure or selling cost. Selling cost can increase the profit of the firm in two ways. First, more consumers know and hear about product through advertisements. As a result, the demand for the commodity increases at the same price. Second, if there are economies of scale, increased sales due to advertisements may reduce cost of production. Advertisements entail costs which may be very high at times. The average cost curve shifts upward when the firm advertises its product through newspaper, television, radio and many other devices of mass media. At the same time, the sales of the firm increases. Figure 8.4 shows the effects of advertisement expenditures. Initially the firm used to produce the quantities  $q_1$  at an average cost of  $C_1$ . The short-run average cost curve shifts to  $SAC'$  from  $SAC$  when the firm undertakes advertisement expenditures.

The Sales and hence production of the firm increases to  $q_2$  from  $q_1$  after

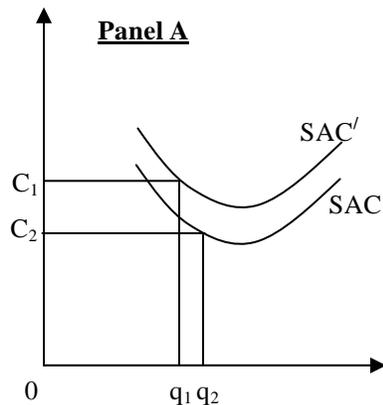


Figure 8.4: Effect of Advertisement

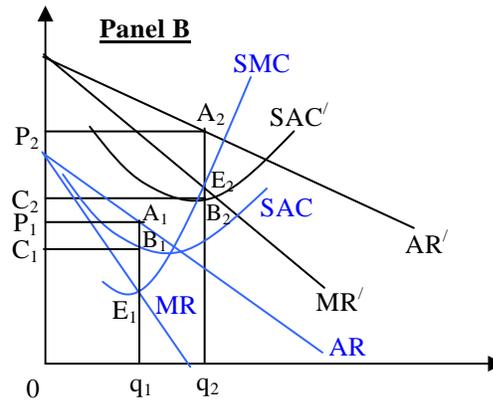


Figure 8.5: Profit maximization with selling cost

advertisements As we can see from Figure 8.4, the average cost of production falls to  $C_2$  from  $C_1$  due to economies of scale involved with higher level of production. But these economies of scale may not always be obtained. We illustrate the process of determining the profit maximizing level of selling cost by Figure 8.5.

In Figure 8.5, the AR, MR, SAC and SMC curves show the demand and cost conditions of the firm before advertising costs are incurred. Accordingly, the initial equilibrium point  $E_1$  determines output  $q_1$ , price  $P_1$  and a profit equal to area  $P_1C_1B_1A_1$ . A given amount of advertisement cost shifts the average revenue curve to  $AR_1$ , the marginal curve to  $MR_1$  and the average cost curve to  $SAC_1$ . The marginal cost curve does not shift because the total advertisement cost is treated as an item of total fixed cost. The new equilibrium point is  $E_2$  which gives rise to new output level  $q_2$  and a profit level equal to area  $P_2C_2B_2A_2$ . This figure shows the effect of a fixed level of advertising expenditure on the price, output and profit of the firm. It is difficult to show in this figure how the profit maximizing level of advertising cost is determined. Instead we can provide a verbal explanation of the process of determining the optimum level of selling cost. The monopolistic competitor can change the amount of fixed advertising cost and see how much profit it brings for each level of advertising expenditure. The firm can adopt a trial and error process for determining the profit maximizing level of selling cost. We should remember that the AR, MR and SAC curves shift upward each time the entrepreneur changes the level of selling cost and the extent of shift of these curves depends on the amount of change of selling cost. We can, however, deduce the conditions for such an optimum level of advertising expenditure. When the firm spends one taka on advertising it increases the firm's sale level. To meet the additional demand for its product, the firm needs to incur some expenses for producing the additional output. It is natural to expect that at the profit maximizing level of advertising cost, the additional taka spent on advertising plus the additional cost per unit of increased output brought about by advertising cost, should be equal to additional revenue per unit of increased output. This condition can be put in an equation form :

The monopolistic competitor can change the amount of advertising cost.

$$P \frac{\Delta Q}{\Delta A} = 1 + MC \frac{\Delta Q}{\Delta A} \dots\dots\dots(1)$$

where P = Price

$\Delta Q$  = increased sale due to advertising

MC = Marginal cost

$\Delta A$  = Change in advertising expenditure

$P\Delta Q$  measures the change in total revenue brought about by additional advertising expenditure of an amount  $\Delta A$ .  $MC\Delta Q$  shows the change in total production cost for additional output from advertising.  $P\Delta Q/\Delta A$  then reflects the additional revenue per unit of taka spent on advertising.  $MC\Delta Q/\Delta A$  shows the additional production cost per unit of increased output. The above

condition for profit maximizing level of advertising costs can be rearranged so that it can be used in every day business practice.

$$P \frac{\Delta Q}{\Delta A} - MC \frac{\Delta Q}{\Delta A} = 1 \dots\dots\dots(2)$$

$$\text{or, } (P - MC) \frac{\Delta Q}{\Delta A} = 1 \dots\dots\dots(3)$$

Multiplying both sides by A/PQ, the advertising to sales ratio, we get

$$\frac{P - MC}{P} \left( \frac{A}{Q} \cdot \frac{\Delta Q}{\Delta A} \right) = \frac{A}{PQ} \dots\dots\dots(4)$$

The bracketed term on the left-hand side of Equation 4 can be called advertising elasticity of demand. It shows the ratio of percentage change in quantity demanded to percentage change in advertising expenditure. In previous chapter (P-MC)/P was found to be equal to inverse of absolute value of price elasticity of demand. Using the notations  $E_{AD}$  for advertising elasticity and  $E_p$  for price elasticity, equation (4) can be rewritten as shown below:

$$\frac{A}{PQ} = \frac{E_{AD}}{E_p} \dots\dots\dots(5)$$

Equation (5) says that to maximize profit from advertising, the expenditure on advertisement should be chosen such that the ratio of advertising expenditure to total sale should be equal to the ratio of advertising elasticity to price elasticity of demand . It is easy to collect information from a monopolistic competition market, which can be used to estimate the relevant elasticities.

## Review Questions

### • *Essay-type Questions*

1. Discuss the characteristic features of monopolistic competition. How does it differ from perfect competition?
2. What is monopolistic competition? What are the effects of product differentiation on:
  - (i) Firm's MR and AR curves; and
  - (ii) Firm's equilibrium
3. Discuss the equilibrium of a firm under monopolistic competition under the condition of price competition among the firms.
4. How is the equilibrium of a firm affected under monopolistic competition where there is no barrier to entry of new firms.
5. How is the long-run equilibrium of a firm under monopolistic competition affected by the entry of new firms indulging in price competition?
6.
  - (a) What are the characteristics that cause monopolistic competition?
  - (b) Give some examples of monopolistically competitive firms.
  - (c) How can two retail stores that sell the same brand of product be considered as selling differentiated products?
7. Suppose by lowering its price from \$1.20 to \$1.15 per gallon, a service station can sell 15,000 gallons of gasoline per week as opposed to 10,000. Can we infer from these figures that the marginal revenue of an extra gallon sold in this range of output is \$1.15? Why or why not? What is MR in this case?
8. Using the appropriate diagrams, illustrate the case where a monopolistically competitive firm is making:
  - (a) pure profits
  - (b) just normal profits
  - (c) a loss
9. Describe the process of adjustment that would occur if a grocery store in an expanding resort area is making pure profits.
10. What are the two ways in which pure profits are competed away in a monopolistically competitive industry?
11.
  - (a) Why do firms advertise?
  - (b) Would society be better off if advertising was banned? Explain.
12. How is the profit maximizing level of advertising expenditure decided?
13. Explain the excess capacity in monopolistic competition.
14. Compare:
  - a. perfect competition and monopolistic competition.
  - b. monopoly and monopolistic competition.

- ***True or False***

Which of the following statements are true?

- (a) The long run equilibrium of a monopolistically competitive firm is characterized by the presence of normal profit.
- (b) Excess capacity results from the failure of the firm to use the lowest cost plant in the long run.
- (c) The long-run equilibrium of a firm under monopolistic competition occurs to the left of the minimum point.
- (d) Deadweight loss results from the monopoly power of the monopolistically competitive firm.
- (e) In long-run equilibrium of a monopolistically competitive firm price exceeds marginal cost.

- ***Multiple Choice Questions***

1. Which of the following points are inconsistent with monopolistic competition?
  - (a) Larger number of buyers and sellers
  - (b) Free mobility of factors
  - (c) Homogeneous product
  - (d) Free entry and exit
  - (e) Differentiated products
2. Product differentiation makes the demand curve of firm under monopolistic competition:
  - (a) shift rightward
  - (b) more elastic
  - (c) less elastic
  - (d) none of the above
3. The profit of firm under monopolistic competition is maximum where:
  - (a)  $AR - AC$  is maximum
  - (b)  $AR = AC$
  - (c)  $MR = MC$
  - (d)  $AR = MR$
4. Which of the following are the most realistic reaction of the firm under monopolistic competition?
  - (a) When a firm raises its price, rival firms follow
  - (b) When a firm reduces its price, rival firms follow
  - (c) When a firm raises its price, others do not follow
  - (d) When a firm changes its price, others do not react
5. The objective of selling cost is to change:
  - (a) the shape of the demand curve
  - (b) the place of the demand curve
  - (c) both shape and place of the demand curve

- (d) none of the above
  - (e) Differentiated products
6. Monopolistic competition includes those firms that sell a ..... share of the market, and sell a ..... product:
    - (a) large; differentiated
    - (b) small; differentiated
    - (c) large; undifferentiated
    - (d) small; undifferentiated
  7. Retail stores that sell the same brands of merchandise can be viewed as selling ..... products because of:
    - (a) undifferentiated; service and location
    - (b) differentiated; product quality differences
    - (c) undifferentiated; product quality differences
    - (d) differentiated; service and location
  8. The profit-maximizing quantity for a monopolistically competitive firm corresponds to the point where ..... equals .....:
    - (a) MC; demand
    - (b) MC; MR
    - (c) MR; demand
    - (d) MR; price
  9. The profit-maximizing price for a monopolistically competitive firm corresponds to the point where the ..... equals .....:
    - (a) MC; MR
    - (b) MC; demand
    - (c) profit-maximizing quantity; demand
    - (d) profit-maximizing quantity; MR
  10. If the actual quantity sold by a monopolistically competitive firm is less than the profit-maximizing quantity, profits can be increased by increasing the quantity sold because the ..... of an extra unit is greater than its .....:
    - (a) MR; MC
    - (b) price;MR
    - (c) MR; price
    - (d) MC; MR
  11. A monopolistically competitive firm will earn a pure profit if ..... is greater than ..... at the profit-maximizing quantity:
    - (a) MC; product price
    - (b) product price;MC
    - (c) ATC; product price
    - (d) product price; ATC
  12. A monopolistically competitive firm will incur a loss if ..... is greater than ..... at the loss-minimizing quantity:
    - (a) MC; product price
    - (b) product price; MC

- (c) ATC; product price
  - (d) product price; ATC
13. A monopolistically competitive firm will earn normal profit if ..... equals ..... at the profit-maximizing quantity:
- (a) ATC; MC
  - (b) ATC; product price
  - (c) ATC; MR
  - (d) MR; product price
14. If existing monopolistically competitive firms are making pure profits, ....., causing the demand curve facing each firm to .....
- (a) firms will leave; increase
  - (b) firms will leave; decrease
  - (c) new firms will enter the market; increase
  - (d) new firms will enter the market; decrease
15. As new monopolistically competitive firms enter a market, the demand facing each firm in the market ....., causing the price received by each firm to ....., In a long-run equilibrium ..... profits are earned:
- (a) decreases; increase; pure
  - (b) increases; decrease; pure
  - (c) decreases; decrease; normal
  - (d) increases; increase; normal
16. As monopolistically competitive firms leave a market, the demand facing each firm in the market ....., causing the price received by each firm to ....., In a long-run equilibrium ..... profits are earned:
- (a) decreases; increase; pure
  - (b) increases; decrease; pure
  - (c) decreases; decrease; normal
  - (d) increases; increase; normal
17. A firm that has special characteristics or a special product that cannot be duplicated by competitors and is making pure profits will experience ..... in the value of its assets and earn ..... profits in the long run:
- (a) an increase; normal
  - (b) a decrease; normal
  - (c) an increase; pure
  - (d) a decrease; pure
18. A firm that is incurring a loss and is sold to a new owner can earn a ..... for the new owner if the the firm's assets are revalued .....
- (a) loss; downward
  - (b) normal profit; downward
  - (c) loss; upward
  - (d) normal profit; upward

19. When assets of a firm are revalued up or down because the firm is making either a pure profit or a loss, costs are said to be:
- (a) price determining
  - (b) price determined
  - (c) fixed
  - (d) variable
20. It has been argued that ..... advertising is wasteful:
- (a) all
  - (b) persuasive
  - (c) informational
  - (d) price
21. It has been observed that when advertising is banned, prices are ..... because: .....
- (a) higher; of a reduction in competition
  - (b) higher; of higher costs
  - (c) lower; of increased competition
  - (d) lower; of lower costs
22. For a perfectly competitive firm, the ..... curve is also a supply curve. For an imperfectly competitive firm, price and quantity depend on both ..... and .....
- (a) MR; MC; MR
  - (b) MC; MC; demand
  - (c) MR; MC; demand
  - (d) MC; MR; demand

## Lesson 2: Oligopoly

### Objectives

After studying this lesson, you will be able to:

- State the characteristics of oligopoly;
- State the concept of Nash equilibrium;
- State how price and output are determined in Cournot Model;
- State why price remains rigid in the Kinked demand curve Model; and
- State how Game theory can be applied in oligopoly market.

### Characteristics of Oligopoly

In oligopoly, each firm takes its rival's reactions into account.

In oligopoly, there are a few sellers so that in any decision it makes, each firm takes its rival's reactions into account. Unlike the monopolistically competitive firms, the oligopolistic firms are interdependent in decision making. The products produced by these firms may be homogeneous or differentiated. Often, the firms in an oligopoly market are large scale production enterprises and a few firms account for all or most of total production. It may happen that some or all of the oligopoly firms earn substantial amount of supernormal profit in the long run because barriers to entry prevents other firms from entering the market.

Making price and output decisions in oligopoly is very difficult because each firm may not know precisely what other firms' reactions will be when it implements a decision about price and output. Suppose, for example, a firm lowers its product's price. Its rivals may also lower their prices so that the firm's sales will not increase significantly. Or, the rivals may keep their prices fixed, consequently the firm's sales fall drastically. On the whole, the firm is not certain about the possible consequences of its decision to reduce its product's price. A firm can only make guesses about its rivals' reactions under different strategies or policies it adopts. But different firms may make different assumptions about rivals' retaliatory actions depending on the size and financial positions of the firms. This variation in assumptions about rivals' reactions is called *conjectural variation* and any action undertaken in logical response to perceived reaction of the rivals' is called strategic decision making. Since there is no commonly accepted assumption about rivals reactions, there is no single model of price and output determination in oligopoly. Instead, a few oligopoly models based on different assumptions about reactions of the rivals have been developed to explain price and output determination in an oligopoly market.

There is no commonly accepted assumption about rivals reactions.

We can classify these assumptions about reactions of the rivals into three broad groups and discuss a few popular models from each group.

## The Concept of Nash Equilibrium

Before discussing the different oligopolistic models, we mention one general principle underlying oligopolistic equilibrium known as the Nash equilibrium. It is stated as follows:

### *Each firm is doing the best it can given what its competitors are doing*

In the case of Nash equilibrium, one question then naturally arises. If a firm does the best it can given what its competitors are doing, what does it assume that its competitors are doing? It is natural to assume that the competitors are doing the best they can given what the firm is doing.

The concept of Nash equilibrium is pertinent for the equilibrium of an oligopolistic firm which acts under a strategic consideration about the reactions of its rivals. This principle is not relevant to pricing and output decisions made by the oligopolistic firms under formal and informal agreements. The general principle of Nash equilibrium is different from general principle of Non-Nash equilibrium used in the context of other market structure like perfect competitions, monopoly, etc. In these markets, a firm does not have strategic considerations about the behaviour of other firms. The nature of equilibrium in absence of strategic considerations is stated as follows:

A firm is doing its best it can do and has no reason to change its price and output. The firms in an oligopoly market may operate in two situations. They may work in an environment of uncertainty about reactions of rivals, though each firm may make a certain assumption about the behaviour of its competitors. Alternatively, these firms may cooperate with each other eliminating all uncertainties about actions and reactions of the competing firm. The first situation may be called the non-cooperation environment, and the second situation, the cooperation environment. Some models have been developed for each situation. Next we discuss these models.

The firms in an oligopoly market may work in an environment of uncertainty about reactions of rivals.

### **Assumption 1 : Non-cooperation and Ignore Interdependence**

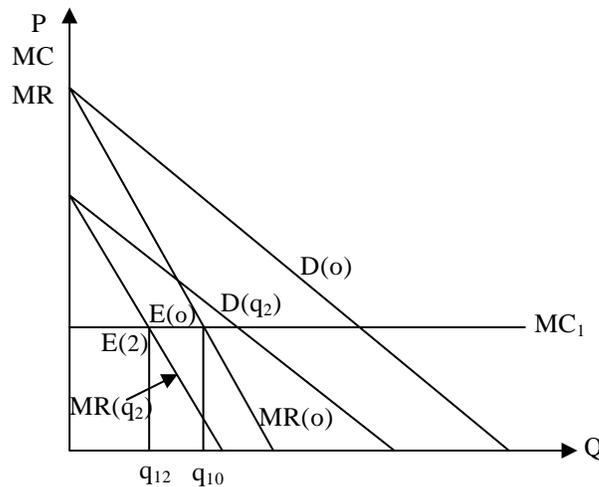
Here it is assumed that other firms will not retaliate when a firm takes any decisions about price and output. There are two reasons for making such an assumption. First, the rivals' reactions patterns can be so complex and diversified that it is better to ignore the reactions by other firms. Second, in most of the oligopolistic firms, management decisions are taken by salaried executives, not by the owners who happen to be the share holders. The executives and managers are more interested in successful running of enterprises by maximizing sales revenue rather than profit. Consequently, they can ignore the possible retaliations from their competitors. It should be noted that the assumption does not reject the existence of interdependence among the firms. This will be clear when we discuss the assumptions of the Cournot Model next.

**The Cournot Model**

This model was introduced in 1838 by Augustin Cournot who was a french economist. The model is based on certain assumptions which are discussed below:

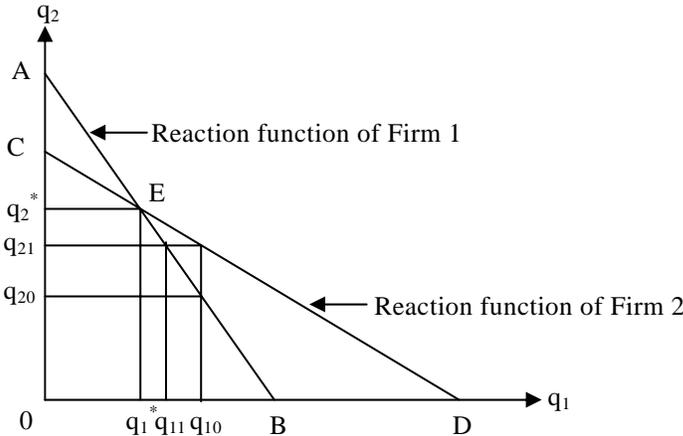
1. There are two firms producing and selling a homogeneous product in the market.
2. Each firm is fully aware of market demand curve.
3. Price of the product depends inversely on total sales by two firms.
4. Marginal cost of production is constant for each firm.
5. Each firm has two considerations at the time of deciding its output level. First, its output level depends negatively on rival's output level. Second, the firm assumes that another firm will not change its current level of production when the firm produces and sells its chosen level of output.

The last assumption plays a significant role in determining the behavioral pattern of the model shown in Figure 8.5. We show relationship between Firm 1's chosen level of output and Firm 2's level of output. In the Figure,  $D(o)$  is the market demand curve for the product. It is also the market demand curve for the product of Firm 1 based on the assumption that Firm 2 does not produce and sell any output. It should be noted that zero is in the brackets of the notation  $D(o)$  signifies the zero output of Firm 2. Corresponding to the demand curve  $D(o)$  the marginal revenue curve of Firm 1 is  $MR(o)$ . The horizontal marginal cost curve of Firm 1,  $MC_1$ , intersects the  $MR(o)$  curve at  $E(o)$ . Equilibrium output of Firm 1 corresponding to Firm 2's output of zero is  $q_{10}$ . If Firm 2's assumed output is  $q_2$ , Firm 1's demand curve and marginal revenue curve become  $D(q_2)$  and  $MR(q_2)$  respectively. We find Firm 1's equilibrium output  $q_{12}$  corresponding to Firm 2's output of  $q_2$  from equilibrium point  $E(2)$  where  $MC_1$  equals  $MR(q_2)$ . Similarly, we can find other equilibrium output levels of Firm 1 corresponding to different output levels of Firm 2. We notice from the Figure that Firm 1's equilibrium output level decreases when Firm 2's assumed output level increases. There is thus an inverse relationship between Firm 1's equilibrium output level and Firm 2's



**Figure 8.5: Derivation of reaction function in Cournot Model**

assumed output level, which is called the reaction function of Firm 1. We can



**Figure 8.6: Equilibrium in Cournot Model**

also obtain the reaction function of Firm 2 by reversing the derivation process. In that case, we find the equilibrium output level of Firm 2 corresponding to different output levels of Firm 1. Reaction function of one Firm shows the desired level of output of the Firm for each of the different output levels of another Firm. Firm-1's decision to produce a given level of output is based on its observation and assumption about Firm 2's output level, which may or may not be true. If firm 1's assumption about Firm 2's output turns out to be true, then Firm 2's assumption about Firm 1's output also turns out to be true. The two Firms assumptions about each other are realized and equilibrium for both Firms is obtained at the intersection of the two reaction functions. If the two Firms assumptions about each other prove to be wrong, equilibrium is not attained and the two Firms keep changing their output level until expectations of both about each other are realized. We have drawn the two reaction functions in Figure 8.6 where the vertical and horizontal axes measure the output levels of Firm 1, ( $q_2$ ), and Firm 2, ( $q_0$ ). The downward sloping straight lines AB and CD in the figure are the reaction functions of Firm 1 and Firm 2 respectively.

Suppose Firm 1 observes that Firm 2 is initially producing the output  $q_{20}$ . According to Firm 1's reacting function, the intended output of Firm 1 is  $q_{10}$  corresponding to Firm 2's output of  $q_{20}$ . But Firm 2's reaction function determines its output  $q_{21}$  given output  $q_{10}$  of Firm 1. Again the reaction function of Firm 1 shows output  $q_{11}$  for Firm 1 corresponding to output  $q_{21}$  of Firm 2. This process of adjusting and readjusting output levels by two Firms continues until both Firms reach the equilibrium point E where both Firms' expectations about each other come true. In the end, Firm 1 produces output  $q_1^*$  and Firm 2 produces  $q_2^*$ . It is easily seen that the equilibrium in Cournot Model is a Nash equilibrium mentioned earlier. This is because  $q_1^*$  turns out to be the profit-maximizing level of output for Firm 1 given Firm 2's output level  $q_2^*$  and  $q_2^*$  turns to be the profit-maximizing level of output for Firm 2 given Firm 1's output level  $q_1^*$ .

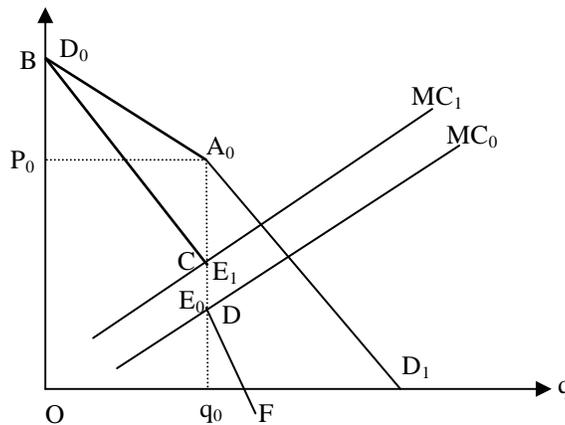
**Assumption 2 : Non-Cooperation And Recognize Interdependence**

Each Firm lives in a world of uncertainty about behaviour of its competitors.

The Firms in an oligopoly market may be fully aware of interdependence prevailing among the Firms; still they cannot cooperate with each other to negotiate a formal agreement or act under an informal agreement for different reasons. It seems that each Firm lives in a world of uncertainty about behaviour of its competitors and no solution in the form of an equilibrium is possible here. One logical consequence of lack of an equilibrium is price rigidity practised by many oligopolistic Firms. A model known as kinked demand curve model shows how price rigidity is created. We discuss this model next.

***The Kinked Demand Curve Model***

This model is based on the assumption that a rise in price is not matched by similar price rise by other Firms whereas a fall in price is always followed by similar fall in prices by rivals. When a Firm raises its price, other Firms do not raise their prices. The Firm then loses most of the customers in the market. As a result, the portion of demand curve above the prevailing price level becomes elastic. When the Firm lowers its price, other Firms will follow it. The sale of the Firm then increases by a small amount. This makes the portion of the demand curve below the current price level less elastic. The asymmetry in responses of other Firms to price changes gives rise to a demand curve with two line segments having different price elasticities. Such a



**Figure 8.7: Price rigidity in Kinked Demand Curve Model.**

demand curve has been shown in Figure 8.7 where  $P_0$  is the prevailing price level. It is seen that the portion  $D_0A_0$  is more elastic and the portion  $A_0D_1$  is less elastic. There is a kink at point  $A_0$ . The curve  $BCDF$  is the marginal revenue curve corresponding to demand curve  $D_0A_0D_1$ . The marginal revenue curve has a discontinuous segment between  $C$  and  $D$ .  $MC_0$  is the initial marginal cost curve of the Firm. The marginal cost curve  $MC_0$  intersects the marginal revenue curve at  $E_0$  giving rise to initial price level  $P_0$  and initial output level  $q_0$ . Due to some external reasons, the marginal cost curve shifts to  $MC_1$ , which intersects the marginal revenue curve at  $E_1$ . The new equilibrium point  $E_1$  leads to the same price level  $P_0$  with no change in output level. The kinked demand curve model thus explains why the price level remains rigid at the current level in most cases. The problem with this model is that it cannot explain how the current price was determined initially. It

shows price rigidity without explaining the reason for such price rigidity. Perhaps Game theory can provide some logical explanations for such price rigidity.

**Game Theory**

The main problem of an oligopolistic Firm is that it does not know what its rivals will do when it takes any decision about price, product variety, selling cost and so on. Game theory suggests that some kind of equilibrium solution for the Firm can be obtained in such an uncertain situation if the Firm behaves according to some predetermined pattern. One such pattern is called game theory with dominant strategy.

**Dominant Strategy**

The Game theory is traditionally explained with the help of a pay-off matrix which shows the expected returns accruing from different strategies. Suppose, there are two Firms in a industry producing a homogeneous product. Each of the two Firms is considering the possibility of increasing its net profit through selling cost but it is unaware of the action taken by another Firm. Each Firm then has two strategies viz., advertise and do not advertise. Since there are two Firms, there will be four combinations of strategies by the two firms. The first number in each cell of the following pay-off matrix shows the profit of Firm 1 and the second number the profit of Firm 2.

The Game theory is traditionally explained with the help of a pay-off matrix.

**Pay-off Matrix 1**

		Firm 2	
		Advertise	Do not Advertise
Firm 1	Advertise	12,6	18,1
	Do not Advertise	3, 12	8, 3

There are two strategies for Firm 2. If Firm 2 advertises, Firm 1 makes a profit of Tk 12 if it advertises and a profit of Tk. 3 if it does not advertise. So, the best strategy for Firm 1 is to advertise when Firm 2 advertises. If Firm 2 does not advertise, Firm 1 earns Tk. 18 if it advertises and Tk. 8 if it does not. So the best strategy for Firm 1 is to advertise when Firm 2 does not advertise. Firm 1's best strategy is to advertise under the two strategies of Firm 2.

Similarly, the best strategy of Firm 2 is to advertise under the two strategies of Firm 1. Both Firms decide to advertise and Firm 1 earns a profit of Tk. 12 and Firm 2 earns a profit of Tk. 6. A solution here exists because each Firm has a dominant strategy which is valid under two strategies of another Firm. This may not be the case always. Suppose, we change the expected returns in the bottom right-hand corner cell as shown below the pay-off matrix 2.

**Pay-off Matrix 2**

		Firm 2	
		Advertise	Do not Advertise
Firm 1	Advertise	12, 6	18, 1
	Do not Advertise	3, 12	19, 13

Firm 1 earns Tk. 12 if it advertises and Tk. 3 if it does not under the first strategy of Firm 2. So, the best strategy of Firm 1 is to advertise when Firm 2 advertises. Firm 1 earns Tk. 18 if it advertises and Tk. 19 if it does not advertise. So the best strategy of Firm 1 is to advertise when Firm 2 advertises and not to advertise when Firm 2 does not advertise. Similarly, the best strategy for Firm 2 is to advertise when Firm 1 advertises and not to advertise when Firm 1 does not advertise. The second pay-off matrix is such that it does not yield any optimal strategy for either of the Firms. Best strategy to one Firm depends on the strategy taken by another Firm. There is no equilibrium solution here.

These examples of pay-off matrix show that application of Game theory in interdependent decision making process of the oligopolistic Firms may sometimes yield an equilibrium solution. At other times, Game theory cannot give any solution.

## Review Questions

### • *Essay-type Questions*

1. (a) What is an oligopoly?  
(b) What characteristics are necessary to have an oligopoly?
2. Using the appropriate diagram, illustrate the profit-maximizing price and quantity for an oligopoly.
3. State and explain the concept of Nash equilibrium.
4. Why is no single theory of oligopoly possible?
5. (a) Draw a kinked demand curve for a firm and identify the region on the corresponding MR curve where a shift in the MC curve will not change the profit maximizing price or quantity.  
(b) Why is the upper portion of the kinked demand curve drawn to be more elastic than the lower portion?  
(c) In constructing the kinked demand curve, what is assumed about the profit-maximizing behavior of competing firms?
6. What are the characteristic features of an oligopolistic industry. How does it differ from monopolistic competition?
7. Explain Cournot's duopoly model and examine his solution to duopoly.
8. Discuss the game theory used to obtain the equilibrium solution of an oligopolistic firm.

### • *True or False*

Which of the following statements are true?

- (a) In oligopoly, there are a few sellers so that in any decision it makes, each firm takes its rival's reactions into account.
- (b) The Firms in an oligopoly market may be fully aware of interdependence prevailing among the Firms.
- (c) The main problem of an oligopolistic Firm is that it does not know what its rivals will do when it takes any decision about price, product variety, selling cost and so on.
- (d) The Game theory is traditionally explained with the help of a pay-off matrix.

• **Multiple Choice Questions**

1. An oligopoly consists of a market where there are ..... firms, each selling a ..... share of the market:
  - (a) many; large
  - (b) many; small
  - (c) few; large
  - (d) few; small
2. The distinguishing characteristic of an oligopoly is that each firm sells a:
  - (a) differentiated product
  - (b) large share of the market
  - (c) undifferentiated product
  - (d) small share of the market
3. Some oligopolies sell a large share of the market and a differentiated product, while others sell a ..... share of the market and ..... product:
  - (a) small; a differentiated
  - (b) small; an undifferentiated
  - (c) large; an undifferentiated product
  - (d) a and b
4. The demand curve facing an oligopoly should be ..... the demand facing a monopolistically competitive firm:
  - (a) the same elasticity as
  - (b) more elastic than
  - (c) less elastic than
5. An oligopoly will maximize profits by producing the quantity that corresponds to the point where ..... equals .....:
  - (a) ATC; demand
  - (b) MC; demand
  - (c) MC; ATC
  - (d) MC; MR
6. An oligopoly will maximize profits by setting a price that corresponds to the point where:
  - (a)  $MC = MR$
  - (b) the profit-maximizing quantity corresponds to demand
  - (c) the profit-maximizing quantity corresponds to MR
  - (d)  $MC = demand$
7. According to the kinked demand curve theory, when a firm increases the price of its product, competing firms ..... When a firm lowers its price, other firms:
  - (a) raise their prices; hold their prices constant
  - (b) hold their prices constant; lower their prices
  - (c) hold their prices constant; raise their prices
  - (d) raise their prices; lower their prices

8. If General Motors increases the price of its cars, the ..... facing Ford Motor Co. will .....:
- (a) demand; increase
  - (b) demand; decrease
  - (c) supply; increase
  - (d) supply; decrease
10. New products which appear on the market generally are priced:
- (a) as high as possible
  - (b) where  $MC = MR$
  - (c) at what the market will bear
  - (d) in line with the competition
11. According to Cournot's model of oligopoly, oligopolists share:
- (a) the total market equally
  - (b) the total market unequally
  - (c) the supplied market equally
  - (d) the supplied market unequally

### Lesson 3: Cartel, Price Signalling and Price Leadership in Oligopoly

#### Objectives

After studying this lesson, you will be able to:

- State how a centralised cartel is formed and how it works;
- Explain how a market sharing cartel works;
- Define price signalling and state how it works;
- Explain how price leadership by low-cost Firm works;
- State how price leadership by the dominant Firm works; and
- State how output and price are determined in a revenue maximizing model.

In the previous lesson we discussed Cournot Model, Kinked demand curve model and game theory on the basis of two assumptions. In this lesson we will discuss the price and output decision taken by the oligopolistic Firms under another assumption where interdependence among the Firms are avoided.

#### Assumption 3 : Cooperation and Abolition of Interdependence

The oligopolistic firms can avoid the agony of interdependence among themselves and eliminate all uncertainties emanating from this interdependence through cooperation. The firms may join and form a joint firm, though such explicit colluding is illegal in many countries of the world. There are also other problems that thwart any attempt to form and maintain a formal joint venture. Implicit colluding, however, is possible, though it can take different forms. We discuss explicit colluding next.

Implicit colluding, is possible though it can take different forms.

#### The Centralized Cartel

The formation and functioning of a centralised cartel are very similar to those of a multiplant monopolist. Suppose Firm 1 with marginal cost curve  $MC_1$  and Firm 2 with marginal cost curve  $MC_2$  decide to cooperate with each other for forming a centralised cartel. We use Figure 8.8 to explain the process of output and price determination under a centralised cartel. Figure 8.8 has three panels and the panels in the left show the marginal cost curves of two firms.

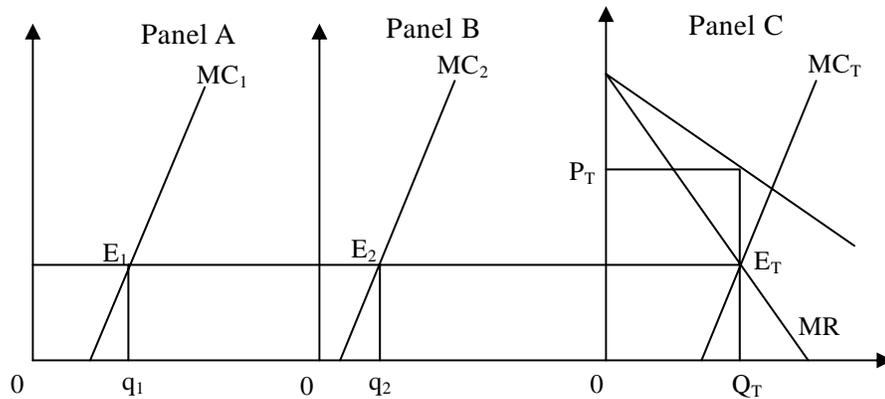


Figure 8.8: Centralised Cartel

We add  $MC_1$  and  $MC_2$  horizontally to obtain the combined marginal cost curve  $MC_T$  in panel C. The marginal revenue curve of the industry  $MR$  intersects  $MC_T$  at  $E_T$  determining the industry output  $Q_T$ . A horizontal line drawn from  $E_T$  and extended leftward to panel B and panel A intersects  $MC_2$  at  $E_2$  and  $MC_1$  at  $E_1$ . These intersection points determine the equilibrium output levels  $q_1$  for Firm 1 and  $q_2$  for Firm 2. The two firms charge the same price  $P_T$  for the product which is determined at the equilibrium output level of industry in panel C. It turns out that output levels  $q_1$  and  $q_2$  are the profit-maximizing levels of output for Firm 1 and Firm 2 respectively. The problem with centralized cartel is that none of the firms may be content with its equilibrium level of output and may try to sell more at a price slightly lower than the agreed-upon industry price  $P_T$ . It is very difficult and hence expensive to monitor the strict adherence of the firms to the centralized decisions about price and output. None the less, the probability of the centralized cartel being effective will be more under the following conditions:

1. The oligopolistic firms are large in size and very few in number.
2. The products of the firms are very much similar.
3. The geographical distance between these firms is less.
4. The economy is in upswing of its business cycle.

The scope for cheating and undercutting each other will be less if the above conditions hold good. The major problem for firms in the process of organizing a centralized cartel is the presence of anti-trust laws which prohibit any such move. It is almost impossible to conceal the organizational activities for a centralized cartel and deceive the national administrative and judicial agencies which defer the formation of monopoly and cartels in the country. As a result, the oligopolistic firms look for different tactics of implicit colluding. The existence of associations of owners of business firms is a clear indication of such implicit collusion. There are different forms of implicit collusion depending on the tactics used. Next we discuss the different forms of implicit collusion.

The existence of associations of owners of business firms is a clear indication of implicit collusion.

### ***Market Sharing Cartel***

In a market sharing cartel a central authority, normally the association of owners, determines a few items of common interest and leaves other items to the discretion of individual firms. For example, the central authority sets the price and leaves the quantity of output to be decided by the individual firms. Each firm then tries to increase its sales through non-price competition like product differentiation, selling cost, etc. The association of doctors, for example, determines the fee of the doctors and each doctor tries to attract more patients by using his specialized skill to heal and please the patients. Markets can also be shared by setting production quotas for different firms. Punitive actions are then taken against those firms who exceed their quotas. These quotas are normally decided in the meetings of associations after a series of long discussions, bargains, haggling, etc. Since these quotas are not based on any objective criterion, they are short-lived and lead to cheating, underpricing, and underselling each other through different legal and illegal means. Quotas may also be based on locations. A certain store in a particular

Each firm in the market sharing cartel tries to increase its sales through non-price competition like product differentiation, selling cost, etc.

locality runs a monopoly business there and no other firm disturbs it by entering into its market.

**Price Leadership**

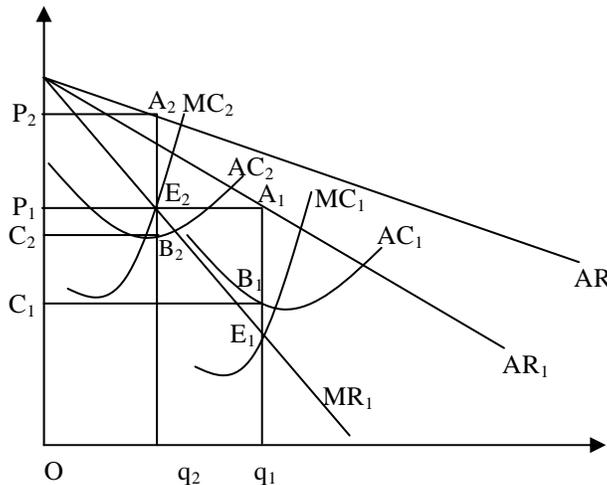
Implicit collusion sometimes takes the form of price leadership. Most often the dominant firm sets the price and other firms follow suit. There are different ways of setting the price and a few models of price leadership have been developed. A less rigorous model of price leadership based on verbal description is *price signalling*.

**Price Signalling:** One problem of market sharing cartel is that it is very difficult to agree upon a common price. This is a more serious problem when the demand and cost conditions change over time. One way of getting around this problem is price signalling. Suppose there are a few firms in an oligopoly market in which one firm is dominant in size and cost of production. The dominant firm raises price of its product and publicizes the rise in price through a business press conference. The small firms in the industry takes the press conference by the dominant firm as a plea for the price rise. The small firms morally support this price rise and raise the prices of their products. These firms could keep their prices fixed and even undercut the dominant firm. The gains from such a move will, however, be short-lived because the dominant firm can take these actions of small firms as a sign of starting price warfare and it will retaliate by lowering price. The net result will be driving profits of all firms to zero. Therefore, it is in the interest of the small firms to follow the leader and raise prices of their products.

We now turn to a discussion of a more rigorous model of price leadership known as *price leadership by low-cost firm*.

**Price Leadership by Low-cost Firm:** Another form of implicit collusion by firms is price leadership by low-cost firm. Often the low-cost firm sets the price and other firms will follow suit.

Suppose, there are two firms producing homogeneous product in an oligopoly market. Since Firm 1 is the low-cost firm and Firm 2 is the high-cost firm,



**Figure 8.9: Price leadership by Low-cost firm**

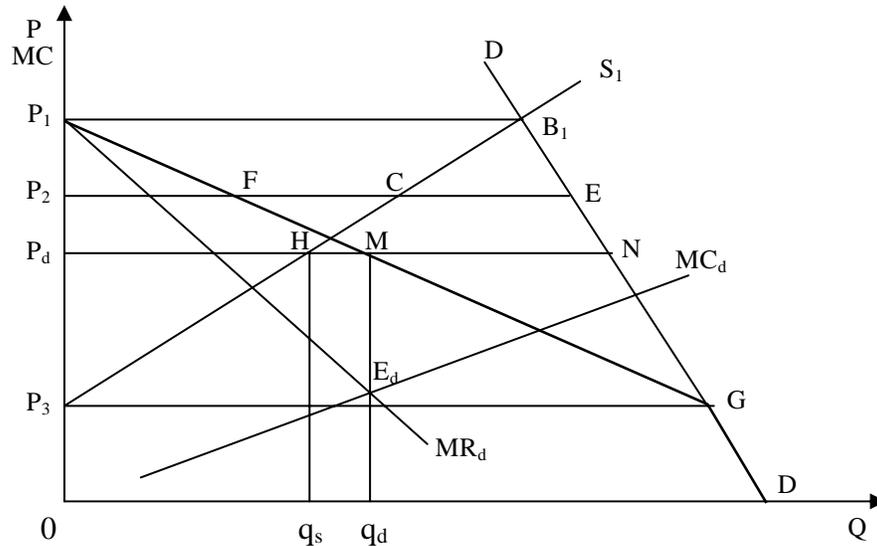
the cost curves of Firm 1 lie below the cost curves of Firm 2. Suppose, total demand of the industry is divided equally between two firms. The process of output and price determination is illustrated in Figure 8.9. The AR curve is the aggregate demand curve for output of the industry. With total demand divided equally, the AR curve of each firm is  $AR_1$  whose marginal revenue curve is  $MR_1$ . The cost conditions of the low-cost firm are shown by the average curve  $AC_1$  and the marginal cost curve  $MC_1$ . Similarly,  $AC_2$  and  $MC_2$  are the average and marginal cost curves of Firm 2. Since  $MC_1$  intersects  $MR_1$  at  $E_1$ , the equilibrium output and price levels of the low-cost firm are found to be  $q_1$  and  $P_1$  respectively. Total profit of Firm 1 is equal to area  $P_1A_1B_1C_1$ . Similarly, the equilibrium point  $E_2$  gives output  $q_2$  and price  $P_2$  for the high-cost firm. It is seen that price of Firm 2,  $P_2$ , is greater than price of Firm 1,  $P_1$ . Since there cannot be two prices for the same product in the market, Firm 2 must sell the quantity  $q_1$  at price  $P_1$ . The consequence is that Firm 2 cannot obtain its maximum profit and must be satisfied with a lower level of profit equal to area  $P_1A_1B_3C_3$ .

The profit of Firm 2 could be equal to area  $P_2A_2B_2C_2$  if it could sell its product at price  $P_2$ .

**Price Leadership by the Dominant Firm:** In price leadership by the low-cost firm, we assumed that the aggregate demand for industry output was equally divided between the two firms through a formal agreement. Such a formal agreement about the division of total output may not be easily reached. This is all the more true when there are more than two firms. Suppose the oligopoly industry is characterized by the presence of one dominant firm and a number of small firms. A more plausible arrangement of division of output may be as follows:

The dominant firm sets the price and each of the small firms accepts this price as given. In other words, the small firms behave as price-takers and each firm determines its output level at the point where its marginal cost equals the given price. It seems that each firm here acts as if it were a competitive firm. There is only one difference with the competitive firm. In the case of perfect competition, the price is determined at the intersection of industry demand curve and industry supply curve whereas in the case of price leadership, the price is set by the dominant firm. Consequently, the marginal cost curve of each small firm becomes its supply curve and the total supply curve by all small firms is given by the horizontal summation of supply curves of all small firms. We explain the process of price and output determination with the help of Figure 8.10. In this figure,  $P_3S_1$  and  $DD$  are the aggregate supply curve of the small firms and the aggregate demand curve of the industry respectively. At price  $P_1$ , total demand is  $P_1B_1$  which is supplied by the small firms. The dominant firm does not supply any output at price  $P_1$  so that  $P_1$  becomes the initial point of the demand curve of the dominant firm. At price  $P_2$ , total industry demand is  $P_2E$  of which the amount  $P_2C$  is supplied by the small firms. The residual amount  $CE$  ( $=P_2E - P_2C$ ) is supplied by the dominant firm. The quantity  $P_2F$  which is equal to  $CE$ , the dominant firm's output, will

The dominant firm sets the price and each of the small firms accepts this price as given.



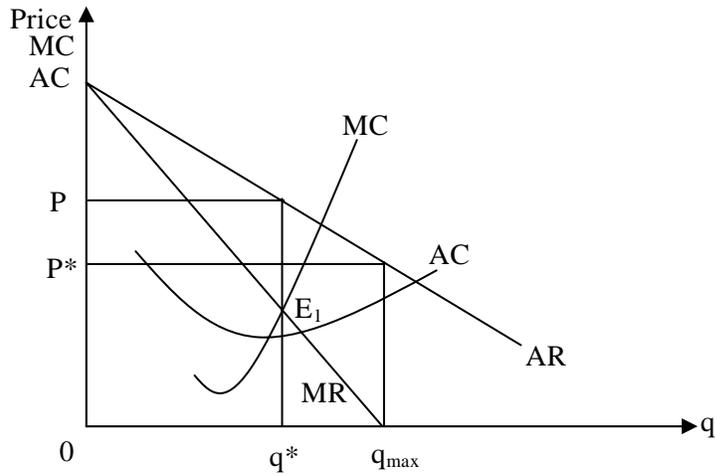
**Figure 8.10: Price Leadership by Dominant Firm**

be demanded at price  $P_2$ . The point  $F$  then qualifies as another point of demand curve of dominant firm. At price  $P_3$ , the small firms supply nothing so that the whole quantity  $P_3G$  comes from the dominant firm. At prices below  $P_3$ , the total demand for the product is met by the dominant firm. Consequently, the curve  $P_1FGD$  becomes the **residual demand curve of the dominant firm**. The corresponding marginal revenue curve is  $MR_d$  which intersects the marginal cost curve of the dominant firm  $MC_d$  at  $E_d$ . The equilibrium output level of the dominant firm is  $q_d$  sold at the price  $P_d$ . The small firms as a whole supply  $q_s$  at the same price. We find that  $P_dH + P_dM = MN + P_dM = P_dN$  holds at equilibrium price  $P_d$ . It implies that the total demand for output  $P_dN$  is supplied partly by the small firms ( $P_dH = MN$ ) and partly by the dominant firm  $P_dM$ .

**Revenue Maximization Model**

The Revenue Maximization model has been suggested by Professor Baumol.

Another variant of collusive model is the Revenue Maximization model suggested by Professor Baumol. He is of the opinion that modern oligopolistic firms are normally large scale production enterprises. The owners of these firms happen to be the share holders who are less likely to be involved in organizational and administrative activities. These production enterprises are administered and organized by salaried executives and managers who are less interested in profit maximization. The executives and managers put more emphasis on successful running of the production enterprise, which is roughly reflected by the amount of sale revenue. As a result, they decide to produce the total revenue maximizing level of output. This is illustrated in figure 8.11. We have drawn the AR, MR, AC and MC curves in the figure. We should remember that total revenue is maximized at the level of output where marginal revenue is zero. This occurs at the level of output where the MR curve cuts the output axis. A vertical line from this



**Figure 11: Revenue Maximization Model**

level of output intersects the AR curve at its midpoint. In the figure, the total revenue maximizing level of output is  $q_{\max}$ . We have also shown the profit maximizing level of output  $q^*$  corresponding to point  $E_1$  at which MC equals MR. We find that the profit maximizing level of output  $q^*$  is less than the revenue maximizing level of output. This should be so because at  $q^*$ , MR is positive since MC is positive. Since the MR curve is downward sloping, output level must increase to reduce MR to zero. It is also seen that the profit maximizing price is less than revenue.

## Review Questions

### • *Essay-type Questions*

- (a) What is a cartel, and why does society consider cartels undesirable?  
(b) Why do cartels tend to break down?
- Explain the following models:
  - Market sharing cartel;
  - Price leadership;
  - Revenue maximization model.

### • *True or False*

Which of the following statements are true?

- Implicit collusion sometimes takes the form of price leadership.
- The Revenue Maximization Model suggested by Professor Baumol.
- explicit colluding is illegal in many countries of the world.
- The oligopoly industry is characterized by the presence of one dominant firm and a number of small firms.

### • *Multiple Choice Questions*

- Two or more firms that collude to raise their prices must:
  - announce their intentions to the Justice Department
  - increase their quantities
  - decrease their quantities
  - lower their profits
- If collusion occurs, each colluding firm is producing a quantity where ..... is greater than .....:
  - MR; MC
  - MR; demand
  - MC; MR
  - MC; demand
- As a consequence of the situation described in question 15, each firm has an incentive to ..... the other firms by selling at a slightly ..... price than the agreed-upon colluding price:
  - cooperate with; higher
  - cooperate with; lower
  - cheat on; higher
  - cheat on; lower
- The added cost to society in the production of goods that pollute the environment over and above the cost borne by the firm is called:
  - marginal cost
  - social cost
  - private cost
  - consumer cost

- **Problem**

*Read and analyse the following news-story carefully:*

**OPEC Tentatively Reaches Accord to Cut Production**

VIENNA, Feb. 15 - Kuwait late today bowed to pressure from its OPEC partners and tentatively agreed to reduce oil production in the spring to help prevent a price collapse.

After three days of bargaining, the dozen nations of the organization of petroleum Exporting Countries reached an accord calling for them to remove nearly 1.5 million barrels of crude a day from the market starting March 1.

The nations were expected to formally accept the deal Tuesday morning. The agreement could unravel at the last minute, but delegates insisted that was unlikely. The agreement would set a new overall

production level for the cartel of 23.6 million barrels a day from March through June.

Western oil analysts have said oil prices should stabilize at current levels around \$18 a barrel as long as OPEC can keep total output — including “leakage,” or above-quota production — below 24 million barrels a day until the end of June.

The price of a benchmark blend of crude oil from the North Sea’s Brent Field has slipped from nearly \$21 a barrel last October under the weight of excess OPEC supply.

**Source:** News service, *The Washington Post*, February 16, 1993. p.C2.

**Hints:** An oligopoly tries to act like a shared monopoly. To maximize industry profit, the firms in an oligopoly must concur on what the monopoly price is and agree to maintain it by limiting output and allocating market shares.

# FACTOR PRICING



## **Highlights**

- ❑ Demand for Labour
- ❑ Supply of Labour
- ❑ Individual Labour Supply Curve
- ❑ Determination of Wage in Perfectly Competitive Labour Market
- ❑ Determination of Wage in Imperfectly Competitive Labour Market
- ❑ Determination of Rent and Interest Rate.

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## Unit-9

### Lesson 1: Wage Determination in Perfectly Competitive Input Market

#### Objectives

After studying this lesson, you will be able to:

- Derive the firm's demand curve for labour with one variable input;
- Derive the firm's demand curve for labour with two variable inputs;
- Derive the industry demand curve for labour;
- Derive the individual supply curve of labour;
- Derive the industry supply curve of labour; and
- State how wage rate is determined in perfectly competitive input market.

#### Demand for Inputs

Let's start with the assumption of perfect competition prevailing in both the product and input markets. Our discussion in this section focuses on market determination of price of an input. To facilitate the discussion, we take the input to be labour. Our initial task is to explain the process of deriving the aggregate demand curve for labour. It is done in two steps. First, the demand for labour of a firm is determined under the assumption that labour is only the variable input of production. Alternatively, it can be treated as the short-run demand for labour of a firm. Then we show how to derive the industry demand curve for labour. We are, however, more interested in deriving the long-run demand curve for labour when two or more variable inputs are used in the production process. Again a firm's demand for labour is discussed first. Then we will explain the process of deriving the aggregate demand curve for labour.

#### Demand for Labour: One Variable Input

Here we first discuss how a firm decides its profit-maximizing level of employment of labour. It should be noted that the demand for an input of production is a derived demand. The demand for labour arises because demand for a finished product produced with the help of labour and other inputs arises.

The profit-maximizing level of employment of a firm gives rise to demand for labour. In this context, we can invoke the marginal productivity theory of distribution which was introduced and popularised by economists like S.B. Clark, Wicksteed, etc. at the end of the nineteenth century.

According to this theory, it is a rational decision to pay an input of production according to its marginal productivity. Marginal productivity of an input is the change in total output brought about one unit change in the quantity of the input in question. Moreover, it was stated that total product would be exhausted if each factor's remuneration is equal to its marginal product. The above statement of the theory begs qualifications. Since an input-owner cannot always live on by

The demand for labour arises because demand for a finished product produced with the help of labour and other inputs arises.

consuming the product she/he produces along with other inputs, the above statement can be rephrased as follows: An employer should employ an input upto the level where the nominal income of the input equals the value of the marginal product of the input. In the case of labour, the profit-maximizing level of employment occurs when the market determined wage rate equals the value of marginal productivity of labour (VMP). Value of marginal productivity of labour is obtained by multiplying marginal physical productivity of labour ( $MPP_L$ ) by price( $p$ ) of the produced product by labour.

$$VMP = MPP_L \times P_x \dots\dots\dots (1)$$

Hence,  $x$  denotes the commodity produced by labour

The above condition can be shown to follow from a more general condition of profit-maximizing level of employment. It says that an employer increases its employment of labour as long as the additional revenue from hiring one extra unit of labour exceeds the additional cost of extra unit of labour. Profit of the employer is maximized at the level of employment where the additional revenue, called marginal revenue product (MRP), equals the additional cost of extra unit of labour, which is the wage rate under the assumed perfectly competitive market

for inputs. Marginal revenue product is obtained by multiplying marginal physical product of labour ( $MPP_L$ ) by marginal revenue of product (MR). Since we have also assumed perfectly competitive market for the product, price of the product equals marginal revenue of the product for a particular firm. As a result, marginal revenue product equals value of marginal product for a competitive firm in the product market.

$$MPP_L \times P = MPP_L \times MR$$

$$MRP = VMP \text{ (Since } P = MR) \dots\dots\dots (2)$$

The profit maximizing level of employment of labour by a competitive firm both in product and input markets is given by the equation.

$$MRP = P_L \text{ (} P_L = \text{Wage rate)}$$

$$\text{or } VMP = MRP = P_L \dots\dots\dots (3)$$

If the firm employs more labour beyond the equilibrium point shown above,  $P_L$  exceeds MRP bringing loss for the employer. It should be noted here that the above equation is a necessary condition for profit-mazimizing level of employment. For realizing the intuition underlying sufficient condition, we need to understand the concept of average revenue product (ARP). ARP is equal to the product of price of commodity and average physical product of labour.

$$ARP = APP_L \times P \dots\dots\dots (4)$$

Since we have assumed perfect competition in labour market, the wage rate is given for the firm. It implies that the supply curve of labour will be a horizontal line at the given wage rate. The firm can buy any amount of labour at the given wage rate. In such a situation, the portion of the MRP curve that lies to the right of maximum ARP qualifies as the demand curve for labour. Figure 9.1 explains derivation of the demand curve for labour.

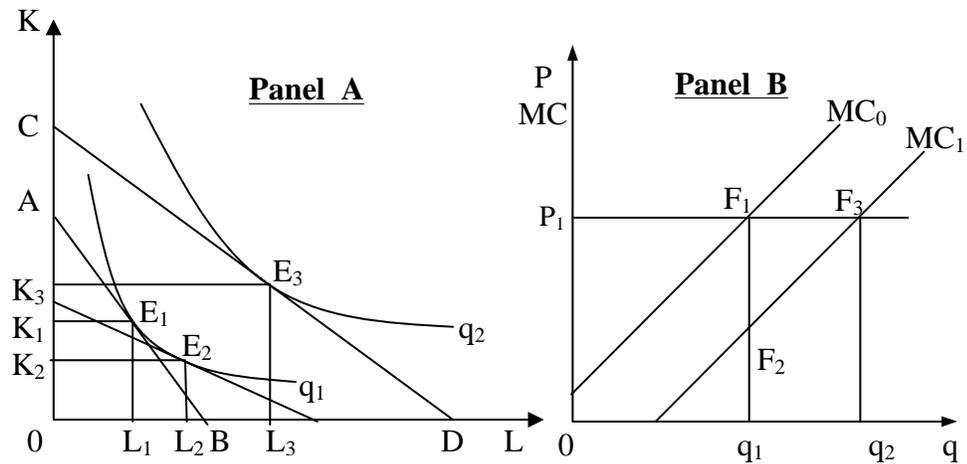
Marginal revenue product equals value of marginal product for a competitive firm in the product market.



### Demand for Labour: Two Variable Inputs

When amounts of two inputs can be changed, we must take into account some facts arising from the relationship between the two inputs. First, change in the price of one input leads to changes in the quantities of two inputs used in the production process. Second, change in the quantity of one input may cause the MRP curve of another input to shift. These points are illustrated in Figure 9.2 which has two panels. In panel A, we show the least-cost combinations of two inputs in an iso-qaunt map. It shows the changes in the quantities of two inputs when the relative prices of two inputs change. Panel B shows the pprofit maximizing levels of output of the firm.

In Panel A, the vertical axis measures capital K and the horizontal axis measures labour L. With the initial wage rate  $P_{L0}$ , the initial interest rate  $P_{K0}$  and the initial buget  $M_0$ , the buget line is AB leading to the least-cost combination of factors at

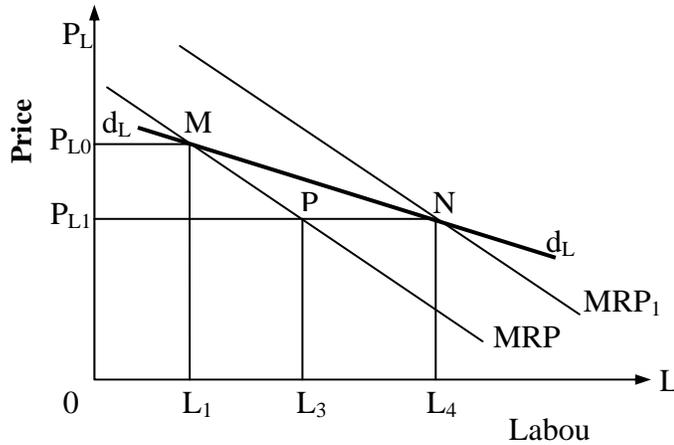


**Figure 9.2: Demand curve for labour (two variable input)**

$E_1$ .

The firm uses  $L_1$  of labour and  $K_1$  of capital to produce output  $q_1$  at minimum cost. In Panel B, we show that maximum profit is obtained by producing output  $q_1$  at the given market price  $P_1$ . Suppose the wage rate falls to  $P_{L1}$  with the interest rate remaining fixed. The least-cost combination of inputs for producing the  $q_1$  level of output at the new relative prices of inputs is shown by the point  $E_2$ . The entrepreneur uses more labour and less capital than before. Consequently, the cost of producing  $q_1$  falls as shown by the downward shifts of the marginal cost curve to  $MC_1$ . We find that the cost of producing  $q_1$  decreases to  $q_1F_2$  which is much less than the previous cost  $q_1F_1$ . At point  $F_2$ , marginal cost  $q_1F_2$  is less than market price  $P_1$ . Profit is not maximum at  $F_2$  and the entrepreneur increases output level to  $q_2$  at which price equals marginal cost. In order to produce the profit-maximizing output  $q_2$ , the entrepreneur is bound to increase the usage of both inputs. It has been shown by point  $E_3$  in Panel A, where the producer uses  $K_3$  units of capital and  $L_3$  units of labour to minimize the cost of producing output  $q_2$  at the new relative prices of inputs. The result is that the producer uses more labour when its relative price falls. But this is not the end result. Since the producer now uses more capital, the productivity of labour will increase. Consequently, the previous MRP curve will shift to the right. It has been shown

in Figure 9.3. Initially, the producer used  $L_1$  units of labour at initial wage rate  $P_{L0}$ . So  $M$  is a point on the demand curve for labour. When the relative price of

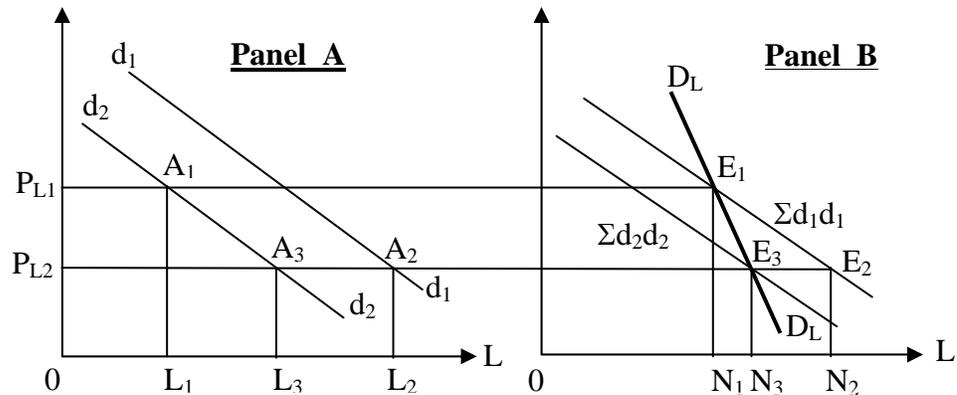


**Figure 9.3: Demand curve for labour (two variable inputs)**

labour falls to  $P_{L1}$ , the producer uses  $L_3$  units of labour for producing the increased output  $q_3$ . Since at  $q_3$  level of output, more capital is used, the MRP curve of labour shifts to  $MRP_1$ . Consequently, the producer uses  $L_4$  units of labour at the wage rate  $P_{L1}$ . Point  $N$  now becomes another point of the demand curve for labour. Joining the points  $M$  and  $N$ , we derive the demand curve for labour  $d_L d_L$  with two variable inputs. We find that the demand curve for labour with two variable inputs is not the MRP curve of labour, though it is downward sloping. The demand curve for labour with two variable inputs is, however, more elastic than the demand curve for labour with one variable input.

**Industry Demand for Labour**

The industry demand curve for labour can be obtained by adding horizontally the individual firm's demand curves for labour with two variable inputs. This is, however, true if each firm's demand curve does not shift in the process of adjustment by all firms in the industry. We explain the process of deriving the industry demand curve for labour with the help of Figure 9.4.



**Figure 9.4: Industry demand for labour**

In panel A,  $d_1d_1$  is the initial demand curve for labour of a firm. The industry demand curve for labour is shown in Panel B. The units of employment level are larger in Panel B than in Panel A, though the units of measurement are the same along the vertical axes of the two panels.

At the wage rate  $P_{L1}$ , the individual firm hires  $L_1$  units of labour. The industry demand for labour is shown by the point  $E_1$  in Panel B. The total employment level of industry stands at  $N_1$  at the wage rate  $P_{L1}$ , where  $N_1$  is equal to  $L_1$  times the number of firms in the industry. When wage rate falls to  $P_{L2}$ , the individual firm's demand for labour increases to  $L_2$ . The corresponding industry demand for labour is  $N_2$  at the wage rate  $P_{L2}$ . Since each firm in the industry demands more labour at the wage rate  $P_{L2}$ , total output of the industry will increase as long as marginal productivity of labour remains positive. The increased total output of the industry leads to fall in the price of the product. As a result, each firm's demand curve for labour shifts downward to  $d_2d_2$ . Employment level of the individual firm is now  $L_3$  at the wage rate  $P_{L2}$ . The industry demand for labour at the wage rate  $P_{L2}$  now stands at  $N_3$ . Therefore, the point  $E_3$  can now be treated as another point of industry demand curve for labour. We join points  $E_1$  and  $E_3$  to obtain the industry demand curve for labour  $D_L D_L$ .

### The Supply of Labour by An Individual

Usually persons rather than firms supply labour, to production enterprises. Supply of labour therefore, results from utility maximization by individuals who choose between leisure and income for maximizing utility. It should be noted here that leisure is always enjoyable and preferred to working. Wage rate is the price of leisure because a person has to give up wage from working when he

enjoys leisure. Most people, however, cannot spend the whole day in leisure, since they are bound to work for income which enables them to buy food and other items for living. Two effects, viz., substitution effect and income effect, influence the work effort of an individual when wage rate increases. The substitution effect induces the person to substitute work for leisure because leisure is more expensive now. Since the person earns more by working, he is motivated to work more hours. There is also the income effect which arises from the increased income of the person. With more income from higher wage rate, the person is willing to consume more of everything including leisure. If the person enjoys more leisure due

to income effect, it means that working hours are decreasing. The net effect of an increased wage rate depends on the combined effects of substitution and income. Initially, the substitution effect outweighs the income effect leading to a larger supply of labour at a higher wage rate. After a certain level, rise in wage rate leads to an income effect which outweighs substitution effect and the person supplies labour at a higher wage rate. We explain the decision making process of an individual for supplying labour to production firm with the help of Figure 9.5. The vertical axis measures income and the horizontal axis measures leisure hours. In the figure, slope of the budget line AB gives wage rate per hour. The point B along the horizontal axis is equal to twenty four hours which is the maximum time a person can work daily.

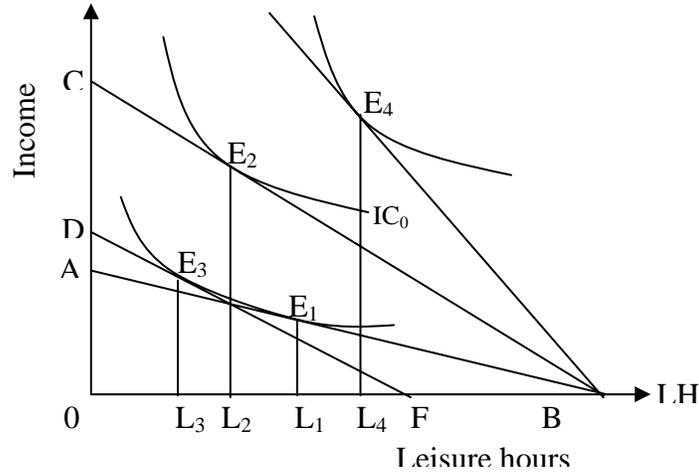
The budget line rotates along the vertical axis when wage rate increases.

The indifference curves in Figure 9.5 show the person's preferences for income and leisure. Now suppose the initial wage rate is the slope of the budget line AB.

The substitution effect induces the person to substitute work for leisure because leisure is more expensive now.

The budget line rotates along the vertical axis when wage rate increases.

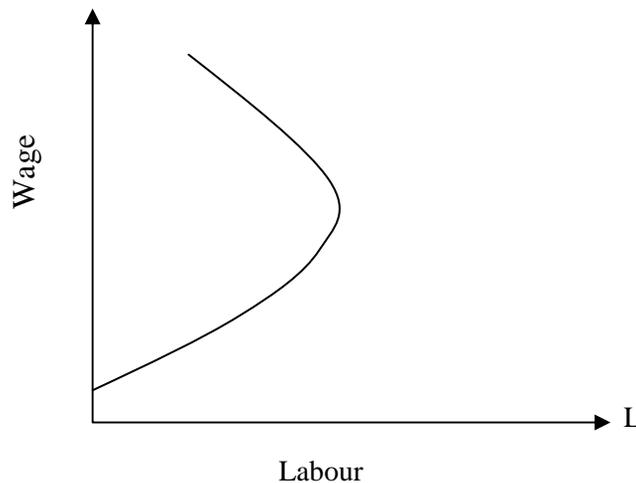
The person gets maximum satisfaction at  $E_1$  which indicates a leisure of  $L_1$  hour and working time of  $B-L_1$  hours for the person. The budget line rotates to  $CB$  when wage rate increases. The person's equilibrium is given by the point  $E_2$  which prompts the person to reduce leisure to  $L_2$  hours and increase working time to  $B-L_2$  hours. The person is found to supply more labour as wage rate increases. The line  $DF$ , which is parallel to new budget line  $CB$ , is tangent with the previous indifference course  $IC_0$  at  $E_3$ . The reduction in leisure by  $L_3L_1$  hours is



**Figure 9.5: Supply of labour by an individual**

the substitution effect and the increase in leisure by  $L_3L_2$  hours is the income effect. Substitution effect outweighs the income effect and the net effect is a reduction in leisure by  $L_1L_2$  hours. Further increase in wage rate causes the budget line to rotate to  $BM$ .

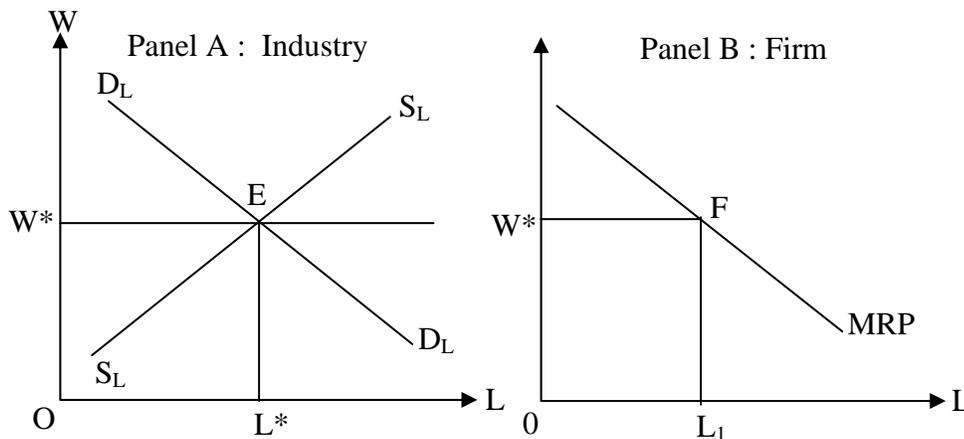
The new equilibrium occurs at  $E_4$  where the person enjoys more leisure than at  $E_2$ . This diagram shows that supply of labour increases initially and then it decreases when wage rate increases. Such a situation gives rise to **backward-bending supply curve of labour** from an individual. We show a backward-bending supply curve in Figure 9.6.



**Figure 9.6: Backward bending supply curve of an individual**

### Industry Supply Curve of Labour

We add the backward-bending supply curves of all individuals horizontally to obtain the industry supply curve of labour. Since the individual supply curves of labour will have backward-bending points at different wage rates, the downward sloping portions of individual supply curves will be eliminated in horizontal summation of these curve. The industry supply curve of labour will be upward sloping as shown in Figure 9.7.



**Figure 9.7: Determination of wage rate in competitive labour market**

It should be noted at this point that the industry supply curve for labour is meaningful when the supply of labour to a particular industry is considered. The supply of labour to all industries may be fixed making the supply curve vertical or very much inelastic. Moreover, the supply of labour must refer to a flow of labour used in an industry during a period of time

### Determination of Wage Rate in Perfectly Competitive Input Market

The preceding discussions centred on the derivation of a downward sloping industry demand curve for labour and an upward sloping supply curve of labour shown in Panel A of Figure 9.7. We have also drawn the industry demand curve for labour in Panel A. Equilibrium price of labour is determined at the intersection of the demand curve for labour and supply of labour. The equilibrium wage rate is  $W^*$  and equilibrium employment is  $L^*$ . If the market wage rate goes above the equilibrium wage rate, a surplus of input develops. The seller is bound to reduce the price of his input. Conversely, an excess demand for input exists when price is set below the equilibrium wage rate. The unsatisfied customers bid up the price of input unit price comes back to equilibrium price. In Panel B, we show the equilibrium of a competitive firm in input market. The firm takes the industry price of input as given and finds its equilibrium at point F where the wage line intersects the MRP curve. The equilibrium level of employment for the firm is  $OL_1$ .

If the market wage rate goes above the equilibrium wage rate, a surplus of input develops.

## Review Questions

- *Essay-type Questions*

1. Why is the VMP or MRP of an input also a firm's demand for the input? What assumption is required?
2. (a) Suppose you apply for a job that pays \$20,000 per year. What must be true of your VMP or MRP to obtain this job and keep it?  
  
(b) Several of the top entertainers in the United States earn over \$50 million per year, while factory, office, service workers, and teachers toil for a fraction of this wage. Are entertainers overpaid? Are low-wage people under-paid for their labour? Explain.

Wage per Hour	Hours per Week Supplied by Employee:		
	1	2	3
\$8	0	0	40
10	0	40	40
12	40	40	40

3. (a) Using the chart in the previous column, plot the market supply of labour from the figures for individual employees  
  
(b) Is the market supply more or less elastic than the supply of each individual? Why?
4. Suppose you own a small business and employ 10 people. One of your main problems is absenteeism. To ease this problem, you consider raising your employees' wages from \$9 to \$10 per hour. Do you think this raise would reduce the number of days missed? Explain.
5. Using diagrams, illustrate how wage is determined in a market made up of perfectly competitive buyers of labor, and how this wage relates to the individual employer.

- *True or False*

Which of the following statements are true?

- (a) Marginal Productivity of an input is the change in total output.
- (b) The Profit maximizing level of employment occurs when the market determined wage rate equals the value of Marginal Productivity of labour.

• **Multiple Choice Questions**

1. Marginal physical product (MPP) is:
  - (a) the units of input required to obtain one more unit of output
  - (b) the units of output obtained from using one more unit of an input
  - (c) dollars of input required to obtain one more unit of output
  - (d) dollars of output obtained from one more unit of an output
  
2. Value of marginal product (VMP) of an input is:
  - (a) the value that an extra unit of output adds to total sales or revenue
  - (b) the cost of adding one more unit of output
  - (c) the cost of adding one more unit of input
  - (d) the value of extra output obtained by adding one more unit of the input
  
3. VMP is obtained by multiplying MPP by .....:
  - (a) input price
  - (b) output price
  - (c) APP
  - (d) MC
  
4. Marginal revenue product (MRP) is obtained by multiplying MPP by .....:
  - (a) input price
  - (b) marginal revenue
  - (c) APP
  - (d) MC
  
5. The VMP curve relates to ..... competitive firms and the MRP curve relates to ..... competitive firms:
  - (a) imperfectly; perfectly
  - (b) perfectly; imperfectly
  - (c) profitable; unprofitable
  - (d) unprofitable; profitable
  
6. To maximize profits a firm should expand the use of an input until its VMP ..... the price of the .....:
  - (a) exceeds; input
  - (b) equals; input
  - (c) exceeds; output
  - (d) equals; output
  
7. Because of the profit-maximizing rule set forth in question 6, the VMP curve of an input also is its ..... curve:
  - (a) demand
  - (b) supply
  - (c) MTC
  - (d) ATC

8. The profit-maximizing rule for output: ..... The profit-maximizing rule for input use: ..... These rules are .....
- (a)  $P_x = VMP_x$ ;  $P = MC$ ; unrelated
  - (b)  $P = MC$ ;  $P_x = VMP_x$ ; unrelated
  - (c)  $P_x = VMP_x$ ;  $P = MC$ ; equivalent
  - (d)  $P = MC$ ;  $P_x = VMP_x$ ; equivalent
9. The price of leisure is equal to:
- (a) the cost of entertainment
  - (b) zero, because money cannot buy happiness
  - (c) wages forgone by not working
  - (d) zero, because leisure is not bought and sold
10. If an employer increases wages of his or her employees to reduce absenteeism, employees will take fewer days off if the ..... effect exceeds the ..... effect:
- (a) wage; income
  - (b) substitution; income
  - (c) wage; substitution
  - (d) income; substitution
11. If wages are higher than the equilibrium wage in a labour market, the resulting ..... is called .....
- (a) shortage; inflation
  - (b) surplus; inflation
  - (c) shortage; unemployment
  - (d) surplus; unemployment
12. A perfectly competitive employer of labor faces a labour ..... that is perfectly .....
- (a) supply; elastic
  - (b) supply; inelastic
  - (c) demand; elastic
  - (d) demand; inelastic
13. Most employers are ..... competitive buyers of labour because most hire a ..... share of the total labor market:
- (a) perfectly; large
  - (b) perfectly; small
  - (c) imperfectly; large
  - (d) imperfectly; small
14. A perfectly competitive employer maximizes profits by hiring labour up to the point where the wage rate equals:
- (a) the price of labor
  - (b) the price of the product
  - (c) the MR of the product
  - (d) the MRP of labor

## Lesson 2: Determination of Wage in Imperfectly Competitive Input Markets

### Objectives

After studying this lesson, you will be able to:

- State how wage rate and employment level are determined in monopsony input market;
- State how wage rate and employment level are determined in monopoly labour market;
- State how wage rate and employment level are determined in bilateral monopoly;
- State how rent is determined according to ricardian theory; and
- State how interest rate is determined.

### Factor Markets with Monopsony Power

A factor market may be non-competitive from two sides. The number of buyers for an input may be small so that the buyers can exert some control on the supply price of the input. The input market may also be characterized by a few sellers who can influence the selling price of the input. We first discuss the input market with one buyer known as monopsony input market. Here we assume that the number of sellers is large.

In monopsony input market, the input supply curve facing the single buyer is the market supply curve. An upward sloping input supply curve implies that the buyers must pay a higher price to buy a larger quantity of the input. Since the buyer has to pay the same price for all units he buys at a point of time, the

marginal expenditure for the last unit of the input must be higher than the price of the input. The upward sloping supply curve is then the average expenditure curve which lies below the marginal expenditure curve. Suppose the input is labour and the product market is perfectly competitive so that value of marginal product (VMP) becomes identical with marginal revenue product (MRP). Figure 9.8 illustrates the process of deciding employment level and wage rate in a monopsony labour market. In the figure, the average expenditure curve AE is upward sloping and the corresponding marginal expenditure curve ME lies above the AE curve. Equilibrium of the firm occurs at  $E_1$  which equates ME to the MRP. Equilibrium level of employment is  $L_1$  and the wage rate corresponding to equilibrium level of employment is  $W_1$ . VMP at  $L_1$  is  $L_1W_1$ , the value which the consumers attach to the productivity of labour. At  $L_1$ , labour's wage rate is  $W_1$  which is much less than VMP. The labour is getting less than the social value of its contribution in the production process. In perfectly competitive labour market, employment level and wage rate would have been  $L_0$  and  $W_0$  respectively. Monopsony in labour market decrease employment level and increases wage rate. Monopsony labour market in combination with imperfect product market brings further changes in the level of employment and wage rate.

The upward sloping supply curve is then the average expenditure curve which lies below the marginal expenditure curve.

Monopsony labour market in the presence of imperfect product market has been shown in Panel B of Figure 9.8. In non-competitive product market, marginal revenue product MRP is less than the value of marginal product VMP. Equilibrium level of employment is  $L_1$ ,

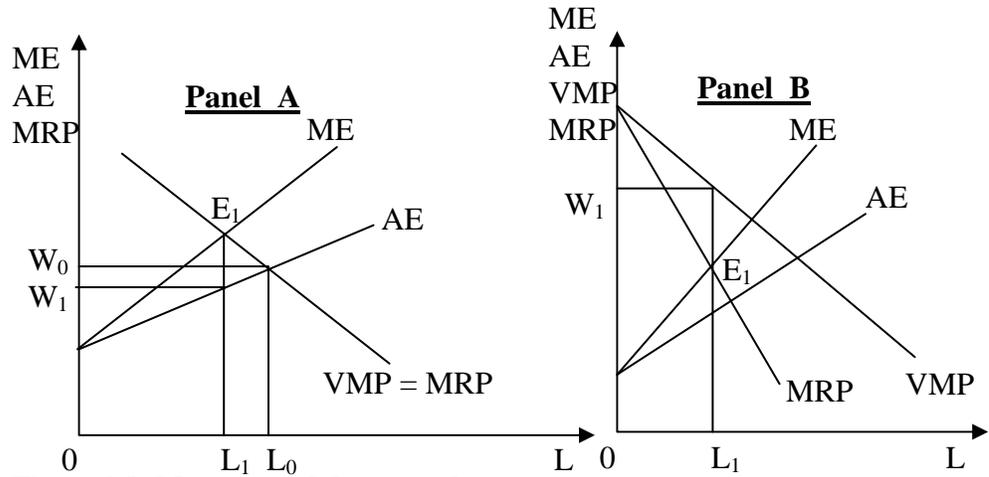


Figure 9.8: Monopsony labour market

where MRP equals ME. The equilibrium wage rate is  $W_1$  corresponding to the level of employment  $L_1$ .

### Factor Markets with Monopoly Power

The labour market can be non-competitive due to the presence of a few sellers of labour. In the extreme case, the labour market can be controlled by a single seller. The market for skilled labour used in producing a specific computer chip is an example of monopoly labour market. Now-days the labour union is normally assigned the task of negotiating wage rate and employment level for its members. The union representative acts as if he were the owner of all production enterprises under jurisdiction of the union. The implication of a monopoly labour market is that the demand curve for labour facing the firm is the industry demand curve. The union may set the wage rate when the quantity demanded at the set

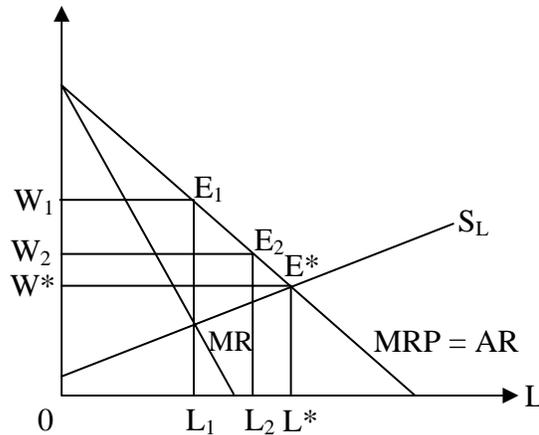
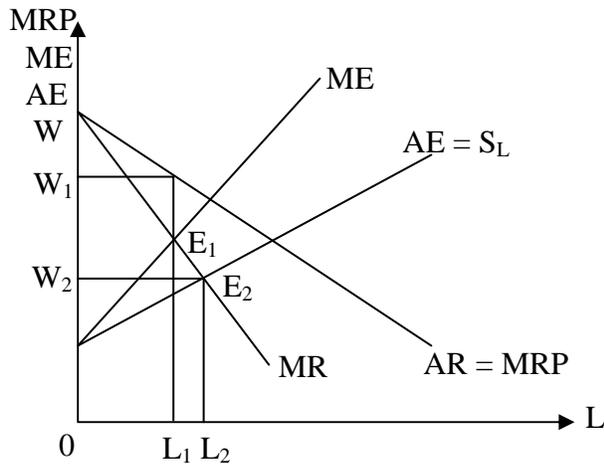


Figure 9.9: Monopoly Labour Market

wage rate depends on the preferences of the employers. Alternatively, the union may decide the level of employment for its members leaving the wage rate to be determined by the employers. The crucial point is that the union must lower the wage rate if it wants to provide employment to a larger number of members. Such a behavioral pattern makes marginal revenue (MR) less than average revenue (AR). Consequently the MR curve lies below the AR curve. Figure 9.9 illustrates pricing and input decisions of a monopolist in the labour market. The MRP curve is the average revenue curve facing the labour-monopolist. The corresponding marginal revenue curve is MR which intersects the industry supply curve  $S_L$  at  $E_1$ . It should be noted that the supply curve  $S_L$  shows the opportunity cost of labour at different levels of employment. A point on the  $S_L$  curve represents the minimum wage that must be paid to the marginal labour in order to encourage him to work in the firm. The difference between the MR and  $S_L$  curves measures the economic rent at different levels of employment. The labour union might be interested in maximizing economic rent. The equilibrium level of employment in that case is  $L_1$  where MR equals  $S_L$ . It is no wonder that the wage rate  $W_1$  corresponding to employment level  $L_1$  is high. The policy of maximizing rent may be desirable if the non-employed workers get jobs elsewhere. Alternatively, the labour union may opt for maximum employment for its members. Maximum employment  $L^*$  is obtained corresponding to point  $E^*$  where the  $S_L$  curve intersects the MRP curve. The wage rate at  $L^*$  level of employment is  $W^*$ . Another target of the labour union may be maximization of total revenue of the workers. This occurs at  $L_2$  level of employment when the MR curve intersects the horizontal axis. The wage rate is  $W_2$  at employment level  $L_2$ .

### Bilateral Monopoly

A bilateral monopoly may emerge in the input market when a single buyer confronts a single seller for an input. A case of bilateral monopoly may arise when the representative of the companies which use a specific type of skilled labour meets the union leader of these labourers to negotiate wage rates and employment levels. We use Figure 9.10 to illustrate the process of determining wage rate and employment level in a bilateral monopoly.



**Figure 9.10: Bilateral monopoly in labour market**

The MRP curve of the single buyer of the input becomes the average revenue curve AR of the single seller of the input. MR is the corresponding marginal revenue curve of the input-monopolist. Suppose the monopolist ignores the fact that there is one buyer of the input, but assumes the number of buyers to be large. The curve  $S_L$  then shows the opportunity cost of the labour that must be paid to encourage the labour to work. The input-monopolist decides the rent-maximizing employment level  $L_1$  and wage rate  $W_1$  corresponding to point  $E_1$  at which the MR crosses the  $S_L$  curve. Suppose further that the monopsonist ignores the presence of the single seller and assumes the number of sellers to be large. The MRP curve then measures the additional revenue that accrues to the monopsonist from one extra unit of employment whereas the ME curve shows the marginal expenditure for the extra unit of employment. The monopsonist maximizes his profit at  $E_2$  where the MRP curve intersects the ME curve. For the monopsonist, equilibrium level of employment is  $L_2$  and wage rate is  $W_2$ . We find that  $W_1 > W_2$ , but  $L_1 < L_2$ . There is a conflict between the monopolist and the monopsonist with regard to decisions on employment level and wage rate. The final outcome depends on the relative strength of bargaining by the two parties. If the monopolist is more powerful than the monopsonist, the final solution would be given by a point very close to  $E_1$ . On the other hand, the final solution would be very similar to that given by the point  $E_2$  if the monopsonist dominates in the bargaining process.

The monopsonist ignores the presence of the single seller and assumes the number of sellers to be large.

## Review Questions

### • *Essay-type Questions*

1. (a) What happens to the demand for labor when there is a decrease in demand for consumer or investment goods?  
  
(b) Why does this phenomenon cause an increase in unemployment?
2. Barbers, taxicab drivers, and teachers probably are not much more productive now-a-days than they were 30 to 40 years ago. Yet, their real wages have increased substantially. Why?
3. Explain how each of the following circumstances will affect the demand for the product produced by labour.
  - (a) A decrease in demand for the product produced by labour
  - (b) An increase in the use of capital that is complementary to labour
  - (c) An increase in the use of capital that is a substitute for labour
  - (d) An increase in the skills of labour
4. Show that the profit-maximizing rule from the standpoint of output is equivalent to the profit-maximizing rule for input use.
5. (a) Traditionally women have earned lower wages than men. Other than discrimination, what are some reasons for this phenomenon?  
  
(b) Why is discrimination against women or minorities irrational for a firm that wishes to maximize profits?

### • *True or False*

Which of the following statements are true?

- (a) In monopsony input market, the input supply curve facing the single buyer is the market supply curve.
- (b) The labour market can be non-competitive due to the presence of a few sellers of labour.
- (c) A bilateral monopoly may emerge in the input market when a single buyer confronts a single seller for an input.

### • *Multiple Choice Questions*

1. An imperfectly competitive buyer of labor:
  - (a) hires a large share of the labor market
  - (b) sells a large share of the product market
  - (c) pays a lower than competitive wage
  - (d) a and c
2. An imperfectly competitive buyer of labour will maximize profits by hiring employees up to the point where the last employee's ..... is equal to his or her .....

- (a) MRP; wage
  - (b) MRP; MRC
  - (c) wage; MRC
  - (d) MRP; MPP
3. An imperfectly competitive buyer of labor will maximize profits by paying:
- (a) a zero wage
  - (b) a wage corresponding to the profit-maximizing quantity point on the supply curve of labor facing the employer
  - (c) a wage corresponding to the intersection of MRC and MRP
  - (d) a wage corresponding to the intersection of MRP and the supply of labor facing the employer
4. An increase in the price of the product ..... the ..... labour
- (a) increases; demand for
  - (b) increases; supply of
  - (c) decreases; supply of
  - (d) decreases; demand for
5. If consumers decrease their demand for products and wages do not decrease, there will be .....
- (a) wage increases
  - (b) unemployment
  - (c) inflation
  - (d) strikes
6. Two inputs are complements if an increase in the quantity of one ..... the ..... of the other
- (a) increases; MPP
  - (b) decreases; MPP
  - (c) increases; supply
  - (d) decreases; supply
7. Two inputs are substitutes if an increase in the quantity of one ..... the ..... of the other
- (a) increases; MPP
  - (b) decreases; MPP
  - (c) increases; supply
  - (d) decreases; supply
8. The demand for skilled people is ..... than the demand for those with less skills because their ..... are higher
- (a) greater; wages
  - (b) greater; MPPs
  - (c) less; wages
  - (d) less; MPPs
9. The productivity of people in certain occupations such as teaching and driving a taxi has not increased appreciably over the past several decades. Yet their real wages have increased. This can be explained by the increase

in real wages in alternative occupations which had the effect of ..... the ..... labor to teach and drive a taxi.

- (a) increasing; demand for
- (b) increasing; supply of
- (c) decreasing; demand for
- (d) decreasing; supply of

10. Which combination of characteristics results in the highest wages?

- (a) high skill and pleasant working conditions
- (b) high skill and disagreeable working conditions
- (c) low skill and pleasant working conditions
- (d) low skill and disagreeable working conditions

11. Discrimination by employers against women and minorities decreases the profits of their firms because the VMPs (MRPs) of those discriminated against are ..... than their wages. Profits for these firms could be increased by hiring ..... women and minorities

- (a) greater; more
- (b) greater; less
- (c) less; more
- (d) less; less

## Lesson 3: Determination of Rent and Interest Rate

### Objectives

After studying this lesson, we will be able to:

- Describe Ricardian theory of rent determination; and
- State the process of interest rate determination.

### The Theory of Rent

As a factor of production, land possesses one specific feature -- the supply of land is fixed in the economy. The supply of other factors varies in response to some external factors. For example, increase in demand for a product may ultimately lead to increase in the supply of labour. Increased price for land will not increase its supply. We need a separate theory of rent which is the remuneration for land. In fact, the evolution of the theory of rent was linked with some historical events. During the end years of the nineteenth century, the price of food crops increased many times. Some people blamed the landlords for rise in the price of food crops. They argued that the rise in rent of land fuelled the increase in prices of food grains. A few people including the famous economist David Ricardo did not agree with this view and opined that the increase in rent was the effect, not the cause of price hike for food crops. In fact, he founded a theory of rent known as the Ricardian theory of rent.

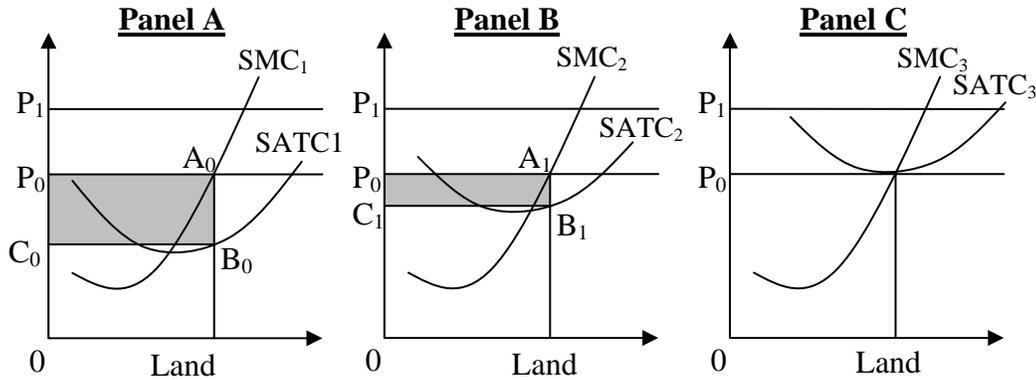
We need a separate theory of rent which is the remuneration for land.

### *The Ricardian Theory of Rent*

David Ricardo applied his theory to explain the difference in rents from different categories of land. He illustrated his theory with the help of an example. Suppose there are four categories of land which can be identified as Grade-A, Grade-B, Grade-C and Grade-D land. Figure 9.12 explains the Ricardian process of determining rent. Each panel in the figure shows the average and marginal cost curves for a particular category of land. Since Grade-A is superior quality land, it has the lowest average and marginal cost curves as shown in Panel A. The average and marginal cost curves of other categories of land have been drawn by assuming that Grade-B is better than Grade-C which, in turn, is better than Grade-D. At initial market price  $P_0$ , the farmers earn supernormal profit from Grade-A and Grade-B land. The owner of Grade-C land earns only normal profit.

Grade-C land is called marginal land without any rent. The amount of total profit from Grade-A land, which is equal to area  $P_0C_0B_0A_0$ , is charged as rent by its owner for using it by other farmers. In fact, this profit is treated as an item of implicit cost that must be borne by any farmer willing to use Grade-A land. Using the same interpretation for supernormal profit we find the rent for using Grade-B land to be equal to area  $P_0C_1B_1A_1$ . Rent is, therefore, defined as that portion of total revenue which is excess over the minimum amount necessary to keep the piece of land in cultivation. Since price is equal to its minimum average cost, Grade-C land earns no rent. Rent is the maximum for Grade-A land, because, supernormal profit from this category of land is, maximum.

Rent is defined as that portion of total revenue which is excess over the minimum amount necessary to keep the piece of land in cultivation.



**Figure 9.12: Ricardian theory of rent**

When price level increases to  $P_1$  due to increase in demand for food grains, the level of supernormal profit increases for Grade A and Grade B land. The higher price level enables the Grade C land to earn supernormal profit and hence rent from now on. Moreover, Grade D land now comes under cultivation, though it becomes the marginal land with price level  $P_1$ . As price increases, the growing demand for food grains is met in two ways (i) by bringing more and more inferior categories of land under cultivation and (ii) by cultivating the previous categories of land more intensively. As a result, rents start coming from inferior categories of land and the level of rent increases for superior categories of land. According to modern theories of rent, any factor of production with finite elasticity of supply earns rent. Only factors having infinite elasticity of supply cannot earn rent. Ricardo assumed a fixed supply of land with no opportunity cost. Hence the whole amount of supernormal profit can be regarded as rent.

### The Theory of Interest Rate

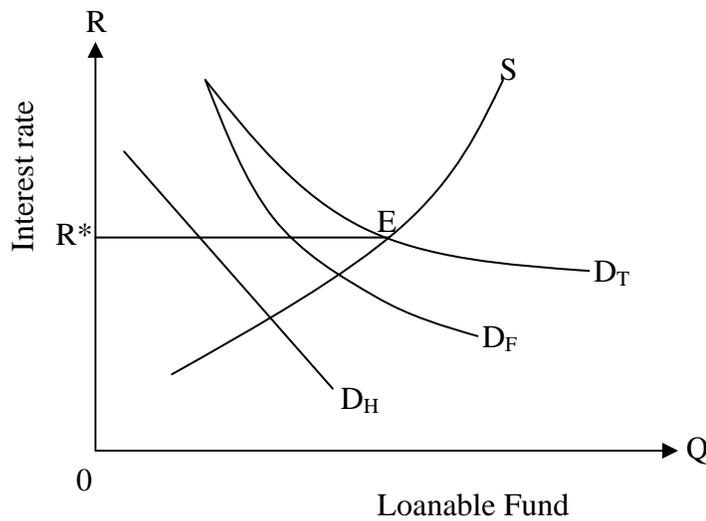
Capital is an important input of production. It is defined as the produced means of production. It is that part of produced commodity which is used for additional production in future. The remuneration for capital is interest. Our objective here is to discuss briefly how the interest rate is determined. Interest rate is nothing but the price paid for the services of capital. Like the price of any commodity, the interest rate is determined at the intersection of demand for and supply of capital. The demand for capital or funds comes from two sources, viz. households and firms. Some households borrow funds from different non-institutional and institutional sources. These households raise their present consumption levels by taking loans which they expect to repay in future. The present income levels of these households are low but these households expect to earn more in future. Or, these households make big purchase which must be paid for out of future income. These households prefer present consumption to future consumption and try to even their consumption pattern over life-time by borrowing when income is low and repaying when income is high.

Since the interest rate is a price for loaned funds, these households borrow more funds at low interest rate and less funds at higher interest rate. Firms also borrow

Interest rate is nothing but the price paid for the services of capital.

funds for investing in production enterprises. A firm decides to undertake an investment project if the net present value (NPV) of the project is positive. As interest rate rises, NPVs of some investment projects become negative and these projects are rejected. As a result, the demand for investible funds decreases when interest rate increases and vice versa. We add the demands for funds from both households and firms horizontally to obtain the total demand for funds which will be a decreasing function of interest rate. The supply of funds or capital comes from those households which like to consume less now and more in future. These households like to leave bequeasts for their future generations. Or, their present income levels are high, but future income levels will be low. These households even change their consumption patterns by saving now and consuming in future. They earn interest income by lending their funds to households and firms. These households will save

The supply of funds or capital comes from those households which like to consume less now and more in future.



**Figure 9.13: Determination of interest rate**

more and supply more funds when the rate of interest paid on savings increases. In other words, the supply curve of loanable funds will be upward sloping. Figure 9.13 illustrates the process of determining interest rate. The curves  $D_H$  and  $D_F$  are the demand curves for loanable funds of households and firms respectively. We add the  $D_H$  and  $D_F$  curves horizontally to derive the total demand curve for loanable funds,  $D_T$ . The curve  $S$  shows the aggregate supply curve of loanable funds.  $D_T$  intersects the aggregate supply curve of loanable funds  $S$  at point  $E$  to determine the equilibrium interest rate  $R^*$ . This is how the rate of interest is determined.

## Review Questions

### • *Essay-type Questions*

1. (a) What is capital?  
(b) What do capital and consumer durables have in common?
2. (a) What is the annual cost of owning a \$10,000 automobile the first year of ownership if the rate of interest is 12 percent and the auto depreciates 25 percent per year? Assume insurance, license, and maintenance cost \$1,000 per year and that the car is driven 15,000 miles per year at 20 miles per gallon of gasoline. Assume gasoline is \$1 per gallon.  
(b) What is the cost of the second year of ownership?
3. (a) Why does capital depreciate?  
(b) What are the common methods of calculating depreciation?
4. (a) What is capitalized value?  
(b) What is the capitalized value of a parcel of land that yields \$100 annual net returns if the interest rate is 15 percent?  
(c) What is the capitalized value of the above parcel if the interest rate is 10 percent?  
(d) During the 1970s, farmland in the United States sold for three to four times its capitalized value. Why?
5. (a) Why do nominal interest rates rise during inflation?  
(b) Can real rates of interest be negative? Explain.
6. (a) What type of borrower pays the highest rate of interest?  
(b) How do usury laws affect such borrowers?
7. How does the interest rate ration and allocate investment funds?
8. (a) What determines stock prices?  
(b) How is the price/earnings ratio related to the rate of return on money invested in the stock market?  
(c) Why do stock prices change?

### • *True or False*

Which of the following statements are true?

- (a) According to modern theories of rent, any factor of production with finite elasticity of supply earns rent.
- (b) Capital is an important input of production. It is defined as the produced means of production.
- (c) Since the interest rate is a price for loaned funds, these households borrow more funds at low interest rate and less funds at higher interest rate.

• ***Multiple Choice Questions***

1. Capital is:
  - (a) money
  - (b) Washington, D.C.
  - (c) inputs used up in the production process
  - (d) long-lasting, durable inputs
2. Which of the following characteristics differentiate capital from labour?
  - (a) it contributes to output
  - (b) it costs money
  - (c) working conditions are not so important
  - (d) it doesn't wear out
3. The two items that determine the annual cost of capital are:
  - (a) wear and tear
  - (b) wages and prices
  - (c) interest and depreciation
  - (d) time and money
4. Capital depreciates because:
  - (a) it wears out
  - (b) it becomes obsolete
  - (c) the future is unknown
  - (d) a and b
5. An interest charge should be included in the annual cost of ownership:
  - (a) only if the money to purchase the capital is borrowed
  - (b) only if the money to purchase the capital is the owner's
  - (c) only if capital depreciates
  - (d) regardless of whether the money is borrowed or obtained from the owner's funds
6. What is the annual cost of owning a \$12,000 automobile the first year of ownership if the interest rate is 10 percent; it depreciates 25 percent; and gasoline, license, insurance, and repairs amount to \$1,500 per year?
  - (a) \$12,000
  - (b) \$5,700
  - (c) \$4,200
  - (d) \$1,500
7. In reference to question 6, what is the cost of ownership the second year, assuming the same conditions?
  - (a) \$4,650
  - (b) \$5,700
  - (c) \$9,000
  - (d) \$3,150
8. Under a constant percent depreciation pattern the largest depreciation occurs the ..... year of ownership:
  - (a) first
  - (b) last
  - (c) second

- (d) next to last
9. With straight-line depreciation pattern a capital item depreciates:
- (a) a constant dollar amount each year
  - (b) a constant percent each year
  - (c) a decreasing dollar amount each year
  - (d) an increasing dollar amount each year
10. The MRP of capital is:
- (a) interest plus depreciation
  - (b) the additional income generated by utilizing the capital
  - (c) the additional units of output obtained by utilizing the capital
  - (d) interest plus depreciation plus operating expenses such as insurance and repairs
11. The rate of return on capital is:
- (a) annual interest plus depreciation expressed as a percent of the value of capital at the beginning of the year
  - (b) the annual monetary contribution of capital expressed as percent of the value of the capital at the beginning of the year
  - (c) the annual physical contribution of capital expressed as a percent of the value of capital at the beginning of the year
  - (d) the annual monetary contribution of capital expressed in dollars
12. The rate of return on capital is calculated by ..... the ..... by .....
- (a) dividing; annual net returns; capital value
  - (b) dividing; capital value; annual net returns
  - (c) multiplying; annual net returns; capital value
  - (d) multiplying; capital value; annual net returns
13. The higher the rate of interest, the ..... the .....
- (a) higher; capitalized value
  - (b) lower; capitalized value
  - (c) higher; rate of return
  - (d) lower; rate of return
14. During inflation the demand for loan funds ....., their supply ....., and the nominal rate of interest .....
- (a) increases; decreases; increases
  - (b) decreases; increases; increases
  - (c) increases; decreases; decreases
  - (d) decreases; increases; decreases
15. Interest rates tend to be lowest for ....., ..... risk loans:
- (a) small; high
  - (b) small; low
  - (c) large; high
  - (d) large; low

16. If the rate of inflation is 5 percent, and the nominal rate of interest is 8 percent, the real rate of interest is ..... percent:
- (a) 13
  - (b) - 3
  - (c) 3
  - (d) - 13

• **Problem**

*Read and analyse the following news-story carefully:*

**US Farm Incomes and Land Prices**

In 1972-73 the demand for US farm output increased substantially as a consequence of poor harvests elsewhere in the world. US farm output could not expand fast enough to keep pace with demand. As a result, the price of farm products increased dramatically; the average price of farm output rose by nearly 40 percent in one year.

The rising prices of farm goods sharply increased farm incomes. They also made farmland more valuable. The resultant competition for farmland pushed land prices up more than 25 percent in 1973-74. The rest of the 1970s continued to be good for farmland. Crop prices generally increased faster than inflation, and the value of farmland more than tripled.

The 1980s were not so good for farm prices. The prices of major agricultural products started to fall in 1980, as a consequence of huge harvests and generally weak demand. Net farm income fell dramatically between 1979 and 1983 as cost increases greatly outpaced price increases (see Chapter 29). In response to this diminishing income potential, the price of farmland started falling as well. From 1981 to 1985 farmland prices fell sharply. In the 1984-85 season alone, average farm prices fell 13 percent. The decline in land prices was reversed in 1987 when crop prices rose sharply. From 1987 to 1992 farm incomes rose substantially as did the price of farmland.

**Source:** Bradley R. Schiller, *The Economy Today* (sixth edition), p-720, 1994, McGRAW-HILL, INC.

**Hints:** The value of farmland depends on the value of crops produced from the land. Ricardo emphasized that crop prices determine land prices rather than vice versa.

# WELFARE ECONOMICS



## Highlights

- Pareto Optimality
- Pareto Efficiency Conditions in Consumption
- Pareto Efficiency Conditions in Production
- Derivation of Grand Utility Possibility Curve
- Pareto Optimality and Perfect Competition
- Bliss Point
- Definition of Market Failure
- Causes of Market Failure/Different Forms of Market Failure.

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## Unit-10

### Lesson 1: Pareto Optimality and Perfect Competition

#### Objectives

After studying this lesson, you will be able to:

- Define Pareto Optimality;
- Derive the condition for Pareto efficiency in consumption;
- Derive the condition for Pareto efficiency in production;
- Derive the condition for Pareto efficiency in product mix;
- Derive the grand utility possibility curve;
- Define the social welfare function and find the bliss point; and
- Show how Pareto optimum can be obtained in perfect competition.

#### Welfare Economics

Economics deals with means of enhancing welfare of the people. The term 'welfare' is a generic word implying anything which makes a person feel good. It should be borne in mind that feeling 'good' is very much subjective varying from person to person. The science of Economics believes in sovereignty of the consumer which can be enjoyed in a democratic state. In previous lessons, maximization of self-interest was taken to be the only guiding motivation for any economic activity. The consumer is interested in utility maximization and the firm-owner in profit maximization. Profit is also a kind of income that goes to the entrepreneur. Ultimately, utility is taken as an index of welfare. Even welfare measured through utility is not free from shortcomings. For example, a policy which increases utility of some persons and decreases utility of other persons cannot be judged without making interpersonal comparison of utility which is an impossible task to do. One famous Italian economist, Vilfredo Pareto, introduced a welfare criterion free of inter-personal comparison of utility. The position of maximum welfare for the economy, known as Pareto Optimum, is attained when a policy through reallocation of resources cannot improve the position of some persons without degrading the position of at least one person. A policy is said to bring about Pareto improvement if the policy benefits some people without hurting other people in society. An economy is in Pareto Optimum when a Pareto improvement cannot be obtained by adopting any policy for the economy. Pareto Optimum requires that some conditions, known as Pareto efficiency conditions, are to be met. We discuss these Pareto efficiency conditions next.

Vilfredo Pareto, introduced a welfare criterion free of inter-personal comparison of utility.

#### Pareto Efficiency in Consumption

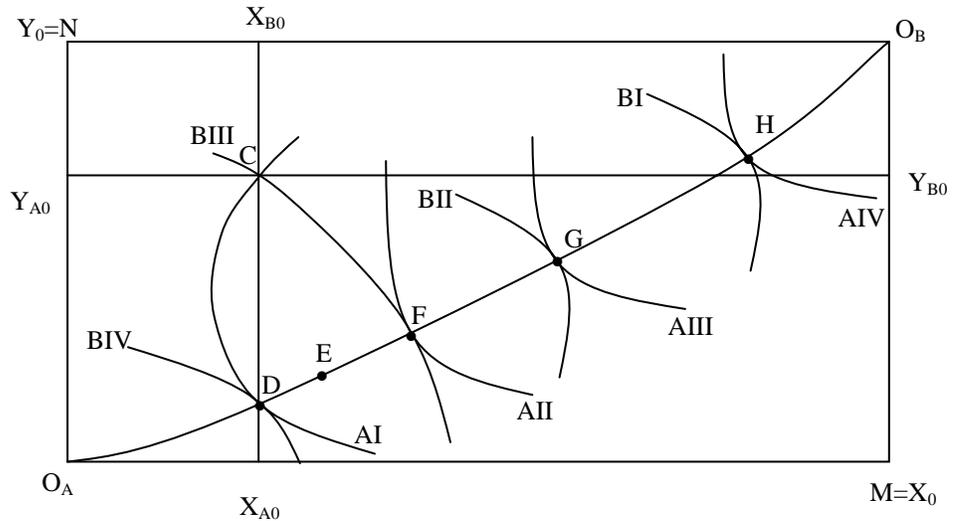
Suppose there are two persons, A and B, and two commodities, X and Y, in the economy. The initial endowments of two commodities,  $X_0$  and  $Y_0$ , must be fully utilized.

$$X_{A0} + X_{B0} = X_0$$

$$Y_{A0} + Y_{B0} = Y_0$$

$X_{A0}$  denotes person A's initial endowment of commodity X,  $Y_{B0}$  signifies person B's initial endowment of commodity Y, etc.

We use a famous diagram, known as Edgeworth Box Diagram, for deriving the Pareto efficiency condition in consumption. An Edgeworth Box Diagram is mainly a rectangular box whose length and width are equal to initial quantities of commodity X and commodity Y respectively.  $O_A$  is the origin of person A's indifference map and  $O_B$  is the origin of person B's indifference map. The curves marked AI, AII AIII and AIV represent the indifference curves of person A and the curves marked BI, BII BIII and BIV are the indifference curves for person B. Person A's level of satisfaction increases as he goes to higher indifference curves in the upward direction. Person B's level of satisfaction increases as he goes to higher indifference curves in the downward direction. Suppose the initial



**Figure 10.1: Pareto Efficiency in Consumption**

distribution of two commodities is given by the point C. The initial bundle of person A consists of  $X_{A0}$  units of commodity X and  $Y_{A0}$  units of commodity Y. Similarly, person B possesses  $X_{B0}$  units of commodity X and  $Y_{B0}$  units of commodity Y. Point C is not a Pareto efficient distribution in consumption. A Pareto improvement occurs if a reallocation of two commodities brings the two persons to point D. A movement from C to D improves the position of person B by moving him to higher indifference curve *BIV* from lower indifference curve *BIII* without changing the position of person A at indifference curve *AI*. Similarly, the movement from C to F benefits person A by raising him from lower indifference curve *AI* to higher indifference curve *AII* without hurting person B who stays at his initial indifference curve *BIII*. A movement from C to D or from C to F constitutes a Pareto improvement. Point D is Pareto efficient point in consumption, because, a movement from D to C keeps the utility of person A fixed at indifference curve *AI* but decreases the utility of person B from indifference curve *BIV* to indifference curve *BIII*. Similar interpretation holds for point F which is another Pareto efficient point in consumption. It can be seen from the diagram that the two persons' indifference curves are tangent to each other at D and F. It is true that Pareto efficient points in consumption occur at

tangency points where the tangents to two persons' indifference curves are equal. Though we have not shown in the diagram, there are other indifference curves of two persons which give rise to Pareto efficient points like E between the points D and F. A reallocation of commodities from C to E is clearly a Pareto improvement because the satisfaction levels of two persons increase at E. At E also the indifference curves of two persons are tangent to each other. We can select other initial distribution points like C and find the reallocations which lead to Pareto efficient points in consumption.

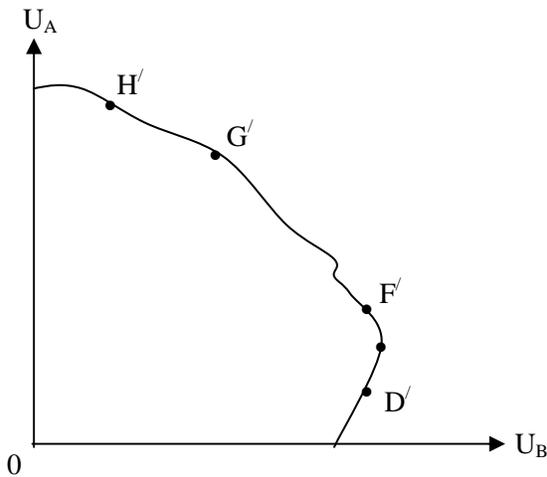
We can select other initial distribution points like C and find the reallocations which lead to Pareto efficient points in consumption.

We can draw a curve between  $O_A$  and  $O_B$  known as **contract curve** by joining Pareto efficient points in consumption like E, F, G, and H. Each point on the contract curve is a Pareto efficient point in consumption at which the tangents to indifference curves of two persons are equal to each other. Mathematically, the condition for Pareto efficiency in consumption can be stated in terms of marginal rate of substitution of X for Y,  $MRS_{xy}$ .  $MRS_{xy}$  is the number of units of Y that a consumer is willing to forego for one additional unit of X when his level of satisfaction remains the same along his initial indifference curve.

The *mathematical condition* for Pareto efficiency in consumption is given by the equation given below:

$$MRS_{xy}^A = MRS_{xy}^B$$

Marginal rate of substitution of X for Y must be the same for two persons, A and B. We can select a Pareto efficient point on the contract curve in Figure 10.1 and plot the levels of utility of two persons obtained at that point as a point in another diagram in utility space shown in Figure 10.2. We measure utility level of person A along the vertical axis and utility level of person B along the horizontal axis



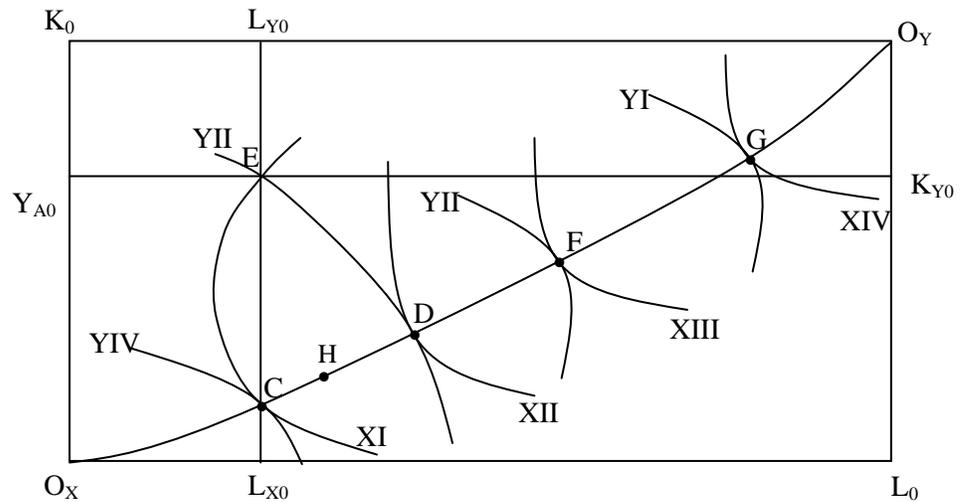
**Figure 10.2: Derivation of Utility Possibility Curve**

For example, at point D in Figure 10.1, person A's utility level is AI and person B's utility level is BIV. At point D person A's utility is the lowest and person B's utility is highest. Point D of Figure 10.1 is plotted as point D' in Figure 10.2. Similarly, point F in Figure 10.1 maps into point F' in Figure 10.2. By mapping all Pareto efficient points in consumption of Figure 10.1 into Figure 10.2 and joining these points we obtain the curve which is known as utility possibility curve, UPC. It should be noted that all points on the utility possibility curve

represent Pareto efficient points in consumption.

### Pareto Efficiency in Production

The Pareto efficiency condition in production is very similar to Pareto efficiency condition in consumption. Suppose the economy is endowed with fixed amounts of capital and labour which are  $K_0$  and  $L_0$  respectively. The two inputs are allocated to the production of the two commodities X and Y. We use another Edgeworth Box diagram to derive the Pareto efficiency condition in production. The length and width of the box are equal to  $L_0$  and  $K_0$  respectively.  $O_x$  is the origin for iso-quant map for commodity X and  $O_y$  is the origin of iso-quant map for commodity Y. The curves marked XI, XII, XIII, and XIV represent the iso-quant for commodity X and the curves marked YI, YII, YIII and YIV are the iso-quant for commodity Y. The level of X increases along the iso-quant in the north-east direction and the level of Y increases along the iso-quant in the south-west direction.



**Figure 10.3: Pareto Efficiency in Production**

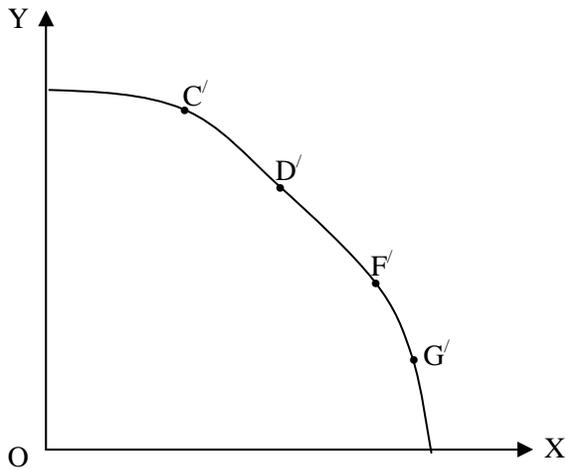
The initial distribution of the two inputs is given by the point E. The initial allocation of labour and capital in the production of X are  $L_{X0}$  and  $K_{Y0}$  respectively. Similarly,  $L_{Y0}$  and  $K_{X0}$  are the initial quantities of labour and capital in the production of Y. The distribution of resources shown by point E is not, however, Pareto efficient. A reallocation of resources shown by the movement from E to C certainly increases the level of Y, whereas the level of X remains the same. Alternatively, the reallocation shown by the movement from E to D increases the level of X without changing the level of Y. The reallocation at H, however, increases the production of both commodities. The movements from E to C, from E to D and from E to H constitute Pareto improvements but the corresponding reverse movements are not Pareto improvements. In fact, the movement from C to E will be Pareto inefficient because at E, production of X remains fixed but production of Y falls. Points C, H, D, F, and G are Pareto efficient points and the curve between  $O_x$  and  $O_y$  obtained by joining these points is called the **contract curve for production**. The Pareto efficient points in production occur where the iso-quant of two commodities are tangent to each

other. Mathematically, at the Pareto efficient point in production, marginal rate of technical substitution of labour for capital will be equal for both commodities.

$$MRTS_{LK}^X = MRTS_{LK}^Y$$

$MRTS_{LK}$  shows the number of units of capital that the producer must give up for one additional unit of labour for producing the same level of output. We now select one Pareto efficient point in production on the contract curve in Figure 10.3 and plot the production levels of two commodities in that point as a point in another diagram in output space. For example, the efficient point C in Figure 10.3 shows XI units of commodity X and YIV units of commodity Y. This combination of output is shown by point C' in output space in Figure 10.4. Repeating the procedure for points H, D, F, and G in Figure 10.3 and joining their counterparts in output space we derive the production possibility curve in Figure 10.4 with commodity Y measured along the vertical axis and commodity

The Pareto efficient points in production occur where the iso-quants of two commodities are tangent to each other.



**Figure 10.4 : Derivation of Production Possibility Curve**

X measured along the horizontal axis. The slope of the production possibility curve, called the marginal rate of transformation of Y into X ( $MRT_{YX}$ ), shows the amount of Y that has to be sacrificed for producing one additional unit of X. It should be noted that  $MRT_{YX}$  is dependent upon the prevailing state of technology in the country.

**Pareto Efficiency in Product-Mix**

We discussed the Pareto efficiency conditions in consumption and production separately. An overall Pareto efficient condition is obtained by combining the two efficiency conditions. This is formally given by the condition that marginal rate of transformation of Y into X must be equal to marginal rate of substitution of X for Y.

$$MRT_{xy} = MRS_{xy}$$

Both  $MRT_{xy}$  and  $MRS_{xy}$  measure the units of Y that must be given up for an additional unit of X. There is, however, one difference between these two rates. MRT is determined by the prevailing state of technology whereas MRS is given by the consumers' preferences.

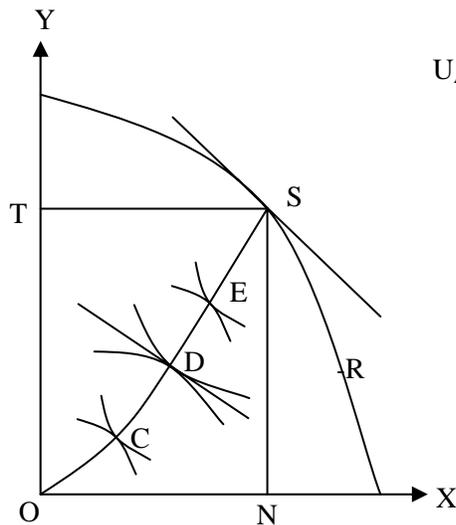
Technology determines the MRT -- the number of units of Y that must be

released for producing one more unit of X. The consumer's preference determines the MRS - the number of units of Y that the consumer is willing to release for obtaining one more unit of X. Pareto efficiency requires that MRT be equal to MRS. If the consumer releases more Y than that is needed by technology to produce one additional unit of X, the economy can save some units of Y which can be used to increase the utility of one person without decreasing the utility of another person. Then the initial situation with unequal values of MRS and MRT was not clearly in Pareto optimum-situation.

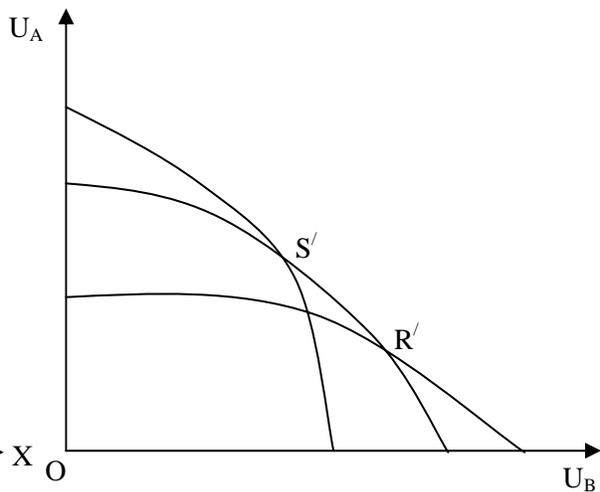
### Derivation of Grand Utility Possibility Curve

We now use the three conditions of Pareto efficiency derived earlier. We start with the given amounts of initial capital and initial labour,  $K_0$  and  $L_0$ , respectively. We use the Pareto efficiency condition in production, viz.,  $MRTS_{KL}^X = MRTS_{KL}^Y$ , to derive the production possibility curve as shown in Figure 10.5. Let us select the point S on this production possibility curve and draw a rectangular box from point S.

Suppose the rectangle corresponding to point S is OTSN. The point S shows that N units of commodity X and T units of commodity Y can be produced using the initial endowments of capital and labour. Taking the point O as the origin of person A and S as the origin of person B, we can draw the indifference curves of person A and person B in the box.



**Figure 10.5: Derivation of Efficient Product-Mix**



**Figure 10.6: Derivation of Grand Utility Possibility Curve**

The curve between O and S is then the contract curve showing Pareto efficient points in consumption. The points C, D and E are three such Pareto efficient points in consumption. We notice the tangent lines at D and S to be parallel. The slope the tangent line at S measures MRT and the slope of the tangent line at D gives MRS. Consumption at point D by two persons A and B ensures that  $MRS_{XY}$  of each person will be equal to MRT. Moreover, the  $MRS_{XY}$  of two persons are equal at D.

$$MRS_{XY}^A = MRS_{XY}^B = MRT_{XY}$$

We show the utility levels of two persons at point S by the point S' in another diagram in utility space. We can select other combinations of two commodities in Figure 10.5 and repeat the process of mapping the utility levels of two persons from output space in Figure 10.5 into utility space in Figure 10.6. The point R in Figure 10.5 is plotted as point R' in Figure 10.6. Joining points like S' and R' in Figure 10.6, we derive what is called Grand Utility Possibility Curve (GUPC). Each point on the GUPC qualifies as a Pareto optimum point because the derivation procedure for GUPC has been designed such that the three conditions of efficiency are met at each point on GUPC.

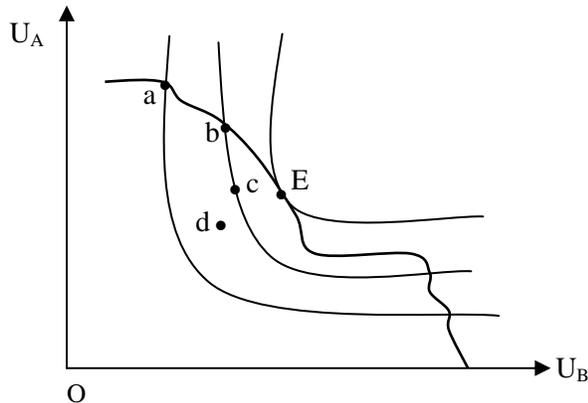
### Social Welfare Function and The Conflict Between Efficiency and Equity

A social welfare function shows the aggregate welfare of the society depending on the various combinations of utilities of all persons living in the society. In a society consisting of two persons A and B, the social welfare function can be written as

$$W = f(U_A, U_B)$$

Where social welfare  $W$  depends on the utility level of person A,  $U_A$ ; and the utility level of person B,  $U_B$ . The social welfare function gives rise to a set of community indifference curves. A community indifference curve shows the different combinations of utility levels of two persons which yield the same level of social welfare. It is very difficult to derive a social welfare function from individual preferences. Sidestepping the issue of forming a social welfare function, we show how a social welfare function eliminates the uncertainty involved in determining a particular Pareto optimum position. In Figure 10.7, we have drawn the Grand utility possibility curve and a set of community indifference curves originating from the social welfare function. It can be easily seen that the *bliss point* occurs at point E at which the community indifference curve becomes tangent to the grand utility possibility curve. The bliss point E helps the economy choose a particular Pareto optimum position which is also the most desirable to the members of the society.

It is very difficult to derive a social welfare function from individual preferences.



**Figure 10.7 : Social Welfare Function and the Bliss Point**

There is, however, a problem with this bliss point. The economy may not be at E initially. Suppose the economy is at point 'a' initially. It needs a redistribution of income for reaching the bliss point E. But such a redistribution of income may violate the efficiency condition of Pareto optimum so that the economy may

reach point c. The social welfare of the economy increases at c, though it is not Pareto optimum position. Further policy of redistributing income may shift the equilibrium to d, which is clearly inferior to c. The economy may reach point b if it is possible to execute a policy of redistributing income without violating any efficiency condition. Under such a situation, the economy might eventually reach the bliss point. It is, however, very difficult to design and execute such a redistribution of income policy.

**Pareto Optimum and Perfect Competition**

It can be shown that Pareto optimum can be obtained if the market is perfectly competitive. Person A maximizes her/his utility subject to a budget constraint when his  $MRS_{XY}$  is equal to ratio of output prices.

$$MRS_{XY}^A = \frac{P_X}{P_Y} \dots\dots\dots(1)$$

The same condition holds for person B:

$$MRS_{XY}^B = \frac{P_X}{P_Y} \dots\dots\dots(2)$$

In perfect competition, the consumers are price-takers and hence all consumers face the same price ratio  $\frac{P_X}{P_Y}$ . Since the right hand sides of equation (1) and equation (2) are equal, it follows that the left-hand sides of these equations will also be equal:

$$MRS_{XY}^A = MRS_{XY}^B = \frac{P_X}{P_Y} \dots\dots\dots(3)$$

Equation (3) ensures that the condition for Pareto efficiency in consumption is satisfied in perfect competition. Using similar arguments, we can show that the condition for efficiency in production is also satisfied in perfect competition:

$$MRT_{KL}^X = MRT_{KL}^Y = \frac{P_L}{P_K} \dots\dots\dots(4)$$

Mathematically,  $MRT_{XY}$  is equal to ratio of marginal costs of X and Y:

$$MRT_{XY} = \frac{MC_X}{MC_Y} \dots\dots\dots(5)$$

It is also true that the price equals marginal cost at the competitive equilibrium. So we get,

$$P_X = MC_X \dots\dots\dots (6)$$

$$P_Y = MC_Y \dots\dots\dots (7)$$

Using the values of equations (5) through equation (6) and (7) in equation (3), we obtain:

$$MRS_{XY}^A = MRS_{XY}^B = \frac{P_X}{P_Y} = \frac{MC_X}{MC_Y} = MRT_{XY} \dots \dots \dots (8)$$

Equation (8) ensures that the condition for efficiency in product-mix is also met in perfect competition. Since the three efficiency conditions for Pareto optimum are met in perfect competition, we can conclude that a Pareto optimum position can be obtained in perfect competition.

## Review Questions

- **Essay-type Questions**

1. (a) Define Pareto Optimality  
(b) Derive the condition for Pareto Efficiency in consumption  
(c) Derive the condition for Pareto efficiency in production  
(d) Derive the condition for Pareto efficiency in product mix
2. Derive the grand utility possibility curve.
3. Define the social welfare function and find the bliss point
4. Show how Pareto Optimum can be obtained in perfect competition

- **True or False**

Which of the following statements are true?

- (a) The consumer is interested in utility maximization and the firm-owner in profit maximization.
- (b) An economy is in Pareto Optimum when a Pareto improvement cannot be obtained by adoption any policy for the economy.
- (c) The Pareto efficiency condition in production is very similar to Pareto efficiency condition in consumption.
- (d) A community indifference curve shows the different combinations of utility levels of two persons which yield the same level of social welfare

- **Multiple Choice Questions**

1. Economics deals with ..... of enhancing..... of people.  
(a) means; welfare  
(b) welfare; means  
(c) laws; welfare  
(d) non of the above
2. Pareto efficiency condition in production is:  
(a)  $MRTS_{LK}^X = MRS_{XY}$   
(b)  $MRS_X^{XY} = MRS_{YZ}$   
(c)  $MRTS_{LK}^X = MRTS_{LK}^Y$   
(d) None of the above
3. Pareto efficiency in product-mix occurs when:  
(a)  $MRS_{XY} = MRS_{YZ}$   
(b)  $MRS_{XY} = MRT_{LK}^Y$   
(c)  $MRTS_{XY} = MRS_{XY}$   
(d) None of the above

## Lesson-2: Market Failures and the Role of Government

### Objectives

After studying this lesson, you will be able to:

- Describe the central problems of every economic society;
- Explain the concept of a market economy;
- Discuss how market economy provides answers to the three fundamental questions;
- Define market failure and discuss the different forms of market failure; and
- Discuss how the government can intervene for correcting the different forms of market failure.

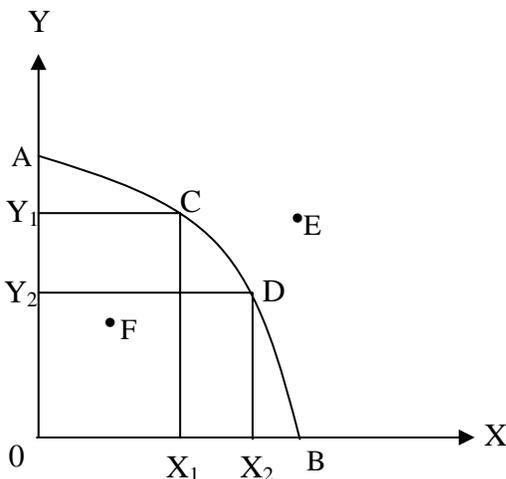
### The Central Problems of Every Economic Society

People have unlimited wants, but the resources needed to satisfy these wants are limited. Scarcity of resources in the presence of unlimited wants gives rise to all kinds of economic activities. If the resources were not scarce there would not be any economic activity at all. However, the resources can be put into different uses. For example, a piece of land can be used for raising a crop or it can be earmarked for creating a building on it, but the piece of land cannot be utilized for both purposes at the same time. A producer then has to make decisions determining which of the unlimited wants are to be met first according to the degree of intensity of different wants and nature and availability of the resources. It is said that an economic society faces three decision-making problems usually expressed by three interrogative:

If the resources were not scarce there would not be any economic activity at all.

#### *What ? How? For Whom?*

The term 'what' refers to the problem of deciding which commodities and services would be produced in the economy. Related with this problem is the necessity of determining the quantities of selected commodities and services. Had the resources been not scarce, the necessity of selecting and determining the

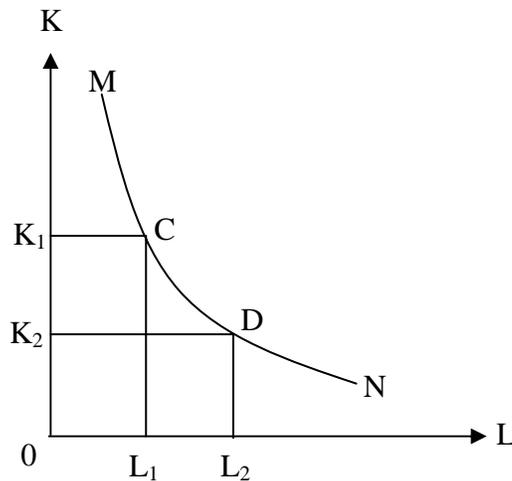


**Figure 10.8: Explaining the problem 'what?' by using Production Possibility Curve**

quantities would not have arisen. Figure 10.8 illustrates the problem related with the interrogative word 'what'? We measure commodity X along the horizontal axis and commodity Y along the vertical axis. Suppose that there are only two commodities X and Y in a hypothetical economy. The concave curve AB, known as the production possibility curve, shows the different bundles of two commodities X and Y that can be produced utilizing all the available resources in the economy. For example, the country can produce the combination shown by the point C or the combination shown by the point D.

Combination C signifies  $Y_1$  of Commodity Y and  $X_1$  of commodity X. Similarly, combination D shows  $Y_2$  of commodity Y and  $X_2$  of commodity X. Each point on the curve AB shows a specific combination of two commodities. The country can choose one and only one point from the set of points on the curve AB. It cannot choose more than one combination of two commodities. The economy cannot also choose the combination denoted by the point E which it cannot produce with the given resources. Similarly, the economy would not produce at the point F because production at that point would imply underutilization of resources. The problem abbreviated by the interrogative word 'what?' refers to the problem of choosing one specific combination of commodities X and Y from a large number of combinations lying on the production possibility curve AB.

The interrogative word 'how?' refers to the choice of method of producing the selected commodities. There are different methods of producing a predetermined quantity of a commodity. For example, there are labour intensive and capital intensive methods of production. The economy must choose one of the methods of production. Figure 10.9 illustrates the nature of the problem. The downward sloping convex curve MN is known as equal product curve. In Figure 10.9, capital is measured along the vertical axis and labour along the horizontal axis. Equal product curve MN shows the different combinations of capital and labour which produce a given amount of the commodity. For example, combination C with  $K_1$  units of capital and  $L_1$  units of labour can produce the same quantity of



**Figure 10.9: Explaining the problem 'how?' by using Iso-quant**

the commodity as does the combination D with  $K_2$  amount of capital and  $L_2$  amount of labour. Combination C, however, implies a capital intensive method of production, because, at C production of the commodity requires more capital

than labour. Similarly, combination D implies a labour intensive method of production. Each point on the curve MN implies a distinct capital-labour ratio and hence a distinct production process. The choice problem indicated by the word 'how?' refers to the problem of choosing one method from several methods of production.

The third decision problem expressed by the phrase 'for whom?' refers to the problem of distributing the produced commodities and services fairly among different consumers. Every man in society has a dual role. On the one hand, she/he is a consumer of produced commodities and services. On the other hand, she/he is a supplier of input of production. The third problem refers to the problems of determining the consumers and the consumption levels of the consumers.

## **Solutions Under Alternative Economic Systems and the Idea of a Market Economy**

### ***Socialist and other centrally planned economies***

In socialist and other centrally planned economies, the answers to the fundamental questions are dictated by a central authority under the government. Usually a planning commission under close supervision of the government takes decisions about the nature and production targets of different commodities and services. In doing so, the planning commission often makes use of the vast wealth of data on consumers' tastes, preferences and demand and supply conditions prevailing in the country.

### ***Capitalist economy***

In a capitalist economic system, answers to the three fundamental questions are provided through the operation of the market mechanism in the economy. A market for a commodity is the collection of all consumers and suppliers of the commodity who act according to the signals of price system. Operation of market economy presupposes fulfilment of three fundamental psychological attributes. First, people are assumed to enjoy unfettered freedom in making decisions about consumption, production, etc. This psychological view is often referred to as *individualism* which ensures that only individuals make decisions without being influenced by any authority and by any other pressure group. Second, in a market economy, every economic agent is supposed to be a maximizer. For example, a consumer tries to maximize her/his satisfaction by consuming goods and services. The producer tries to maximize her/his profit which is equal to total revenue minus total cost. In a capitalist economy, everybody is motivated by her/his self-interest which is either utility maximization or profit maximization or both. The attempt to augment self-interest by everybody in the economy leads to discipline and integration among the diversified economic activities of different economic agents in a society.

In a market economy, every economic agent is supposed to be a maximizer.

Let's now explain how a market economy provides answers to the three fundamental questions. In a market economy, price is determined at the point where aggregate demand equals aggregate supply. Price acts as a signal in the market economy. The consumers dictate the commodities and services to be produced in the economy. Their preferences are expressed through prices. If

consumers' demand for a commodity increases, they bid up the price of that commodity. Since producers are profit maximizers, increased price of a commodity acts as the signal to the producers for increasing production of that commodity. Thus, the message of consumers' preferences is conveyed to the producers through the price system. Quantity of the selected commodity is also determined through the price system. Producers must produce that level of output at which demand is equal to supply. If she/he produces more than equilibrium quantity, she/he will not be able to sell all of her/his output. If she/he produces less than equilibrium quantity, she/he will not be able to meet all the demands from the consumers.

A method of production will be less expensive if it uses the cheaper inputs more than the dearer inputs.

We now explain how the market mechanism determines the *method of production*. Since a producer's ultimate objective is to maximize her/his profit, she/he will use the cheapest method of production. A method of production will be less expensive if it uses the cheaper inputs more than the dearer inputs. An input is cheaper when its relative abundance in a country makes its price lower. Thus, market determines how commodities and services should be produced.

*Distribution* of the produced goods and services also takes place through the market mechanism. Every economic agent has a dual role in a market economy: she/he is a consumer and a supplier of productive inputs at the same time. By supplying the productive input, she/he earns income which is spent on consumer goods. A person's purchasing power will be higher if the price of her/his input increases due to increased demand for it. A person's income will be lower if there is less demand for her/his input. A person with higher income will consume more commodities than another person with a lower income. Thus, the question who consumes what amount of the produced commodities is also determined by the market mechanism.

### **Market Failure and Role of Government**

It has been theoretically proved that unfettered functioning of market yields Pareto optimum for an economy if the market structure is perfectly competitive. But market fails to provide correct signals and answers to the three fundamental questions of an economy for a number of reasons. Especially, the failure of an economy to attain Pareto optimum is often attributed to market failure.

Market failure takes different forms as shown below:

#### **Different forms of Market failure**

1. Presence of non-competitive markets;
2. Public Goods;
3. Common Property;
4. Externalities;
5. Increasing Returns to Scale;
6. Markets with Asymmetric Information; and
7. Uncertainty.

***Non-Competitive Markets***

It was mentioned earlier that a market economy can work properly in perfect competition. Very few markets in the real world correspond to the theoretically conceived structure of perfect competition. Markets for most of the commodities and inputs of production are not perfectly competitive; rather these markets take different forms of imperfect competition like monopoly, monopolistic competition, oligopoly, monopsony, etc. In a perfect competition, the number of firms is so large that no single firm can influence the market price determined at the intersection of aggregate demand and aggregate supply of industry. In the cases of imperfect competition, the number of sellers or buyers is small so that each seller or buyer can exert some control in the determination of price and quantity of his product. Such an opportunity to influence price leads to the divergence between price and marginal cost in imperfect competition. In the case of non-competitive equilibrium, price exceeds marginal cost.

In a perfect competition, the number of firms is so large that no single firm can influence the market price.

$$P > MC$$

The price offered by a consumer measures the valuation the consumer puts on the benefit from marginal unit. A price greater than marginal cost implies that the consumers value marginal benefit more than marginal cost and total benefit of the society could be increased by producing more output. Clearly, the output produced by the monopolist is not Pareto efficient. We also showed in Unit-7 that monopoly in product market results in deadweight loss for the society. Elimination of monopoly will save the cost of deadweight loss for the economy. In other words, the economy benefits from elimination of monopoly. Obviously, monopoly market is not Pareto efficient.

***Public Goods***

Market also fails in the presence of public goods. Public goods have a unique feature. Each member of the society consumes equal amount of public goods. Moreover, consumption of public good by one person does not reduce the available quantity of public goods to be consumed by other persons. For example, every citizen of the state enjoys equally the services of a national defense system. If a consumer does not pay the market price for private good, he is excluded from the consumption of the private good. But the consumers of public goods cannot be excluded from consumption, even if they do not pay at all or pay less than the extracted marginal benefit from the public good. In other words, 'exclusion principle' is not applicable in the case of public goods. Most often, the consumers do not reveal their true preferences for public goods for the fear of being taxed. The consumers know that public goods will be provided by the government even if they do not reveal their preferences for these goods. The attempt by the consumers to consume public goods without revealing their preferences and paying for public goods is called the free riders' problem. Since all consumers consume the same amount of public goods, marginal cost of additional use of public good is zero. Hence, from efficiency consideration, nobody should be barred from consuming public good. Since nobody is willing to reveal his marginal utility for public goods, the social marginal benefit for public goods cannot be determined. Hence the efficient level of public goods cannot be provided. The level of public goods is efficient when social marginal benefit of public goods equals its social marginal cost. Due to free riders'

'Exclusion principle' is not applicable in the case of public goods.

problem, provision of public goods through markets is not possible. Even the government cannot supply the efficient level of public good. Still the government provides public goods by raising the requisite money through some ad-hoc non-efficient mechanisms. The quantity of public goods determined arbitrarily by the government is not Pareto efficient and leads to wastage of resource.

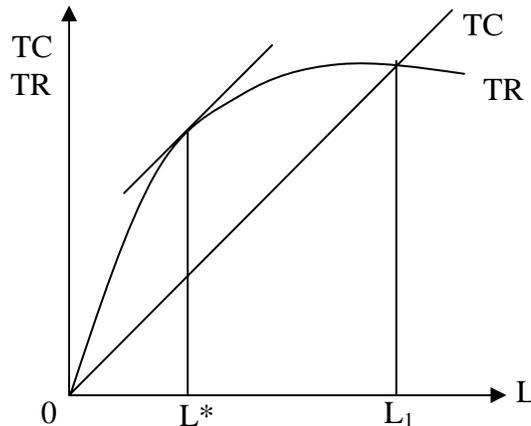
**Common Property**

No market exists for common property and excessive use of common property lowers social welfare.

Exclusion principle is not also applicable in the case of common property, though different persons consume different quantities of common property. Moreover, consumption of common property by one person reduces the available amount of consumption by other persons. No market exists for common property and excessive use of common property lowers social welfare.

We show the use of common property with the help of Figure 10.10. Suppose the common property is a fishing lake. We measure cost and revenue from fishing along the vertical axis and fishing effort along the horizontal axis of Figure 10.10. Total cost of fishing has been assumed to rise at a constant rate with the increase in fishing effort. Total revenue from fishing, however, increases at a decreasing rate since the fisherman has to reduce the price of fish if he wants to sell more fish. We also make the implicit assumption that more fishing effort brings more fish. The profit maximizing level of fishing effort is  $L^*$  where the slope of the total revenue curve (MR) equals the slope of the total cost curve (MC).

$L^*$  would have been the equilibrium level of fishing effort had the lake been a private property. Since it is a common property, access to it is free. As a result, people will make excessive use of the lake driving the profit to zero at effort level  $L_1$ . It may happen that marginal revenue is negative at effort level  $L_1$ .



**Figure 10.10: Use of common property**

Employing an effort level which yields zero or negative marginal revenue is not Pareto efficient. Total revenue and hence total profit can be increased by reducing effort level. Even state ownership of the lake may not remove the problem of inefficiency here. The government can sell the lake to the private sector and private management of the lake may increase the level of social welfare.

**Externality**

In Economics, externality refer to the effects which extend beyond the reign of the individual or firm which creates these effects. Externalities are of two types, viz., consumption externalities and production externalities. In the case of consumption externality, utility of the consumer depends on some external factors in addition to the commodities consumed by him. For example, a flower garden owned by the next-door neighbour certainly increases the utility of the consumer, though he does not pay for that garden. This is an example of positive consumption externality because the presence of the garden increases the utility of other persons. Externality may also be negative when activities by an individual or by a firm hurt other people and firms in the economy. For example, production activities of a firm in the close vicinity of a village may pollute the environment of the village by emitting smoke and disposing a large quantity of garbage. A lot of people in the village may contract non-curable diseases from the polluted environment. The firm, however, does not pay for purification of the environment or for medical treatment of the people suffering from the diseases. There is no market which allows for adjustments in the costs and prices of firm's products for the negative externalities inflicted on the surrounding locality and the people living there. The firm owner does not take into account the costs of negative externalities when determining her/his profit maximizing level of output. Here the firm's profit-maximizing level of output is not equal to Pareto efficient level of output. The Pareto efficient level of output is determined by equating social marginal benefit to social marginal cost. Social marginal cost is the sum of private marginal cost and cost of negative externalities. Similarly, social marginal benefit is obtained by adding benefits of positive externalities to private marginal benefit.

The firm's profit-maximizing level of output is not equal to Pareto efficient level of output.

These can be written, symbolically, as follows:

$$\text{SMB} = \text{SMC}$$

$$\text{SMB} = \text{PMB} + \text{BPE}$$

$$\text{SMC} = \text{PMC} + \text{CNE}$$

Where,

SMB = Social marginal benefit

SMC = Social marginal cost

PMB = Private marginal benefit

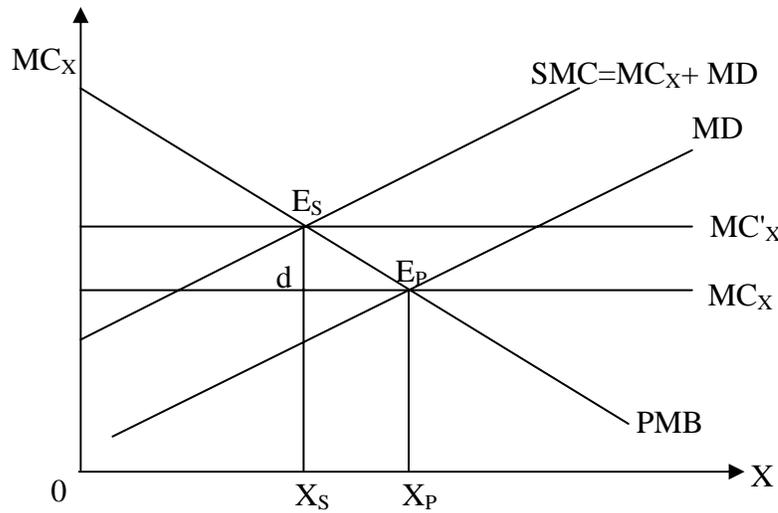
BPE = Benefits of positive externalities

PMC = Private marginal cost

CNE = Cost of negative externality

In the case of negative externalities, SMC is greater than PMC. Consequently, the Pareto efficient level of output will be less than the firm's profit maximizing level of output. In the case of positive externalities, SMB exceeds PMB and hence Pareto efficient level of output will be more than profit-maximizing level of output. Since market mechanism only considers private costs and benefits without taking the benefits and costs of externalities into account, market determined output levels are clearly Pareto inefficient. We illustrate the case of negative externality with the help of Figure 10.11 with cost and revenue

measured along the vertical axis and output level of commodity X along the horizontal axis. We have assumed marginal cost to be constant and show the marginal cost curve by the horizontal curve  $MC_x$ . The curve PMB shows private



**Figure 10.9: Effect of Negative Production Externality**

marginal benefit of the firm from the production of commodity X. The damage inflicted on the society by the production activities of the firm has been shown by the curve MD. The SMC curve, which has been obtained by summing the  $MC_x$  and MD curves vertically, shows the social marginal cost.

The firm's profit-maximizing level of output  $X_p$  is corresponding to the equilibrium point  $E_p$ , where PMB cuts  $MC_x$ . The intersection point of the PMB and SMC curves determines the Pareto efficient level of output  $X_s$ . We find that the Pareto-efficient level of output  $X_s$  is much less than the profit-maximizing level of output  $X_p$ . The government can induce the firm to restrict its output level by using one of three alternative methods:

- (i) by imposing tax as a punitive measure against the act of creating negative externality;
- (ii) by giving subsidy to the firm for reducing its output level to  $X_s$ ;  
or,
- (iii) by defining and implementing property right properly.

For example, the government can impose a unit tax equal to marginal damage at output level  $X_s$ , which is equal to  $dE_s$  in the figure. The marginal cost curve of the firm shifts to  $MC'_x$ , which intersects the PMB curve to determine the equilibrium output level  $X_s$  in the changed situation.

### ***Increasing Returns to Scale***

Long-run average and marginal cost curves decline continuously as output level increases if the production function is characterized by increasing returns to scale. This creates an opportunity for the bright firms in the industry to undercut the small firms and drive them out eventually. Once a competitive industry is thus transformed into a non-competitive industry, which in turn leads to market failure.

### ***Markets with Asymmetric Information***

Markets with asymmetric information emerge when buyers and sellers in a market are not equally informed about the product. A few variants of markets with asymmetric information have been developed depending on the nature of access to information enjoyed by contrasting parties. We briefly discuss two such markets as follows:

1. **Quality uncertainty and the market for Lemons:** This type of market arises when there is asymmetric information about the quality of the product. For example, an almost new but second hand car is sold at a price much less than the price of a new car. This happens because the seller knows more about the quality of the car, though the buyer is quite ignorant about the quality. To the buyers, the car is a 'lemon'.
2. **Moral Hazard:** Moral hazard occurs when an insured party can behave such that it can change the probability of the event that necessitates the payment against which it has been insured.

The outcomes in markets with asymmetric information are not usually Pareto-efficient. More efficient outcomes can be obtained with proper dissemination of information.

### ***Uncertainty***

The Pareto Optimum position can be obtained if everything happens in a predetermined fashion. But we live in a world of uncertainties. For example, a consumer might not be able to derive the expected utility from a commodity because the selected commodity is bad. If such events occur due to reasons beyond the control of the consumers, producers and other economic agents, an economy might not reach an Pareto-optimum position. Market fails to solve the problems arising from uncertainties.

## Review Questions

- ***Essay-type Questions***

1. Describe the central problems of every economic society
2. Explain the concept of a market economy
3. Discuss how market economy provides answers to the three fundamental questions.
4. Define market failure and discuss the different forms of market failure
5. Discuss how the government can intervene for correcting the different forms of market failure.

- ***True or False***

Which of the following statements are true?

- (a) People have unlimited wants, but the resources needed to satisfy these wants are limited.
- (b) The term 'what' refers to the problem of deciding which commodities and services would be produced in the economy.
- (c) There are different methods of producing a predetermined quantity of a commodity.
- (d) In socialist and other centrally planned economies, the answers to the fundamental questions are dictated by a central authority under the government.
- (e) A market for a commodity is the collection of all consumers and suppliers of the commodity who act according to the signals of price system.
- (f) The failure of an economy to attain Pareto optimum is often attributed to market failure.
- (g) Consumption of public good by one person does not reduce the available quantity of public goods to be consumed by other persons.
- (h) Exclusion principle is not also applicable in the case of common property, through different persons consume different quantities of common property.
- (i) Externalities refer to the effects which extend beyond the reign of the individual or firm which creates these effects.

- ***Multiple Choice Questions***

1. Scarcity of resources in the presence of ..... wants gives rise to all kinds of economic activities:
  - (a) Unlimited
  - (b) Limited
  - (c) None of the above

2. In a capitalist economy, everybody is motivated by his:
  - (a) Self-interest
  - (b) Financial ability
  - (c) Economic ability
  - (d) None of the above
  
3. In market economy, price acts:
  - (a) As a signal
  - (b) As a value
  - (c) As a multiplier
  - (d) None of the above
  
4. In the case of public good, ..... principle is not applicable
  - (a) Exclusion
  - (b) Non exclusion
  - (c) None of the above

- **Problem**

*Read and analyse the following news-story carefully:*

**Demise of Telephone Monopolies**

The breakup of AT&T was spurred by new technology that undercut the basis for natural monopoly. The same technological advances have transformed the telecommunications industry around the world:

- **Japan:** In 1984 the Japanese government ended the monopoly long held by Nippon Telegraph & Telephone (NTT). More than 500 companies have now entered the industry, chipping away at NTT's market share.
- **Great Britain:** The British government has "privatized" British Telecommunications and licensed another company to build a second, competing network.

- **France:** The French government has retained a single state-owned network but opened the door to competition in equipment and services.
- **European Community:** As the member nations of the European Community remove trade barriers, competition between state monopolies (e.g., France and Germany) is increasing. A German citizen can call New York by using the Bundespost to call London, then switching to a cheaper service for the transmission to the United States.

**Source:** Bradley R. Schiller, *The Economy Today* (sixth edition), p-622, 1994, McGRAW-HILL, INC.

**Hints:** The deregulation of telephone industries has spurred price competition and innovation, while greatly increasing the volume of telephone service.

# MICROECONOMIC PRACTICES IN BANGLADESH



## **Highlights**

- ❑ Economic Features of Bangladesh
- ❑ Microeconomic Analysis of the Agriculture Sector
- ❑ Employment Situation in Agriculture Sector
- ❑ Import of Major Agricultural Crops
- ❑ Price Support for Agricultural Commodities
- ❑ Microeconomic Models for Industrial Goods

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## Unit-11

### Lesson 1: Microeconomic Practices in Bangladesh

#### Objectives

After studying this lesson, you will be able to:

- Discuss the economic features of Bangladesh;
- Make microeconomic analysis of employment situation in agriculture sector of Bangladesh;
- Make microeconomic analysis of imports of major food crops of Bangladesh;
- Make microeconomic analysis of price support system for agricultural commodities; and
- Make microeconomic analysis of industrial commodities in Bangladesh.

#### The Economic Features of Bangladesh

Bangladesh gained her independence on December 16, 1971, after a bloody liberation war with Pakistan which was led by the father of the nation Bangabada Sheike Mujibur Rahman. The liberation war told upon her economy heavily. It was an immensely difficult task to reconstruct a war-devastated economy. Bangladesh had to start from scratch in every sector of the economy. Immediate attention was given to the reconstruction of a totally collapsed infrastructure of the economy. Bangladesh started her journey towards economic prosperity with a very small capital stock. The ever growing population of Bangladesh aggravated her economic problems. Natural calamities like cyclones and floods occurring at regular intervals of time retarded the economic growth of the country significantly. The economic damage inflicted upon by political unrest in the country over the years also added to economic losses caused by natural disasters. Lack of efficient management of state affairs and wide-spread practices of corruption in administration network of Bangladesh worsened the economic situation in the country. Bangladesh made some economic progress achieving target growth rates in a few sectors amidst all economic and non-economic odds against sustainable economic development. But the overall economic situation in the country is still far from satisfactory. The per capita annual income of Bangladesh is \$386 in 1999. Bangladesh is still dependent upon foreign aid for financing development projects in the economy. Every year, Bangladesh imports a large volume of agricultural and industrial commodities from abroad. Her export earning is very small compared to import-expenditure leading to deficit in trade balance every year. Agriculture is the dominant sector of the Bangladesh economy accounting for a major share in GNP of the country. Most of the people depend on agriculture for earning their livelihood. Though the share of the agriculture sector in GNP has been decreasing and the shares of the industry and services sectors have been increasing over the years after independence, the pace of the these trends is not satisfactory. With this general discussion on economic features of Bangladesh, we turn to sector analysis of Bangladesh economy and show how the analytical tools of Microeconomics can be applied to explain the events occurring in different sectors. Let's start with the agricultural sector.

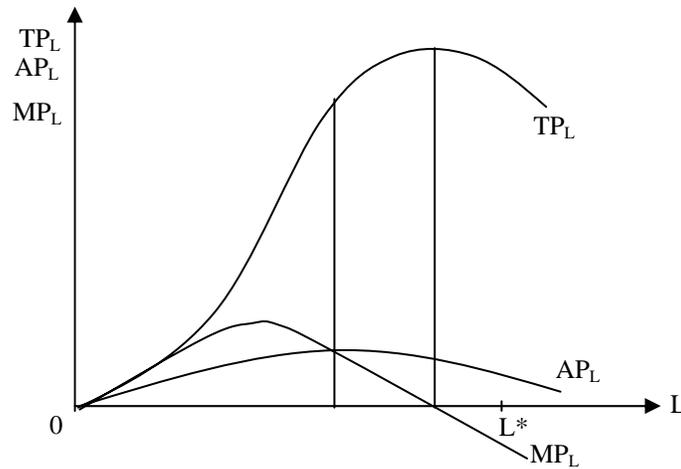
Natural calamities like cyclones and floods occurring at regular intervals of time in Bangladesh.

## A Microeconomic Analysis of the Agriculture Sector

### The Employment Situation in Agriculture Sector

The rate of technological advancement in sector has been low over the period after independence.

The agriculture sector of Bangladesh economy has some distinguishing features. First, the agriculture sector provides employment to a maximum number of people. Though the agriculture sector is the dominant sector in Bangladesh, the rate of technological advancement in this sector has been low over the period after independence. The agriculture sector is dependent on outdated method of cultivation with very low productivity of labour. We can explain the phenomenon of low-productivity of labour in Bangladesh agriculture sector with the help of a short-run total product curve shown in Figure 11.1. Assuming labour to be the variable input, we have drawn the total product, marginal product and average product curves in Figure 11.1. The theoretical



**Figure 11.1 : Employment in Agriculture Sector of Bangladesh**

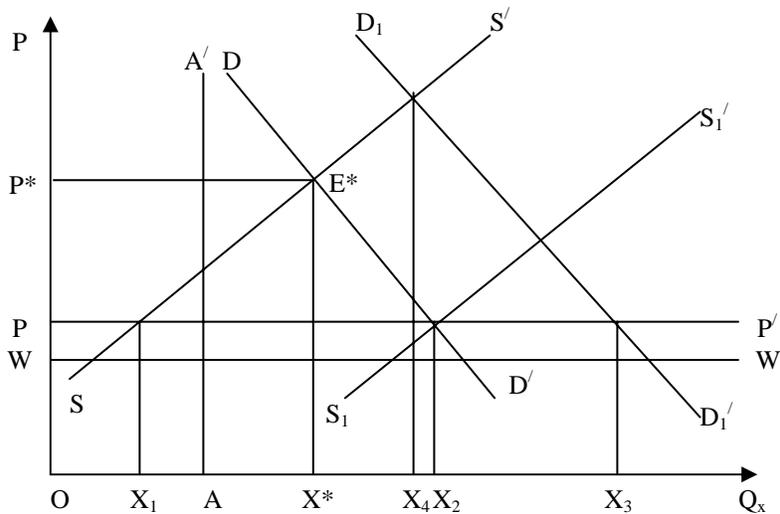
explanations underlying the derivation of these curves and identification of stages of production were provided earlier. We avoid these explanations here. Our objective is to show the position of labour in agriculture sector in the context of Figure 11.1. It can be easily argued that the employment situation in Bangladesh agriculture sector can be represented by employment level  $L^*$  in the figure. The employment level  $L^*$  is characterized by negative marginal productivity of labour. The theoretical implication of negative marginal productivity of labour is that total product will increase if some units of labour are withdrawn from the production process. This is indeed the real situation prevailing in the agriculture sector of Bangladesh. Due to lack of jobs available elsewhere, all active members of a typical rural household work in their agriculture farm with negative or very low marginal productivity. Total productivity will not be hampered at all if some of the family members move to other places and take jobs there. But the probability of getting jobs elsewhere with little education and training is very low. The government can reduce the rural unemployment level by financing small scale development projects in rural areas and by imparting vocational training to rural unemployed youth.

### Import of Major Agricultural Crops

Bangladesh has a large population to feed on. As mentioned earlier, the pace of technological progress occurring in agriculture sector has been very slow. Bangladesh cannot grow enough quantity of major food crops to meet the high demand of a growing population. Bangladesh has to import a large quantity of major agricultural crops like rice, onion, lentil, etc. for meeting the domestic demand for such commodities. Rice is the most important food item among the imported food crops. The political career of a government in Bangladesh is very much dependent on the price of rice. The successive governments in Bangladesh after independence had a tendency to keep the price of rice low, even lower than what would have been domestic and international market price.

Bangladesh has to import a large quantity of major agricultural crops.

Here we present two formal models of import trade of Bangladesh. The first model is relevant when a minimum amount of the imported commodity is needed to feed the population. The model can be applied to explain the imports of a few essential food items like rice. The second model is relevant when there is no minimum requirement for the imported commodity. The imports of some food items and most industrial commodities can be explained by using the second model. The formal analysis is very much similar in the two models. We illustrate the first model of imports with the help of Figure 11.2.



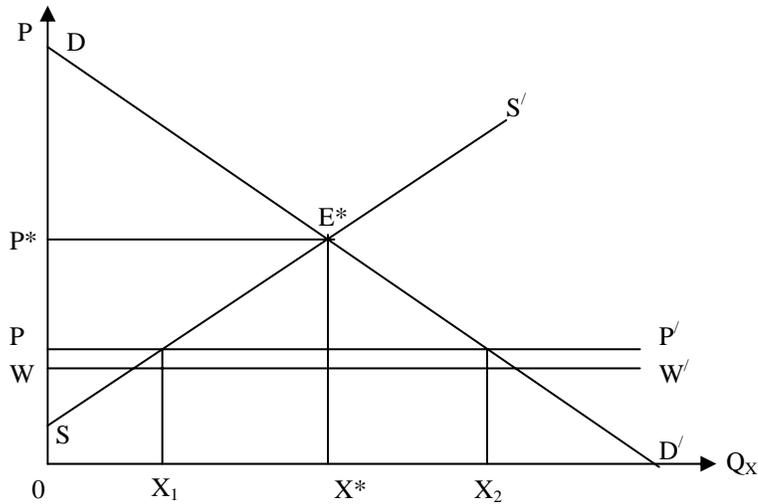
**Figure 11.2: Import of Major Food Crops**

Suppose the figure represents the demands-supply model for commodity X, which is rice, to say. We assume the market for commodity X to be perfectly competitive so that the DD' and SS' curves represent the industry demand and supply curves for the commodity. The vertical line AA' shows the minimum requirement of the country for rice. The amount OA must be procured at any price for keeping the people alive. The demand and supply curves intersect at E\* to determine the equilibrium price P\* and equilibrium quantity X\*. The equilibrium price level P\* seems to be high and the government wants, for reasons mentioned earlier, to keep the price level fixed at a much lower level by importing the commodity from abroad. We assume the country to be small so that it can import any quantity at the given world price WW' expressed in local currency. The importers normally have to pay tariff, therefore the tariff inclusive

price line becomes  $PP'$ . At price  $P$ , the aggregate demand for the commodity is  $X_2$ , of which the amount  $X_1X_2$  comes from imports and the amount  $X_1$  comes from local supply.

Once a country gets used to the culture of imports, it cannot come out from the trap.

The immediate effect of import trade is that domestic production of the commodity has fallen by the amount  $X_1X^*$  and domestic consumption has increased by the amount  $X^*X_2$ . It seems that we choose the easy way out. The government opts for increased imports through liberal import policy at the expense of higher level of domestic production and industrialization to avoid the unpopular regime of higher domestic price in the short run. Once a country gets used to the culture of imports, it cannot come out from the trap and the level of import keeps rising with the increase in demand for the product. This is shown in Figure 11.2 where a shift of the demand curve to  $D_1D_1'$  increases the level of import from  $X^*X_2$  to  $X^*X_3$  without any increase in the level of domestic production. In the absence of imports, the increase in demand would stimulate the level of domestic production from  $X^*$  to  $X_4$ . Another demerit of import trade is that it shuns the producers' incentives for new innovations and inventions in production technology. Such innovations and inventions might cause the supply curve to shift further to the right so that the consumers could enjoy the same benefit of lower price without imports. For example, the supply curve  $SS'$  shifts to  $S_1S_1'$  due to innovations in the production technology of food crops. As a result, the domestic price level falls to the level of import price  $P$ . Domestic production increases to  $X_2$  and the consumers enjoy the benefits of a reduced price level without imports of the commodity. We present the second model of import trade in Figure 11.3. It is very much similar to the model given in Figure 11.2 with the exception that the vertical line  $AA'$  has not been drawn here.

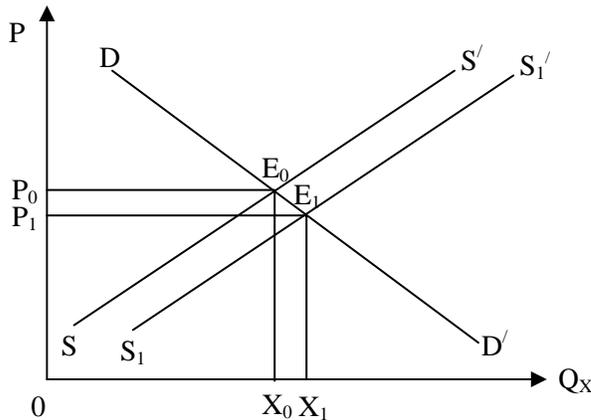


**Figure 11.3: Imports of Industrial Commodities**

Since similar analysis holds for the curves in Figure 11.3 as in Figure 11.2, we avoid such an analysis. We now turn to the third microeconomic analysis for the agriculture sector in Bangladesh.

### Price Support for Agricultural Commodities

There is a paradox of good and bad which is generally applicable for agricultural commodities. The demand curve for agricultural commodities is believed to be inelastic. A bumper crop in agriculture shifts the supply curve of agricultural commodity to the right. As a result, the price of the agricultural commodity falls. It may happen that the total revenue and hence the total income of the farmers falls due to the fall in price. So a 'good crop' leads to a 'bad income' for the farmer. Conversely, a 'bad crop' may lead to a 'good income' for the farmer such a situation is shown by Figure 11.4.  $SS'$  and  $D_1D_1'$  are the initial demand and supply curves respectively. The initial equilibrium points is  $E_0$  which determines

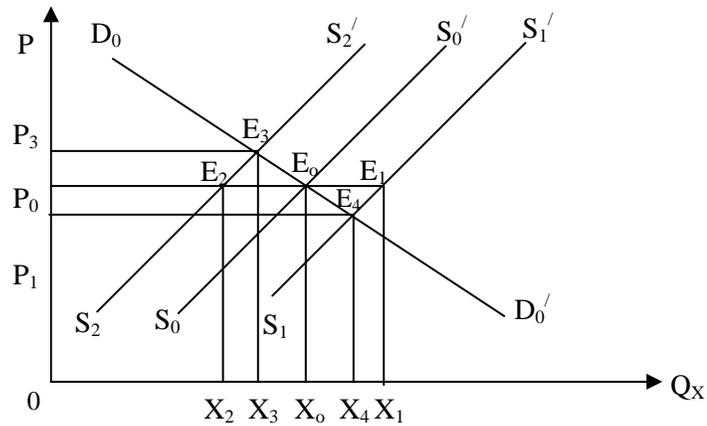


**Figure 11.4: The Paradox of 'Good and Bad' for Agricultural Commodities**

the equilibrium price  $P_0$  and the equilibrium quantity  $X_0$ . Hence the initial income of the farmer is  $OP_0E_0X_0$ . Suppose the supply curve shifts to  $S_1S_1'$  due to an innovation in agricultural production technology. The new equilibrium point is  $E_1$ . The new price is  $P_1$  and quantity of output sold is  $X_1$ . The new income of the farmer is equal to area  $OP_1E_1X_1$ . It is easily seen that the area  $P_0P_1E_1E_0$  exceeds the area  $X_0E_0E_1X_1$ . Hence area  $OP_0E_0X_0$  exceeds area  $OP_1E_1X_1$ . In other words, the income of the farmers has fallen due to bumper crop. It seems that the farmers will always go for bad crops since these 'bad crops' benefit them by raising crop prices. This conclusion is a nonsense for two reasons. *First*, what is bad for farmers may be good for consumers. *Second*, the farmers cannot curtail production indefinitely. It is indeed a paradox. The government can intervene to solve the paradoxical problem prevailing in the market for agricultural commodities. One scheme followed by the government for solving this problem is called price support system. Figure 11.5 illustrates the mechanism of price support system. The initial demand and supply curves are  $D_0D_0'$  and  $S_0S_0'$  respectively. The initial equilibrium price level is  $P_0$  and output level is  $X_0$ . If the supply curve shifts to  $S_1S_1'$ , price falls to  $P_1$  and output rises to  $X_4$ . As a result, income of the farmer may fall. To prevent the income of farmer being reduced, the government can buy the quantity  $X_0X_1$  at the initial price  $P_0$  when the supply curve shifts to  $S_1S_1'$ . As a result, the price level will remain at  $P_0$  and the farmer's

The government can intervene to solve the problem prevailing in the market for agricultural commodities.

income will increase in the case of a downward shift of the supply curve. If the supply curve shifts upward to  $S_2S_2'$ , price rises to  $P_3$  and quantity falls to  $X_3$ . As a result, the farmer's income may rise. The government can sell the quantity  $X_2X_0$  at initial  $P_0$  so that price remains fixed at  $P_0$ . But the farmer's income will fall in the case of a upward shift of the supply curve. We find that the price support system reverses the direction of change of the farmer's income due to shifts in supply curve. The farmer's income increases when the supply curve shifts to the right and decreases when the supply curve shifts to the left. In Bangladesh, we find the price support system in operation for paddy and jute. The government buys paddy and jute at a predetermined minimum price during the peak season and sells paddy at a predetermined maximum price during the slack season.



**Figure 11.5: Price Support System**

**Microeconomic Models for Industrial Goods**

The capitalists in Bangladesh are not very much interested in investing their funds in production enterprises.

The industrial sector is not well developed in Bangladesh. The pace of industrialization was slow during the post-liberation years. The capitalists in Bangladesh are not very much interested in investing their funds in production enterprises. The rate of return from production enterprises are deemed to be low. Moreover, organizing a production firm involves a lot of risks of different kinds. The potential investors find trading more remunerative and certain than production enterprises. Even the financial institutions of Bangladesh lend much of their fund to trading firms engaged in importing and exporting. The banks provide more funds to LC (Letter of Credit) business than to any other business undertaking. As mentioned earlier, Bangladesh has developed a culture of LC and import trade over the last two decades. Consequently, Bangladesh imports a large volume of industrial goods from abroad. The model depicted in Figure 11.2 is applicable to imports of industrial commodities. The final outcome is a reduction in domestic production of industrial commodities. The pace of industrialization in Bangladesh has also been low due to widespread smuggling in

and around Bangladesh. Bangladesh is haven for international smugglers for gold, electronic appliances and a multitude of other commodities.

Most of the markets for the industrial commodities in Bangladesh can be identified as monopolistically competitive. We have also oligopoly markets for some commodities. Both perfectly competitive markets and pure monopolies are very rare in Bangladesh. It should be remembered that identification of markets depends a lot on the level of aggregation used in the classification of commodities.

Most of the markets for the industrial commodities in Bangladesh can be identified as monopolistically competitive.

### **A Final Word**

We have just shown a few examples of microeconomic modelling. The economy of Bangladesh is very much complicated involving a lot of interrelated issues. Each sector has its unique features and it needs a specific microeconomic model to explain and predict the events occurring there. Much hardwork and patience are needed for modelling the facts and issues underlying the different sectors of Bangladesh economy.

## Review Questions

### • *Essay-type Questions*

1. Discuss the economic features of Bangladesh.
2. Make macroeconomic analysis of employment situation in agriculture sector of Bangladesh.
3. Make microeconomic analysis of imports of major food crops of Bangladesh.
4. Make microeconomic analysis of price support system for agricultural commodities.
5. Make microeconomic analysis of industrial commodities in Bangladesh.

### • *True or False*

Which of the following statements are true?

- (a) The Liberation war told upon the economy of Bangladesh heavily.
- (b) In Bangladesh, most of the people depend up agriculture for earning their livelihood.
- (c) Agriculture sector in Bangladesh providend employment to a maximum number of people.
- (d) People working in Agriculture sector have very low marginal productivity.
- (e) The industrial sector is well developed in Bangladesh.

### • *Multiple Choice Questions*

1. Economic growth in Bangladesh is continually hampared by:
  - (a) natrual calamities
  - (b) political unrests
  - (c) population growth
  - (d) all of the above
2. The Major share in GNP occupied by:
  - (a) agriculture sector
  - (b) garments sector
  - (c) Tertiary sector
  - (d) none of the above
3. Productivity of the people working in the agriculture sector of Bangladesh is:
  - (a) very high
  - (b) average
  - (c) every low
  - (d) none of the above

4. Major share in the of the international trade is occupied by:
  - (a) import
  - (b) export
  
5. People of Bangladesh are not much interested in investing capital in:
  - (a) production enterprises
  - (b) importing
  - (c) exporting
  - (d) b and c