NATIONAL OPEN UNIVERSITY OF NIGERIA

COURSE CODE AEM 751

COURSE TITLE: MICROECONOMICS

Department of Agricultural Economics and Extension
National Open University of Nigeria, Kaduna

UNIT ONE: SCOPE ECONOMICS

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1.0 INTRODUCTION

Most of you must have acquired some basic knowledge of economics before this stage of study. In this introductory unit, we shall be investigating the scope of economics in terms of how economics play the important role of preferring solution to the problem of society. It has been realized that resources are limited and human wants. Economist therefore focus on the problem of making the best use of resources available to satisfy these wants. Since there are many alternative things we can do with our resources, choice has to be made as to which to have per time. This unit will take you through the concept of wants, scarcity and opportunity cost. The unit will also consider some basic problems that economist attempt to deduce solution.

2.0 OBJECTIVE

It is expected that after you must have gone through this course, you should be able to:

1. Define economics and make basic distinction between macroeconomics and microeconomics.
2. Define resources
3. Identify the various types of productive resources
4. Describe the relationship between scarcity and choice.
5. Explain the concept of opportunity cost
6. Explain the basic problems facing economists.

3.1 DEFINITION OF ECONOMICS

The features of economics are constantly changing and its definition is frequently subjecting to controversy. Modern definitions of economics are based on the concept of scientific study of human behavior as a relationship between ends and scarce means, which have alternative uses. The commonly used definition however, characterizes economics as the study of limited resources for the achievement of alternative ends. This definition is adequate if interpreted to include the study of employment of resources by individuals and groups to satisfy competing needs. Most specifically, economics may be defined as a social science, which cove the action of individuals and groups of individual in the process of producing exchanging and consuming good and services. This definition will help you get oriented to the course, but to understand it fully, you must know what resources are, why they are scarce and how choice are made as to their use and allocation.

Attempt has also been made to classify economics into two branches: microeconomics and macroeconomics. Microeconomics looks at consumers and firm's behavior in decision – making and the nature of their interaction in individual markets. Microeconomics deals specifically with individual market and the interaction between different markets. Macroeconomics on the other hand looks at relationship between broad economic aggregates. It specifically applies to the study of overall averages and aggregate of the system. Macroeconomics focuses mainly on income, employment, prices and money. While microeconomics on the other hand looks at the overall status of the

economy's total output of final goods for a period of time. You should note that both macroeconomics and microeconomics deals with the employment of scarce resources to produce goods and services.

3.2 RESOURCES

Resources are valuable items that can be used to create the good and services that we need. Productive resources are factors that firms use to produce output. Economist deivided productive resources into four major categories: land, labor, capital and entrepreneur. These resoources are also referred to as factors of production or productive inputs. Such factors of production should be combined to be able to produce any produce.

LAND: land is used to embrace all raw natural resources that aids in production. Land in the economic sense includes air, soil, forest, mineral, farmland, rivers, seas and lakes. Land is the most basic material for all production. If you want to start faming for instant, the first resource you will consider if farmland. Similary, land determines the scale of operation of any production. Natural resources are neither evenly distributed around the world nor within a nation. Land is therefore a basic limiting resource in any type of production either by individual firm or the aggregate national production.

LABOR: All human resources, mental and physical, both inherited and acquired are referred to as labor. Labor is defined as the physical and intellectual exertion of human beings. The effort of a tailor, carpenter, lecturer and farmer are considered as labor. Labor is the starting point of production. Unless there is someone to work on the farmland, it will remain uncultivated. The amount of labor is limited by the size of the population and consequently limiting the amount of natural resources available to produce good and services.

CAPITAL: The word capital is usually taken to mean money but to economist capital refers to all such things as tools, machinery, plants and equipments. Capital is a finished good, which is used to produce another good. It is important to note that capital goods are tools of production while money is a means of carrying out exchange and cannot directly

produce anything on its own. Capital resources are man-made and their production depends on the use of economic resources, which are limited. Thus decision has to be made concerning the various end products of capital.

Entrepreneur: Entrepreneur refers to a capital type of labor, which directs, controls and coordinates the other factors for the production of goods and services. The entrepreneur combines the other resources and organizes their use to produce the good or service, which are also called output. The entrepreneurs take risks, organize the other factors of production and direct them along new lines. The success therefore of an enterprise depends on the competence and foresight of the entrepreneur.

Exercise 1.1: Define the various types productive resources.

3.3 Scarcity

Economics is the social science concerned with scarcity. This means that economics is the subject that studies how society use or employ its scarce resources to produce goods and services in order to satisfy human wants. It has been stated that it is impossible to satisfy all of human wants, for all practical purpose in today's world, human wants are insatiable. The desires of individual for such commodities like better food, clothing, housing, schooling, holidays, health care, and entertainment, etc is grossly inadequate. It is possible to produce only a small fraction of the goods and services that people desire. This gives rise to the basic economic problems of scarcity. I am sure scarcity is not a new phenomenon to you. You must have experience one form of scarcity or the other before. Let's assume you have N12000 a month to spend, and you have a monthly expenditure of about N25000. This creates an economic problem because the income available to you is limited relative to your desired expenditure. You will discover that no matter how large an amount you have at a time, you will always find out that your desires exceeds your resources.

The fact that resources available to use are limited compared to our needs makes economizing inevitable. We have to make the most of what we have by constantly

counting cost, weighing up alternative and going without some things so as to be able to operate within the limit of our resources.

Exercise 1.2: Explain what economist mean by scarcity.

3.4 choice and opportunity cost

Because resources available to an individual or a nation at a point in time are scarce, we are always forced to make choice between the alternative goods and service that will give us satisfaction. Choices are therefore inevitable because our needs are unlimited and resources for satisfying them are scarce. The decision to have more of one thing necessarily implies the decision to have less of something else. Also, because our needs are unlimited and resources for satisfying them are scarce. The decision to have more of one thing necessarily implies the decision to have less of something else. Also, because a country cannot produce everything its citizen would like to consume, there must exist a mechanism to decide what will be done and what will be done and what must be left undone. If you choose to have more of one thing, then whee is an effective choice, you must have less of something else. For instance if your monthly income is N12000, you know what this amount of moner can buy. You know that within the monthly income of N12000, you cannot satisfy all you desire to have. You will have to decide which of these wants are most important and which ones can be postponed or forego. These important ones may be arranged in order of preference, from which decision as to the ones that will give the by making a choice, you are making decision not to have some other things that are considered least important, suppose in a given month you desire to buy either a stereo or a video set, and each of them cost N10000, your monthly income is limited to N12000, which means that you cannot have both the stereo instead of the video set, you gain the satisfaction derived from the stereo, but forego the satisfaction that could have been obtained by purchasing the video set. The opportunity cost of the stereo is the video set which was not bought. Thus, the sacrifice of foregoing of one choice in order to attain another is called the opportunity cost. The principle of opportunity cost arises because

wants are limitless and resources to satisfy these wants are scarce, therefore choice must be made among the limitless wants. The principle emphasizes the problem of choice measuring the cost of obtaining a quantity of one commodity in terms of the quantity of the other commodity that could have been obtained instead.

Exercise 1.3: Define the concepts of choice and opportunity cost

3.5 Basic economic problems

There are some basic economic problems, which are faced in all types of economies, whether they are capitalist, socialist or communist. But the dimension of these problems and the difficulty of solving them differ for various types of economies. These problems centers on three basic questions: what commodity are to be produced and in what quantities, how to produce these commodities, and for whom to produce. We shall briefly consider each of these questions.

What to produce is determined by the stock of resources available to an individual or an organization at a point in time. A farm enterprise to be located in northern Nigeria will not consider cultivating cocoa because the farmland in that area of the country is not suitable for the production of cocoa, instead the firm will consider growing say, cereals, legumes or any other crop that is adaptable to the location or on the alternative, the firm can relocate to the south where both the soil and and climate favor the production of cocoa. The answer to the question of what to produce depends on the allocation of the economy's scarce resources among alternative uses. For example, producing a large output of one good requires that substantial amount of resources be allocated to its production. Thus what a society produces is governed by the available of resources or factors of production.

The question of how to produce is purely technological. This question arises because there are more than one technically possible ways in which good are produced. It concerns the way or form in which the factors of production must be combined to yield maximum output or least cost of production. Let us take the case of agriculture as an

example: agricultural commodities can be produced by farming a small quantity of land intensively using large quantities of fertilizer, labor and machinery: or by farming large quantity of land extensively using only small quantity of fertilizer, labor and machinery. Both methods can be used to produce the same amount of goods. The same is true of manufactured goods. Questions about why one method of production is used rather than another, and the consequences of these choices about production methods, are important topics in the theory of production.

For whom to produce will be decided by the taste and preference of individuals. In other words, taste and preference of the society will dictate the goods and services to be produced. Such taste and preference must of course be backed up effectively by individuals income. It is not enough to have a taste for air-conditioned apartment: the individual must have the income to buy the air condition.

4.1 Conclusion

Economics deals with the use of limited resources to achieve maximum satisfaction. Because resources are scarce, choice has to be made and for every choice made, there is a cost called opportunity cost. Each economic system is faced with the problem of what commodities to produce, how to produce them and for whom to produce these commodities. The various discussions and the mechanisms by which society go about answering these basic questions of life is what the scope of economics entails. Individuals, firms and governments make these economic decisions. Irrespective of who makes the decision, the outcome is to maximize the use of available resources to satisfy competing ends.

5.0 Summary

In this introductory unit, we have attempted to defined economics as a social science, which cover the action of individuals and groups of individual in the process of producing, exchanging and consuming goods and services. We equally differentiated between microeconomics, which centers on individual consumers and firms, and

macroeconomic, which encompasses the entire economy of a nation. We looked at scarcity as a fundamental problem faced by all economic systems. We defined opportunity cost as the sacrifice of foregoing one choice in order to attain another. Finally, we considered the basic economic problems which centers on three basic questions: what commodity are to be produced and in what quantities, how to produce these commodities, and for whom to produce. What to produce is observed to depend on the stock of resources available to an individual or a nation as a whole. The question of how to produce was observed to depend on the way or form in which the factors of production must be combined to yield maximum output or least cost of production while for whom to produce will be decided by the taste and preference of individuals. We concluded that answering these economic problems would aim at maximizing the use of available scarce resources to satisfy human wants.

6.0 Tutor marked assignment

Questions:

1. What are the main economic problems that may face an individual or a nation?

2. Explain scarcity and choice and how are they related

7.0 Reference and further readings.

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UNIT TWO: METHODOLOGY OF ECONOMICS

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1.0 Introduction

The emphasis of this unit is on the science of economics as it relate to observation of events and formulation of theories. Economics is involved with the analysis of human action by abstracting form the real world and developing theories to explain them. Economic theories are developed in somewhat the same way as theories are developed in other sciences. We will look at how economist observe events, attempt to find pattern in them, formulate theories and tests prepositions that can be used to predict and explain phenomena we observed in the world around us. The analysis goes beyond problem solving to deal with the basic principles and mechanisms that make economic systems work the way they do. Some of the methodologies hazards involved in economic investigation will also be considered in this unit.

2.0 Objectives

After going through the content of this unit, you should be able to appreciate the various methodological issues in economics. A careful study of the unit will enlighten tou on the:

1) Relationship between economics and other social sciences
2) Economic approach to problem solving
3) Basic steps necessary for the development of an economic theory
4) Means of judging the validity of economics

3.1 Economics in relation to other fields

Economics is much more than a bag of techniques for solving practical problems. Economics is classified as social science, like history, political science, sociology and psychology because it takes as its subject the behavior of human beings, individually or a group. Psychology and economics share an interest in what motivates people to take certain actions: but economists are primarily concerned in those actions, which are reflected in market activity or in collective resource allocation decision through government. While sociologist are interest in all facts of organized human activity: economics are interested mainly in the production and consumption aspects. Economics apart from being a social science is also referred to as a decision science, which includes some branches of applied mathematics, operational research, and some areas of management and engineering.

3.2 Model building in economics

By way of definition, a model is a simplified representation of a real life situation. It is composed of a number of assumptions from which conclusions or predictions are deduced. The economist proceeds along similar lines when he sets forth a model of economic behavior. For a model to be useful, it must in general simplify and abstract form the real world. For example, just as physicist work with simplified models of atoms, economist work with simplified models of markets. The rick is to construct a model so that irrelevant and unimportant considerations and variables are neglected, but major factors that seriously affect the phenomena the model is designed to predict are included.

An economic model is a set of economic relationship, which is ecpressed by means of equations. The relation of a model to reality is through reasonable abstraction, which contains certain aspects of the reality that are relevant to the model. A model that is based on realistic assumption will fit to the real world situation.

The purpose of a model is to make analysis and predictions about an economic entity. The economic entity may be an individual, a household, an industry, an economy or even the world as a whole. Economist build models in order to increase their understanding of the real world economic problems, and in many respects the most important test of a model is how well it predicts. For instance. A road map is a model to make predictions about the route a driver will take to get a particular destination. How detailed a map you will need will depend on where you are going and how you want to get there.

If you want to predict the outcome of a particular event, you will be forced to use the model that predicts best, even if this does not predict very well. After all, if you must make a forecast, you will use the most accurate device available and any such device is a model of some sort. Thus if a model can predict the price of iron to within plus or minus N0.0 per unit, and no other model can do better, this model will be considered most adequate.

3.3 Values and decision

Economist make an important distinction between positive economics and normative economics. Positive economics contains descriptive statements and prepositions about the world. Normative economics on the other hand make statement or sets of prepositions about what ought to be; value judgment about the world. Preposition can be tested by an appeal to facts. Needless to say, it is sometimes difficult to get facts you need to rest particular prepositions. In normative economics, however, this is not the case. The result you get depend on your values or preferences. Because economists like physicists, mathematicians, lawyers etc, differ in their preference and values, they come to different conclusions when they enter the realm of normative economics. However there is very

substantial agreement on most of the prepositions of positive economics. Since the pure science of economics is positive economics, most of the methods that we shall discuss here shall be related to positive economics.

By way of illustration, in economics the questions what policies will reduce un-employment? And what policies will prevent inflation? Are positive ones, while the question ought we be more concerned about un-employment than inflation? Is a normative one? Positive statements, such as the one just considered, assert things about the world. If it is possible for a statement to be proved wrong by empirical evidence, we call it a testable statement. Many positive statements are testable, and disagreements over them are handled by an appeal to facts. Normative statements on the other hand are never testable.

Exercise 2.2: There is almost complete agreement with regards to most of the prepositions of normative economics. True/False? (explain your answer).

3.4 Statistical tests and quantitative models

In order to utilize and test economic models, economist need facts of many kinds. Each economic model yields predictions, and to determine whether these predictions are accurate enough to be worth anything, economists must continually collect data to show how accurate the predictions are. For example if a model predicts that the price of a kilogram of iron would be N500 higher in 2001 than 2000, it is important to determine what price change really occurred, and how close the model predictions are to reality. You should not that economic is not an experimental or laboratory science. Consequently, they usually cannot study the effects of varying one factor, while holding constant other factors that may influence the outcomes. Therefore to set a certain model of consumer behavior an economist may set out to estimate the effect of households income on the amount of money it spends per year on clothing. To make such an estimate, the economist cannot perform an experiment, instead, he must gather data

concerning the incomes and clothing expenditure of a large number of households, and study the relationship between them.

A model should be built in such a manner that it may be testable. Economists determine how well various models fir in reality by the process of observation and verification. This will depends on the ability of the model to explain as well as predict accurately. Two types of error can be made in estimating models. You can reject a satisfactory model, or accept an unsatisfactory one. Using standard statistic methods economists formulate their tests so that the probability of committing each type of error is greatly minimized. Measurements of relationships enable economist to construct models that can predict the effect one variable has on another. Such quantitative models can be extremely valuable to individuals, firms and government in decision-making. For instance, an economist may set out to estimate the effect of household's income on the amount of money it spends per year on clothing. To make such an estimate, the economist cannot perform an experiment of a large number of households, and study the relationship between them. Instead he must gather data concerning the incomes and clothing expenditures of a large number of households, and study the relationship between them.

3.5 Graphs and Relationships

Economists find it useful to present data and relationships between variables in graphs. A graph has horizontal axis and vertical axis, each of which has a scale of numerical values. For example, the relationship between household's income and expenditure on clothing can be presented in form of a graph ~ shown 'In fig\Jre 2.1. The vertical axis shows the annual amount spent by households on clothing, and the horizontal axis shows household's annual income. The point of intersection of the two axes is called the origin. You can explain relationship between two variables by plotting the value of one variable against the value of the other variable .. If you look at the graph in fig. 2.1, each observation is represented by a dot while the line joining the polnts characterizes the relationship between the variables. The relationship between two variables is direct if the

line of averaqe relationship is upward sloping, as in figure 2.1. That is, the variable measured along the vertical axis tends to increase -or decrease in response to increase or decrease in the variable along. the horizontal axis. On the other hand if the line of average relationship is downward . sloping,' the relationship is inverse. That is, the variable measured along the vertical axis tends to increase in response to a decrease in the variable along the horizontal axis and vice versa.

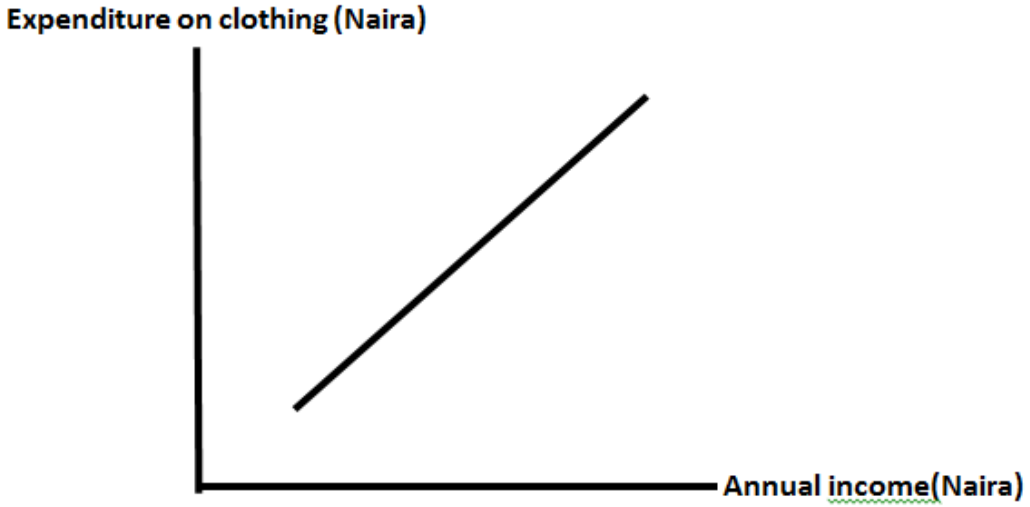

Figure 2.1 Relationship between annual clothing expenditure and household income

Exercise 2.3 Explain what economists mean by relationships

The relationship between two variables could be linear or non-linear (curve) depending on the rate of change of the variables. If the change in the values of one variable leads' to a proportionate change in the values of the other variable, the relationship is said to be linear. However, if the change in the values of one variable at various points is proportionately different from the change in the values of another variable at these points, the relationship is said to be non-linear. The slope of a linear relationship is constant from point to point while the slope of a non-linear relationship differs at various points of the curve.

3.6 MethodologicalHazards in Economics

There are lots of impediments to straight thinking in economics that are not present in the pure Sciences like Chemistry and Biology. Some of the most important ones are as follows:

Bias: People have preconceptions about economic matters that they don't have about chemical and biological matters. Some people grow with the idea that profits are a bad thing or that Trade union is a social evil. If you want to learn anything in economics,you must respect facts, unpleasant though they may be at times.

Loaded Words: Economics use loaded emotional words, at times. For example, Marxists often refer to the exploitation of labor by Capitalists, which sound bad, since no one can be in favor of exploitation. Western economists do not hold this view of the Marxists.

Jargons: Economics like other social sciences uses unfamiliar words, or jargons to describe common phenomena. What more, economists define some terms different from the man on the street. You find out that rent to the economists is not an amount paid every month for an apartment, but a payment for a resource that is fixed in supply. You will require caution not to assume that seemly familiar terms mean what you think they mean.

Fallacy of Composition: Some people assume that what is true of a part of a system must be true for the whole system. For instance, a business firm will go bankrupt by continuing to spend more than it takes in, but it does not follow that an entire nation will go bankrupt if its government spends more than it takes in. Grievous errors can be avoided by keeping clear of this fallacy's clutches.

Myopic Specialization: Economics is closely intertwined with other social sciences" there is no well-defined border between them. To understand many problems in society, one must consider the Sociological and Political as well as economic angles. For

example, non-economic factors are important in explaining why some countries are richer than others. Thus, the economists must continually keep abreast of the advances made in other fields, since they can help him solve his own problems. A myopic refusal to cross-disciplinary boundaries can result in poor or misleading results.

4.0 Conclusion:

The methodology used by economists is much the same as that used in any other kind of scientific analysis. The basic procedure is the formulation and testing of models. To test and quantify their models, economists gather data and use various statistical techniques. Economics dwells more on making statements that are testable the results of such test can be presented graphically. Some pitfalls that should be guided against in the applications of the methods of investigation in economics were also highlighted.

5.0 Summary

We have been able to establish how economics relate to other Social Sciences and illustrate the various methodologies it employs in solving social problems. A distinction. was made between positive and normative economics; Positive economics deals with results that are testable, at least in principles by an appeal to the facts. Where as in normative economics, the results you get depend on your basic values and preferences. A number of methodological impediments to right thinking in economics to take note of were equally treated.

6.0 Tutor marked Assignments

Questions:

1) What is the purpose of a model in economic analysis?
2) Given the quantity of balloons demanded in a particular market in Abuja at

various prices as indicated in the table below:

Table 2.1

Price of a balloon (#)	Quantity demanded ('000)
180	1
150	2
120	3
090	4
060	5
030	6

.

With the aid of a graph illustrate the relationship between price of balloon and quantity demanded. What kind of relationship exists between price and quantity demanded?

7.0 Reference and further reading

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UNIT THREE: CONSUMER BEHAVIOR, CARDINAL UTILITY ANALYSIS

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1.0 Introduction

The economic activities of human beings are the production of goods and services and the consumption of those goods and services to satisfy want. Human wants are unlimited but we do not have unlimited 'supply of the means to satisfy these' wants or needs. Hence consumers are faced with the problem of choosing between various wants, based on the resources at their disposal. We stressed in unit 1 that consumption units must make choice because of scarcity. This is the fundamental notion of economic analysis. We now want to expand on that analysis to determine why consumers react in the way that they do. Why does an' individual purchase certain good or services? An obvious answer is that the good or services are expected to satisfy some need or desire of the consumer. The first approach economist took in examining consumers behavior involved the concept of measurable utility. This unit will focus on the use of this approach to analyzing consumer behavior towards choosing between alternatives.

2.0 **Objectives**

After studying the materials found in this unit you should be able to:

- State the assumptions of the cardinal utility analysis .
- Explain the meaning of utility, total utility and diminishing marginal utility.
- Derive a marginal utility curve from a total utility curve.
- Derive an individual demand curve for a good based on:
    a. The equation for maximizing total utility
    b. The principle of diminishing marginal utility.

3.1 **Meaning of utility**

The ordinary meaning and dictionary definition of utility always include something about usefulness, but this meaning is much more restrictive than the one used in economics. In economics, if an individual wants a commodity, then that commodity has utility. Utility is simply the ability of a good or service to yield satisfaction to the consumer. It is the major determinant of consumer demand. Consumer demands goods because of the satisfaction be derives from the commodity. The numerical measurement and summation if referred to as cardinal valuing.

3.2 Assumptions of the cardinal utility analysis

To analyse the cardinal theory of consumer behaviour more accurately, we use some simplifying assumptions that do not distort the crucial aspects of economic reality.

1. Perfect knowledge: an individual has complete information on all matters pertaining to its consumption decisions. He knows all the full range of goods and services in the market; he knows precisely the technical capacity of each good or service in the market; he knows precisely the technical capacity of each good or service to satisfy a want. He knows the exact price of each good and service and their utility are not influenced by variations in their prices
2. Rationality: this theory assumes that the consumer is rational. The individual must make choice because he has limited income and is forced to choose which want to satisfy. He measures, chooses and compares the utility of different goods

and aims at maximizing his utility subject to constraint imposed by his income.

3. Cardinal utility: the cardinal utility of each commodity is measurable. A consumer is able to assign a precise numerical value on utility based on the satisfaction derived from consuming each commodity. Money is assumed to be the measure of utility, the marginal utility of money is assumed to be constant.
4. Diminishing marginal utility: the utility gained from successive unit of commodity diminishes as increasing amounts of the commodity is consumed. This implies that as a consumer acquires larger quantities of a commodity, the resulting increment in utility diminishes.
5. Total utility: total utility of a bundle of goods depends upon the quantities of each commodity consumed per period of time. If there are n commodities in the bundles with quantities X_1, X_2, ….Xn1 the total is given as

   $U = f(X_1, X_2 ……..X_n)$

3.3 Concepts of total and marginal utility

The cardinal utility theory emphasized the measurement of utility based on the satisfaction that an individual receives from consuming a good or service. An arbitrary unit called utils can be employed to measure this satisfaction (utility). This numerical measurement and summation is referred as cardinal ranking: a ranking that puts a precise numerical value on utility.

Total utility depends upon the quantities of each commodity consumed per period of time, but it is not simply the sum of the independent utilities obtained separately from each commodity. Lets attempt to construct an individual's utility or preference function for consumption of coke. First we choose a convenient time period, say a day. Then, one bottle of coke per day may yield 10 utils to the consumer, rather than one, assuming the individual chooses to take two bottles rather than just one. The value of satisfaction may be 18 utils, using the same understanding; you can determine the value of satisfaction as the individual increases the number of bottles of coke per day. A utility schedule can be established to depict the total utility derived from consuming additional bottles of coke.

Exercise 3.1: Define utility, total and marginal utility.

Table 3.1 utility schedule for coke

Bottle of coke per day	Total utility	Marginal
1	15	15
2	27	13
3	37	11
4	43	8
5	45	5
6	45	0
7	42	-3

The important characteristic of the schedule is, while the total utility becomes larger the more you consume per day (up to a point), the, additional (marginal) utility from each additional unit consumed becomes smaller. Marginal utility is the amount of utility that an additional unit of consumption adds to total utility. It is the satisfaction a consumer derives from acquiring one more unit of a good or service.

Marginal utility is the change in total utility that is brought about by consuming one more unit or one less unit of the good. In our example above, the first bottle of coke adds 15 utils to total utility. However, the fourth bottle adds only 8 utils to total utility. The marginal utility is obtained by subtracting the total utility of the previous bottle from that of the current bottle. Using the above example, the graphical illustration of total and marginal is presented in Fig: 3.1

3.4 Principles of diminishing marginal utility

One of the characteristics of human wants is their limited intensity. As we have more of anything in succession, our intensity for its subsequent units diminishes. This concept is known as diminishing marginal utility. The principle of diminishing marginal utility holds that for a given time period, the greater the level of consumption of a particular commodity, the lower the marginal utility. In other words, as you consume more units of

a commodity, the additional units yield less of an addition to total utility than the preceding units did. For instant if an individual consumes a bottle of coke a day. This would yield a large amount of utility. But perhaps instead of one bottle a day he can have two. This will yield additional utility, but not as much as that yielded by the first bottle. A third bottle per day will add to his satisfaction, but by less than the second bottle did. Successive bottles per day beyond what the' system can take will yield no additional utility,

We can illustrate the principle of diminishing marginal utility by looking at a consumer's total utility schedule (Table 3.1) and deriving both deriving both the total and marginal utility curves from this schedule. Column three of Table 3.1 shows how much additional satisfaction an individual gets from each additional bottle of coke consumed, The qualification per day is important. Consumption must always be shown as a quantity per unit of time. The entries in column three declines as we go down the column, in accordance with the principle of diminishing marginal utility. The individual would never wish to take more-man 5 bottles of coke a day, since the sixth bottle has a marginal utility of zero, thus conferring no satisfaction and further additions yield negative marginal utility.

The fact that additional utility declines as consumption increase implies that less satisfaction is ontained per additional unit. Fig 3.1 shows the marginal utility curve that corresponds to total utility curve in column 2. Note that when the total utility curve reaches its maximum, marginal utility is zero. This is expected because if total utility is to decline, marginal utility must become negative.

Exercise 3.2: State law of diminishing marginal utility.

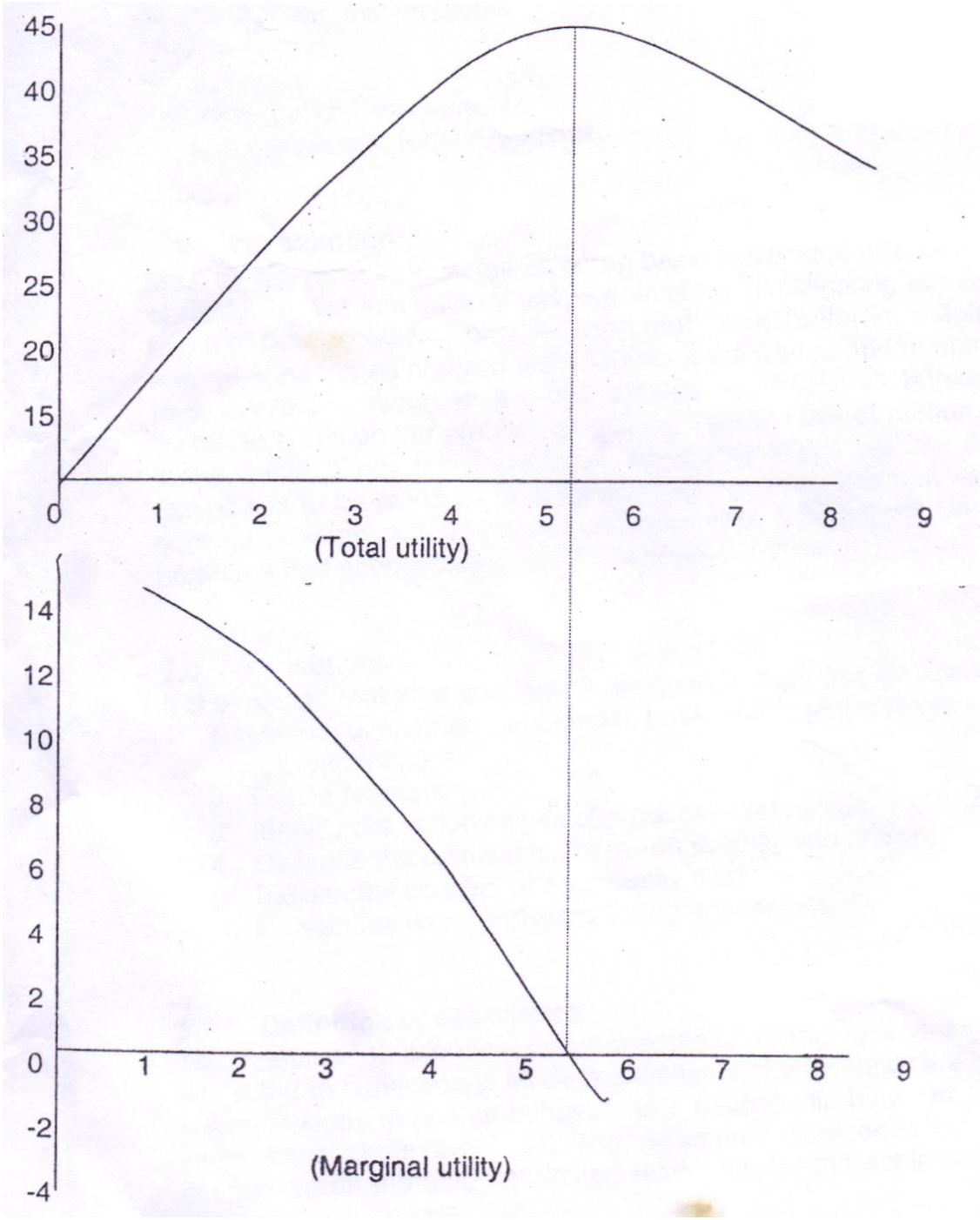

Fig.3.1 Total and marginal utility curves

3.5 Utility maximization

Consumers have unlimited wants but the money income available to them at every point in time is limited. Thus they make choice about which goods and services to buy based on their budget constraint. It is generally assumed that consumers make choice in the way that maximizes their total utility. We have established the fact that the consumption of a given commodity depends on the amount of utility derive from it. Let us start the concept of utility maximization with a model of single commodity x. With a given money income Y, the consumer's utility is maximized when the marginal utility of x (MUx) equal to the market price (Px) of the commodity, symbolically, MUx = Px.

It is all very well to set up a marginal utility schedule for one good. But the typical individual buys hundreds of different goods and services. How can he do this in a way that will yield greatest satisfaction? To see how marginal utility and price influence how a household maximizes utility, let's look at an example with two commodities rice and cowpea, where a kilogram of rice and cowpea cost N100 each. The household's utility schedule for the two goods are presented in Table 3.2 Assuming the household has given amount of income (budget constraint) worth N6nO.00, how will this income allocated between the two goods, so as to achieve maximum utility?

Table 3.2 Utility schedule for rice and cowpea

COWPEA			RICE		
Kg/day	MU	TU	Kg/day	MU	TU
1	7	7	1	10	10
2	6	13	2	9	19
3	5	18	3	8	27
4	3	21	4	6	33
5	2	23	5	2	35
6	1	24	6	1	36
7	-1	23	7	0	36

To maximize utility, the household will spend the first N100.00 to purchase the first kg of rice because its marginal utility is highest (10 utils) compared-to marginal utility of 7 utils. if the household had chosen the first unit of cowpea. The second and third N1 00.00 will also be spent on rice because they give higher marginal utility to the household. However, the fourth N100.00 will be spent to purchase the first kg of cowpea, rather than the fourth kg of rice because the first kg of cowpea gives the household higher marginal utility (7utils) than the fourth kg of rice which gives 6 utils. The fifth and the sixth N100 would be spent on purchasing the fourth kg of rice and the second kg of cowpea because both give the household 6 utils of utility. The income of the household will therefore be exhausted on the first four kg of rice and the first two kg of cowpea. The household cannot go beyond this point because of the limited income. Therefore the maximum utility the household can derive from N600.00 to be spent on rice and cowpea is 46 utils (10 + 9 + 8 + 7 + 6 + 6). This is obtained by adding the marginal utility of the first kg of rice to that of the first two kg of cowpea or by adding the total utility of the second kg of cowpea to the total utility of the fourth kg of rice (13 + 33). The rule for maximizing utility is that the marginal utility of expenditure on each good purchased must be equal. If there are n commodities in the consumer's budget, the condition for maximum satisfaction is that;

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \frac{MU_3}{P_3} = \cdots = \frac{MU_n}{P_n}$$

This equation implies that the marginal utility yielded by a unit of each good must be proportionate to its price. If you consider the example in Table 3.1, you will observe that the marginal utility of the second kg of cowpea is 6 utils while that of the fourth kg of rice is also 6 utils, dividing each of these marginal utilities by N100.00, which is the respective unit prices of the commodities, the condition for maximizing utility is fulfilled. That is:

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \frac{6}{100} = 0.06$$

Exercise 3.3: If the marginal utility of one good is four and the price is N2.00 and the marginal utility of another good is five and its price is N1.00, is the individual maximizing total utility?

3.6 Derivation of the consumers demand curve

The derivation of consumer's demand curve is based on the axiom of diminishing marginal utility. The marginal utility of a commodity x may be depicted as a line with a negative slope. Mathematically, the MUx is the slope of the total utility curve. Total utility increases but at a decreasing rate up to a point and it starts to decline. MUx continues to decline continuously and becomes negative beyond the point of decreasing total utility. If marginal utility is measured in monetary unit, the demand curve for x is identical to the positive segment of the marginal utility of x.

Consider an individual demand for a good. He distributes his income so as to obtain maximum satisfaction while consuming the goods at his disposal. He his following the rule

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \frac{MU_3}{P_3} = \cdots = \frac{MU_n}{P_n}$$

Lets' assume P_1 falls while all other prices remain the same, the ratio MU_1/ P_1 is no longer equal to the other ratios. To restore conformity to the rule, MU_1 must decline. But we know that marginal utility of a good decline when more of it is consumed because of the principle of diminishing marginal utility. It implies that the individual will buy more of the first good than before to obtain the same ratio MU1/ P1.

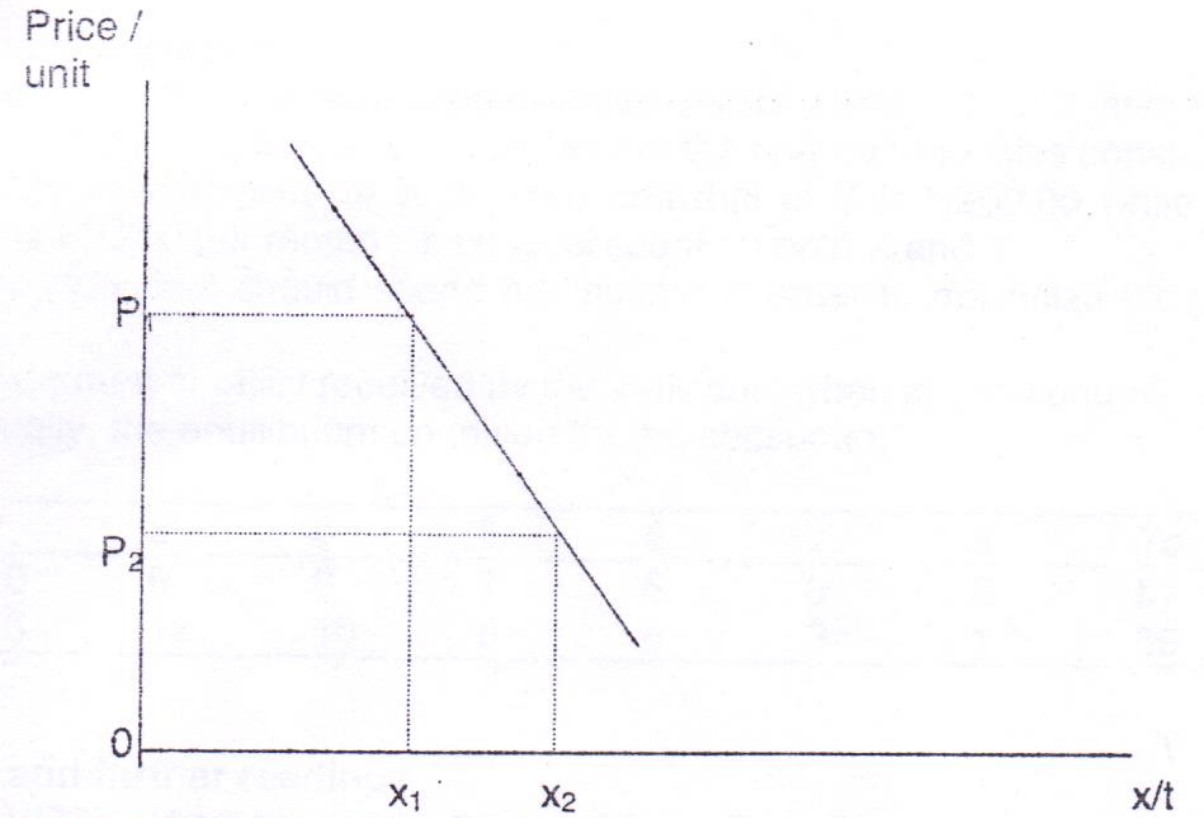

Fig 3.2 Consumers demand curve.

Fig. 2.3 shows that when price falls from P1 to P_2, consumer maximization is thrown out of equilibrium. However, equilibrium will be. Restored if the consumer increases consumption from X1 to X2. Consumer maximization behaviour requires that when the price of a commodity falls, the consumer will increase its consumption. Since this is necessary for utility maximization, it proves that the demand curves of individual consumer must have a negative slope. Thus the individual demand curve Slope downwards to the right.

Exercise 3.4: Explain why the individual's demand curve is negatively sloped.

4:0 Conclusion

Individuals make decision about consumption of goods and services. This decision is based upon the level of satisfaction derived from these goods and services. The focus of cardinal utility theory is that individuals are able to quantify the satisfaction they derive from consuming goods and services. This satisfaction is called utility, which is measured by an arbitrary unit called utils. Utility theory is a useful tool for analysing consumer behavior and allocating consumer budget between goods and services in a given time frame. This theory is also used in explaining consumer demand based on the marginal utility derive from consuming additional units of goods and services.

5.0 Summary

This unit focused on the utility approach to consumer behavior. The underlying assumptions to this theory were highlighted. We defined utility as the satisfaction an individual derive from consuming goods and services and we have identified the characteristics of total and marginal utility as more and more quantities of a particular commodity is being consumed per unit of time. Finally we derived the consumer demand curve from the concept of utility maximization.

6.0 Tutor marked assignment

Question: Given an individual's marginal utility schedule for commodities X and Y as presented in table 1. Assuming these commodities are the only commodities consumed by the individual. The market price of X is N100 and that of Y is N200.00 while the individuals income is N1200 per month which is all spent on both X and Y.

a. Indicate how this individual should spend his income in order to maximize his total utility.
b. What is the total amount of utility received by the individual when at equilibrium?
c. State mathematically, the equilibrium condition for the consumer.

Q	1	2	3	4	5	6	7	8	Total
Mux	13	10	8	8	7	6	3	2	57

Muy	15	13	12	10	9	6	3	1	69

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UNIT FOUR: CONSUMER BEHAVIOR, INDIFERENCE CURVE ANALYSIS

Table of contents

1.0 Introduction

We have now passed from the original concept of measurable, additive utility and the associated utility ranking to the concept of preference and indifference. The essential difference between the two concepts lies in the nature of the measurement scale involved. In the former approach, utility was assumed to be cardinally measurable in some units such as utils. The. In difference curve approach to consumer behavior shows that only ordinal measurement of utility is required.

Indifference curve analysis is an approach to consumer behavioral theory which emphasis on preference or indifference. The focus of this theory is that consumers are able to rank their bundles of wants/goods -in an order from low to high in which they prefer them. This approach of analyzing consumer behavior is well preferred to the marginal utility theory, which requires precise marginal values to be assigned to alternatives. Thus instead of saying the next cup of tea has 15 units of utility or the next bottle of coke has 20 units of utility, the consumer needs only to say 'I prefer another

bottle of coke to a cup of tea".

Exercise **4.1:** differentiate between cardinal utility and the indifference curve theory?

2.0 Objectives

This unit aims to provide you with fundamental knowledge of indifference curve approach to consumer behavior to choosing between alternatives. It is hoped that on successful completion of this course you should be able to define:

2. What indifference or preference is
3. Explain what is a budget line and how to illustrate this graphically
4. Define the equilibrium point in terms of the slope of the budget line and the marginal rate of substitution
5. Derive an income consumption curve
6. Derive price consumption curve

3.1 Concept of preference or indifference

Consumer wants are limited by the resource at their disposal; hence they are faced with the problem of choosing between a bundle of goods and services. The concept of preference or indifference deals with the way consumer makes choice between alternative. The indifference curve analysis assumes that the consumer is able to state preference for different bundles of goods or to profess indifference between some of them. In order words, confronted with a choice of buying a car or a land, the individual might rank the car as a preferred choice. The individual might also say, I don't have a preference; I am indifference between the two choices.

Suppose an individual is offered different combination of commodities say X and Y the individual might say the different combinations are equal in the amount of satisfaction he expects to derive and therefore is indifferent between the various combinations. The set of combination of goods among which a consumer is indifferent is called the indifference set (see Table 1). Plotting these combinations on a graph, we can derive a

smooth curve that passes through the point of combinations of indifference set. an indifference curve therefore, shows all combination s of the two commodities among which a consumer is indifferent. (Fig.1).

Table 4.1: Indifference set

Combinations	Y	X
A	18	5
B	15	8
C	10	9
D	6	15
E	4	22

Exercise 4.2: Explain what happens if one more good is added to the combinations in the indifference set.

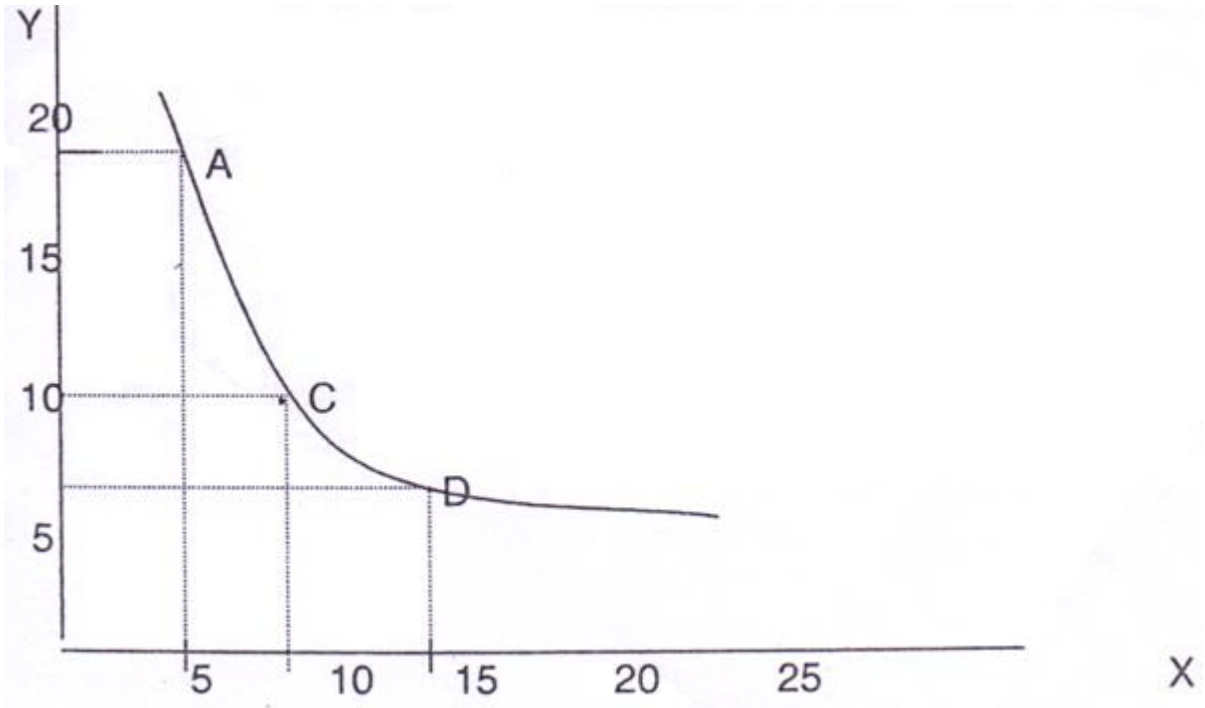

Fig.4.1: Indifference Curve.

The two commodities in an indifference curve are inversely related. In order words each combination represents a trade off. In our example, if combination A is to have more X than in combination C, then it must have less Y as observed in combination D since the bundles are to yield the same level of satisfaction. If a combination has more of one goods, without having less of the other, it would be preferred and the consumer would no longer be indifferent. The indifference set represented by a higher indifference curve is referred to that represented by a lower indifference curve. A higher indifference curve implies that the consumer will have more of both commodity X and Y and so have a higher level of satisfaction.

A set of indifference curve corresponding to different level of satisfaction is called an indifference map (Fig. 2). Higher curves on the map represents higher levels of satisfaction because they ·represent more of at least one good and no less of the other

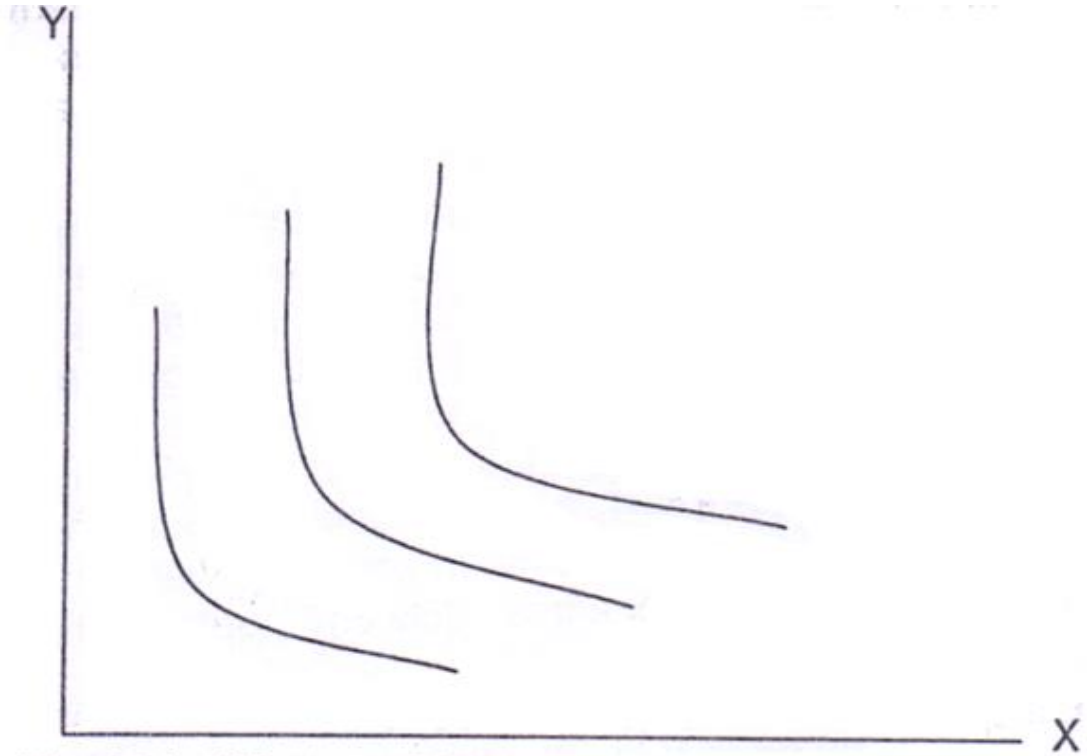

Fig 4.2 Indifference Map

3.2 Diminishing marginal rates of substitutions

A typical indifference curve will have some degree of convexity and negatively sloped which. means that for you to be indifference between two bundles of commodities, some extra amount of one good is necessary to compensate for the loss of some amount of the other. The convexity feature means that as you attain more utility of one good, fewer units of another good is required to compensate for the loss of one unit of the good that is become scarce. This is illustrated in Fig 4.3.

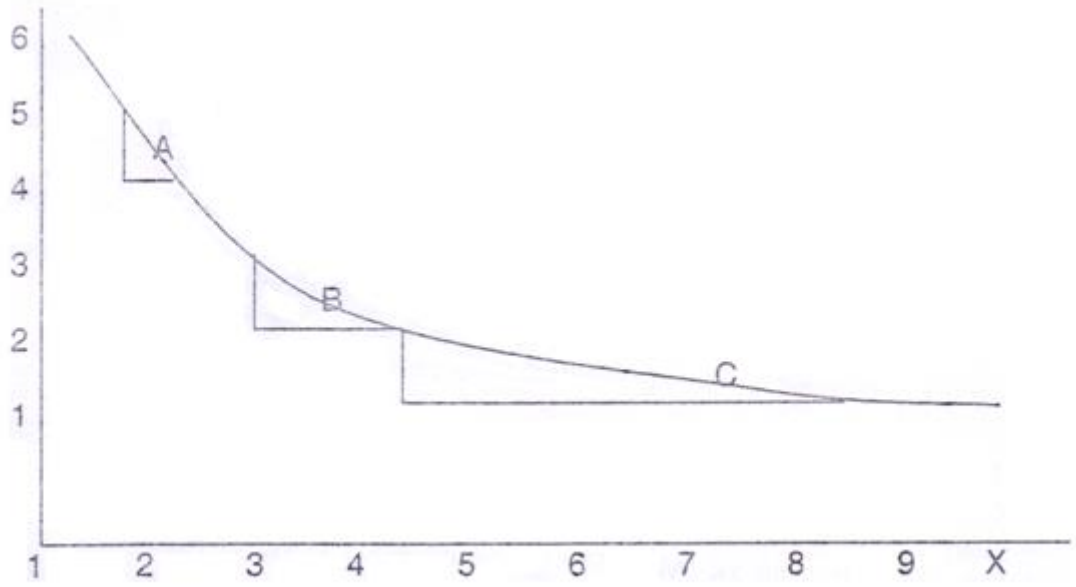

Fig 4.3 Convexity Feature of Indifference curves

At point A, the individual is consuming relatively large amount of Y and small amount of X in order to compensate for a reduction in consumption of one unit of Y, the consumer will only require two units of X to be satisfied with such a trade. But at paint B, since less of Y and more of X is being consumed compared to point A it will take a larger quantity of X to compensate for the loss of one unit of Y. At point C the individual now consumes large amount of X and very little of Y, so to give up one unit of Y more units of X will be required to retain the same level of satisfaction. This trade off ratio is called the marginal rate of substitution. It shows the rate at which the consumer is willing to give up one

good to obtain more of another. The slope of the indifference curve represents this trade off.

$$\text{MRS xy} = \frac{Number\ of\ units\ of\ Y\ given\ up}{Number\ of\ units\ of\ X\ gained}$$

The declining value of MRS xy is a reflection of the principles of diminishing marginal rates of substitution. It shows that as more of one good (X) is substituted for the other good (Y), the value of good X in terms of good Y declines.

3.3 Budget constraints and maximization of satisfaction

An indifference map allows us to compare points representing combinations of goods x and y which the consumer is indifference to. We know that all points on any single indifference curve are equivalent to each other while indifferen.ee curves located to the right and above other indifference curves are preferred combination. An individual will naturally want to operate on a higher indifference curve, but how high the consumer can get is constraints by his real income, that is his money income relative to the prices of the goods he wants to buy. Bearing in mind that the consumer faces prices' that are determined in markets. The consumer cannot influence these prices. Thus income constraints the individual from buying all that might be desired. Income is the budget constraint. The budget constraint, when combined with prices .ot the two commodities, is called the budget line.

In drawing the budget line the following assumptions are made:

The income of the individual is fixed.

The individual is spending all his income on the two commodities.

The prices of the commodities are given.

There is a possibility of substituting one commodity for the other.

Suppose the individual income is N200.00, and meat cost N100 per kilogram and gari cost N40.00 per kilogram. If he spends the entire income on meat, 2kg (L) of '(neat can

be purchased if you divide income by the unit price of meat and if he spends the entire income on gari he could buy 5kg (M) as shown in Fig 4. With a straight line, we can connect the points that' represents buying only meat or only gari, thus LM express all possible combinations that can be purchased with a given income level. It is a budget line because any combination outside the line is unattainable at that income level.

To demonstrate how a consumer maximizes his satisfaction, we combine a set of indifference curves with the budget line and observe at which point a consumer attains the highest satisfaction based on his budget constraint. Given an indifference map corresponding to different levels of satisfaction, a consumer maximizes his utility at the level where the budget line is tangent to an indifference curve as shown in Fig. 5.2. The individual moves down the budget line through points a, band c. His utility is maximized at point b on the indifference curve lzla If he moves to point c it is on - a lower indifference curve with lower level of satisfaction. Satisfaction is maximized at the point where an indifference curve is tangent to a budget line, ie at point c. At that point, the slope-of the indifference curve is equal to the slope of the-budget line.

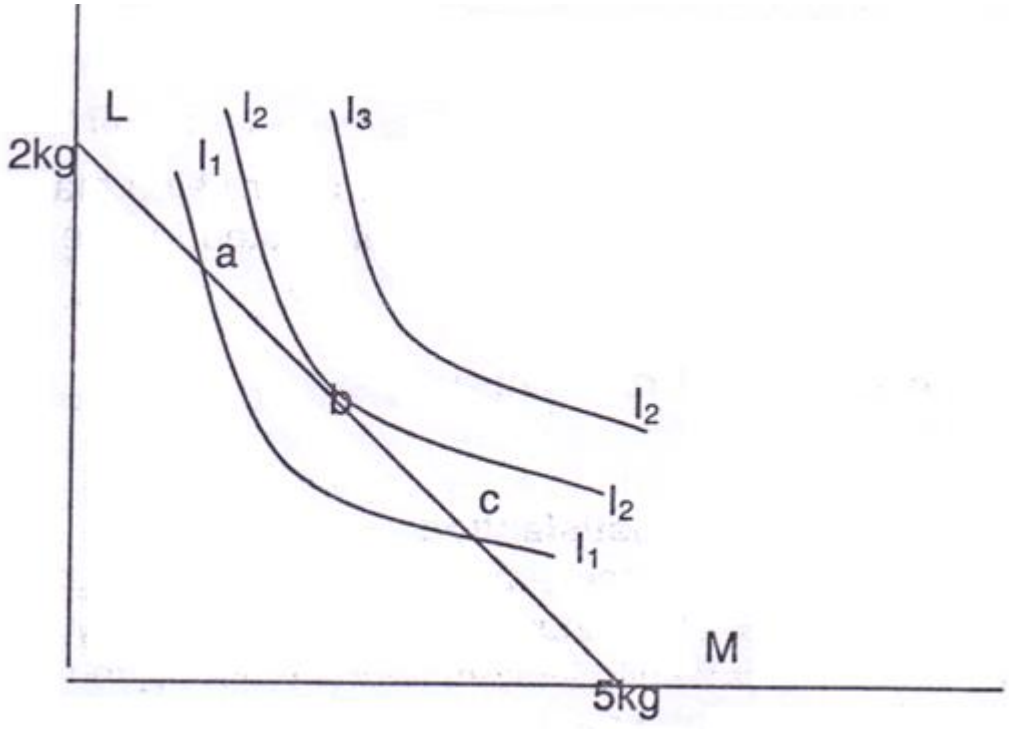

Fig 4.4 Budget line

3.4 Change in income and consumer equilibrium

If you know an individual's preference system, his income, and product prices, you can determine how much of each good he will buy. Nut what happens if one of these condition changes? Suppose his income rise to N350.00. this means more of both goods can be purchased, if prices stay the same. He can now buy either 3.5kg of meat or 8.75kg of gari. His new budget line is L_1M_1, parallel to LM at a higher level. Since prices of the products have not changed, L_1M_1 will have the same slope as LM. The highest indifference curve he can reach is now l_3 and he will settle at c, where L_1M_1 is tangent L_3. Therefore buys both more meat and more gari than before. An increase in income is represented by a parallel outward shift of the budget line while a decrease in income is represented by an inward parallel shift of the budget line. For each level of income there corresponds an equilibrium position at which an indifference curve is tangent to the relevant budget line. Points a, b and c in fig. 4.5 show such equilibrium positions. The locus of such equilibrium positions is known as the income consumption line.

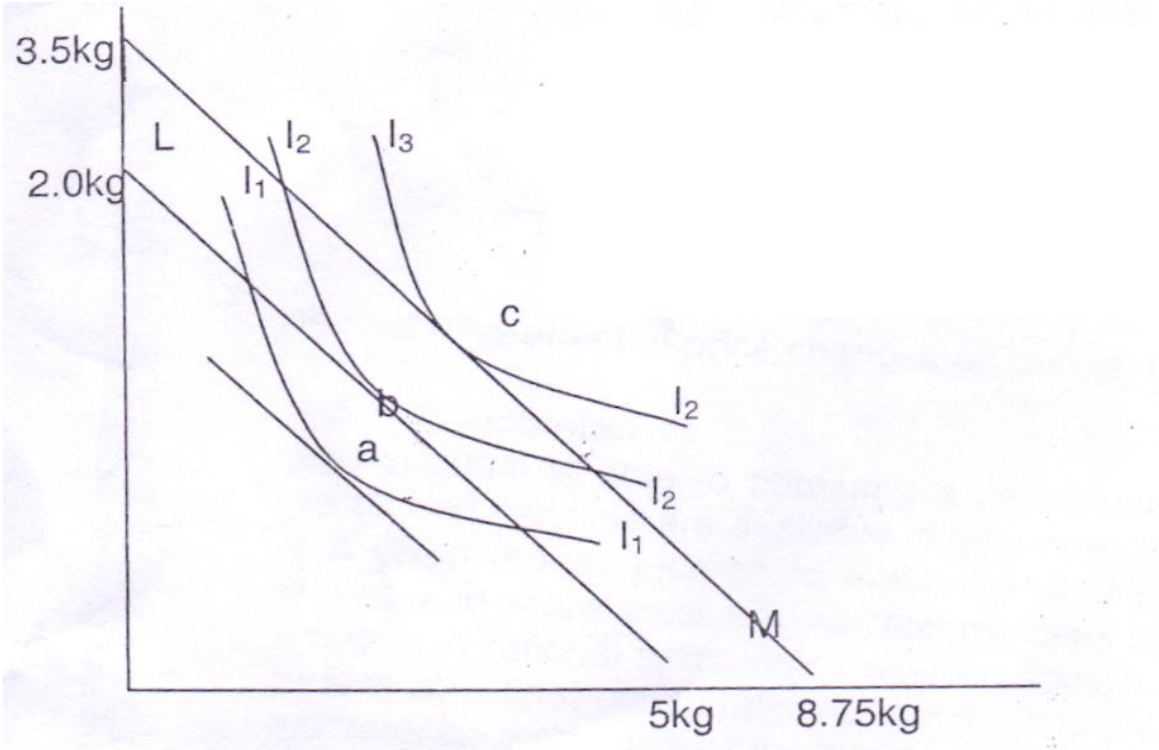

Fig 4.5 Effect of income changes on budget line

3.5 Changes in price and consumer equilibrium

A change in relative price of two commodities changes the slope of the budget line. With a given income level, a change in the price of one commodity only affects the quantity of that commodity that can be purchased but not the quantity of the second commodity. Let's assume an individual income is constant at N200.00 and the price of meat changes from N100 to N120 per kg. The most meat he can buy is now 1.67kg while the quantity of gari that can be purchased remained at 5kg. The budget line becomes L_2M as shown if fig 4.6. An increase in the price of one commodity causes the budget line intercept to move closer to the origin, reflecting the fact that less of that commodity can be purchased with the constant income. A decrease in the price of the commodity would mean more of it could be purchase and the intercept would move away from the **O** reflecting increase in the potential consumption of the commodity. An increase in the price of a commodity causes the individual to substitute that commodity for the other his consumption pattern. This is termed the substitution effect. However, with increase in the price of one commodity, the real income decreases meaning that with the sale amount of money, less of both commodities can be purchased. This is termed as income effect.

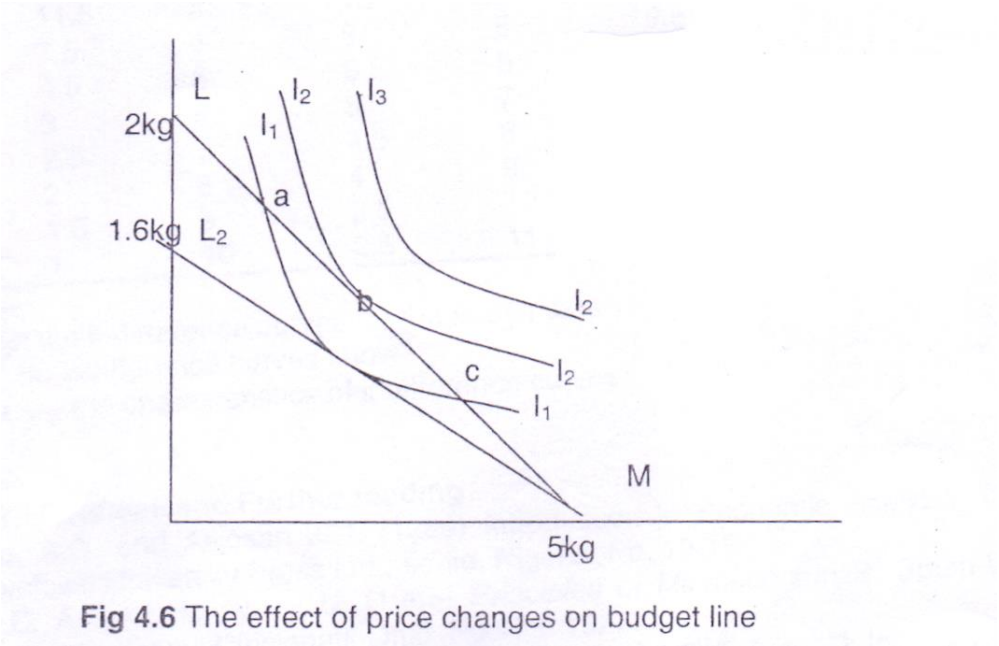

Fig 4.6 The effect of price changes on budget line

5.0 Conclusion

An individual is able to consume a combination of goods and services because the goods and services are available in quantities that enable it to make a choice and there is a given money income to make the choice effective. The fact that our income is limited and there exist several commodities enables us to prefer one commodity to another. A rational consumer therefore substitutes one commodity for another until he arrives at a final combination of goods that gives maximum satisfaction. The focus of indifference theory is that consumers are able to rank the bundles of goods in the order in which they prefer them. With a given income and prices of goods, the consumer can arrive at the combinations of goods that would be equally acceptable to him.

5.0 Summary

In this unit we have tried to discuss the use of indifference theory in consumer behavior. We have looked at the concept of indifference as it relates to combinations of goods which gives the consumer equal satisfaction. We have defined diminishing marginal rate of substitution as the rate at which the consumer is willing to give up one good to obtain more of another. We have also looked at individual's behavior to consumption of goods as income changes and as the price of one of the goods changes. Finally we have identified two forces at work that cause consumer to react to changes in relative price of one of the commodities; income and substitution effects.

6.0 Tutor – Marked Assignment

Question: hypothetical data of points on three indifference curves for a consumer is presented in the table below:

XI	YI	XII	YII	XIII	YIII
2	11.5	3	12	4	13
3	7.5	4	8	5	9.5
4	4.5	5	6.5	6	8

5	3	6	5	7	7
6	2.5	7	4.5	8	5.5
7	2	8	4	9	5
8	1.5	9	3.5	10	4
8	1	10	2.5	11	3.5

- Sketch the indifference curves for the above data
- What do indifference curves show?
- What are the characteristics of indifference curve?

7.0 References and further reading

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UNIT FIVE: CONSUMER SURPLUS

Table of contents

1.0 . Introduction

So far we have discussed consumers theory using the marginal and indifference cur approach. We deduced that consumers purchase goods and services in order to derb satisfaction or utility. The utility derived could be measured as in the marginal anaiys or ranked in relation to other goods and services as in the case of indifference cur, approach. The behavior of consumers is consistence with maximization of utility base on the avaiiable income and prices of the goods and services he consumes. Usualf consumers are able to satisfy their needs by foregoing less than what they are willing t pay rather than going without the goods and services. This brings us to the concept (consumer surplus. Two approaches to measuring consumer surplus are considered il this unit: cardinal utility and indifference curve approaches. Though there are sorru criticisms and difficulties in measuring consumer surplus, this concept is of grea practical importance in economic theory.

2.0 Objectives

On successful completion of this unit, you should be able to do the following:

a. Define consumer surplus
b. Explain the concept of consumer surplus in terms of cardinal utility and indifference curve approaches
c. Explain the effect of subsidy on consumer surplus

3.1 Concept of consumer's surplus

The behavior of consumers is consistence with maximization of utility based on the available income and prices of the goods and services he consumes. In order to satisfy his utility, a consumer will be willing to pay more for a commodity than he actually pays rather than do without that commodity. That is, the consumer is able to purchase a good or service by sacrificing something that is worth less to him than the satisfaction derived from its purchase. The excess of the price which a consumer would be willing to pay rather go without the commodity over that which he actually pays is the result of surplus satisfaction. The consumer surplus is a concept introduced by Marshall to mean the extra utility or satisfaction consumer's gain by paying less for an item than they would be willing and able to pay for it rather than forego it. Consumer surplus is therefore the difference between the amount consumers actually spends on a good (market price times quantity demanded) and the amount they would be willing and able to spend for the same commodity. Instances of commodity from which we derive consumer's surplus in our daily life are salt, matches, fuel newspaper etc. These goods are basic necessities and therefore consumers will be willing to pay higher for them than they actually pay thus creating excess satisfaction or consumer surplus.

Exercise 5.1 Define consumer surplus

3.2 Consumer's surplus in terms of cardinal utility analysis

The basic assumption underlying the theory of cardinal utility is that utility is quantitatively measurable. If we assumed that utility could be measured in _monetary

unit, then consumer surplus can be measured as the difference between the amount of money that a consumer actually pays to buy a certain commodity and the amount that he would be willing to pay for this quantity rather than do without it. Let's assume you are willing to buy the two bottles of coke at N50 per bottle, assuming the market price is N30 per bottle, the surplus derived from your consumption of coke can be estimated to be (2 x 50) minus (2 x 30), which is equal to 40. Based on cardinal utility theory, the consumer surplus can be derived from the demand curve for the commodity and its market price. Assuming the straight line, DD in fig 5.1 represents an individual's demand for coke. At the market price OP the consumer buys 00 bottles of coke and pays OP times OQ for the total number purchased. Assuming the- consumer is willing and able to pay OD for OQ rather than doing without it. It means that the market price is lower than the price the consumer will be' willing to pay for the initial units of coke implying that his actual expenditure is less than he would be willing to spend to acquire the quantity. Thus, area DRP on the demand curve represents consumer surplus. It is the difference between OQRD (the amount the consumer is willing to pay and OORP (the amount he actually pays). If the market price falls to OP_1, the number of bottles of coke that will be demanded will increase to OQ_1 in response to the law of demand and consumer's surplus will therefore increase to DR_1P_1 (OQ_1R_1D - $OQ_1R_1P_1$), thus DR_1P_1 will be available to the consumer to allocate on other goods and services. A rise in price to OP_2 will decrease the quantity that will be bought to OQ_2, which will conversely diminish the consumer surplus to DR_2P_2, thereby reducing the amount that consumers can spend on other goods. We can therefore infer that the higher the market price relative to the price that consumers are willing and able to pay for a commodity rather doing without it, the lower the consumer surplus and vice versa.

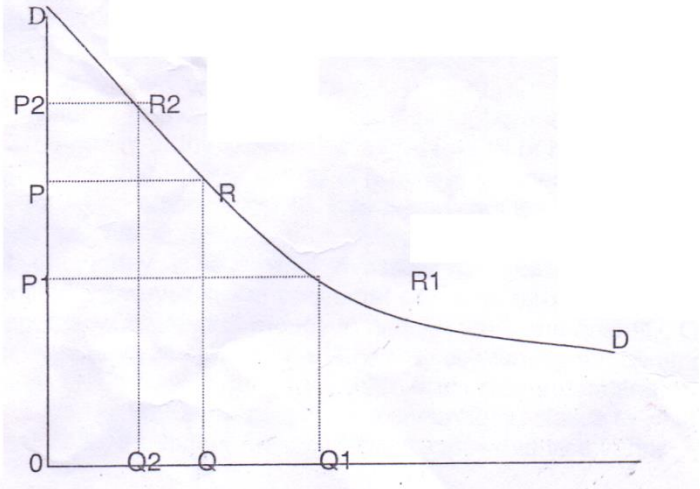

Fig 5.1 Derivation of consumer surplus (Utility approach)

The magnitude of consumers surplus can also be related to the total utility derived from consuming the commodity. When the total utility is high consumers would be willing to offer higher prices than do without the commodity while the reverse is the case for a commodity that generates lower utility to the consumer. The implication of this is that consumer surplus tends to be higher for commodities with high total utility than the one with lower total utility.

Exercise 5.2 Explain why an increase in the market price will reduce consumer surplus

3.3 Consumer's surplus in terms of indifference curve analysis

The basic doctrine underlying the indifference curve approach is that consumer's satisfaction is based on his scale of preference for a bundle of goods. An indifference curve is the combinations of two goods representing the same level of satisfaction. Measurement of consumer's surplus using the indifference curve approach will be based on diminishing marginal utility of money. The law of diminishing marginal utility states that, for a given time period, the greater the level of consumption of a particular commodity, the lower the marginal utility. In the last unit, we established the fact that a consumer is at equilibrium when the budget line is tangent to the indifference curve. An

indifference curve is defined as the combination of two goods among which the consumer is indifferent while a budget line is the combination of two goods that can be consumed with a given level of income.

Using this approach, let us consider the measurement of consumer surplus with the illustrations in Fig. 5.2. Money income is measured along the vertical axis while quantity of goods Q is measured along the horizontal axis. Suppose the budget line of the consumer is MN. Given the price of good Q, the consumer is in equilibrium at point A where the indifference curve I_0 is tangent to the budget line MN. At this point, the. consumer buys OQ quantity of the commodity and pays BN of his income for it. In order to estimate how much the consumer will be willing to pay for OQ quantity of the commodity rather than doing without the commodity, we will consider another indifference curve below I_0, say l_1. This indifference curve is flatter than l_0 indicating that for any given quantity of the commodity, the marginal utility of money changes inversely with the amount of money income. On this indifference curve, the consumer buys the same OQ quantity of the commodity and pays DN of his income for it. The indifference curve h shows that the consumer is prepared to spend DN amount of money for OQ quantity of the commodity, but he actually spends BN on the same quantity. Hence the consumer surplus derived from consuming this commodity is DN - BN = CA. CA amount of money is therefore available for the consumer to spend on other commodities. However, if the consumer operates on still a lower indifference curve 1_2, he will spend FN amount of money to acquire the same quantity, OQ of the commodity, the excess amount of money he will gain by consuming the commodity will increase to, EA (ON - FN). We can therefore infer from this understanding that the higher the satisfaction an individual derives from a commodity relative to what he actually pays for its consumption, the higher the consumer surplus and vice versa.

Exercise 5.3: What is the relationship between total utility and consumer surplus?

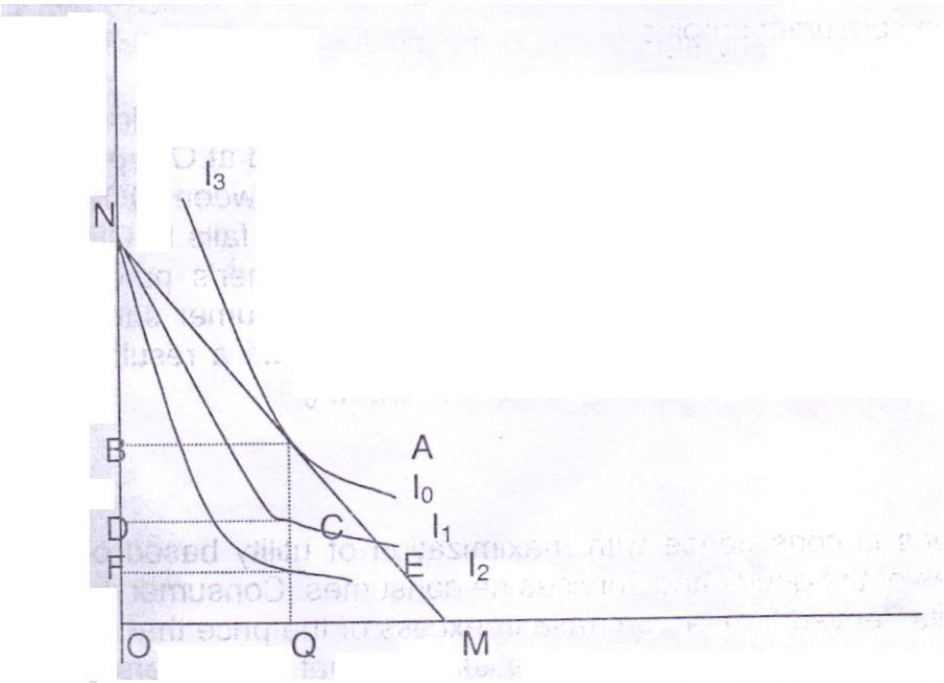

Fig 5.2 Consumers surplus using indifference curve

3.2 Effect of subsidy on consumer surplus

The concept of consumer surplus is of prime importance in understanding the benefits of subsidy and other related measured adopted to enhance consumers' welfare. Subsidy is the monetary help given by the government to reduce the high cost of production so that it may be possible for the producer to sell his commodity at a lower price and still make profit. With subsidy, the firm produces at a lower unit cost and therefore sells at a lower price than the actual price of the commodity thus raising demand and consumers surplus. Let us illustrate the effect of a subsidy on consumer surplus using Fig. 5.3.

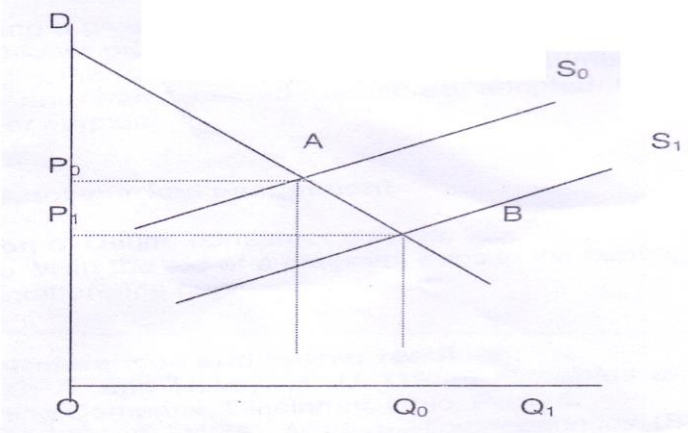

Fig 5.3 Effect of subsidy on consumer surplus

With the subsidy, the firm's supply curve moves downwards to the right of the old supply curve On the old supply curve S_o, OQ_0 amount of the commodity is sold at OP_0 price on the demand curve D. The consumers surplus is the difference between $OQ_oAD - OQ_0AP_o = DAP_o$. However, after the amount of AB subsidy, the price falls to OP_1 and the quantity supplied increased to OQ_1). With the subsidy, consumer's purchasing power increases as a result of price reduction, thus increasing consumer surplus to DBP_1 ($OQ_1BD - OQ_1BP_1$). Thus the net gain in consumer surplus as a result of the subsidy is P_oABP_1, which is the difference between DBP_1 and DAP_o

4.0 Conclusion

The behavior of consumer's is consistence with maximization of utility based on the available income and prices of the goods and services he consumes. Consumer surplus is a measure of the benefits derived from a purchase in excess of the price that is paid. This concept is based on the assumption that the satisfaction that consumers derive from any given commodity is more than the price they actually pays for the commodity instead of doing without it. Though there are some criticisms and difficulties in measuring consumer surplus, this concept is of great practical importance in economic theory.

5.0 Summary

This unit has taken through the concept of consumer surplus using two important measures- cardinal utility and indifference curve approaches. We defined consumer surplus as the excess of the price, which a consumer would be willing to pay rather go without the commodity over that, which he actually pays. We observed that the magnitude of consumer surplus can be related to the total utility derived from consuming a given commodity. When the total utility is high consumers would be willing to offer higher prices than do without the commodity while the reverse is the case for a commodity that gives lower utility to the consumer. We finally considered the effect of subsidy and other related measured adopted to enhance consumers' welfare on consumer surplus.

6.0 Tutor Marked Assignment

Question: a) Define consumer surplus. b) With the aid of a diagram, explain the concept of consumer surplus in terms of indifference curve.

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UNIT SIX: PRINCIPLES OF DEMAND

Table of contents

1.0 Introduction

Demand is basic to the study of economics. Economics view demands as desires to consume at certain prices, not needs or wants that can be quantified. For these needs or wants to become demands, they must be viewed as what people will actually do when confronted with different set of prices. This is planned expenditure backed up by purchasing power. Demand in economic refer to the desire to obtain goods or services and the willingness and ability to pay for them. Thus, by demand we refer to effective demand, that is, demand backed up by ability to pay. We can therefore define demand as the list of the quantities a person is willing to buy at a given price in a given period of time.

2.0 Objectives

After going through the content of this unit, you should be able to

1. Define demand and state the law of demand
2. Compare individual and market demand

3. List the various determinants of demand
4. Illustrate with the aid of a diagram the effect of changes in price and income on the demand curve.

3.1 Individual demand

The principal assumption upon which the theory of consumer behavior and demand is built is: a consumer attempts to allocate his limited money income among available good and services so as to maximize his satisfaction. Demand results from people's desire to use goods and services. But to be able to translate this desire into demand, the individual must be able to back it up with money. For an individual to be able to satisfy his desire, he must get the product, and to get the product he must pay its price. How much of a commodity an individual will buy depends on his personal preference, taste, income, price of the good and price of related good. Initially we want to focus on what happens when the price of a good or service changes relative to the price of other goods or services. Holding constant all the other factors that affect demand, the law of demand state that the quantity demanded of a good or service is negatively related to its price. An individual tends to buy more units of good when the price is lower, and he decreases his purchases when price increases. This particular behavior of the individual is understandable and rational if other determinants of demand are held constant. A person can buy more goods at a lower price because his purchasing power has increased. For example, when one kg of meat wan N200.00, a consumer with N600.00 could buy 3kg. however, if the price increased to N350.00 the buyer cannot even get two kg for his N600.00 (income effect). Also if the price of a commodity increases relative to the price of a substitute, the consumer may be forced to increases his demand for the substitute and thereby decreasing the quantity of the costly product (substitution effect).

The list of quantities demanded at various alternative prices is called demand schedule. A hypothetical demand schedule is presented in Table 6.1. The table shows the quantities of

coke demanded per day at various prices all other determinants of demand being kept constant.

Exercise 6.1: State the law of demand. Why does the demand curve of a normal good slopes downward to the right?

Table 6.1: Demand schedule for oranges per week

Price	Quantity
50	1
40	7
30	13
20	19
10	25
5	28

The data in table 6.1 are inversely related. That is, the quantity demanded of oranges rises as the price of orange falls. This relationship is in keeping with the law of demand, which postulates an inverse relationship between price and quantity demanded.

If the data in table 6.1 are plotted on a graph they will trace out the demand curve for oranges. The demand curve for a commodity is the graphical representation of the demand schedule showing the quantity demanded at various prices. The demand curve in Fig 6.1 is a straight line, sloping downward to the right. Such a line is a convenient way to describe the inverse relationship between price and quantity demanded that corresponds to the law of demand. The shape of a demand curve is not necessarily a straight line. A demand curve could easily bend one way or the other depending on the data found for the commodity or on what economists are willing to assume about the data.

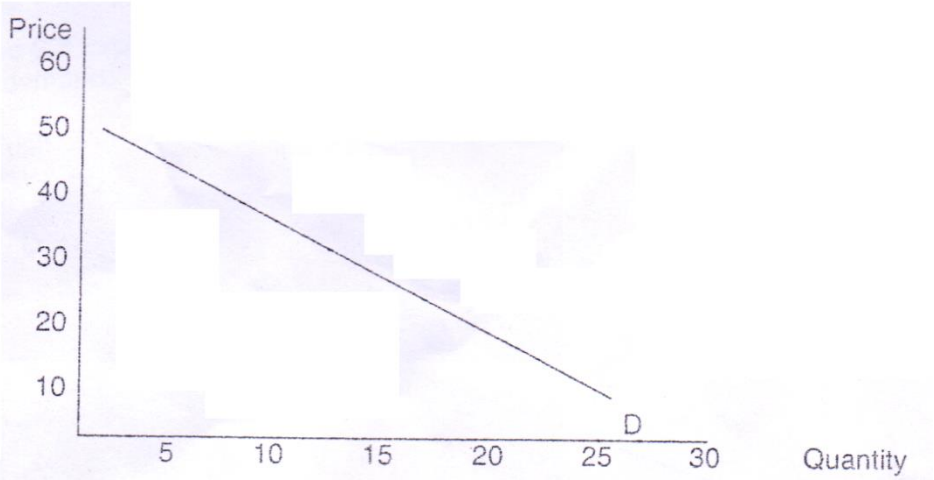

Fig. 6.1 Individual's demand curve for oranges per week

3.2 Market demand

Up to now our discussion on demand has been focused on the individual consumer's demand schedule and demand curve. However, it is useful to relate the demand of one individual for a particular commodity to the demand of all consumers taken together for that commodity (market demand). The market demand for a commodity could be found by adding all the individual demand for that commodity. It involves the summation of the individual demand of each consumer. That is, the market quantity demanded at each price is the sum of individual quantity demanded at that price. Table 6.2 provides an illustration when three consumers are in the market.

Table 6.2: Individual and market demand in three consumer market.

Price	Quantity A	Quantity B	Quantity C	Market demand
50	6	1	0	7
40	10	7	11	28
30	16	13	10	39
20	21	19	15	45

10	25	25	21	71
5	30	28	25	83

The graphical representation of this demand schedule is a downward sloping demand curve shown in Fig. 6.2. This implies that as price changes in the market, the quantity demanded changes in the opposite direction.

Any change in the number of consumers will shift the market demand curve. That is, if the number of consumers increases, the market demand curve will shift outwards. if the number of consumers decreases, the reverse will occur. Anything that will shift the demand curve of an individual in the market (such as change in income or prices of related goods) will also shift the market demand curve.

Exercise 6.3: Explain the nature of the relationship between individual demand and market demand.

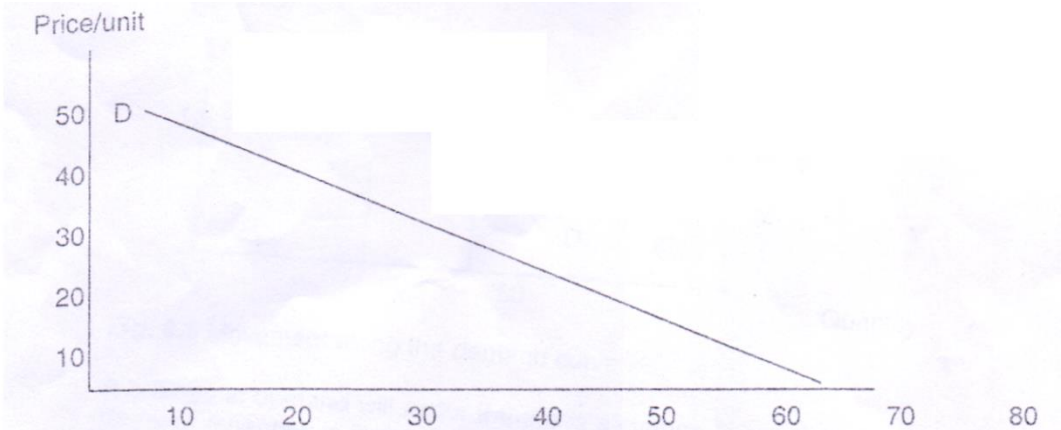

Fig. 6.2 Market demand curve of oranges per week

3.3 Change in quantity demanded and change in demand

We mentioned at the beginning of this unit that demand is determined by a number of factors like, price of the commodity in question, the prices of other commodities, consumer's income and taste etc. In deriving the market demand curve, we assumed all the determinants to be fixed except the price of the commodity in question. Suppose we relax this assumption and consider what happens if one or more of the other determinants

are allowed to vary. The amount of a product consumers are willing and able to purchase at each price in the demand schedule has already been identified as the quantity demanded. Thus a change in the price of a product, all other things equal, results in change in the quantity demanded of that product. A movement along the demand curve represents such a change. Fig 6.3 shows change in quantity demanded as a result of change in price from N12 to N15/unit. The increase in price decreased quantity demanded from 40 to 50 units. A change in the nominal price of a commodity actually exerts two influences on quantity demanded; income effect and substitution effect. When the price of a commodity increases, the real income or purchasing power of the consumers declines and therefore he or she will be able to buy less of that commodity with the same income. This is the income effect. However, if the commodity has a substitute, and the price of the substitute is lower, the consumer may be forced to shift to some or all the substitute in order to maximize the available income. This is the substitution effect.

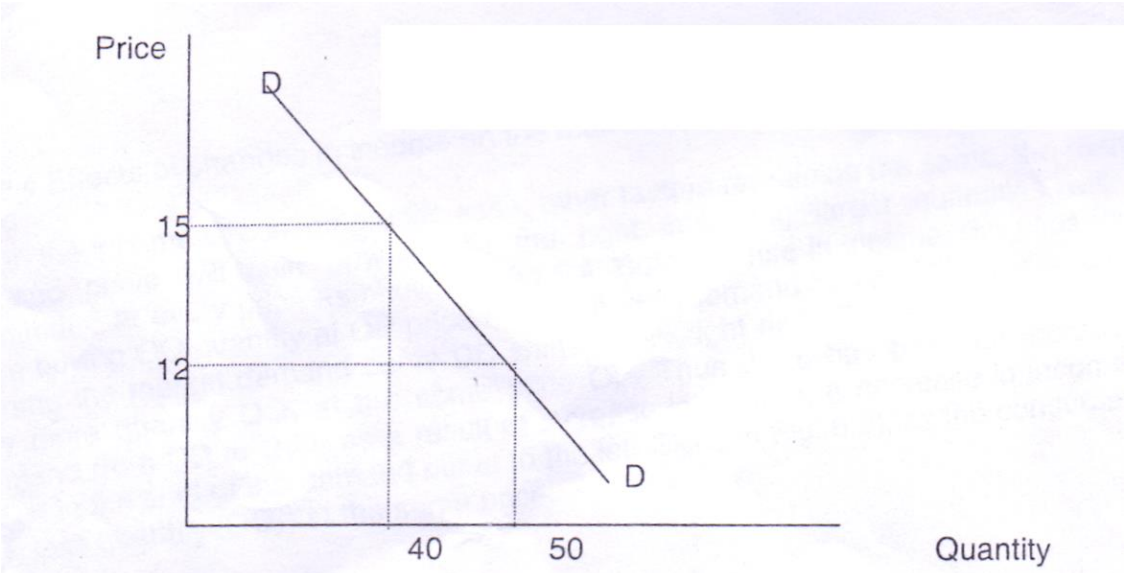

Fig. 6.3 Movement along the demand curve

A change in demand will occur if there is a change in one of the other determinants of demand (changes in income and expenditure, taste, price of other commodities, future expectation in price and income etc). a change in demand is indicated by a shift in the demand curve resulting from a change in one of the other determinants of demand. A shift of the demand curve to the right means an increase in demand while a shift to the left indicates a decrease in demand.

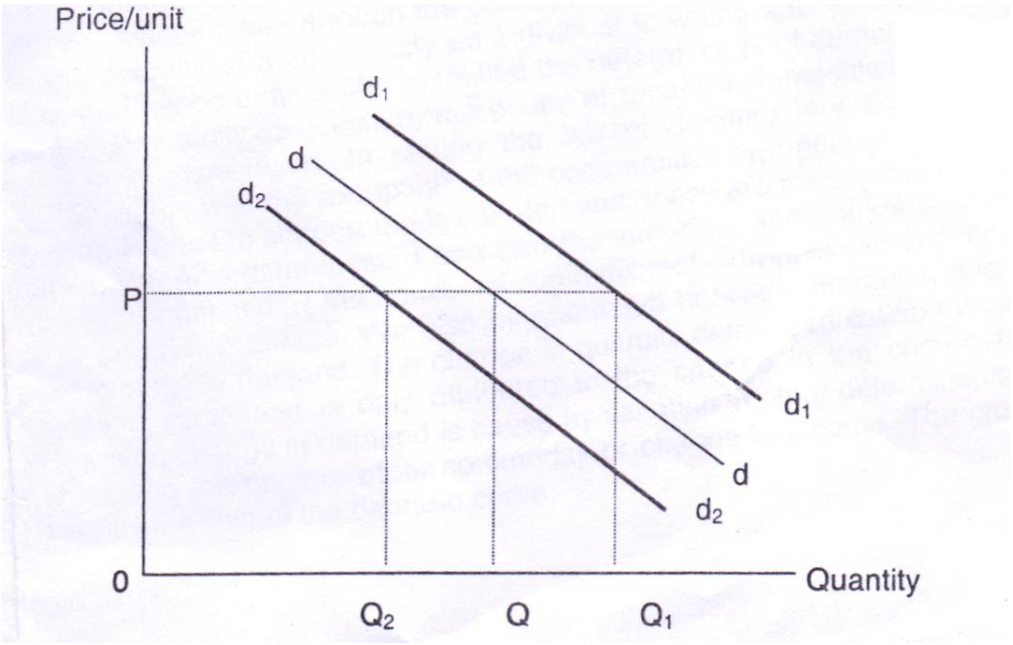

Fig 6.4: Effect of changes in income on the market demand curve.

When the income of consumers increase, other factors remaining the same, the market demand curve will shift upwards to the right indicating larger quantities will be demanded at every price as shown in Fig 6.4. before a rise in income, the consumers were buying OQ quantity at OP price on DD market demand curve. With an increase in income the market demand curve DD shifts to the right as D_1D_1. The consumers now buy more quantity OQ_1 at the same price OP. Thus there has been an increase in demand from DD to D_1D_1 as a result of increase in income. A decrease in income will result in

the shift of the demand curve to the left (D_2D_2 in Fig. 6.4), as the consumer will buy less quantity (OQ_2) at the same price.

4.0 Conclusion

Economists view demand as the desire to obtain something and the willingness and ability to pay for the thing. The framework of the analysis of demand is hinged upon some key variables that affect the ability to acquire certain quantities of goods or services at a given period of time. We identified some of the variables or determinants of demand to include: price of the commodity in question, consumers income, prices of related commodities, consumers taste and consumers expectation. In stating the law of demand, all these factors with exception of the price of the commodity in question, are assumed to be constant. Two factors interact to support the law of demand: these are the income and the substitution effect.

5.0 Summary

You have been taken through the concept of demand in this unit. We defined demand, as the quantity of a commodity an individual is willing and able to buy at a particular price and period of time. We identified the determinants of demand to include the price of the commodity in question, the prices of related commodities, consumer's income, taste and expectation. In stating the law of demand, we assumed that all these determinants with the exception of the commodities own priced remained constant. Two factors interact to support the law of demand: these are the income and the substitution effect. We also differentiated between the individual and market demand. The market demand is defined as the horizontal summation of individual demand for a commodity at a given price and time. We also differentiated between change in quantity demanded and change in demand. The change in quantity demanded cause movement along the demand curve and is only attributed to the change in the commodities own price. However, change in demand is cause by variation in other determinants of demand like change in the price of

other commodity or change in income. The change in demand results in a shift of the demand curve.

6.0 Tutor Marked Assignment

Question: Given four individual's demand schedule for a particular brand of soap in table 1,a) draw the four individual demand curves on the same set of axes. b) what are the relationships between these four demand curves? c) Assuming there are only four individuals in the market for this commodity, derive the market demand schedule for this commodity and draw the market demand curve.

Table 1: Four individual's demand schedules for a brand of soap

Price/Unit	Qty Demanded I	Qty demanded II	Qty demanded III	Qty demanded IIII
14	2	6	9	25
12	5	8	12	25
10	8	11	14	25
8	10	13	16	25
6	12	16	19	25
4	15	18	21	25
2	16	20	24	25

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UNIT SEVEN: PRINCIPLES OF SUPPLY

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1.0 Introduction

Supply is basic to the study of economics. Economics view supply as desire and willingness to produce at certain prices in a given period of time. The primary of any firms supplying a good or service is to make profit. You will therefore expect a supplier or any good or service to aim at maximizing is profit by responding to price changes and other determinants that affects his production decision. This unit will take you through the basic principles of supply with emphasis on the behavior of supplies to some major factors affecting what is taken to the market.

2.0 Objectives

After going through the content of this unit, you should be able to do the following:

- Define supply and state the law of supply
- Compare individual and market supply
- List the various determinants of supply
- Illustrate with the aid of a diagram the effect of changes in price and income on the supply curve

3.1 Supply concepts

In many ways supply and demand are alike. However, they do differ in several important ways. Supply is like demand in that supply refers to a specific period of time and is also expressed as a schedule. That is, the quantities of a commodity offered for sale at various prices at a particular time and place is called the supply schedule. The only difference between supply and demand is that the demand schedule has a price and quantity demanded while a supply schedule has a price and a quantity supplied. We will therefore define supply as the schedule of the quantities supplied at various prices during a specific period of time.

Let us consider what happens to quantity supplied when the price of a given commodity changes while holding all other factors constant. A schedule that tells us the number of crates of coke sellers would offer for sale in a week, at various prices charge per bottle is

presented in table 7.1. if you study the supply schedule carefully, you will observe that the supplier is willing to offer more to the market at higher prices than when prices are low. For instance when the price of a crate of coke is N10, the supplier only offered 5 crates in the market per week, however, when the price rose to N20, the quantity offered in the market rose to 15 crates. This implies that the seller supplies larger quantities of coke at higher prices and vice versa. This brings us to the law of supply which states that, the quantity supplied of a good service is positively related to price, that is the higher the price higher the quantity supplied. Thus the relation between price and quantity supplied is direct.

Exercise 7.1: what does a supply curve represent?

Table 7.1 A firms supply schedule of coke per week

Price per bottle	Quantity supplied
5	0
10	5
15	10
20	15
25	20
30	24

A graphical representation of the supply schedule is called the supply curve. A supply curve is a graphical relationship between the quantities supply at various prices. The supply curve of coke is presented in figure 7.1 below. If you read this graph carefully, you will see that when the price is low fewer numbers of crates were offered for sale and at higher price the number increased. The fact that the supply curve slopes upwards form left to right expresses the law of supply. The slope depicts an inverse relationship between price quantity supplied.

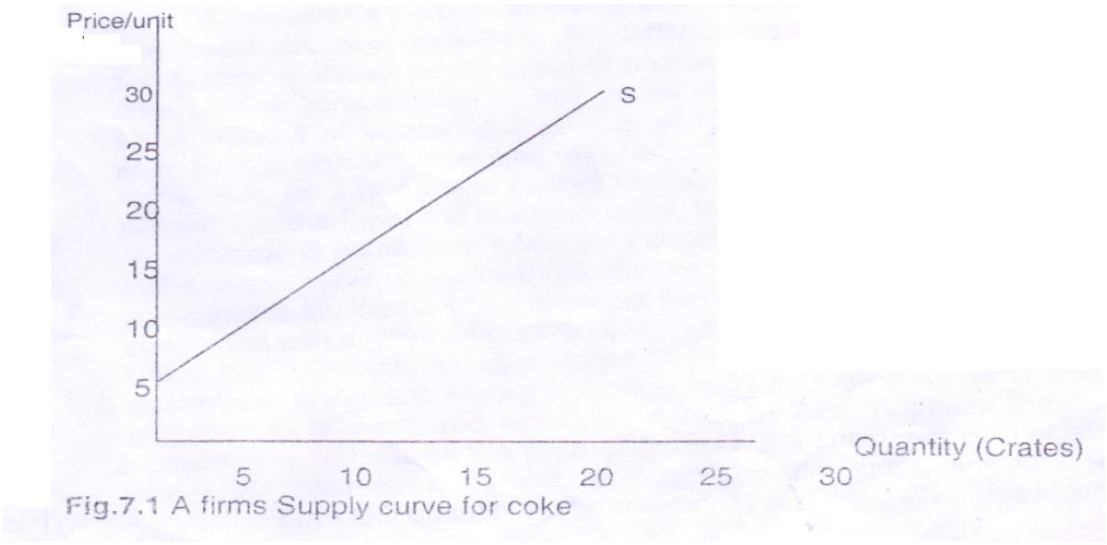

Fig.7.1 A firms Supply curve for coke

Exercise 7.2 Distinguish between individual and market supply curve.

3.2 Market supply

The supply schedule and the supply curve generated above is for an individual supplier, we want to consider the aggregate or market supply for a given commodity. The market supply is the horizontal summation of all individual firms in the market. The market supply curve of a product shows what quantities firms will supply at various prices at a period of time. Consider a case of three firms selling the same product in a given market. Table 7.2 shows how to derive the aggregate or market supply of coke per week. The market supply is obtained by summing the individual firms supply at various prices while this schedule is represented in Fig. 7.2 as the aggregate supply curve.

Table 7.2 Aggregate supply schedule of coke per week

Price/crate	Firm1	Firm2	Firm3	Aggregate supply
5	5	0	3	8
10	12	5	10	22
15	12	10	15	37
20	18	15	18	51
25	22	20	20	62
30	26	24	24	74

As price changes in the market, the quantity of coke supplied by individual firms changes thereby changing the aggregate supply. If you study the graph in figure 7.2, you will

observe that when price was N15 per bottle, 37 crates of coke were supplied to the market, however this number rose to 62 crates when the price increased to N25 per bottle. The aggregate supply curve like the individual supply curve is upward sloping as shown in fig. 7.2. The positive slope of this curve expresses the law of supply. That is, the quantity supplied of a good or service is positively related to price, that is, the higher the price, the higher the quantity supplied.

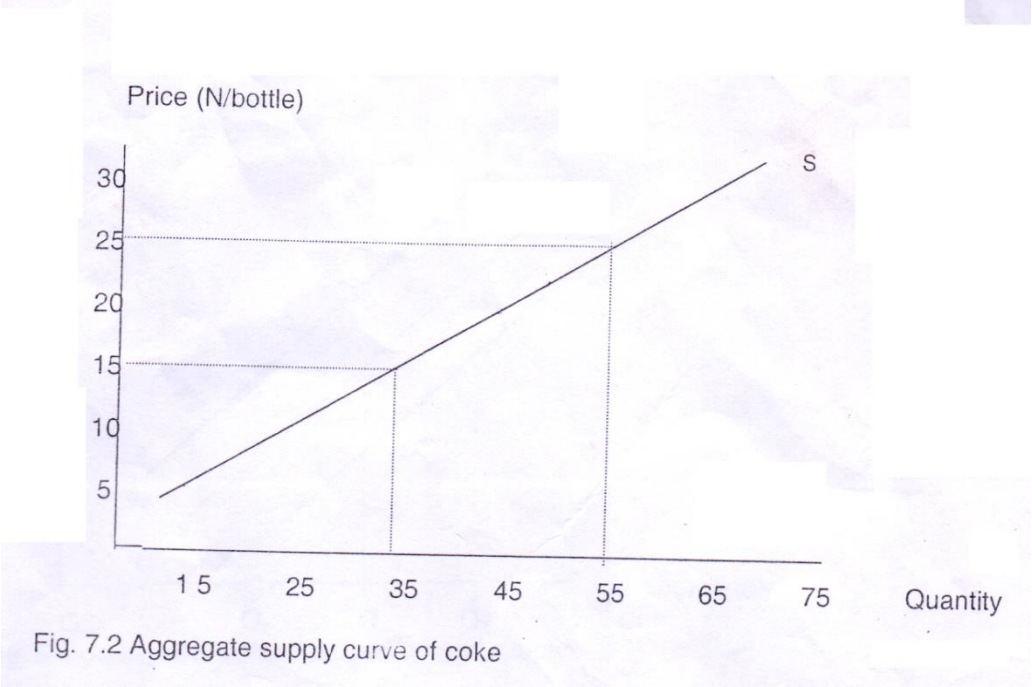

Fig. 7.2 Aggregate supply curve of coke

Exercise 7.3: List the determinants of supply?

3.3 Change in supply

When we talk about supply, as in demand, there are certain factors that must be kept constants as the price of the commodity changes theses are called the determinants of supply. These determinants, among others include: the level of technology, price of the factors of production, the number of suppliers, price expectations and price of related goods. A change in any of these factors will affect supply. It is very important to note the difference between change in supply and change in quantity supplied. The effect of price on quantity supplied is termed as change in quantity supplied. A change in quantity supplied occurs when a commodity's own price changes, other determinants being

constant. The change in quantity supplied results in movement along the supply curve. For instance, a change in the price of a bottle of coke from N15 to N25 is represented by movement from 37 crates to 62 crates as shown in the supply curve in Figure 7.2.

When analyzing the movement along the supply curve, the law of supplied assumes that all other determinants are held constant while the price of the commodity in question is allowed to vary. Suppose we relax this assumption and consider what happens if one of the other determinants is allowed to vary. A change in any of the other determinants price remaining constant will lead to a change or shift in the supply curve from its original position. A shift in supply curve to the right implies increase in supply, that is, suppliers will be willing to sell more at the various prices However. a shift to the left suggests a decrease in supply, implying that suppliers will be willing to sell less at the various prices. Generally, any change that increases production costs will lead to a decrease in supply, whereas the reverse will occur if some changes reduce production costs.

Exercise 7.4 How would you define an increase in supply?

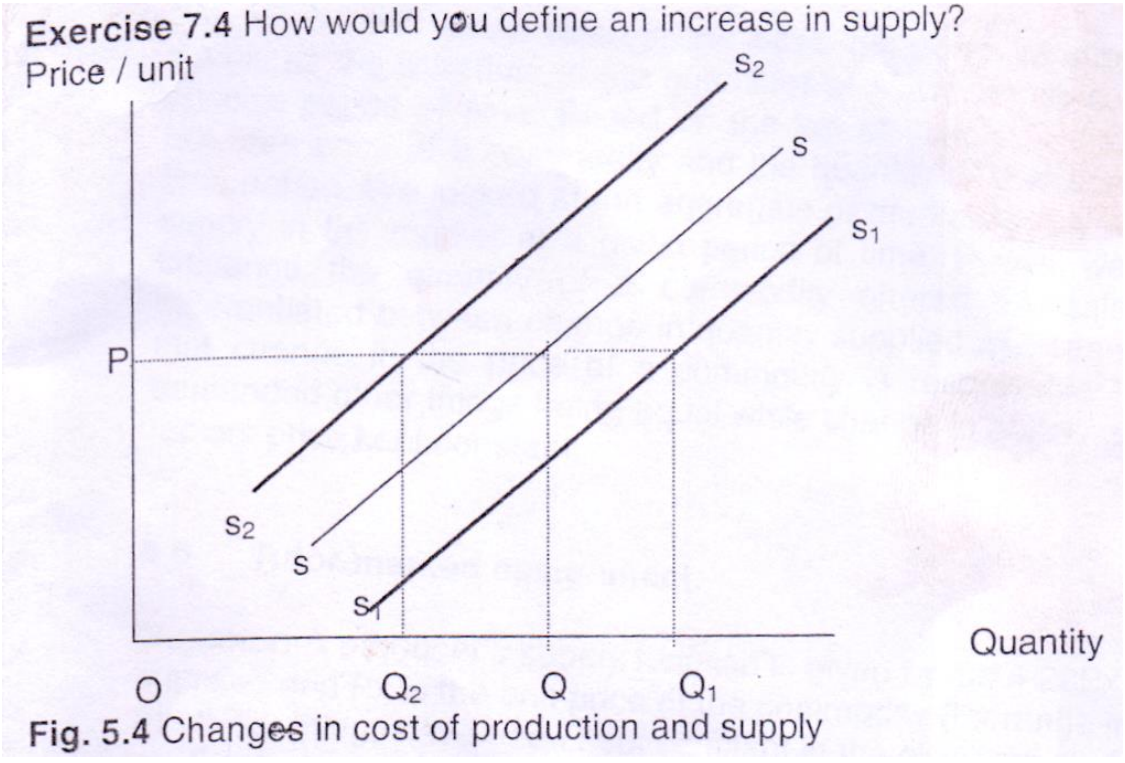

Fig. 5.4 Changes in cost of production and supply

Let us consider the effect of change in wage rate on the production of coke. With a decrease in wage rate, other factors remaining the same, the producers of coke will now

require less cost for every possible crate of coke produced since they will now pay less for labor. Let us illustrate the shift in the supply of coke as a result of changes in wage rate by the graphs in Fig. 7.3. Before the reduction in wage rate, the firms were supplying **OO1** quantity at OP price on SS aggregate supply curve. With a decrease in wage rate resulting. in a decrease in cost of production, the aggregate supply curve shifts to the right as S_1S_1. The firms now supply more quantity at the same price OP. Thus there has been a decrease in supply represented by an outward shift of the supply curve from SS to S_1S_1 as a result of decrease in the cost of production. An increase in wage rate or cost of product will cause the firms to decrease their supply because the cost of producing every possible crate of coke has increased. The decrease in supply will be represented by an inward shift from SS to S_2S_2 and the level of supply resulting from this shift will be OQ_2. This same principle holds for changes in other determinants of supply. We can therefore infer that, when supply decreases the quantity offered for sale will decrease.

4.0 Conclusion

The concept of supply is very important in analyzing the structure of the market and changes in the market situation. Supply is an indication of the behavior of the firm in making decision on the volume of goods and services to offer for sale at various prices in a given period of time. A couple of factors influence a firm behavior as to what is released into the market at a given period of time. A basic understanding of these factors and how they influence supply is important in understanding the market situation of any good or service. In the next unit we shall be looking at how demand and supply Interact to bring about the equilibrium price and the quantity bought and sold at this price

5.0 Summary

You have been taken through the basic principles of supply in this unit. We defined supply as the schedule of the quantities of a commodity supplied at various prices in a specific period of time. Based on the law of supply, a direct relationship was defined between price of a commodity and the quantity of that commodity supplied in a given time period. We looked at the aggregate or market supply as consisting of all individual supply in the market at a given period of time. Finally, we looked at the factors that influence the quantity of a commodity offered for sale and based on this we differentiated between change in quantity supplied and change in supply. We observed that change in the price of a commodity is responsible for the change in quantity demanded other things being equal while change in supply depends on change in other factors price kept constant.

Tutor – marked assignment

Question: A producer's supply function is given by Qs = 20Px, where Qs is the Quantity supplied and Px is the Unit price of the commodity (Px range from N10 to N60).

a). What things have been kept constant in the given supply function?
b). Suppose that as a result of an improvement in technology, the producer's supply function becomes Qs = 20Px + 10, derive the producer's supply schedule and supply curve before and after the improvement in technology
c) How much of the commodity will this producer supply at the price of N40.00 before and after the improvement in technology?

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UNIT EIGHT: MARKET EQUILIBRIUM

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You should be very familiar with the basic concepts of demand and supply by now. We considered these economic tools separately in the last two units and neither told us what the price of a given commodity would be or how much of it would be bought or sold. We also learnt that price is the major determinant of demand and supply. Therefore, the quantity of a commodity that would be bought and sold in a given time period would depend on the prevailing price in the market. If we define market simply as an organization where all buyers and sellers are involve in the exchange of goods and services, then, the forces of demand and supply play an important role in determining the market price of a commodity and the quantity of the commodity that will be bought and sold. Market equilibrium can be defined as that price at which the quantity offered for sale equal to the quantity consumers are willing and able to buy. This unit will take you through the basic concepts of market equilibrium and how changes in the conditions of demand and supply affect market equilibrium.

2.0 Objectives

After successfully going through this unit, you should be able to

1. Define market equilibrium
2. Explain how equilibrium price and quantity are reached.
3. Explain the causes of surplus and shortage of commodity in the market.

4. Identify factors that affect market equilibrium

3.1 Equilibrium price and quantity

The forces of demand and supply interact in the market to determine the price of a commodity and the amount of that commodity that would be bought and sold. The law of demand specifies an inverse relationship between price and quantity demanded while the law of supply stipulates a direct relationship between price and quantity supplied. These economic tools are therefore like two forces pulling in opposite direction. As you Will expect, sellers would generally put a greater quantity in the market when prices are high while consumers would tend to reduce their purchases with increase in price, in the process of interaction, they will eventually agree at a price that will be reasonable for both sides. If the price is unfairly low, producers will not be willing to produce and consumers will have nothing to buy to meet their need. On the other hand, if the price is unreasonably too high, most consumers may not be able to afford the good and the producer may not be able to sell his or her goods. These two forces are balanced at the price at which the quantity demanded equals quantity supplied. The price at which the quantity demanded equal to the quantity supplied is called the equilibrium price while the quantity bought and sold at the equilibrium price is called the equilibrium quantity. To illustrate how equilibrium price and equilibrium quantity is reached, let us consider the market for maize we will use the schedule in Table 8.1 to show the quantity of maize demanded and sold at various prices

Exercise 8.1: Define equilibrium price and equilibrium quantity

Table 8.1 Demand and supply schedule for maize (bags)

Price per mudu	Quantity demanded	Quantity sold
85	800	2000
80	1000	1800
75	1200	1600
70	1400	1400
65	1600	1200
60	1800	1000
55	2000	800
50	2200	600

If you study the above schedule carefully, you will observe that when the price is N70, the quantity of maize bought and sold was 1400 *mudu*. Thus at a price of N70, the quantity demanded and quantity supplied are equal. We can therefore infer that the

market price of a commodity will tend to be that price at which quantity demanded and quantity supplied are equal. The price at which quantity demanded equal quantity supplied is called the equilibrium price while the quantity of maize bought and sold at the equilibrium price is the equilibrium quantity. At this point the market is in equilibrium because suppliers are willing to bring to the market the same quantity that consumers are willing to buy at the prevailing market price. The schedule in Table 8.1 can be put on a graph to further illustrate how equilibrium price and equilibrium quantity are reached.

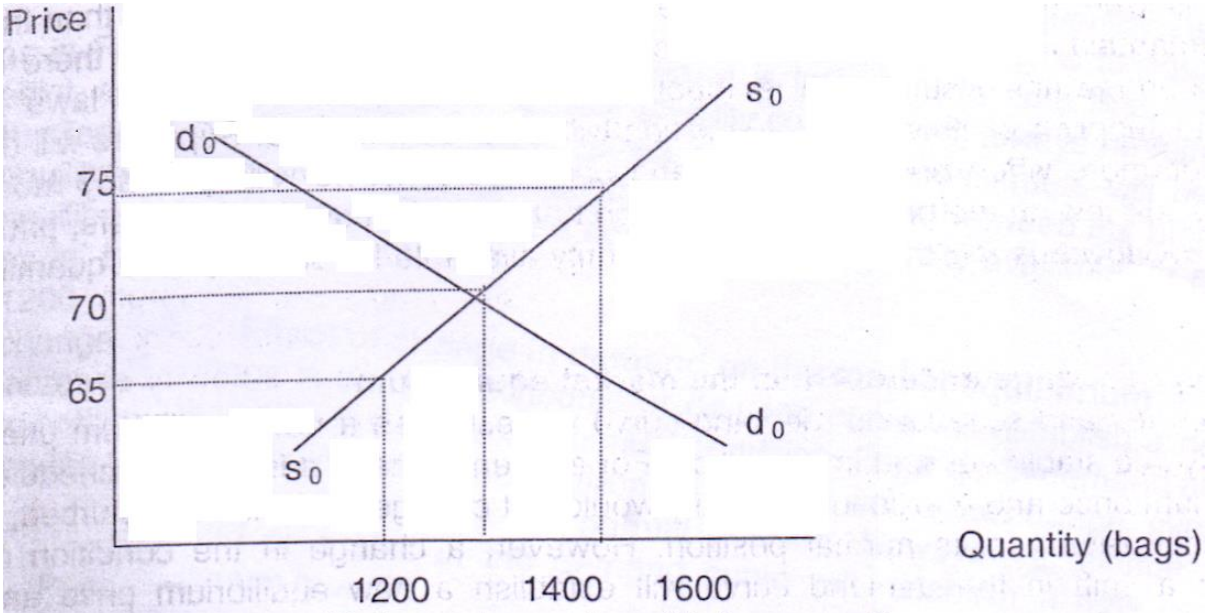


Figure.8.1 The equilibrium price and equilibrium quantity

As you can see in figure 8.1, the point of interaction of the demand and supply curves is N70, which is the equilibrium price and the quantity bought and sold at this price is 1400 *mudu,* which is the equilibrium quanity. Any other price above or below the equilibrium price will disturb the market equilibrium, whether the equilibrium will be re-establish again or not after the disturbance will determine whether the equilibrium is stable or not.

3.2 Stable equilibrium

The quantity demanded and quantity supplied is equal at the equilibrium price. Other prices above or below this price will disturb the market equilibrium that is the quantity bought and sold will change. When the condition of demand and supply are such that a change in the equilibrium price automatically react until the equilibrium is once again established, the equilibrium is said to be stable. I will want you to refer back to the

schedule in Table 8.1, at N70, price is at equilibrium and the quantity supplied equal to the quantity demanded. However, when the price increases to N75, suppliers will be willing to supply more (1600 *mudu)* while consumers will cut down their purchases *(1200 mudu)* in response to the price increase. This will result in a surplus (400 *mudu)* of the commodity in the market. Sellers would compete among themselves to dispose their product, thus, the price will move down until it eventually return to equilibrium On the other hand, if the equilibrium price moves down to say, N65, consumers will increase their purchase (1600 *mudu)* while sellers will only be willing to supply 1200 *mudu.* Thus there will be a shortage of the commodity in the market because the quantity demanded is greater than the quantity supplied. Consumers will therefore be forced to compete among themselves for the limited supply, as a result, price will move up until it eventually returns to the equilibrium price where quantity demanded equal to quantity supplied. Let's summarize this concept as follows, there is a surplus of a commodity in the market whenever the prevailing market price is higher than the equilibrium price of the commodity and the quantity supplied is greater than the quantity demanded. On the other hand, there is a shortage of a commodity in the market whenever the price of the commodity is lower than the equilibrium price and the quantity supplied is less than quantity demanded. When the price of the commodity is at equilibrium price, there neither a shortage not a surplus. It is important to note that, as long as the laws demand and supply hold, this stability condition will always be fulfilled. Suppliers will willing to sell more when prices are high and consumers will be willing to buy more when prices are low. In the process of interaction between the buyers and sellers, pretends to move towards the equilibrium until quantity available for sale equal to quantity demanded.

3.3 Effect of change in demand on the market equilibrium

A change in demand schedule or demand curve will establish a new equilibrium price and quantity in a stable equilibrium condition. For a given demand and supply scheduled the equilibrium price quantity would not change in the condition of demand or a shift in the demand curve will establish a new equilibrium price and equilibrium quantity.

Exercise 8.2 What is the effect of an increase in demand on the equilibrium price quantity?

Let us illustrate the effects that change in demand has upon the equilibrium price and quantity bought and sold by looking at the demand and supply scheduled in table 8.2

Table 8.2 Effect of change in demand on the market equilibrium

Price per *mudu*	D_0D_0	D_1D_1	D_2D_2	S_0S_0
85	800	1200	400	2000
80	1000	1400	600	1800
75	1200	1600	800	1600
70	1400	1800	1000	1400
65	1600	2000	1200	1200
60	1800	2200	1400	1000
55	2000	2400	1600	800
50	2200	2600	1800	600

With a given level of supply S_0S_0, assuming the demand for maize increased from D_0D_0 To D_1D_1, that is, consumers are now willing to buy more than before at the same price, this will result into a new equilibrium price and equilibrium quantity. If you consider the demand and the supply schedule D_0D_0 and S_0S_0 in the table above, demand and supply are equal at the equilibrium price of N70 per Mudu, and equilibrium quantity of 1600 Mudu. We can therefore infer that an increase in demand will lead to an increase in the equilibrium price and equilibrium quantity bought and sold. This can also be illustrated graphically as in figure 8.2. the point of intersection of D_1D_1 and S_0S_0 is indicated by "a", at this point, equilibrium price in N75, and equilibrium quantity is 1600 Mudu.

Similarly, if demand were less, say D_2D_2 as shown in column four of table 8.2, the equilibrium price would also decrease to N65 per mudu and a decrease in the equilibrium quantity to 1200 mudu. The point of intersection of D_2D_2 and S_0S_0 is indicated by "c" in figure 8.2 at this point, equilibrium price is N65,and equilibrium quantity is 1200 mudu. In conclusion, we can say that there is a direct relationship between change in demand and the equilibrium price and equilibrium quantity. That is, an increase in demand will

result in an increase in the equilibrium price and equilibrium quantity while a decrease in demand will result in a decrease in equilibrium price and equilibrium quantity.

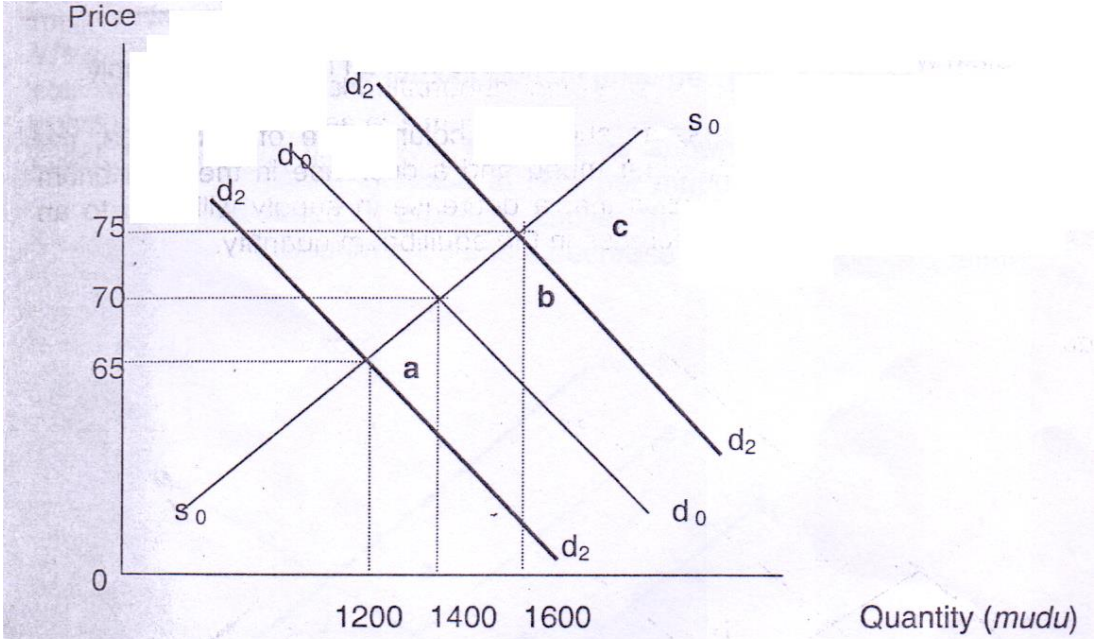


Figure 8.2 Effect of change in demand on the equilibrium position

3.4 Effect of change in supply on the market equilibrium

Consider an increase in supply from S_0S_0 to S_1S_1 as shown in the schedule presented in Table 8.3. At S_1S_1 producers are now willing to offer a larger quantity of goods at the same price. At the initial level of d_0d_0 and SoSo demand and supply are equal at the equilibrium price of N70 per *mudu*, and equilibrium quantity of 1400 mudu. However, with the increase in supply to S1S1, a new equilibrium price is established at a lower price (N65 per *mudu)* and at a larger quantity of 1600 *mudu.* We can therefore infer that an increase in supply will lead to a decrease in the equilibrium price and an increase in the equilibrium quantity.

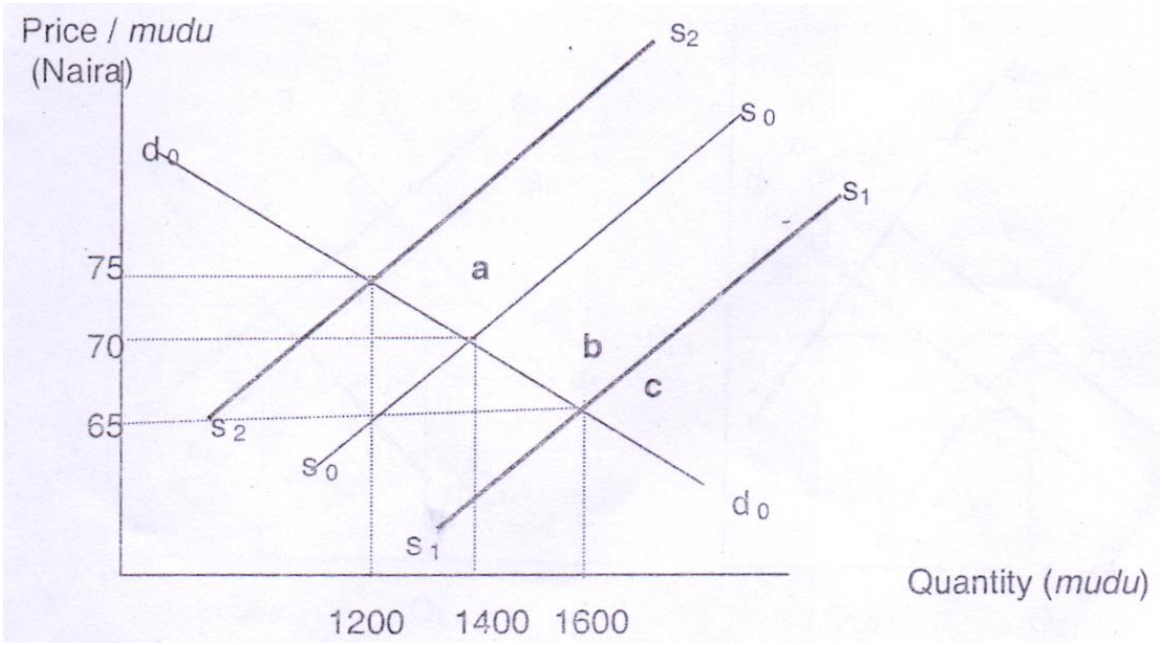
Table 8.3 Effect of change in supply on the market equilibrium

Price per Mudu	D_0D_0	S_0S_0	S_1S_1	S_2S_2
85	800	2000	2400	1600
80	1000	1800	2200	1400
75	1200	1600	2000	1200
70	1400	1400	1800	1000
65	1600	1200	1600	800
60	1800	1000	1400	600

55	2000	800	1200	400
50	2200	600	1000	200

Exercise 8.3: Explain why the equilibrium price decreases with an increase in supply

Similarly, if supply were less, say S_2S_2 as shown in column five of table 8.3, the equilibrium price would increase to N75 per mudu and a decrease in the equilibrium quantity to 1200 mudu. It therefore implies that a decrease in supply will lead to an increase in the equilibrium price and a decrease in the equilibrium quantity.

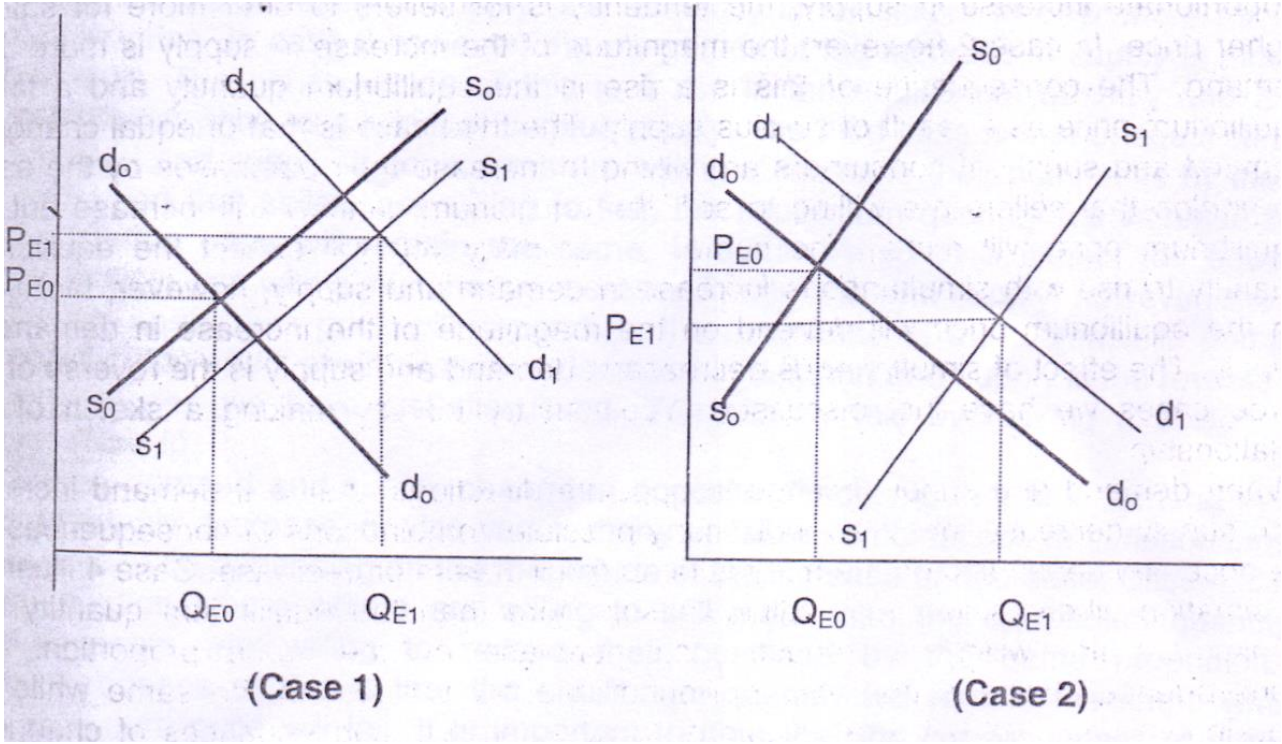


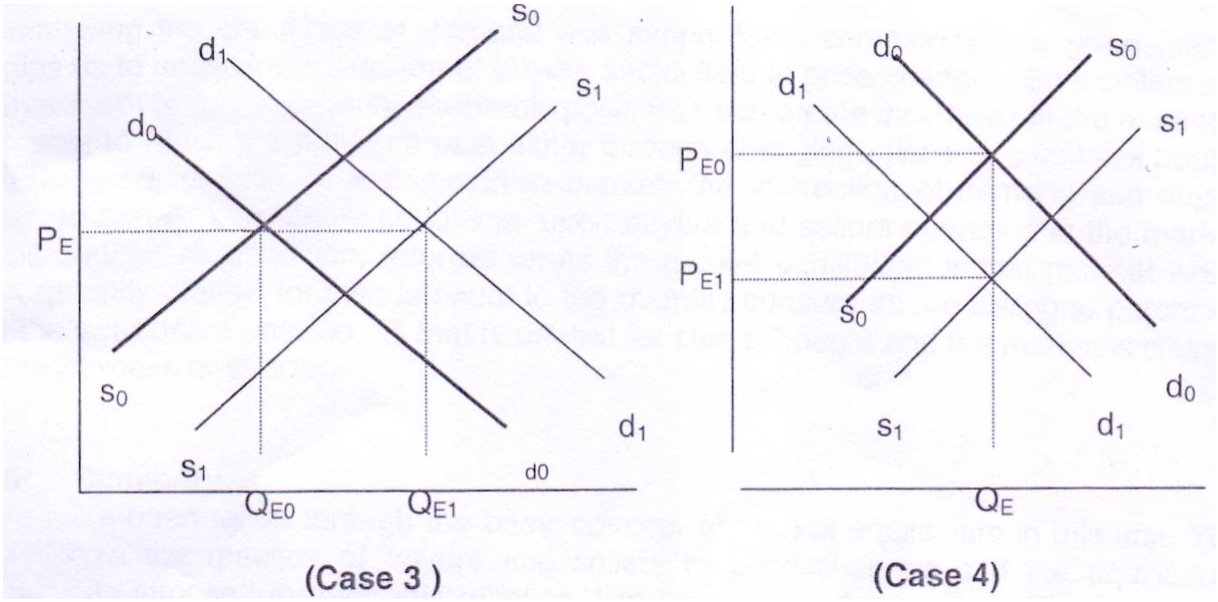
We can also illustrate the effect of change ins supply on the equilibrium point on a graph as shown in figure 8.3 an increase in supply curve to the right (S_1S_1) and this will establish a new equilibrium at the point of intersection of D_0D_0 and S_1S_1 as indicated by "c" on the graph. At the new point of intersection, the equilibrium price is N65/Mudu while equilibrium quantity is 1600 mudu. Similarly a decrease in supply is represented by supply curve S_2S_2, the point of intersection of D_0D_0 and S_2S_2 is indicated by "a" in figure 8.3, at this point, equilibrium price is N75, and equilibrium quantity is 1200 mudu. We can therefore summarize the effect of changes in supply on the equilibrium price and equilibrium quantity thus: a change in supply will result in the opposite change. in. the equilibrium. price that is an increase in supply will result in .a decrease in equilibrium price and vise versa. However, a change In supply will result In a direct change in the equilibrium quantity, that is, when supply increases, equilibrium quantity will also increase and vice versa.

3.5 Simultaneous change in demand and supply on the market equilibrium

We have discussed the effect that changes in either demand or supply of a given commodity will have on the equilibrium price and equilibrium quantity. We now want to look at what happens to the market equilibrium when both demand and supply changes simultaneously. If both demand and supply changes simultaneously, there are many possible combinations of consequences depending on the shape of the curves and the magnitude of the shift.

We will illustrate this graphically and see what happens under various conditions. Let us start with a case of simultaneous increases in demand and supply. There are three possible consequences of simultaneous increase in demand and supply as indicated in cases 1, 2 and 3 of figure 8.3 below:





In case 1, the magnitude of the increase in demand is more than the increase in supply; the consequence of this is a rise in both the equilibrium price and equilibrium quantity. You should expect this because when consumers increase their demand, with less than proportionate increase in supply, the tendency is for sellers to offer more for sale at higher price. In case 2 however, the magnitude of the increase in supply is more than demand. The consequence of this is a rise in the equilibrium quantity and a fall in equilibrium price as a result of surplus supply. The third case is that of equal change in demand and supply. If consumers are willing to increase their purchases by the same proportion that sellers are willing to sell, the equilibrium quantity will increase but the equilibrium price will remain the same. In summary you will expect the equilibrium quantity to rise with simultaneous increase in demand and supply, however, the effect on the equilibrium price will depend on the magnitude of the increase in demand or supply. The effect of simultaneous decrease in demand and supply is the reverse of the three cases we have just discussed. You can try this by making a sketch of the relationship.

When demand and supply change in opposite directions, that is if demand increase and supply decrease, or vice versa, many possible combinations of consequences will be

observed depending on the magnitude of the increase or decrease. Case 4 illustrate a situation where sellers are willing to sell more than the equilibrium quantity and consumers are willing to reduce their purchase by the. same proportion. The consequence of this is that the equilibrium quantity will remain the same while the equilibrium price will fall. It is important to note that the consequences of change in demand and supply condition on the market equilibrium is based on the law of demand and supply. As long as these laws hold, changes in demand and supply will establish a new equilibrium condition in a competitive market.

Conclusion

Combining the conditions of demand and supply for a commodity in a given market helps us to analyze the reaction of buyers and sellers to price changes. Both sellers and buyers aim to maximize their economic position. Each create incentives in the market to be able to reach the optimum gain either through changing prices or quantities bought and offered for sale. In a competitive market, the interaction of demand and supply impose certain equilibrium conditions upon buyers and sellers operating in the market. This equilibrium condition, referred to, as the market equilibrium is that price at which the quantity offered for sale is equal to the quantity consumers are willing to purchase. At the equilibrium position, all that is offered for sale is bought and the market is cleared of any excess or shortage.

5.0 Summary

You have been taken through the basic concept of market equilibrium in this unit. You now know the reaction of buyers and sellers to price changes and the equilibrium conditions imposed through this reaction. We have defined market equilibrium as that price at which the quantity offered for sale equal to the quantity consumers are willing and able to buy. The price at which the quantity demanded equal quantity supplied is referred to as the equilibrium price and the quantity bought and sold at the equilibrium

price is the equilibrium quantity. We differentiated between a stable equilibrium and 'unstable equilibrium. When the condition of demand and supply are such that a change in the equilibrium price automatically react until the equilibrium is once again established, the equilibrium is said to be stable. Finally we observed that the equilibrium condition can only remained stable if the demand and supply schedule or curve for a commodity does not change. That is to say a shift in demand, or supply or both will establish a new equilibrium position.

6.0 Tutor – marked assignments

Hypothetical supply and demand schedules for milk sachets are shown below.

Table 1 supply and demand schedules for milk sachets.

Price (Naira/sachet)	Quantity demanded	Quantity supplied
10	100	20
12	80	40
14	60	60
16	40	75
18	20	95
20	10	110

a) plot the supply and demand curves and determine the equilibrium price and quantity.

b) is the equilibrium condition stable?

c) suppose the quantity supplied at each price rises by 10 sachets, determine the new equilibrium price and quantity. Does the equilibrium quantity sold increased by more or less than the increase in the quantity supplied at each price?

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Combining the conditions of demand and supply for a commodity in a given market helps us to analyze the reaction of buyers and sellers to price changes. Both sellers and buyers

aim to maximize their economic position. Each create incentives in the market to be able to reach the optimum gain either through changing prices or quantities bought and offered for sale. In a competitive market, the interaction of demand and supply impose certain equilibrium conditions upon buyers and sellers operating in the market. This equilibrium condition, referred to, as the market equilibrium is that price at which the quantity offered for sale is equal to the quantity consumers are willing to purchase. At the equilibrium position, all that is offered for sale is bought and the market is cleared of any excess or shortage.

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b) is the equilibrium condition stable?

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7.0 **References** and, **further readings**

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UNIT NINE: CONCEPT OF ELASTICITY

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1.0 Introduction

So far, we have seen that a number of variables determine the quantity of a particular product consumers are willing and able to buy at a given period of time. Adjusting or changing any of these determinants will affect the quantity that the consumer will demand. A measure of the degree to which quantity demanded would respond to any single variable is called elasticity with respect to that variable. There are as many elasticities of demand as its determinants. For example the measure of responsiveness of quantity demanded of a product relative to its own price is called price elasticity of demand. The concept of elasticity was developed to measure the sensitivity of the variables affecting demand and also to compare demand for various products. Although the demand for a product usually responds to changes in any of the affected variables, there are differences in the degree of responsiveness of different products to changes in its determinants. Elasticity is based not in terms of absolute changes, but on the relative

responsiveness of the demand to changes in any of the determinants while holding others constant.

2.0 Objectives

After successfully going through this unit, you should be able to

1. Define elasticity of demand and supply
2. Differentiate between elastic, inelastic and unit elastic demand and supply
3. Calculate the coefficients of elasticity for the following;
    - Price elasticity of demand
    - Income elasticity of demand
    - Cross elasticity of demand
    - Price elasticity of supply
4. Explain the importance of elasticity of demand in the market economy.

3.1 Price elasticity of demand

Price elasticity of demand is a measure of the responsiveness of the quantity demanded of a good relative to a change in its price. In other words, price elasticity of demand at given price is the ratio of the percentage change in the quantity demanded to the percentage in its price all other things remaining the same. The equation for the price elasticity of demand is given as: $\frac{E_d = \%\ change\ in\ quantity\ demanded}{\%\ change\ in\ price}$ E_d = price elasticity of demand.

For example, suppose the price of a bottle of coke increased from N25 to N30 (20%). And this led to a decrease in demand from 8 to 6 bottles (33%). The price elasticity of demand (E_d) in this case is equal to – 33%/20% = -1.65. the coefficient of price edacity of demand for normal goods is always negative because when price changes demand moves in the opposite direction to conform to the law of demand. However, the absolute values of the coefficients are used in explaining the nature of elasticity. The absolute value of -

1.65 is 1.65 while the absolute value of 2 is 2). Price elasticity of demand is divided into three general categories based on the absolute value of the coefficient of elasticity.

Price elasticity of demand may be unity, greater than unity or less than unity. This is illustrated in table 9.1 when price elasticity of demand is unity, it implies that a proportionate change in price result in the same proportionate change in quantity demanded. For example, if a 10% change in price causes a 10% change in quantity demanded, then E_d is 10%/10% =-1. The demand for that commodity is unitary elastic with respect to its price.

Price elasticity of demand is greater than unity when the change is more than proportionate to the change in price. For example, if the change in demand is 20% when the price change is 10% E_d is 20%/10%/ = 2: demand in this case is said to be elastic.

If, however, the change in demand is less than proportionate to the change in price, E_d is less than unity and demand is said to be inelastic. For example, when a 20% change in price results in a 10% change in demand E_d = 10%/20% = 0.5

Exercise 9.1: Define price elasticity of demand.

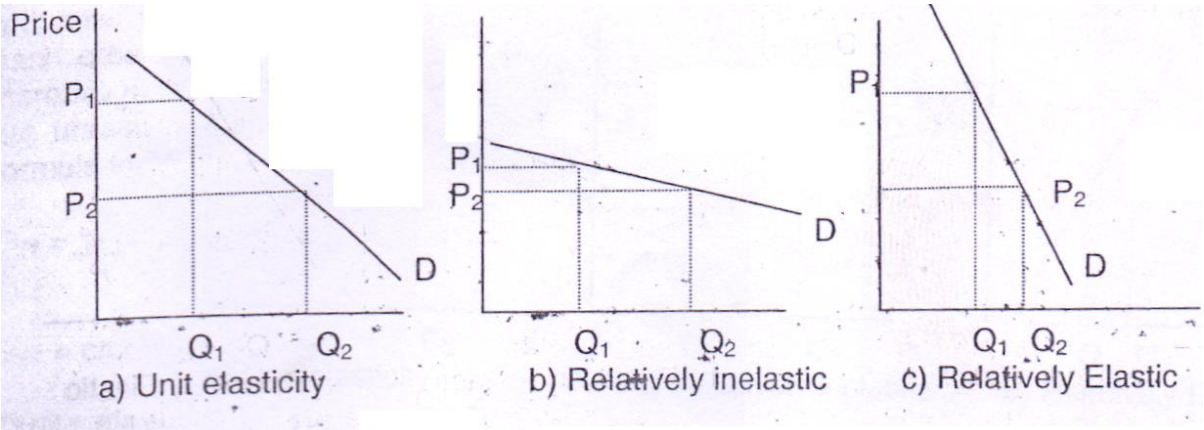

Fig 9.1 Price elasticity of demand

Demand could be also be said to be perfectly elastic or perfectly inelastic. Price elasticity of demand is said to be perfectly elastic when there is no absolute change in demand whatever the change in price. That is, quantity demanded is unresponsive to price changes. A 20% rise or fall in price has no effect on quantity demanded. Ed in this case is equal to zero. This condition violates the law of demand and is very rare in real life situation.

Another limiting case of price elasticity is the perfectly elastic demand. Demand for a commodity is said to be perfectly elastic when at a given time an unlimited quantity is demanded. That is, the response to changes in price in infinite E_d is equal to infinity.

3.2 Income elasticity of demand

Demand for a good or service is assumed to vary with price, income and other determinants including price, being held constant. What happens if there is a change in income, the demand for the commodity either increases or decreases depending on the magnitude of the change. The measure of the sensitivity of demand to changes in income is called income elasticity of demand. The income elasticity of demand measures the relative responsiveness of change in quantity demanded to changes in income, while price and other factors affecting quantity demanded remained constant. In other words, it is the ratio of percentage change in the quantity demanded of a commodity to the percentage change in income. The equation for the income elasticity of demand is given as; $Ey = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ income}$ Ey = income elasticity of demand.

The coefficient of the income elasticity of demand is always positive for normal goods. That is a change in consumer's income and his demand for any commodity will usually be In the same direction. However, for inferior goods an inverse relationship is obtained between income and demand for that commodity. We will limit our discussion to normal good, with positive income elasticity of demand.

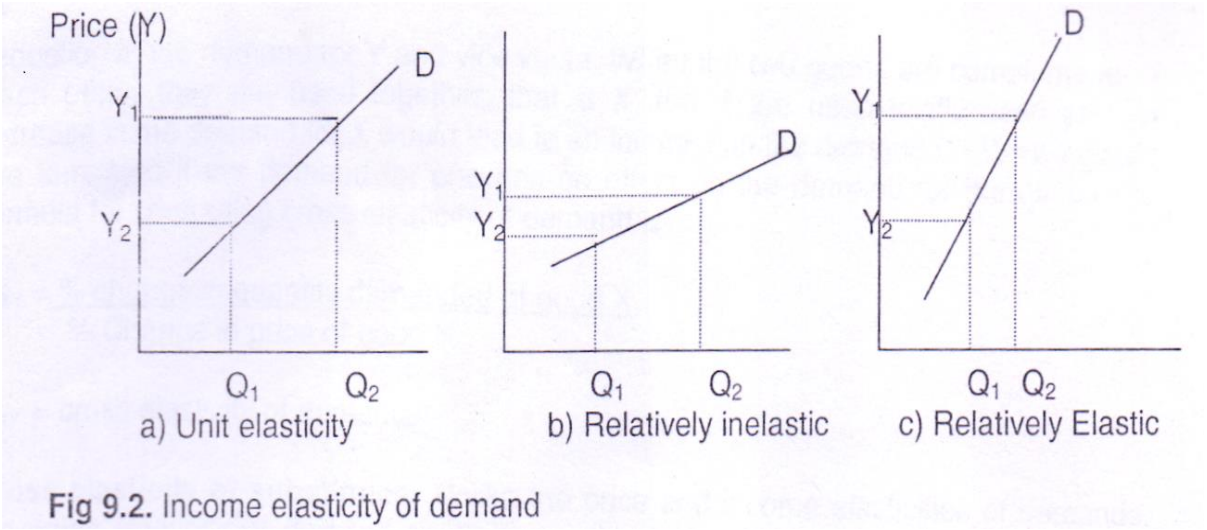

Fig 9.2. Income elasticity of demand

We can use the same designation in classifying income elasticity of demand for normal goods: That is, income elasticity of demand is elastic when a percentage change in income results in more than one percentage in quantity demanded (Ey > 1). When the income elasticity of demand is equal to one, Ey = 1, demanded is said to be unitary elastic with respect to income. That is a percentage change in income causes the same percentage change in demand.

If, however, the change in demand is less than proportionate to the change in income, Ey is less than unity and demand is said to be inelastic with respect to income. For' example, when a 20% change in income results in a 10% change in demand, Ey = 10% /*120%* = 0.5. A graphical representation of these three classes of income' elasticity of demand is shown in Fig. 9.2. The demand curves represent the quantities of a commodity that a consumer would buy at various levels of income. We have assumed a linear relation between income and demand though there are cases with non-linear relationships.

Exercise 9.2: Classify and explain elasticity of demand with respect to income.

3.3 Cross elasticity of demand

Demand for a good depends not only on its own price and on buyer's income but also on the prices of other products that are consumed along with it or which are substitutes for it. If the demand for products X and Y are related, then a change in the price of Y will affect

the demand for X. The strength of the relation is measured by the cross elasticity of demand. Cross elasticity of demand refer to the degree of responsiveness of a proportionate change in the quantity demanded of a commodity to a proportionate change in the price of a related commodity. The cross elasticity of demand of .good X with respect to changes in the price of good Y is defined as the ratio of the percentage change in quantity of good X demanded to the percentage change in the price of good Y. The relationship between two commodities, say X and Y may be substitutes, complements or unrelated. Two good are substitutes of each other, if X and Y satisfy equally well the same need. In which case an increase in the price of X will result in a reduction in the demand for Y and vice versa. When the two goods are complements of each other, they are used together, that is X and Y are used jointly used and an increase in the demand for X would lead to an increase in the demand for Y. Two goods are unrelated if the demand for one has no effect on the demand for the other. The formula for computing cross elasticity of demand is

$$Exy - \frac{\%\text{ change in quantity demanded of good X}}{\%\text{ Change in price of good Y}}$$

Exy = cross elasticity of demand.

Cross elasticity of substitutes: Unlike the price and income elasticities of demands, the cross elasticity of demand could be positive, negative or zero depending on the nature of the relationship between the two commodities in question. The cross elasticity of demand is positive if the two commodities are substitutes. The higher the positive coefficient of the cross elasticity of demand, the better substitutes the goods are. If Exy is equal to one, the two goods are perfect substitutes, and the percentage change in the price of good Y will cause the same percentage change quantity of X that will be demanded. The two goods in this case are said to be perfect substitutes. Either of the goods will yield the same utility. If Exy is greater than one than a proportionate change in the price of Y will lead to more than the proportionate change in the quantity of X

demanded. While Exy less than one implies that a proportionate change in the price of Y will lead to less than proportionate increase in the demand for X.

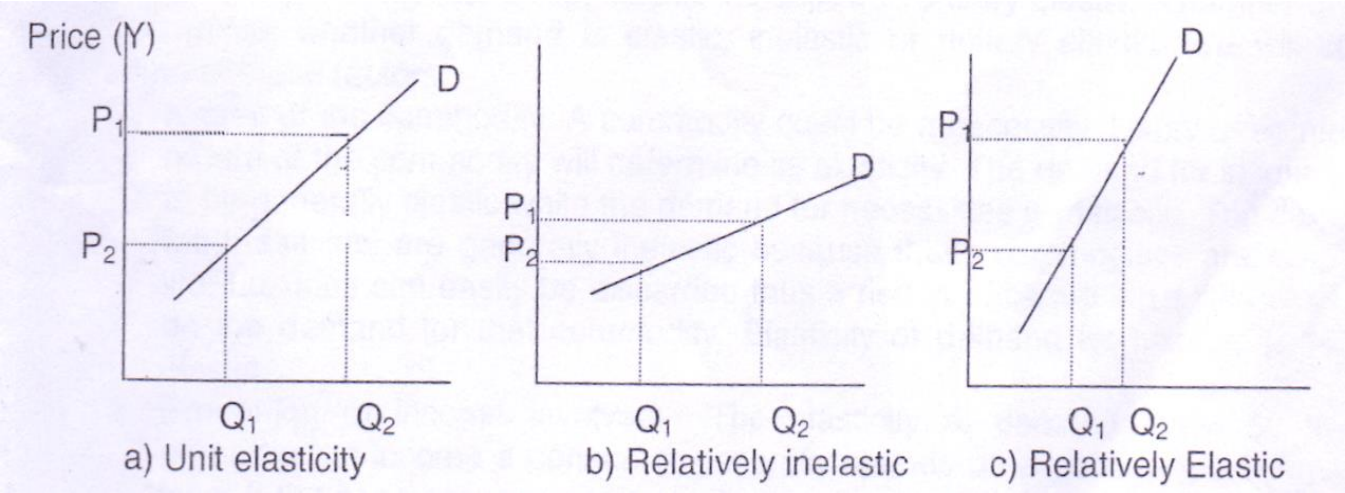

Fig 9.3 Cross elasticity of substitutes

Cross elasticity of complements: If two goods are complements, a rise in the price of one would lead to a rise in the price of the other. And the same trend applies to their demand. Example of complementary good is cars and petrol. Since price and demand vary in the opposite direction the cross elasticity of demand for complements is negative If the Proportion of change in quantity demanded is exactly as the change in price of the other commodity, then E_{xy} is equal to one. Cross elasticity is greater than unity when the change in the demand for X is more than proportionate to the change in the price of Y. while cross elasticity is less than one when the quantity of X demanded is less in response to a change in the price of Y. The various illustrations of cross elasticity of Complements is shown in Fig. 9.4.

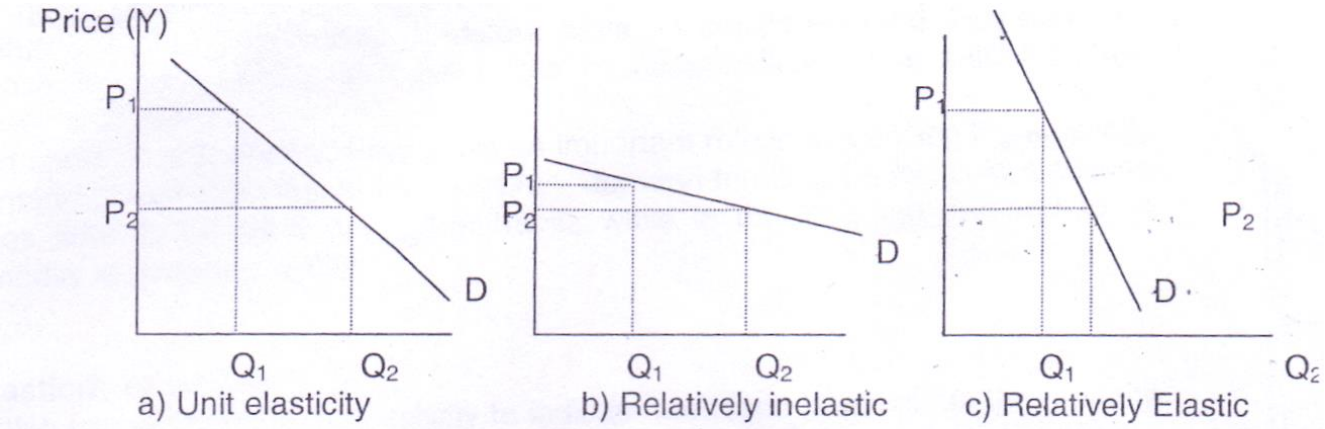

Fig 9.4. Cross elasticity of complements

3.4 Factors determining the elasticity of demand

We defined elasticity of demand for a commodity as the degree of responsiveness of demand to changes in its determinants. The coefficient of the elasticity of demand determines the strength of responsiveness of demand to changes in its determinants. We classify elasticity into three: elastic, inelastic and unitary elastic. A number of factors determines whether demand is elastic, inelastic or unitary elastic. We will consider some of these factors.

1. Nature of the commodity: A commodity could be a necessity, luxury or comfort. The nature of the commodity will determine its elasticity. The demand for luxuries is said to be generally elastic while the demand for necessities is inelastic. The demand for food, salt etc. are generally inelastic because these commodities are essential to life. Luxuries can easily be discarded thus a rise in price will have little or no effect on the demand for that commodity. Elasticity of demand for luxuries is therefore elastic.

2. Proportion of income involved: The elasticity of demand depends upon the proportion of income a consumer generally spends on a good in a given period of time. If the consumer spends a small proportion of his income on a commodity, the demand for that commodity is inelastic while the demand for a commodity, which requires a large proportion of income, is elastic. For example, the consumers expenditure on salt, .pen or matches constitutes such a small fraction of his total income as such a rise in their price

would not induce the consumer to cut down his expenditure on these items. The demand for these items is inelastic. However, the demands for such products like clothing, wristwatch, shoes etc are elastic because the consumer spends a considerable portion of his income on them. Thus an increase in any of the determinants of demand will have a larger impact on the quantity demanded.

3. Uses of the good: Demand is said to be more elastic when the commodity has a variety of use than when it has only one use. For example items like kerosene, sugar, milk, fuel have composite demand and as such a decrease in their price would induce the consumption of the goods in all its uses while a decrease in the prices of commodities with only one use lesser influence on demand.

4. Availability of substitutes: The demand for a commodity IS said to be more elastic if it has good substitutes. A small rise in price will induce consumers to go for the substitutes. These commodities therefore have an elastic demand. However, the demands for commodities that have little or no substitutes, like salt, fuel, are generally inelastic.

5. Period under consideration: Time plays an important role in influencing the elasticity of demand of commodities. In the short run, demand tends to be inelastic, because it takes time to adjust to taste and habits while in the long run demand for a commodity is generally elastic.

3.5 Elasticity of supply

We can also use the concept of elasticity to indicate the responsiveness of the quantity supplied of a product to change in the products price. Price elasticity of supply can be defined as the ratio of the percentage change in the quantity supplied to the percentage change in its price. The equation of price elasticity of supplied to the percentage change in its price. The equation of price elasticity of supply is given as

$$E_s = \frac{\%\ change\ in\ quantity\ supplied}{\%\ change\ in\ price}$$ E_s = Elasticity of supply

Price and quantity supplied normal moves in the same direction so we will expect the coefficient for the elasticity of supply to be positive, that is producers would be willing to supply more at a higher prices than at a lower price. Supply elasticity, like demand elasticity, depends on the period of time considered, if E_s is greater than one, we say that the supply of the commodity is elastic with respect to its price. That is, the quantity of a commodity supplied changes by a larger percentage than the percent change in price. However, if E_s is less than one, then supply is said to be inelastic. This implies that the percentage change in quantity supplied is less than the percentage change in price. Supply is said to have unitary elasticity when E_s is equal to one in which case amount supplied increases in the same proportion as price change. The three major categories of supply elasticity are illustrated in Fig 9.5.

Exercise 8.4
Define elasticity of supply.

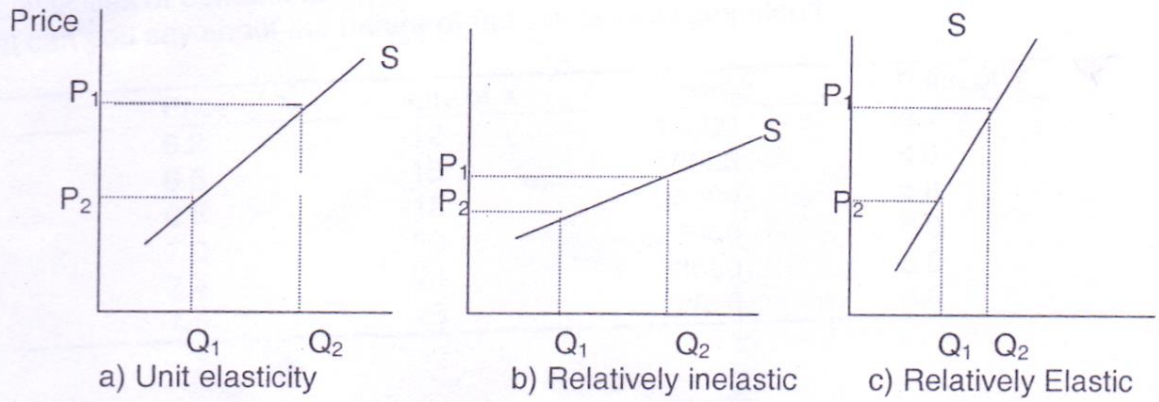

Fig 9.5. Elasticity of supply

It is usually difficult to increase output rapidly even when price increase, hence, over a short period supply is inelastic. Over a long period however, more resources can be diverted to producing the good in response to price increase, thus supply elasticity is higher.

4.0 Conclusion

The important point about elasticity is that it allows you to think logically about what is

happening in the markets. It allows you to analyze the effect of changes in the determinants of demand on sales. Elasticity, either of demand or supply, is influenced by a number of factors that affects the sensitivity of demand or supply to changes in their determinants. Understanding the nature of the commodity and the characteristics of the consumer plays a greater role in understanding the responsiveness of sales to changes in demand-supply variables and also enhance the establishment of market equilibrium.

5.0 Summary

This unit focuses on the concept of elasticity as a tool for measuring the sensitivity of the variables affecting demand and supply. We have defined elasticity as a measure of responsiveness of demand or supply to changes in their determinants. We also identified three classes of demand elasticities: price, income and cross elasticities of demand. Price, income and cross elasticities of demand were defined as the ratio of the percentage change in quantity demanded of a commodity to the percentage change in its price, consumer's income and price of another commodity respectively. We also categorize the responsiveness of demand and supply into elastic, inelastic and unitary elastic. Demand or supply is said to be elastic when elasticity is more than one, inelastic when elasticity is less than one and unitary elastic when elasticity equal to one. Finally the factors affecting demand and supply elasticity were considered.

6.0 Tutor marked assignment

a. What does elasticities of demand and supply measure in general?

b. The following table gives hypothetical data for a consumer, compute the income and cross elasticities of demand for X.

c. What can you say about the nature of the elesticities computed?

Month	Price of X	Qty of X	Income	Price of Y
1	6.2	12	14000	3.4

2	6.5	15	16000	4.0
3	6.8	18	20000	4.6
4	7.0	20	24000	5.0
5	7.4	24	28000	5.8
6	7.5	25	32000	6.0

7.0 References and further readings

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UNIT TEN: PRODUCTION FUNCTION WITH ONE VARIABLE INPUT

Table of contents

1.0 Introduction

This unit examines the behavior of the firm as producers of marketable output using factors of production or inputs. The transformation of inputs into marketable output is called production. Production is a process of creation of goods and services for the satisfaction of human wants. Every act of production requires certain types and amount of inputs. For instance, production of ten bags of maize requires certain amount of arable land, seed, fertilizers, herbicide, farm implements and human labor. Usually, production process requires a wide variety of different types of inputs, however, the analysis of production in this unit will be based on the use of one variable input. We will assume in this unit that there is only one variable input, which can be combined, in different proportions with one or more fixed inputs fixed input to produce various quantities of output.

2.0 Objectives

After successful completion of this unit, you should be able to

- Define production function
- Diagram Total product, average product and marginal product.
- Explain the relationship between AP and MP

- State the law of diminishing return and its application in economics
- Define the three stages of production

3.1 Concept of production function

Making our understanding of the production process more explicit will require knowledge of the production function. The output of a firm depends on the quantity of inputs used; this relationship is called the production function. Production function is purely technical relation, which connects factor inputs and outputs. It describes the technologically efficient methods of, combining inputs to produce output. Production function generally emphasizes on the efficient method of production. A production process that uses 2bags of fertilizer, 20kg ,of seed and 250 man-days labor on one hectare of farmland to produce 3000kg of 'maize .will be considered more efficient than a production process that uses 3bags of fertilizer, 25kg of seed and 300 man-days of tabor on the same hectare of farmland to produce the same quantity of maize. The second combination takes more of all the inputs to produce the same level of output, which makes it inferior to the first method. A production function can be described as a schedule showing the maximum amount of output that can be produced from specified set of inputs. A typical production function describes how many units of a product would be produced at a particular time, given combinations of factor inputs. The simplest production- decision involves only changing one factor input and determining the effect on volume of output produced. Technically speaking, a production function with one variable input is ofts~ captured qenerally as;

$$Q = f(X_1/X_2,\text{----}X_n)$$

This mathematical expression states that the quantity of output (Q) depends on the amount of variable input, (X_1) used, keeping all other inputs, X_2,----- X n fixed. The exact nature of the relationship depends on the curr-ent state of technology. Production function changes with improvement in technology.- The level of technology of a firm at a

particular points in time affect the nature of production function.

The analysis of production in this unit will be based on the assumption of only one variable input, which can be combined, in different proportions with fixed inputs to produce various quantities of output. We will therefore consider what happens to total product if one input is allowed to change in amount while others are kept fixed. The total product of an input indicates the maximum level of output that can be produced using different amounts of that input and a fixed amount of other inputs. Let us consider a simple agricultural production function involving various combinations of labor per unit of time, combined with a fixed amount of farmland to produce alternative outputs of a given commodity. Table 10.1 shows the combinations of labor with fixed amount of farmland to produce alternative amounts of output.

Exercise 10.1: Define production function

Table 10.1: Total product of maize with variations in labor use.

Land	Labor	Total product
1	1	17
1	2	36
1	3	60
1	4	80
1	5	94
1	6	104
1	7	112
1	8	112
1	9	100
1	9.5	95

The first column indicates that land is fixed at one hectare for each farm while the second column is the number of man-days of labor used in cultivating each hectare **O**fland. The third column shows the total product resulting from the combinations of labor with fixed amount of farmland. If you study the table carefully, you will observe that totalproduct of

labor continues to increase, even though at a decreasing rate at some point until an optimum combination of factors is reached, beyond which TP declines.

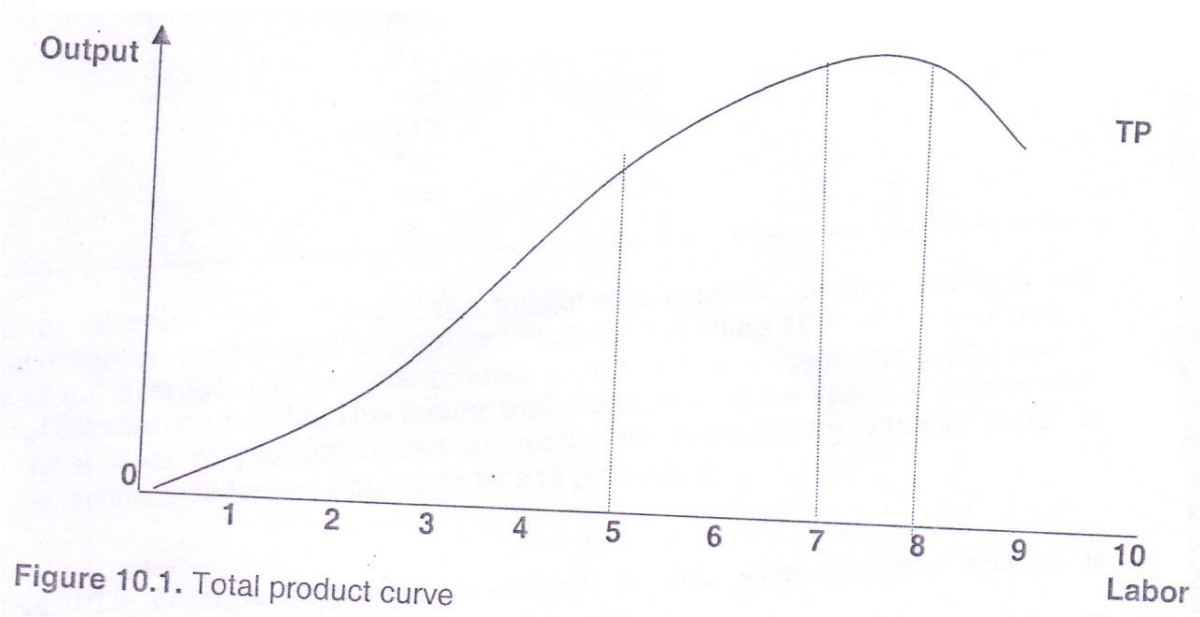

Figure 10.1. Total product curve

The relationship between labor and total product is illustrated in figure 10.1. the characteristic shape of the total product curve is in response to the principle of diminishing returns which states that as more and more of a variable factor are added to a set of fixed factors, the resulting addition to total output becomes increasingly smaller. As more and laborers are made to work on one hectare, the productivity increases at the beginning but after some time, the workers begins to get on each others way and productivity starts to decline.

3.2 Relationship between average product and marginal product

The average product (AP) is simply the per unit output of an input. It is obtained by dividing the total output by the variable factor. Column four of Table 10.2 shows the average product for each level of labor used. If you study the figures carefully, you will observe that as more and more units of labor is used on the fixed farm size, average product first rises up to the fourth labor input, reaches a maximum and then declines thereafter. The point of maximum average product marks the starting point of

diminishing average productivity.

Marginal product (MP) of an input defines the change in total product resulting from a unit change in the variable factor. The values of marginal product in our example are indicated in column five. Like the average product, marginal product initially rises, reaches a maximum and then decreases thereafter. The average product continue to decreases but never negative because at the worst, if nothing is produce, the unit product can only be zero. Marginal product on the other hand, may actually become negative when the variable input is used too intensively with the fixed input.

Table 10.2: Total, average and marginal products of labor

Land (hectare)	Labor	TP	AP	MP
1	1	17	17	-
1	2	36	18	19
1	3	60	20	28
1	4	80	20	20
1	5	94	19	14
1	6	104	17	10
1	7	112	16	8
1	8	112	14	0
1	9	100	11	-2
1	9.5	95	10	-5

In order to describe more precisely, the relationship between average products and marginal products, we will use the graphical illustration in figure 10.2. the characteristic shapes of the average and marginal product curves are because of the expression of the law of diminishing returns. This means that productivity of the variable factor is high at the initial level of production, but as more and more of the variable factor is employed, successive factors would add less to productivity.

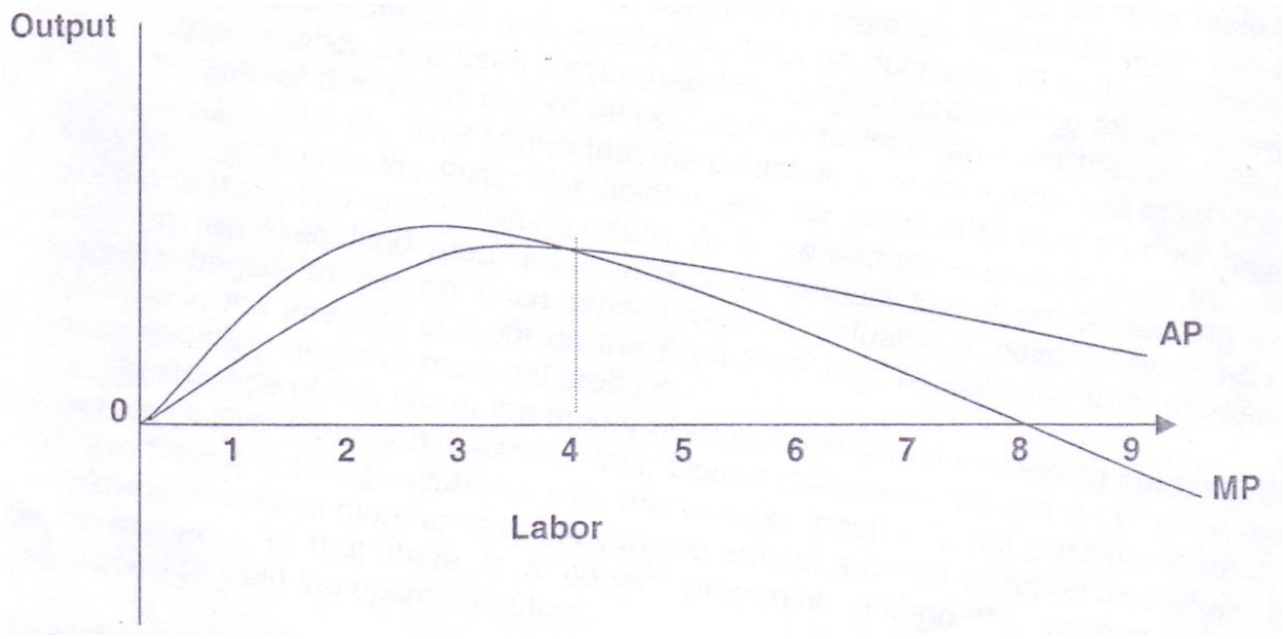

Figure 10.2: relationship between average product and marginal product

Looking at Figure 10.2, you will observe that the average product curve slopes upwards as long as the marginal product curve is above it. This is to say that the productivity of labor increases as long as the addition to total product is higher than it. Up to the fourth unit of labor in our example"; AP is rising and it is below MP. For AP to rise, the addition to total product (MP) mustbe greater than the previous AP. Thus, as long as the AP is rising, MP will be above it, and when AP is at its maximum level, AP equal MP. AT this point, the addition to total product (MP) as a result of additional unit of the variable factor must be equal to the previous average. When AP begins to fall, marginal product is below the AP. This is so because, when AP is falling, the addition to total product must be less than the previous average. The law of diminishing returns starts operating at the point of maximum MP. From this point, addition to total product begins to decline. This occurs because of excessive use of the variable input on the fixed input. If this situation continues, that is if more and more units of the variable input are combined with the fixed input, the 'marginal product eventually becomes zero and then turns negative.

3.3 Law of diminishing return

The shapes of the total, average and marginal product curves in figure 10.1 and 10.2 illustrate the principle of diminishing returns. The law states that when successive units of a variable input is combined with a fixed input, beyond a certain point the resulting addition to total output becomes increasingly smaller. Let us go back to table 10.2 to illustrate this important principle. You will observe from the table that when two units of labor were used instead of one, addition to total product was 19 units. Similarly, when three units of labor were used rather than two, output increased by 28 units. However, with the use of the fourth unit of labor, addition to total labor on the fixed land area decreased to 20 units. This shows that the contribution of the fourth unit of labor to total product is less than the third. The point where the addition to total product begins to decline. is the onset of diminishing return. As more and more units of labor continue to work on the fixed land area, addition to total product keeps on decreasing as the laborers begins' to get on each other's way. Eventually, a point is reached when increase in the intensity of labor on the fixed land area reduces the total product and hence results in negative marginal product.

The significance of this law in the theory of production is that increasing output through more and better input is not without limit. Output decreases beyond a certain point as the fixed input is being combined with the variable input. It is not possible to keep on employing more and more units of the variable without adverse effect on the output. The paint therefore is that there is a correct proportion among the various factors of production to yield the optimum output.

Exercise 10.3: State the law of diminishing return.

3.4 The stages of production

The relationship among total, average and marginal products is used to define the stages of production, as illustrated in Figure 10.3. The basic theory of production depicts three stages of production based on the principle of diminishing returns. We will use figure

10.3 to examine the features of each of these stages.

Stage I: The first stage of the typical production function is the stage of increasing return to scale. This stage corresponds with the range of labor inputs; over which total product is increasing at an increasing rate. In other words, average product and marginal product are also rising. In stage I, the total product is rising faster than inputs for the first four units of labor. A rational producer will not stabilize at this stage because additional unit of variable input will add more to output

Stage 11: Stage two of the production function is the stage of decreasing return to scale. Within this stage, TP is increasing, though at a decreasing rate and both AP and MP are decreasing but MP is decreasing at a faster rate. This means that a rational producer has an avenue for reaping maximum benefit This stage covers the range of variable input from the point of maximum AP to zero MP. At stage 11, the MP of labor though declining is still positive, meaning that a rational producer has an avenue for reaping maximum benefit from increased output. This stage extends from 4 - 8 units of labor in Figure 10.3. From physical consideration, production is limited to stage II of the production function. However, the exact point at which to produce in this stage will depend on the prices of the variable input and output.

Stage III: At the onset of stage Ill, the total product is at its maximum, adding further units of labor produces no more output. Thus within stage Ill, lower levels of output is being produced with higher levels of inputs. Stage III covers the range over which TP is decreasing and MP is negative. In figure 10.3, the 9^{th} and 10^{th} units of labor produce negative marginal products while the s" unit gave zero MP. The implication of this is that, any use of additional input within this stage is irrational because too many variable inputs are added to a fixed input resulting in negative addition to total output.

5.0 Summary

This unit discussed the various relationships in the production function. We defined production function as a schedule showing the maximum amount of output that can be

produced from specified set of inputs. We also looked at the relationship between AP and MP. We observed that both the AP and MP first rises, reach a maximum, and decline thereafter. When i\P attains its maximum, AP and MP are equal, subsequently, AP lies above MP. We also illustrated the law of diminishing returns from the TP, AP and MP curves. The principle of diminishing return states that when successive units of a variable input is combined with a fixed input, beyond a certain point the resulting addition to total output becomes increasingly smaller. Finally we looked at the three stages of the production function. We concluded that stages I and II are irrational stages to produces because in the first stage, output can be increased by using more units of the variable input while in stage Ill, additional unit of the variable input will result in declining total product or negative marginal product. Stage 11 was therefore considered to be the rational stage to produce though the exact point to operate will depend on the input-output prices.

6.0 Tutor – marked assignment

a). State and explain the law of diminishing returns in terms of labor and land.
b). With the aid of a diagram, define the three stages of production for labor and determine where the law of diminishing returns starts operating.

7.0 References and further readings

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UNIT ELEVEN: PRODUCTION FUNCTION WITH TWO VARIABLE INPUTS

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1.0 Introduction

Production function involves concepts, which are useful tools in all fields of economics. Production function is purely a technical relationship between inputs and output. A product can be produced through various processes each process containing a certain combination of factors. The choice of any particular process is in most cases based on the available technology and other economic consideration. Analysis of production in the last unit was based on the use of one variable input. We will build on this assumption by considering a production function with two variable inputs The production function with two variable inputs will look at combinations of two factor inputs required for the efficient production of an output. We -will also examine the use of production in the choice of the optimal combination of factors by the producer. It is important to note that all the variables in the production function are flow that is they are measured per unit of time. For instance, agricultural production function can be estimated per cropping season while production of industrial products can be estimated even daily.

2.0 Objectives

After successfully going through the content of this unit, you should be able to

- Define an Isoquant
- List the characteristics of an Isoquant
- Define input substitution
- . Explain what is meant by marginal rate of technical substitution
- Define isocost line and its relevance in production decision.
- Explain what is meant by expansion path

3.1 Isoquant

A production function with two variable inputs can be depicted by the formula:

Q = f (L, k)

Where Q is the output and Land k are factor inputs, say, labor and capital respectively. We will use this function to illustrate a very important physical relationship between inputs and output: isoquant. An isoquant shows the different combinations of inputs .say tabor and capital, which can be used to produce a specific quantity of output. It is a locus of points each of which represents a combination of inputs capable of producing stipulated quantity of output. The graph of an isoquant may assume various shapes depending on the degree of substitutability of inputs. We will limit ourselves to a smooth curve isoquant, which is negatively sloped and convex to the origin. This shape of isoquant assumes continuous substitutability of the two variables over a certain range, beyond which the factors cannot substitute each other. Figure 11.1 shows the isoquant of combinations of labor and capital to produce a specified quantity of an output.

Exercise 11.1 : What are the characteristics of a conventional isoquant

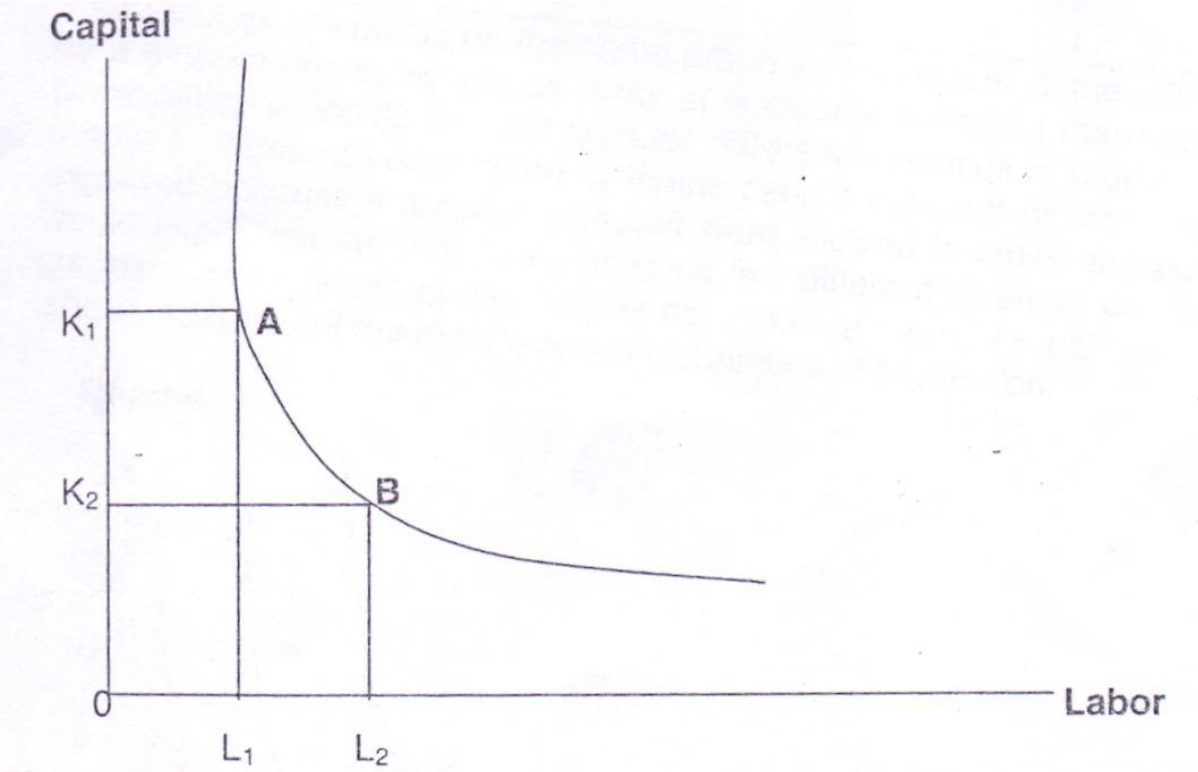

Figure 11.1 Isoquant showing different combinations of labor and capital

At points A and B of the isoquant in Figure 11.1, the same quantity of output could be produced using the various combinations of labor and capital in the ratio of L_1: K1 and L2 : K2 respectively. Other combinations of labor and capital along the isoquant curve will yield the same level of output. The slope of the isoquant decreases as we move downwards along its length. In other words, one factor could be substituted for another along a particular range on the isoquant to produce the same level of output. Production function with more than one variable input describes a whole array of Isoquants relating output to different combinations of factor inputs. It shows how output varies as the factor inputs varies. For a production function involving labor and capital, we could have an array of isoquant showing the various trade-off between capital and labor at specified levels of output. A higher isoquant refers to a greater quantity of output and a lower one, to smaller quantity of output. Let us consider three different combinations of capital and labor to produce three levels of output using the same set of axes as indicated in table 11.1

Exercise 11.2 Define an isoquant map

Table 11.1 Combinations of capital and labor in a production

ISOQUANT I		ISOQUANT II		ISOQUANT III	
2	13	4	15	5	17
1	11	3	13	5	15
2	10	4	11	6	13
3	8	5	9	7	11
4	7	6	8	8	10
5	5	7	7	9	8
6	3	8	5	10	6
7	2	9	3	11	5

If you plot all the points on the same graph and connects all the different combinations by a smooth curve, we get an array of isoquants (isoquant map) each representing a combination of inputs that will produce different quantities of output. Isoquants relating output to different combination of inputs cannot intersect or cross each other. This is expected because if a set of isoquant were allowed to cross, the point of intersection would be imply that the firm could produce two different levels of output using the same combination of factor inputs. This is not possible based on our assumption that each isoquant represent the most efficient techniques of production.

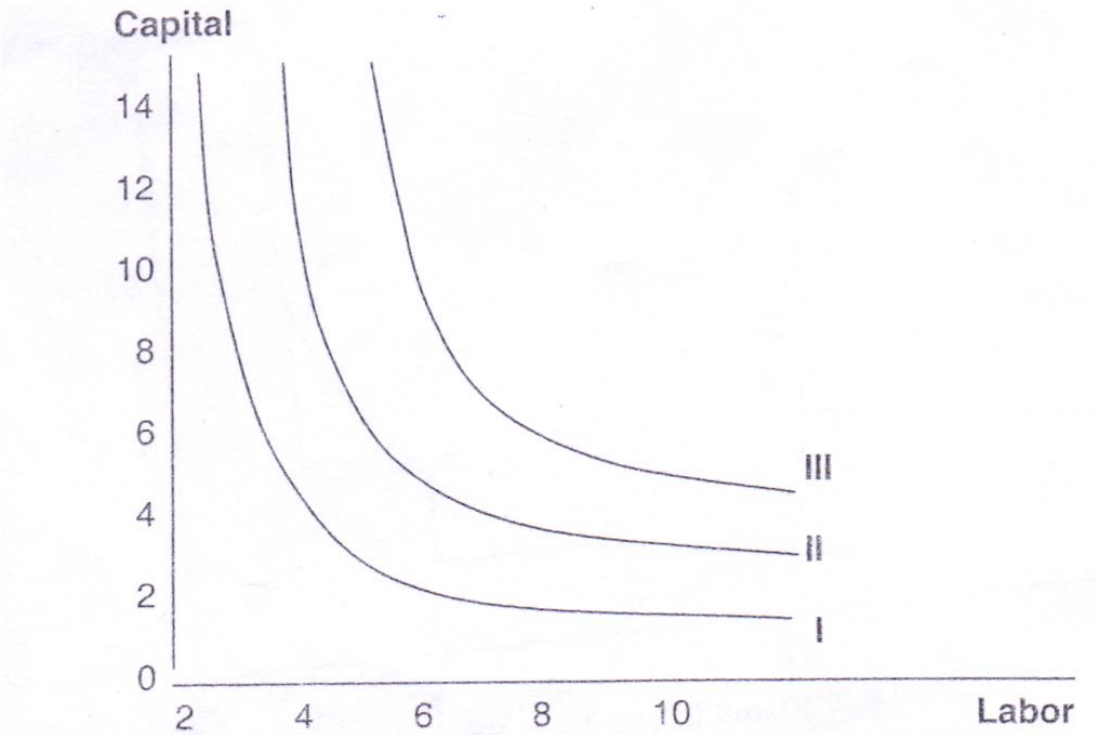

Figure 11.2 Isoquant map showing different levels of production

An isoquant map relating output to different combinations of labor and capital is shown in Figure 11.2. The more to the right an isoquant lies, the higher the level of output it represents, thus you will observe, from Figure 11.2 that isoquant represented by III depicts a higher level of output than that given by I. This implies, that a rational producer will always prefer to operate on a higher isoquant with greater quantity of output.

3.2 Marginal rate if technical substitution

The points on an isoquant represent different combinations of factor inputs that will yield the same level of output. This implies that, to operate on a given isoquant, one factor input would have to be substituted for another to produce the same level of output. The rate of substitution, which equally expresses the slope of the isoquant, is called the rate of technical substitution. The rate of technical substitution of one input for another is the amounts of one input that must be given up by increasing the amount of the second input used by one unit and still remain on the same isoquant. It is referred to as marginal rate of

technical substitution (MRTS) because it is the ratio of the marginal products of the factor inputs. That is: $MRT_{LK} = \frac{MP_L}{MP_K}$

As the producer moves along an isoquant, the $MRTS_{LK}$ Diminishes. The declining value of marginal rate of technical substitution along is a reflection of the convex nature of an isoquant. We will use figure 11.3 to illustrate the declining nature of the slope of an isoquant.

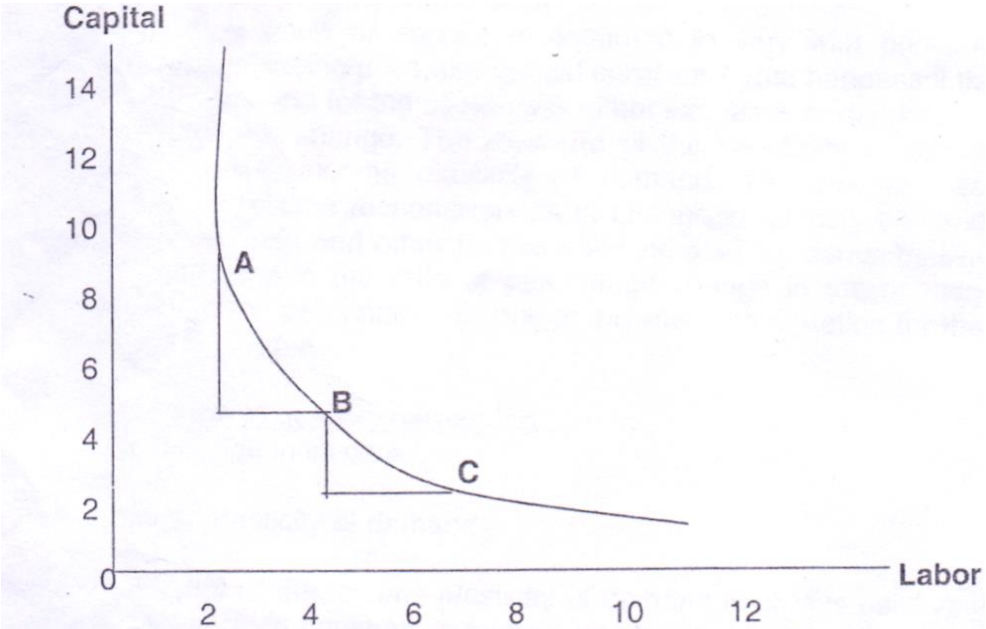

Figure 11.3 Declining marginal rate of technical substitution

At point A on the isoquant in Figure 11.3, the combination of capital and labor is (9, 2) while at point B, the combination is (5, 4.2)-respectively. Thus moving from point A to B, the firm gives up 4 units of capital (MP_k) for additional 2.2 units of labor (MPL1' Thus the $MRTS_{kL}$ = *4/2.2* = 1.8. Similarly, moving from point B to C, the combination of capital and labor change from (5, 4.1) at point B, to (2, 6.4) at paint C. Thus, the firm gives up 3 units of capital (MP_k) for additional 2.3 units of labor ($MP_{L)}$. Thus the $MRTS_{kL}$ = *3/2.1* = 1.4. As you move down the isoquant, the marginal rates of technical substitution continue to diminish. This is so because the less capital and the more labor the firm is using the lower the point on the isoquant.

Exercise 11.3. What do you understand by the rate of technical substitution of one good for another?

3.3 Isocosts

An isoquant map allows us to compare points representing combinations of factor inputs, which will give the same quantity of outputs. You will also recall that isoquant located to the right and above other isoquants represents higher quantity of outputs. A rational producer will naturally want to operate on a higher isoquant. However, the relative prices of factor inputs and the total cost outlay of the firm will determine the optimum input combination, which a firm will use. Let us assume that the total cost outlay of a firm is C, and the two inputs the firm uses in production are labor (L) and capital (k). Assuming the labor wage rate is wand the price of capital service is r and if the firm spent all of its total cost outlay on labor, it could purchase C/P_w_ units of labor., which is the total cost outlay divided by the unit price of labor. On the other hand, if the firm spends all its cost outlay on capital, it could purchase C/P_r units of capital, that is total cost outlay divided by unit price of capital. If you join these two points by a straight line as shown in Figure 11.4, we get the isocost of th-e firm. Points on the isocost line represent different combinations of labor and capital that can be purchased with a given cost outlay. An isocost line can be defined as the combination of factor inputs the firm can purchase with a given monetary cost outlay. It is an isocost line because any combination of input outside the line is unattainable at the given total cost outlay.

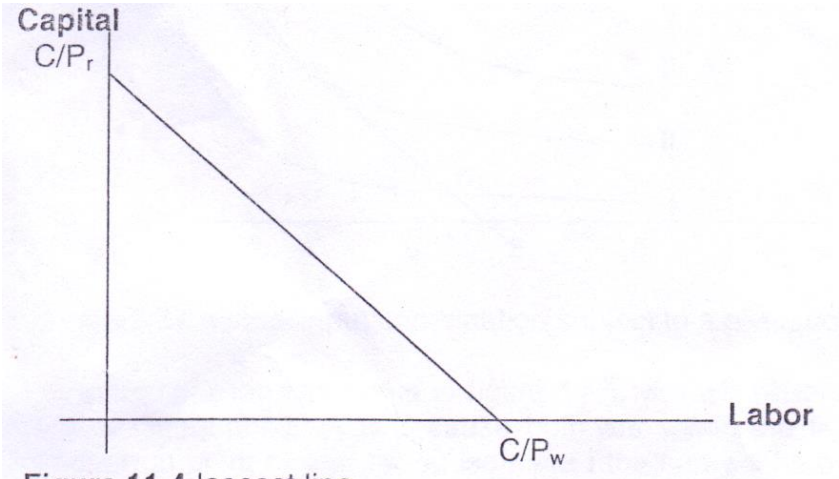

Figure 11.4 Isocost line

Exercise: 11.4 Define an isorevenue line.

The slope of the isocost line is equal to the ratio of the input prices. With the wage rate of tabor (w) and the price of capital service (r), the slope of the isocost line illustrated in Figure 11.4 is represented by - P_w / P_r. An isocost line is negatively sloped because increasing the expenditure on one input implies that less will be left to spend on the other input.

3.4 Producer equilibrium

The goal of a firm is how to combine factor inputs to produce the largest quantity of output for a given cost outlay. Let's assume the price of capital service is N10 per unit and the wage rate is N8 and the firm's total cost outlay is N500 per day. Subject to this input prices, the firm will maximize output attainable by selecting the proper input combination. That is, among all input combination he can purchase for the available total cost outlay, he must select the one that results in the greatest level of output. Given a set of isoquants representing different levels of output, a firm will operate on the highest isoquant subject to the total cost outlay. Thus a producer will maximize his level of output at the point where the isocost line is tangent to an isoquant as shown in Figure 11.5. A producer is said to be in equilibrium when the highest isoquant is reached, given the particular isocost.

Exercise 11.5. At what point on the isoquant is output maximized.

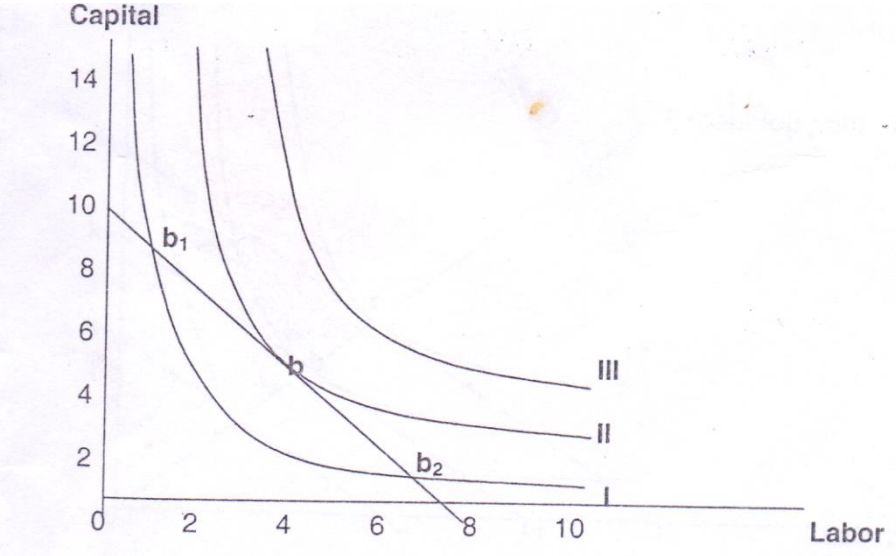

Figure 11.5 Optimal input combination subject to a given cost outlay

If you consider the isoquants in figure 11.5, you will observe that the firm can operate either on isoquant I, or II because both are within the level of the total cost outlay. However, at point b1 and b2, on isoquant I the firm will be operating at a lower isoquant with smaller quantity of output. At a point b, the isoquant I is tangent to the isocost line, thus the producer is at equilibrium at this point. At the point of equilibrium, the slope of the isoquant is equal to the slope of the isocost. The slope of the isoquant is the ratio of the marginal products of the inputs, that is MP_L/MP_K while the slope of the isocost line is the ratio of the input prices, P_L/P_K. Thus at equilibrium,

$MP_L/MP_K = PL/Pk$. Or $MP_L/P_L = MP_k/P_K$

This means that a producer will maximize output when the marginal product of the last amount of money spent on labor is the same as the marginal product of the last amount spent on capital.

3.5 Expansion path

An isocost line is the line showing all the different combinations of factor inputs that a firm can purchase, given the total cost outlay of the firm and input prices. If the firm changes its total outlay while the prices of input remained constant the isocost line also shifts. An isocost line will shift to the right if there is an increase in total outlay while the line will shift to the left with decrease in total cost outlay. The series of isocost line resulting from changes in cost outlay will be tangent to different isoquants thus defining different equilibrium points for the producer. If you join all the points of equilibrium of a producer (points a, b and c), we will get what is referred to as the expansion path as indicated in Figure 12.6.

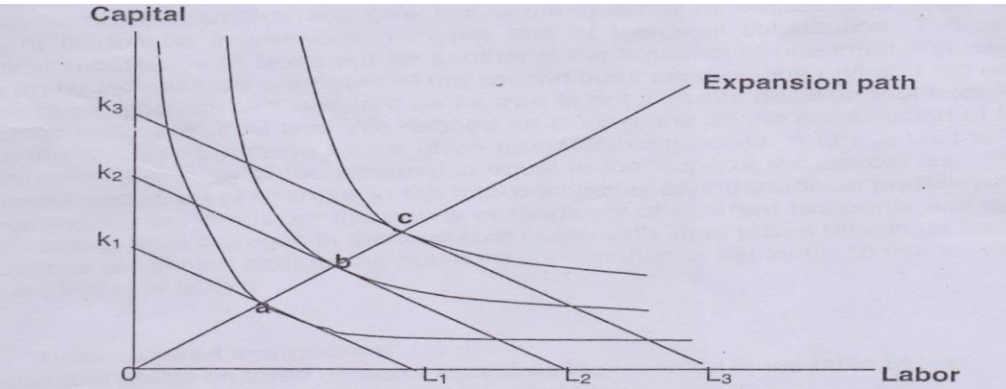

Figure 11.6 Expansion path of a producer

points a, band c are the path along which output will expand. when factor prices remained unchanged. The expansion path shows optimum 'combination of the inputs to use to produce different levels of output as illustrated in fig. 11.6. At *every* point of the expansion path, the slope of the isocost line is equal to the slope of the isoquant.

4.0 **Conclusion**

Production function involves concepts, which are useful tools in all fields of economics. Understanding the production situation requiring more than one variable input enable firms make decision regarding the choice of least input combination to produce the desired level of output. This choice, in most cases is based on economic consideration, as a technically efficient method may not necessarily be economically efficient. Economic efficiency has to do with variables like prices of factor inputs which also depend on the input market situation.

5.0 **Summary**

The focus of this unit is on the production function involving two variable inputs. We looked at the various concepts of input combinations and how firms reach equilibrium output based on the total cost outlay. We defined an isoquant as a locus of points each of which represents a combination of inputs capable of producing stipulated quantity of output. We derived an isoquant map from a set of isoquants each representing different combinations of input that will give the same quantity of output. The slope of an isoquant is defined in terms of marginal rate of technical substitution. The rate of technical substitution of one input for another is the amounts of one input that must be given up by increasing the amount of the second input used by one unit and still remain on the same isoquant. An isoquant on its own is not a useful decision tool except it is combined with an isocost line. We defined an isocost line as the combination of factor inputs the firm can purchase with a given monetary cost outlay. A firm is said to be at equilibrium if the slope of the isoquant is equal to the slope of the isocost line. Finally,

we considered effect of changes in the total cost outlay on the producer equilibrium. We derived expansion path from the points of tangency of different isoquants and isocost lines resulting from changes in the total cost outlay with input prices remaining constant. We defines expansion path as the optimum combination of the inputs to use to produce different levels of output

6.0 Tutor-marked assignment

Hypothetical points on three different isoquants is presented in the table below:

a). Draw the three isoquants on the same set of axes.

b). Assuming the prices of the two products (P_1 and P_2) are N100.00 and N200.00 respectively, and they remained constant. If the total cost outlay of the producer rises from N1200 to N1600 and then to N2000 per period of time, derive the producer's expansion path.

c). What do you understand by a firm's expansion path?

Table 1 Hypothetical data on three isoquants

Labor (L)	Capital (K)	Labor	Capital	Labor	Capital
3	14	4	14	5.5	15
2	10	3	11	5	12
3	6	4	8	5.5	9
4	4.5	5	6.3	6	8.3
5	3.5	6	5	7	7
6	3	7	4.4	8	6
7	2.7	8	4	9	5.6
8	3	9	4.4	10	6

7.0 References and further readings

Olukosi, J. O. and Ogungbile, A. O. (1989); *Introduction to Agricultural Production Economics: Principles and Applications.* AGITAB Publlshers Ltd., Zaria-Nigeria. Pp. 41 - 69

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UNIT TWELVE: PRODUCTION FUNCTION OF A TWO PRODUCT FIRM

Table of contents

1.0 Introduction

We have discussed the production function relating output to one or more variable inputs in the last two units. There are situations in which we have two or more products to be produced using a limited amount of resources. We will extend our understanding of production function to that of a relation between two outputs and fixed factor inputs. A production function involving two products with fixed factor input can described as the technologically efficient methods of producing a combination of two products with a given set of fixed input. The analysis of two-output production function has to do with the concept of efficient resource allocation among alternative products. This unit examines the production process from the viewpoint of enterprise combination using the concept of production possibility curve.

2.0 Objectives

This unit is expected to give you the basic principles of efficient resource allocation using the concept of production possibility curve. On successful completion of the

content of this unit, you should be able to:

1. Derive a production possibility curve
2. Explain what is meant by marginal rate of product transformation
3. Define an isorevenue line
4. Illustrate how a firm maximizes his output combination with fixed inputs
5. Define output expansion path

3.1 Production possibility curve

We have in earlier units discussed production function with one and two variable inputs. We shall now look at the choice of products or combinations of products to produce in order to maximize the use of limited resources. We will assume that there is one variable input (Iabor) that is used to produce two products (Q1 and Q2). Each product has a production function showing how much output can be produced when different amounts of variable inputs are added to the stock of fixed factors. Suppose there is only one variable factor; labor, and the total labor force is used in producing product 1 (Q1), with no labor left for producing the second product (Q2). If you move one worker from Q1 to Q2, then output of Q1 will decrease because fewer workers will be available for production, while output of Q2 will increase from zero. A two-product firm can move labor between the products to obtain different combinations of outputs using the limited amount of labor. The combinations of Q1 and Q2 that can be produced from the limited available factor inputs are referred to as the production possibilities. A production possibility curve indicates the various combinations of two goods that can be produced using a fixed amount of an input. It is important to note that production possibilities are a planning device because a firm cannot produce the various combinations of the two products at a time. That is, only one of the various combinations can be produced at a point in time. The production possibility curve does not say anything about how choice are made among these alternative combinations

Exercise 12.1. Define production possibilities of a firm.

We will use the hypothetical data in Table 12.1 to derive the production possibility curve for a firm producing Cotton and groundnut using labor as the only variable input while other inputs are kept fixed.

Table 12.1 A schedule of production possibilities of cotton and groundnut

Labor (Men)	Cotton	Groundnut
10	40	0
10	38	10
10	35	20
10	30	30
10	20	40
10	0	45

The above data indicates that allocation of all the firm's labor force (10 men) to the production of cotton would result in an output of 40bags of cotton but no groundnut. However, if only 38bags of cotton were produced, enough labor would be released from the production of cotton to produce 10bags of groundnut. If the production of cotton were further reduced to 30bags and 20bags, production of groundnut would increase to 30bags and 40 bags respectively. When zero cotton is produced, all the firm's workers will be utilized to produce 45bags of groundnut.

When the data in table 12.1 are plotted in a coordinate system with the quantity of cotton on the vertical axis and that of groundnut on the horizontal axis, the result is a production possibility curve.

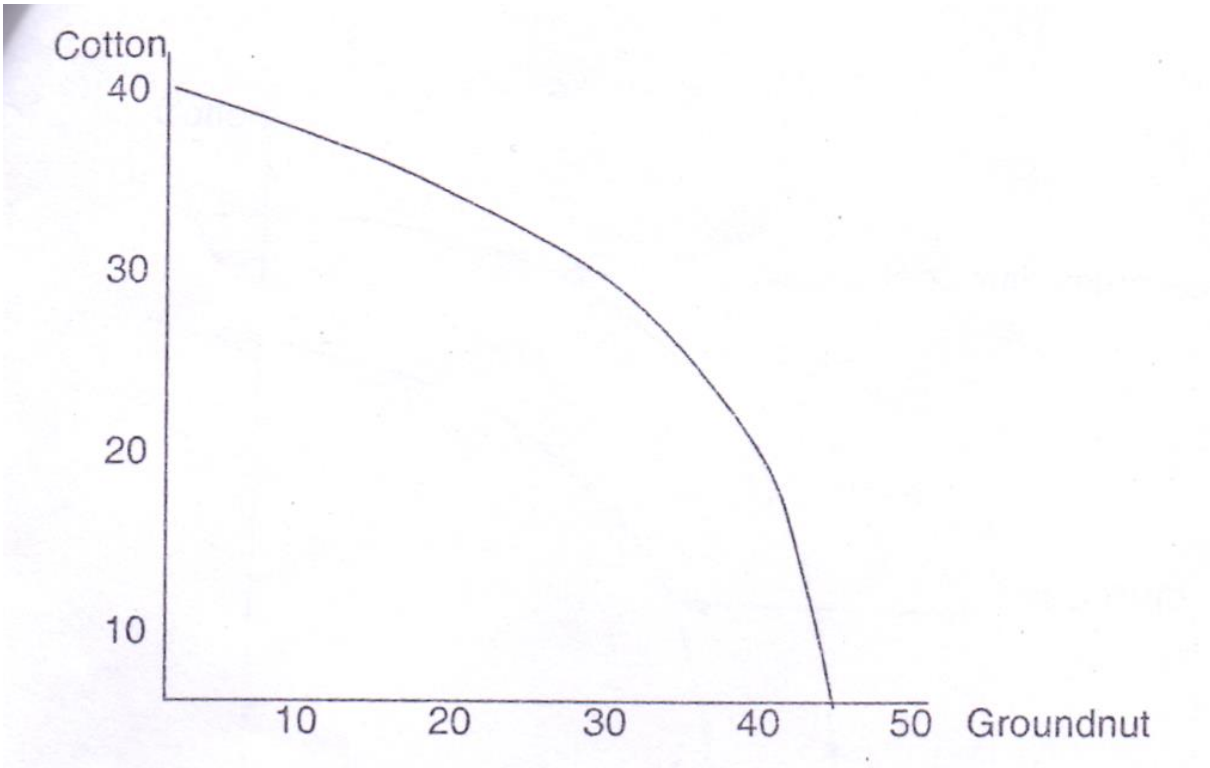

Figure 12.1 Production possibility curve for cotton and groundnut

The production possibility curve (PPC) shows the optimal output of each commodity corresponding to every possible allocation of labor input while other inputs are kept fixed. No output combination represented by a point lying outside the production possibility curve can be attained. Such a level would require a greater labor force than the firm has. On the other hand, a point lying inside the locus is productively inefficient since they do not use up all the available labor input. As we increase production of one good we must give up increasing amounts of the other good.

Production possibility curve is affected by the same factors that affect the production function. For example, a change in technology or the intensity of use of inputs can cause a shift in both the production function and also the production possibility curve. Figure 12.2 shows a shift in the production possibility curve as a result of improvement in technology, which shifts the production of cotton and groundnut at the same input level. A change in the total available factor input will shift the production possibility curve.

Intensity in the use of factor input will result in an upward shift of the production possibility curve implying that more of both goods can be produced, that is output of both goods could be increased without sacrificing units of the other. Figure 12.2 shows that before the introduction of the improved technology, 40 bags of cotton and 45 bags of groundnut are the maximum attainable production with 10 units of labor. However, with improvement in technology the same amount of labor was able to yield 50bags of cotton and 65 bags of groundnut.

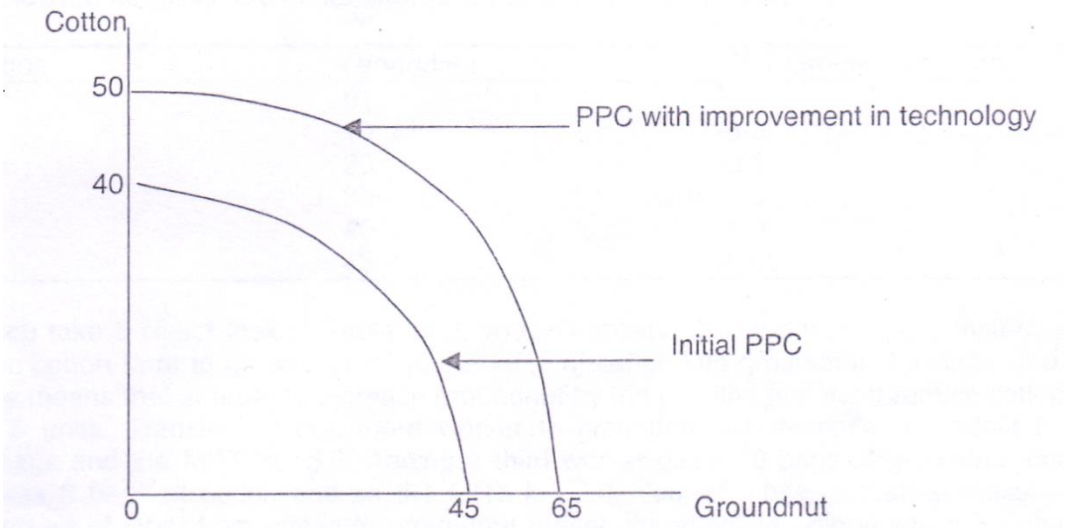

Figure 12.2 Production possibilities with improvement in technology

Exercise 12.2. With a given cost outlay, what will be the effect of a general increase in the cost of factors of production on the production possibility curve?

3.2 The marginal rate of product transformation

In order to increase the production of one good with the same level of input, there has to be a trade off between the extra units of the output produced and the output lost. This trade off is called marginal rate of product transformation (MRT). Marginal rate of product transformation MRT is negative because we have to give up one good to gain more of the other good. MRT of one good for the other is given as:

MRT $Q1\ Q2$ = Change in Q_2/ Change in Q_1 = MP L, $Q2$/ MP L, $Q1$

Where MRT $Q1\ Q2$ is the marginal rate of product transformation of 0_1 for 02, MP L, 02 is the marginal product of labor in producing 01 and MP L, $Q1$ is the marginal product of labor in producing Q_2.

We can derive the MRT of cotton for groundnut and vice versa (Table 12.2) using the example in Table 12.1.

Exercise 12.3 Define the marginal rate of product transformation

Table 12.2 Marginal rate of transformation of cotton for groundnut

Cotton	Groundnut	MRT Groundnut/cotton
40	0	
38	10	-5.0
35	20	-3.3
30	30	-2.0
20	40	-1.0
0	45	-0.25

If you take a closer look at Table 12.2, you will observe that if a worker is transferred from cotton farm to groundnut farm, the MRT of cotton into groundnut is initially -5.0. This means that in order to increase groundnut by ten unit, the firm must reduce cotton by 5 units. Transferring one more worker to groundnut will increase groundnut by 10bags and the MRT to -3.3. Adding a third worker gains 10 bags of groundnut but losses' 5 bags of cotton. and so the MRT is -2.0. You will observe that, successive transfers of labor from cotton to groundnut reduce the absolute ratio in which we can trade off cotton for groundnut. The MRT shows us the trade-off between cotton and groundnut. Hence, the MRT must be the slope of the production possibility curve. It tells us how much of one good the firm can produce when it sacrifices production of the other good. Because MRT is always negative, the production possibility curve slopes downward reminding us that when production is efficient, output of one good can be increased only if the output of the

other good is reduced. MRT is the slope of the PPC. The MRT also tells us why the production possibility curve is curved outward as in figure 12.1. Initially, we can get a lot of extra groundnut by reducing cotton output a little. The MRT is, a large negative (-5.0) As we add successive amounts to the groundnut, the MRT becomes a smaller negative number because of diminishing marginal productivity in both products. Hence the slope of the production possibility becomes flatter as we move to the left.

3.3 Isorevenue line

To find the equilibrium level of a firm producing two goods, we need to derive the isorevenue line. An isorevenue line is the locus of all points of various combinations of quantities of Q_1 and Q_2 whose sale yields the same revenue to the firm. Since output price do not change irrespective of the quantity of output sold, the isorevenue line is a straight one. The isorevenue line for given total revenue can be determined by joining the extreme values of Q_1 and Q_2 as shown in figure 12.3. The extreme values of Q_1 and Q_2 axes are obtained by dividing total revenue by the unit prices of Q_1 and Q_2 respectively. The location of isorevenue line depends on the magnitude of total revenue. For example the isorevenue line for total revenue of N2000.00 lies to the right of the one for N1500.00 while that of N1 000.00 lies closer to the origin. Assuming the out prices of 0_1 and Q_2 are N100.00 and N200.00 respectively, The extreme value for Q_1 with N2000.00 total revenue is 20 while that of Q_2 is 10. If the output prices do not change, such isorevenue lines shown in figure 12.3 will be parallel to each other implying that the slopes of these isorevenue lines are the same.

Exercise 12.4 Construct the isorevenue line for a total revenue of N300,00 when price per unit of product X and Y are N60.00 and N50.00 respectively.

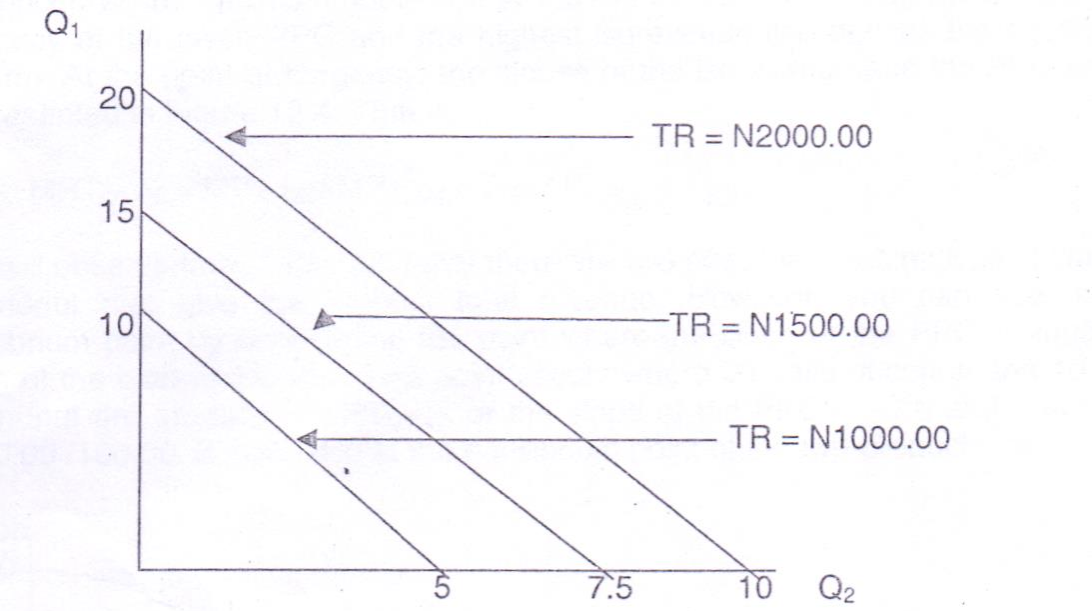

Figure 12.3 Isorevenue line

The ratio of the output prices determines the slope of the isorevenue line. The slope of the isorevenue line is given by - P_1/P_2. This implies that the slope of the line is the ratio of the output prices with a negative sign attached because the line slopes downwards to the right.

3.4 Equilibrium level of a two – product firm

With a given combinations of output obtainable from a fixed level of input, the output combination that gives the maximum revenue can be determined by computing the total revenue for each possible combination. This is illustrated using Table 12.2. Assuming the unit price of cotton is N 1 00 and that of groundnut is also N 100, the total revenue for
each combination is shown in column three.

Table 12.2 Total revenue from different production possibilities

Cotton	Groundnut	Total revenue
40	0	4000
38	10	4800
35	20	5500
30	30	6000
20	40	6000
0	45	4500

You will observe that the maximum revenue of N6000.00 occurs with output combination of 30 units each of cotton and groundnut or 20 units of cotton and 40 units

of groundnut. Based on the prevailing market prices of the two commodities, all other combinations give lower total revenue.

The revenue maximizing output combination can also be determined using the PPC, the unit prices of the two commodities and the isorevenue line. Graphically, the point of tangency of the given PPC and the highest isorevenue line defines the equilibrium of the firm. At the point of tangency, the slopes of the isorevenue and the PPC are equal as presented in Figure 12.4. That is:

$MRT_{Q1\ Q2} = MP_{L,\ Q2}/MP_{L,\ Q1} = P_{\ Q1}/P_{Q2}$

You will observe from Table 12.2 that there are two possible combinations of cotton and groundnut that give the highest total revenue. However, you can determine the equilibrium point by considering the point where the slope of the PPC is equal to the slope of the isorevenue line. This point occurs where 20 units of cotton and 40 units of groundnut are produced. MRT 01 02 or the slope of the PPC is -1.0 and P 01 / P 02 or N100.00/100.00, is also -1.0 at the equilibrium point of the two-product firm.

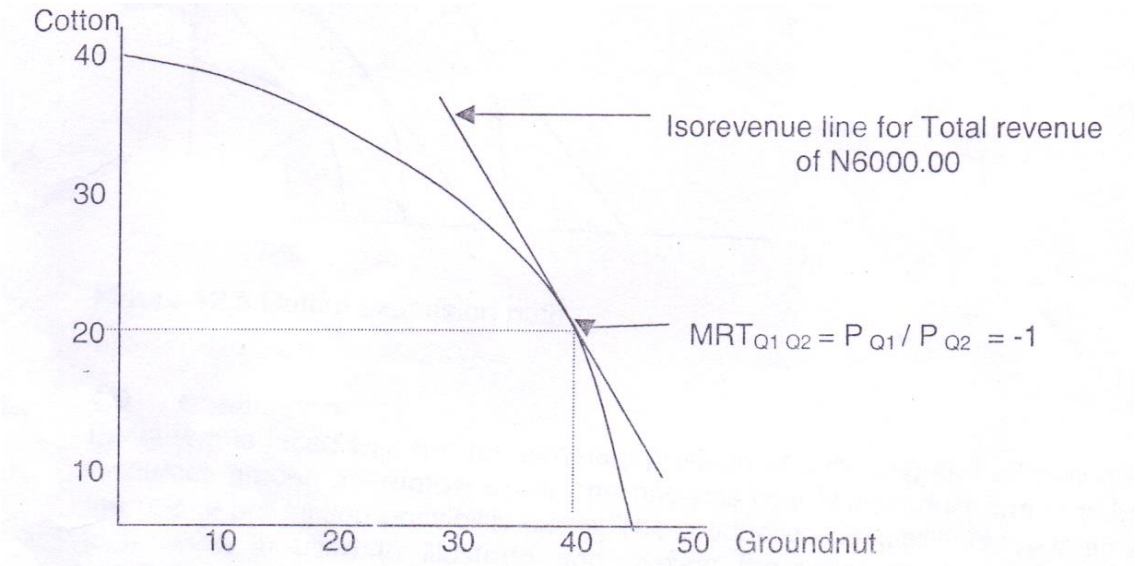

Figure 12.4 Equilibrium of the two-product firm

3.5 Expansion path of a two – product firm

Production possibility curve is affected by the same factors that affect the production function. For example, a change in technology or the intensity of use of inputs can cause a shift in the production possibility curve. Intensity in the use of factor input will result in an upward shift of the production possibility curve implying that output of both goods could be increased without sacrificing units of the other. On the contrary, reduction in the use of factor input will result in downward shift of the PPC, that output of both goods will have to decline. Based on the relative prices of these goods, the location of the isorevenue lines could also change resulting in different points of tangency between the various PPC and the corresponding isorevenue line. If you join all the points of equilibrium of a the firm, you will get what is referred to as the output expansion path as indicated in figure 12.5. the expansion path is a line that determines the output combinations that gives the maximum revenue at various levels of factor inputs. At each point on the expansion path, the slope of the PPC is equal to the slope of the corresponding isorevenue line.

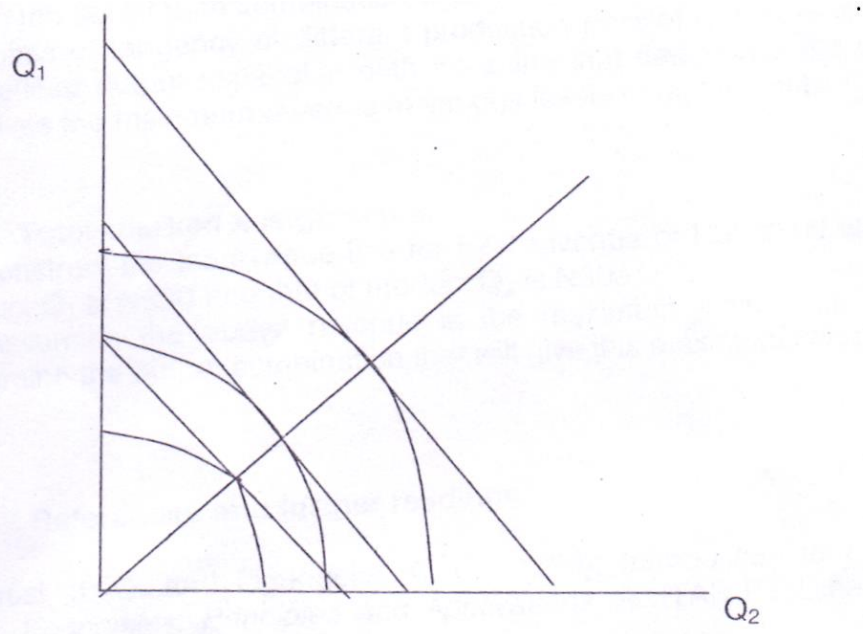

Figure 12.5 Output expansion path

4.0 Conclusion

Every firm is faced with the fundamental problem of choosing and allocating its scarce resources among alternative uses. The analysis of a two-product firm is enhanced by the use of production possibility curve. The production possibility curve is an analytical tool,

which is used to illustrate and explain the problem of choice of enterprise combinations. Based on some underlying assumptions, the equilibrium of a two-product firm using limited amount of factor inputs can be derived.

5.0 Summary

The unit looked at the analysis of production function involving two products. We considered the various concepts of output combinations with limited resource base and how firms reach equilibrium output combination based on the PPC, unit prices of the goods and the isorevenue line of the firm. We defined production possibility curve as the various combinations of two goods that can be produced using fixed amount of inputs. We also deduced that a change in the total available factor input will shift the production possibility curve. Intensity in the use of factor input will result in an upward shift of the production possibility curve implying that of both goods could be increased without sacrificing units of the other. The slope of the production possibility curve is defined in terms of marginal rate of product transformation. The rate of transformation of one good for another is the amounts of one good that must be reduced to increase the amount of the second good and still remain on the same production possibility curve. We also defined isorevenue line as the locus of all points of various combinations of quantities of two goods whose sale yields the same revenue to the firm. A two-product firm is said to be at equilibrium if the slope of the production possibility curve is equal to the slope of the isorevenue line. Finally, we considered effect of changes in the resource base of the firm on the equilibrium combination of products. We derived output expansion path from the points of tangency of different production possibility curves and isorevenue lines. We defined output expansion path as a line that determines the output combinations that gives the maximum revenue at various levels of factor inputs.

6.0 Tutor-marked assignments

a). Construct the isorevenue line for total revenue of N3000.00 when price per unit of product $\mathbf{O_1}$ is N500 and that of product O_2 is N300.

b). Assuming the above revenue is the maximum a firm can attain, how will you

determine the output combination that will give this maximum revenue.

7.0 References and further readings

Olukosi, J. O. and Ogungbile, A. O. (1989); *Introduction to Agricultural Production Economics: Principles and Applications.* AGITAB Publishers Ltd., Zaria-Nigeria. Pp. 71-93

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UNIT THIRTEEN: FIRMS SHORT RUN COST

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1.0 Introduction

Producing units come in many forms and sizes, ranging from one-man firm to the giant corporations. The basic similarity in their production operation is that they all employ capital, labor, raw material and other inputs. The various types and characteristics of

these factors of production have been mentioned in unit 1. The cost of producing a good depends not only on factor prices but also on what quantity of each factor is used in production; this in turn depends on the method of production. Most importantly, the production of goods and services generally requires time. Therefore, output level must be determined on some recognized period of time. Accordingly, the cost incurred in the production process must be equally be specified per unit of time. Therefore in conceptualizing cost, we must first of all identify clearly the period of time over which they apply. Analysis of cost theory is therefore based on the period of time in which cost can be varied. A distinction is therefore made between the short run and long run cost upon which the analysis is often applied. This unit will focus on the theory of cost in the short run.

Exercise 13.1 What are the components of cost in the short run?

2.0 Objectives

This unit analyzes the theory of costs in the short run. It is hoped that after studying the unit, you should be able to

1. Define short run total costs, total fixed costs, total variable cost
2. Illustrate, with the aid of a diagram average fixed cost, average variable cost and marginal costs.

Differentiate between the short run costs curves.

3.1 Short – run total cost

The short run is a period of time over which certain factors of production cannot be changed as production is altered. That is, in the short run there are certain inputs whose usage cannot be changed regardless of the level of output. Accordingly, short run costs normally represent a situation where the costs of certain factors of production remain fixed as others change in line with changes in production. The analysis of cost in the short run depends on two propositions, i) the physical condition of the production inputs and the unit price of the inputs used in the production process and ii) the components of fixed and variable costs. The various components of short run costs are discussed below.

3.1.1 Total cost: Total cost (TC) of production is all expenses incurred in the process of production. The total cost of production in the short run may be divided into two components, total fixed cost and total variable cost. .

3.1.2 Total fixed costs: By fixed inputs we mean factors of production whose quantities cannot be varied during the period under consideration. The total fixed cost (TFC) is simply the sum of unit prices of the fixed inputs multiplied by the number of units used. Fixed cost, is a short run concept since in the long run, all costs are variable. Fixed costs have to be incurred by the firm even if production is at zero level. Fixed costs are cost over and above the usual expenses of production and are therefore described as overhead cost. For example, once a farmer has acquired land and borrowed capital for farming, whether he farms that year or not, the cost of renting the land and the interest on the borrowed capital remained the same. Other examples of fixed cost are depreciation charges, wages and salaries, etc.

3.1.3 Total variable costs: Total variable costs (TVC) are expenses of production that vary with changes in the firm's output. These costs are also referred to as direct cost because they vary directly with the level of output. The total variable cost is the amount spent for each of the variable input used. Examples of variable costs are expenditure on labor, fertilizer, seed, component parts of machinery etc. Increasing or decreasing the level of variable inputs used in a given production period will increase or decrease output.

3.2 Relationship between total costs, variable costs and fixed costs

In establishing the relationship between the total, fixed and variable costs, our illustrations will be based on the cost components of a cotton farm in the short-run. Suppose the cotton farmer has a tractor and a farmland (one hectare) as components of, his fixed assets. Let's assume the annual depreciation from the tractor is N500.00 and the

rent for farmland is N700.00/hectare in a season, the total fixed cost for this farm is, therefore, N1200.00. This cost is the same irrespective of the level of production as reflected in column 2 of Table 13.1. Variable inputs must be used if production must exceed zero. Assuming the total costs of cottonseed, fertilizer, hired labor and agro-chemicals constitutes the total variable cost. The entries in column 3 represent the total variable costs at different levels of output. An increase in the level of output requires an increase in the usage of variable input and thus increases in the total variable costs as reflected in column 3 of the above Table. Summation of the total fixed and total variable costs gives the total cost of production as indicated by the entries in the last column.

Exercise 13.2 Define the following short cost components: TC, TFC and TVC.

Table 13.1: Total fixed cost, total variable cost and total cost of cotton production (Naira/hectare).

Quantity of output	TFC	TVC	TC
0	1200	0	1200
1	1200	500	1700
2	1200	950	2150
3	1200	1050	2250
4	1200	1150	2350
5	1200	1280	2480
6	1200	1500	2700
7	1200	1850	3050
8	1200	2370	3570
9	1200	2970	4170
10	1200	3820	5020

A clearer illustration of the behavior of costs described in Table 13.1 can be depicted in graphical format as shown in Fig. 13.1. From the figure, we can observe that the total fixed cost curve is parallel to the output axis indicating that the costs are the same irrespective of the output level. In our example above, the total fixed costs remained at

N1200.00 for every output level. The shapes of the total variable costs and the total costs curves are similar and they move together in the same direction and in a sense, parallel to each other. This is to say that the change in the TVC and TC curves are the same for every change in the level of production. For instance, if the level of output change from 5 to 6 bags, the TVC will change from N1280.00 to N1500.00 that is N220.00 difference while the TC will also change from N2480.00 to N2700.00, giving the same N220.00 difference.

A vertical distance equivalent to N 1200.00 separates the TC and TVC curves. That is, the total fixed cost. The total cost cuts the output axis above the origin indicating TC cannot be zero because even when no output is produced the farm has to incur fixed cost. The TVC, however, starts from the origin, because when output is zero, the TVC is also zero. Both the TVC and TC curves have inverted S shape and rise continuously from left to right indicating that with increasing output levels, these costs components also increases.

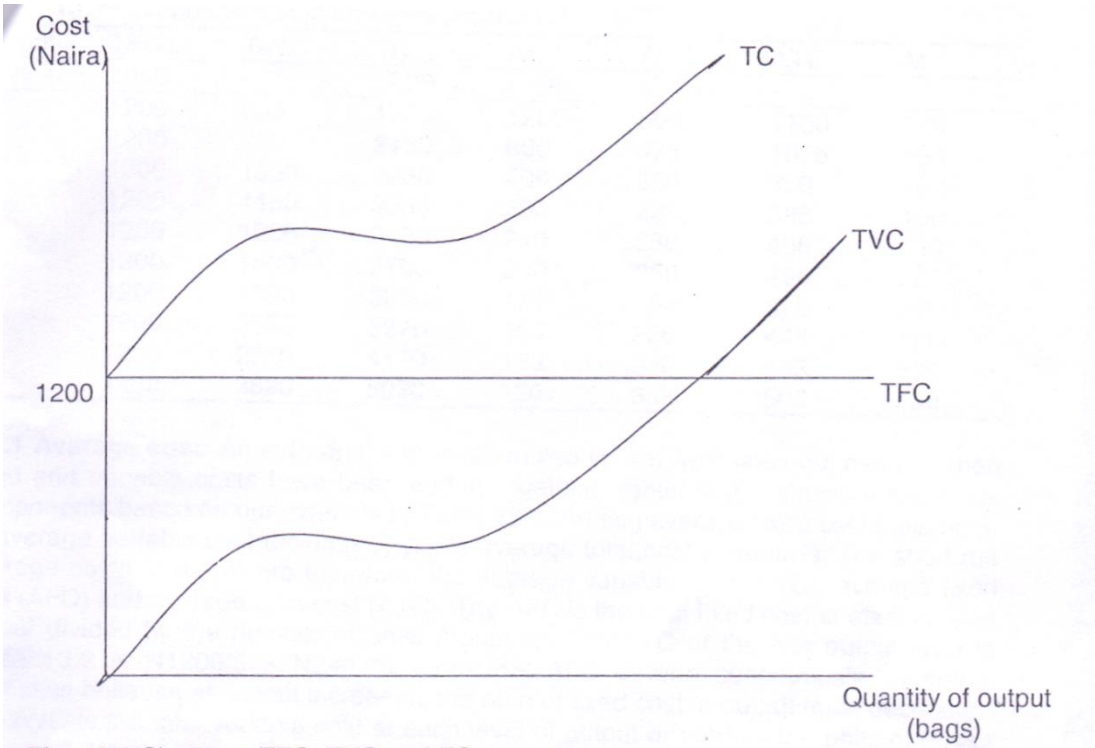

Fig. 13.1 Short-run TFC, TVC and TC curves.

The inverted S-shape of the *TVC* and TC reflects the law of variable proportion which states that when the quantity of -variable factor is changed while keeping the quantities of other factors fixed, the productivity of the variable factor increases and its cost reduces but after some time until an optimal combination of the fixed and variable factor is reached after which the productivity of the variable factor declines and their cost rises steeply. You will observe in Table 13.1 that, with the first four levels of output, TFC is higher than *TVC* and *TVC* is increasing at a decreasing rate. With the use of more variable factors in proportion to the fixed inputs, the *TVC* begins to rise steeply.

Exercise 13.3 Define the law of variable proportion.

3.3 Average and marginal costs

Having considered the major components of cost in the short run, we will now look at the behavior of these costs components in terms of their response to changes in output levels. We will be looking at the average and marginal costs of producing an additional unit of output and how it enhances understanding of cost concept in the short-run.

Output	TFC	TVC	TC	AFC	AVC	ATC	MC
0	1200	-	1200	-	-	-	-
1	1200	500	1700	1200	500	1700	500
2	1200	950	2150	600	475	1075	450
3	1200	1050	2250	400	350	750	100
4	1200	1150	2350	300	288	588	100
5	1200	1280	2480	240	256	496	130
6	1200	1500	2700	200	250	450	220
7	1200	1850	3050	171	264	436	350
8	1200	2370	3570	150	296	446	520
9	1200	2970	4170	133	330	463	600
10	1200	3820	5020	120	382	502	850

3.3.1 Average cost: An individual firm is interested in how he comes out overall, when fixed and variable costs have been added together. Table 13.2 shows these costs components based on our example in Table 13.1. Adding average fixed cost (column 5) to average variable cost (column 6) yields average total cost (column7). The short run average costs of a firm are therefore, the average variable cost (AVC), average fixed cost (AFC) and average total cost (ATC). The AFC is the total fixed cost at each level of output divided by the number of units produced. The AFC of the fifth output level in Table 13.2 is *N1200/5* = N240.00. Note that AFC decline continuously as output increases because as output increases, the ratio of fixed cost to output must decrease. The AVC is the total variable cost at each level of output divided by the units of output produced.When two units of output is produced the AVC in our example above is *N950/2* = N475.00. For the first five units, AVC decline with the level of output but subsequently, they begin to rise in response to the law of diminishing return.

The ATC is the sum of AFC and AVC. This is the per unit cost of producing each level of output The total cost at each level of output is obtained by dividing the total cost by the number of units produced. We want to know how AVC behaves as output expands. The common situation is that AVC will first decline, reach a minimum and rises thereafter. In our example above, AVC continue to decline up to the 7^{th} unit, which is the minimum, and rises thereafter up to the 10^{th} unit. Over the range of values for which both AFC and AVC decline, ATC must obviously decline as well. However, when AVC begin to rise after the 7^{th} unit, the marked decrease in AFC causes ATC to continue to decline up to the 8^{th} unit after which it begin to rise.

3.3.2 Marginal cost: A fundamental concept for the determination of the exact level of output of a firm is the marginal cost (MC). MC is the additional to total cost by producing an additional unit of output. Since fixed cost does not change with output. Marginal fixed cost (MFC) is zero. MC can therefore be calculated either from the TVC or TC. MC is obtained by subtracting successively the entries in the TC column. For instance, the MC of the third unit of output is given as; $MC_3 = TC_3 - TC_2 = 2250 - 2150 = 100$. MC

may also be computed by successively subtraction of the entries in the TVC column. Thus marginal cost of the third unit is also; $MC_3 = TVC_3 - TVC_2 = 1050 - 950 = 100$. The MC decreases with output, reaches a minimum and then rises thereafter. With a given plant size, varying other factors at the initial stage might cause the extra cost to decrease gradually as production steppes up. However, beyond a certain plant capacity, as the firm tires to get more and more output from the same plant, marginal cost must eventually begin to rise. MC is thus, decreasing when total cost is increasing at a decreasing rate, it reaches a minimum and starts rising when TC starts increasing at an increasing rate.

Exercise 13.4 Explain the relationship between the short run marginal cost and the average cost curves.

3.4 Relationship between short – run AFC, AVC, ATC and MC Curves

Graphically, the AFC is a rectangular hyperbola, which implies that, at all points on the AFC curve, the same total fixed cost is being divided by an increasing quantity of output. The AFC decreases continuously without touching either axis.

The AVC starts to decline with increase in output, reaches a minimum, and as larger quantities of the variable factor is applied to the fixed factor, eventually, AVC begin to rise in response to the law of variable proportion. ATC has the same shape as the AVC, inverted U shape. However, the minimum point of the ATC is to the right of that of the AVC as can be observed in Fig. 13.2. The level of output at the minimum AVC is Q_1 while that of ATC is Q_2. The reason for this is that when AVC reaches its minimum and begun to rise, the marked decrease in AFC causes ATC to continue to decline. However, successive increases in the AVC may become so strong and more than offset the fall in the AFC such that the ATC begins to fall. As AFC approaches the quantity axis, the AVC approaches the ATC. This is expected because as more and more units of output is produced the AFC becomes smaller and smaller and thus the AVC approaches the ATC.

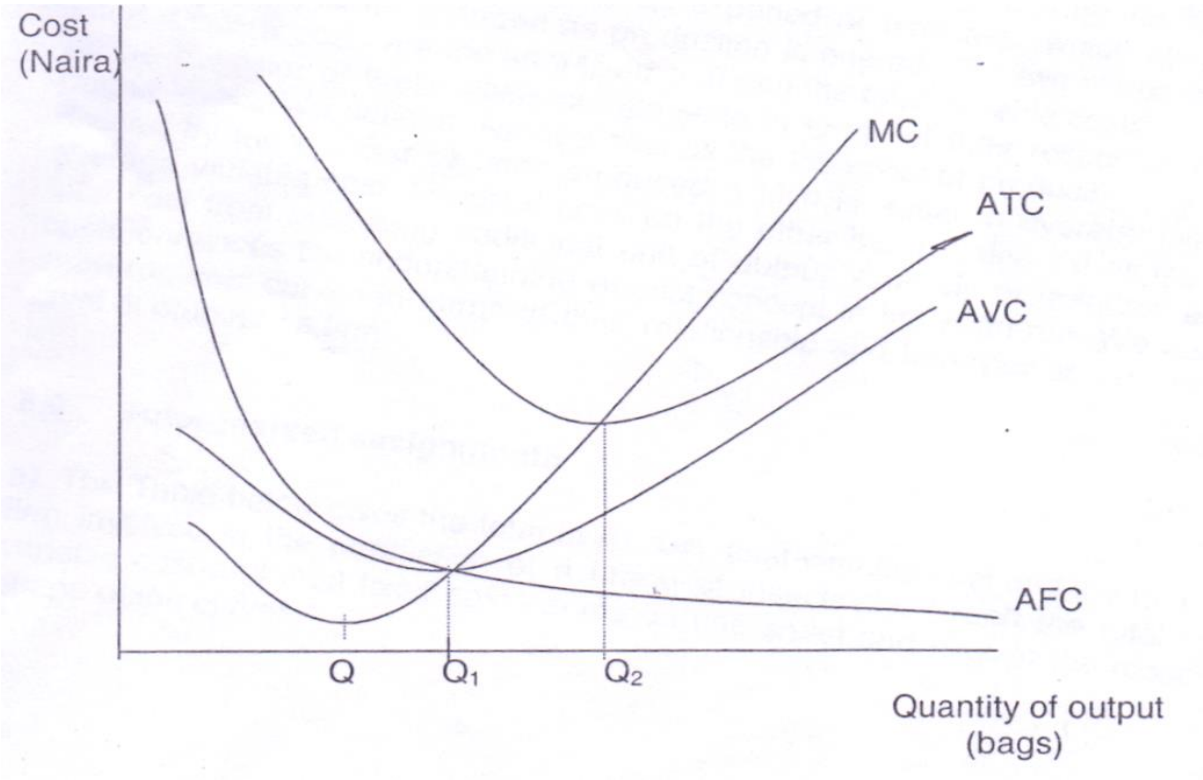

Fig. 13.2. Average and marginal cost curves.

The MC curve is U-shaped like the AVC and ATC curves. The MC curve first decreases, reaches its minimum and then rises thereafter. MC is decreasing when total cost is increasing at a decreasing rate it reaches a minimum and starts increasing when TC starts increasing at an increasing rate. MC is equal to the AVC and ATC at the minimum paints of the AVT and AVC. In other words, the MC must cut AVC and ATC at their minimum paints.

4.0 Conclusion

Time plays an important role in the decision making process of a firm. It is on this basis that economists talk about short and long run period of production. The short run period of a firm is the period within which only variable factors of production can be varied in response to market changes in the demand for the firm's product. Since firms strive to maximize their profit, which is the difference between costs and revenue, the analysis of costs and how these vary as output varies is very important. A good understanding of

short-run cost concepts enhances firm's decision-making, not only in the short-run but also in the long-run planning horizon.

5.0 Summary

This unit covered a number of issues on short-run' cost concepts. We shall now summarize the basic points that have been considered in analyzing theory of cost in the short run. We defined a short-run as a period of time over which certain factors of production cannot be changed as production is altered. The two major components of short-run total costs are the total fixed cost and the total variable costs. We also looked at the behavior of these C0StS components in terms of their response to changes in output levels. We defined average cost as the total cost of producing any given output divided by the number of units produced, which is equal to average fixed cost plus average variable cost. Marginal cost, on the other hand is defined as the increase in total cost from producing additional unit of output. Analysis of marginal and average costs enhances the understanding of cost concept in the short-run. We also analyzed short-run cost curves in terms of their relationship and behavior as they influence the level of output of a firm.

6.0 Tutor-marked assignment

a). The Table below gives the total fixed cost, total variable cost and the total cost of a firm involved in the production of a brand of insecticide. Graph the total cost, total variable cost and total fixed cost curves on one sheet and explain the reason for the shape of the curves.

Table 1 cost components of a firm producing insecticide

Quantity	Total fixed cost	Total variable cost	Total cost
0	100	0	100
1	100	40	140
2	100	50	150
3	100	55	155
4	100	65	165
5	100	85	185

6	100	120	220

b) what is the relationship between the quantity of fixed inputs used and the short run level of output.

7.0 References and further readings

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UNIT FOURTEEN: FIRM'S LONG RUN COST

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1.0 Introduction

In the previous unit, we emphasized that production level must be specified per unit of time and therefore the analysis of costs concept must be based on the period of time over which they apply. A distinction is usually made between the short run and long run costs depending on the extent to which they can be varied. The conventional definition of long run is a period of time of such length that all inputs, and invariably, all costs are variable. There are no fixed factors of production; as a result, there are no fixed costs in the long run. Usually production takes place in the short run while the long run is considered as the planning period. Thus the long run consists of all possible short run situations from which a firm can choose. In this unit you will be learning a number of important concepts of cost in the long run and theories on how the various components of cost vary with output.

Exercise 14.1 Explain the difference between the long run and short run of a firm

2.0 Objectives

This unit analyzes the theory of costs in the long run. It is hoped that after studying the unit, you should be able to

1. Define long run total costs, average cost and marginal cost.
2. Illustrate, with the aid of a diagram the derivation of long run average cost curve from short run average cost curves
3. Differentiate between the short run and the long run average and marginal costs.
4. Derive the long run cost curves from the short run cost cureves

3.1 The Long run total cost

As we defined earlier, the long run is a period during which all inputs (and thus all costs) can be varied. Therefore by definition in the long run, there is no fixed costs. That is all long run costs are variable costs. We can therefore infer that the long run total cost is the same as the total variable cost since all costs are variable in the long run. Total variable cost as defined in the previous unit is the total expenses on variable inputs. This cost varies with the level of output produced. That is the higher the unit of output, the higher the total variable cost.

3.2 The short run and the long-run average costs

The average cost is the total cost divided by the unit produced. The short run average cost (SAC) is the per unit cost of producing each level of output from the same plant size while the long run average cost is the per unit cost which could be attained when plant and equipment can be varied. Since all costs are variable in the long run, the long run average variable cost (LAVC) is the same as the long run average total cost (LAC). The SAV and the LAC curves bear a definite relation to each other. More specifically, long-run average cost (LAC) curve can be derived from a series of short-run average cost curves. As mentioned earlier, the long run is usually a planning horizon while the actual operation is carried out in the short run. That is, each of the short run cost structures represents a given plant size or plant capacity, from which the firm chooses the scale to operate.

To illustrate this concept, let's assume that the technology available to a firm at a particular period of time include three methods of production, each with different plant size, small, medium and large plant sizes. "Let's further assume the small plant operates on a short run average cost (SAC_1) structure indicated in Fig. 14.1. The medium and large size plants have short run average curves given by SAC_2 and SAC_3 respectively. In the long run, the firm has to choose among the three methods of production.

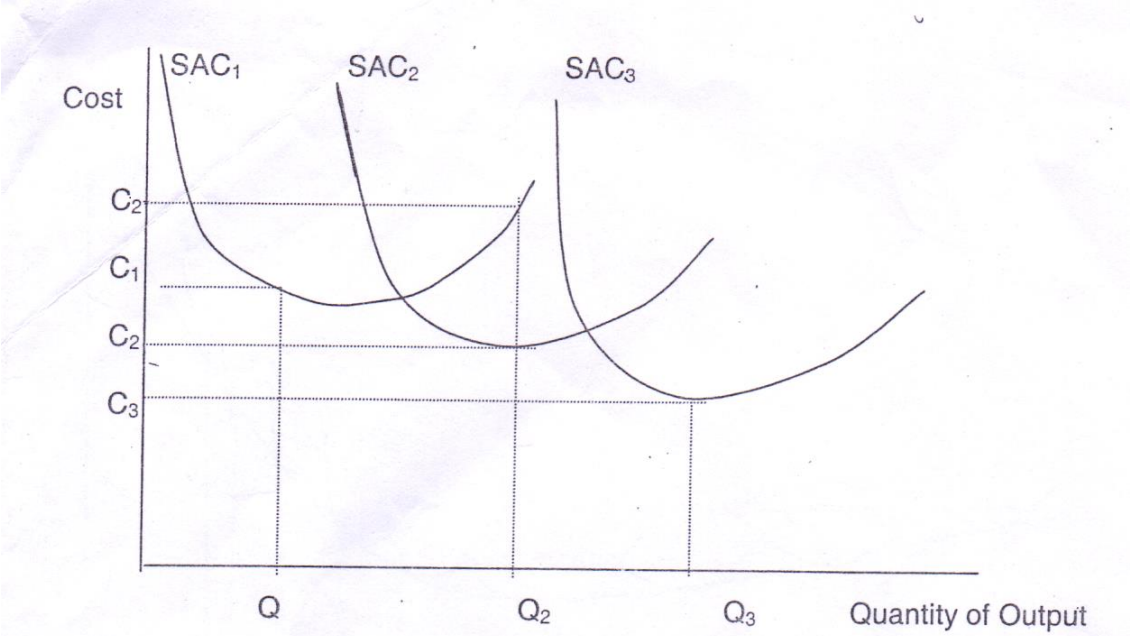

Fig. 14.1 Short run average cost curves for firms of different sizes

Suppose the firm intends to produce output Q_1, it will use the small plant with SAC_1 thereby incurring the minimum average cost of C_1. But the demand for the product turns out to be higher than expected, and the firm wants to expand production to Q_2 instead. This level of output can be obtained from the small or medium plant size. Thus the firm can either operate on SAC_1 or SAC_2. However, the unit cost (C_2*) of producing output Q2 on the small plant size (SAC_1) is higher than what will be incurred (C_2) should the producer operates on SAC_2. A rational producer would allow enough time to build additional capacity (medium plant size) which will produce the expected output at the lowest unit cost. Thus the firm would operate on SAC_2. Similarly, to produce Q3, the larger plant size with SAC_3 curve would be adopted because the least cost (C_3) will be incurred. It is important to note that, in the short run, the producer must operate within the respective short run curves for each plant size. In the long run, however, he can

plan to build the plant whose size leads to the minimum unit cost of producing each possible output.

Exercise 14.2 Differentiate between the short run average cost curves and the long run average cost curve.

3.3 Derivation of long run average cost curve

If we relax the assumption of three plant size in the example. above, and assume that the available technology includes many plant sizes, each suitable for a certain level of output, we obtain a series of short run curves with minimum points which generate the planning LAC curve of the firm (Fig. 14.2). The LAC curve is the locus of points denoting the least unit cost of producing the corresponding output. All the possible short run curves of the firm are tangent to the LAC curve. The LAC curve is a planning curve because on the basis of this curve the firm decides what plant to set up in order to produce optimally the expected level or output with the least unit cost.

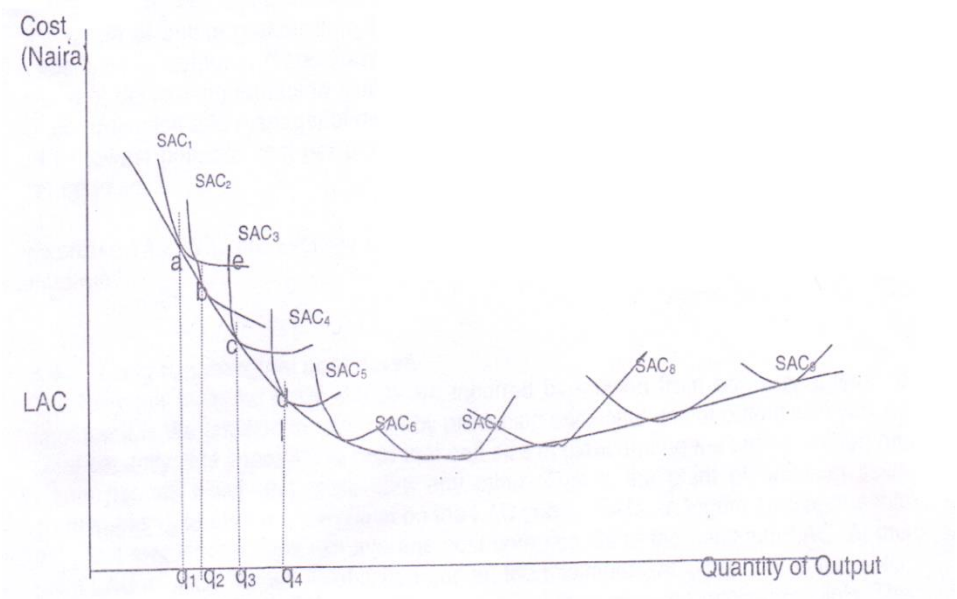

Fig. 14.2 Derivation of long-run average cost curve

At each point on the LAC, the firm is producing a given output at minimum cost. By definition therefore, the LAC curve describes the minimum cost-way to produce each

output when all factors can be freely varied. Thus points a, b, c and d on the LAC curve represents the minimum average cost for producing quantities q_1, q_2, q_3 and $q_4$respectively. Based on this understanding, the firm will be operating at a higher average cost, at point e, if he produces q3 while operating on SAC_2. We can infer from this illustration that for any rate of output, you can get a lower unit cost if you have time to adapt your plant capacity to that rate of output. Thus any point on the short run curves above the LAC curve describes a higher unit cost of production while any point below the LAC is economically desirable because it implies a lower unit cost. But point below LAC is not attainable based on the available plant size and factor prices. The implication of this is that, in the long run the firm can vary all its factors and will generally be able to produce a particular output more cheaply than in the short run with the same quantity of fixed plant.

Just like the short run average cost curve, the long run average cost curve is equally U-shaped. We established the fact that the U-shape of the SAC is due to the law of variable proportion. However, in the long run, the shape of the average cost curve reflects the law of returns to scale. The basis of this law is that, as output expands from very low levels, increasing returns to scale causes the unit cost of production to decline initially, but as output continue to expand, diseconomies of scale may become apparent, causing the LAC to rise. The LAC curve in Figure 14.2 is shown as falling over the range of output from zero to Q. At this stage, expansion of output results in a reduction of per unit cost because output expands faster than input as the scale of the firm's production expands. This stage is called increasing return to scale or economies of scale resulting from specialization and other advantages of large-scale operations. Over the range of output greater than 0, the firm encounters increasing costs because an expansion in output is proportionately lower than the expansion in inputs. This is the stage of decreasing returns to scale or diseconomies of scale resulting from difficulties of co-ordination and managerial diseconomies of scale. However, at point 0, the firm is at its lowest possible cost per unit of output and this stage is referred to as constant return to scale.

Exercise 14.3 Why are average curves are U-shaped, both in the short run and in the long run? .

3.4 Long run marginal cost curve

The long run marginal costs (LMC) are incurred by moving from one output level to another. It is the addition to total cost by producing additional unit of output with varying plant capacity. It is important to note that one size of plant among the series of short run plants permits lower unit costs than any other. This is the plant of optimum scale corresponding to the minimum point on the LAC curve. SACM in Figure 14.3 represents the plant size whose minimum average cost corresponds to the minimum LAC. At this point LAC = SAC_M. As we established earlier, the minimum SAC_M is equal to the SMC, thus SACM and SMC curves are tangent to LAC at their common minimum points. The long run marginal cost (LMC) is therefore obtained by drawing a perpendicular line from the points of tangency of the SACs and the LAC to the SMCs. This relationship is illustrated in Figure 14.3. You will notice in Figure 14.3 that the LMC pass through the minimum point on the LAC. At output level 00, in Figure 14.3, the firm will be operating at optimum scale with the lowest unit cost. At this point, LMC = LAC = SAC M = SMC_M. This is an optimum position, because unit production costs are at the lowest permitted by existing factor prices and technical knowledge.

There are two special features of the relationship between the LAC and the LMC. First the LAC is declining whenever LMC is lower and rising whenever Uv1C is higher than LAC. Secondly, the LMC curve cuts the LAC curve at the minimum point of the LAC curve. That is, at the point where output is produced at the lowest unit cost. After this point, the LMC rises above the LAC. We defined marginal cost as the addition to total cost by producing one more unit, while average costs is the per unit costs of all units produced up to that points. Thus, LMC rises faster than LAC because the latter is being pulled down by the lower costs of earlier units included in the average.

For an expansion of output beyond 00, the perpendicular line from the point of tangency of the SACs and the LAC touches the SMCs above the LAC curve indicating that LMC

at these points is higher than the SMCs. At point 00_2 in Figure 14.2, the LMC is higher than the SMC as indicated by the perpendicular line connecting the LMC and the corresponding SMC curves. In the long run, after the optimum plant size might have been reached, cost may be reduced by a greater amount because inputs are optimally allocated. Hence, the change in long run total cost is greater than the change in short run total cost and, therefore, long run marginal cost exceeds its short run counterpart.

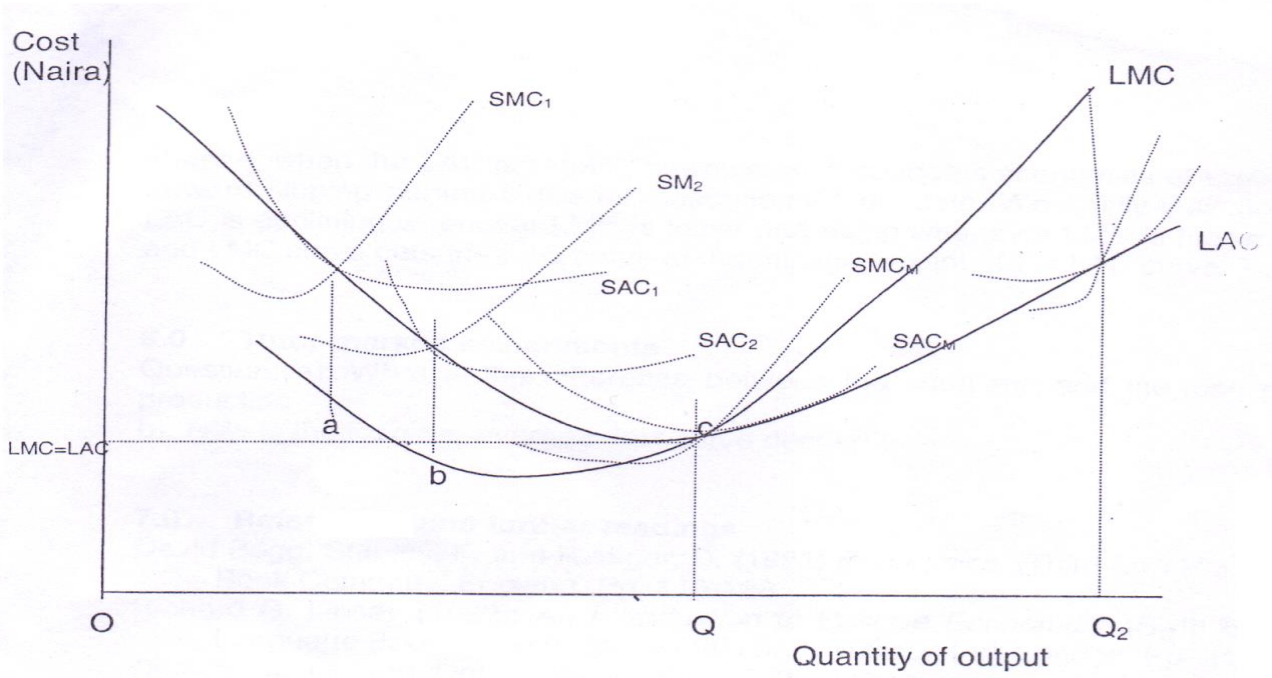

Figure 14.3 Long run average and marginal cost curves.

4.0 Conclusion

The physical conditions of production and resource price jointly establish the cost of production. A detailed knowledge of the costs of production is essential to the individual firm and the economy as a whole. In this unit you have learnt a number of important concepts of cost in the long run and how it influence the firm's production decision. We established the fact that short run is the period of operation while long run is a planning period. Thus, the firm's long run decision focuses on the determination of which size of plant to build based on the short run operation. The general criteria for selecting the plant

size to operate will usually be based on the optimum position where unit costs are at the lowest point permitted by existing factor prices and technical knowledge.

5.0 Summary

This unit has dealt with the concept of cost in the long run. The following basic points were considered. We defined long run as a period of time of such length that all inputs, and invariably, all costs are variable. We indicated that the long run total cost is the same as the total variable cost since all costs are variable in the long run. We also established the 'fact that the long average cost of the firm can be obtain from the minimum points of a series of short run curves. We defined the LAC curve as the locus of points denoting the least unit cost of producing the corresponding output. We noted that in the short run, the producer must operate within the respective short' run curves for each plant size. In the long run, however, he can plan to build the plant whose size leads to the minimum unit cost of producing each possible output. LAC is typically U- shaped. When the LAC is sloping downwards. It connotes. Economies of scale while the upward sloping portion indicates diseconomies of scale. We finally indicated that the LAC is declining whenever LMC is lower and rising whenever LMC is higher than LAC and LMC curve cuts the LAC curve at the minimum point of the LAC curve.

6.0 Tutor-marked assignments

Question: a). What is the difference between the short run and the long periods of production

b). How is the long run average cost curve derived?

7.0 References and further readings

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UNIT FIFTEEN: MARKET STRUCTURE

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Introduction

We have developed the principles of production and the general cost relationships that are derived from the production process. Any firm making production decisions will relate potential or forecasted revenues to these costs in order to determine output levels. However, these decisions will depend on the market condition faced by the firm traditionally. Economists found it useful to classify markets into four broad types: Perfect competition, Monopoly, Monopolistic competition and oligopoly. This unit will focus on the concepts of market, firm and industry and also differentiates between the various market structures and their characteristics

2.0 Objectives

After studying the materials in this unit, you should be able to distinguish between the various types of market structures and also be able to do the following.

1. Understand better the concepts of market, firm, and industry.
2. Identify the various types of market structure; and

3. Describe the features of each of the market structures.

3. L Concept of Market, Firm and Industry

3.1.1 Market: A market may be defined as an area over which buyers and sellers negotiate the exchange of well - defined commodity. A market can also be viewed as a set of arrangement by which buyers and sellers are in contact to exchange goods and services. Market brings together buyers and sellers of goods and services. Whether the buyers and sellers meet physically or not, a market Performs the economic function of price determination and output policies.

Markets are separated from each other by commodity sold, natural economic barriers and barriers created by the central authorities (government). Individual markets differ from each other in many ways. The type of commodity sold or the nature of competition within the market can distinguish markets. Goods markets are those where goods and services are bought and sold. The sellers are the firms and the buyers are households and central authorities. The factor markets are those where services are bought and sold. The sellers are the owners of factors of production (usually households, but sometimes firms); the buyers are usually firms and the central authorities. Individual markets may differ from each other to the degree of competition among the various buyers and sellers in each market. In this respect we have competitive markets, monopoly, Monopolistic competition and oligopoly markets.

Exercise 16.1 How do we distinguish between markets?

3.1.2 Firm: Economists use the terms producer, supplier and firm interchangeably. A firm is defined as the unit that employs factors of production to produce commodities that it sells to other firms, households and government. This single concept of the firm covers a variety of business organizations, from the single proprietorship to the joint stock company. The two major attributes of a firm are:

1. Firm's takes single consistent decision and these decisions are taken in order to

achieve the common goal of maximizing profit.

2. Firms are the principal users of the services of factors of production. For instance, in factors markets, firms do the buying and households do the selling; and

3.1.3 Industry: Industry is a group of firms producing the same, or at least similar products. The difficulty with this definition centers on the degree of dissimilarity allowed before the two products are thought of as being produced by different industries. Consider the container industry. Are firms producing glass bottles and aluminum cans similar enough to be included in the same industry?

The problem is even more difficult if we consider, that some multi product firms produce variety of goods that might be included in different industries. In what industry should we put a firm that produces coffee in addition to soap? Informed judgments and somewhat arbitrary definitions are necessary in order to move from the world of theory into the real world of industrial studies.

3.2 Elements of Market Structure

Market structure means those characteristics of markets that influence the behavior and performance of firms that sell in that market. Economists have group markets into four broad types based on the number of buyers and sellers and determination of output and pricing policies. The four major types of markets are perfect competition, monopoly, monopolistic competition and oligopoly. We shall briefly examine the characteristics of each of these key market structures. .

1. Perfect competition: There are a large number of firms in the industry and the product is homogenous. Competition is perfect because each firm can sell any amount of output at the prevailing market price. Implying that there are no rivalries among the individual firms.

The products are perfect substitutes for one another so that the price elasticity of demand curve of the individual firm is finite. This market structures thrives mainly on farms.

2. Monopoly: There is only one firm in the industry and there are no close substitutes for the product of the monopolist. Monopoly power is acquired when a firm has developed effective market mechanism to prevent competition or entry into the market. The demand of the monopolist firm coincides with that of the industry, which has finite price elasticity. There is a barrier to entry in a monopolistic market. Examples of this market structure are in local telephone; electricity and oil utilities, these are referred to as "natural monopolies". 3. Monopolistic Competition: There is very large number of firms, but their product is somewhat differentiated. Hence the demand of the individual firm has a negative slope, but the price elasticity is high due to the existence of the close substitutes, produced by the other firms of the industry. Entry is free and easy. Firms in the industry are neither complete monopolists nor perfect competitors. Examples of a monopolistic competition include automobile industries, textile industries, food and soap industries. A monopolistic competitive firm spends much on advertisements in order to create awareness on the particular brand whose differences in the real sense may be either real or fancied

4. Oligopoly: There is a few numbers of firms, so that sellers are conscious of their interdependence. There is a substantial barriers to entry into the industry The competition is not perfect, yet the rivalry is very high among firms, unless they make a collusive agreement. The product that the oligopoly produces may be homogenous (pure monopoly) or differentiated (differentiated oligopoly). In the later case the elasticity of the individual market demand is smaller than the former. Examples of oligopoly markets are those of automobiles, computers and aircraft industries.

3.3 Features of Perfect Competition.

The model of perfect competition is focused on the following assumptions.

a. Large numbers of sellers and buyers:-Under this condition each firm alone cannot affect the price in the market by changing its output.

b. Product homogeneity: The industry is defined by a group of firms producing a homogenous product. The assumption of large number of sellers and product

homogeneity imply that the individual firm in a purely competitive market is a price-taker. Its demand curve is infinitely elastic, indicating that the firm can sell any amount of output at the prevailing market price.

c. Free entry and exit of firms: Entry or exit may take time, but firms have freedom of movement in and out of the industry.

d. Profit Maximization. The goal of a" firms is profit maximization.

e. No government Regulation: No government intervention in the market (tariffs, subsidies rationing of production and demand and so on are ruled out). Any market where the above assumptions (a-e) are fulfilled is called pure competition though this is almost impossible in real life. It is different from perfect competition, which requires the fulfilment of the following additional assumptions.

f. Perfect mobility of factors of production. Factors of production can be moved from one place to the other.

g. Perfect knowledge: Sellers and buyers have complete knowledge of the conditions of the market. Information is free and costless uncertainty about future development in the market is ruled out.

Exercise 16.2 Define a perfectly competitive market

3.4 Features of Monopoly

A market structure, which exhibits the following characteristics, is described as a monopoly market. The assumptions underlying the monopolistic market are as follows:

a. The main feature of monopoly is that the total supply of the product is concentrated in a single firm. That is, there is a single seller in the market

b. The product may not be homogenous.

c. The-goal of the firm is profit maximization.

d. Entry into the market is restricted.

e. Perfect knowledge is assumed. However obtaining information is at an expense. Information is decided on marginalistic rules, by equating marginal cost (MC) of information to its Marginal Revenue (MR).

f. The demand of the firm is also that of the industry and hence it is negatively sloping.

The monopolistic can determine either his output or his price, but not both. Thus the monopolist has no policy variables at his disposal (product, price, research and development, advertising etc).

g. The market elasticity of demand must be greater than unity in equilibrium because the monopolist can increase his revenue by increasing his price.

h. The supply function is not uniquely determined thus the monopolist Mc curve is not its supply curve.

Exercise 16.3 what conditions might give rise to monopoly?

3.5 Features of Monopolistic Competition

Monopolistic competition is similar to pure competition in certain ways: there are many sellers and there is free entrance into the industry. The- difference is that the product is differentiated or not identical with that of another. The term monopolistic competition refers to the fact that each seller has a kind of limited monopoly for his own product. The advantage of having your own brand is that it enables you develop your own regular customers whom you hope will come back to you again. To the extent that he can gain some independence in price setting. If he cuts his price below that of others, he will gain some customers.

3.6 Features of Oligopoly

An oligopoly is an industry that contains only a few competing firms. Few enough so that each firm can keep watch on the action of his rivals. The few sellers may be selling either a homogenous product or a differentiated product. In the former case, they will normally sell at the same price while in the latter case this is not strictly necessary; but there is still strong tendency to sell at about the same price. Each firm in the oligopolistic market has enough market power to- prevent its being a price taker, but each firm is subject to enough inter-firm rivalry to prevent its considering the market demand curve as its own.

Exercise 16.4 what is the most important feature of oligopolistic market?

4.0 Conclusion

A market is where seller and buyers meet and these sellers are referred to as firms that make up an industry. Market are structured basically on the basis of the substitutability of their product, the ease of entry into the market and the degree of interdependence of the participants in each of the markets. While all these markets are based on a set of assumption, they ultimately provide criteria by which to evaluate actual market operations and practices. The next three units be devoted to the analysis of pricing and output policies in each of these market structure

5.0 Summary

Individual markets are partially separated from each other because of different commodities that are sold in each, natural barriers and policy induced barriers. We have discussed four major types of market in this unit. Perfect competition is characterized by large number of buyers and sellers homogenous products and ease of entry into and exit from the industry, the market faces a perfect elastic demand curve at the market price; monopoly is a market situation in which there is a single seller of a product with no close substitute the monopoly firm faces a negatively sloped demand curve:

Monopolistic competition is a market characterized by many producers of heterogeneous product. They produce a smaller output at higher price than firms under perfect competition. We also defined oligopoly as the market structure in which there are only a few firms producing goods that are either homogenous or heterogeneous barriers to entry are important in oligopoly just as they are in monopoly. Oligopoly takes the interdependent of firms into account in their economic decisions.

6.0 Tutor Marked Assignments

Questions:

1. Identify four different market structure
2. Enumerate two characteristics of each of the markets

3. Differentiate between a firm, an industry and a market?

7.0 References and further reading

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UNIT SIXTEEN: PRICING AND OUTPUT POLICIES: PERFECT COMPETITION

Table of contents

1.0 Introduction.

The price and the total output, or production of any product is determined by the cost of producing it and the demand for it. But the price and total production of a product also depend upon the market condition under which the product is produced, and whether we are talking about the short run or long run price and output. This unit will focus on how demand and cost determine price and output in both the short run and the long run when the product is produced by a purely competitive industry. You should, by now, be familiar with the features of a perfectly competitive market. We will build on what you already know to determine how price and output of a commodity are determined under this market structure. We will examine the decision rules a perfectly competitive firm

should follow to maximize profit in both the short run and the long run.

2.0 Objectives

This unit aims at providing you with fundamental knowledge of the pricing and output policies of the pure competition market. At the competition of this course you should be able to: .

a. Describe the equilibrium of the firm and the industry;
b. Illustrate the short run profitability of the firm;
c. Describe the long run equilibrium of the firm and industry; and
d. Examine the long run industry supply curve under various demand conditions.

3.1 Equilibrium in the market period

In the previous units we focused on the employment of inputs to produce output and on the associated cost of production in the short run and the long run. We distinguished between the short run and the long run in terms of whether some factors of production are fixed or not as output is altered. The changes in the level of output in the short run can only be achieved by altering the amount of variable factors used in production. However, in the long run all factors are varied and therefore a change in the level of output can be accomplished by changing any of the production inputs. Production of some goods are fixed for a short period of time, such that even when there is urgent need for expansion, it is impossible to adjust output level within such a short periods. For example, after the harvest of an agricultural product, the quantity of the commodity cannot be increased until the next harvest. On the contrary, production of some goods can be altered instantaneously. The short period of time in which supply is absolutely fixed is called the market period. We can distinguish three different supply periods, the market period in which all goods available for sale have already been produced (fixed supply), the short run period which allows changes in the rate of production from existing plants, and the long run period which is long enough for new plants to be built for expansion. Since

supply of each firm is absolutely fixed in the market period, the market supply curve is simply the horizontal summation of all firm's supply curves.

the market period, also referred to as the very short run period is characterized by a completely straight-line market supply curve parallel to the vertical axis as shown in Fig 16.1

Exercise 16.1: Distinguish between the market period and the short run period.

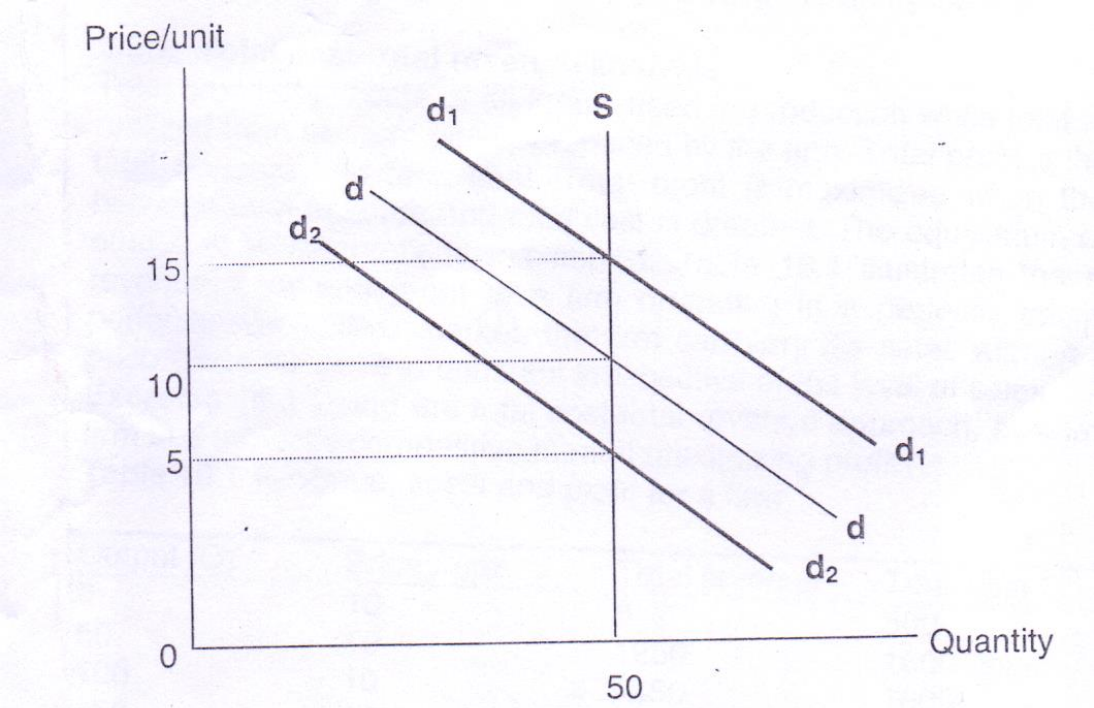


Fig 16.1 Equilibrium in the market period

If we represent the total market supply of a commodity in the market period by the . straight-line labeled S, and if the fixed quantity of the commodity available for sale is 50 units, market equilibrium is attained at that price where market demand is equal to market supply. Consider the initial market demand labeled d, the equilibrium market price is N1 0.00 per unit in the market period. This is the price at the point of intersection of market demand d and market supply curve S. If market demand were greater, say, d_1 in Figure 16.1, the equilibrium price will increase to N15.00 per unit but the market equilibrium quantity would remain fixed at 50 units because supply is absolutely fixed in the market

period. Similarly, if demand were less, d_2, equilibrium price would decrease to N5.00per unit at the same market equilibrium quantity. We can therefore deduce that in the market period, demand alone determines the market equilibrium price, given fixed supply. It is important to note this condition applies to only the market period, in the short and the long run, both demand and supply jointly determine both the equilibrium price and quantity.

3.2 Short run equilibrium of a firm in a perfectly competitive market

A firm makes short run decision subject to the limitations imposed by its fixed inputs. In the short run, altering the intensity of available resources used in production can change the rate of output per period of time. The firm in a perfectly competitive market can adjust its level of output in the short run to maximize profit or minimize losses. The short run equilibrium of the firm can be explained with the help of total cost-total revenue analysis and the marginal cost-marginal revenue analysis.

3.2.1 Total cost-total revenue analysis

Total cost is the costs of all inputs used in production while total revenue is the money realized from sales of goods produced by the firm. Total profit is the difference between total revenue and total cost. Total profit is maximized when the positive difference between total revenue and total cost is greatest. The equilibrium output of a firm is the output at which profit is maximized. Table 16.1 illustrates the relationship between revenue, cost and profit of a firm operating in a perfectly competitive market. In a perfectly competitive market, the firm can vary his sales without affecting the market price. Thus the price is constant irrespective of the level of sales.

Exercise 16.2 Using the total cost-total revenue approach, at what level of output is a firm in a perfectly competitive market maximizing profit?

Output *(0)*	Price / unit	Total revenue	Total cost	. Profit
0	10	0	500	-500
50	10	1250	1500	-250
100	10	1450	1600	-150
150	10	1900	1900	0

200	10	2800	2200	600
250	10	3650	2500	1150
300	10	4000	3000	1000
350	10	4500	4000	500
370	10	5000	5000	0

the total revenue for the firm is obtained by multiplying output in Column 1 by the respective unit price in column 2 while the total cost in column 4 from the total revenue in column 3 3 gives the profit for the firm. You can see from the above table that total profit is maximized at N1150.00 when the firm produces and sells 250 units of the commodity per period of time.

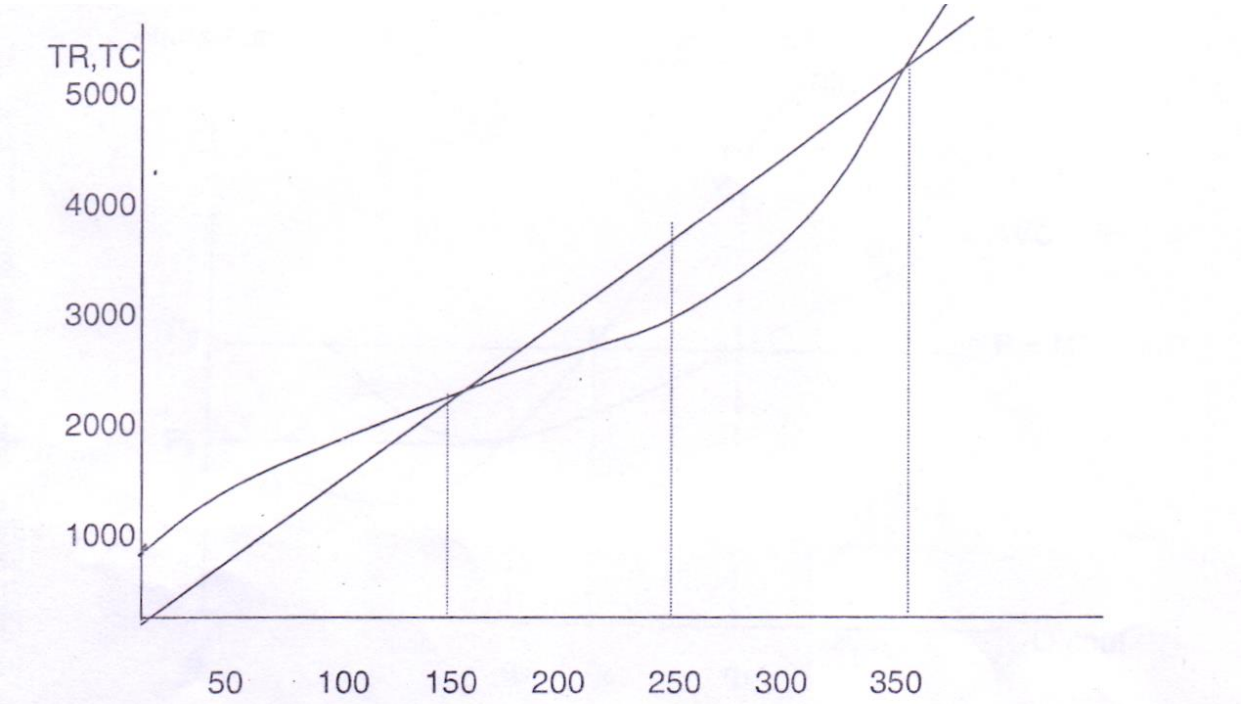


Figure 16.2 Profit maximization by total revenue total cost analysis

Figure 16.2 further illustrates the maximization of profit by total revenue-total cost approach. A straight line represents the total revenue curve. This is because, in a perfectly competitive market, unit price of a commodity does not change with changes in the quantity sold. Thus, increasing the level of sales will continuously increase total revenue at the prevailing market price. You will observe in figure 16.2 that maximum profit is achieved with an output level of 250 unit.

3.2.2 Marginal revenue- marginal cost analysis

It is generally more useful to analyze the short run equilibrium of the firm with the marginal revenue-marginal cost approach, We defined marginal cost in unit 13 as the extra cost incurred in producing one more unit of output. Marginal revenue is the increase in revenue obtained by selling an additional unit of output. Thus marginal revenue equals the slope of the total revenue curve while marginal cost is the slope of the total cost curve. The additional revenue must be balanced against additional costs to determine the most profitable level of production. Under perfect competition, price and marginal revenue are the same thing. If you can sell an additional unit with no reduction in price; then your revenue will increase by the price of that. unit. This implies that marginal revenue equal equals marginal constant, which is constant for all levels of output sold. The marginal revenue-marginal cost analysis tells us that the perfectly competitive firm maximizes its short run total profits at the output level, where MR or P equals MC.

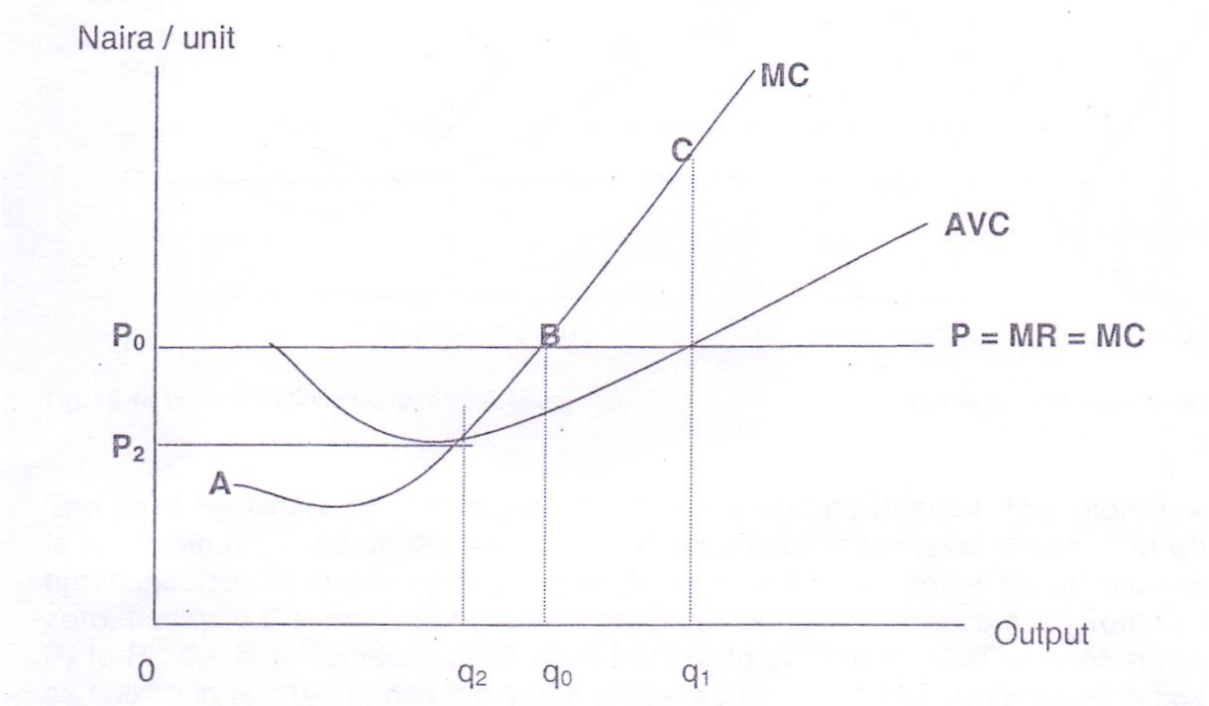


Figure 16.3 the short run Equilibrium of a firm in perfect competition.

The profit maximizing level of output can be illustrated using the graph in Figure 16.3. You will observe that as long as MR exceeds MC (from A to 8) it pays for the firm to expand output because the firm will be more to its TR than to its TC and so its total profit rises. Output levels above Oq_o would cost more to produce than its unit price and thus total profit falls. The firm therefore maximizes its total profit at the output level where P = MR = MC.

The supply curve of the individual firm under perfect competition, then, slopes upward to the right. As the price of the commodity rises, the price line intersects MC at higher and higher levels of output. For all prices above the minimum point of the AC curve, OP2, the supply curve of the firm is identical with its marginal cost curve. The .market supply curve for a commodity is obtained from adding together the individual supply curves of the firms in the industry. This is illustrated in figure 16.4. At the left of the diagram are cost curves while at the right is the supply curve for the industry. We can deduced from this diagram that in perfect competition the segment of the firms marginal cost curve that is above the AVC curve is the same as the firm's supply curve. For a price-taking (perfect competition) firm, the supply curve has the same slope as the MC curve above the level of AVC.

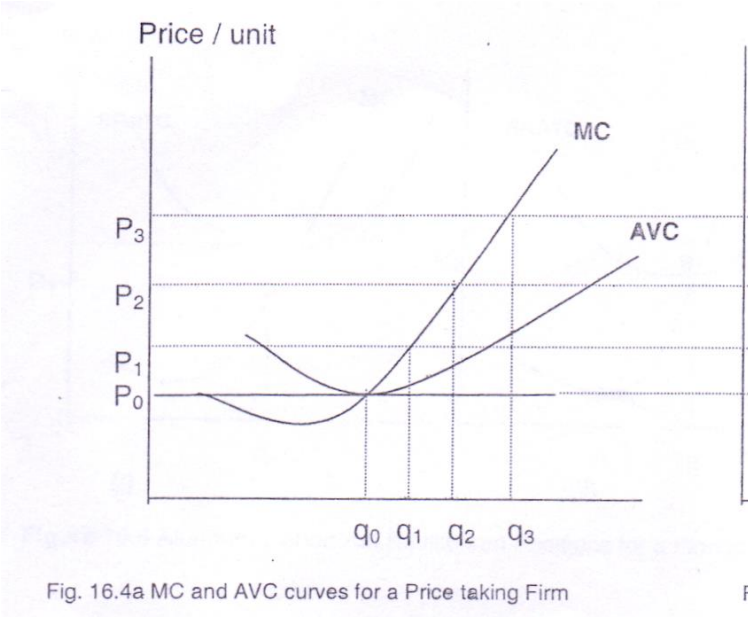
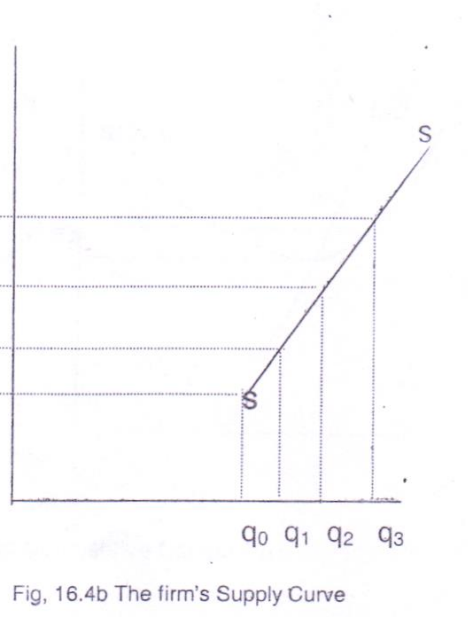


Fig. 16.4a MC and AVC curves for a Price taking Firm



Fig, 16.4b The firm's Supply Curve

The point E_o, where price P_o equals AVC, is the shut down point. The short down point is the minimum paint on the AVe curve. It is defined as the level of output at which the firm minimizes its losses by ceasing production. For prices below Po, optimum output is zero, because the firm is better of if it produces nothing. As price rises from Pc to P_1 to P_2 to P3, the firm increases production from qo to q1 to q2 to q3. The firms supply curve as shown in fig. 16.4b, has the same shape as the firm's MC curve for all prices above AVC in figure 16.4b.

Exercise 16.3 Define short down point.

3.3 Short run Equilibrium of the Industry

The supply curve for a competitive industry is the horizontal sum of the marginal cost curves of all the firms in the industry. The short run equilibrium price and quantity for the industry is determined by the interaction of the industry supply curve with its demand curve. At the equilibrium market price each firm is producing and selling a quantity for which marginal cost equals the market price and no firm is motivated to change its output in the short run. Since quantity demanded equals total quantity supplied, there is no reason for market price to change in the short run; the market, and all the firms in the industry, are in short run equilibrium.

3.3.1 **Short run Profitability of the Firm**

We know that when the industry is in short run equilibrium each competition firm is maximizing its profits. It is one thing to know that a firm is doing well as it can in particular circumstances; it is another to know how well it is doing when it is in short run equilibrium, a competitive firm may be suffering losses, breaking even or making profits.

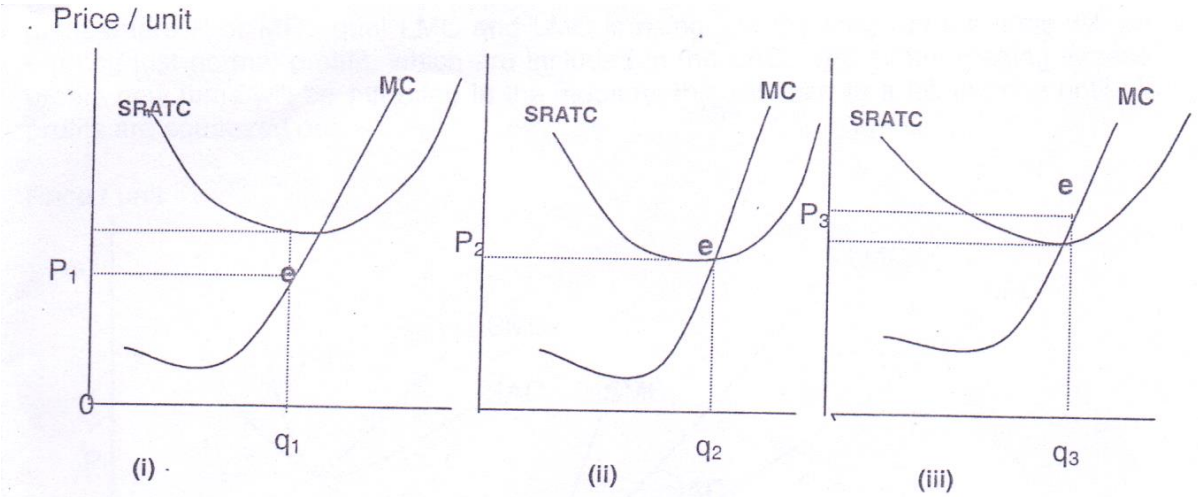


Figure 16.5 Alternative Short run Equilibrium Positions for a Firm in Competitive Competition.

Figure 16.5 shows a firm with given costs, faced with three alternative prices of P_1, P_2, P_3. In each part of the diagram, e is the point where MC = MR = Price. Since in all three cases price exceeds AVC, the firm is in short run equilibrium. In part (i), price is P_1. Because P_1 is below short run average variable cost (SRATC), the firm is suffering losses shown by the boarded rectangle. Because price exceeds average variable cost (AVC), the firm continues to produce in the short run. Because price is less than ATC, the firm will not replace its capital as it wears out.

In part (ii) price is P_2 and the firm is just covering its total costs. It will replace its capital as it wears out since its revenue is covering the full opportunity costs of its capital. The firm is said to be at break even.

Part (iii), price is P_3 and the firm is earning pure profits in excess of all its costs as shown in the boarded rectangle. As in part (ii), the firm will replace its capital as it wears out.

3.4 Long run Price and Output Policies

The first step in studying long run reactions is to note an important change in the classification of costs. The short run is characterized by fixed costs, so that firm's total costs are divided into fixed and variable costs. To emphasize that we are referring to the short run, these measures of costs are often referred to as SRVC, SRTC, and

SRAVC etc. In the long run, total cost and average total cost will be denoted by LRTC and LRAC.

3.4.1 Long run Equilibrium of a Firm

In the long run, all factors of production and all costs are variable. The key to long run equilibrium under perfect competition is entry and exit. Therefore, a firm will remain in business in the long run only if its TR equals or is greater than its TC. The best, or optimum, level of output for a perfectly competitive firm in the long run is given by the

Point where P. or MR equal LMC and LMC is rising. In the long run the firms will be earning just normal profits, which are included in the LAC. If they are making excess profit new firms will be attracted in the industry; this will lead to a fall in price until all profits are squeezed out.

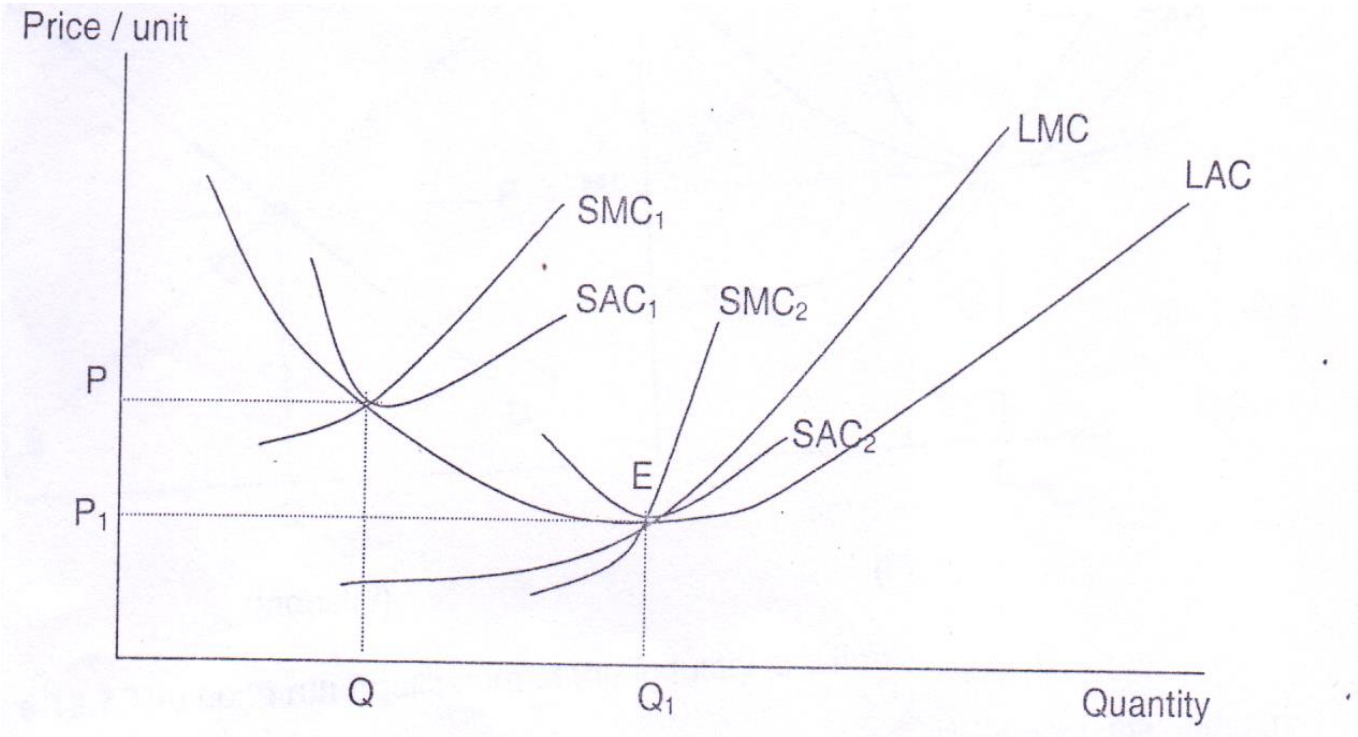


Figure 16.6 Short run Versus Long run Equilibrium of a Competitive Firm

At the market price of P, the perfectly competitive firm is in long run equilibrium where P = SMC = LMC = SAC = LAC. That is, LMC = LAC = SAC = P

At equilibrium the short run marginal cost is equal to the long run and the short run average cost and this is equal to the long run average cost. We therefore have:

SMC = LMC = LAC = LMC = P = MR

This implies that at the minimum point of the LAC the corresponding (short run) plant is worked at its optimal capacity, so that minimum levels of the LAC and SAC coincide. On the other hand, the LMC cuts the LAC at the minimum paint and the SMC cuts the SAC at its minimum paint. Thus at the minimum point of the LAC, the above equality between short run and long run cost is satisfied at point E.

3.4.2 Long run equilibrium of the industry

The industry is in the long run equilibrium when a price is reached at which all firms are in equilibrium (producing at the minimum point of their LAC curve and making just normal profits). Under these conditions there are no further entry or exit of firms into the industry. The long run equilibrium of the industry is shown in fig. 16.6. At the market price, P, the firms produce at their minimum cost, earning just normal profits. The firm is in equilibrium because at the level of output Q, LMC = SMC = P = M

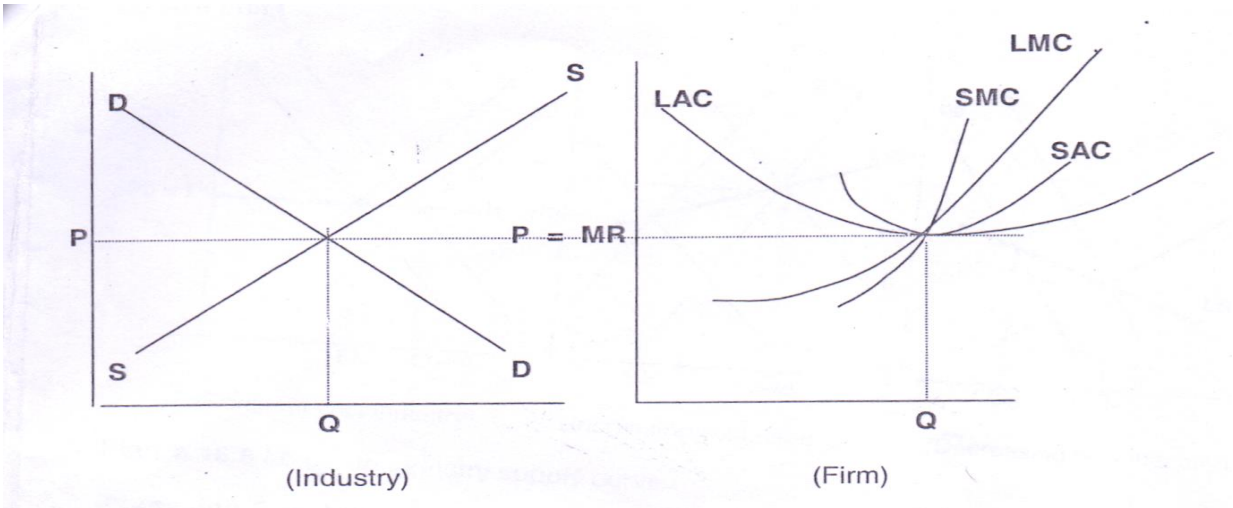


Figure 16.7 The Long run Equilibrium of the Industry and firm

Exercise 16.4. At what level of output is the long run equilibrium of the industry attained?

Exercise 16.4: At what lee of output is the long run equilibrium of the industry attained?

At the price P, the industry is in equilibrium because profits are normal and all cost are covered so that there is no incentive for entry and exit. This condition prevails when: LAC = SAC = P, which is observed at the minimum point of the LAC curve. With all firms in the industry being in equilibrium and with no entry or exit, the industry remain stable, and, given the market demand of 001 in Fig. 16.7, the price P is a long run equilibrium price.

3.4.3 The long run industry supply curve

The long run supply curve connects positions of long run equilibrium after all demand induced changes have occurred. When induced changes in factor prices are considered, it is possible for the long run supply to be horizontal, positively or negatively sloped. Each of these situations are considered below.

Constant cost industries

Starting from a position of long run equilibrium for the perfectly competitive firm and industry, if the market demand curve for the commodity increases, thus giving a higher market equilibrium price, each firm will expand within it existing plant in the short run and make some pure economic profit. In the long run, more firms will enter the industry, if factor prices remain constant, the market supply of the commodity will increase until the original market equilibrium price is re-established. Thus, the long run market supply curve for his industry is horizontal (at the level of Minimum LAC) and the industry is referred . to as a constant cost industry.

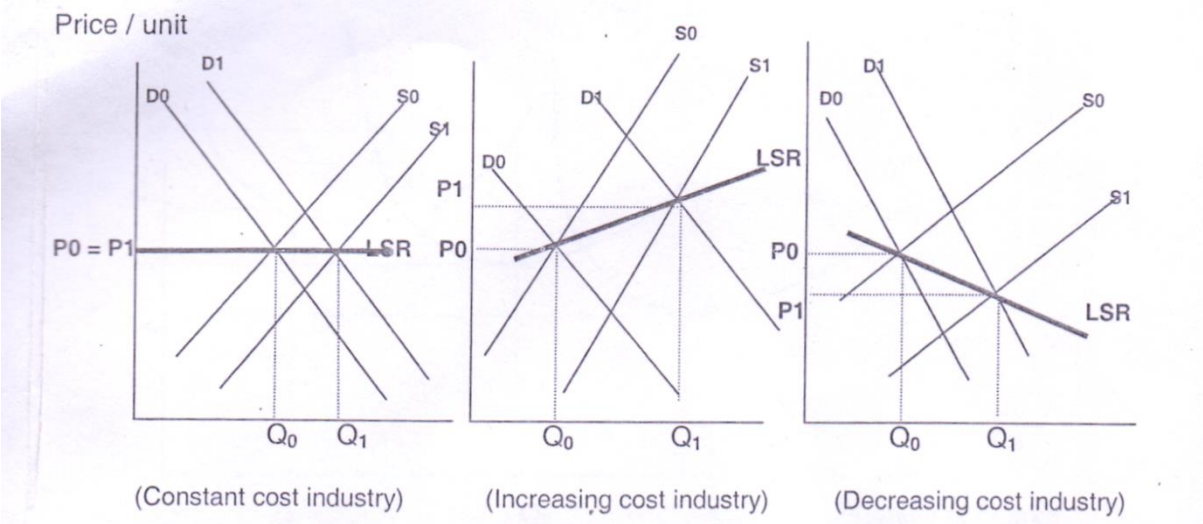


Figure 16.8 Long run industry supply curve

Increasing Cost Industries

If factor prices rise as more firms (attracted by pure economic profits in the short run) enter a perfectly competitive industry in the long run and the industry output is expanded, we have an increasing cost industry. In this case, the industry LRS curve is positively sloped. From fig.16.8 (ii), profits are eliminated before price falls to its original level, giving rise to a positively sloped LRS curve.

Decreasing Cost Industries

If factor prices fall as more firms (attracted by the short run pure economic profits) enter a perfectly competitive industry in the long run and as the industry output is expanded, we have a decreasing cost industry. In this case the industry LRS curve is negatively sloped. In part (iii), of fig.16.7 the price falls below its original level before profits return to normal, giving the LRS curve negative slope.

4.0 Conclusion

The determination of the output and price of goods in the market and the allocation of productive resources among various products depends not only on demand and cost

condition but also on the market structure. Of importance in the study of price and output policy is the effect of time in market adjustments. A firm is in equilibrium when it has no tendency to change its level of output. Firms will only continue to use inputs in production if they are making profit from the use of these inputs. The decision of a firm therefore is to make supply and output decision so as to make as much profit as possible. We have been able to establish the price and output policy under perfectly competitive market both in the short and long run. In the short run profit is maximized by each firm by equating their marginal cost price at the point above the average cost while the long run equilibrium of the firm is the point where the market price is equals to the marginal revenue and equals to the long run marginal cost.

5.0 Summary

We have considered the equilibrium levels of output of a firm and industry in the long run and in the short run. We looked at the perfectly competitive firm as a quantity adjuster, facing a perfectly elastic demand curve at a given market and maximizing profits by equating its marginal cost to that of price. We defined the supply curve of a firm in perfectly competition as its marginal cost curve, and the supply curve of a perfectly competitive industry as the sum of its marginal cost curves of all its firms. The intersection of this curve with the market demand curve for the industry's product determines market price. We also established the fact that the long run industry equilibrium requires that each individual firm be producing at the minimum point of its LRAC and be making zero profits. We finally deduced that when induced changes in factor prices are considered, it is possible for the long run supply to be horizontal, positively or negatively sloped

6.0 Tutor marked assignment

Questions:

a) To what length of time does the market period refer?

b) What is the most important assumption in determining the equilibrium output level of a firm? What methods are used in analyzing short run equilibrium of the firm?

c) Illustrate the conditions for equilibrium in both short and long run for a firm and an industry in perfect competition?

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UNIT SEVENTEEN: PRICING AND OUTPUT POLICIES MONOPOLY

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Introduction

Monopoly power is acquired when a firm has developed effective market mechanism to prevent competition or entry into the market. Under this arrangement, production levels generally will be lower and prices higher than in perfect competition. In the previous unit we discovered what price a purely competitive firm will charge and how it will produce in both the short run and the long run, in this unit we shall be considering what price a pure monopolist will charge and how much he will produce in the short run and long run. We shall also look at how monopoly regulates and operates under price discrimination.

2.0 Objectives

After going through the materials in this unit you should be able to do the following:

- Determine the relationship between MR and demand elasticity;
- Understand the short run equilibrium in the purely monopolistic market
- Define and explain the long run equilibrium of the purely monopolistic market;
- Describe how monopoly is being regulated; and
- Explain conditions for price discrimination under monopoly.

Any rational producer of a good will continues production only if the marginal revenue derived exceeds the marginal cost of producing an extra unit of the product. Monopolists are no exception to this profit-maximizing rule. However, in monopoly market, the marginal revenue does not remain constant as output expands. It instead

falls over the range of production as expansion is affected. The monopolists marginal revenue declines as output expands because the price charged must be lowered to induce customers to buy more. As a result of this condition, the monopolist's price must vary inversely with the quantity of the item he produces. Being the only producer of the item in the market, its demand curve must be equal to the market demand curve. Instead of the horizontal demand curve for a seller under- perfect competition, the monopolists demand curve is downward sloping because the monopolists supplies the entire market for the product. As a result, if the monopolist wants to sell more of the commodity, he or she must lower its price. In essence the monopolistic producer determines his own price. Having set his price, he can sell only the quantity demanded at that price, as shown in Table 17.1. The consequence of this is that marginal revenue is no longer identical with price.

Exercise 17.1: Explain why marginal revenue of a monopolistic firm is not equal to the market price of the commodity.

Table.17.1: Demand and marginal revenue schedule of a monopolist firm

Price	Quantity	TR	MR	E_D
80	0	0		-
70	1	70	70	7.0
60	2	120	50	4.0
55	2.5	137.5	30	2.2
50	3	150	10	1.7
40	4	160	10	1.0
30	5	160	-10	1.0
20	6	120	-30	0.3
10	7	70	-50	0.1
0	8	0	-7	0

The table presents the demand schedule of a monopolist's product together with the total

and marginal revenue figures. The total revenue is the product of the unit price of the commodities and the corresponding output levels. You will observe from the table that the monopolist's total revenue is at a maximum when he produces and sells 4 units of the commodity and charges N4.00 per unit. However, the goal of a monopolist is to maximize his total profit. Thus we need to compare the cost structure of the monopolist with his revenue to determine the maximum profit.

The Marginal revenue is the increase in total revenue obtained by selling an additional unit of output. If you study Table 17.1 carefully, you will observe that the quantity demanded of a rnonopolist's product is inversely related to price. By comparing each percentage change in price with the corresponding percentage change in quantity and applying the elasticity formula, we can calculate the elasticity of demand. These calculations are shown in column 5. Note that elasticity varies widely from the top of the column to the bottom. Demand of a monopolist's product is elastic at lower levels of output, becomes unitary elastic and subsequently, inelastic at higher levels of output. Figure 17.1 illustrates the relationship between the marginal revenue and demand for a monopolist's product.

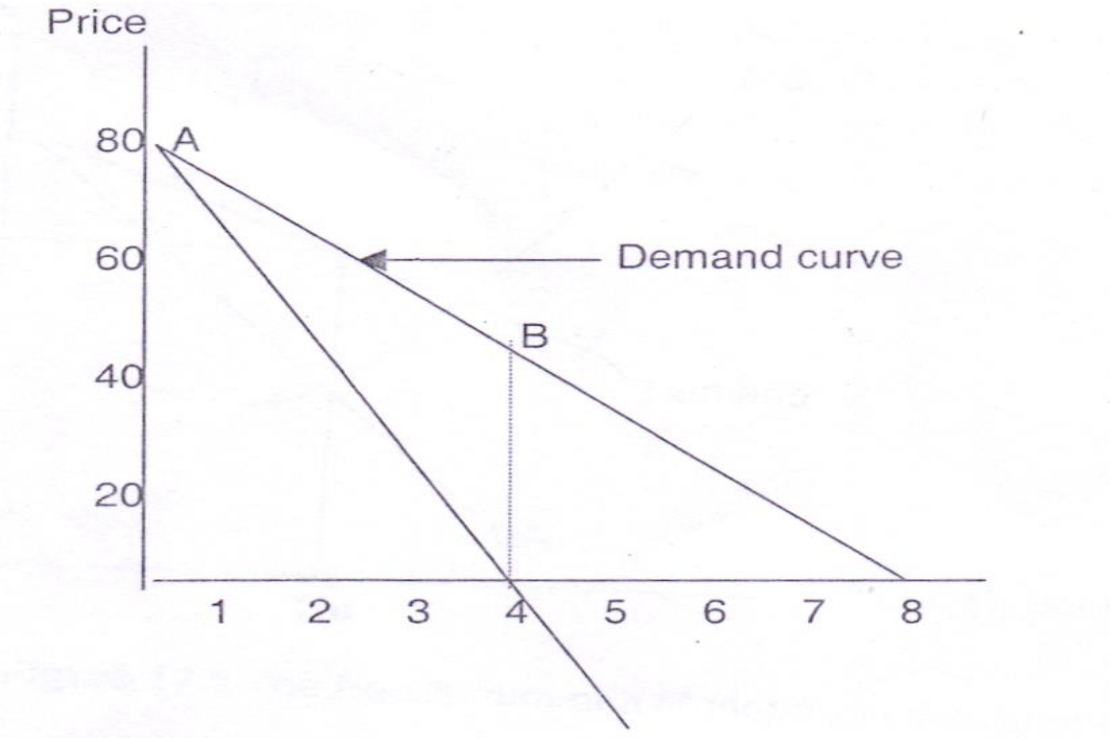

Figure 17.1. Demand and MR Curves of a monopolist

For a downward sloping demand curve, marginal revenue is always less than price because prices must have been lowered for any increase in sales. Thus the monopolist's MR curve must lie below the demand, and its distance from the demand curve increases as the price falls. Thus, the MR curve for any straight line demand curve is also a straight line, which starts at the same point on the vertical axis as the D curve but falls at twice the rate. It is important to note that MR is positive as long as demand curve is elastic(from point A towards B), MR is zero when elasticity of demand is 1 (at point B) and is negative when elasticity of demand is less than 1.

3.2 Short run equilibrium

To describe the price and output policy of a monopoly, we need only bring together information about a firm's revenue and costs and apply the rules of marginal analysis. The monopolist, just as the perfect competitor, attains maximum profit by producing and selling at that rate of output for which the positive difference between total revenue and total cost is greatest. The profit maximizing output level of a monopolist in the short run is also attained at a point of equality between the marginal cost curve and the marginal revenue curve so that the equilibrium price charged at this level will be traced from the demand curve. This is illustrated in figure 17.2

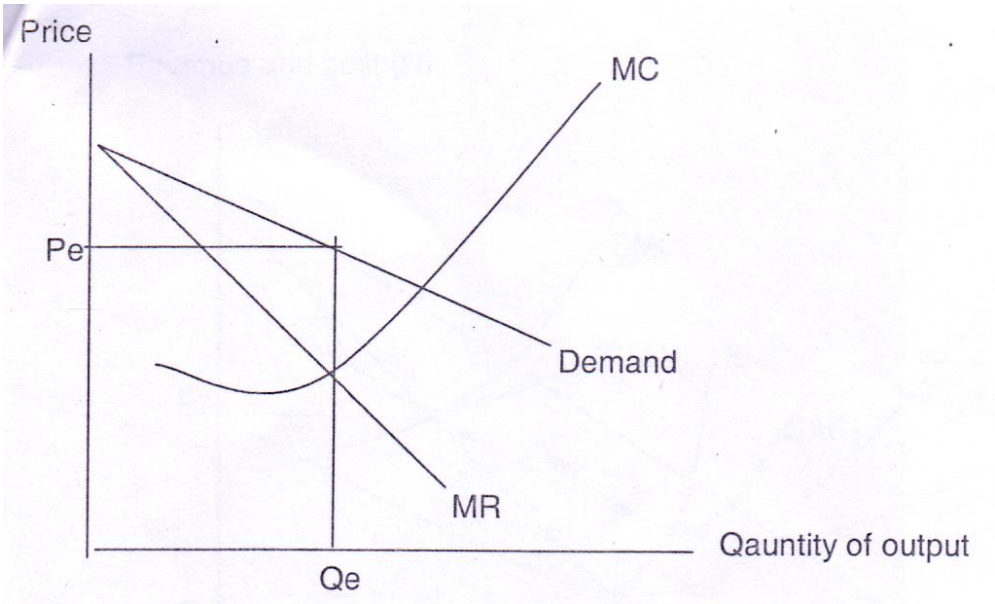

Figure 17.2 The Equilibrium of a Monopoly in the Short run.

The monopoly produces the output Qe for which MR=MC. At this point, price, Pe is determined by the demand curve-excess the average variable cost curve. This tells us that in the short run, equilibrium level of output for the monopoly is the output at which MR=SMC and the slope of the MR curve is smaller than the slope of the SMC curve. Note that if the monopolist produces fewer than Qe, profit will be lost unnecessarily because for output to the left of Qe, MR is greater than. Also with output level greater than Qe, MC is higher than MR. It is therefore uneconomical for the monopolist to expand production beyond Qe.

3.3 long run equilibrium

In the long run, a monopolist will remain in business only if he or she can make profit or at least break even by producing the best level of output with the most appropriate scale of plant. If a monopolist earns a short run economic profit, he will not be confronted in the long run with competitors because the market is effectively closed to entry. Thus in the long run the equilibrium of an industry under monopoly may be characterized by economic profits.

A monopolist maximizes profit in the long run by producing and marketing the rate of output for which long run marginal cost (LMC) equals marginal revenue (MR). The optimal plant to operate in the long run is the one whose short run average total cost (SATC) is tangent to the long run average cost (LAC) at the point corresponding to long run equilibrium output. At this point, short run marginal cost equals marginal revenue. This relationship is illustrated in Figure 16.3.

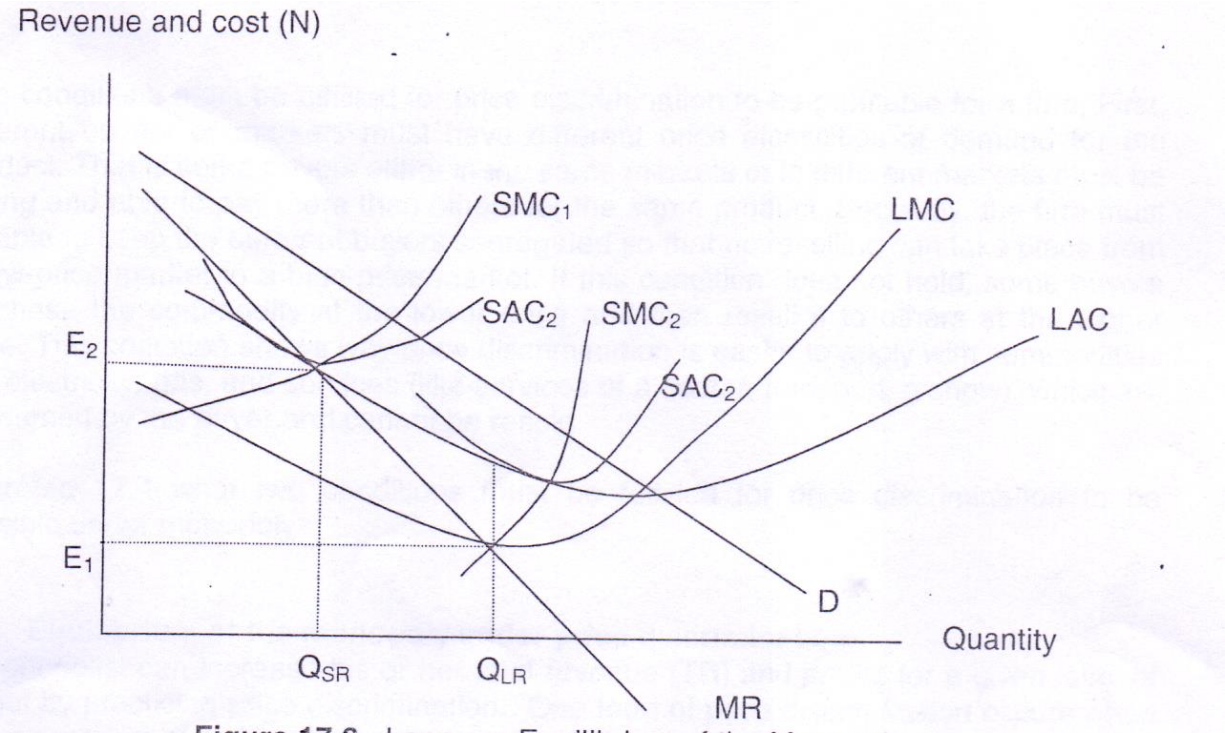

Figure 17.3. Long run Equilibrium of the Monopoly

Exercise 17.2 Differentiate between the short run and long run conditions for equilibrium of a monopolist

You will observe from this illustration that the long run average cost curve envelopes the short run cost curves (SAC_1 SAC_2). LMC is the associated long run marginal cost curves while D and MR are the monopolist demand and marginal revenue curves respectively. At the level of output of QSR, and price E_2. The monopolist is maximizing profit in the short run be equating its marginal cost to marginal revenue. However, he can reap more profit in the long run by expanding his output to Q_{LR}, the output level at which LMC equals MR, at this he sells his product at E_1. The most appropriate scale of plant for a monopolist to operate in order to attain maximum profit is given by the SAC_2 curve, which is tangent to the LAC curve at Q_{LR} units of output. Thus in the long run a monopolist is at equilibrium when SMC_2 =LMC = MR.

3.4 Price discrimination

Price discrimination exists when the same product is sold at different prices to different buyers. The product is basically the same, but it may have slight differences (for example, different binding of the same book; different seats on an aircraft or train etc). Although a monopolist easily implants price discrimination, this price policy is quite

commonly practiced by most firms, which charge a different price (give different discount) to their customers depending on item purchased, length of time etc.

Exercise 17.3: What do you understand by the price discriminations?

Two conditions must be fulfilled for price discrimination to be profitable for a firm, First, different buyers or markets must have different price elasticities of demand for the product. That is some buyers either in the same markets or in different markets must be willing and able to pay more than others for the same product. Secondly, the firm must be able to keep the different buyers segregated so that no reselling can take place from a low-price market to a high-price market. If this condition does not hold, some buyers purchase the commodity at the lower price and then resell it to others at the higher price. This condition shows why price discrimination is easier to apply with commodities like electricity, gas, and services (like services of a doctor, transport, a show), which are consumed by the buyer and cannot be resold.

Exercise 17.4 What two conditions must be fulfilled for price discrimination to be possible under monopoly?

3.5 Equilibrium of the monopoly under price discrimination

A monopolist can increase his or her total revenue (TR) and profits for a given level of output by practicing price discrimination. One form of price discrimination occurs when the monopolist charges .different prices for the same commodity in different markets. Monopolist practicing price discrimination in say, two different markets has to make the following decisions in order to maximize profit: i) what total output to produce, ii) how to share output produced between markets and iii) the price to charge in each market. A graphical analysis of a case involving two separate markets is presented in Figure 17.4. If the marginal cost of output is the same for all markets, a firm will maximize its profit by producing its output up to the point where the marginal revenue for each market is equal to the firm's marginal cost.

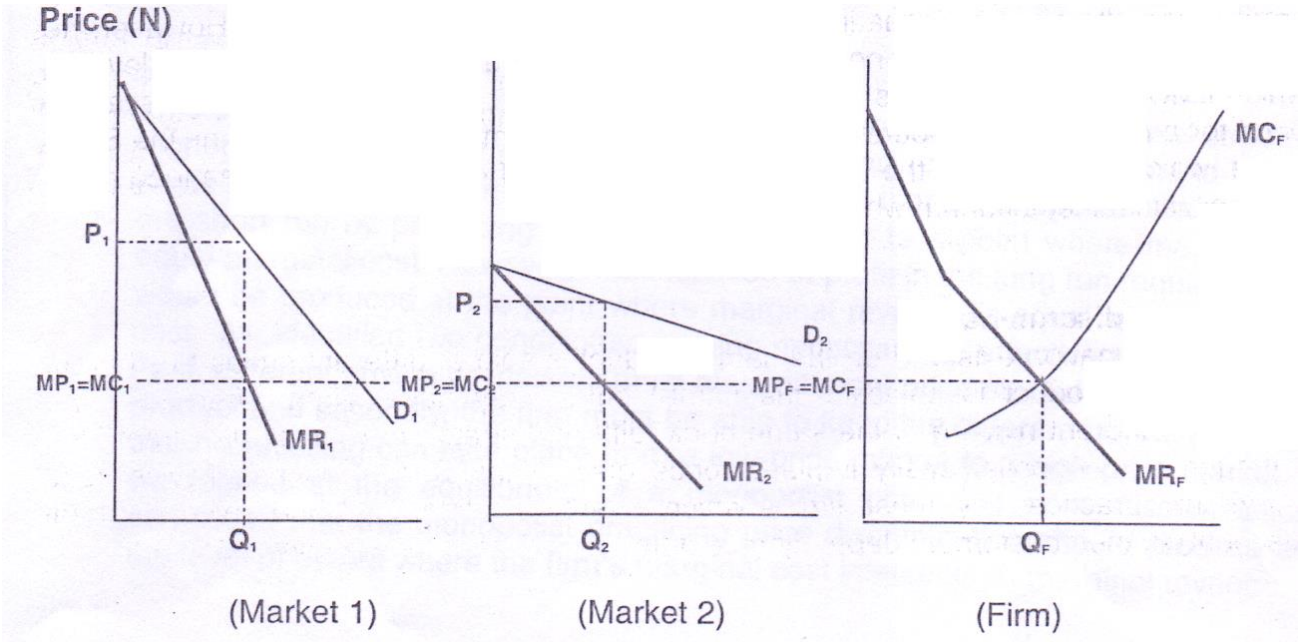

Figure 1 **7.4** Equilibrium under Price Discrimination

D_1 and D_2 and the corresponding MR_1 and MR_2 in figure 17.4 refer to the demand and MR curves faced by the monopolist in the two separate markets. By summing horizontally, the MR1 and MR_2 curves, we get the firms MRF curve. The point where MC intersects the MRF from below is the best level of output for the monopolist to produce. The 'firm's profit-maximizing level of total output is OF, which is also the horizontal summation of Q_1, and Q_2 At this point, $MR_F = MC_F$ and the monopolist charges P1 in the first market and P_2 in the second market. If ·MR in one market were larger, the monopolist would sell more in that market and less in the other, until the above condition of $MR_F = MC_F$ was fulfilled.

Because the cost of producing an extra unit of output is the same for either market, it does not matter from a cost standpoint in which market the output is sold. However, in terms of revenue obtained, the choice of market is very important for effective price discrimination. The optimal output sold in market 1 and market 2 should be such that $MR1 = MC_2 = MR_F = MC_F$ In this way, the firm will maximize revenue from OF units of output at the respective market prices of P_1 and P_2. In general, the higher price will be charged in the market with

the less elastic demand for the product.

4.0 Conclusion

The monopolistic market structure, though somehow theoretical, is useful as a tool to examine real-world situations. We saw in the last unit that the purely competitive firm faced a perfectly elastic demand curve and as a result, price and marginal revenue are equal. The monopolistic is the sole supplier of his product and therefore his downward sloping demand curve is the same as the industry demand curve. As long as the entry barrier remains monopolist can maintain economic profit in the long run. Where markets are Imperfect, monopolist can increase his total revenue and profit level by practicing price discrimination.

5.0 Summary

This unit examined the pricing and output policies of monopolistic market structure. The monopolistic is the sole supplier of his product and therefore his demand curve is the same as the industry demand curve. We illustrated that a monopolist maximizes profit in the short run by producing and selling his output to a point where marginal revenue equal marginal cost. However, maximization of profit in the long run requires that output would be produced at the point where marginal revenue is equal to long run marginal cost. We identified two conditions as being necessary for effective price discrimination:
First, different buyers or markets must have different price elasticities of demand for the product and secondly, the firm must be able to keep the different buyers segregated so that no reselling can take place from a low-price market to a high-price market. Finally we looked at the equilibrium of a monopolist practicing price discrimination. We concluded that the monopolist practicing price discrimination should produce and sell the level of output where the firm's marginal cost intersects its marginal revenue.

6.0 Tutor Marked Assignment

Questions

1.The demand functions faced by a rnonopolist, his total cost and total revenue schedule are presented in Table 1. In a tabular form determine the equilibrium level of output and equilibrium price for which the monopolist maximizes his profit.

Table 1. A monopolist's demand. Total cost and total revenue schedule

Price (Naira)	Quantity	Total revenue (N)	Total cost
17	0	0	20
16	1	16	23
15	2	30	27
14	3	42	32
13	4	52	39
12	5	60	46
11	6	66	55
10	7	70	66

2) Under what condition is the monopolist in both short and long run equilibrium?

3) When does the monopolist make a profit or breaks even?

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UNIT EIGHTEEN: PRICING AND OUTPUT POLICIES: MONOPOLISTIC COMPETITION AND OLIGOPOLY

Table of contents

1.0 Introduction

In the previous units we had considered the pricing and output policies under Perfect Competition and Monopoly. Monopolistic competition and Oligopoly are two cases of Imperfect competition. Monopolistic competition refers to the market organization in which there are many firms selling closely related but not identical commodities while Oligopoly is the market organization in which there are few interdependent sellers of a commodity such that the actions of each seller will affect the other seller. In this unit we shall be focusing on the short and long run equilibrium under monopolistic competition and to some extent, oligopoly.

2.0 Objectives:

After going through the content of this unit, you should be able:

- Explain how price is determined under monopolistic competition.
- Define the short run and the long run equilibrlum under monopolistic competition;
- Explain how price is determined under oligopolistic market.

3.1 Price under monopolistic competition

Monopolistic competition refers to a market situation where there are many firms selling a differentiated product. The market involves a large number of sellers producing close but not perfect substitutes for each other. Under pure competition, each firm must sell strictly .at the market price and thus faces a horizontal demand curve. However, under monopolistic competition, the firm operates under a sloped demand curve as indicated in Figure 18.1. The shape of the demand curve under monopolistic competition shows the effect on his sales as a result of a variation in his price, the prices of all other sellers remaining unchanged. The size of the effect of variations in price on sales is indicated by the elasticity of demand.

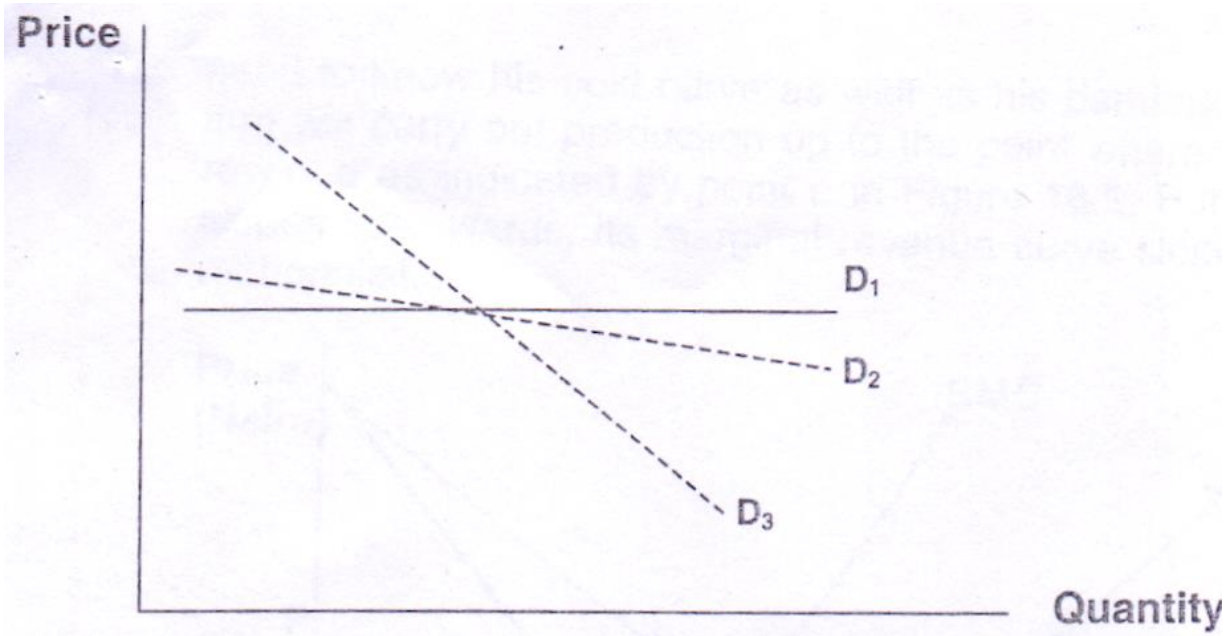

Figure 18.1 Demand curve for differentiated product.

The horizontal demand curve D_1 in figure 18.1 is what operates under pure competition where firms are compelled to sell at the prevailing market price. However the demand curve under pure competition is downward sloping with the steepness of the slope depending on the response of sales to changes in price. If the demand curve is D_2, a small change in price will result in a large increase or decrease in sales. However, if the monopolistic competitor operates under demand curve D_3, the sales effect will be much smaller. .

Exercise 8.1. What determines the elasticity of demand for one seller under monopolistic competition?

Basically, the degree of substitutability of the product and the attitude of the buyers in terms of their loyalty to brand or strength of customer attachment will determine the elasticity of demand of a firm under monopolistic competition. Since the products of a monopolistic competitor are seemingly differentiated and substitutable for each other, some customers may choose to go for substitutes when price rises thereby resulting in elastic demand curve as in D_2. D_3 shows situation in which brand loyalties are strong and in which it is hard to change people's preference, even by a substantial change in price. Generally, the coefficient of cross elasticity is high under monopolistic competition, thus the demand curve of a firm in the market will be highly elastic particularly when the products are close substitutes.

3.2 Short run equilibrium under monopolistic competition

We mentioned earlier that a firm in a monopolistic competitive industry faces a negatively sloping demand curve for the product of the individual firm because of product differentiation. Thus a firm under monopolistic competition may deviate a little' from the price quantity combination under perfect competition To know how much a firm under monopolistic competition will produce and at what price to charge, we will need to know his cost curve as well as his .demand curve. A monopolistic competitive

firm will carry out production up to the point where marginal cost is equal to marginal revenue as indicated by point e in Figure 18.2. But because the firms demand curve slopes downwards, its marginal revenue curve slopes downwards too, like that of the monopolist.

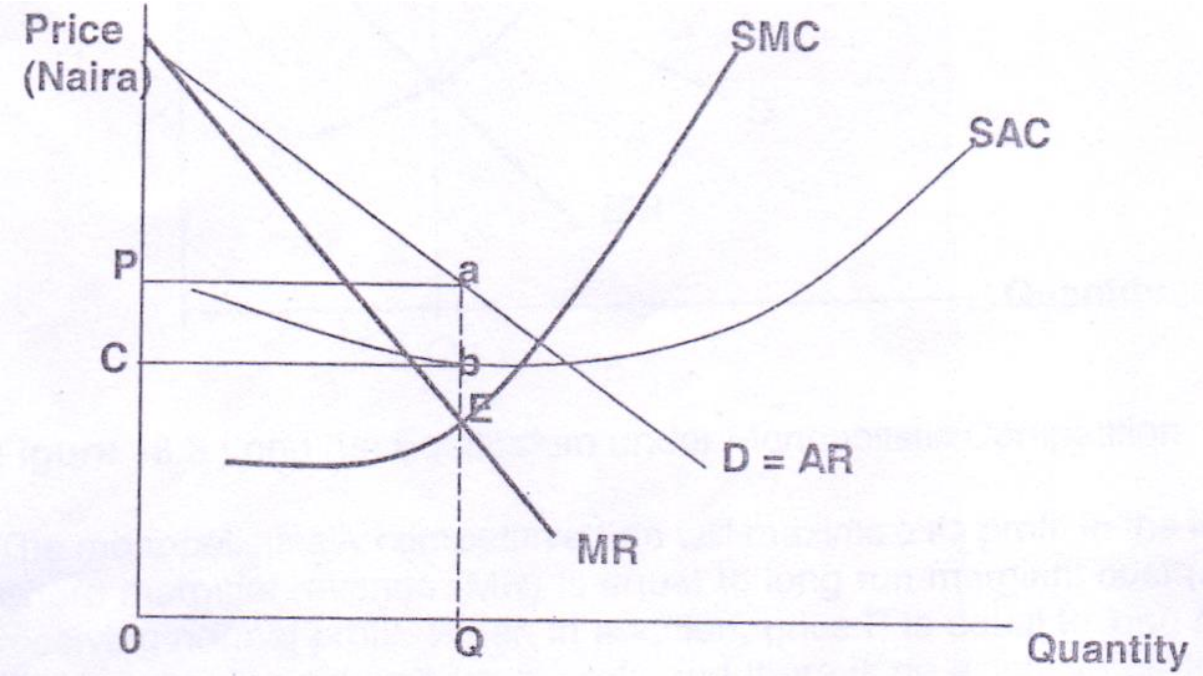

Figure 18.2 Short run profit in monopolistic competition

In figure 18.2, the short run marginal cost curve (SMC) cuts the marginal revenue (MR) curve at point E. This equilibrium point establishes the price at OP and output at OQ. The firm's short run profit is therefore represented by the rectangle PabC. Because of product differentiation, industry prices and quantities cannot be derived. Each firm acts in accordance with his own short run costs and equates its SMC with the MR curve. The implication of this is that, the magnitude of individual firm's short run profit may differ depending on its costs condition, the demand for its products and the number of producers in the market.

Exercise 18.2. Define the short run equilibrium level of output for a monopolistic competitor.

3.3 long run Equilibrium under Monopolistic Competition

If the firms in a monopolistically competitive industry received economic profits in the short run, firms will be attracted into the industry in the long run. The existing market will be divided among more sellers so that each firm will sell lesser quantities of the product than before thus shifting the firms demand curve to the left. At the same time the entry of new firms will increase the demand and hence the factor prices thus the cost curves of the individual firm will shift upwards. This two-way adjustment process of lowering the demand curve and raising the cost curves will squeeze out super-normal profit. Thus the monopolistically competitive industry will reach a long run equilibrium position when each firm is in a situation shown in Figure 18.3. Price is equal to long run average cost at the profit-maximizing level of output, so that each firm is earning only a normal profit in the long run.

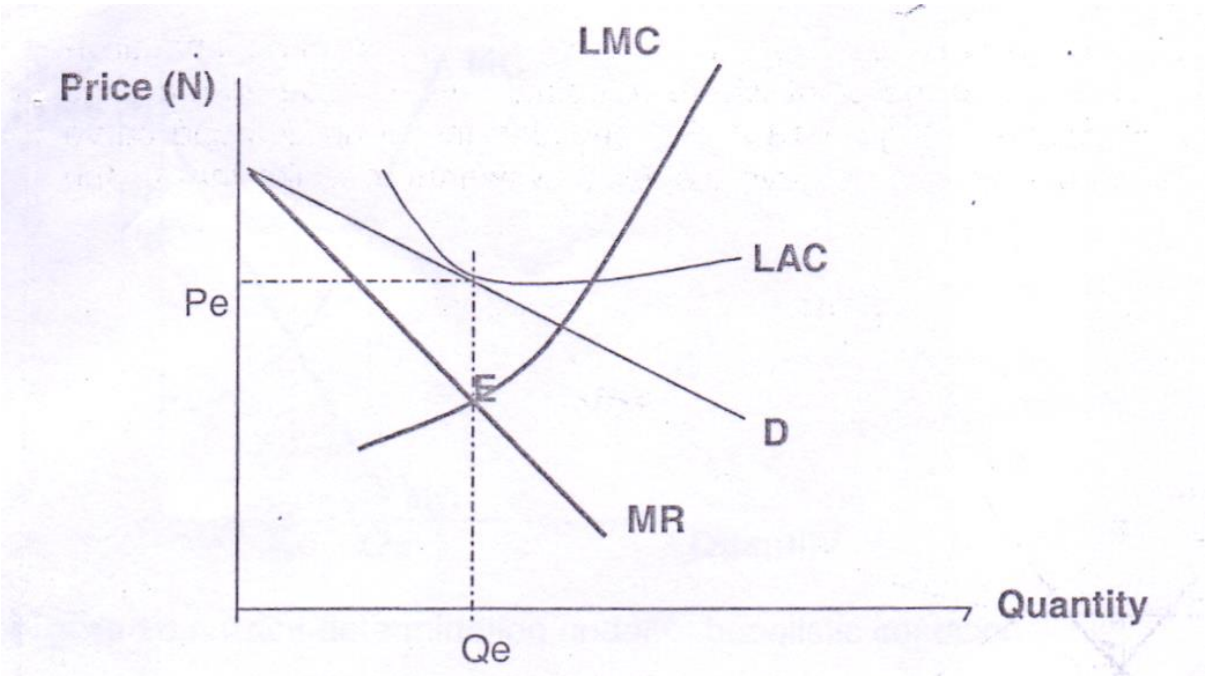

Figure 18.3 Long run Equilibrium under Monopolistic Competition

The monopolistically competitive firm will maximize its profit in the long" run by producing where marginal revenue (MR) is equal to long run marginal cost (LMC) as long as it is receiving normal profit. When in addition, price P is equal to long run average cost, the firm is receiving only a normal profit and there is no incentive for firms to enter or leave the industry.

3.4 Price determination in an oligopolistic market

The major feature of an oligopolistic market structure is that the industry is made up of few interdependent firms producing identical or differentiated product with entry restriction. In certain oligopolistic industries with differentiated products, firm typically spend a great deal of money advertising and product development, each hoping to convince customers that its product is superior to that of his rivals. Each firm tries to increase the demand for its product and thereby increase its market share. But because oligopolistic firms are so interdependent, it is impossible for one firm to determine the demand curve for its products without making some assumption about the behavior of its rivals. The price one producer ask significantly affect the others sales. For instant, when one oligopolist lowers his price, all others can be expected to do likewise, to prevent loosing customers. Oligopolist pricing decisions are mutually interdependent Just like any profit-making firm. An oligopolist produces goods by equating its marginal revenue to its marginal cost. However, given the complexity in the pricing policy of the industry, the oligopolist firm, particularly if it is the dominant firm in the market, may simply decide to behave like a monopolistic and produce at point Qo units as indicated in figure 18.4. This level of output is just a little higher than the competitive price Po but may not be as high as what would have been charges if he were a pure monopolist.

Exercise 18.3: What is the single most important characteristics in a oligopolistic market.

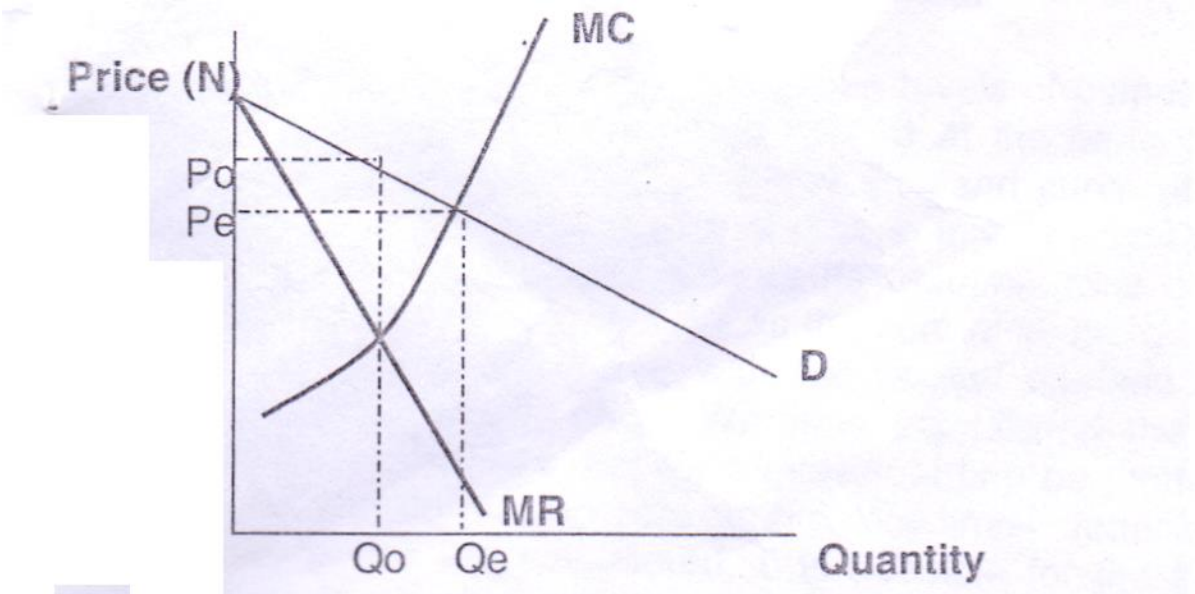

Figure 18.4 Price determination under oligopolistic condition

4.0 Conclusion

Many firms operate in monopolistically competitive industries, and each firm maintains some control over price as a result of a limited amount of product differentiation. For the monopolistic competitor, there is no unique relationship between price and output. The decision of the firms in this industry .is based on the action of his rivals. The oligopolistic market structure may make pricing decision similar to those of a monopoly if the firms in the industry cooperate with each other. Because of the interdependent of firms under oligopolistic market the analysis of its pricing systems tends to be complex and usually requires use of models in predicting the action of rivals in the industry.

5.0 Summary

This unit has examined two types of market structure: monopolistic competition and oligopoly. We looked at how firms determines price in the long run and the short run. Like all firm, the firm under monopolistic competition maximizes its profit by producing the level of output where marginal revenue is equal to short rum marginal cost. In the long run the firm maximizes profit by producing where marginal revenue is equal to long run marginal cost. It was also deduced that if firms in under monopolist competition are earning a greater than normal profit, new firms will enter the industry, which will result in a smaller market share for tach firm. The reverse will occur if firms are earning less than normal profit. We finally examine price determination of an oligopolist. Since the firms in an oligopolistic industry are so interdependent, the behavior of one firm in terms of maximizing its profit will depend on the actions taken by the other firms in the industry.

6.0 Tutor Marked Assignments

Questions:

1. Identify the competitiveness and the monopolistic elements in monopolistically competitive markets
2. What is the single most important characteristic in oligopolistic markets and to what problem does it lead? .
3. With the aid of a diagram illustrate the equilibrium of the firm in the short run under monopolistic competition.

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