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CLASS: M.A. ECONOMICS, SEMESTER - I
PAPER – I : MICRO ECONOMICS -I
[CODE : MAECO - 101]
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Introductory Letter

Dear Learner,

Welcome to MA (Eco) Sem.-I, Course of CDOE. The subject of Economics is not new for you, you must have studied it at UG level. But taking up Economics as a subject of your study at the Postgraduate level would indeed prove to be very rewarding. In our day to day life, most of our actions are motivated directly or indirectly, by economic considerations. Economics is not merely of academic significance, but also of practical importance.

Why is per capita income and standard of living of U.S.A. or Canada much higher than that in India ? What are the causes of rising prices, growing unemployment and problem of poverty? The analysis and discussion of these problems falls within the review of the particular body of knowledge called Economics. Economics as a subject, deals with the rationale of choices. As consumers, we choose so as to make the best use of our limited resources, while keeping an eye on trends of prices and allocate our scarce resources among innumerable competing demands. As producers, we should know how to combine the various inputs so as to get the maximum output at minimum costs. A working knowledge of economics also enables us to see through the process of pricing, the complex system of production and distribution of the fruits of production among various agents of production and in different factors of the economy. The behaviour of an individual unit as a consumer or producer or seller is studied under the domain of Micro Economics.

This first paper of M.A. Semester I (Syllabus enclosed) is titled of Micro Economics and is split into four units. Each unit is on a specific topic-central ideas, consumer choice, consumer decisions and producer's decisions. You are expected to go through every unit thoroughly. Of course, at times, you may feel some difficulty in understanding the topic you can mark your problems and can meet the teacher during the Personal Contact Programme. In case you want to visit the department personally, you are most welcome.

Including this paper, there are four papers in total in Semester-I of MA Economics course. The syllabi of all the papers are available on our website of CDOE at www.puchd.ac.in (Click at PG syllabi). You will have to attempt assignments fetching 20 marks for each paper. This is internal assessment and the marks will be added in your final marks. For updates go through the Prospectus thoroughly and CDOE Notice board. (both available online)

With best wishes,

Cordially,
Course Leader.

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SYLLABUS
M.A. ECONOMICS, (SEMESTER SYSTEM)
SEMESTER – I

Paper-MAECO-101 : MICRO ECONOMICS-I

Max. Marks	100
Theory	: 80 Marks
Internal Assessment	: 20 Marks
Time	: 3 Hours

Objective :

The objective of the paper is to rigorously and comprehensively equip the students with theoretical concepts, methodology and process of reasoning involved in analyzing economic behavior of individuals, firms and markets using, in general, a static and partial equilibrium framework.

The students would be evaluated at the end of each semester through subjective type questions/answers (both short and essay type). The scripts would be evaluated by the examiners having adequate postgraduate teaching experience in the paper/option concerned.

Pedagogy of the Course Work :

The course relies on a combination of lectures, solving problems, and discussing of academic articles or real-life situations. Teacher will assign topic for assignments on contemporary themes and issues from the syllabi. Special tutorials/contact hour for one-to-one student-teacher interactions.

INSTRUCTIONS FOR THE PAPER-SETTER AND CANDIDATES :

1. *The syllabus of this paper has been divided into four units.*
2. There shall be 9 questions in all.
3. The first question, which would be **compulsory**, shall be short answer type (word limit 25-30 each). It would carry 15 short questions, spread over the entire syllabus. The candidate will be required to attempt any 10 short answer type questions. Each short answer type question would carry 2 marks ($10 \times 2 = 20$).
4. Rest of the paper shall contain 4 units. Each unit shall have two questions and the candidates shall be required to attempt one question from each Unit— 4 in all. Each question shall carry **15** marks ($15 \times 4 = 60$).

UNIT – I

Central Ideas of Economics :

How do People Make Decisions? People : face 'Trade Offs' ; Incur Opportunity Costs and Gain Benefits of Decisions; Think at the Margin and Respond to Incentives. How do People Interact? Specialization and Exchange can make each party 'Better Off' Market often work efficiently, The Invisible Hand; Three Coordination Tasks in the Economy: Which Commodity

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be Produced and How much of it? Who should produce it and how? Who should Consume and How much of it?

Methodology of Economics as a Social Science: Alternative Processes of Construction of Positive Economic Theories.

Equilibrium: Concept, Stability, Existence and Uniqueness of Equilibrium.

Types: Static and Dynamic Equilibrium. Partial and General Equilibrium.

Stability Analysis: Marshallian and Walrasian Approaches.

UNIT- II

Analysis of Consumer Choice under Certainty :

Cardinal Analysis,

Ordinal Utility Approach : Revisiting Consumer Equilibrium and Effects of Changes in Relative Prices and Money Incomes and Derivation of 'Marshallian' and 'Compensated' Demand Curves.

Consumer Surplus: Hicks' and Marshall's Approach.

Application of Indifference Curves: Cash Subsidy Vs. Kind Subsidy: Income Leisure Choice; Inter-temporal Choice of Consumption.

Revealed Preference Theory and Consistency of Choice.

UNIT-III

Market Demand: The Role of Network Externalities, 'Bandwagon', 'Veblen' and 'Snob' Effects.

Analysis of Consumer Choice under Uncertainty : Measurement of Risk. Expected Utility and Preferences towards Risk. Why do people gamble (insure)? Risk Return Trade-Off. Reducing Risk.

Analysis of Consumer Behaviour under Asymmetric Information :

Hidden Actions: Principals, Agents and Moral Hazard.

Hidden Characteristics : Adverse Selection Problem. Market and Government Responses to the Problems of Moral Hazard and Adverse Selection.

UNIT-IV

Theory of Production and Costs :

Production, Input Choice and Cost with One Variable Input. Law of Returns to Variable Proportions and Choice of Optimum Quantity of an Input. Derivation of Short Run Cost Curves from Productivity Curves of a Variable Factor of Production. Reserve Capacity and the Shape of Short Run Cost Curves.

Multiple Input Decisions : The Choice of Optimal Techniques of Production and Factor Combinations. Factor Price Changes: Substitution and Output Effects. Elasticity of Input

Substitution. Constant, Increasing and Decreasing Returns to Scale. Expansion Path and derivation of Long Run Cost of Production Curves.

Economies and Diseconomies of Scale :Shape of Short and Long Run Costs Curves: Theory versus Empirical Evidence. Multi Product Firms and Dynamic Changes in Costs: Economies of Scope; The Learning Curve Analysis.

Recommended Readings

Essential Readings :

1. Pindyck, Robert S., Rubinfeld Daniel, L. and Gupta, P.L. (2017) : *Principles of Economics*, 3rd Edition, Thomson, 3rd Indian Reprint (2017).
2. Maddala, G.S. and Miller Ellen(2004) : *Micro-Economics*, Prentice Hall of India, New Delhi.
3. Mankiw Gregory N. (1998) : *Micro-Economic Theory and Applications*, Tata McGraw Hill.

Further Readings :

1. Boumol,William J. and Blinder Alan S. (2007) : *Microeconomics; Principles and Policy*, (9th Ed.) Alan S. Thomson, 1st Indian Edition.
2. Salvatore Dominick (2007) : *Microeconomics: Theory and Applications*, (4th Edition), Oxford Univ. Press.
3. Koutsoyiannis, A. (2016) : *Modern Micro Economics*, McMillan Press, London.
4. Ryan, W.J.L. and Pearce, D.W. (1989) : *Price Theory*, McMillan India, New Delhi.
5. Ferguson, C.E. and Gould, J.P. (1989) : *Micro Economic Theory* (6th Edition), All India Book Seller.
6. Briet, W. and Hochman, H.M. (Ed.) (1977) : *Readings in Micro Economics*, Dryden Press.

CENTRAL IDEAS OF ECONOMICS

Structure

- 1.0 Objectives
- 1.1 Introduction
- 1.2 How do people make decisions?
- 1.3 List of basic principles underlying decisions
- 1.4 Markets are usually a good way to organize Economic Activity
 - 1.4.1 Missing or Non-existent or Under developed Markets
 - 1.4.2 Imperfect Markets
- 1.5 Summary
- 1.6 Glossary
- 1.7 References
- 1.8 Further Readings
- 1.9 Model Question

1.0 OBJECTIVES

After studying this lesson, you shall be able to :

- explain why scarcity is the fundamental economic fact of every society.
- identify the functions of an economic system i.e. functional set up of an economy.
- describe the basic problems of an economy including economic problems faced by the people in general.
- discuss the how an economy works is provide solution to the economic problems of the people.
- explain the concept of margin in unifying theme of microeconomics
- describe the government's role to resolve these problems.

1.1 INTRODUCTION

In this lesson, we shall study about the fundamental problem of scarcity, functional set-up of an economy, working of an economy, central problems of an economy and about government's role in solving these problem.

1.2 HOW DO PEOPLE MAKE DECISIONS?

Economics, as a social science, is concerned with studying the interactive behaviour of 'Economic decision making' units (individuals, institutions and societies) in managing the

use of scarce and alternatively useable economic resources at their command (owned, borrowed or leased in) to achieve their chosen objectives or achieve their chosen objectives with the least expense of these resources. In short it implies intelligent or rational conduct by 'economic' decision making units at different levels of aggregation in their use of available scarce but alternatively useable economic resources to achieve their (intelligently?) chosen objectives.

Though the process of human decision making is really complex, our effort to analyse, understand and predict it is facilitated by the presence of a set on Central Ideas of Economics as a subject. In this lesson, therefore, we focus our attention to a few of these central ideas that help us understand the process of decision making by individuals whose collective decisions will reflect the behaviour of the society/economy they are a part of. We propose first to list these principles and then discuss each in some detail to bring out the central idea underlying the basic principle.

1.3 LIST OF BASIC PRINCIPLES UNDERLYING ECONOMIC DECISION-MAKING BY INDIVIDUALS

- (i) People Face Trade-Offs.
- (ii) The Cost of Something is The Next Best You Give Up to Get it
- (iii) Rational People Think At The Margin.
- (iv) People Respond to Incentives.
- (v) Specialization and Trade Can Make Everyone Better Off.
- (vi) Markets Are Usually a Good Way to Organize Economic Activity.
- (vii) Governments Can Sometimes Market Outcomes.

We, now proceed to discuss each of the above mentioned Principles to drive home the central idea underlying the concerned principle.

1.3.1 People Face Trade-offs

The first of these ideas is that people face 'Trade Offs' due to the possibility of alternate uses of economic resources that are scarce in relation to demand for them.

While nobody can deny that there are people who may have limited wants for economic goods ... people for whom (as Frank Knight had pointed out long before) 'economic provision' is a pre requisite to the pursuit of higher objectives of life.. .like extending the frontiers of knowledge ... or seeking a communion with their Creator etc.; an overwhelming proportion of people have a predominantly a materialistic orientation of life. Such people are nearly totally involved in the pursuit of material goods and services and their motto is 'the more the better'. Their intra and inter temporal wants for needs, comforts and luxuries are proverbially unlimited.

Since demand for economic resources is a demand derived from demand for goods and services, demand for the former becomes unlimited too. If the means of production and distribution were unlimited in supply, no economic problem would have arisen and everybody would always have had everything, in any quantity, anywhere and anytime like the availability of (still largely unpolluted) fresh air for breathing. However, this unfortunately is not the general case in a world we live in. Not only are resources scarcer in relation to their

current demand, some are deplete- able and their increased current use may cause the supply to totally or nearly totally dry up in future.

The resources of production are in limited supply to each economic entity.... each person has only 24 hours at his command and he cannot do all that he wants to within this limited hours ... each family has a limited income to meet the virtually unlimited current and future demands of her members.... so is the case of each society i.e. having resources that can produce only a fraction of what her current members want currently and in future.

If the economic resources were not alternately useable, their limited availability would have created at best, a 'Technological' and not an 'Economic' problem viz. how to get the most out of a resource that had only a specific use. The number and quantity of goods and services produced would have been determined by the variety and quantity of use- specific resources available. The 'Economic' problem arises because the available scarce resources are alternately useable too i.e. any given resource(s) is capable of being used in the production of a variety of goods and services at the same time and in many cases overtime as well. This opens up the problem of choice....how much of a resource(s) be used in the production of which of the numerous goods and services that it can help produce. Since the resources are limited in availability, using them in one good and service, say 'X' deprives us of using it in the production of another good and service say 'Y'. Hence the problem of choice... to trade one kind of use of resource(s) for another kind of use or 'Trade Off' the quantity of production of one good or service for another.

Luckily the wants, though unlimited, are rank-able by decision makers in terms of their 'order/intensity of preferences'. Given the characteristics of completeness, continuity and transitivity of preferences, it is possible to rank one want ahead of another in the context of a given objective.

This ranking of wants together with the possibility of alternate use of available resources allows us to use a resource(s) for the production of a good/service ranked higher than use the same for the production of another good/ service. This is what we mean by term people facing 'Trade Offs'. Since the scarcity of resources does not allow anybody to have all that he/she wants everybody has to prioritize his/her wants and in order to have a 'prioritized' good or service called 'X', he (she) has to give up any of the nearly endless other goods and services that could have been produced by the use of the same resources. Each decision maker; be it an individual or a family or a business institution or a society, has to make a rational choice of using its scarce and alternately useable resources in pursuit of its chosen objective(s).

1.3.2 Giving up cost to get something

This brings us to the discussion of Economics' Central Idea number II i.e. the cost of acquiring something is what one has to give up in the process of getting it. This characteristic of economic resources i.e. being alternately useable implies that by varying the kind of use a resource is put to, it can help produce different kinds of goods/services that obviously would be valued differently by the market. Just as the wants are capable of being ranked in order of preference, alternative uses of a resource unit can be ranked in terms of the valuation that market puts on the outcomes of its alternative uses. These alternative uses can be ranked in a descending order of the market valuations: with the highest valuation occupying the top place followed by the second best the third best and so on. Rationality would obviously dictate the employment of a resource unit in a use that promises the highest market valuation. Doing so will deprive us the opportunity of using this resource unit in its next best

use. The cost of a resource unit's use in its 'First Best' alternative is foregoing the market valuation of its use in the 'Second Best'.

In other words, the cost of using a resource unit in one alternative is the opportunity foregone in its next best use. The point to be noted is that the cost is measured by **the opportunity foregone in the next best and not in just any other of the multiple uses it can be put to**. The Economist's concept of cost is therefore, the 'Opportunity Cost'.

It would be useful to distinguish between Economist's concept of 'opportunity cost' and an Accountant's concepts of 'historical' and 'Out of Pocket' costs. Failure to do so will lead to widely inaccurate decision making. Suppose, Ms. Meera is an expert at knitting and had in 2009 purchased wool for Rs.300/- enough for knitting a pullover when a medical emergency occurred that put her out of knitting. After two years now she is fit to resume her work and can knit the pull over in a day that will sell for Rs.750/-. In the meantime a hosiery unit has also got located in her neighbourhood and offers her a daily wage of Rs.300/-. She is faced with a decision whether to knit the pull over and sell it or dispose of the wool whose market price is Rs.500/- now and seek employment with the hosiery. The following three situations are possible.

- (1) As the wool had cost her Rs.300/- and will spend nothing out of her pocket to knit it, her total cost would be only Rs.300/- and selling the pullover for Rs.750/- would bring her a profit of Rs.450/-. **She should knit the pullover.**
- (2) The wool had cost Rs.300/- but knitting at home will result in not doing hosiery job and a lost opportunity of earning Rs.300/- . The total cost in fact, taking in to account the opportunity cost of her time, would be Rs.600/- and not Rs.300/- as calculated above. Since the sale price of the pullover is Rs.750/- It is profitable to knit at home and sell the pullover.

However, to an economist the opportunity cost of wool is Rs.500/- and not the historical cost of Rs.300/- at which she had purchased it two years ago. (She can sell the wool in the market at Rs.500/-). The real economic cost of knitting the pullover at home is therefore, the sum of opportunity costs of her time (Rs.300/-) plus the opportunity cost of wool (Rs.500/-) i.e. Rs.800/-. Since she will get only Rs.750/- from the sale of pullover, **it is therefore, profitable for her not to knit the pullover herself** but sell the wool and seek job. That way she can make a profit of Rs.200/- on wool and get Rs.300/- as wage ... a total of Rs.500/-. This conclusion is in direct contradiction of the: above two conclusions which fail to take into account the opportunity costs of either the wool or her time or both at the same time.

Sound economic decision making therefore, requires taking into account the opportunity cost of use of scarce and alternately useable resources.

What is true for individuals is equally true for any aggregation of decision makers: be it family or the society because of the perennial scarcity of alternatively use-able resources.

1.3.3 Rational People think at margin

Another principle guiding people in rational decision making is that 'people think at the Margin'. Use of scarce and alternatively useable resources in satisfying virtually unlimited wants forces decision makers to consider the cost and benefit of their decisions. While a non-economics student would bear it out (of both intuition and own experience) that, all else remaining the same, as a decision maker increases the use of a good/service/factor of production the successive benefit (satisfaction/output/revenue; whatever be the case) goes on declining, an economics graduate would recollect this as the outcome of the eventual

operation of 'The Principle of Diminishing Marginal Utility/Diminishing Marginal Returns' etc. The opportunity cost of using the successive units of the goods/services/factors of production would eventually be increasing.

To make the best of available resources, a rational decision maker would perform compare the expected benefit and cost of using an additional unit of a good/service/factor of production and continue till the former exceeds the latter and stop where they are equal. The decision whether to consume/produce additional unit, Marginal in Economics jargon (provided the addition is infinite small), depends upon the resulting additional benefit and the cost and **not on average benefit or per unit cost or average benefit**.

While the economics graduates will recollect the solution of Water-Diamond' puzzle as application' of marginal cost-marginal benefit principle, others may benefit from their observation of a peculiar Air Line pricing strategy. Often, one may observe that one hour prior to taking off, if there are seats vacant in a plane, the Airline may offer the seat(s) at half or even at a quarter of the average fare charged from those who had booked the tickets well in advance. The reason is that the additional/Marginal cost of flying one more traveller is only of the refreshments ... usually negligible (though the Average total Cost would be very high) and therefore, even reduced fares (in so far as they more than recover their marginal costs) would add to their profits. It would be perfectly rational for the Air Lines to charge much less than their average or per seat cost if some seats are going to be unoccupied. This, is also true for such activities as theatre/cinema shows/teaching institutions if seats remain unfilled in a course/programme.

Self Assessment Question

Q1. What do you know about water diamond paradox?

Ans. _____

Rational decision makers always compare the marginal benefit with the marginal cost and go for an action only in so far as the former exceeds the latter and reach their equilibrium where both the marginal values become equal.

The Economics students are ought to be aware that an equilibrium position is the most preferred state of affairs and no decision maker is likely move away from it unless there is a change in the value(s) of underlying variable(s) causing either a change in the marginal benefits or the marginal cost or both. This leads us the next principle of decision making mentioned below :

1.3.4 People respond to incentives

An incentive can be defined as any inducement or deterrent that elicits a response from the decision maker(s). A monetary incentive may either increase the 'marginal benefit or reduce the marginal cost of a decision maker or may affect both in the desired way to induce the decision maker to move away from his/her initial equilibrium **position**.

- *Examples from Day to Day Life*

Many examples can drive home the point easily, economically and efficiently. Suppose due to some reason or the other (unfavourable weather conditions or a breakdown or an increase in the cost of transport or whatever) reduces the supply of oranges in the market.

Given the demand conditions, both the stand alone as well as the relative market price of oranges would increase. This raises the marginal cost of oranges to the buyer forcing him to consume less of oranges than before in order to raise the marginal benefit (courtesy Diminishing Marginal Utility) to equal the now increased marginal cost of consuming oranges. Simultaneously, reduced demand for oranges may lead to increased demand for other citrus fruit(s) as the consumer(s) may substitute the latter (now comparatively cheaper after price increase of oranges) in place of oranges.

The Government policies too can alter the incentives by altering its Tax/ Subsidy policies just the same way as the market functioning does. The decision makers do respond to incentives/ disincentives irrespective of the source of incentive.

For example, the cropping decisions of Punjab farmers can be cited as a classic case of people responding to Government created incentives. In spite of the fact that Rice is not the staple food of the people of Punjab, the State has become the leading producer of Paddy in India post-Green Revolution. The obvious reason is that **Punjab farmers consider the Minimum Support Price for rice to be more remunerative than the competing crops of the concerned season (e.g. cotton) and hence they respond to this incentive by cultivating rice crop.**

Self Assessment Question

Q1. What is an incentive Activity? Give two examples related to India.

1.3.5 Specialisation and Trade can make everyone better off

The next basic principle in economic decision making is the answer to the question "what propels people to interact with each other"? Apart from the reactions to the decisions of other(s), people consciously, voluntarily and as a matter of strategy enter into contracts with each other in order to make an economic gain. It is an undeniable fact that different individuals/societies/countries are endowed with basic factors of production that differ in their productivity. For example; the productivity of human capital does differ from person to person for reasons both of 'nature' and 'nurture' in the same society and more sharply among different societies. In some countries land may be more fertile/may have more minerals/oil below the surface while in others the climatic conditions may be more suitable for a particular activity, say agriculture. This may and does result in an individual/society being in a position to produce a good and or a service more efficiently i.e. at a lower resource cost than another or others. This differential productive capacity could bestow on a part both absolute and/or a Comparative advantage that makes specialization gainful for all the contracting parties.

Suppose, A and B are trained Tailors. For a full working week (six days), A can stitch either 100 shirts or 40 safari suits while B can either stitch 400 shirts or 10 safari suits. A thus has an absolute advantage over B in stitching safari suits while B has an absolute advantage over A in stitching shirts.

If each of the them produces both the goods by expending 3 days to each product, after a full week the total factory output would be 250 shirts (50 by A and 200 by B) and 25 safari suits (20 by A and 5 by B). Now suppose we allow A to specialize in the stitching of Safari suits"... his full week's production would be 40 suits. Similarly we allow B to specialize in the production of shirts; his full week's production would be 400 shirts.

The total factory output would be 40 safari suits and 400 shirts. A and B can sub contract among themselves the production of safari suits and shirts and gain; so will the society in having much larger production of both the goods with the same labour input.

It is possible that instead of each having an absolute advantage over the other in a particular product, one of them may have a productive advantage over the other in both the products. The advantage may however be not to the same extent and may be comparatively more in one of the two products. Suppose A's productive abilities result in 100 shirts or 50 safari suits per week and B's abilities are assumed to result in 400 shirts or 52 safari suits in a week. B has an absolute advantage over A in the production of both the goods (400 shirts rather than 100 shirts and 52 safari suits than 50 safari suits by A) but B's comparative advantage is more in shirts than safari suits.

Alternately we may say A is at a greater comparative disadvantage in the production of shirts than' safari suits. He will do better to focus on the production of safari suits and specialize rather than producing both. Suppose none specializes and both allocate half of their time in the production of each of the product. In this case, total factory output would be 250 shirts (50 by A+200 by B) and 51 safari suits (25 by A and 26 by B).

Suppose now A totally specializes in the production of safari suits, he will produce 50 safari suits in a week while B spends 3/ 4th of his week in the production of shirts and 1/ 4th of his time in the production of safari suits. His production would be 300 shirts and 13 safari suits. The total factory output would be 300 shirts and 63 safari suits ... much larger than 250 shirts and 50 safari suits if A is not to specialize.

We therefore, conclude that whenever and wherever an individual or a society or a nation has a comparative advantage over the other in the production of a commodity, each will gain from specialization in production and by entering into trade with each other.

Specialization and trade can benefit both the interacting parties that compete with each other unlike sports where competition results in one winning and the other losing. It is a win-win situation for both the parties to trade.

1.3.6 Markets are Usually a Good Way to Organize Economic Activity.

In a market economy, millions of freely competing decision makers guided, as if by an 'invisibly hand' of market signals, organize their respective economic activities in order to make the best use of the resources at their command. 'Economic Darwinism' insures that those 'whose perception and interpretation of the market signals is correct survive as economic decision making agents while others do not. Those who survive, while maximizing their own well being, unwittingly and without any intention promote optimum social well being as well.'

Easiest approach to show' this result is as follows. As discussed in principle III, A consumer buys units of a commodity up to the extent where his/her marginal benefit (Marginal Utility) equals his Marginal Cost of acquiring that unit i.e. the price the consumer has to pay to acquire that unit.

On the other side of the market, a producer, seeking to maximize his/her profits, would ever sell units of a commodity till his Marginal Revenue equals his/her Marginal Cost of production.. Since in perfect competition the Marginal Revenue equals Average Revenue i.e. the Market Price, one may say the producer's Marginal Cost of production must equal the Market price of the commodity for his profits to be maximized. Combining these two, it can be concluded that in a perfectly competitive market equilibrium a consumer's Marginal Benefit from consumption equals a producer's Marginal Cost of Production.

If we assume that there are no Consumption Externalities, A's consumption will not in any way (Snob and or Bandwagon etc.) affect B's consumption. In such a situation, a consumer's Private Marginal Benefit would be the same as Social Marginal benefit of consuming a unit of a commodity ($PMB=SMB$) as a society is a collection of individuals. Similarly, if we assume that there are no production externalities (i.e. Producer A's production does neither positively nor negatively affect the production costs of producer B, apart from the effects that travel through the market), a producer's Private Marginal Cost (PMC) would equal Social Marginal Cost (SMC) of producing a unit of a commodity. In short PMC would equal SMC .

Since in consumption $PMB=SMB$, and in production $PMC=SMC$, it follows that SMB equals SMC i.e. the production and consumption of each commodity is pursued to the extent where the last unit brings to the society as much benefit as it costs her to produce that unit.

When consumers and producers successfully pursue their own well being, they too, un-intentionally though, achieve maximum social well being. The society makes the best (optimum) use of her resources.

A corollary of the functioning of 'Invisible hand' in achieving optimum social well being, one may say that whenever, wherever and in whatever way its functioning is interfered with, some degree of misallocation of a society's resources will take place. Achieved Social Wellbeing would fall short of potential wellbeing that could have been achieved.

Governmental Regulation of Prices: Sometimes governments, for varied reasons, fix prices of some goods and services above or below their market clearing prices. Minimum Wage Regulation and The Rent Control Acts are common examples. When prices are fixed below the market clearing prices there is bound to be shortages leading to the emergence of Black marketing forcing Governments to introduce Licensing that has its own administrative problems. Thus whenever Governmental intervention and or other imperfections impede or cause some degree of inability to the functioning of 'Invisible Hand' to transmit right market signals at the right time, there would be misallocation of resources from a society's point of view.

This result also partially explains the failure of Communism in the Soviet Union and Eastern Europe in the 1980s and the economic reforms in other countries including India in 1990s. In all such economies, and most outstandingly in those that were centrally planned, the prices were not determined in the market but were either dictated or interfered with (in varying degrees) by some planning or Governmental authority.

The varying degrees is incapacitation of the 'Invisible Hand' in these economies caused wide spread misallocation of resources and lower economic wellbeing. No wonder how then: is almost a universal clamour/ attempt to develop market economies, endanger competition and restore the functioning of Smith's 'Invisible Hand'.

We may end this section with the conclusion that left to be guided by the 'Invisible Hand'.

Self Assessment Question

Q1. Last basic principles underlying economies decisions.

1.4 MARKETS ARE USUALLY A GOOD WAY TO ORGANIZE ECONOMIC ACTIVITY

Governmental interference is just one of the factors that may cause distortions in the functioning of the 'Invisible Hand' and the markets. Even in the apparently well functioning Market Economies, we may frequently come, across many more factors that cause **Market Failure in a situation where the market forces, left to their own, fail to achieve optimum resource allocation. In such situations, Governmental intervention can Sometimes Improve Market Outcomes.**

Though the topic of Market Failure would be dealt in detail in the second semester, at this juncture it is necessary **at least to list out the situations in which the market could fail** to do its job of optimum resource allocation or the 'Invisible Hand' may not work or may work inefficiently.

1.4.1 Missing or Non Existent or under developed Markets: For optimization of social wellbeing, markets must function in each and every case. However, there is a wide variety of instances/areas in which there are no functioning markets e.g. there is **no market for Clean Air.**

Additionally, there is the case of **Common Property** where the absence of Individual Property Rights encourages each to over exploit the resource like:

- (i) Air (for purposes of Air Travel),
- (ii) Natural sources of water like Ocean (for Fishing),
- (iii) Common Village Lands (for Cattle grazing).

Some kind of Community or Government regulation is a must for ensuring efficient use of Commons.

Presence of Incomplete Markets: Markets may be incomplete due to the presence of:

- (i) **Externalities.** Presence of Externalities in Consumption and Production would cause a divergence between PMB and SMB on one hand and PMC and SMC and operation market forces would lead to inefficient resource allocation. Some kind of Tax/ Subsidy scheme, such as the one suggested by Prof. Pigou, would be necessary to avoid under / over production of goods and services and ensure socially optimal resource allocation.
- (ii) **Public Goods.** Such goods for which nobody can be excluded from using them and in whose case use by one person does not reduce another person's ability to use them. For example, consider the case of creation of Basic or general knowledge. Suppose a mathematician develops a new theorem and after the theorem enters the pool of general knowledge nobody can be prevented from using it and use by one scientist does not debar another scientist from using it.

Profit seeking firms tend to free ride on the Knowledge created by others and, as a result, devote too few resources to creating new knowledge. Government spending on basic knowledge creation is thus a must for efficient use of a society's resources.

- (iii) **Asymmetric information** leading to Market break downs due to Adverse Selection and Moral Hazard problems. The Governments pass laws to force the firms (Alcohol/content in beverages or energy content of food items) to improve upon the information of the buyers of their products to avoid adverse selection problems. Interfering in free functioning of Labour Markets by allowing for Piece-Rate remuneration or Profits or productivity linked Bonuses are instances to tackle problems created by Moral Hazard.

Self Assessment Question

Q1. What is an externality?

Q2. What is asymmetric information?

1.4.2 Imperfect Markets: The markets may not be a good way to allocate resources if there are markets with imperfect competition or there are Monopolized markets.

It is easy to see this because while the consumer would still try to optimize his wellbeing by equating PMB (assumed to equal to SMB) with Price paid by him, the producer would try to maximize his profits by equating his Marginal Cost of production (PMC assumed equal to SMC) with his Private Marginal Revenue (PMR) which is always less than the Market Price. Since PMR is less than Price that reflects $PMB=SMB$, it follows that $PMB=SMB$ exceeds the SMC. The industry produces less than it should if SMB is to equal to SMC. There is therefore, invariably under production of the commodity concerned; it employs resources less than it should from a social point of view, forcing others to employ more than they should resulting in misallocation of resources of the society.

Government policies like facilitating entry of new firms into industries by eliminating or lowering of entry/exit barriers are policies to reduce the Market or Monopoly Power of Firms and improve the degree of competition and hence resource allocation. Similarly, various institutions to control Monopoly and promote competition are steps to improve resource allocation.

Economic wellbeing of a society does not depend only on efficiency in resource allocation. Even if markets exist in all goods and services, are perfectly competitive and there are no complications caused by Externalities etc. as discussed above, the functioning of the 'Invisible Hand' does not ensure that everyone gets food, shelter, clothing, health care, education etc. in consonance with human dignity. It is not only the level of Economic Well

being but its Equitable Distribution as well that concerns societies and the Governments. Each society has its own norms or a Welfare Function of her own reflecting her accepted 'Trade Off between Efficiency and Equity. An example of it is the Progressive Income Tax and Welfare Transfer Payments that Governments resort to equitable distribute the economic well-being.

However, the principle that Government intervention may sometimes lead to outcomes better than achieved by the un-inhibited functioning of market forces does not mean that All Public Policy interventions will do so. Public Policy is not decided by a disinterested Superman concerned only with social welfare but generally is the outcome of a political process involving bargaining and lobbying by political pressure groups and may be aimed to benefit a specific group at the cost of another. Additionally, sometimes policies may be made by political leaders who are honest but not adequately informed or may be downright inept. ***So we conclude this section saying that the Government interventions may sometimes improve the Market Outcomes.***

1.5 Summary

Let's recapitulate what we have understood in this lesson.

- Economics deals with the allocation of scarce resources among alternative uses to satisfy human wants. Scarcity of resources and commodities is a fundamental economic fact of every society.
- All societies must decide what to produce? How to produce? For whom to produce? How to provide for the growth of the system and how to ration a given amount of commodity over time. Under a free enterprise or mixed economic system, it is the price system that performs these functions.
- Micro economic theory studies the economic behaviour of individual decision making units such as individual consumers, resource owners and business firms and the operation of individual markets in a free-market economy. Micro economic theory focuses attention on households and business firms as they interact in the markets for goods and services and resources.
- Because of scarcity, all economic activities give rise to some benefits but also involve some cost. The aim of economic decisions is to maximise net benefits. Net benefits increase as long as the marginal or extra benefits from an action exceed the marginal or extra cost. Net benefits are maximized when the marginal benefits are equal to the marginal cost. This concept applies to all economic decisions and market transactions. It applies as much to consumption decisions of individuals as to the production decisions of firms, the supply choices of input owners and government decisions. In deed the concept of margin and marginal analysis represents the key unifying concepts of microeconomics.

1.6 GLOSSARY

- **Rational decision makers :** The one who compares Marginal Cost with Marginal Benefit.
- **Marginal cost :** The price paid by the consumer to purchase the last unit of Commodity.

- **Marginal benefit :** The utility derived by the consumer from the consumption of last unit.

1.7 REFERENCES

- Pindyck, RS, Rubinfeld DL Mehta, PL (2011). *Micro Economics*, Pearson Prentice Hall, Seventh Edition (2011).
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1.8 FURTHER READINGS

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1.9 MODEL QUESTION

1. Write a detailed note on Central ideas of Economics.

BEHAVIOURAL ECONOMICS

Structure

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Behavioural Economics - An Introduction
- 2.3 Formulation of Behavioural Assumptions
 - 2.3.1 Forgetfulness causes a behaviour that reflects Bounded Rationality
- 2.4 People may not behave rationally because of imperfections of human reasoning :
 - 2.4.1 Because of Inertia
 - 2.4.2 Because of Rigidity of their Already held beliefs
 - 2.4.3 Because of their overconfidence
 - 2.4.4 Gambler's Fallacy
 - 2.4.5 Because they care for "Fairness" and not for "Efficiency" or Self Interest Alone
 - 2.4.6 Because they may behave inconsistently
- 2.5 Summary
- 2.6 Glossary
- 2.7 References
- 2.8 Further Reading
- 2.9 Model Question

2.0 OBJECTIVES

After studying this lesson, you shall be able to :

- know how people actually make choices in the real world.
- understand what happens when some economic agents exhibit human limitations and complications in making economic decisions.
- answer why consumers often procrastinate, adopt rule of thumb in making complex decisions.
- describe how people make choices that are not in our long-term interest

2.1 INTRODUCTION

Recall that the basic theory assumes that individuals and other economic agents always behave and act rationally. i.e. It assumes that they make logical, rational and self-interested decisions that weigh benefits against costs so as to maximize utility, value or profit. The 'economic man' is analytic, calculating, selfish and unemotional. This is often contradicted by reality, where actual human beings often act illogically or irrationally, make

inconsistent and even self-sabotaging choices, fail to learn from experience, exhibit reluctance to trade, retreat to unscientific 'rule of thumb' in making choices in the face of uncertainty and behave in other ways that depart from the standard model of unbounded rationality.

In this lesson, we shall study about how and when do people behave rationally or irrationally.

2.2 BEHAVIOURAL ECONOMICS : AN INTRODUCTION

During the early stages of development of Economics as a distinct field of study, eminent Economists treated their subjects of study as 'Homo Sapiens' who, while being calculative and focussed on their self interest could also be intuitive, impulsive, emotional, reactive, forgetful etc. in their actual behaviour. These Economists, tried to read the psychology of 'Homo Sapiens' to speculate about **'how people feel and think about their economic choices' and internalized** these insights while propounding their theories. Adam Smith, considered the Father of Economics, and best known for his concept of 'Invisible Hand', also wrote an important book **'The theory of Moral Sentiments'** detailing out psychological principles of individual behaviour. Irving Fisher's reference to people's psychology **to always prefer present over future consumption** or **Keyne's 'Psychological Law of Consumption'** or **'Money Illusion', Entrepreneurs' 'Animal Spirits'** are a few that are cited from among numerous other examples.

As the Neo Classical tradition took roots, Economists started treating their subjects of study as 'Homo Economics' ... perfectly rational robots so programmed as to go through detailed economic calculations aimed solely at the pursuit of their 'self interest'. It could be maximization or minimisation of some pre defined objective variable. They are never forgetful, have no emotions, have no moral or ethical considerations like being 'Fair' to others, no regard for service to the society or the nation they are a part of or the issues like survival of human race. It is another thing that in some cases the pursuit of Smithian 'invisible hand' to further their own self interest may also serve the social interests as an unintended outcome.

Though scholars of the caliber of H. Leibenstein, T. Scitovsky and Herbert Simon continued to emphasise the need to look closely into the human psychology and suggested bounds on rationality, the mainstream neoclassical revolution continued to sidetrack these contributions.

Towards the second half of 20th century, as the anomalies and counter examples from observed, behaviour of people were becoming too common to be ignored, economists started accepting **the importance of applying psychological insights** pertaining to the functioning of individual human minds **in formulating behavioural assumptions of economic agents.**

Thus the revival of the use of psychology in economics constitutes the beginning of Behavioural Economics. Interaction between Psychology and Economics has resulted in immensely increased realism of the psychological underpinnings of behavioural assumptions of economics. It is expected to definitely **enrich economic theorizing, improve the congruence of economic theory predictions with reality and suggest a better Public Policy.**

2.3 FORMULATION OF BEHAVIOURAL ASSUMPTION OF ECONOMICS

The first outcome of applying basic psychology to the formulation of behavioural assumptions of Economics was to accept that **'People could not be and are not always**

rational in their behaviour as assumed by Neo Classical theorists'. It could be for a variety of reasons like:

(a) Forgetfulness

As human beings they could, at times, be forgetful and fail to fully use, at the right time, all the information/knowledge that has been stored in their memory. Rather than **Rationality per se**, their behaviour, at best can be described as '**Bounded Rationality**'.

(b) Imperfections of Human Reasoning

Clarity in human reasoning may, at times, be clouded by a very large number of factors. A few of these factors are listed below and their respective implications, in the context of rationality, are discussed in the following pages.

- (i) Impulsive behaviour.
- (ii) Confusion caused by failure to handle information overload.
- (iii) Short sightedness.
- (iv) Inertia.

2.3.1 Forgetfulness Causes a Behaviour that Reflects 'Bounded Rationality'.

In order to appreciate it, let us first detail out **the steps**, assumed to be sequentially followed by a neoclassical rational decision maker, while arriving at a decision involving choice.

Step I.

A neoclassical rational decision maker is assumed to list out all Technical as well as Economic' alternatives that are feasible and open to him, carefully **rejecting** all those that are **not feasible on either or both counts**.

For example, suppose a student with moderate economic means is to travel from Chandigarh to Delhi to attend an interview.

Though the **Air Travel is a technically feasible alternative open to him, yet it may not be economically feasible** for him. He will have to consider only alternatives that are both technically and economically feasible. On the other hand, for his friend with abundant means, traveling by Air may be both economically as well as technically feasible.

It should therefore be clear that even though for a number of people, at a given time and at a given place, the ends may be the same, they may have alternative sets of means open to them.

Step II.

Having listed technically and economically feasible alternatives open to him, he is assumed to **take into account all information** (readily available as well as such self collected information as is considered worth collecting), **for each of the alternatives listed**. This involves the collection/receiving of information, sifting of relevant from irrelevant information and **storing in memory only the relevant information**.

Step III.

Having done that, he is supposed to process the stored information to assess the **Economic consequences** (both in terms of costs and benefits) **of choosing an alternative** with reference to the preferred objective. This involves retrieving of stored information and processing it.

Step IV.

The exercise on working out the Economic consequences of alternatives open to him he proceeds to **Rank these alternatives in order of his preference**. It is assumed that his ordering satisfies the canons of Completeness, Consistency and Transitivity.

Step V

Finally, he/she must **choose the alternative that ranks highest** in his preference ordering. It is a moot question whether being rational he has any choice to make unless some alternatives have the same or nearly the same rank and he has to make a judgement or take a call.

The foregoing sequential steps, indispensable for Neo-classical notion of 'Rational' decision making, are highly unlikely to be followed in practice. There may be failures at one or the other or even at all levels, because of many reasons ... chiefly because of the **Neurological and Physiological limits that inherently constrain the functioning of human beings**'. The resultant behaviour would thus reflect 'Bounded Rationality'. **Bounded Rationality describes a behaviour which is intended to be rational (in neo-classical sense) but in reality is limitedly so.**

It is pertinent to further elaborate this line of reasoning challenging the Neo Classical behavioural assumption of Rationality through an example. In a class room all students are exposed to the same lecture i.e. the same information. Being rational all are expected to have the same objective of maximizing their score in the examination.

But it must be recognised that each student has limitations of his own with regard to the **Concentration, Comprehension, Differentiation, Memory, Memory Recall and Articulation**. As such, during the lecture some of the students may be fully attentive and by and large be able to understand and take note of the lectured information/knowledge. There would be others who may either be not able to concentrate (even if they earnestly intend to) or even if they fully concentrate, for reasons of intellect and language etc. may comprehend and take mental note of only parts of the lecture. .

There may, even be some students, **the author of this lecture script being one for sure**, who fail to make any head or tail of the lecture and thus may understand and take mental note of precious little of it.

We may therefore, conclude that barring exceptional cases, a vast majority of the students may **fail, in varying degrees, to receive and record in their minds all information** that is beamed at them and is available for free.

The sub assumption that rational decision maker **must take into account all information** ignores the limitations of mind and body of human beings and therefore, seems to be too unrealistic even to approximate their behaviour. It is true that assumptions by nature have to be descriptively false but they should be reasonable approximation of reality if the theory aims at understanding, explaining and prediction of human behaviour.

After the lecture, each student is supposed to sift from his mental record of information what he considers relevant, say from examination point of view, **and store only the relevant information in his memory.**

Due to differing **capabilities of sifting** important from unimportant, relevant from irrelevant etc. and differences in **capacity to store information**, the stored information by all students is likely to differ by a wide margin. Even the most modern computers have limited memory!

At the time of the examination each student is supposed to **retrieve** information from his/her memory and articulate his/her answer to the question being attempted.

After the examination is over, the students often discuss their attempts with each other and sometimes with their teacher(s). The author has frequently come across instances where a student would ask him what was the answer to a question and upon being told the answer would sigh saying 'O God! I knew this answer very much but could not recollect it in the examination hall'. Or 'O God! why did I not recollect this crucial point while he answer in the examination hall? Nervousness caused by time pressure, limitations of language and speed of writing causes many students to attempt lesser number of questions than they are required to and their obtained score suffers vis-a-vis their stock of knowledge.

I am sure the readers of this lesson must have experienced this (failure to recollect/retrieve information from their memory) in their own career at some or the other point of time. Over 90% of my students, year after year, would readily admit it and except a few of those who did not admit, might be lying.

Self Assessment Question

Q1. What do we study in Behavioral Economics?

For reasons of Neurological and Physiological limits on the functioning of human beings, failure to retrieve the right quantity of information, at the right moment and at the right place, is not a bizarre behaviour. This results in sub optimal outcomes though the attempted behaviour was rational i.e. the attempt to maximize the score.

Concluding, it might be said that the observed behaviour may be better called 'Bounded Rationality' and not rationality as assumed in neo-classical theory. By **'Bounded Rationality'**, we mean **'behaviour that was intended to be rational but in reality it is limitedly so'**.

Prof. Keith Stanowich (Toronto Univ.) and Prof. Richard F. West (James Madison Univ.) too hold **'Limits on processing of information by human beings' as a reason for people not always behaving rationally**. Seeking to explain as to why individuals do not always think rationally and logically, they distinguish between The System-I and The System-II thought.

The System-I thought, according to them, is based on intuition and is quick, automatic, effort less and influenced by Emotion. The System-II thought is slower, more conscious, effortful and logical. It involves a greater attention to details and careful consideration of options. One may say it approximates the neo classical notion of Rationality.

When situations get complex and there is information overload, human ability to process information is pushed to the limit. In such circumstances, they argue that the decision makers like managers, executives, negotiators etc. fall back on The System-I thought process in their decision making.

Self Assessment Question

Q1. What do you understand by Bounded Rationality?

2.4 PEOPLE MAY NOT BEHAVE RATIONALLY BECAUSE OF IMPERFECTIONS OF HUMAN REASONING.

Prof. Herbert Simon, one of the front runners to emphasize the use of psychology in the formulation of behavioural postulates of economics, argued that for a variety of reasons people often make decisions that are 'Satisfying' rather than maximizing. Instead of adopting what could, on cold calculations, turn out to be the best course of action, people make decisions that are just good enough.

2.4.1 People Often do not Behave Rationally Because of Inertia.

Inertia ... the habit of not acting or unwillingness to do act represents a behavioural failure to act rationally. To elaborate this point let us take the example of Tax advantaged retirement savings accounts' as operative in USA.

In some firms (Type-I) workers can choose to participate in such planes) by filling out and submitting a simple form signifying their consent is voluntary and final. In other firms (Type-II) workers are automatically enrolled to participate in the scheme(s). In case a worker does not want to participate, he/she has to fill and submit a simple form signifying his voluntary and final decision to opt out. For rational decision making, it should not matter whether a worker has to fill in a form to become a member or to fill in a form not to become a member. If workers are rational decision makers and consider the proposed retirement savings accounts scheme(s) to be beneficial, then the percentage of those availing of this opportunity should be the same in both types of the companies. However, in practice it is not so. A greater percentage of workers are found to participate in the cited scheme(s) in type II firms rather than type I firms.

The answer to this surprising result is that workers suffer from Inertia. In firms where workers are automatically enrolled in these savings scheme(s), **quite a large number of workers fail to put in their 'opting out' slips and get automatically enrolled** even when they were not inclined to do so. In the other type of firms, only those who choose to become members fill in their forms.

2.4.2 People do not Often Behave Rationally Because of Rigidity of Their Already Held Beliefs.

Not only most people are over confident, they are reluctant to reconsider their conclusions even when they come across fresh information. They tend to interpret new evidence as only further conforming / confirming to their previously held belief.

In one study, the participants were given a new research report on whether death penalty deters people from committing the requisite crime. After reading the report those who, to begin with, had held death penalty as a deterrent, said they were surer of their view. Those who had initially opposed death penalty also argued that they were now more convinced of their logic and belief. In other words, **most people fail to revise their existing**

purchase/sale plans and have a tendency to interpret newly available information in their own way. And such behaviour can by no means be called either a scientific or a rational approach.

Suppose a consumer, on considerations like the cost of maintenance, mileage, seating, capacity and comfort etc., has concluded that a particular model of car (e.g. Swift Desire) is the best. However, on visiting a show room he comes across a comprehensive technical study comparing a number of car models on the basis of not only the criteria used by him but on many more desirable characteristics like say resale value. The new information may indicate another model of a car to be ahead of his preferred model. He may, however use the contents of this report as supporting his conclusion and fail to revise his opinion. The net result of his behaviour may be a sub optimal choice!

2.4.3 People Often do not Behave Rationally Because of Their Overconfidence

Suppose all students appearing in M. A. Economics, Semester-I, Paper-I at an examination centre are asked to record their expected scores. Agreeing that specifying a specific percentage is rather difficult, they are allowed to specify a range of marks ... **a range in which they says they are 90% confident that their Score will fall** (e.g. a typical student may say there is a 90% chance that her score would be within a range of 70 to 75%). When the result is declared, it is usually found that the true score falls within their specified range in far less than 90% of the cases. When psychologists conduct such experiments, they find that most people give ranges that are too small and the true number falls within the specified intervals in far less than 90% of the time. In other words **most people are far too sure of their own abilities.**

Being over confident most people may make decisions without going through the detailed process of seeking, processing and retrieving information from their respective memories... a task that involves the expending of time and energy. **Their responses may be called 'Guesstimates' that may be good enough rather than rationally arrived at 'Estimates'.**

2.4.4 People May Suffer from 'Gambler's Fallacy'.

Experimental work has shown that people do not always evaluate uncertain events according to the laws of probability, nor do they always maximize expected utility as expected of rational decision making.

People often suffer from a bias called 'Law of small numbers'. They tend to overstate the probability of some event(s) happening on the basis of relatively small information from recent happening/memory.

Suppose two students are gambling through the 'Toss' of the coin. Further suppose one of them who bet the coin falling 'Head' has lost four times in a row as the coin had been falling 'with 'Tail' side up. He is found to bet fifth time once again calling for 'Head'. When asked, he argues that the coin is **highly unlikely** to fall 'Tail' five times in a row! He is in fact suffering from 'Gambler's Fallacy' and ignores the Law of Probability. He should know that every time a coin is tossed, the probability of its falling 'Head' is just 50% and is independent of what had happened in the previous toss(s).

More commonly, you may come across a gambler who, having lost the previous game(s), plays further on the expectation that he **cannot be that unlucky to lose another**

time! Conversely a winner may play further with greater bets presuming that **it is his day and therefore, riding his luck he can continue to win.**

Stock Markets are prone to 'Herd' behaviour because when the market is rising more investors (mistakenly) believe that it will still continue to rise and therefore, join bulls in pushing the market further. After some time, when some investors feel that enough is enough and the market will now fall, many more join the Bears and the decline gains the momentum.

2.4.5 People Often do not Behave Rationally Because They Care for 'Fairness' and not for Efficiency or Self Interest Alone.

One example of this behaviour is the support of the rich and well to do people for 'Progressive Taxation' knowing fully well that it will cost them higher tax payout and there is no apparent and immediate benefit to themselves. Further examples can be given such as Contributions to Charity, Tipping in a restaurant even when knowing fully well that you have already been charged the requisite 'Service Charges'. Tipping in a restaurant in another city that you are unlikely to visit once again or visit soon.

This can be best explained with the help of what has come to be known as '**Ultimatum Game**'. In this kind of game, we invite two persons who are not known to each other. May be by a toss of the coin or somehow otherwise, we select one of them as the leader who is then given the opportunity to make the first move. Let us call her '**Rabri**' and the other '**Jalebi**' and as usual before playing they are made aware of the rules of the game and **in particular that this is only a one act game**. They are told that they could win Rs.1000/- should they clinch a deal agreeing to divide this money between themselves and get nothing if they fail to do so. The first mover, **Rabri**, in this example, is asked to propose a division of Rs.1000/- between himself and the other. Should **Jalebi** accept the offer, they would share Rs.1000/- between themselves as proposed. Should **Jalebi** reject the offer, none will get anything and the game ends.

If **Rabri** is to act as a rational wealth maximiser (as assumed in the conventional theory) one can predict that she would exploit this opportunity and propose 999/- for herself and Rs. 1/- for **Jalebi**. This is more so because she knows that accepting this proposal is in **Jalebi's** interest. **Jalebi** will accept it because she is better-off getting something rather than get nothing by rejecting the offer. The wealth maximising proposal of Rs.999/- to **Rabri** and Rs. 1/- to **Jalebi** should be the rule in such circumstances.

However, when experimental economists, get the people to play this **ultimatum game**, the results are startling. People in the role of **Jalebi**, usually reject the proposals that offer them Rs.1/- or similar small amounts because they think that such proposals are blatantly unfair and hurts their innate sense of fairness. They therefore, reject such proposals even if it monetarily hurts them a little. Dignity and fair treatment are valued by people who are free to choose and act.

On the other hand, people in the role of **Rabri** know it and of their own propose to the people in the role of **Jalebi** divisions ranging from 30% to 40% of the amount in question. Though 30:70 or 40:60 proposals are still unfair, yet they are considered not so unfair to hurt their sense of dignity and fair play as to deserve this amount of economic sacrifice. In some examples even 50:50 has been proposed and accepted.

Fairness issues are common in self employed as well as in formal and organised sectors of factor markets. It is because of a sense of **being fair** to others or a sense of **service** to the needy/society/humanity etc. that a great majority of Doctors, Lawyers, Teachers do not treat their patients/ clients/students as an 'Opportunity' to exploit and maximise their income as would be predicted if they are to behave rationally in tune with the conventional theory.

In the 'paid for job' markets, many firms are observed to implement 'Profit Sharing' bonus schemes for the workers even when it is not mandated by labour laws. It is common that when a firm makes windfall profits workers are often given a share in it. Workers often adopt 'go slow' or work to rule' or adopt other tactics resulting in lower productivity if they believe that they are paid wages that are less than fair.

It is thus clear that is ordinary day to day life, people's pursuit of self interest is tempered with a sense of being fair to others even if it costs you economically. In other words, people may often not behave rationally (as dictated by conventional notion of rationality) because of considerations like being fair to others.

Self Assessment Question

Q1. What is Gambler's Fallacy?

2.4.6 People may not always be rational because they may behave inconsistently over time.

They may exhibit a trait of 'Procastination' or 'Put off till tomorrow what can be done today'.

Suppose there is a student who has attended a lecture and after reaching her hostel she intends to write down notes about the major issues raised by the speaker. She has the following two sets of options:

Set I.

- (A) Spend 50 minutes right today to finish the notes or
- (B) Spend 60 minutes to do the job tomorrow.

Set II.

- (A) Spend 50 minutes doing the job in 90 days or
- (B) Spend 60 minutes doing the task in 91 days.

When asked such questions many students choose (B) in Set I, i.e. spending 60 minutes tomorrow rather than 50 minutes today. It is a trait to 'put off till tomorrow what could and should have been done right now to save time as demanded by rational behaviour. Almost every one of us, unless lying, would admit procrastination at some time or the other.

When confronted with Set II option involving time, people are often found to prefer (A) that is they tend to save on time. Why should they behave differently? When dealing in the present they tend NOT to save time and when looking to the future they tend to save on

time. The contradiction is heightened by this example. Suppose the student facing Set II options had opted for (A) that is economizing on time by spending 50 minutes and finishing the job in 90 days. On the 90th day we offer her the choice of finishing the job in 50 minutes right on that day or finish the same job spending 60 minutes on the 91st day and she opts to finish the job next day. This is the same as was in option I i.e. to spend 50 minutes right on that day or spending 10, more minutes for the same job tomorrow.

When the time horizon is 90 days she economises on time spending and on 90th day when the time horizon is just one day she chooses not to economise on time. Why a mere passage of time lead to different decisions?

This observation of 'Procrastination' by people has huge policy implications in that people fail to stick to their plans and fall for immediate gratification. People do plan to save for their retirement but when they have money in their valet/bank account they spend it and fail to implement their savings plans. A survey is credited with 76% of Americans saying they are not saving enough for their retirement leading to the adoption of schemes that deduct retirement related savings at the source.

2.5 SUMMARY

In this lesson we have studied the psychological aspect of consumer's decision making i.e. when and why consumer's behave rationally and what situations make them behave irrationally i.e. make choices that are not in our long term interest.

2.6 GLOSSARY

- **Bounded Rationality** : A behaviour that is intended to be rational (in neo-classical sense) but in reality not so.
- **Guesstimates** : The responses may be good enough be close to reality rather than rationally arrived at "Estimates"
- **Ultimatum Game** : A kind of game played between two persons, not known to each others, with different results arrived at.

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- Mankiw, N. Gregory (2012). *Principles of Micro Economics*. Cengage Learning India Private Limited (2012)
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2.8 FURTHER READING

- Mankiw, N. Gregory (2012). *Principles of Micro Economics*, Cengage Learning India Private Limited

2.9 MODEL QUESTION

1. "People could not be and are not always rational in their behaviour". Illustrate.

COORDINATION TASKS IN AN ECONOMY AND CONSTRUCTION OF THEORIES

Structure

- 3.0 Objectives
- 3.1 Introduction
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- 3.0 OBJECTIVES**

After studying this lesson, you shall be able to :

- explain types of goods and services that are to be produced during a given period of time i.e. the issue of output selection.

- discuss how these goods and services are to be produced i.e. the issue of organizing production.
- describe who is to consume and how much of the produced goods and services i.e. the issue of distribution or rationing.
- explain how economic theories are formulated and how economic models are built.
- decide whether economic theories can be applied for the solution of economic problems or not.

3.1 INTRODUCTION

Major economic problem of the societies is the rational use of its limited albeit alternatively useable resources. In order to adequately respond to the economic problem of a society, all types of social economic organizations must be capable of performing three coordinating functions in an economy.

In this lesson we shall study the co-ordination tasks and theory building in detail.

3.2 ECONOMIC PROBLEM AND ITS SOLUTION

Humans share with all other species their concern with self-preservation and survival. As such, in a primitive society while they too needed food, water and shelter against varied environmental hazards; in a modern society their consumption is way beyond their biological necessities and is ever growing. The stock of alternately useable (natural as well as man made) resources and the resultant flow of economic services, even at Full Employment, at the command of any society today falls woefully short of the derived demand for them. This is 'The *Economic Problem*'. Each society therefore, has to create *institutions that serve as 'mechanism(s) of coordination and control'* so as to result in an *intelligent Optimal/Rational use of her limited, albeit alternatively useable, resources*. Economics is, in fact, the study of 'how does a particular society solve its 'Economic Problem' or 'how does an economy organize its economic activity to solve its 'Economic Problem'.

3.3 DECISIONS OF FUNCTIONS FOR SOLVING ECONOMIC PROBLEM

Prof. Frank H. Knight in his landmark 1933 'Social Economic Organization' refers to *five functions* that all types of social economic organizations must be capable of performing in order to adequately respond to the economic problem of a society.

Briefly these Functions are to decide

- (i) The types of goods and services that are to be produced (as also their proportion) during a given period of time? In Knight's words this involves 'Setting of Standards' or 'Establishing Social Scale of Values';
- (ii) How are these goods and Services to be produced? This involves decisions in the domain of 'Choice of Technique', allocation of resources and coordinating operations to get the largest output out of the available resources;
- (iii) The distribution of the produced goods and services among numerous claimants. In other words, it is to decide as to 'who is to consume how much of the produced goods and services'?
- (iv) In view of the fact that the population in each society tends to grow (howsoever slowly) and there is an unending clamor for raising standards of living, more and more goods and services need be produced over time. The system must provide not only for

maintenance of production capacity of the economy but also provide additions to this capacity i.e. provision for economic growth;

- (v) the allocation of consumption of a commodity overtime.

3.3.1 Interdependence among the Functions of an Economic System.

Though mentioned separately, it must be noted that these functions are highly interdependent. For example, take the case of 'what is to be produced?' While the availability of productive resources does matter, it also depends on 'the state of Technology' i.e. 'how to produce?' Equally it also depends on the valuation that consumers put on the commodity. While the resources and technology to produce a car with pure gold metal does exist, its cost may be too high to permit even one buyer to buy it. Such a Commodity may not be produced at all. Similarly some consumers may be prepared to pay huge per unit price for a medicine or food supplements that may raise the height of a person. In spite demand for such a commodity, it may not be produced because no such technology and ingredients/resources exist.

3.4 THREE COORDINATING FUNCTIONS OF A SYSTEM ECONOMIC ORGANIZATION

Though Knight mentions and discusses the above mentioned *Five* functions of a system of economic organization, it has become a standard practice in modern texts to discuss only the first three functions viz.

- What goods and services to Produce and in which Proportion? (Output Selection)
- How to Produce? (Organizing Production)
- For whom to produce? (Distribution or Rationing):

A wide variety of social economic organizations may be able to perform these essential functions with different degrees of success. Knight mentions the following types :

- (i) *Traditional Economies* in which; 'status' and 'Tradition' is the controlling and coordinating institution;
- (ii) Economies in which institution of *autocracy or Military approach* controls, and coordinates economic activities;
- (iii) An *Anarchic System* without any controlling or coordinating authority or institution;
- (iv) *Democratic Socialist Economies* that operate with wide spread and varying degrees of State coordination and control on economic activities;
- (v) *Market Exchange Economies* in which the whole operation is controlled and coordinated through exchange in an *impersonal competitive market*.

Though different societies may organize their economic systems in any of the above mentioned forms or in any combination of them, we propose to discuss the issue in the context of what Knight termed '*a system controlled and coordinated by the institution of impersonal competitive market*' In other words, we propose to discuss the issue in the context of a competitive free enterprise economy.

In market based economies, various Economic Agents ... Consumers, Producers of goods and services, Resource Suppliers et al, are allowed, within legal limits, freedom of choice in economic decision making. This results in millions of consumers/investors expressing their willingness to buy trillions of Consumer and Capital goods and services in varying quantities.

At the same time millions of Entrepreneurs/Producers scout around to pick up these demand signals, process them, conceive and implement production plans, bear risk', and uncertainty to earn profits. An 'invisible hand' seems to guide them.

Similarly the owners of natural and man made economic resources, including producers and sellers of technology, seek profitable use of services of their resources. Millions of those who plan to organize production of various goods and services and have derived demand for services of these resources pick up these signals of resource owners' intents. They interact with them and hire the kind of resource(s) they need and in the quantity they need.

3.4.1 The Issue of 'Output Selection'. (What to produce)

The very basic premise on which the edifice of Economics is erected is that there is no such economy in the world that has means of production in so much abundance (even *when fully employed*) as to meet all demands of all her citizens/buyers during a particular time period in other words, there is always an inevitable *scarcity* of alternately useable means of production. Producing more of one commodity must inevitably involve the reduction in the production of some other good(s) or service(s). However, the students must recapitulate the reservations with the concept of full employment viz. that as a situation it is likely to be an exception and as a concept it is hopelessly vague.

In such a situation an intelligent or rational use of resources of production available to an economy dictates that some goods and services may not be produced at all, some may be produced in large quantities while others may be produced in miniscule quantities. We, therefore, need an ***institution*** that will coordinate the activities of consumers and producers in deciding as to **what will be produced and in how much quantity**. This issue is called '**output Selection**'.

In free market economies the institution of what Knight terms '*Impersonal Competitive Market*' handles this issue remarkably well. '*Optimum Quantities*' and the '*Optimum Product Mix*' are determined through the interaction of Technical Conditions of Production on one side and the Consumer Valuations of the products on the other.

On the production side, absolute quantity of resources, their substitutability and the efficiency of the available technique of production determine the placement and shape of the Production Possibility Curve (PPC), facing a multi product Firm/an Economy. While alternative points on a PPC shows alternative combinations of 'X' and 'Y' that can be produced, its slope (-) $\Delta Y / \Delta X$ shows the marginal Rate of Technical Transformation' (MRTT_{xy}) of commodity 'X' for commodity 'Y'. Since (-) Δy shows the absolute amount of 'y' that need be sacrificed in order to produce an infinitesimal more amount of 'X' it can also be termed as the Marginal Cost of 'X'

$$(-\Delta Y = MC_x).$$

Conversely ΔX measures the Marginal Cost of 'Y'. ($-\Delta X = MC_y$). Slope of PPC can be taken to represents the Ratio of Marginal Cost of Production of the commodities i.e.

$$-\Delta Y / \Delta X = MRTT_{xy} = MC_x / MC_y$$

On the consumption side, consumers Tastes and Preferences determine consumer valuation of respective commodities. Slope of an indifference curve (Social/Group/individual) represents the Marginal rate 'of Substitution between 'X' and Y'

$$(MRS_{yx} = (-), \Delta Y / \Delta X).$$

Like $MRTT_{yx}$, it measures the rate at which a consumer(s) are prepared to sacrifice a unit of Y in order to have another, unit of X.

Equality between $MRTT_{yx}$ and MRS_{yx} , determines both the optimum quantities and the optimum product mix for an economy/a Multi Product Firm. It shows that at the point of equilibrium, a society's (or a firm's) Marginal Cost of Production of commodities x and y (and their ratio i.e

$$MC_x / MC_y$$

is equal to the Marginal Utility (and their ratio

$$MU_x / MU_y$$

to the consumer. In other word a society spends as much on the production of a unit of commodity 'X' ('Y') as it derives utility from its consumption. In terms of symbols:

$$\text{In equilibrium} \quad MRTT_{yx} = MRS_{yx}. \quad \text{----- (1)}$$

$$\text{Since} \quad MRTT_{yx} = MC_x / MC_y; \quad \text{----- (2)}$$

$$\text{it implies that} \quad MRS_{yx} = MC_x / MC_y; \quad \text{----- (3) [using (1) and (2)]}$$

$$\text{Further since} \quad MRS_{yx} = MU_x / MU_y; \quad \text{----- (4)}$$

$$MC_x / MC_y = MU_x / MU_y. \quad \text{----- (5) [using (3) and (4)]}$$

As the consumer's equilibrium requires

$$MU_x / MU_y = P_x / P_y, \text{----- (6)}$$

it implies:

$$\boxed{P_x / P_y = MC_x / MC_y} \quad \text{----- (7) [using (5) and (6)]}$$

and that defines producer's equilibrium as well.

3.4.2 The Issue of 'Organizing Production' (How to Produce)

At any point of time, alternative technologies or methods of production are available to the producers to produce almost every good/ service. They can, within certain ranges vary the use of substitutable resources in the production of a given commodity or a service in order to make more profit). The issue therefore, is the '**choice of technique**' of production to produce the required goods and services in consonance with the resource .endowment of the economy. In other words, the second issue is '**how to produce**' the requisite quantity of goods and services and is also called '**Organising Production**'.

Let us assume that, following the exercise under '**Output Selection**' as discussed above, an economy has decided to produce 20 Lac meters of plain grey cotton cloth. This quantity of cloth can be produced totally in the 'Handloom Sector' where more labour and less capital is used or the same quantity can be produced in 'Power Loom', sector where more capital than the handloom sector is used. Still the job can be accomplished in the Mill Sector where more capital and less labour is used. The, issue therefore, is '*how will the production be organized*' so as to make the best use of available resources of labour and capital.

The optimum solution to this problem is once again provided by the free operation of markets.....the state of technology will determine the degree of substitution between the

factors....as reflected in an iso-output (Isoquant)... A curve similar to an Indifference curve that shows alternative techniques of production that can be used to produce a given quantity of a particular commodity. All along an iso-product/isoquant curve, its slope shows the Marginal Rate of Technical Substitution between two factors of production say Labour and Capital (i.e. $MRTS_{L,K}$).

The factor endowments of the economy (the supply side of the factor market) along with the demand for these factors determines the current relative market prices of the factor of production. In general in an labour abundant economy, the wages are expected to be lower in relation to the hourly/daily/monthly rentals of the capital goods that are scarcer in relation to their demand. Each potential producer therefore, faces a given factor price ratio...say wage/rental ratio determined in the impersonal competitive factor market. Facing a given array of techniques of production represented in an iso-product/isoquant curve and a given relative factor price ratio; represented in the slope of the factor price line, The producer **Chooses an optimum technique of production** (or a combination of technique) such that the **Marginal Rate of Technical Substitution between Labour and Capital ($MRTS_{L,K}$) equals the wage/Rental ratio (w/r) i.e.**

$$MRTS_{L,K} = w/r.$$

Since $MRTS_{L,K}$ represents the ratio of marginal productivities of labour and Capital i.e.

$$MRTS_{L,K} = MPP_L / MPP_K$$

we may write the equilibrium condition as

$$MPP_L / MPP_K = w/r$$

which is the, same, thing as

$$MPP_L / w = MPP_K / r.$$

In other words, productivity per unit wage is the same as for a unit of rentals of machinery. The returns from the last rupee spent on hiring the factors of production is the same. Since in a labour abundant economy, like India, the wage rates are likely to be relatively lower as compared to machinery rentals, the chosen techniques of production are expected to be relatively labour intensive.

3.4.3 Issue of Distribution or Rationing (For whom to produce)

Production of goods and services is sustained by their consumption. Since due to resource constraint the production falls short of the total demand for various goods and services or say there is an excess demand for goods and services, the pertinent issue is that of rationing of goods and services already produced. In other words, if all demands of all buyers' cannot be met due resource constraint, the question that arises is **who will be consume how much of which commodity and service**. This is called '**Distribution**' of produced quantity of goods and services.

The demand for goods and services at a particular time is determined by various factors such as the income and Tastes and Preferences of the consumers/households. Since the consumers/households are also suppliers of factor inputs their incomes are determined in the factor market. Those who own a larger quantity of factors of production (including human capital skills) get greater incomes and are able to demand larger quantity of good, should their preferences be for them. Aggregating over the whole society, we may generate a market demand curve for each commodity which through interaction with the supply plants of the producers determines the market price for each commodity produced. At the ruling market price, some people will buy

less while others would buy more and the whole quantity supplied would be purchased. The market would clear and both the consumers and producers would optimize should the market be perfect.

The consumers would optimize their consumption pattern by equating their Marginal Utility from each commodity consumed with the price paid i.e.

$$\text{MRS}_{yx} = P_x / P_y$$

The producers would also optimize by selling their outputs at prices that equal their Marginal Costs of Production as discussed earlier.

We may conclude that the institution of Competitive Markets if allowed to operate freely and the economic agents...consumers... producers...resource...suppliers are allowed freedom in their decision making, the issues of output selection, organising of production and the allocation of produced goods and services among members of a society would be optimally solved. The scarce and alternatively useable resources of a society would be optimally utilized.

3.5 CENTRAL COORDINATING TASKS OF AN ECONOMY AND PRODUCTION POSSIBILITY CURVE

The economizing problems have been highlighted in the Prof. Robin's definition of Economics which are considered as the central problems of any economy. The main cause of these problems is the scarcity of resources where as ends are multiple. These problems are very clearly analyzed by Professor Samuelson with the help of production possibility curve which shows the relationship among the set of problems in an economy.

"A production possibility curve is the locus of such points which shows all the various combinations of production of two goods with the fullest use of available resources. To draw the production possibility curve following assumptions are made.

3.5.1 Assumptions

- (a) Only two goods are produced.
- (b) Supply of various factors of production is fixed.
- (c) There is no change in technology.
- (d) The resources are capable of alternative uses.
- (e) The resources are efficiently allocated.
- (f) There is neither unemployment nor under employment in the country.
- (g) Time assumed is short period because in the long term there is every possibility that resources might increase and technology might improve. But in the short period, these remain constant.

Let us assume that two commodities X and Y are produced.

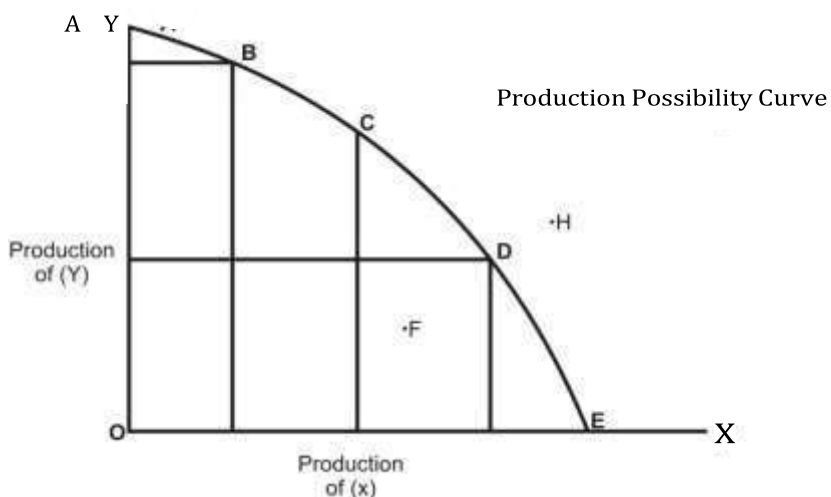
3.5.2 Derivation of PPC

Due to limited resources, the amount of X and Y commodity produced is fixed. The society has to make a choice as to what quantity of each product it has to produce. Any increase in the production of X will shift the resources away from the production of Y. More Y means less for consumption of X and vice versa. The opportunity cost of more of X is shown by the amount of Y forgone in greater production of X. This is essence of economic problem. Let us illustrate this economizing problem with the help of a table.

Table 3.1 : Production Possibility Schedule

Production Possibilities	Output of X good	Output of Y good
A	0	12
B	1	10
C	2	9
D	3	6
E	4	0

These are some of the alternative combinations of x and y commodities which a society is capable to produce. As table shows that when the economy devotes all the available resources to the production of Y, it can produce 12 units of Y but no X as shown by combination A. Again at alternative E, all the resources are employed to produce X commodity only. Both these extremes are unrealistic situations. The other alternatives represent various other possibilities where resources are allocated between X and Y to produce some amount of both these goods. An economy strikes a balance and produces different types of goods as shown by different combinations like B, C and D. These alternatives show that every sacrifice in the production of Y, leads to an increase in the production of X.

**Production Possibility Curve****Figure 3.1**

As we move from point A to E the production of X is increased by diverting the resources from the production of Y. Consequently the production of Y declines. Similarly by moving from point E to A, output of Y is increased at the cost of output of X good. By showing all these possibilities graphically we get a curve AE which is known as *Production Possibility Curve*. This curve is also known as *Transformation Curve* since by moving from one point to another; we are transforming one commodity into another. Every point on the curve represents the maximum output of two goods which the society can choose. One point worth noted is that any economy can neither produce at point H or F because the combination can lie anywhere on the curve AE but not inside or outside it. At point F, the resources are not fully utilized and point H is beyond the capacity of the society. The production possibility curve has a negative slope. It is because with the given resources, an

economy can produce more of one good only by giving up some amount of the other good. Resources being limited, we can not have more of both X and Y we must have to give up some amount of one good in order to produce more of another good. The amount which must be given up is called *opportunity cost*.

Then production possibility curve is always concave to the origin. This shape is due to the fact that as the production at one good is increased not only the production of other good is sacrificed but also the rate of sacrifice also increases. In other words, the law of diminishing returns operates in production. The cost of production increases more than proportionately as production is expanded. The opportunity cost rises because initially least efficient resources are transferred but as the process of transfer continues, the more efficient resources will be shifted and opportunity cost will rise. This increasing opportunity cost will make the production possibility curve concave to the point of origin.

Self Assessment Question

Q1. What is PPC?

3.5.3 Use of PPC to coordinate the tasks of an Economy:

The basic tasks such as scarcity of resources, the choice involved the efficiency, can be explained with the help of the production possibility curve, as follows :

- a) **Scarcity and choice of production:** Given the scare production resources and techniques of production a society cannot produce all the commodities at the same time. A specific choice regarding the product and its quality has to be made. Accordingly, the scare resources are allocated among them for their respective production. This is explained with the help of the figure 3.2. The production possibility curve shows the maximum amount of either each individual goods or the combination of both the goods that the economy can produce.

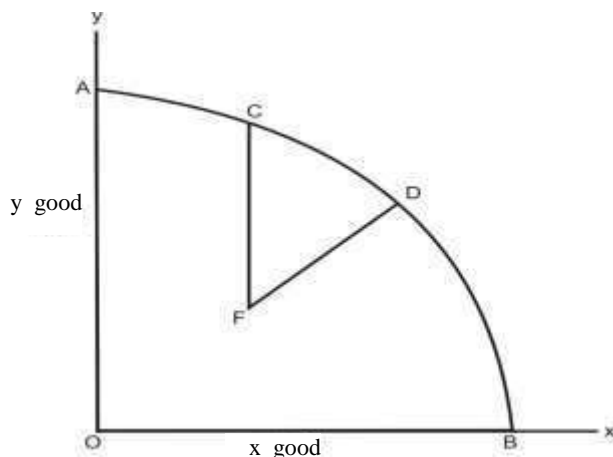


Figure 3.2

In figure, x good is measured on OX axis and y good is measured on OY axis. The society is capable to produce any combination A B C D E of two commodities x and y. All these combinations are on the curve AB. The F combination shows a situation when resources are not fully utilized. At point G, the society is not capable to produce

as it is beyond its capacity. If the society selects points D but previously it was choosing point C it means society wants to increase the production of x good and reduce the quantity of y. Consequently a part of the productive resources employed in the production of y will have to be diverted to the production of X. This way, the curve shows the maximum limit of production possibilities with given resources. This diagram clearly explains that scarce resources place a limit on maximum production needs that the economy may be able to reach.

- b) **Choice of method of Production and PPC:** The society has to make a choice whether it should adopt labour intensive techniques or capital intensive techniques. The problem of choice of technique arises because all the countries do not possess all the resources in the same equal quantities. Some countries have abundance of labor but scarcity of capital. The logical choice before every economy is to select a technique that uses more of abundant factor with less use of scarce factor. It will lead to an increased output with minimum cost because the abundant factor is in excess supply. Therefore, it is bound to be cheaper than scarce factor. In Fig. 3.2, if country wants to produce OA of y good which is supposed to be a capital good. In case of such a choice it is likely that capital intensive technique is adopted. The decision whether to use labour intensive technique or capital intensive technique depends not only on the nature of the product but also on other factors like resource endowments, relative factor prices and training of labour force.
- c) **For whom to produce or distribution of National Income:** The society has to make a choice for whom the goods are to be produced or how is the national income distributed. If the capitalists have larger share of national income, then demand for luxury goods would be larger. Then distribution national income is said to be inequitable. The greater demand for luxuries would lead to high price and therefore high profits in luxury goods. More resources will be diverted towards it. Hence the economy shall be producing more for rich and wealthier section of the society.

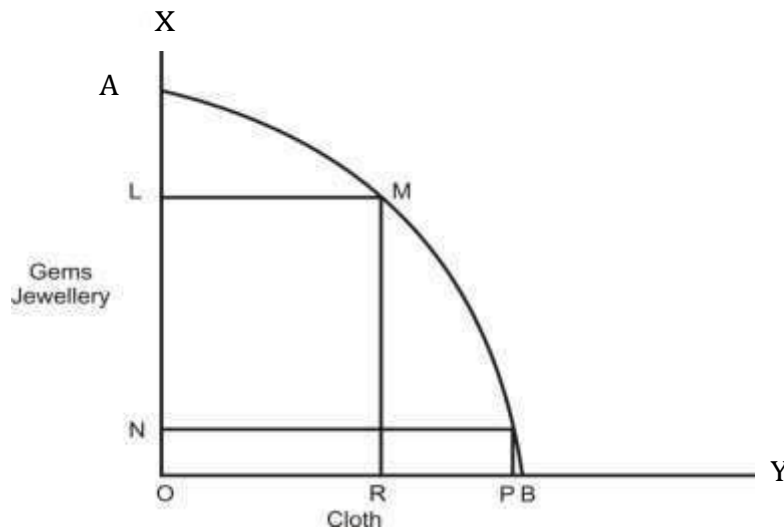


Figure 3.3

In Fig 3.3 cloth is a consumer good, a necessity measured on x axis but gems jewellery a luxury is measured on vertical axis: AB is production possibility curve. At point M OL of jewellery and OR of cloth is produced. Hence the proportion of jewellery is greater in national product. Therefore the distribution of national product is in favour

of rich and vice versa. In this way, PPC provides some indication of nature of distribution.

- d) **Problem of waste of resources:** The PPC assumes full use of resources where all the factors (labour, capital and other factors of production) are fully employed. The PPC implies no waste. But any point below PPC shows under utilization of some resources. If these unused resources are truly utilized, then production would increase to the maximum.
- e) **Economic efficiency and PPC:** Economic efficiency is said to exist when there is no possibility of raising the output of one good without reducing the output of some other and the combination produced corresponds fully with scale of preference of the society. The PPC is drawn on the assumption that resources are used in such a manner that lead to maximum possible level of output. Any reallocation would lead to lower output. Since PPC shows the limits beyond which output can not increase, it is implied that resources are being used most efficiently.

The production possibilities curve proves very useful in practice. The erstwhile Soviet Union at the revolution of 1917, embarked upon a series of five year plans to bring about industrialization within a short span of time. It gave stress to capital goods industries at the cost of consumer goods industries. In this way Production Possibility Curve is very helpful to understand the basic concepts of economics.

3.6 CONSTRUCTION OF A THEORY

All the branches of science progress through development of theories. Like other sciences, economics too has its theories. A theory is considered to be simply an abstraction from reality. A theory accounts for observed phenomenon and explains it. It simplifies an economic phenomenon and explains some sequences of events. It also generalizes and tries to find out some regularity in the relationship between two or more variables observed in the real world. An economic theory also studies the economic behavior of many decision making units like consumers, business firms, and economy. Economics also builds up theories. Many examples of economic theories can be cited. For example theory of national income says that the government policy of budget deficit will reduce the volume of unemployment. Similarly, theory of demand establishes an indirect relation between price and quantity demanded. This way economic theory makes predictions about economic phenomenon.

Self Assessment Question

Q1. What are the central problem of an economy?

3.6.1 Meaning of a Theory:

A theory consists of a set of definitions stating clearly what we mean by various terms and a set of assumption about the way in which the phenomenon under investigation behaves. This definition makes it clear that a theory consists of three parts a) language, b) assumptions, c) substantive theory containing the characteristics of generalization. Having defined the terms and assumptions the next step is to use a process of logical deduction in

order to discover the implications of these assumptions. The logical process is supposed to be carried out in words, geometry or mathematics. Out of these, the mathematical form of reasoning is easy and economical. The implications are tested against empirical observations in order to find out whether the theory is consistent or inconsistent with facts. We would then conclude whether the theory refuted by the facts or that is consistent with facts. If the conclusions are in consistent with facts then the hypothesis is rejected and a new one is formulated only if the conclusions confirm to reality the hypothesis is accepted as a theory. There is a word of difference between a hypothesis and theory. A hypothesis is an if-then statement which is obtained from a casual observation of the real world. It represents a tentative and yet untested explanation of the event. But theory on the other hand signifies greater likelihood of the truth. It is regarded as a tested hypothesis. The greater the number of successful tests conducted for an economic theory, the greater the degree of confidence that we have in theory. A law is a theory which is always true under the same set of circumstances, i.e. the law of diminishing returns.

3.6.2 Nature of Economic theories:

Economic theories are the statements of tendencies. They tell us what is likely to happen and not what will actually happen. For example economic theory says that competitive price is likely to be less than the monopoly price or people are likely to buy more when their income increases. But these economic theories do not show the exact picture as the physical sciences do. That is the main reason that the laws of economics cannot be compared with the exact laws of gravitation. The main reason is that economic laws are concerned with the behavior of human beings and that behavior is quite varied and uncertain. That is the reason that economic theories are known as statement of tendencies. Then most economic theories are qualitative in nature. We can not say with hundred percent that if a particular industry increases the wage rate by 5% then the employment would rise by 8%. What we can say with certainty is only that employment would increase but by how much is not told by economic theory. One important point worth noted is that these laws have universal applicability because the human behavior essentially remains the same under all circumstances. For example, Law of Substitution as well as law diminishing marginal utility has a universal applicability.

3.6.3 Testing goodness or badness of a theory:

According to Samuelson "that theory is operational which is capable of being refuted". A good theory is either according to the facts or capable of being proved contrary to fact. If we find that facts go against the prediction of the theory the theory is shown to be false. If facts turn out according to the predictions the theory is said to be consistent with facts. Therefore, the theory should not be judged from its assumptions rather it should seek whether the theory is consistent with facts. The realism of assumptions should not be the test of validity of a hypothesis. However, a theory can never prove to be true because we can make only a limited number of observations. At last, economics is considered to be very young science. There are many problems yet unsolved and many questions unanswered. Certain economic theories are yet untestable. There are many theories whose predictions no one has yet satisfactorily tested. Many a times a tautology is mistaken for a theory. Only in such cases where a theory can be tested the realism of assumptions becomes an important aid in ensuring that we have valid theories.

3.7 THE CRITERIA OF CHOOSING BETWEEN ALTERNATIVE THEORIES

There are different criteria of choosing between alternative theories pertaining to a given phenomenon:

- a) **Explanatory power:** The theory should have a good explanatory power. If there are two theories to explain an economic phenomenon then that theory would be considered better which explains in a better way. For example in the classical theory of money, Keynes version is preferred over classical version because it explains the relation of quantity of money and prices in a better way. In the same way analysis of consumer behavior is done in a better way with ordinal analysis rather than cardinal analysis.
- b) **Assumptions should be near to reality:** the second criterion for choosing between alternative theories is the realism of the assumptions. For example Chamberlin's concept of monopolistic competitions is better than perfect competition as the assumptions in the model of Chamberlain are closer to reality.
- c) **Less assumption:** This criteria is given by Occam. According to him, that theory is better which has fewer assumptions. This criteria of choice was used by prof. Hicks to assert that his indifference curve analysis of demand is better than cardinal utility analysis given by Marshall.
- d) **Falsifiability criteria:** It is known as logical positivism. In arriving at economic principles, two general methods are employed. One is external apriorism and second is ultra-empiricism. But the economists say that these two methods should be supplementary to each other. So that economic theory is better which follows a middle group i.e. logical positivism:

Self Assessment Question

Q1. Mention the steps/criteria of choosing between alternative theories.

3.8 ASSUMPTIONS AND THEIR ROLE

Every theory has its assumptions all of which may not seem realistic. In fact, in order to understand economic phenomenon, in the complex real world, we build models based on simplified assumptions. Assumptions are the starting point and framework of an economist's thinking. Sometimes these assumptions are called premises postulates or restrictions. These assumptions are taken so as to outline the set of conditions under which a theory is meant to hold.

Broadly, the assumptions are divided into three categories.

- a) **Implicit assumptions related to physical structure of world:** The first group of assumptions underlying economic theory is those which are related with physical structure of the world, such as geography, biology and climate. These are not explicit assumptions but it should be borne in mind that economic theory asks nothing which is physically impossible. For example, while

discussing agricultural problems, it is knowledge that harvest time is determined by nature. Similarly, it is assumed, technology always sets a limit for the expansion of output. Further it is implicitly assumed that goods are scarce. There supply is less than demand. Had it not been so, there would have been no economic system and no economics even.

- b) **Assumptions related to social and economic institution:** In this type, comes those assumptions on which the western theories are based. For example, free market economy, democratic form of government and a legal structure based on private ownership. Since the great depression, the government interference is increasingly accepted but still the economic theory is based on the assumption of free market and private property.
- c) **Behavioral assumptions:** The third type of assumptions is related with the behavior of individual human beings. For example, it is assumed that consumers behave relationally. They seek maximum satisfaction from limited money income. In the same way, producers aim at maximizing profits. The benefits of these assumption is that it helps us not only to build theory of consumer behavior and theory of firm but also helps us to find determinate solution.

3.8.1 Role of Assumptions:

- A) **Simplification and specification:** According to Friedman, the assumptions play three different roles.
 - 1) They are convenient and economical method of presenting a theory. These are many ways to describe a theory but we select the most economical one.
 - 2) They help in facilitating an indirect test of the hypothesis by its implications.
 - 3) They are considered to be a convenient means of specifying the conditions under which the theory is valid. A theory can be stated under more than one set of assumptions. Sometimes, assumptions help to choose between two theories when two theories make the same prediction then we should choose those assumptions which are simple and specified.
- B) **In building explanatory theories:** According to this, the adequacy of a theory must be judged not only by assessing the realism of assumptions but rather by examining the concordance of the theory's logical consequences with the phenomenon which the theory is designed to explain.
- C) **Building better theories:** According to this, there should be fewer assumptions. If some of the assumptions are dropped, without sacrificing the scope of conclusions of theory, then it would mean an improvement in the theory. If two theories give the same result, and then the theory with less assumptions should be preferred.

Self Assessment Question

Q1. What is the role of assumptions in economic theory?

3.9 SUMMARY

Let's recapitulate what we have studied in this lesson :

Economics is the study of how does a particular society solve its 'Economic problem' or how does an economy organizes its economic activities to solve its economic problem. Each societies economic problem is the optimal/rational use of its limited albeit alternatively useable resources. In order to achive this objective Prof Kinght has mentioned and discussed 'Five' functions of a system of economic organization. However it has become a standard practice to discuss' the following three functions.

1. What goods and services to produce and in which proportion? (output selection) The issue of output selection is resolve by obtaining the equality between $MRTT_{yx}$ and MRS_{yx}

i.e. marginal Rate of technical transtromation ($MRTT_{xy}$?) of commodity x for commodity Y should be equal with the Marginal Rate of substitution between x and y. Equality between $MRTT_{xy}$ and MRS_{xy} determines both the optimum quantities and the optimum product mix for an economy.

2. How to produce, i.e. how are these goods and services to be produced i.e. organizing production. The issue of organizing production involves decision in the domain of choice of technique allocation of resources and coordinating operations to get the largest output out of available resources. The second issue is of output selection i.e. how to produce the requiste quantity of goods and services. The optimum solution to this problem is again provided by the free operation of markets. The state of technology will determine the degree of substitution between the factors as reflected in an iso-output/isoquant. All along as iso-output/isoquant curve its slope shows the marginal Rate of Techninical Subsitution between two factors of peoduction say labour and capital. Similarly on the supply side of the factor market, each producer faces a given factor price ratio...Thus for the output selection producers choose an optimum technique of production such that

the Marginal Rate of Technical Substitution between labour and capital ($MRTS_{LK}$) equals the wage/rental ratio. (w/r)

i.e. $MRTS_{LK} = w/r$.

3. The Third issue/function that arises is who will consume how much of which commodity and service i.e. **for whom to produce**. The is called distribution or Rationing of produced quantity of goods and services. In a perfect market consumers would optimize their consumption pattern by equating their marginal ability from each commodity consumed with the price paid

i.e. $MRS_{yx} = \frac{P_x}{P_y}$.

The producers will also optimize by selling their output at prices that equals their marginal cost of production.

3.10 GLOSSARY

- **Economic Problem** : How to use available and useable (natural and man-made) resources, that have alternate uses to fulfil demand. Usually the supply falls short of demand. And this is termed as economic problem.
- **Assumptions** : These are beginning point of a model. These are promises or postulates.

3.11 REFERENCES

- Knight F.H., '*Social Economic Organisation*', reprinted in Brief and Hochman (ed.) Readings in Micro Economics.
- Bhumas, Lester, O. (2003). *Intermediate Economics*. Pretintice Hall of India
- Ahuja, H.L. (2014). *Advanced Micro Economics*. S Chand Publications Pvt. Ltd., New Delhi

3.12 FURTHER READINGS

- Knight F.H. '*Social Economic Organisation*'. reprinted in Brief and Hochman (ed.) Readings in Micro Economics.
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3.13 MODEL QUESTIONS

1. Explain the three coordinating functions of an economic system.
2. Define production possibility curve. Explain central coordinating tasks of an economy with the help of Production Possibility Curve.
3. Define Economic theories. Also explain the nature of Economic theories.
4. Explain in detail the criteria of choosing between alternative theories.
5. Explain the meaning of Assumptions as well as role of Assumptions.

METHODOLOGY OF ECONOMICS

Structure

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Scientific Method
- 4.3 Methods of Scientific Study
- 4.4 Economics : Whether positive or Normative Science
- 4.5 Summary
- 4.6 Glossary
- 4.7 Reference
- 4.8 Further Readings
- 4.9 Model Questions

4.0 OBJECTIVES

After studying this lesson, you shall be able to :

- distinguish between Positive science and Normative science
- explain whether Micro economics is a positive science or a normative science i.e. whether microeconomics is purely theoretical science or a value based science.

4.1 INTRODUCTION

In the previous three lessons we have studied about three basic problems of Economics i.e. three issues facing an economy. To tackle these issues, various theories are to be built keeping in view the behaviour of consumers i.e. rational or irrational at times. Accordingly assumptions are made followed by methodology of Economics. This lesson is devoted to the nature of Economics i.e. Positive or Normative and its methodology.

4.2 SCIENTIFIC METHOD

Scientific method is a term through which we explain the *process and steps by which a science is built*. It involves the following six steps:

(i) Selecting the Problem

The first step in an enquiry is the *selection of the problem*. The problem must be stated clearly and correctly at the very beginning. It is impossible to collect data without clear idea of the problem. Even the development of the hypothesis (which is a subsequent step) depend upon the problem itself.

The problem thus selected can be very wide like unemployment, inflation etc. or it can be narrow one relating to one aspect. It has been observed, that a narrow problem (i.e. pertaining on a particular aspect) is considered better for researcher, Prof. M.H. Gopal says

in his book, "An Introduction to Research Procedures in Social Science." "It is desirable that investigator should concentrate scope for future intensive rather than extensive work should be an important criteria for the problem."

(ii) **Collection of Data**

After the problem has been selected, the next step is the *collection of data* or the facts pertaining to the problem. There are two important techniques available for the collection of data. There are : (i) *Census Technique* (ii) *Sample Technique*. In the census techniques each and every member of the universe is studied, where as in the sample technique only a selected basis. It depends on the technique being used as to how much time will be taken for the collection of data.

(iii) **Classification of Data**

After collection the next step is to *classify the data*. Classification is a process of grouping the related facts according to their resemblance/similarities or difference. For example, if we are interested in studying the trends in the population growth in India. For this purpose the census data may be collected and classified by age group, sex marital status religion, occupation etc.

(iv) **Formulation of Hypothesis**

The next step is the *formulation of hypothesis*. "Townsend" defines the hypothesis as, "suggested answer. to a problem". These suggestions are likely to occur researcher, when the examines the problem he is analysing. In the words of Wolfe, "A hypothesis is any tentative *supposition* by the aid of which we endeavour to explain facts by discovering their borderlines". This supposition arises from the observed facts or from the precious knowledge of the researcher. At this juncture, "simplifying assumptions may be introduce or consideration may be restricted to special aspect of the problem, so that a specific hypothesis may be developed more fully." "It is these special assumptions which become formulated 'consciously as hypothesis also called theories' in economics,"

(v) **Testing of Hypothesis**

After the formulation of hypothesis the next step is to *test the hypothesis* as formulated. The hypothesis is tested through the well established method of statistics/logic. The hypothesis should provide an answer to the problem under study. Of the various hypothesis formulated that hypothesis should be preferred, "which can predict what will happen, and from which we can infer what has already happened, even if we did not know what has happened when the hypothesis was formulated."

(vi) **Verification of Conclusion**

Verification of hypothesis is the last step. If the hypothesis comes to be true, it is said to be verified. If a hypothesis is verified to be wrong, it stands rejected. It is not necessary that a false hypothesis is always unless, sometimes, "a false hypothesis may directed our attention to unsuspected facts or relations between facts, and so increase the (evident for other theories.)" As pointed out by de Morgan, "Wrong hypothesis have produced more useful results than unguided observation." However, if the hypothesis is verified as wrong, another should be formulated and the researcher should proceed as before.

The moment the hypothesis is verified to be true, than the solutions to be problem under investigation are to be made.

4.3 METHODS OF SCIENTIFIC STUDY

Broadly speaking, there are two methods of scientific study available to an economist. They are: (i) Deductive method and (ii) Inductive method.

The former proceeds from the general to the particular i.e., we begin from certain principles and carry them down to the subsequences which they implicitly contain, whereas the latter proceeds from particular to the general i.e., we start with the observation of particular fact and then mount up with the help of reasoning founded on experience, so as to formulate laws and theorems on the basis of observed facts. In the words of Geo Wilson,

"By deduction in logic is meant, reasoning or inference from the general to the particular or from the universal to the individual."

Induction is the process of reasoning from a part to the whole, from particulars to generals or from the individual to the universal.

4.3.1 The Deductive Method

Deductive method is also known as *analytical, abstract, hypothetical* method of economic analysis. The Classical and Neoclassical economists strongly advocated and made use of this method to the problems of economic science.

In this method we start from a few facts about human nature and draw inferences from them about concrete individual cases. For insurance, it is a self evident truth that the law of diminishing marginal utility tells us that the utility derived by an individual from a commodity goes on diminishing with every successive increment of it. From this law, we can deduce subsidiary theorems as a result of deductive reasoning which runs on following lines. The law says larger stocks of money with an individual, the lower is the utility that he gets from it. The inference is that rich people derive less utility from a fixed stock of money as compared to poor people. If this inference is correct than another, inference flows from it directly i.e. taxation must not be on proportional basis. If taxation is on proportional basis, the poor people will have to pay a heavy tax in comparison to the rich people. Obviously taxation need not be proportional rather it should be progressive i.e. rich people should pay a higher amount of tax. You must have observed this principle of progressive taxation has been arrived at from the law of diminishing marginal utility as a result of deductive reasoning.

This deductive method has three steps

- (i) the first step is to choose and select the premises from which the conclusion are to be drawn,
- (ii) The second step is purely deductive i.e. the setting up of hypothesis from the original premises
- (iii) the last step is the theoretical development and verification of the hypothesis. In the example given above the law of diminishing marginal utility, the deductive inference could only be adopted if confirmed by the use of method observation. This deductive method can be applied to all economic problems. The deductive method is further of two types, the mathematical and the non mathematical. The classical economists followed the non-mathematical approach of deduction, but Cournot, Pareto and Edgeworth preferred the mathematical approach. This method is now being adopted in economic analysis.

A. Merits of Deductive Method

This deductive method was popular with classical economists like Ricardo, Senior, J.S. Mill, Cairnes etc. It is still popular with many modern economists because of its following advantages :

- (a) According to Boulding, it is the method of "intellectual experiment". Since the actual world is very *complicated*. "What we do is to postulate in our own minds economic systems which are *simpler* than reality but more easy to grasp. We then work out the relationships in these simplified system and by introducing more and more complete assumption finally we work up to the consideration of reality itself." Thus this method is nearer to reality.
- (b) Secondly, the use of *mathematics in deduction* brings accuracy, exactness and clarity in economics. The economist making use of the latest mathematical method is able to deduce inference in a short time and make analogies with other generalizations and theories.
- (c) The use of mathematical deductive method helps in revealing inconsistencies in economic analysis. "It forces us into first approximation on the basis of which we make 2nd, 3rd and further approximations. In this way it *saves us from pure empiricism* which merely observes records and classifies on the basis of superficial similarities.
- (d) The use of deductive method helps us in *drawing inference* which are of universal applicability, because these are based on general principles.

In the words of Prof. Koopmans in his Three Essays in the state of Economic Science we may include, "the theories that have become dear to us can very well stand themselves, as an impressing and highly valuable system of deductive thought, created on a few premises that seem to be well chosen first approximations to a complicated reality."

B. Demerits of Deductive Method

While all this is true about Deductive method, we should not overlook its dangers or pitfalls which are as under:

- (a) *First*, it should be clearly understood that the generalizations arrived at as a result of deductive reasoning can be true only *if certain assumptions hold good*. These assumptions through which we deduce inferences are generally untrue or partially true. If that is so, the inferences drawn from them automatically cease to be true.
- (b) *The second* defect of deductive of method lies in the fact that these who follow this method may be absorbed in the *framing* of intellectual toys and the real world may be forgotten in the intellectual gymnastics and mathematical treatment.
- (c) *Lastly*, the deductive method proves particularly dangerous when its universal applicability is claimed for economic generalizations which are reached at as a result of deductive reasoning from incorrect or partially correct premises. Well the most dangerous thing would be to frame government policies on the basis of deductive generalizations. Any such

attempt is bound to be followed by disastrous consequences. As such the "deductive arm chair analysis", as Prof. A.P. Lerner calls it need to be taken with a grain of salt."

4.3.2 The Inductive Method

The inductive method is also known as *historical empirical or a posteriori* method of economic analysis. This method was strongly advocated by the German School of economics. This method involves the process of reasoning from particular facts to general principles. In the words of Joyce, it is "*the legitimate derivation of universal laws from individual cases.*"

Fowler defined induction as, "the legitimate inference of the general from the particular or of the more general from the less general."

In the words of Bacon it is "an ascending process" in which we collected parts, and then arrange those and finally draw general conclusion. Thus this method has the following four stages :

- (i) Observation
- (ii) Formulation of Hypothesis
- (iii) Generalization and
- (iv) Verification

A. Merits of Inductive Method

The following are the merits of this inductive method :

- (i) Since economic generalization under this method are made on the basis of collected facts, it is considered to be more reliable than deductive method. These, generalizations can be used for the formulation of government policies.
- (ii) Since under this method prepositions can be tested and verified easily, the method is considered very useful.
- (iii) This method takes into consideration a complete note of the complex relationships found in actual life and examines them carefully.
- (iv) The method is dynamic as it takes full note of changeable nature of assumptions in economic analysis.

B. Demerit of Inductive Method :

However, this inductive methods also suffers from certain weaknesses which are listed below:

- (i) Boulding points out that statistical information can only give us preposition whose truth is more or less probable, it can never give us certainly.
- (ii) Induction relies on statistical numbers for analysis that can be misused and misinterpreted when the assumptions which are required for their use are forgotten.
- (iii) The conclusions drawn with the help of their method are often biased. These are generally found prejudiced on account of individual likes and dislikes.
- (iv) The method is not only time consuming but also very costly. Collection of facts and data require a number of experiments and much investment.

Self Assessment Question

Q1. Mention two merits and two demerits of Inductive and Deductive Methods

4.3.3 Logical Positivism (A middle group)

There is an acute controversy regarding which of the two methods, deduction and induction is better. The classical group of economists emphasized deduction method while the institutionalists preferred induction. The Austrian school based their pure theory on deduction whereas the historical school favoured the inductive method. Now the controversy which existed among the earlier economists as to whether deductive or inductive approach is more appropriate in developing economic theories and principles has been resolved. The credit however goes to the neoclassicals for synthesizing the two methods. It is now increasingly realized that deductive (analytical) studies must be supported by inductive (empirical) studies.

The logical positivism known as a middle group, embraces the positive economists who place primarily emphasis on a model's ability to predict. Models which predict better are considered superior. They further say that basic assumptions cannot be tested but conclusions can be tested. The assumptions need to be realistic if the models predict accurately. The main protagonist of the logical positivism i.e. Friedman, says that both the induction and deduction methods are needed for the proper development of scientific economic theories. Indeed, the two are complementary rather than competitive. The modern economists first derive economic hypothesis through the process of logical deduction and then empirically test them through the process of statistical techniques.

Empirical studies made through inductive methods without theoretical hypothesis are useless. In fact, empirical studies by inductive approach also brings to light those facts which require analytical explanation through deductive logic. For example maximum farm management studies in India shows an indirect relation between size of the farm and output per acre in early sixties. This led to the various theoretical explanations of the phenomenon observed in empirical studies.

To conclude, empirical study is important for analytical work. These empirical studies, help us to examine the validity or otherwise of the assumptions as well as predictions of analytical work. Keynes adopted both approaches simultaneously. According to him, empiricism is meaningless unless guided by some theory. A theory is also worthwhile after it is tested by empirical facts. It is clear that both are complementary rather than competitive.

Conclusion

There had been a strong controversy between the classical schools of Britain and the Historical School of Germany during the 19th century on the relative merits and demerits of deductive and inductive methods. *The Classical economists advocated deductive method, while the Historical School and the Statistical School of modern times used the inductive method for the formulation of economic laws and theorems.* It was first scholar and then *Alfred Marshall* who attempted to resolve the controversy between the deductive and inductive method of economics.

In the words of Alfred Marshall : "*Induction and deduction are both needed for scientific thought as the left and right foot are both needed for walking.*"

Self Assessment Question

Q1. What is Logical Positivism?

4.4 ECONOMICS: WHETHER POSITIVE OR NORMATIVE SCIENCE

Another issue which is generally raised and which was discussed by Professor Robinsons with some vehemence in his Essay already referred to above is *whether economics is a Positive or normative science.*

A **positive science** is concerned with the exploring and explaining of causal relationship between phenomena belonging to a particular field. It occupies itself with the problem of explaining "what is" and refrains from recommending "what ought to be". A *Normative science*, on the other hand, is concerned with determining and recommending "what ought to be", it seeks to make policy recommendations.

Robbins and his followers had stressed that **economics is a strictly positive science** and it should, therefore, avoid making policy recommendations which commit the economist to some given ends which are assumed to be desirable and thus involve value judgement. However, it should be remembered that it is not possible to avoid value judgements and implicit or explicit policy recommendations in social sciences like economics, the subject matter of which is not dead matter or animal and plant life but human behaviour is it takes place in an organised society and consequently has far reaching implications for the latter. It is wrong to say that the study of "*ends*" lies outside the scope of economics. But the economists are, no doubt, required to study the desirability of ends objectively and dispassionately to facilitate choice of required to study the desirability of ends objectively and dispassionately to facilitate choice of ends.

Thus, economics, like any other social science, **is both a positive and a normative science**. One should not forget that the Robinsonian view that economics is positive science and, therefore it should avoid making value Judgement and policy recommendations is itself a normative statement involving a value judgement. John Robinson and John Eatwell have rightly observed in their *an introduction to Modern Economics* "Economics can never be a perfectly "pure" science unmixed with human values". They rightly-point out that "economics has three aspects of functions to try to understand how an economic operates to make proposals for improving it and to justify the criterion by which improvement is judged. Often the moral and political view points from which economics problems are seen have become so intractably entwined with the questions asked, and even with the methods of analysis used that these three elements of political economy are not always easy to keep distinct."

4.5 SUMMARY

Following important aspects have been studied in this lesson :

- Microeconomic relies heavily on the use of theory which can help to explain how economic units behave? And to predict what behaviour will occur in the future.
- There are basically 'four' stages in the development of a theory. These are :
 - (1) observation and isolation of phenomenon

- (2) setting up a model in the framework of assumptions
- (3) use of logic to develop a casual explanation
- (4) Testing the hypothesis.
- The main function of microeconomic as a positive science is to establish cause and effect relationship, if there is any, between two or more economic variables at micro level and to provide the basis of prediction.
- Microeconomics as a normative science involves value judgement on “what is good” and ‘what is bad’ for the society.
The values are drawn from the moral, ethical social and political aspirations of the society.
- It is important to note that microeconomics is fundamentally a positive science. Examining "how price of foodgrain is determined?" is a question for positive microeconomics. It acquires its normative character from the application of microeconomic theory to examine the economic phenomenon from their social desirability point of view to show the need for a public policy action and to evaluate the policy action of the government. e.g. how should the price of foodgarains be determined to prevent starvation is a question of normative microeconomics.

4.6 GLOSSARY

- **Positive analysis** : Analysis describing relationship of cause and effect.
- **Normative analysis** : Analysis examining questions of what ought to be.
- **Deductive Method** : The process of drawing generalizations through a process of reasoning on the basis of some assumptions which are either self evident or based on observations. In deduction we draw conclusions from General to Particular.
- **Inductive Method** : Inductive method proceed from particular to general. It insists on the examination of facts and then lying down general principles.

4.7 REFERENCE

- Pindyck, R., Rubinfule, DL and Mehta, P.L. (2014). *Micro Economics*, Pearsons Prentice Hall. 7th Edition.
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4.8 FURTHER READING

- Pindyck, R., Rubinfule, DL and Mehta, P.L. (2014). *Micro Economics*, Pearsons Prentice Hall, 7th Edition.

4.8 MODEL QUESTIONS

1. Explain in detail the methodology of economics.
2. What is Micro economics? Is Micro economics a positive or normative science? Give arguments for your answer.

EQUILIBRIUM CONCEPTS – STABILITY ANALYSIS, MARSHALLIAN AND WALRASIAN APPROACH

Structure

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Concept of Equilibrium in Economics
- 5.3 Equilibrium and its Classification
- 5.4 Partial Equilibrium
- 5.5 General Equilibrium
 - 5.5.1 Assumption
 - 5.5.2 Criticism
 - 5.5.3 Importance
- 5.6 Stability Conditions of Equilibrium (Walras Vs. Marshall)
 - 5.6.1 Walras Stability Condition
 - 5.6.2 Marshall Stability Condition
 - 5.6.3 Walras Stable Marshall Unstable Equilibrium
 - 5.6.4 Marshall Stable Walras Unstable Equilibrium
- 5.7 Equilibrium - Existence and Uniqueness
 - 5.7.1 Existence of Equilibrium
 - 5.7.2 Uniqueness of Equilibrium
- 5.8 Summary
- 5.9 Glossary
- 5.10 Reference
- 5.11 Further Readings
- 5.11 Model Questions

5.0 OBJECTIVES

After reading this lesson, you shall be able to :

- discuss the concept of equilibrium as used in Economics.
- explain the concept of existence of equilibrium.
- discuss the concept of uniqueness of equilibrium.
- discuss the concept of Stability of equilibrium.
- comment on Walrasian adjustment process.

- discuss Marshallian adjustment process.

5.1 INTRODUCTION

The concept of equilibrium is the cornerstone of Micro economics. In this lesson we shall study about equilibrium, its classification particularly partial and general equilibrium. We shall also study about stability of equilibrium in the form of Marshall and Walrasian conditions. Moreover, we shall study about the conditions for existence and uniqueness of equilibrium.

5.2 CONCEPT OF EQUILIBRIUM IN ECONOMICS

The concept of equilibrium is a basic concept in economics. The term equilibrium is borrowed from Physics and means *a state of balance between the various forces acting on a particular entity*. It implies absence of any tendency in a particular body (things) to change its present state. Thus, a consumer, a firm, industry or the economy is said to be in equilibrium if there is no tendency to adjust to a new position.

As Scitovsky has also said, *"A person is in equilibrium when he regards his actual behaviour as the best possible under the circumstances and feel no urge to change his behaviour as long as circumstances remain unchanged. The same is true of the equilibrium of a firm."*

A market or an economy or any other group of persons and firms is in equilibrium when none of its members feels impelled to change his behaviour.

Suppose, an economy is in a state of equilibrium. Then due to some disturbance the economy is thrown out of equilibrium. Will the economy come back to equilibrium? If an equilibrium is such that any movement out of equilibrium generates forces which bring the economy or the system back to the equilibrium, then we say that the equilibrium is *stable*. In economics, the concept of stable equilibrium occupies a very important position. If an equilibrium is unique and stable, then we know that the economy or the market or the system must ultimately move to that equilibrium. This provides us with a justification for analysing the equilibrium position in detail.

It should be easily understood that the adjustment of supply to a change in the price of a commodity takes time. For example, if the demand for houses in a city suddenly goes up, then the rents will immediately increase. As a result of this more houses will gradually be built and the rents will come down.

5.3 EQUILIBRIUM AND ITS CLASSIFICATION

Equilibrium can be Classified as follows :

- (1) Equilibrium according to its nature (i) Stable (ii) Unstable (iii) Neutral.
- (2) Equilibrium according to Static demand Analysis and Dynamic Analysis i.e. (i) Static Equilibrium (ii) Dynamic Equilibrium.
- (3) Equilibrium according to segments of the economy i.e. Partial Equilibrium and General Equilibrium.
- (4) Equilibrium according to time period i.e. Short Run Equilibrium and Long Run Equilibrium.
- (5) Single and Multiple Equilibrium.

The learning curve is expressed in terms of Marginal labour cost. The Average cost as expressed by cumulative average labour cost has also been declining (col. 6) showing the impact of improving efficiency of labour with practice.

1. Stable, Unstable and Neutral Equilibrium

According to Pigou stable equilibrium is when small disturbance takes place and equilibrium is disturbed. The forces on demand and supply come into play and re-establish the original position. The Neutral Equilibrium is that when there is small disturbance and equilibrium is disturbed. The forces on demand and supply side come into play but no re-establishing. The original position as well as no further disturbance. The new equilibrium position is established.

The unstable equilibrium is that when there is small disturbance and equilibrium is disturbed. The forces come into play. But they take the position further away in a cumulative manner. The original position is never regained.

2. Static and Dynamic Equilibrium

Static Equilibrium represents a stationary static. It is such a situation which every consumer, produces and economy would like to achieve. A consumer is said to be in static Equilibrium where it is getting the maximum satisfaction. A produces is said to be in static Equilibrium where it is getting the maximum profits. The economy of nation is said to be in static Equilibrium where the effective demand for every commodity is exactly equal to its effective supply.

Dynamic Equilibrium on the other hand relates to dynamic conditions of an economy. In it economy moves from one position to another. In it all variables such as population, stock of capital, consumption and production increase or decrease at a constant rate. In reality economic world does not confirm to essential condition of Dynamic Equilibrium i.e. Increase or Decrease in all variables take place at constant rate. In fact they increase or decrease at varying rates. If there is uniformity in the rates it will just be an accidental.

3. Partial and General Equilibrium

According to Stigler the Equilibrium may be partial and Dynamic, the partial Equilibrium is based on restricted range of data. For example, under partial Equilibrium we seek to explain price determination of a commodity. Keeping the prices of other commodity constant and also assuming the various commodities are not interdependent.

On the other hand General Equilibrium is ostensibly based on all data relevant to the problem which is studied. Price of the any good is not determined independently. It is rather related with other commodities. A change in price of any commodity brings a change in prices of all its related commodities which in turn causes change in other related variables. In brief we can say general Equilibrium analysis deals with inter-relationship and interdependence between Equilibrium adjustment with each other.

4. Short-run and Long-run Equilibrium

Marshall gave a distinction between short-run and long-run. Under the short-run scale of the plant is fixed. Short-run does not allow firms to change its plant or capital equipment.

On the other hand long-run is period Long enough to permit the firms to build new plants or abandon old ones.

5. Unique and Multiple Equilibrium

The unique Equilibrium is where single set of prices and quantities fulfill the conditions of Equilibrium. On the other hand Multiple Equilibrium exists where different set of prices, quantities satisfy the Equilibrium condition.

6. Partial and General Equilibrium

Partial equilibrium analysis is a counterpart of Microeconomic analysis; Partial equilibrium is thus a study of individual, a firm, an industry etc. In order to find out a determinate solution to any problem, we take out only the relevant variables and assume other variables to be constant. The processes to be dealt with are, however, so numerous that it is best to take a few at a time and to work out a number of partial solutions as auxiliaries to our main study. Thus we begin by isolating the primary relations of supply, demand and price with regard to a particular commodity. We reduce the inaction of all other forces by the phrase other things being equal. We do not suppose that they are absent but for the time being we ignore their activity. This scientific device is a great deal older than science, it is the method by which consciously or unconsciously sensible men deal from time immemorial with every difficult problem of ordinary life.

5.4 PARTIAL EQUILIBRIUM

Partial of particular equilibrium analysis is especially suited to two types of problems. First, those problems which are confined, to a particular industry and do not produce any disturbance in rest of the economy. For example if workers of toy manufacturing unit go on strike, to press their demand for higher wages and if the workers are fairly evenly distributed in different residential areas of the city their strike will not produce any disturbance anywhere else except the firm; we are dealing with. Particular equilibrium analysis can easily be used to give answer to most of the economic problems originating from the strike. *Secondly*, it can be used to analyse the immediate or primary effects of 'economic' disturbance of any type. For example, if the Government of India chalks out a programme of railway wagon's and machinery exports to the U.S.S.R. particular equilibrium analysis can be useful in arriving at the first order effect's on the iron and steel industry of india. The effects on steel prices, its output, its profits, wages and employments in it.

Of course, the effects of such a programme will, by no means, remain limited to Iron and, Steel Industry alone.

The limitations of partial equilibrium analysis are given below :

- It does not deal with economy as a whole. It is limited to a particular phenomena of the economy.
- It assumes other things remaining the same. Therefore it cannot be used as a policy guide.
- The partial Equilibrium based on the assumption that an economic disturbance in a particular industry has only localised effects. In reality, such cases are few and far between.

Even then, partial-equilibrium analysis has the place of pride in price and resource allocation theory. In adopting the particular equilibrium approach, Marshall had sound reasons. In Marshall's view partial equilibrium is easily comprehensible and more effective it gives us simpler partial and simpler analysis. He was sensitively aware of the limitations of the human mind. In his view, the best we can do is to examine a commodity from the angle of such variables as price, cost and quantity. We cannot easily examine every aspect. He therefore applied his mind mainly to the analysis of equilibrium of a consumer, a firm and an industry.

5.4.1 Advantages of Partial Equilibrium

1. There is need to separate particular economic phenomena from complex economic world. Partial equilibrium fulfils that need.
2. The partial equilibrium helps us in the knowing the behaviour of individual, a firm or an industry.
3. It helps us in predicting the consequences of change in behaviour and plans of the market participants.
4. It is indispensable tool of analysis for the solution of practical problems. Because it limits the field of enquiry to one or two variables. Therefore, it becomes easy to understand the complex economic system.
5. Its application can be seen in case of which spill out and feed back effects are insignificant. The meaning of spill out and feed back is given below :

A change in one of its elements brings a change in all other related elements, which turn causes a change in other related variables and so on and so forth. Thus a change in one of its elements of the economic system effects the rest of the economy. For example, if price and output of commodity X changes, this will cause a change in the price and output of its substitute Y and complement Z. The change in prices and outputs of Y and Z will affect prices and outputs of their related goods and so on. These effects are called spill out effects. Since price and output of commodity X are a part of the economic system, they can not remain unaffected when the other elements are changing. So the change in the rest of the economy will in turn affect the price and output of commodity X. Such affects are known as feed back effects. The spill out and feedback effects may be negligible or considerable often depending on change. For example consider a change in the price of salt on which a negligible proportion of income is spent and which has no substitute. Since salt is allotted a weightage in the national output, a change in price of salt would have negligible spill out and feedback effects. But considerable effect, so it in case of wheat or Rice having a high weightage in the national output would have necessarily a economy can be explained ignoring, this effect. But where effects are significant, there it becomes difficult to explain the behaviour of an economy.

5.5 GENERAL EQUILIBRIUM

Contrary to Partial equilibrium analysis, there is another approach in economics which is known as General Equilibrium approach. The General equilibrium analysis deals with the whole system. Unlike the Partial equilibrium its study is not based upon a restricted range of economic data. In the General equilibrium analysis interdependence among different kind of markets is taken into consideration. For example a fall in the price of apples effects the demand for other fruits. Therefore a disequilibrium in the market for Apples take other fruit markets into disequilibrium. Therefore one cannot discuss the question of equilibrium of a particular fruit in isolation. Obviously the general equilibrium approach is more complicated than partial equilibrium.

Taking cognizance of inter dependence between all prices, these can be determined mathematically in market economy. The quantity demanding of a good is a function of its price i.e. price is an independent and demand is a dependent variable. Besides its own price, the quantity demanded of any good includes prices of all other goods. The consumer will not be in a position to decide how much of one good he should buy unless he, also know the

prices of all other goods. For example there are N goods. The total demand for any of other goods will be determined by prices of all of them. Representing the aggregate demand for each good by D_1, D_2, \dots, D_n and the price of each by P_1, P_2, \dots, P_n an equation can be written for each commodity showing that amount demanded is a function of all prices.

$$D_1 = F_1 (P_1, P_2, \dots, P_n)$$

$$D_n = F_n (P_1, P_2, \dots, P_n)$$

Since in equilibrium, the amount demanded of any good equals the amount supplied of the good i.e.

$$D_1 = S_1$$

$$D_n = S_n$$

Substituting supply for demand in the above equations we get :

$$S_1 = F_1 (P_1, P_2, P_n)$$

$$S_n = F_n (P_1, P_2, P_n)$$

It is assumed that the supply is given and fixed. With ' n ' number of goods, there are ' n ' unknown prices. Since we have one equation for each good, there are ' n ' number of simultaneous equations and these are sufficient to determine the ' n ' unknown prices. As soon as all prices are known, the Aggregate demand for anyone good can be calculated.

The General equilibrium analysis given by Walras is static in nature. It does not include business cycle, Technological improvements etc. According to, him equilibrium is that situation in which all prices are in equilibrium and demand and supply of the products are equal on equilibrium prices. He developed a system of equations to explain the state of General equilibrium. He distinguished between product and factor markets. In the product market, goods are supplied by firms and the same are demanded by consumer. In the factor market consumers supply factor inputs and in return receive income from them. Therefore consumers are buyers in the product markets and sellers in factor markets. This model of Walras is based on the following assumptions.

5.5.1 Assumptions of General Equilibrium given by Walras

1. Tastes and income of the consumers are given.
2. There is Perfect competition in both factor market and Product market.
3. Factors of production are perfectly mobile.
4. There is constant returns to scale in the economy.
5. All units to factors of production are homogenous.
6. There is full employment.
7. There is no change in Technology.

5.5.2 Criticism of General Equilibrium

1. It is based on number of unrealistic Assumptions.
2. The model is static in nature.
3. It assumes a set of simultaneous equations which makes it totally mathematical.

5.5.3 Importance of General Equilibrium

1. It enables us to see the picture of entire Economy.
2. It helps us in understanding the complex economic system.
3. It helps in integrating a variety of individual decisions affected by price changes.

4. It is helpful in modern planning where all production functions are of input output type. It leads to linear Programming problem and meaningful solution can rigorously be proved with the help of this approach.

Most economists are now interested in the problems of dynamic optimization rather than static optimization. The dynamic economizing problem is that of allocation of scarce resources among competing ends over an interval of time from initial time to terminal time. In mathematical terms the problem is that of changing time paths for certain variables called control variable from a given class of time paths called the control set. This dynamic optimization technique has been applied to most of the Neo-classical economic growth models.

Nonetheless, General Equilibrium analysis is still not only very fascinating but also very useful and with the passage of time and growth of knowledge, it is being popular.

5.6 STABILITY CONDITIONS OF EQUILIBRIUM (WALRAS VS. MARSHALL)

As we all know the equilibrium of price and quantity are determined by the equality of demand and supply. The changes in consumers preferences will generally shift the demand curve and innovations will shift the supply curve. Both these forces will tend to disturb the equilibrium position.

Now the question is what are the stability conditions of Equilibrium. In this context we shall discuss two types of views Walras vs. Marshall. Firstly we will discuss Walras stability condition of Equilibrium.

5.6.1 Walras Stability Condition of Equilibrium or Price Adjusting Mechanism of Equilibrium

The Walras stability condition is based on the assumption that buyers tend to rise their prices if excess demand is positive and sellers tend to lower their prices if excess demand is negative. In other words Walras assumes it is the price that adjusts to quantity changes. This can be explained with Fig. 5.1 given below.

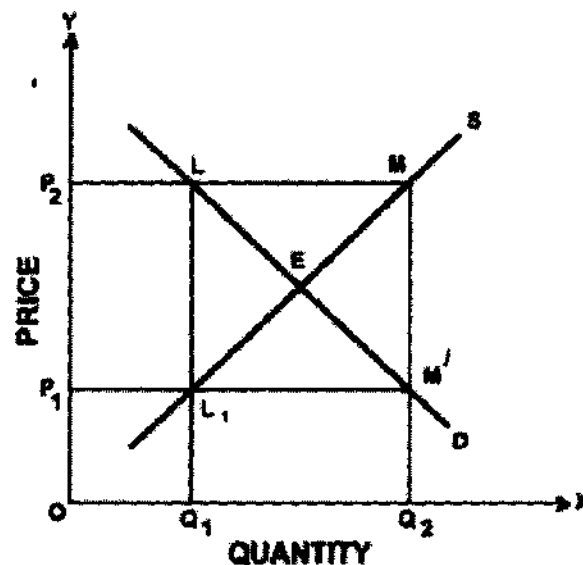


Fig.5.1

In Fig. 5.1 on OX we measure quantity and on OY we measure price. At quantity OQ_1 excess demand price is positive i.e. demand price Q_1L is more than the supply price Q_1L_1 . Similarly at OQ_2 Quantity demand price is negative i.e. demand price Q_2M —is less than the supply price Q_2M . Now according to Walras when excess demand is positive, the sellers will increase the price and when it is negative, sellers will reduce the price till Equilibrium E is attained. This is Walras Stability conditions of Equilibrium.

5.6.2 Marshall Stability Conditions of Equilibrium or Quantity Adjusting Mechanism of Equilibrium

On the other hand Marshall stability condition is based on the *assumption* that producer will tend to increase output when excess demand price is positive and they tend to reduce output when excess demand price is negative. In other words, Marshall analysis is based on the Assumption that it is the Quantity that adjust to price changes. This we can see from Fig. 5.1. At Quantity OQ_1 excess demand price is positive i.e. demand price Q_1L is more than the supply price Q_1L_1 . When this excess demand price is positive, the producers realize that consumers are offering a higher price than he is charging. Then he will increase his output till Equilibrium E is attained. On the other hand, when demand price is negative i.e. at OQ_2 Quantity demand price Q_2M is less than the supply price Q_2M' . Then sellers realize consumers are offering lower price than he is charging. Then he will immediately reduce his output till Equilibrium E is attained.

In this way both Walras and Marshall Stability conditions are satisfied when demand curve is positively sloped.

However when supply curve is negatively sloped an Equilibrium can't be stable according to both the approaches.

5.6.3 Walras Stable and Marshall Unstable Equilibrium

The Equilibrium will be stable in Walras sense when supply curve is steeper than the demand curve. When supply curve cuts the demand curve from above this can be explained with fig. 5.2.

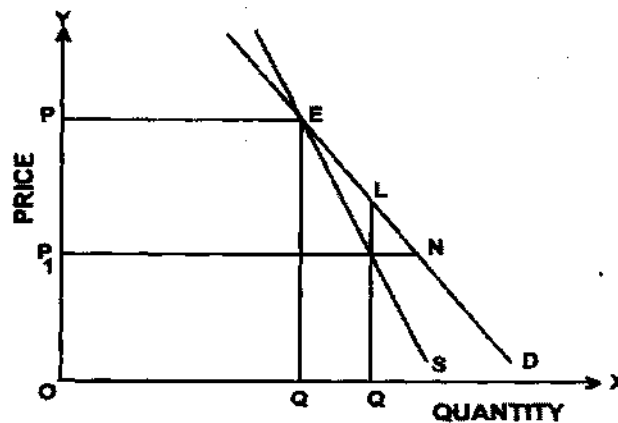


Fig.5.2

In Fig. 5.2 on OX we take quantity and on OY we measure price. At price, OP , Excess demand price MN or ML is positive. In other words, consumers are ready to pay higher price. Therefore competition among consumers will tend to raise the price upto OP . This will reduce the demand and Equilibrium shall be attained at point E. But in Marshallian sense at price OP_1 when excess demand price is positive, this will encourage producers to increase output.

When they increase their output excess demand price also increases and Equilibrium is never attained. They move further away from the Equilibrium.

5.6.4 Marshall Stable and Walras Unstable

The Equilibrium is stable in Marshallian sense when supply curve is less steeper than demand curve i.e. when supply curve cuts the demand curve from below. This we can see from the Fig. 5.3.

In this Fig. on OX we measure quantity and on OY we measure price. At price OP_1 demand price MN or ML is negative. In other words, when sellers are charging higher price then buyers are ready to pay. According to Marshall when excess demand price is negative this will inspire producer to reduce output from OQ_1 to OQ . This will result in increase in price and reduction in demand as a result of which equilibrium E is attained.

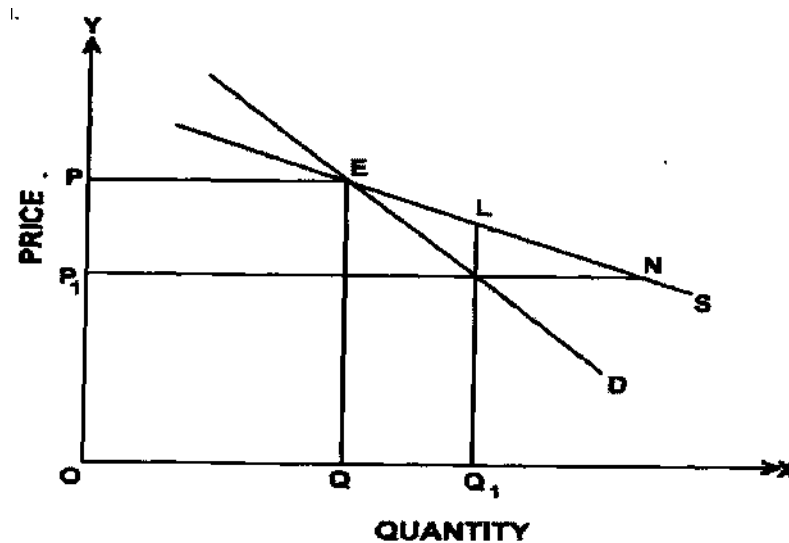


Fig.5.3

But in Walras sense when demand price is negative. It will inspire sellers to make further reductions in their price. Thus equilibrium is never attained. We move further away from the equilibrium.

Thus we can conclude equilibrium is stable in Walrasian sense if supply curve is steeper than the demand curve and unstable in opposite. On the other hand Equilibrium is stable in Marshallian sense when the supply curve is less steep than the demand curve and unstable in opposite.

It is clear that both Marshall and Walras discussed a comparative static model of the competitive market. Comparative static analysis tells us nothing about the way in which the system approaches a new equilibrium if the demand or supply curve shifts. The problem on stability is essentially a problem in dynamic. As Prof. P.A. Samuelson has said even comparative static analysis needs some sort of dynamic assumptions about adjustments in the market in order to derive some meaningful results.

Static analysis of equilibrium assumes a complete and instantaneous adjustment to market forces. But we know that in reality the market mechanism is never perfect. Imperfection in the market tends to lengthen the period of adjustment to equilibrium. Time lags in the process of production can result in a dynamic (time) path of adjustment away

from equilibrium. Or it can result in a situation where the market price and quantity neither converge towards nor move farther away from equilibrium. In the former case, the market shall tend to diverge from the equilibrium situation. In the latter case, equilibrium shall not be attained and the market shall follow a cyclical path.

5.7 EQUILIBRIUM- EXISTENCE AND UNIQUENESS

5.7.1 Existence of equilibrium:

If there is equality between the number of equations and number of unknown various then, there is a common notion that general equilibrium exists but in reality, the equality of number of equations and number of unknowns is neither a sufficient nor a necessary condition for the existence of equilibrium. There is every possibility of finding a system of two equations with two unknowns that has no solution in the realm of real numbers. Walrus was never able to prove it. But in 1954, Arrow found a proof of *existence of equilibrium in perfectly competitive market*. But it was based on the condition that there were neither indivisibilities nor increasing returns to scale. The problem is that since this is based upon the unrealistic assumptions of perfect competition and increasing returns to scale, it is not a real life situation.

(1) If DD curve is below SS curve

Theoretically market equilibrium may not exist at a positive quantity and price. In figure 5.4 the demand curve is below the supply curve. Mathematically, if we extend both of them towards the vertical axis they will intersect at a point. But in economical jargon, it would mean that a negative quantity is being produced and sold which is a very absurd statement. This case, in which equilibrium does not exist at a positive quantity, is one where MC of production is very high relative to its demand. (In case of perfect competition, firm's supply curve is that part of MC which lies above the minimum point of AVC). The production is of such commodity is technically feasible but not economically viable.

(2) For example, the manufacturing of pure gold four wheelers.

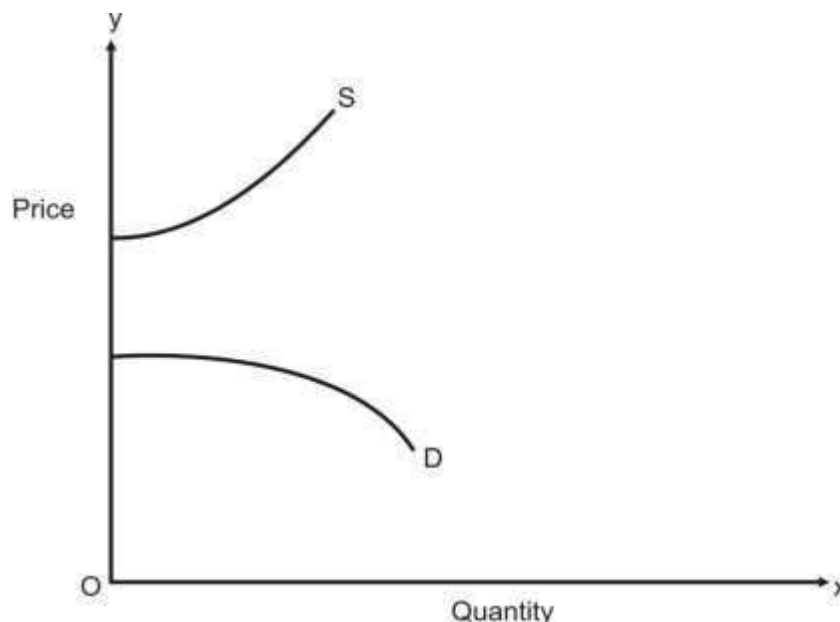


Figure 5.4: Case of Horse Buggies

At any rate, these commodities cannot constitute a perfectly competitive market since there are only few buyers. To quote another example, the trading of work horses and buggies has almost disappeared due to decrease in demand for them. This example shows the market depicted by Figure 5.4.

(3) When MC is Zero

On the other hand in case of other commodities, the marginal cost of production for producing a large number of quantities is zero. If demand is not very high, people are able to secure this commodity from natural resources. As a result, the commodity does not fetch a positive price. It is a *free good*.

Alternatively there are some commodities which were free one time but now due to change in environment, they have become paid now. In many states of America the water commands a positive price. In figure 5.5 a free good has been taken because given the demand curve, no cost is involved in providing the commodity to meet user requirements. Some economists say that problem of existence of equilibrium can be solved by eliminating free goods and nuisance goods but as Menger has pointed out, *there is a tendency of free goods to decrease as economic development takes place.*

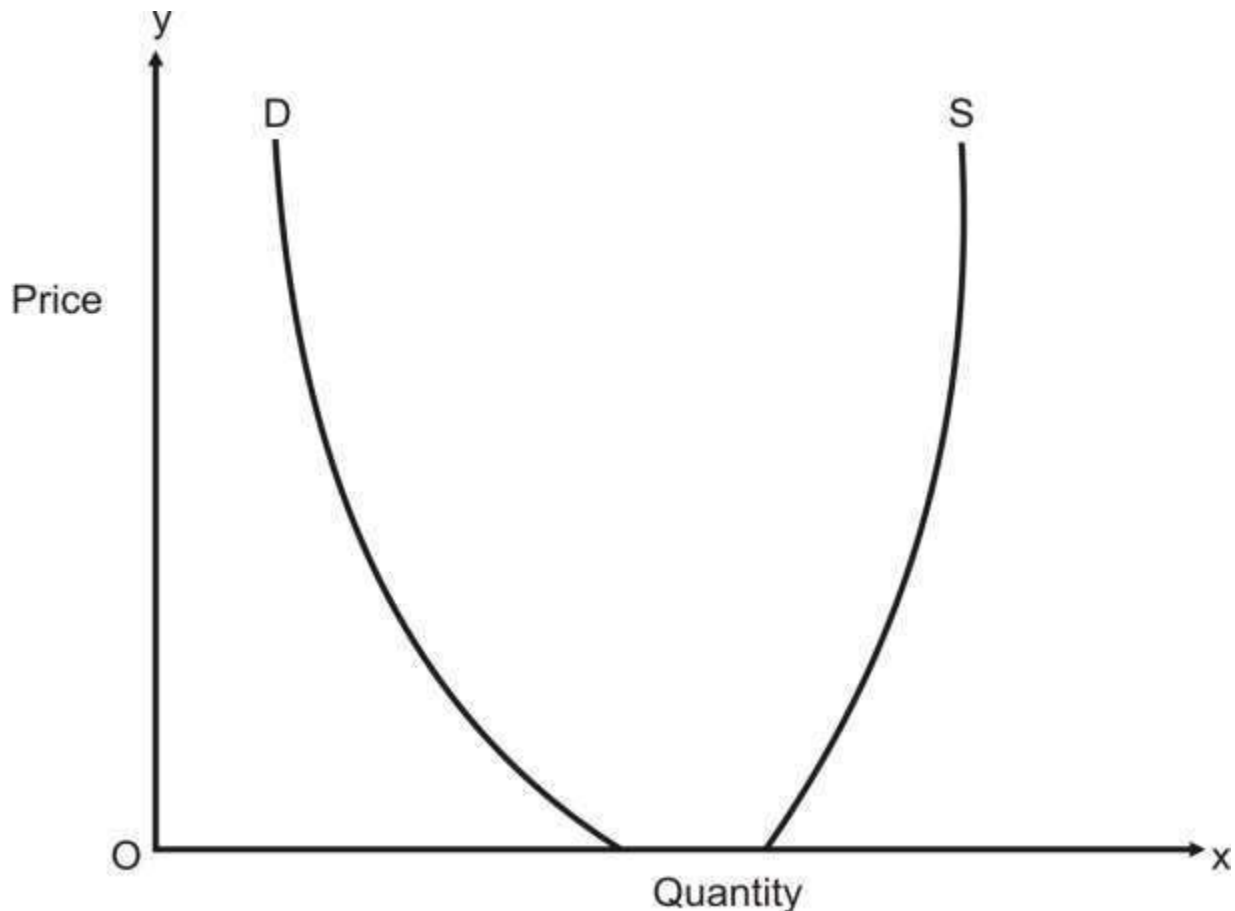


Figure 5.5 : Case of Free Goods

5.7.2 Uniqueness of Equilibrium:

Another problem relating to equilibrium is that of uniqueness that is, if an equilibrium solution exists, is it unique? The use of numeraire and the detection of abundant equations

do not guarantee that the general equilibrium solution is unique or economically meaningful. *Uniqueness is the property of an equilibrium solution which is more important rather than stability.* The uniqueness of general equilibrium says that at all partial equilibrium levels, demand and supply schedules intersect at one point only and thereby giving a positive price. If the price is higher than the price-so-determined, then supply would be greater than demand ($S > D$) and at a price lower than that, demand would be greater than supply. ($D > S$) Sometimes this happens that when equilibrium does exist in a competitive market then there may exist more than one equilibrium. In Fig 5.6 the same situation is observed.

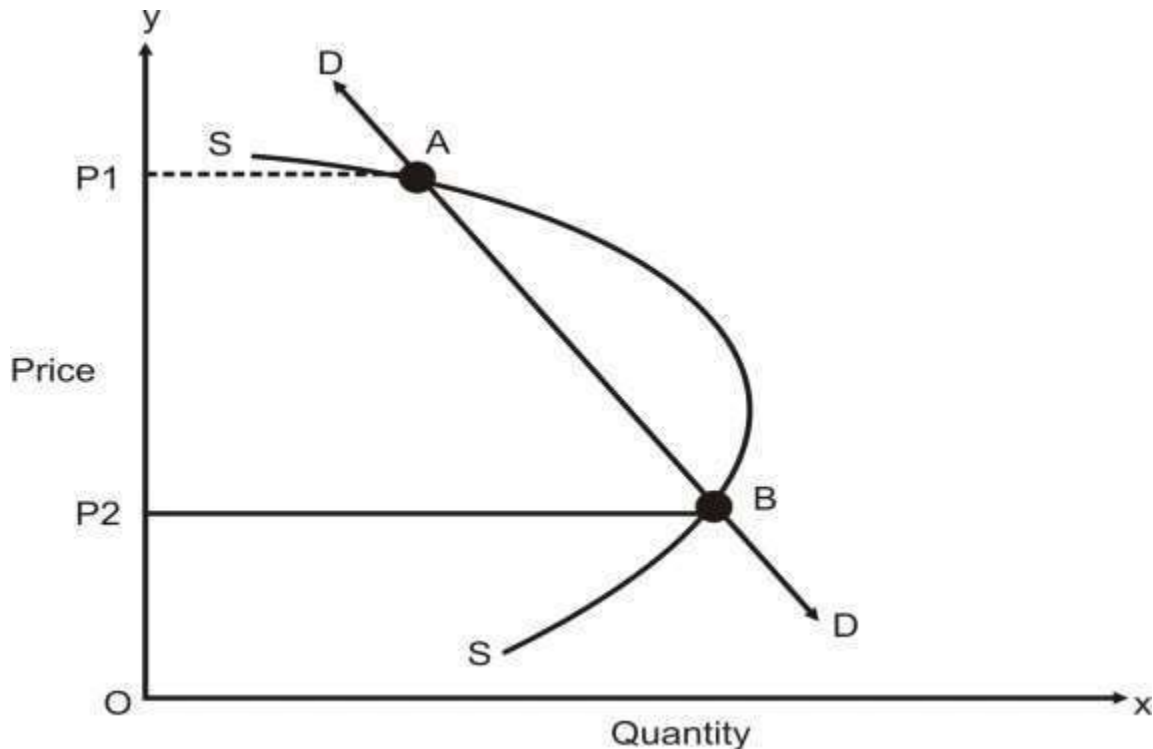


Figure 5.6 : No Unique Equilibrium [work-leisure]

This diagram shows that demand curve has a negative slope through out its range. However, the supply curve is backward bending which means it has a positive slope at lower price but negative slope at higher prices. According to the definition both the points A and B represent the points of equilibrium But theoretically, it is all inconclusive. *It is not clear whether the market will settle at price P1 or P2* (Given the demand and supply combinations). Some economists have observed that labour supply curve in certain labour markets is backward bending. It is due to the fact that when wage rate is low, the standard of living is low. Therefore, a higher wage rate will attract people to work longer hours and induce more people to engage in production activities. Hence a higher wage rate results in higher supply of labour being supplied at a lower range of wage rates but once wage rate becomes high, the standard of living also rises and leisure becomes more important with increased wage rate. Automatically, the working hours would be reduced and that is why the supply curve of labour is backward bending at a higher wage rate which results in *more than one equilibrium price and quantity and uniqueness disappears.*

Similarly, in **figure 5.7** the demand and supply curves have vertical segments. They coincide with each other. This is the case of *unique equilibrium quantity* but not unique equilibrium price. Both these diagrams show that equilibrium may not be unique.

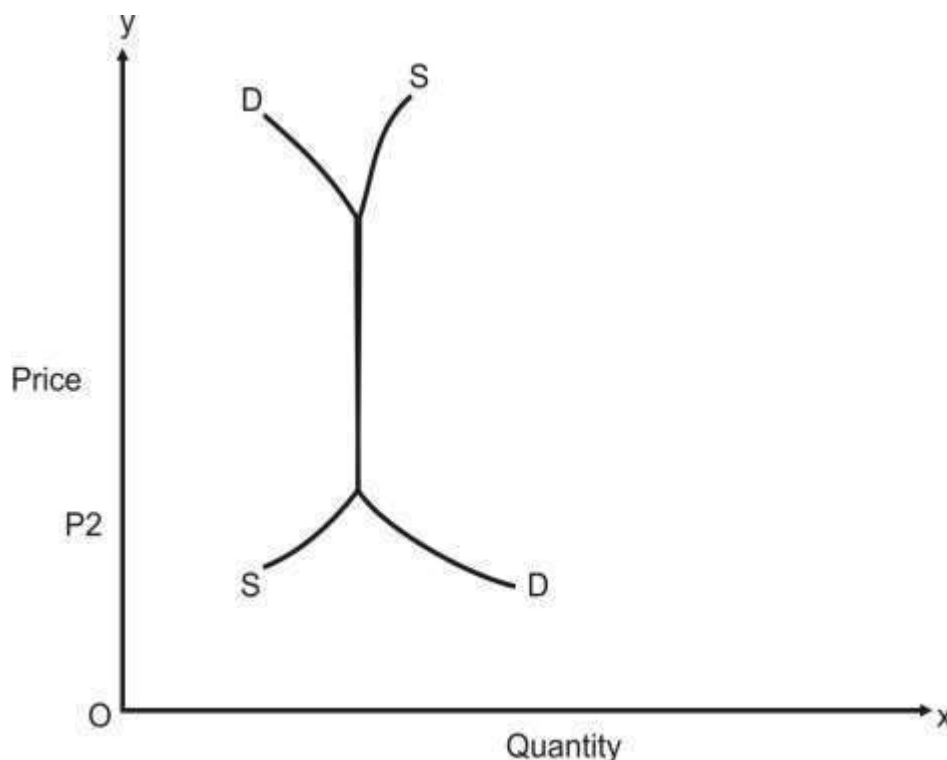


Figure 5.7 : Unique Equilibrium [Qty but not price]

However, Walras later and Arrow have shown that *Walrasian system does possess a unique and meaningful solution*, provided returns to scale are constant or diminishing and there are no joint products or external effects either in consumption or in production. *Obviously, it indicates that unique equilibrium may exist under restrictive assumption.*

5.8 SUMMARY

In this lesson, we have studied about the concept of equilibrium, its classification, and conditions. The existence and uniqueness of equilibrium also depends on certain conditions. We have also studied about the stability conditions of equilibrium as given by Walras and Marshall.

5.9 GLOSSARY

- **Equilibrium** : Equilibrium in a competitive market implies that forces operating from the demand side exactly balance the forces operating from the supply side.
- **Existence of Equilibrium** : However, the question arises that if all the forces operating in the market for product can be accounted for by demand and supply functions, what guarantees existence of equilibrium.
- An alternative Hicksian method using excess demand function can be used to analyse existence of equilibrium. According to Hicks for existence of equilibrium excess demand curve must be downward sloping and must intersect the price axis.
- **General Equilibrium** : Whether general equilibrium exists or Not? Even if the number of equations is equal to the number of unknown, there is no certainty that a general equilibrium solution exists.

- **Uniqueness** : Even if equilibrium exists, there is no guarantee that such an equilibrium will be unique. Uniqueness implies that there exists only one positive price at which demand equals supply or excess demand for the good equals zero.
- **Existence a Uniqueness of Equilibrium:** We may restate it : If demand and supply curves are normally shaped and if the price at which demand becomes Zero is higher than the price at which supply becomes zero, then equilibrium will 'exist' and also be 'unique'.
- **Stable and unstable Equilibrium** : When the process of adjustment converges to equilibrium, equilibrium is described as 'Stable' and when the adjustment process diverges from equilibrium, we describe market equilibrium as 'unstable'.
- **Stability of equilibrium** can be analysed using two adjustment hypothesis.
 1. Walrasian adjustment process
 2. Marshallian adjustment process.
- Both adjustment processes have taken different assumptions about the market behaviour of buyers and sellers.
- **Walrasian process** works through price movement while Marshallian process operates through quantity adjustment.
- **Walrasian stability condition** is based on the assumption—When excess demand price is positive, buyers should raise, the price. If excess demand price is negative, sellers should lower the price.
- **Marshallian stability condition** is based on the assumption---When excess demand price is positive, producers should increase the supply of the product and reduce it when excess demand price is negative.
- For **Existence and uniqueness:** See Sections 5.4 and 5.5.

5.10 REFERENCE

Koutsoyiannis, A. (2011). *Modern Micro Economics*. McMillan Pvt. Ltd.

Ahuja H.L. (2014). *Advanced Micro Economics*. S Chand Pvt. Ltd. New Delhi

5.11 FURTHER READINGS

- Koutsoyiannis, A. (2011). *Modern Micro Economics*. McMillan Pvt. Ltd.

5.12 MODEL QUESTIONS

1. Distinguish between Partial and General equilibrium analysis.
2. Define and distinguish between Static and Dynamic economic analysis.
3. Explain the concept of Existence, Uniqueness and Stability of equilibrium.
4. Distinguish between Walrasian and Marshallian conditions of Stability of equilibrium.

Unit – II

Lesson-6

ANALYSIS OF CONSUMER'S CHOICE – CARDINAL APPROACH

Structure

- 6.0 Objectives
- 6.1 Introduction
- 6.2 What is Demand?
 - 6.2.1 Relation between Demand and Price
- 6.3 Marshallian Approach and Law of Diminishing MU
- 6.4 Marshallian Approach and Law of Equi-Marginal Utility
- 6.5 Appraisal of Marshallian Approach
- 6.6 Consumer's Equilibrium with Utility Analysis
- 6.7 Critical Evaluation of Cardinal Utility Analysis
- 6.8 Summary
- 6.9 Glossary
- 6.10 References
- 6.11 Further Readings
- 6.12 Model Questions

6.0 OBJECTIVES

After reading this chapter, you shall be able to :

- discuss the decision problem of the individual as a consumer.
- comprehend the logical process of making a rational choice which ought to be followed by a consumer.
- explain the logical process under varying assumptions about measurement.
- elaborate on the use of Marginal Analysis in arriving at optimal solutions by the consumer.
- discuss meaning of cardinal utility and how it is measured.
- describe cardinal utility changes with change in the consumption of a commodity.
- ascertain how a consumer finds the level of consumption of a commodity which maximizes his/her total utility in case of a single commodity.

- describe how a consumer consuming many goods decides the quantity consumed in each good which maximizes his/her total utility given his income and prices of different goods.

6.1 INTRODUCTION

In this lesson, we shall study about the first principle of consumer behaviour i.e. demand. This lesson is devoted to the Cardinal approach towards demand i.e. the preferences for a good is measurable in cardinal numbers 1, 2, 3. We shall study about law of diminishing marginal utility, law of demand, consumers equilibrium, and law of equi-marginal utility.

6.2 WHAT IS DEMAND?

Demand, in economics, originates with the consumers in the market. It implies that amount of a commodity which people are prepared to purchase at a given price at a given time. It is obvious that the keenness of the people to purchase a commodity will not be the same always it differs at different times and under different circumstances. At a particular time, the demand for a commodity is influenced by many factors, such as the price of the given commodity, prices of the related commodities (substitutes or complementary goods), income of the purchasers, tastes and preferences of the people, using the commodity in question, etc. In other words we can say that demand for a commodity depends upon or is a function of such variables as the price of the commodity concerned prices of related goods, income and tastes of the people. In mathematical terms,

$$D_x = f (P_x, P_n, Y, T, \text{etc.})$$

Where D_n is the people's demand for the commodity n , P_n is the price of the commodity X , P_n represents the prices of all other related commodities. Y stands for income of the people and T for tastes and preferences of the people; f indicates that D_x is a function of the variables put in the brackets.

The above relationship between demand and other variables is not a simple one. The analysis of demand is bound to be complex one, if efforts are made to study the influence of all these variables on demand simultaneously. The economists, accordingly, follow the usual technique of assuming that at a given time, only one of the independent variable changes and all other variables remain constant (other things remaining the same or *ceteris paribus*). This simplifies the process of analysis and enables the economists to arrive at some conclusion about relationship between the dependent variable (Demand) and each one of the independent variables. (Factors affecting demand)

6.2.1 Relation between Demand and Price : Law of Demand

As we are mainly interested in the determination of price, and we have already concluded that demand represents one of the forces determining prices, we are required to know how the demand is influenced by changes in price of the commodity. In other words, we wish to study the nature of the relationship represented by $D_x = f (P_x)$ on the assumption that other factors do not change and remain the same. This relationship is called the price-demand function or simply the demand function.

Marshall was the first economist to introduce the concept of demand function in Economics. The distinction between demand and demand function should be properly understood. While demand refers to the quantity of the given commodity that would be purchased at a given price, the demand function refers to the whole schedule of such quantities that would be purchased (quantity demanded e.g. point A on DD) at different

possible prices of the commodity. In other words, while demand refers to particular point *on the demand curve*. Demand function *refers to the whole of the demand curve*. It is the shape as well as the *position* of demand curve or demand function which depicts the "force of demand".

It can be logically demonstrated that there is an inverse relationship between price and the demand for commodity. In other words, other things remaining the same, the lower the price of commodity, the greater will be its demand, and the higher the price of a commodity, the lower will be the demand for this commodity. This is what is generally known as the Law of Demand. This law can be explained in Fig. 6.1. *Demand schedule* refers to the table which shows negative relationship between price and quantity demanded and demand curve is the graphical presentation of demand-price relationship

"The curve DD is called a demand curve. On the X-axis, we measure the amount demanded and on the Y-axis the price is measured.

This relationship is known as Law of Demand. The demand function

$$D_x = f(P_x, P_y, I, T, S, (I),$$

where P_x = Price of good, P_y = Price of related good, Y = Income of consumer, T =Taste & Habit of consumer, S =Season - etc.

This shows demand is determined or affected by many factors. Keeping other factors constant, the inverse relationship between price and quantity demanded is called Law of demand i.e. $D_x = f(P_x)$ & other factors as constraints.

In view of the nature of the demand function as stated above, the slope of the demand curve will be negative i.e., it will fall from left to right.

Table 6.1 : Demand Schedule

Price (Rs. per kg)	Quantity Demand (in Qtls.)
25	100
20	80
25	70
30	50

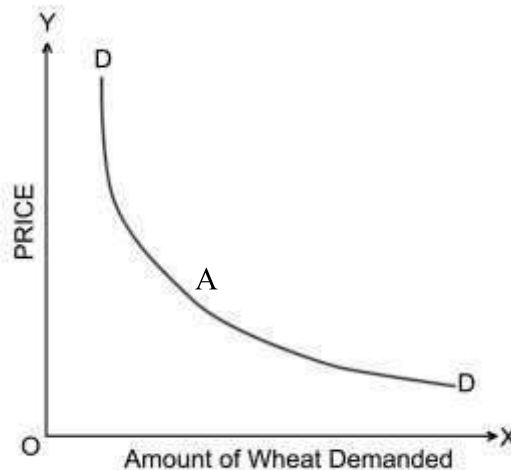


Fig.6.1

Demand Curve

Two important points may be noted with regard 'to' the demand curve in Figure 6.1. *In the first* instance, it has been drawn on the assumption that, excepting price, all other independent variables in the above demand function, namely, income, prices of other commodities and tastes and preferences of the consumer remain unchanged. *Secondly*, as Meyers says, all the points on the demand curve are 'alternative' points and not 'successive' points. This means that each point only shows that if price of the commodity were such, the demand would be such and such. No actual transaction takes place at any particular price. In other words, each point only shows the amount *desired* to be purchased at the price corresponding to that point.

It may be further noted when we talk about the *demand conditions* for a commodity we actually visualize the whole demand function i.e. the *demand curve*. When one says that the demand conditions in the market have changed, it means that the demand function itself has assumed a different value (i.e. demand curve as a whole has changed its positions).

Self Assessment Question

Q1. What is Marginal Utility?

Q2. What is Demand Meaning?

6.3 THE CARDINAL UTILITY APPROACH

Of all the approaches to the theory of consumer's behaviour, the cardinal utility approach is the oldest. Its origin can be traced to such 19th century economists as Gossen, Jevons, and Walras although the real credit for its present development goes to Marshall and Pigou.

A. Features

The basic idea of this approach is that a consumer buys a commodity or service because of its utility. A product has utility because it has the power to satisfy a want. Utility is the want-satisfying power.

Two features of this concept must be emphasized:

First, utility and usefulness is by no means the same thing. A diamond ring is useless in the ordinary sense of the word and yet is of great utility to a newly-wedded bride. Wine and tobacco can kill a man and yet many people smoke and drink because it gives them satisfaction. In short, the concept is *ethically neutral*.

Second utility is a subjective concept. The utility of a particular product differs widely from person to person. A book may have tremendous utility for a student intending to appear in a particular examination but very little utility for a man who cannot read. Similarly, a cigarette may yield great utility to a smoker, but zero or negative utility to a non-smoker.

6.3.1 The Marshallian Approach with the Law of Diminishing Marginal Utility

For explaining the inverse relationship between price and demand, Marshall made use of what is now known as the Law of Diminishing Marginal Utility. This law says that as a person consumes more and more units of a commodity, the utility of each successive unit goes on declining.

Assumptions

- **Cardinal measurement.** It is based on this assumption that the utility is measureable. The name of the measurement unit is utils. It is the name which is given by some economists. As we measure length in meters or centimetre and weight in kilograms etc similarly utility is measured in utils.
- **Rational Consumer:** It is supposed that consumer must be rational one. A rational consumer is a person who wants to get maximum utility from his given resources.
- **Constant income:** Money income should remain constant in a budget period. There should be no change in income when a consumer is spending his income on different commodities.
- **Marginal utility of money remains constant:** It is assumed that the marginal utility of money should remain constant with the increase in the size of income. Suppose MU of Rs. 10 is equal to 8 utils then total utility of Rs. 20 will be 16 utils and Rs. 30 will have total utility equal to 24 utils. It means MU of Rs. 10 remains 8 utils.
- **Commodities are divisible:** Commodities must be divisible i.e. a consumer may spend his income in small proportions on different commodities. For example he may spend his income in rupees etc. in other words he will not spend a major chunk of his income on one commodity.
- **Perfect Knowledge of utility:** A consumer must have perfect knowledge of utility derived from different commodities. He may be able to calculate how much utility he gets from one and how much from other commodity.
- **Independent utility:** The utility of different commodities is independent. Utility derived from commodity 'A' has no effect on the utility derived from commodity 'B'. It means a consumer may consume different types of commodities as their utilities are independent.
- **No Change in taste, fashion, liking, and habits of the consumer:** No change in the fashion habits, liking and taste of the consumer should be there while he is spending his income on different goods and services.

6.3.2 Marginal Utility : Concept

Economists put forth the ideas that particular consumer wants can be satisfied with the succeeding units of a commodity in the Law of Diminishing Marginal utility. *By Marginal Utility, we simply mean the extra utility or satisfaction which is consumer gets from an additional unit of a particular product.* To put it differently, we may say that marginal utility is the gain in utility by consuming one more unit of the commodity or else it is the utility lost by consuming one less unit of the commodity. Symbolically,

$$Mu_x = \frac{\Delta U_x}{\Delta X} \text{ where } \Delta X \text{ signifies one unit change in the quantity of X commodity, and } \Delta U_x \text{ shows change in total utility}$$

This law of consumption is based upon everyday experience of any consumer. It recognizes the fact that human wants are although unlimited yet each particular want is satiable. As consumer goes on purchasing the units of a commodity one after the other, the marginal utility from the subsequent units goes on decreasing. A stage comes when the consumer wants to have no more unit of that commodity. It means the marginal utility from

the commodity has dwindled down to zero. This state of mind of the consumer is known as the state of 'satiety' or full satisfaction. If the consumer buys and consumes any more unit of the commodity, the marginal utility becomes negative or there is disutility from the commodity to the consumer.

6.3.3 Statement of Law

Marshall defined this law in these words, "The additional benefit which a person derives from a given increase in this stock of a thing diminishes with every increase in the stock that he already has." According to Chapman, "The more we have of a thing, less we want to have additional increments of it." In the words of Samuelson, "As the amount consumed of a good increases, the marginal utility of the good tends to decrease."

6.3.4 Assumptions

- *Utility is a cardinal concept.* It means that the utility of each commodity is quantitatively measurable. The most convenient measure is money: the utility is measured by the amount of money which a consumer is prepared to pay for an additional unit of the commodity.
- *Marginal utility of Money is constant.* This assumption is necessary if money is to be used as a measure of utility. The essential feature of any unit of measurement is that it be constant. If marginal utility of money changes as income increases or decreases, then the measuring-rod for utility becomes, like an elastic ruler, inappropriate for measurement.
- *It is assumed that the consumer is rational* and that he tries to maximise his utility or satisfaction out of his income. The fact that the consumer is rational means that he clearly knows the utilities of various quantities of good he wants to buy and can measure and compare them. It also implies that the consumer will always choose the alternatives which bring him maximum satisfaction. The assumption of rationality rules out the influence of habit, tradition, or impulse on the behaviour of the consumer.
- *The total utility of a combination of goods depends on the quantities of the individual commodities.* If there are n commodities in the combination with quantities x_1, x_2, \dots, x_n then total utility is

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

It is assumed that utility is additive.

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

- *Additivity implies independent utilities* of the various commodities in the combination. It means that the utility which a consumer gets from a commodity depends upon the amount of that commodity only. It is not related to the quantities of other goods purchased by the consumer. The utility of Mangoes depends on the amount of mangoes alone and has nothing to do with the amount of oranges or bananas which the consumer might have purchased. The cardinal utility theory assumes that with increase in the stock of a commodity its marginal utility declines.

6.3.5 Explanation of Law

Based upon the assumptions enlisted above the law of Diminishing Marginal utility (DMU) is explained with the help of a schedule as well as diagram.

Table 6.2 depicts that a consumer is getting 20 utils of utility from the 1st glass of juice and Total Utility goes to 32 utils from the 2nd glass-and 40,42,42, and 39 utils from the 3rd,4th,5th, and 6th glass of juice. The Marginal Utility start to decrease from 12 utils from 2nd glass to 8, 2, ,0, and -3 utils from 3rd,4,5, and 6 glass of juice. This shows that as he is consuming successive doses of glass of juice MU is decreasing continuously. It is zero from 5th glass of juice and -ve from 6th glass. This is shown with the help of a diagram no.6.2.

Table 6.2. Schedule of Law of Diminishing Marginal Utility.

Units (Glass of Juice)	Total Utility	Marginal Utility
(Number)	(In terms of utils)	(In terms of utils)
1st	20	
2nd	32	12
3rd	40	8
4th	42	2
5th	42	0
6th	39	-3

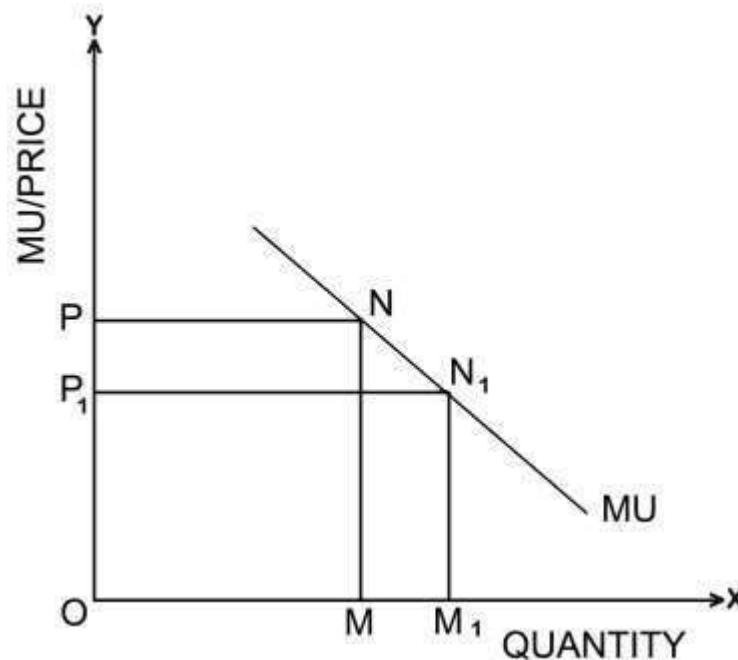


Fig. 6.2 Diminishing Marginal Utility

Fig. 6.2 shows decreasing sizes of vertical bars NM , N_1M_1 which indicate that MU is falling continuously to zero and negative. This law is not always applicable in every sphere of life. Some exceptions are there where this law in general is not applicable.

6.3.4 Exceptions of the Law

The exceptions of the law are only true when certain postulates have to obey.

- **In case of Intoxicants:** Consumers who are fond of drinks or other intoxicants would demand more and more. But this is true up to that stage when they get out of control or they have no consciousness. After this stage they take less and less. So the law is not applicable in short period but in the long run it will hold good.
- **Accumulation of money:** Consumer is generally interested to accumulate more and more money, for this purpose he remains eager to collect or earn more money and enjoy more utility. But in reality the marginal utility of money declines with richness but it never comes to zero.
- **Rare collection:** Those people who are having the hobbies to collect stamps of rare kings or coins are getting more utility with the every newly added stamp or coin or any other article of their interest. If they are collecting the same coins or stamp then marginal utility will decline.
- **Misers:** This law is not valid in case of misers. They are not interested to get more. So they are unable to define what marginal utility they will get if they will not purchase.
- **Initial unit:** This law does not apply on the initial units of the commodity which consumer consumes. The law will be applicable when a consumer has successive doses of a commodity which he is consuming.
- **Good book or song:** When a consumer reads a good book or listens a good song then he will enjoy up to sometime but if he listens the same song or reading the same book again and again then he will get less and less utility.

6.3.5 Practical Importance of the Law

The law of diminishing marginal utility has great practical importance in every field in general and in economies in particular. Some of the areas in economies where its practical importance is realized are as follows:

- **Basis of the law of demand:** The law of DMU and the law of demand are the chips of the same block. The law of DMU shows an inverse relationship between the number of units of the commodity and the utility derived from them. Lesser is the units of the commodity more marginal utility a consumer will get and vice versa. In the same pattern law of demand establishes an inverse relationship between the price of a commodity and units of the commodity. This law is based on law of DMU because a consumer is always ready to compare MU and price of the commodity. He will pay more prices if he will get more utility than the price but the number of units will be less. He will pay less if he buys more because utility will diminish from the successive doses of the good: This law (DMU) is important to decide whether a consumer will pay more or less price, he has to compare the utility of the commodity with that of price.

- **Basis of consumer's surplus:** Law of DMU is also helpful to consumer to measure his surplus. Consumer surplus is the difference between willingness to pay for a commodity and he (consumer) actually pays. He is always taking care of what he is spending in the form of income which he pays via price. A consumer will compare MU and the utility of money which he sacrifices in terms of price. If the utility of the commodity is more than the utility which consumer sacrifice in terms of price then he will get consumer surplus and he will keep on purchasing till the MU of the good and the price paid for that equates.
- **Basis of price determination:** Law of DMU assists in determining the price of any commodity. If the producer wants to sell more units of the same commodity, he has to fix lower price. Consumer will purchase more units at less price as he knows that he will get less utility from the successive units.
- **Basis of variety in production:** This law is also the basis of producing different styles of the same commodity because a consumer needs variety as he become monotonous by using same commodity again and again. If a consumer is consuming one commodity every time he will get less MU from that commodity. That is why this law is helpful to introduce variety in production.
- **Basis of re-distribution of income:** This law is also the basis of re-distribution of income between rich and poor. Rich people have less utility from the income while poor have more. If the income is redistributed in favor of poor then the poor may be benefited from this and there may be an increase in the welfare of the poor.
- **Basis of progressive taxation:** This law is also helpful for the finance minister to impose tax in such a manner that the marginal rate of sacrifice' for rich and poor should be the same. Rich are taxed at high rate and poor are at less because the utility of the money for rich will be less and for poor it is more. The income collected through tax may be redistributed among poor.
- **Helpful to consumer in purchasing goods:** This law is also helpful for consumer to know that up to what extent he may purchase goods. A consumer will take into consideration MU of the good and the price paid for that good. If MU is more than the money paid in' terms of price consumer will continue to purchase and he may do so till the MU and the value of money (price) in terms utility are equal.

6.3.6 Criticism of the Law

Pareto an Italian economist severely criticized the concept of cardinal utility. He stated that utility is neither quantifiable nor addible. It can however be compared. Pareto along with his contemporary economists has criticized this law on the basis of following grounds:

- **No cardinal measurement:** Utility can't be measured in terms of numbers called utils. Utility is subjective. It differs from man to man. One can't quantify how much utility he is getting from a commodity which he consumes. He can make a comparison of the utility derived from the first and the second and other units.
- **MU of money does not remain constant:** with the ever increasing price level, the MU of money does not remain constant. The value of money varies inversely

with price. The MU of money remains constant subject to no change in price of that commodity which consumer purchases.

- **No independent utility:** utility of one commodity has an impact on the utility of another commodity. One can't say that whatever utility he is getting from a chapatti has no effect on the Utility of other consumable product.
- **MU can't be calculated in all cases:** The law of DMU has been criticized on the ground that-MU each and every commodity cannot be calculated. This law is valid only in case of divisible goods. Those goods which are durable and can't be divided into parts their calculation of M.U. is not possible. E.g. the MU of refrigerator or washing machine can't be calculated. So this law is not applicable for durable commodities.
- **Man is not a machine:** This law says that whenever a consumer purchases any good he has to compare MU of that with the price of that commodity. But in reality man is not calculating the MU of each and every commodity at each and every stage.
- **Unrealistic Assumptions:** this law is based on some unrealistic assumption in the form of constant habits, tastes, income, budget and MU of money but all these don't remain constant.

6.3.7 Derivation of the Demand Curve from the Law of DMU

We now turn to explain how the demand curve and the law of demand is derived in the cardinal utility analysis. As stated above, the demand curve or the law of demand shows the relationship between price of a good and its quantity demanded. *Marshall derived the demand curves for good from their utility functions.* It should be further noted that in his cardinal utility analysis of demand Marshall assumed the utility functions of different goods to be independent of each other. In other words, Marshallian technique of deriving demand curves for the goods from their utility function rests on the hypothesis of *additive utility functions*, that is, utility functions of each good consumed by the consumer does not depend on the quantity consumed of any other good. As has already been noted that in case of independent utilities or additive utility functions, the relations of substitution and complementarity between goods are ruled out. Further, in deriving a demand curve or law on demand Marshall assumes that marginal utility of money expenditure (MU_₹) to remain constant. The law of demand or the demand curve can be derived in two ways:

First, with the aid of law of diminishing marginal utility, and secondly, with the help of the law of equi-margin utility. We shall explain below these two ways of deriving the demand curve and the law of demand.

Derivation of Demand Curve from Law of Diminishing Marginal Utility

In order to derive the demand curve (and accordingly law of demand) we measure marginal utility of a good in terms of money (i.e. in terms of rupees) as Marshall did. Measuring marginal utility in terms of money or rupees implies how much value in terms of rupees an individual places on the successive units of the commodity consumed. In other words, how much money a consumer is prepared to pay for a unit of commodity will measure the marginal utility of that unit of the commodity in terms of money.

The law of marginal utility states that, as the quantity of a good with a consumer increases marginal utility of the good to him expressed in terms of money falls. In other words, the marginal utility curve of a good is downward sloping. Now, a consumer will go on purchasing a good until the marginal utility of the good equals the market price. In other

words, the consumer will be in equilibrium in respect of the quantity of the good purchased where marginal utility of the good equals its price. His satisfaction will be maximum only when marginal utility equals price. Thus "*marginal utility equals price*" is the condition of equilibrium. When the price of the good falls downward-sloping marginal utility curve implies that the consumer must buy more of the good so that its marginal utility falls and becomes equal to the new price. It therefore follows that the diminishing marginal utility curve implies the downward-sloping demand curve, that is, as the price of the good falls, more of it will be bought. The whole argument will be more clearly understood from Fig. 6.4. In panel (a) of Fig. 6.4 the curve MU represents the diminishing marginal utility of the good measured in terms of money. In panel (b) of Figure 6.4 we measure price on the Y-axis. Suppose the price of the good is OP_1 . At this price the consumer will be in equilibrium when he purchases Oq_1 quantity of the good, since at Oq_1 the marginal utility MU_1 is equal to the given price OP_1 . Now, if the price of the good falls to OP_2 , the equality between the marginal utility and the price will be disturbed. Marginal utility MU_1 at the quantity Oq_1 will be greater than the new price OP_2 . In order to equate the marginal utility with the lower price OP_2 , the consumer must buy more of the good. It is evident from Fig. 6.4 that when the consumer increases the quantity purchased to Oq_2 , the marginal utility of the good falls to MU_2 and becomes equal to the new price OP_2 . Hence, at price OP_2 , consumer demands Oq_2 amount of the commodity. Further, if the price falls to OP_3 this is equal to the marginal utility MU_3 at the larger quantity Oq_3 . Thus at price OP_3 , the consumer will demand Oq_3 quantity of the good X. It is in this way the downward sloping marginal utility curve is transformed into the downward sloping demand curve when we measure marginal utility in terms of money. It is worth noting that negative segment of the marginal utility curve MU_x will not constitute a part of the demand curve. This is because no rational consumer will buy any further units of the commodity which reduces his total utility and make marginal utilities negative.

It is thus clear that when the price of the good falls, the consumer buys more of the good so as to equate the marginal utility to the lower price. It follows therefore that the quantity

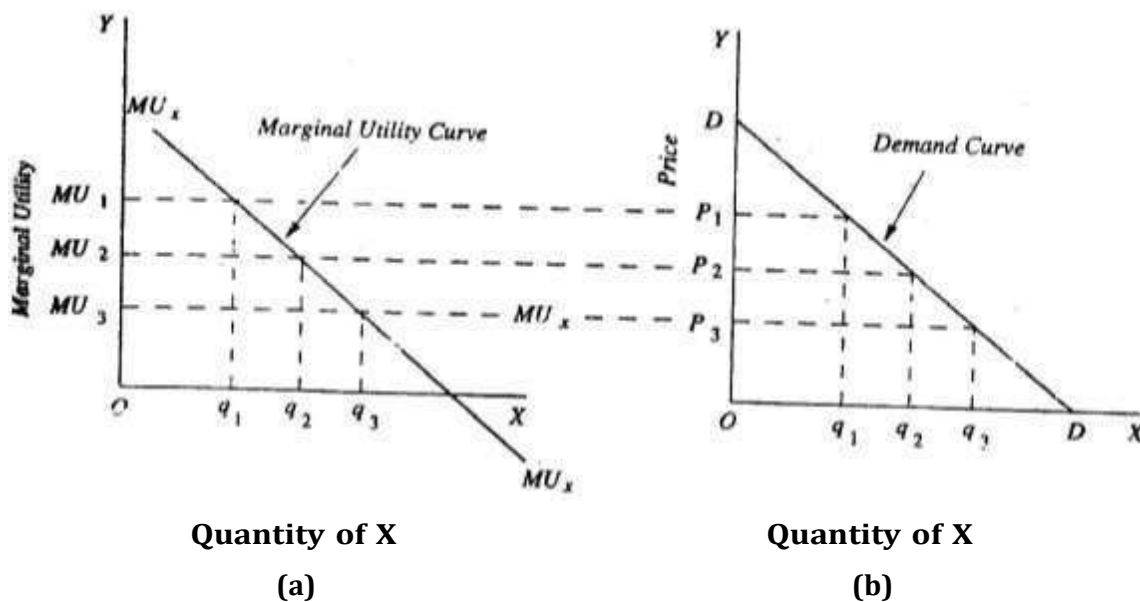


Fig. 6.4 Derivation of Demand Curve in Marshallian Utility Analysis

demand of a good varies inversely with price; the quantity bought rises when the price falls and vice-versa, other things remaining the same. This is the famous Marshallian Law of Demand. It is quite evident that the law of demand is directly derived from the law of diminishing marginal utility. The downward-sloping marginal utility curve is transformed into the downward-sloping demand curve. It follows therefore that the force working behind the law of demand or the demand curve is the force of diminishing marginal utility.

Note : Please go through Law of Equi-Marginal utility from your UG level book : Assumption and criticism almost same as in case of Law of DMU. Derivation of demand curve from Law of EMU has been discussed in Section 6.4.

Self Assessment Question

Q1. Name the variables on the y-axis in case of price effect and demand curve derived from it.

6.4 THE MARSHALLIAN APPROACH : LAW OF EQUI-MARGINAL UTILITY

The inverse relationship between price and demand as derived by Marshall takes into view only a single commodity. This procedure gives the impression that the consumer consumes only one commodity. Such an implication of the procedure adopted was not acceptable to the followers of Marshall. Accordingly, the Law of demand was derived with the help of another law called the law of Equi-marginal Utility.

Assumptions

This law tells us how a consumer will plan his expenditure. If (i) he has a fixed income. (ii) he knows the set of goods available in the market. (iii) he knows the utility schedule of each commodity, and (iv) he has complete knowledge of the price of these commodities.

Law of EMU and Explanation

It is assumed that the consumer is a rational person and his object is to maximize his total utility from the various commodities that he purchases with a given amount of expenditure.

Marshall pointed out that in case the price of each commodity was the same, the consumer would look at the marginal utilities of various commodities that he wants to purchase and will purchase so much of each commodity with his given income that marginal utility in each case was the same. Such a distribution of income over various commodities will maximise his total utility from the commodities purchased. i.e. $MU_A = MU_B = MU_C =$ A, B, C are commodities.

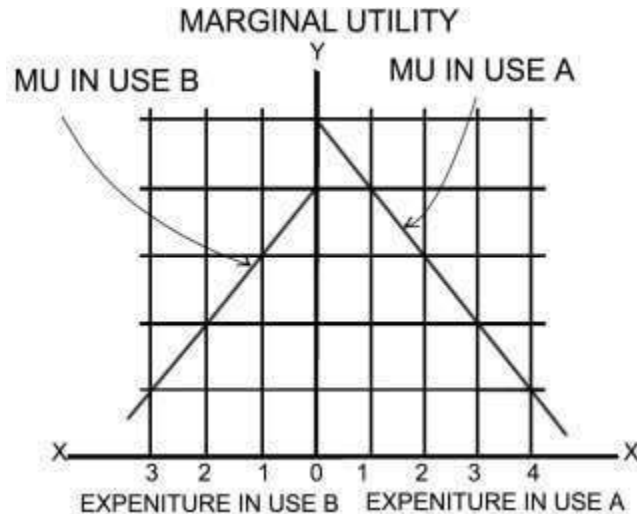


Fig. 6.5 : The Equal Marginal Principle

This can be explained with Fig. 6.5. In figure 6.5, it is clear that if the consumer has to put money at his disposal into two uses, say Rs.5 to purchase two commodities (price per unit of each commodity being the same or $P = \text{Re. } 1$), he should purchase 3 units of A and 2 units of B. If his income enables him to purchase 7 units of two commodities he should purchase 4 units of A and 3 units of B. His total satisfaction will be maximum through such a distribution.

In case, the prices of the commodities purchased by the consumer were different, then the condition for maximising the total utility will be stated as follows:

$$\frac{\text{Marginal utility of A}}{\text{Price of A}} = \frac{\text{Marginal utility of B}}{\text{Price of B}} = \frac{\text{Marginal Utility of C}}{\text{Price of C}} = MU_m$$

Where A, B and C are goods and MU_m is marginal utility of money

Thus, in other words it means that total utility from a given amount of expenditure is maximum when the marginal utility of expenditure in each direction brings in the same increase of utility, that is when the marginal utility of expenditure in each direction is the same. This, in fact, is a more general condition of optimum allocation of consumption expenditure of an individual. The law of Equi-marginal utility referred above follows from it, when price of each good is the same. This condition is also known as the *proportionality* rule of Marshalian demand analysis.

When a consumer has allocated his expenditure in such a manner, he is said to be in equilibrium. The consumer is said to be in equilibrium, because he is perfectly satisfied with the allocation of his expenditure over various commodities, which he is consuming and is not at all inclined to change the composition of his expenditure. Change in any direction, he feels, will decrease the total of the commodities that he has decided to consume.

Followers of Marshall use this Proportionality Rule to explain that the demand for a commodity will rise, when its price falls and vice-versa. Suppose the price of A fall, but the price money (MU_m) does not change as a result of a change in price of one good. The consumer will no longer be in equilibrium because the proportionality rule will be disturbed. As price of other commodities are

$$\frac{\text{M.U. of A}}{\text{Price of A}} = \frac{\text{M.U. of B}}{\text{Price of B}} = \frac{\text{M.U. of n}}{\text{Price of n}} = \text{MU}_m$$

assumed to be unchanged the only way to make is to decrease (M.U. of A and increase M. U. of B as well of other commodities). This will be done by increasing the purchase of A and by decreasing the purchase of B and other commodities, if necessary, and thus shifting the demand in favour of A. In other words, so far as the amount of commodity A is concerned, its demand will be increased when its price falls. This increase in demand for commodity A will continue till proportionality condition is fulfilled i.e.

$$\frac{\text{MUA}}{\text{Price of A}} = \frac{\text{MUB}}{\text{Price of B}}$$

6.4.1 Derivation of Demand Curve from Equi-marginal Utility Principle

We now proceed to derive the law of demand and the nature of the demand curve from the principle of equi-marginal utility.¹ Consider the case of a consumer who has a certain given income to spend on a number of goods. According to the law of equi-marginal utility, the consumer is in equilibrium in regard to his purchases of various goods when marginal utilities of the goods are proportional to their prices. Thus, the consumer is in equilibrium when he is buying the quantities of the two goods in such a way that satisfies the following proportionality rule :

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} \text{ ---- } \frac{MU_n}{P_n} = \lambda$$

where λ stands for marginal utility of money income or MU_m . Thus, in the equilibrium position, according to the above principle of equi-marginal utility, the ratios of the marginal utility and the price of each commodity that a consumer buys will equate the marginal utility of the last rupee spent on each good. It follows therefore that a rational consumer will

equalise the marginal utility (MU_m) or with $\frac{MU_x}{P_x}$ of good X, $\frac{MU_y}{P_y}$ of good Y and so on.

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \text{-----} = \text{MU}_m$$

Given *Ceteris Paribus* assumption we consider the demand for good X. Assume the price of good X equals P_{x1} . Consumer will allocate his given money income on various goods he purchases so that

$$\frac{MU_x}{P_x} = \lambda, \frac{MU_y}{P_y} = \lambda \text{ and so forth.}$$

¹ It should be noted that the law of diminishing marginal utility is more fundamental, since the law of equi-marginal utility is based upon the law of diminishing marginal utility.

Let us suppose the price of good X falls. With the fall in the price of good X, the price of other good Y, consumer's income and tastes remaining unchanged, the equality of the $\frac{MU_x}{P_x}$ with $\frac{MU_y}{P_y}$ or λ in general would be disturbed.

With the lower price than before, $\frac{MU_x}{P_x}$ will become greater than λ or MU_m . (It is assumed of course that the marginal utility of money expenditure does not change as a result of the change in the price of one good.) Then, in order to restore the equality, marginal utility of X or MU_x can be reduced only by consumer's buying more of the good X. It is thus clear from the equi-marginal principle that as the price of a good falls, its quantity demanded will rise, other things remaining the same. This will make the demand curve downward-sloping. How the quantity purchased of a good increases with the fall in its price and also how the demand curve is derived is illustrated in Figure 6.6a.

In the upper portion of the Figure 6.6a on the Y-axis is shown $\frac{MU_x}{P_x}$ and on the X-axis is shown the quantity demanded of good X. On allocating his given money income on various goods according to the principle of equi-marginal utility, suppose the marginal utility of the last rupee spent on each good equals λ . Now, with λ as the marginal utility of the last rupee spent on each good, the consumer will be in equilibrium when he is buying OQ_1 of good X at the price of good X equal to P_{x1} , since at the quantity OQ_1 of X, the marginal utility of money λ is equal to $\frac{MU_x}{P_{x1}}$. Now, when price of good X falls to P_{x2} , the curve will shift upward to the new position $\frac{MU_x}{P_{x2}}$. In order to equate marginal utility of money (λ) with the new $\frac{MU_x}{P_{x2}}$, the consumer increases the quantity demanded to OQ_2 . Thus, with the fall in

price of good X the consumer buys more of it. It should be noted that no account is taken here of the increase in real income of the consumer as a result of the fall in the price of good X. This is because if the change in real income is taken into account then the marginal utility of money (λ) will also change and this would have an effect on the purchases of goods. *Marginal utility of money can remain constant in two cases. First*, when the elasticity of marginal utility curve (price elasticity of demand) is unity so that even with increase in the purchase of a commodity following the fall in price, the money expenditure made on it remains the same. *Second*, marginal utility of money will remain approximately constant for small changes in price of unimportant goods, that is, goods which account for negligible parts of a consumer's budget. In case of these unimportant goods, increase in real income following the fall in price is negligible and therefore can be ignored.

At the bottom of Figure 5.5, the demand curve for X is derived. In this lower portion, price is measured on Y-axis. As in the upper portion, X-axis in the lower portion represents quantity. When the price of good X is P_{x1} , the relevant curve of $\frac{\text{Marginal Utility}}{\text{Price}}$ is $\frac{MU_x}{P_{x1}}$

which is shown in the upper portion. With $\frac{MU_x}{P_{x1}}$ as explained earlier, he buys OQ_1 of good X.

Now, in the lower portion this quantity OQ_1 is directly shown to be demanded at the price P_{x1} . When the price of X falls to P_{x2} , the curve of $\frac{\text{Marginal Utility}}{\text{Price}}$ shifts upward to the new

position $\frac{MU_x}{P_{x2}}$. With $\frac{MU_x}{P_{x2}}$, the consumer buy OQ_2 of X. This quantity OQ_2 is directly shown

to be demanded at price P_{x2} in the lower portion.

Similarly, by varying the price further we can know the quantity demanded at other prices. By, joining points A, B and C, we obtain the demand curve DD. The demand curve DD slopes downward to the right which shows that as the price of the good falls, its quantity purchased increases.

Deriving Demand Curve from Cardinal Utility Analysis : An Alternative Method

We can illustrate the derivation of the law of demand and the demand curve in a slightly different way also. As stated above, according to the proportionality rule a consumer is in equilibrium when

$$\frac{MU_x}{P_x} = \lambda$$

This can also be written as $MU_x = P_x \lambda$

Thus, the consumer is in equilibrium when the marginal utility of each good he buys is equal to the price of the good multiplied by the marginal utility of the last unit of money spent on various goods, that is, λ ($MU_x = P_x \cdot \lambda$). If the price of X falls from P_{x1} to P_{x2} , then the previous MU_x/P_{x1} would now be found to be greater than the new price P_{x2} multiplied by the marginal

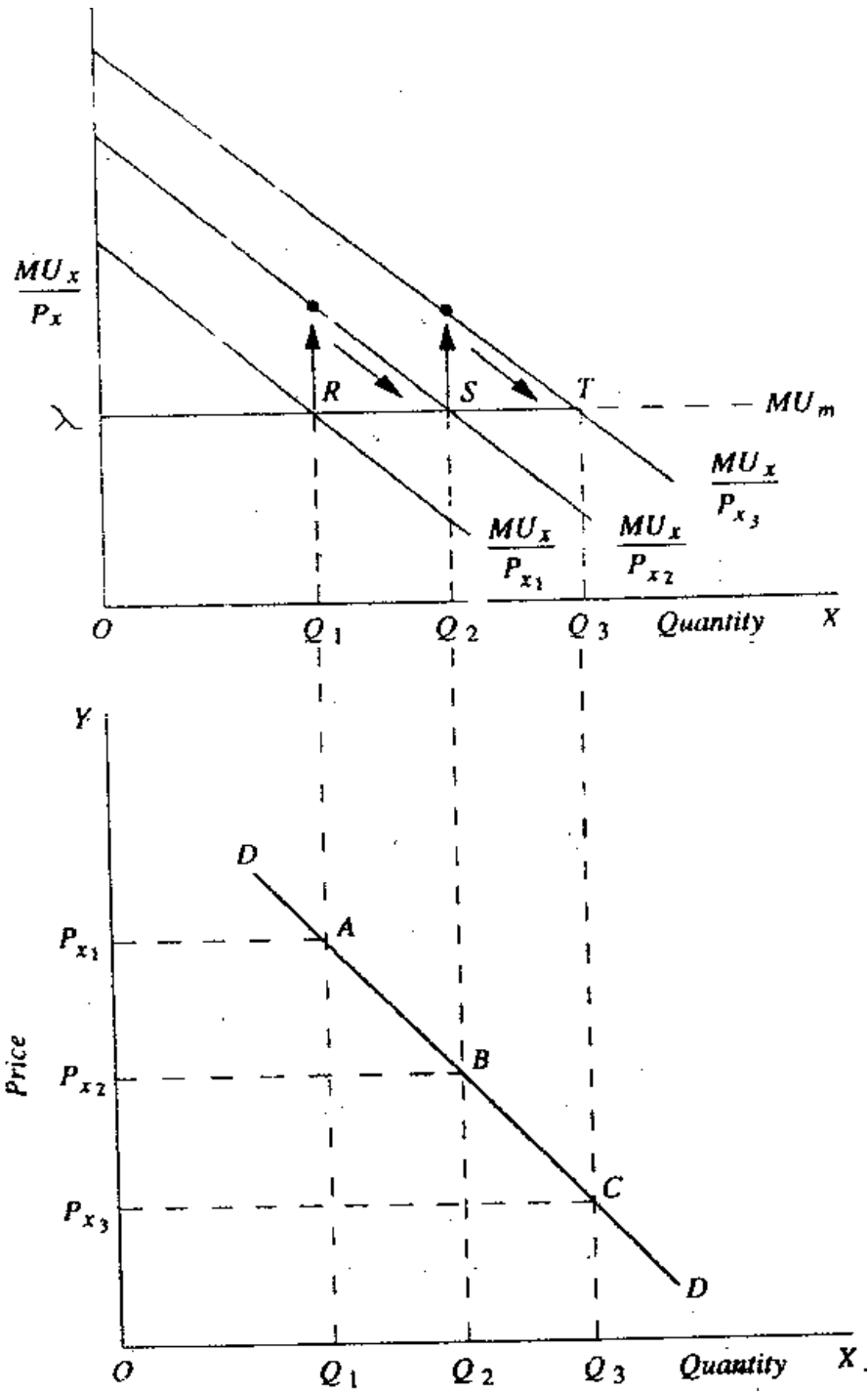


Fig. 6.6a Derivation of Demand Curve in Marshallian Cardinal Utility Analysis

utility of x_2 and all equate with Marginal Utility of money spent in general (λ) and thus the above equality. Therefore the consumer's equilibrium would be disturbed. Since the marginal utility curve of a good slopes downward, to restore the equilibrium the more of the good X must be purchased so that its marginal utility falls and becomes equal to the product of the new price (P_{x2}) and the marginal utility of the last rupee spent in general (λ). It follows therefore that the consumer will buy more when the price of a good falls, and vice-versa.

If we measure $P_x \lambda$ on the Y-axis and quantity of the good X on the X-axis, we can graphically illustrate the derivation of the law of demand and the demand curve. This is done in Figure 6.6(a)

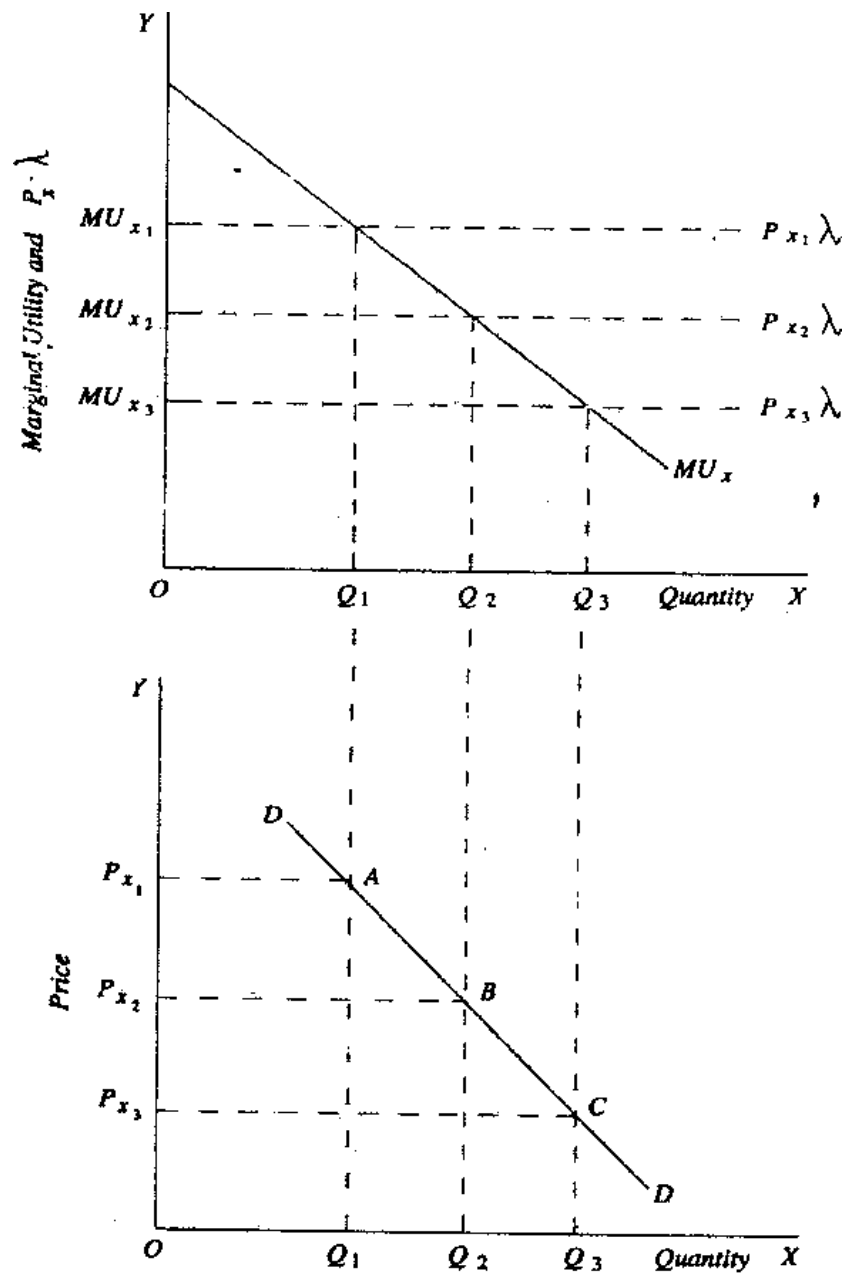


Fig. 6.6 (a) Derivation of Demand Curve in Cardinal Utility Analysis : Alternative Way

In the upper portion of this figure marginal utility curve of X is drawn. When the price of good X is P_{x1} , then the product of the price and the marginal utility of money will be $P_x \lambda$. It will be seen from the upper portion of the figure, that at $P_{x1} \lambda$ the consumer buys OQ_1 quantity of the good since at OQ_1 the $P_{x1} \lambda$ is equal to the marginal utility of the good X_1 . When the price falls to P_{x2} then the product of new price and marginal utility of money will be equal to $P_{x2} \lambda$ which will be less than $P_{x1} \lambda$. It will be noticed that at P_{x2} the consumer

buys OQ_2 of X since at OQ_2 the $P_{x_2} \lambda$ equals the marginal utility of good X. Thus, the quantity purchased rises with the fall in price of X from P_{x_1} to P_{x_2} .

In the lower portion of the Figure 6.6(a) only price of good X is measured on the Y-axis, quantity of X is measured on the X-axis as above. It will be seen from the upper portion that quantity OQ_1 is purchased when the price is P_{x_1} , in the lower portion quantity OQ_1 is directly shown to be demanded at price P_{x_1} . Likewise, it is known from the upper portion, that OQ_2 is demanded when the price of X is P_{x_2} , therefore quantity OQ_2 is plotted directly against the price P_{x_2} in the lower portion. By further varying the price we can know the quantities of good X purchased at other prices (from the upper portion) and then we can plot these quantities directly against the corresponding prices in the lower portion. By joining points such as A and B, we obtain the required demand, curve.

The law of Demand as derived above is, in fact, for one individual only, because the Law of Equi-marginal Utility was considered with reference to one particular consumer only. The demand curve that will emerge, according to the above procedure, will therefore be an *individual demand curve*. If we know the demand curve for various consumers in the market, we can find out the market demand curve or the demand curve for the industry as a whole through the horizontal summation of the various individual demand curves as in Fig. 6.6(b). However, this is on the assumption that there are only two buyers in the Market.

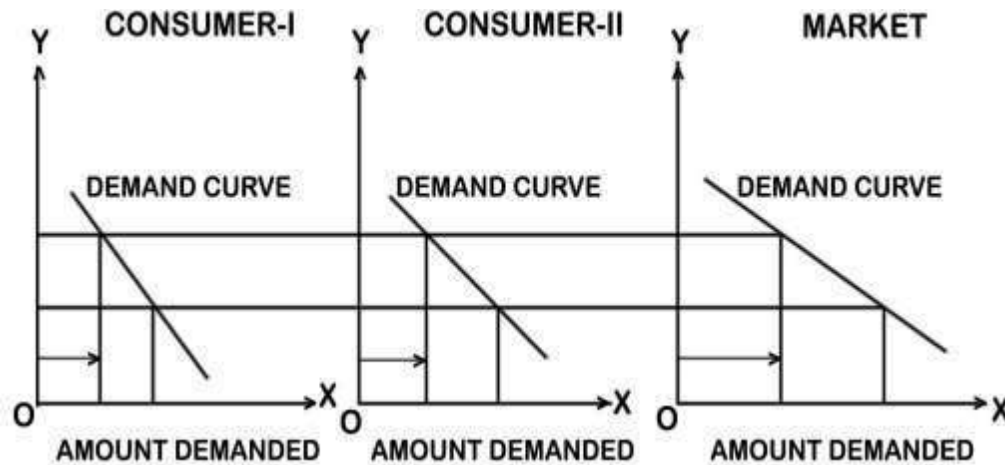


Fig. 6.6(b) MARKET DEMAND CURVE

Self Assessment Question

Q1. Why do we assume Marginal Utility of Money to be constant?

6.5 LIMITATIONS/CRITICAL APPRAISAL OF THE MARSHALLIAN APPROACH

Though the modern economists have no quarrel with Marshall and his followers with regard to the conclusions arrived at, they have strong reservation with regard to the

assumption on the basis of which such a condition has been derived. Specifically, they object to the following assumptions.

(i) Untenable Cardinal Measurement of Utility

Pareto and later on, Hicks criticised Marshall for his assumption that utility can be cardinally measured. Utility is subjective. One could agree with Marshall's proposition that the utility of a succeeding unit is less than the utility of a preceding unit. But the assumption that the marginal utility of a commodity can be given a numerical magnitude is rather questionable *Fisher* and, later on, Pareto were the earliest critics of this assumption.

However, it is wrong to say that the measurability controversy has been finally settled. But those who criticised Marshall for this assumption have developed other methods to derive the Law of Demand.

(ii) Relationship between Price and Marginal Utility

Again, to assume that the consumer is able to establish a systematic relationship between the price that he is willing to pay for a particular unit of a commodity and its marginal utility (as was done by Marshall in deriving the Law of Demand from the Law of Diminishing Marginal utility) is also not correct. It is pointed out by critics like Jacob Viner that "men commonly seek, not utilities, not pleasure, but objects and those they do not commonly engage in deliberations and careful comparison and calculations of the units of pleasure which successive units of the same good yield to them." They ridicule the notion that "men's desires are held in leash and spring into action only after completion of the fine actual comparisons of the hedonistic potentialities of different commodities."

(iii) Separate Measurement of Utility of each product is not always correct

Another assumption that came up for criticism was that the utilities of difference commodities were independent i.e. the utility of each commodity was dependent upon its own quantity only. This is not always the case. Commodities are sometime substitutes of commodity and are sometimes complementary to the commodity in question. The position of the utility curve of one commodity depends upon the quantity of the consumption of another commodity or commodities.

(iv) Wrong concepts of Additive Utility

Existence of such interrelated commodities in fact, demolishes another assumption of the utility analysis i.e. the utilities of various commodities are additive or that the total utility function can be written as:

$$U = U_1(X_1) + U_2(X_2) + U_3(X_3) + \dots + U_n(X_n)$$

Where X_1, X_2, \dots, X_n are various commodities. If these commodities are interrelated individual utility functions become indeterminate and maximisation of total utility according to the formula given by Marshall will become difficult.

(v) Constancy of Marginal Utility of Money

Marshallian approach was criticised on another ground also. Marshall had assumed that marginal utility of money always remains constant otherwise money could not act as the measure of utility which is necessary to make the assumption referred above in (ii) Marshall critics say that the assumption of constant marginal utility of money was made by Marshall in order to make the conversion of a marginal utility curve into the demand curve more easy. If marginal utility of money was allowed to change the consumer would also have to

take this change in marginal utility of money into consideration while deciding how much to pay for every additional unit of the commodity. The conversation process would then become more complicated.

Again, Marshall's assumption, of constant marginal utility of money could be accepted, if the consumer is assumed to spend his money only on one commodity at a time and that commodity is unimportant in the sense that only an insignificant portion of the consumer's money income is spent on it. In such a case as the expenditure on the commodity consumed is an insignificant part of the total income. Therefore *law of Diminishing Marginal Utility operates in the case of money rather very slowly and*, so one could accept the assumption of constant marginal utility of money. But in real world consumer does not buy only one commodity at a time. He buys combination of commodities the total expenditure on which is not an insignificant portion of his total money income and consequently the Law of Diminishing Marginal Utility will apply to money also. In this case the assumption of constant marginal utility of money could not hold good.

Self Assessment Questions

Q1. Mention important points of criticism against Cardinal (Marshallian) Approach of Demand.

6.6 CONSUMER'S EQUILIBRIUM WITH UTILITY ANALYSIS

Consumer equilibrium refers to a situation where a consumer gets maximum satisfaction within the given resources and has no tendency to change it

6.6.1 Definitions

"A consumer is in equilibrium when he regards his actual behavior as the best possible under the circumstances and feels no urge to change his behavior as long as circumstances remain unchanged." Tiber Scitovsky

"Consumer's equilibrium is that state of consumer's demands which he thinks to be the best and which he does not want to alter." Dr. Marshall

It is observed that a consumer is in equilibrium when he is getting maximum satisfaction with in his given income and given time and has no urge to alter that position.

6.6.2 Assumptions

Cardinal measurement. It is based on this assumption that the utility is measureable. The name of the measurement unit is utils. It is the name which is given by some economists. As we measure length in meters or centimetre and weight in kilograms etc similarly utility is measured in utils.

Rational Consumer: It is supposed that consumer must be rational one. A rational consumer is a person who wants to get maximum utility from his given resources.

Constant income: Money income should remain constant in a budget period. There should be no change in income when a consumer is spending his income on different commodities.

Marginal utility of money remains constant: It is assumed that the marginal utility of money should remain constant with the increase in the size of income. Suppose MU of Rs. 10 is equal to 8 utils then total utility of Rs. 20 will be 16 utils and Rs. 30 will have total utility equal to 24 utils. It means MU of Rs. 10 remains 8 utils.

Commodities are divisible: Commodities must be divisible i.e. a consumer may spend his income in small proportions on different commodities. For example he may spend his income in rupees etc. in other words he will not spend a major chunk of his income on one commodity.

Perfect Knowledge of utility: A consumer must have perfect knowledge of utility derived from different commodities. He may be able to calculate how much utility he gets from one and how much from other commodity.

Independent utility: The utility of different commodities is independent. Utility derived from commodity 'A' has no effect on the utility derived from commodity 'B'. It means a consumer may consume different types of commodities as their utilities are independent.

No Change in taste, fashion, liking, and habits of the consumer: No change in the fashion habits, liking and taste of the consumer should be there while he is spending his income on different goods and services.

6.6.3 Determination of Consumer's Equilibrium

Consumer's equilibrium can be explained with utility analysis in three situations:

- A single commodity with single use.
- A single commodity with two uses.
- Several commodities with several uses.

(A) A single commodity with single use

When a consumer is purchasing a commodity having one use only, he will be in equilibrium at a point where marginal utility is equal to its price of the commodity, i.e.

$$\text{Marginal Utility} = \text{Price}$$

In this situation the consumer will get maximum satisfaction and he has no tendency to bring about any change in his pattern of consumption. Supposing, if marginal utility is not equal to price, then there can be two possibilities:

$MU > P$ (either marginal utility is greater than the price)

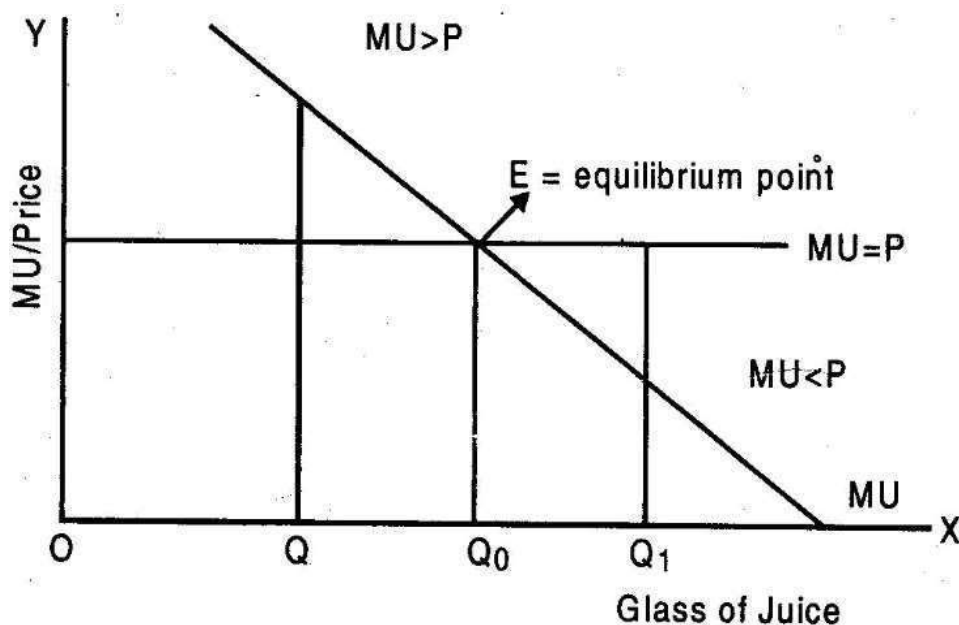
$MU < P$ (or marginal utility is less than the price)

If $MU > P$, consumer will buy more, and marginal utility will come down to the level of price. On the other hand, if $MU < P$ naturally less will be purchased and marginal utility goes up. In short, equality between marginal utility and price indicates the position of consumer's equilibrium, when only one commodity is being purchased and used. When consumer is purchasing only one commodity he will keep on spending till the MU of the commodity becomes equal to the price paid for that commodity. This is explained with the help of table 6.2.

Table 6.2: Consumer's equilibrium in case of single commodity use

Units (Glass of Juice)	Marginal Utility (in terms of utils)	Price
1	100	60
2	80	60
3	60	60
4	40	60
5	20	60
6	0	60

Table 6.2 depicts that a consumer is getting 100 utils utility from the 1st glass of juice and from the 2nd glass 80 utils and 60, 40, 20, and 0 utils from the 3rd, 4th, 5th, and 6th glass of juice. The MU decreases from 100 utils from 2nd glass to 80, 60, 40, 20 and 0 utils 3rd, 4th, 5th, and 6th glass of juice. This shows that as he is consuming successive doses of glass of juice MU is decreasing continuously. It is zero from 6th glass of juice.

**Figure 6.7 Consumer's Equilibrium with Single Commodity**

It is observed that marginal utility in terms of price is 60 utils and consumer gets 60 utils from 3rd glass of juice and gets less utility from 4th and onward and more before 3rd glass. So he will be in equilibrium when price is equal to MU of the commodity.

Figure 6.7 shows that a consumer is in equilibrium at point E. Where both MU and price are equal.

(B) Single Commodity with two uses or Two Commodities with different uses

Generally a consumer does not spend his income on one commodity. He has to purchase other goods two. If he spends his income on two commodities, he will spend in such a way that utility derived from the last unit of each commodity should be equal to the price paid for that commodity. The consumer will be in equilibrium when he spends his income suppose on two good A and B.

When $MU(A) = \text{Price A}$ and $MU(B) = \text{Price of B}$

$$\text{or} \quad \frac{MU(A)}{P(A)} = \frac{MU(B)}{P(B)} = MU_m$$

This is explained with the help of table 6.3

Table 6.3 : Single Commodity with two uses

Units of Kerosene oil (Ltr)	MU of oil in stove	MU oil in Lantern
1	14	12
2	12	10
3	10	8
4	8	6
5	6	4

It is assumed that 1 litre kerosene oil has 10 utils utility. A consumer will use 3 lts oil in stove because from last unit of oil he gets 10 units. Utility which is equal to 1 litre of oil and use 2-litres in Lantern and he gets 10 utils from the last litre oil used in Lantern. This total utility will be maximum in this way ($MU \text{ stove} = 14 + 12 + 10 = 36$) plus MU of Lantern ($12 + 8 = 20$) and total utility is equal to 56 utils. If he has 6th litre of oil he will not make use of it either in stove or lantern because utility from both is less than utility of oil in terms of price. If consumer changes his pattern of expenditure, then his TU will not be maximum. In this situation he is in equilibrium and will get maximum satisfaction and is not ready to alter this situation. This can be explained with the help of figure 6.8.

In Figure 6.8 units of litres of oil are taken on 'OX' axis and MU of stove and Lantern is taken on 'OY' axis in both panel A and B. A consumer uses 3 litres oil in stove and from last unit (3rd litre) he gets MU equal to 10 utils and from 2nd litre in panel B from lantern he gets 10 utils utility. This shows that last litre of oil gives same MU in both uses and utility of one litre oil is equal to 10 utils. If he gets more utility it is gain but consumer will not use one litre more oil because MU from this use will be less than MU of oil. If he uses 4 litres oil in stove then he gains extra utility and he has to sacrifice one litre from lantern. It is obvious that gains in MU from stove is less than loss in MU from the use of lantern. A rational consumer will not change his pattern where he is getting maximum utility i.e. ($14 + 12 + 10$) equal 36 utils from stove and ($10 + 12 = 22$) utils from lantern.

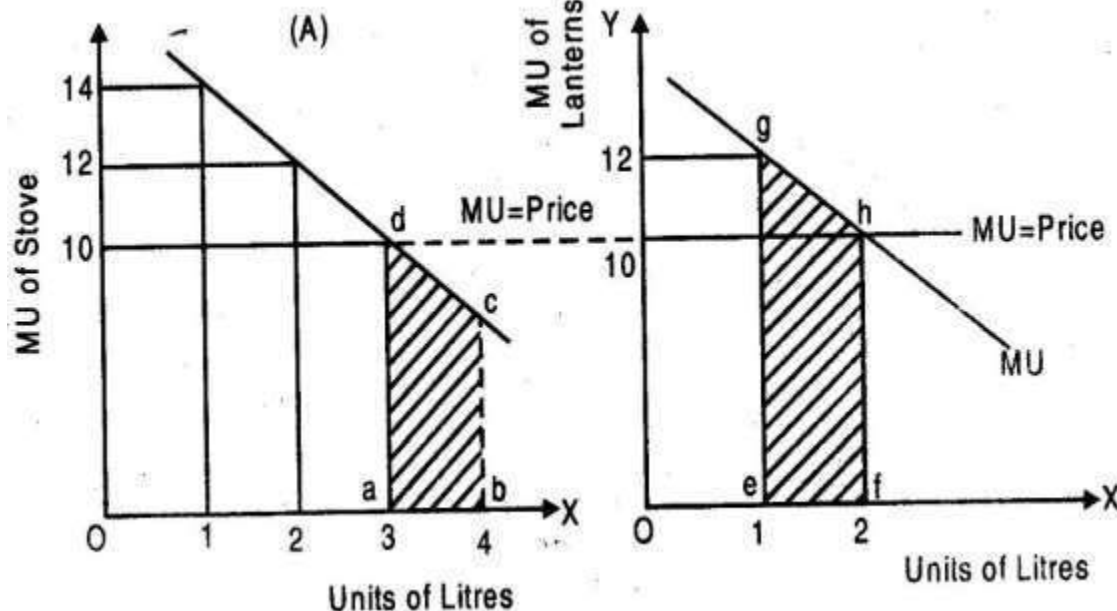


Figure 6.8

(C) Consumer equilibrium in case of several commodities

In case of several commodities, a consumer will be in equilibrium when he will spend his income on different commodities in such a way that utility derived from the last unit of each commodity should be equal to the price of that commodity. In this case he will get maximum satisfaction i.e.

$$\frac{MU_a}{P_a} = \frac{MU_b}{P_b} = \frac{MU_c}{P_c}$$

Or $MU_a = P_a$, $MU_b = P_b$ and $MU_c = P_c$ or

$$\frac{MU_a}{P_a} = \frac{MU_b}{P_b} = \frac{MU_c}{P_c} = MU_m$$

where

MU_a = marginal utility of good a,

MU_b = Marginal utility of good b,

MU_c = Marginal utility of 'C' commodity

MU_m = Marginal utility of money.

and P_a , P_b and P_c price of a, b and c commodities respectively. Marginal utility of all commodities should be equal to money spent on them.

Self Assessment Questions

Q1. Mention the conditions of consumer's equilibrium using Utility analysis.

6.6.4 Limitations of Law

- **Indivisibility of goods:** It does not apply on those goods which are divisible in parts. Some goods such as refrigerator, washing machine, car, T.V. scooter and air conditioner are not divisible. In case of durable or indivisible goods, the process of equalization of marginal utilities would be rendered almost impossible.
- **Marginal utility of money does not remain constant:** It is based on the assumption that marginal utility of money should remain constant. But in real life the marginal utility of money does not remain constant, rather it undergoes a change. When a consumer spends more money from a stock of deposits, marginal utility of remaining stock of deposit increases.
- **Utility cannot be measured:** It is based on the cardinal measurement of utility which is not possible because utility is subjective. There is no instrument which can measure utility. Unless it is measured, the operation of the law will remain dubious.
- **Complementary goods:** It is not applicable in case of those goods and services which are complementary in nature, e.g. car and petrol, pen and ink, fish and water, printer and cartridges, computer hardware and computer software . . These goods can not be substituted with each other.
- **Change in income and prices:** prices and income of the consumer do not remain constant . There is a change in income and prices with the change in time. With this change, the utility derived from prices and income also undergoes change. So it becomes difficult to compare marginal utility to get maximum satisfaction.
- **Change in taste and fashion:** change in the fashion and taste may disturb the consumption schedule of the consumer. In this situation it becomes too difficult to calculate the maximum satisfaction derived from different commodities. Consumer may get more utility from that commodity which he likes the most and less for which he has no taste or preference.
- **Non- availability of some goods:** when some goods which a consumer wants to purchase are not available in the market then he has to compromise to buy other less useful commodities in their place. For example in the absence of cooking gas one has to make use or substitute it with kerosene oil or coal etc. substituted commodities may yield less satisfaction. Due to the scarcity of goods consumer cannot maximize utility from his expenditure.

- **Consumer is not fully rational:** The law of consumer's equilibrium is based on the assumption that a consumer is fully rational. Some consumers are careless and idle by nature. They may purchase commodities under the influence of taste, fashion or customs or they may purchase as a blind followers. In this situation they do not act rationally to maximize satisfaction and the operation of law is thus impeded due to this reason.
- **Consumer is not a calculation machine:** The law of consumer's equilibrium is based on this assumption that consumer calculates utility derived from each and every commodity. But in real life no consumer makes the calculations to equalize marginal utilities while purchasing various goods and services. There is need of concentrated thinking to calculate marginal utility but all consumers have neither the energy nor the time for this job.
- **Indefinite budget period:** The law of consumer's equilibrium assumes that the budget period of the consumer should be definite. As per this assumption a consumer has a definite quantity of resources which he spends in a definite budget period. This budget period may a month, year or any other specific time period. But this budget period is not constant in real life. A consumer may purchase AC, washing machine or T.V. in one budget period and keep on getting marginal utility in successive budget periods. Marginal utility from these commodities can not be compared with marginal utility of those commodities which are purchased and consumed in the same budget period.
- **Ignorance of the consumer:** Sometimes a consumer may substitute commodity with high utility with the one having less utility due to ignorance. Ignorant or careless people seldom obtain maximum satisfaction because they do not give importance to marginal utilities and their expenditure.

6.7 CRITICAL EVALUATION OF CARDINAL OR MARGINAL UTILITY ANALYSIS²

Utility analysis of demand which we have studied in this lesson has been criticized on various grounds. The following shortcomings and drawbacks of marginal utility analysis have been pointed out:

(1) **Premises of utility analysis challenged :** The "utility theorists in their attempt to explain market demand which is an objective phenomenon got involved in difficult psychological and philosophical questions: to explain character of demand they went to the origin of demand and argued how demand was a phenomenon of motivation."³

Utility theorists before Marshall, Wicksteed and Walras. visualised a causal connection between price and utility and then between utility and desire. Taken with their assumption of maximisation of utility by the consumer, its emphasis on 'desire' and 'motivation' as originator of demand rendered their theory open to the criticism of being based upon individualistic, 'hedonistic', (or utilitarian) and rationalistic premises which was said to be unsound psychology. Hedonistic interpretation of utility as pleasure, gratification, desiredness, and to attribute motive to the consumer, has been criticized as unrealistic. Further, the diminishing marginal utility with the successive increases in the units of

² Ahuja, H.L. (2014) Advanced Economic Theory, S. Chand Publications.

³ H. K. Manmohan Singh Demand Theory and Economic Calculation in a Mixed Economy, George Allen and Unwin Ltd., London 1963.

commodity, which is crucial to the cardinal utility analysis of demand, has been held by critics as too naive a description of human nature².

However, the above objections against utility analysis are misplaced. Hedonistic or utilitarian interpretation of utility has long been discarded. Marginal utility analysis in the form presented by Marshall and Walras was free from any hedonistic assumptions². Therefore, the criticism regarding hedonistic assumption of utility analysis was no longer mentioned after the publication of Marshall's Principles of Economics. As far as assumption of diminishing marginal utility is concerned, it is, in view of most of the modern economists, a 'familiar and fundamental tendency of human nature'. Though principle of diminishing marginal utility is based upon introspection, yet it has been strengthened by the observed consumer's behaviour regarding demand for goods in the markets.

(2) **Unrealistic Cardinal measurability of utility** : Cardinal analysis is based on the assumption that utility can be measured in absolute, objective and quantitative terms. It assumes that utility is cardinally measurable. i.e. can be expressed or stated in cardinal numbers 1,2, 3,4 and so forth. Since utility is a psychic feeling and a subjective thing², it cannot therefore be measured in quantitative terms. In real life, consumers are only able to compare the satisfactions derived from various goods or various combinations of goods. Or, in the real life consumers can state only whether a good or a combination of goods gives him more, or less, or equal satisfaction as compared to another. The economists like J.R. Hicks are of the opinion that the assumption of cardinal measurability of utility is unrealistic and should be dropped.

(3) **Impractical and Unrealistic Hypothesis of independent utilities** : Cardinal utility analysis assumes that utilities derived from various goods are independent. In simple words, utility which a consumer obtains from a good does not depend upon the quantity consumed of other goods; it depends upon the quantity purchased of that good alone. Hence, total utility which a person gets from the whole collection of goods purchased by him is simply the total sum of the separate utilities of the good. In other words, utility functions are additive. Neo classical economists such as Jevons, Menger, Walras and Marshall considered that utility functions are additive. But in the real life it is not so. In case of substitute or complementary goods. For example, the utility derived from a pen depends upon availability of good. On the contrary, if you have only tea, then the utility derived from it would be greater, but if along with tea you also have the coffee then the utility of tea to you would be comparatively less. Whereas pen and ink are complements with each other, tea and coffee are substitutes for each other. Therefore, the utility obtained from a good is not the function of its quantity alone but also depends upon the existence or consumption of other related goods (complements or substitutes). Therefore, assumption of the independence of utilities by Marshall and other supporters of Marginal Utility analysis is a great shortcoming of their analysis.

6.8 SUMMARY

The demand by households as a consumer is the crucial force of the market mechanism. Theories that explain the buying behavior of the consumers have been explained in this lesson. The Theory assumes the consumer to be a rational individual capable of expressing his/her preferences. This expression of preferences can be either cardinal or the ordinal form. Utility of a product or service is cardinally measurable i.e. it can be expressed in numerical terms. Hence, it is possible to measure and compare the utilities of two products. The law of diminishing marginal utility states that at a given time if we go on consuming additional units of a commodity, the marginal utility from each successive units of that

commodity goes on diminishing in relation to its Proceeding units, other things remaining constant. The law is based on certain assumptions However, the law does not hold good in some exceptional cases. The law possesses theoretical and practical significance as it forms the basis of several laws of consumption. Progressive taxation policy Socialism and leads to variety consumption.

The law of equi-marginal utility is an extension of the law of diminishing marginal utility. The law suggests that a rational consumer can attain maximum total utility from his limited resources by allocating his income on different budget heads in such a way as to equalize the marginal utility of all goods consumed i.e. $MU_a = MU_b = MU_c$. However if prices of various products are different then consumer will maximize his satisfaction by equalizing to ratios of marginal utility to the prices of different products. This is also known as 'Proportionality Rule'.

6.9 GLOSSARY

- **Cardinal Analysis** : This analysis is based on the assumption that utility can be measured in cardinal numbers 1, 2, 3 ----.
- **Utility** : The want satisfying power of a commodity
- **Marginal Utility (MU)** : The utility derived from consuming last unit of commodity.
- **Law of Diminishing Utility** : As more and more units of a commodity are consumed ultimately the MU starts declining i.e. satisfaction from each additional units declines.

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6.11 FURTHER READINGS

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6.12 REVIEW QUESTIONS

- Q. 1 Explain the Marshallian approach with the law of diminishing marginal utility.
- Q. 2 Explain the Marshallian Approach with the law of equi-marginal utility.
- Q. 3 Explain the derivation of demand curve with law of diminishing marginal utility and Law of equi-marginal utility.
- Q. 4 Define Consumer's Equilibrium. Explain it with the help of Utility Analysis.
- Q. 5 Draw a critical appraisal of Cardinal utility analysis.

ORDINAL UTILITY APPROACH

Structure

- 7.0 Objectives
- 7.1 Introduction
- 7.2 IC Analysis : New Approach
- 7.3 Indifference Curve : Related Concepts and Properties
 - 7.3.1 Indifference Schedule
 - 7.3.2 Indifference Map
 - 7.3.3 Marginal Rate of Substitution
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 - 7.5.3 May be Circular
 - 7.5.4 Revisiting Consumer's Equilibrium
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 - C Slutsky's Method Approach
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- 7.9 Hicksian Approach and Slutsky's Approach
- 7.10 Bandwagon, Snob and Veblen Effects
- 7.11 Summary
- 7.12 Glossary
- 7.13 Reference
- 7.14 Further Reading
- 7.15 Model Questions

7.0 OBJECTIVES

After going through this lesson, you shall be able to :

- explain the concept and properties of Indifference curves, a new tool for analyzing consumers behaviour.
- discuss the meaning and derivation of consumer's budget line.
- explain determination of consumers equilibrium i.e. how a consumer finds the optimum combination of any two goods that maximize his total utility, given his income and the prices of the two commodities.
- describe effect on consumers equilibrium due to changes in consumers income (in case of both normal and inferior goods), all other factors remaining constant.
- elaborate on changes in consumers equilibrium when prices change (in case of normal, inferior and giffen goods).
- discuss measurement of income effect and substitution effect due to change in the prices of normal and inferior goods measured by Indifference Curves technique.
- elaborate on Giffen's paradox and its analytical importance.

7.1 INTRODUCTION

In the previous lesson, we have studied about Cardinal Approach and criticism levelled against it. The next logical formulation is Ordinal Utility Approach based on the concept of indifference curve. This lesson deals with Ordinal Utility Approach.

7.2 IC ANALYSIS : NEW APPROACH

Various objections raised against the Marshallian approach led to the adoption of another approach to the demand analysis. This is known as the *indifference Curve approach*. It is also based on a set of assumptions which differ from the Cardinal Analysis.

This approach is based upon the assumption that utility can be measured only ordinally, i.e. no numerical values can be allotted to the utility of the commodity, the *consumer can only say whether the utility of a particular unit of commodity is more or less*, than or equal to the utility of a unit of another commodity that he consumes. In other words the assumption is that the utility cannot be measured cardinally. It can only be *measured ordinally* (in terms of more or less).

It is also assumed that the utilities of various commodities that a consumer consumes are interdependent. This approach, instead of taking $U = f_1(x_1) + f_1(x_2) + \dots + f_n(x_n)$, is based upon the assumption that $U = f(x_1, x_2, x_n)$.

The assumption of constant marginal utility of money is also avoided in this approach.

- The indifference curve approach, however, has one basic similarity with the Marshallian approach. It is that both explain the derivation of demand curve with the help of various points of consumer's equilibrium.
- This approach has been called the indifference curve approach simply because in finding out the point of consumer's equilibrium we make use of curves called "indifference curves." These curves (alongwith price line) replace the law of Diminishing Marginal Utility and the Law of Equi-marginal Utility : the laws, which form the basis of Marshallian approach. In order to explain how demand curve is derived with help of indifferences curves, we must explain, in the first instance, the basic tools used in this analysis one by one.

7.3 INDIFFERENCE CURVE : RELATED CONCEPT AND PROPERTIES

An indifference curve is the locus of all such combinations, of a given pair of goods which yield the same amount of satisfaction; to the consumer. It is the graphical representation of the indifference schedule of the consumer.

An indifference schedule is a schedule showing various combinations of two commodities (we consider only two commodities to simplify' the analysis) which give a particular consumer the same amount of satisfaction.

7.3.1 Indifference Schedule

The following is an example of an indifference schedule. In the schedule each combination gives the consumer the same amount of satisfaction.

In the below table, each combination of apples and oranges has more of one commodity and less of the other commodity as compared with another combination. Substitution of one for the other has been at such a rate that consumer does not feel better off or worse off after the substitution. He is equally satisfied with each one of these combinations. In other words, he is indifferent to the selection of any combination in the schedule. This is the reason why it is called an indifference schedule, see Table 7.1.

Table 7.1 : Indifference Schedule

Combinations	Apples (X)	Oranges (Y)	MRS _{xy} = $\Delta Y/\Delta X$ See 7.1.3
a	10	70	–
b	11	63	7:1
c	12	57	6:1
d	13	52	5:1
e	14	48	4:1

We represent the above schedule in fig. 7.1 representing, say apples on X-axis and oranges on Y-axis and join the points representing each combination. Hence, we shall get what is called an indifference curve. (The concept of indifference curve is valid only for two commodities. if we take more than two commodities for the purpose of analysis, geometrical expression will become very complicated. We shall then have to depend upon their mathematical tools for the analysis in hand). The diagram below shows the indifference curve corresponding to the above indifference schedule.

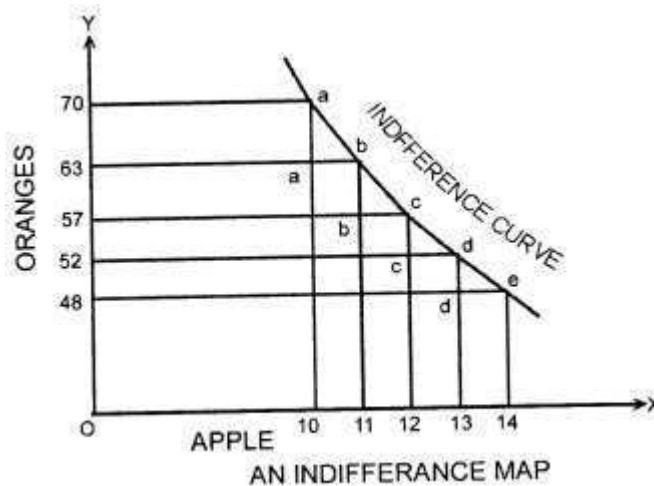


Fig.7.1

Here $aa'=7$, $bb'=6$, $cc'=5$, $dd'=4$ while $a'b = b'c = c'd = d'e = 1$

7.3.2 Indifference Map

One indifference curve, in fact, represents one particular amount of total satisfaction which a consumer can have by consuming two commodities even though we cannot cardinally measure the level of this total satisfaction. However, the consumer can get total satisfaction from the consumption of these two commodities which can be higher or lower in amount each one represented by particular indifference curve. There can be, in fact, infinite levels of satisfaction and corresponding to each level of satisfaction, there will be one particular indifference curve. There can be, in fact, infinite levels of satisfaction and corresponding to each level of satisfaction, there will be one particular indifference curve. There will be thus, infinite number of indifference curves for a consumer consuming two commodities. If we are able to draw all such possible curves, we shall get what is known as indifference map. Obviously a complete indifference map cannot be drawn. However, we can draw a part of such a map as shown in fig. 7.2.

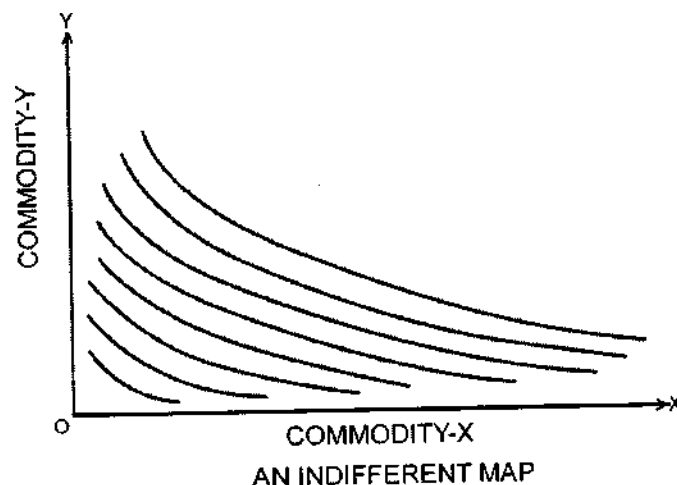


Fig.7.2

7.3.3 Marginal Rate of Substitution

As a 'Marginal Utility curve' in the Marshallian analysis is based on the hypothesis of diminishing marginal utility, an 'indifference curve' in Hicks-Allen analysis is based on the hypothesis of diminishing marginal rate of substitution. You may have a look at the above indifference schedule once more you will find that '*As the number of units of commodity X in the combination increase the number of units of Y falls*'. This is necessary in order to keep the total satisfaction from the consumption of the two commodities at the same level. (Both the commodities are assumed to yield positive satisfaction).

The rate at which one commodity is substituted for the other, while moving to the next immediate combination on the same indifference schedule, is known as the marginal rate of substitution. In the above indifference schedule, the marginal rate of substitution of X for Y (MRS_{xy}) i.e., the amount of Y given up for one additional unit of X is 7 when X is increased from 10 to 11 it is 6.5 and 4 as the amount of X is successively increased by one unit in each of the combination that follows:

$$\text{Thus we can say that } MRS_{xy} = \frac{\Delta Y}{\Delta X} \text{ i.e. } \frac{(\text{Change in } Y)}{(\text{Change in } X)}$$

Similarly if we have to find out the value of MRS_{xy} (marginal rate of substitution of X for Y), we shall find the value using above formula. As shown in Table 7.1 last column, the MRS_{xy} is falling. This is because of the general working of the mind of a consumer. As the consumer gets more of one commodity and less of the other commodity; the former becomes less important for him, while the latter gains in significance. Therefore, the consumer will not be willing to forego as much of the latter commodity for an additional unit of the former as he had given up earlier, so the Marginal Rate of Substitution normally falls. This is shown as aa' = 7, bb' = 6, cc' = 5 and dd' = 4 in Table 7.1 and Fig 7.1 (It may be noted that the marginal rate of substitution is quoted in negative terms to show that an increase in the amount of one commodity is accompanied by a decrease in the amount of the other.)

If we are given an indifference curve with commodity X on X-axis and Y on Y-axis, we can find out the marginal rate of substitution of X for Y (MRS_{xy}) at any point on the curve looking at the slope of the curve (at the point under reference) along X-axis.

Self Assessment Question

1. Define Marginal Rate of Substitution.

2. Define Indifference Curves.

7.4 PROPERTIES OF INDIFFERENCE CURVES

For arriving at various conclusions through the help of indifference curves, it is essential that the indifference curves are correctly drawn. In other words, these must be of such a shape and slope as would depict the mental attitude of a normal consumer. Following properties have been considered necessary for such indifference curves :

(i) **Indifference Curves are Negatively Sloped :**

The reason for this is obvious. We have assumed that the consumer consider only those units of a commodity which have positive utility. If the total satisfaction from the consumption of two commodities is to remain the same when the amount of one commodity in the combination is increased, the amount of the other must be reduced. This is necessary so that the increase in total satisfaction brought about by the increase in the quantity of one commodity in the combination is completely neutralised by the reduction in the amount of the other commodity in the combination. This downward slope of indifference curve is clear from the fig. 7.1.

(ii) **Indifference Curves are Convex to the Origin:**

We have stated above that an indifference curves slope downwards to the right. Now a curve is downward in three ways, i.e. (a) it can be convex to the origin, or (b) it can be concave to the origin, or (c) it can be straight line. The three forms of the indifference curves, will appear as below in Fig. 7.3.

All the three indifference curves are sloping downwards but their shape is different with regard to their curvature.

One would like to know the reason for the convexity of the indifference curves. The reason lies in the diminishing Marginal Rate of Substitution of one commodity for the other in an indifference schedule.

If the Marginal Rate of Substitution were constant throughout (as will be the case when the two commodities in the combination are perfect substitutes of each other), the indifference curve will be a straight line (fig. 7.3(b)).

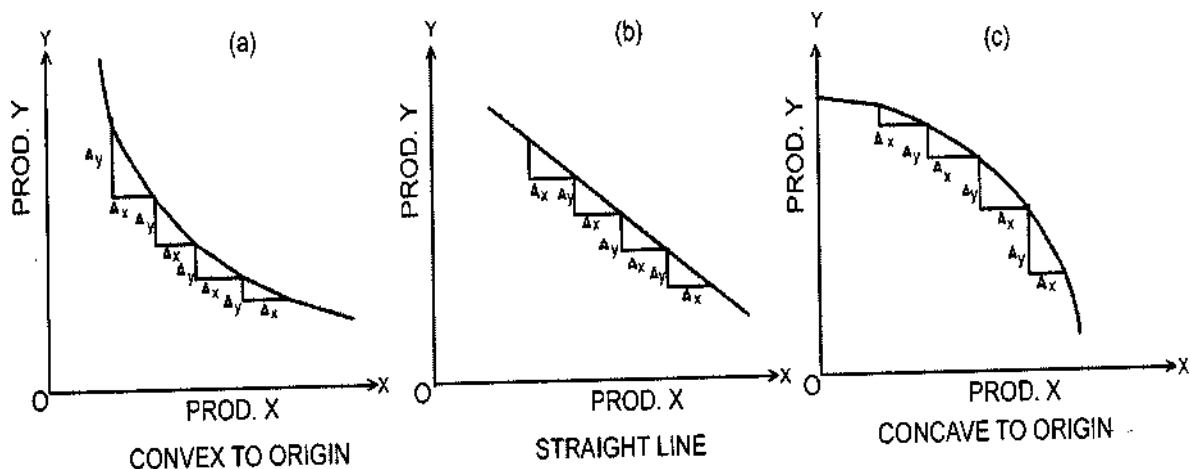


Fig. 7.3

Δx is constant in (a), (b) and (c) but Δy changes in (a) and (c)

If, on the other hand, Marginal Rate of substitution were increasing i.e. the consumer is willing to give up more and more of the commodity, whose amount is constantly decreasing for every additional unit of the other commodity in the combination; the shape of the curve will automatically become concave to the origin Fig. 7.3(c). This will happen, e.g., when the

utility of additional units for each commodity is not only positive but also increases with every additional unit in the combination. Such a situation is rather rare.

If the marginal rate of substitution is decreasing i.e. the consumer is willing to part with less and less of commodity decreasing i.e. the consumer is willing to part with less of commodity whose amount is decreasing for every additional unit of the other commodity in the combination, the shape of the curve will be convex to the origin as depicted through fig. 7.3(a).

(iii) Indifference Curves Neither Touch Nor Intersect Each Other

This can be proved as follows :

Suppose two indifference curves I_1 and I_2 intersect each other at point Q in Fig. 7.4. As Q and R are on the same unit of satisfaction from the combinations of the two commodities represented by R and Q. Thus $R = Q$. (i)

Again, as points S and Q are on the same indifference curve I_2 therefore they represent the same amount of satisfaction. Thus $S = Q$. (ii)

From (i) and (ii) above : $R = S$

S contains more of X than R and as much of Y as R. In terms of satisfaction, therefore, $R < S$. Now this is absurd because R cannot be equal to as well as less than S.

Hence the indifference curves cannot intersect or ever touch each other.

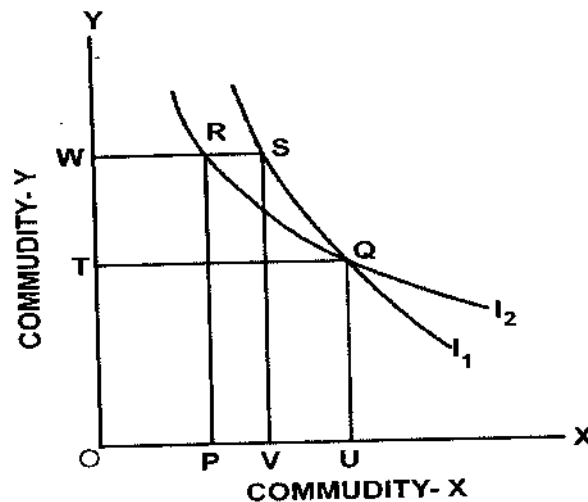


Fig.7.4

(iv) Upper indifference Curves Represent a Higher Level of Satisfaction

Once we have concluded that the two indifference curves in the commodity space, cannot touch or cut each other, it becomes easy to have another conclusion about the relationship between two indifference curves. As the two curves do not intersect each other, this would imply that an indifference curve which is higher than another indifference curve at one point, will, infact, be higher to then curve throughout its length (in the commodity space). As the points and an equal quantity of the other commodity in the combination as compared with the corresponding point, on an indifference curve at a lower level, we can say that higher indifference curve will represent a higher amount of total satisfaction.

7.5 INDIFFERENCE CURVES : SHAPE IN SPECIAL CASES

The special shapes of IC are discussed here :

7.5.1 Indifference Curves for Perfect Complements

We pointed out above that indifference curves are generally convex to the origin. This is the case when the commodities in the combination are imperfect substitutes for each other; there are, however, certain commodities which must be consumed together in fixed proportion e.g., left shoe and the right shoe. Such commodities are strictly complementary. In such a case the indifference curves will no longer be convex to the origin. They will be bent at right angles as shown in fig. 7.5. However, here only the corner points like P, Q, T are the only possible combinations in the "commodity space". The vertical and horizontal portions apart from the corner points are meaningless. The indifference curves in these cases in fact, shrink into mere points like P, Q, T as in fig. 7.5.

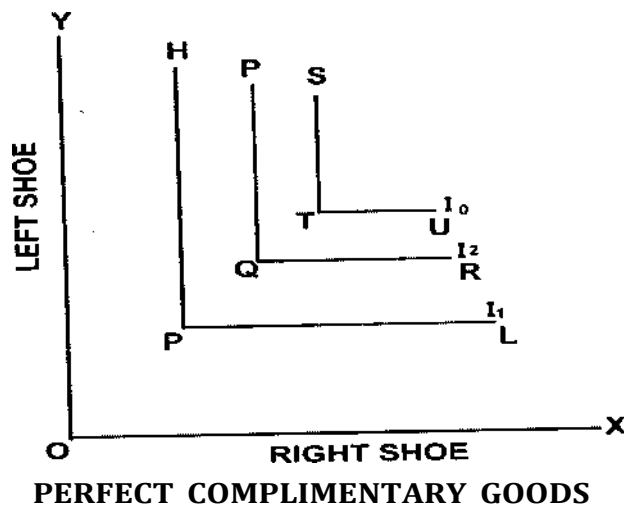


Fig. 7.5

Suppose the consumer has got one pair of shoes, namely, one left shoe + one right shoe. This point is represented by P. Now any increase in the number of right shoes (number of the left shoe still remaining one) has got no extra utility for the consumer. So the total satisfaction will remain unchanged i.e. remain the same. PL will be thus one part of the indifference curve. Similarly PM will be the other part of the indifference curve. MPL thus will be one indifference curve. Same will be the shape of other indifference curves indicating total satisfaction flowing from two, three or more pairs of shoes.

7.3.2 Indifference Curves for Perfect Substitutes

Similarly an indifference curve can be a straight line. This is possible only when goods are perfect substitutes. They are in fact one good. Here the MRS_{xy} remains constant. This is shown in fig. 7.6.

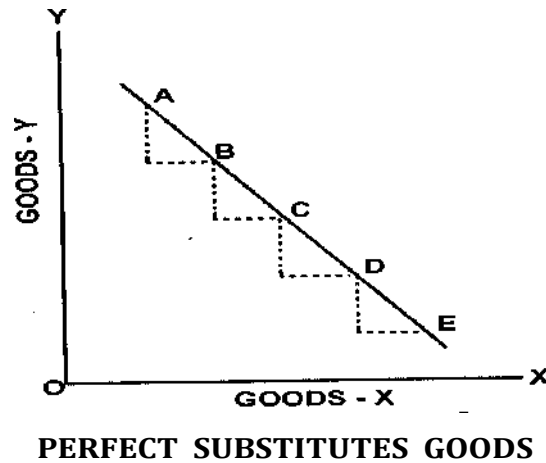


Fig. 7.6

7.5.3 Indifference Curves May be Circular

Indifference curves can be in the circular form too. All goods can be used in limited quantity or in other words all goods have their satiety level. If they are taken beyond that level then they become discommodities. In other words, they start having disutility. When a commodity is taken beyond the satiety level, then disutility obtained from this commodity can be compensated by buying second commodity upto satiety level. In this way loss of A commodity gets compensated by buying more of B-Commodity. In this process indifference curves become circular. This can be shown with the help of diagram. In the diagram 7.7 we see A is the satiety level of commodity A, and B is the satiety level of commodity B. If we just assume in the beginning our consumer is at an equilibrium at point A. At this point he buys OX_2 of A commodity and OY_1 of B commodity, Now supposing he buys OX_3 of A commodity, then he gets disutility from commodity A upto C level. In other, words disutility is equal to X_2X_3 . This disutility can be compensated only if he buys OY_2 of B and OX_3 of A commodity. When he buys more of B commodity i.e. upto OY_3 level, then he gets a loss equal to Y_2Y_3 or in other words equal to BD. This loss is compensated only If he buys more of A commodity i.e., upto X_2 level.

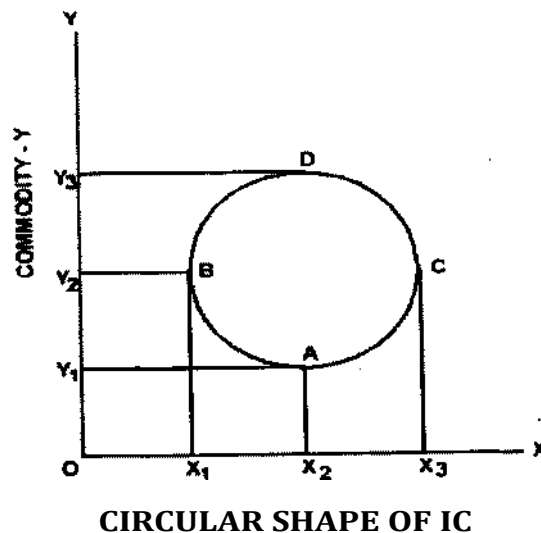


Fig. 7.7

7.5.4 Revisiting Consumer's Equilibrium

Consumer Equilibrium that we have studied in the Utility Analysis has been explained under IC Analysis using the following steps :

- (i) Indifference Map. (we have studied Section 7.3.2, See Fig. 7.2)
- (ii) Budget or Price line, we'll study (See Fig. 6.8)
- (iii) Determination of consumer's Equilibrium (See Fig. 6.9)

The Price Line: The indifference map with its necessary characteristics is one set of tools of analysis for the indifference approach. Price line is the other tool. It is also called the budget line or the opportunity line. This line contains all those points which represent of all the combination of two given commodities which a consumer can buy with his given money income at the prices prevailing in the markets for the two commodities. The derivation of a price line can be explained with the help of an example.

Suppose a consumer has got Rs. 5/- with him. He has to spend this amount for commodity X and Y. The Price of X is 20 P. per unit while price of Y is 10 P. per unit with these prices and with Rs. 5/- at his disposal, the consumer can purchase anyone of following combinations of two commodities :

- 25 X + 0Y
- 24 X + 2Y
- 23 X + 4Y
- 1 X + 48Y
- 0X + 50Y

Table 7.2 Price or Budget Line

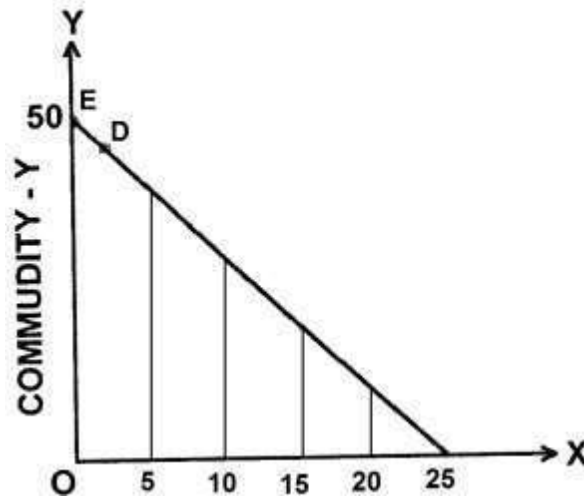
$P_x = 20$, $P_y = 10$, Income = Rs. 5

Table : Price /Budget Line

Combination	X good (units)	Y goods (unit)
A	25	0
B	24	2
C	23	4
D	1	48
E	0	50

If we plot these combinations on a graph in the same way as we have done in case of indifference curves and join the points representing various combinations, we shall get a straight line. This straight line is called the Price Line. The Fig. 7.8 shows the price line representing the above schedule.

As we have stated above, the assumption about rationality of the consumer has been retained in the indifference curve approach also. Here also the consumer is assumed to try to maximize his total satisfaction. So, in this section, we shall try to see how the consumer reaches his equilibrium point, if his indifference map (representing the scale of preferences) and the price line (representing his income and the relative prices of the two commodities) are given.



Commodity - X

Price Line

Fig. 7.8

Self Assessment Questions

Q1. Last Properties of Indifference Map.

Consumer's Equilibrium : Determination

We have seen earlier that a higher indifference curve in an indifference map indicates a higher amount of total satisfaction from X and Y goods. The object of the consumer is to reach the highest possible curve in the indifference map, while remaining on the price line (By assumption, the consumer has to select a combination of the commodities only out of those represented by the various points on the price line. He cannot move away in any direction from the price line. He can only move along the price line) So, for moving where the consumer will reach the equilibrium point, we superimpose, the price line on the consumers indifference map, as is shown in the fig. 7.9.

We shall find that if the indifference curve is convex to the origin, the combination which the consumer can actually select (this being a point of the price line) and which is also the highest possible indifference curve, will be the one where the price line is tangent to an indifference curve in the indifference map.

This is clear from fig. 7.9, is the point of tangency of the price line (EJ) to an indifference curve I_4 and this curve is the highest that the consumer with the given price line can reach. All other combinations represented by the price line are on lower indifference curves namely I_1 , I_2 and I_3 .

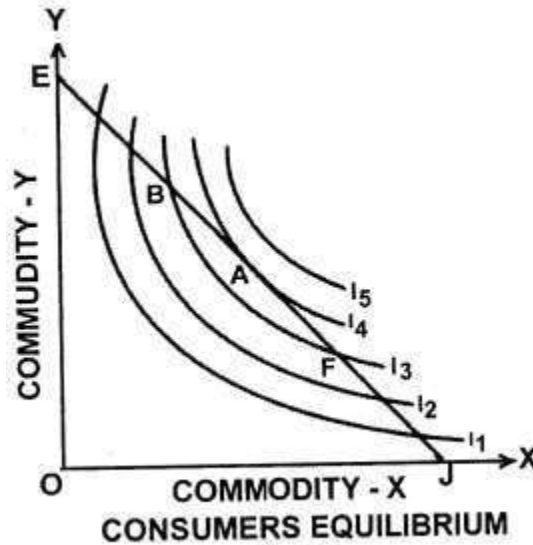


Fig.7.9

Conditions for Consumer's Equilibrium

This condition tangency can also be described as the point where the slope of the price line is the same as the slope of the highest indifference curve which can be reached by the consumer. Slope of the indifference curve as already stated, indicates the marginal rate of substitution. So point of equilibrium will be that where the slope of the price line is equal to the slope of the indifference curve.

Some economists have explained, the fact that at the point of equilibrium the value of the slope of the price line is equal to the marginal rate of substitution.

$$\text{Slop of Price line} = \text{Slope of IC or } \frac{P_x}{P_y} = \text{MRS}_{x,y}$$

The explanation is as follows:

Slope of an indifference curve at any point indicates the rate at which a consumer would like to substitute one commodity for the other. This is subjective rate of substitution and is assumed to be independent of the consumer's income or the prices of the two commodities (In fact, it is assumed that whatever be the income of the consumer, or the prices of the commodities, the indifference map will remain absolutely unchanged).

The Price Line, on the other hand, indicates the objective rate of substitution i.e. rate at which the consumer can actually substitute one commodity i.e. X for the other i.e. Y in the market. This rate will remain unchanged so long as the price of the two commodities are fixed. The objective rate of substitution of X for Y is closely related to the price of the two commodities. We can say that:

$$\frac{\Delta Y}{\Delta X} = \frac{P_x}{P_y}$$

i.e. the number of units of Y, which can be exchanged in the market at the current price of one unit of X, will be the same as is indicated in the ratio between the price of X and price of Y. For example, if price of X is 20 P, and the price of Y is 10 P then objective rate of substitution of X for Y i.e.

$$\frac{\Delta Y}{\Delta X} = \frac{20}{10} = 2:1$$

In other words 2 units of Y will be exchanged for one unit of X in the market.

According to these economists, a consumer will be in equilibrium when he can exchange in the market the two commodities at the same rate of which he is mentally ready to do so, or in other words, when the *objective* rate of substitution is equal to *subjective* rate of substitution.

Now, when we superimpose the price line of the indifference map of the consumer, we find that the various points on the price line lie on different curves. These indifference curves at the point of contact with the price line, will have different marginal rates of substitution. Only at the point of tangency the conditions of equality between the subjective rate of substitution and the objective rate of substitution will be satisfied. Both are represented by the slope of the price line. At the other accessible points, the two rates differ.

It may be noted here that tangency condition is necessary condition for the consumer's equilibrium but not sufficient condition. Another condition which need to be simultaneously satisfied is that the indifference curve must be convex to the origin at the point of tangency. If the price line is tangent to the indifference curve at a point where is the concave to the origin, the point of tangency will not be on the highest possible indifference curve. In fact, if the indifference map contains curves all of which are concave to the origin throughout, the point of tangency will indicate the minimum point of satisfaction and not the highest as is clear from the fig. 7.10.

In figure 7.10 it is clear that the maximum satisfaction will be achieved only when the consumer spends the whole of his income or commodity X this case. (If the prices of X and Y is lower than of X and, therefore, the slope of the price changed the maximum satisfaction could be achieved by spending the income totally on commodity Y). In case, if the curves are concave throughout, maximum satisfaction will be obtained when only one of the two commodities are purchased.

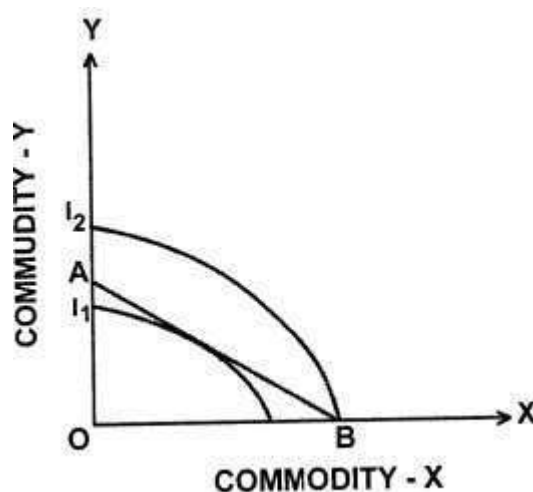


Fig.7.10

The above discussion enables us to state the '**first order**' and the '**second order**' condition of consumer's equilibrium as follows:

The 'first order' necessary conditions is that at the point of equilibrium, the slope of the indifference curve and the slope of the price must be equal: In other words, the marginal rate of substitution between the given pair of goods must equal their relative prices. The addition or 'second order' condition is that at the point of equilibrium, the indifference curve must be convex to the origin, in other words, the marginal rate of substitution between the given pair of goods must be diminishing.

Self Assessment Questions

Q1. Define Marginal Rate of Substitution?

7.6 CONSUMER'S EQUILIBRIUM IN SOME NON-NORMAL CASES OF INDIFFERENCE CURVE

The normal behaviour of indifference Curves that they are convex to the origin. This is mainly because of the diminishing MRS. but sometimes the slope can be concave straight line of in L shape. Now we are going to see under what circumstances we can have such type of shapes in indifference Curve. The concave shape is possible only when MRS of X for Y increases i.e. consumer is willing to part with more and more Y. This shows us that importance for the commodity which he is buying to goes on increasing with him. Normally, under MRS means the commodity which he buys more its importance goes on diminishing. But under increasing MRS reverse is the case. Hence the consumer will go on buying a positive commodity till he stops buying the other commodity. In other words this shows he has developed distaste for a particular commodity.

(1) **In case of Concave, curve, consumer will not be in equilibrium at tangency point.** The tangency point in fig. 7.11 is C but consumer will not be in equilibrium at this point because within this price or budget line he can move to higher points i.e. D, E, and F. His satisfaction goes on increasing from point C to F because he moves to higher indifference curve. But his satisfaction will be maximum when he reaches at extreme point i.e. D. When he moves downward, his extreme point is E.

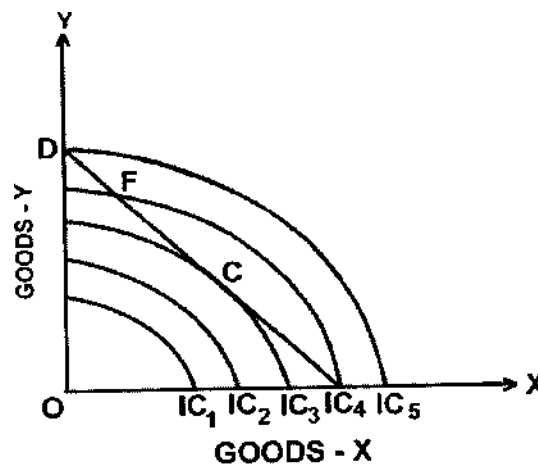


Fig.7.11

In these circumstances he will buy either D or E one of these commodities. In this figure he will choose D point because that takes him to higher indifference curve i.e. IC_4 . But at this point price line is not tangent to indifference curve. At this point he buys only Y commodity and nothing of X commodity.

(2) **The other non-normal cases are where shapes of indifference curves are straight lines or L shaped.**

When goods are *perfect substitute's*, the shape of indifference Curves is straight line. They both infact are known as one good. In this case too price line can't be tangent to the indifference Curves. This can also be explained with the help of Fig. 7.12 (a) and 7.12 (b).

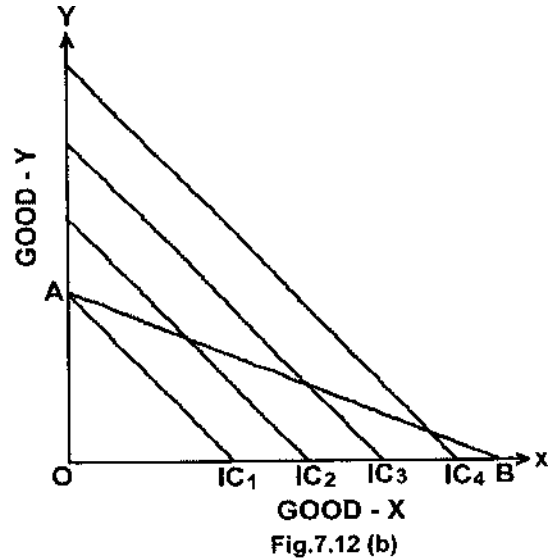
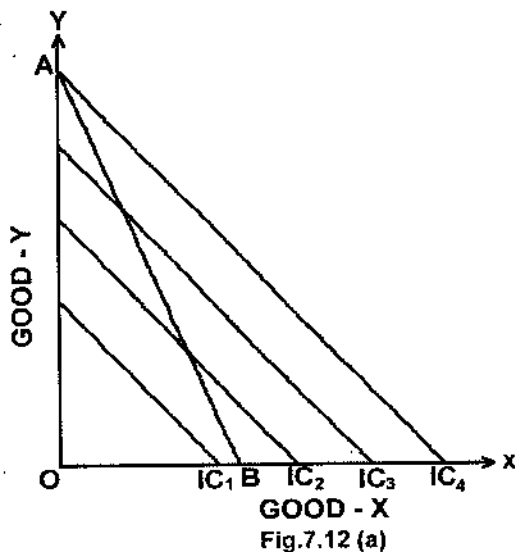


Fig. 7.12 Perfect Substitutes

In these figures slope of the price line can either be less or more than indifference curves. In fig. 7.12 (a) slope of the price line is greater than the Slope of indifference Curves. In fig. 7.12 (b) slope of price line is less than slope of indifference Curves. In both these curves he buys either of the commodities. In fig. 7.12 (a) he buys only Y commodity because he touches the higher indifference Curve at point A. In fig. 7.12 (b) he buys only x commodities because he touches at the highest indifference Curve at point B.

(3) **When goods are *complementary* the indifference Curve is in L shaped.**

They are those goods which must be taken together in a proper combination. The increase or decrease takes place together in a fixed proposition. In such case horizontal as well as vertical, positions are meaningless only the comer points are taken into account. This we can show with the help of fig. 7.13.

Suppose in the beginning consumer has one pair of shoes represented by P. Now any increase in X or Y is meaningless. Similarly indifference curve 2 and 3 represents point Q and T. Any more towards left or right is meaningless. In such cases the consumer will be in equilibrium at comer points i.e. between two extremes (perfect substitute goods or complementary goods). This equilibrium will be at point Q on IC_2 . Because at this point price line is tangent to the IC. At this point he will behaving a fixed proportion of both the commodities i.e. OQ of X and OQ of commodity-Y.

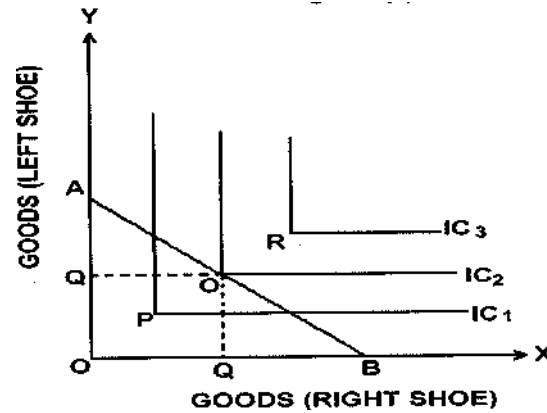


Fig. 7.13 Perfect Complementary

Self Assessment Questions

Q1. Mention the first and second order conditions of consumer's equilibrium as per IC Analysis.

7.7 Income Effect, Substitution Effect and Price Effect

Using IC Analysis, all the three effects are explained below : 7.7.1 Income effect, 7.7.2 Substitution Effect (A) Hick's, (B) Slutsky's, 7.7.3 Price Effect

7.7.1 The Income Effect

By income effect we mean the amount of change in demand for consumer goods as a result of change in the income of the consumer keeping all other things the same. In order to know with the help of indifference curve analysis, by how much the demand for a commodity changes as a result of change in income. Let us, first know what happens to the price line when only the income of a consumer changes. A change in income means that the consumer will be able to purchase more of both the commodities. The increase in consumption of commodities will be in the same proportion in which income has increased. For example, if the income of a consumer is doubled, he will be able to purchase double of either X or Y commodities. (We are assuming here that the price of X and Y are unchanged.)

A. Price Line/ Budget Line

Now, we know that extreme points of price line on Y-axis and X-axis respectively indicate the amounts of commodity Y and commodity X that can be purchased with the given income. If income of the consumer is doubled we shall have a new price or income line and the extreme points of the new price line on Y-axis as well as X-axis will be double the distance from the origin O as compared with the previous points. The new and old price lines will appear as follows :

Fig. 7.14 brings out clearly one important feature concerning the relationship between the two price lines. It is that the new price line is parallel to the old price line. This can be proved very easily as follows :

OC and OD are the two sides of a COD. Points A and B divided these two sides respectively into OA and AC and OB and BD. Now by the above explanation we find

$$\frac{OA}{AC} = \frac{OB}{BC}$$

In other words, line AB is dividing the two sides of the COD namely, OC and OD in equal proportions. This means that AS is parallel to CD. A simpler proof is that the slope of a price line indicates the relative prices of the given pair of goods. When income alone increases, the price line must shift to the right without changing its slope, which means that it must shift in a parallel manner.

So we can conclude that any increase in the income of consumer, relative prices remaining the same, will mean new price line which is parallel to the old price line.

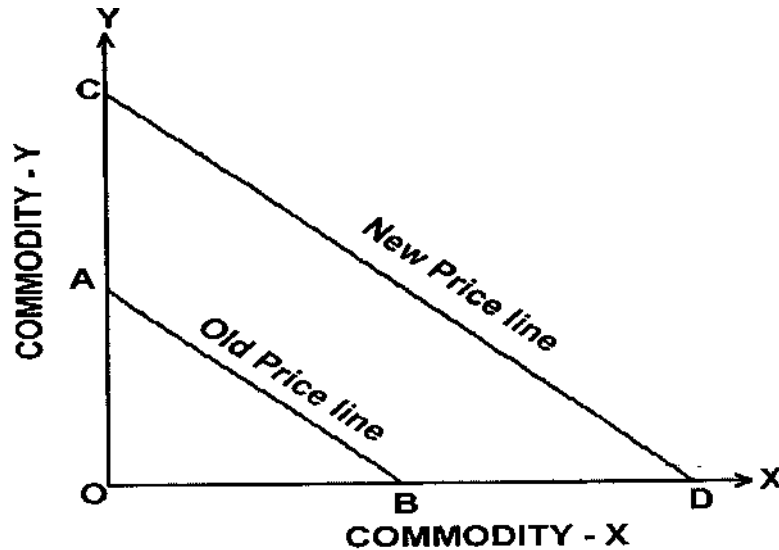
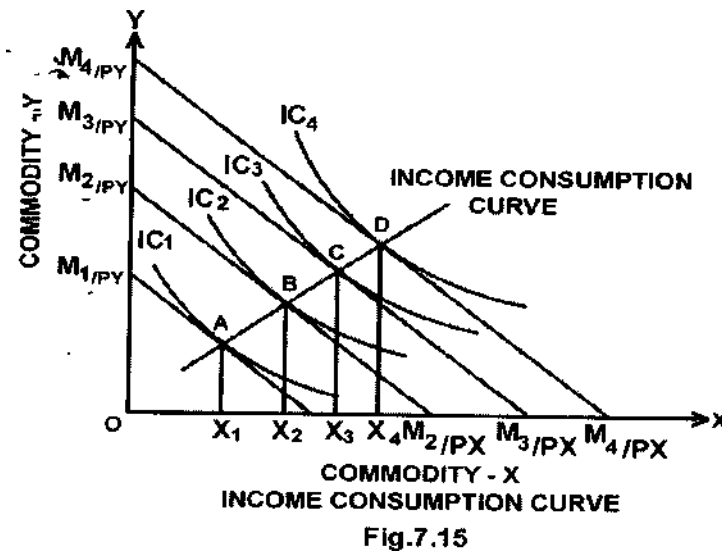


Fig.7.14

B. Income Effect and Income Consumption Curve

In Fig. 7.15 we find that as the income of the consumer increases from M_1 to M_2 to M_3 M_4 the consumer reaches new points to equilibrium at A, B, C and D. The amount of X consumed increases from X_1 to X_2 to X_3 to X_4 . (We would also study the impact of increase in income, through these equilibrium points on the consumption of commodity Y) However, at present, our focus of attention is on commodity. (X) X_2 X_1 X_3 X_2 X_4 X_3 represents the income effect when the income of the consumer increases from M_1 to M_2 to M_3 to M_4 the curve joining the points A, B, C, D etc. that is, the points indicating consumer's equilibrium after change in income, is called the income-consumption curve. Income consumption curve is the curve indicating the various combinations of two commodities which a rational consumer will be consuming at different levels of income, when the relative prices of the two commodities remain unchanged. In it we find that the income consumption curve is moving upwards to the right. Such a curve will be obtained only when none of the two commodities consumed is an inferior good. In other words, these are goods, whose consumption increases with every increase in income.



We can, in other words, also say that when the income-elasticity of demand for both the commodities is positive, the income consumption curve will be rising upwards to the right, and it will be straight line.

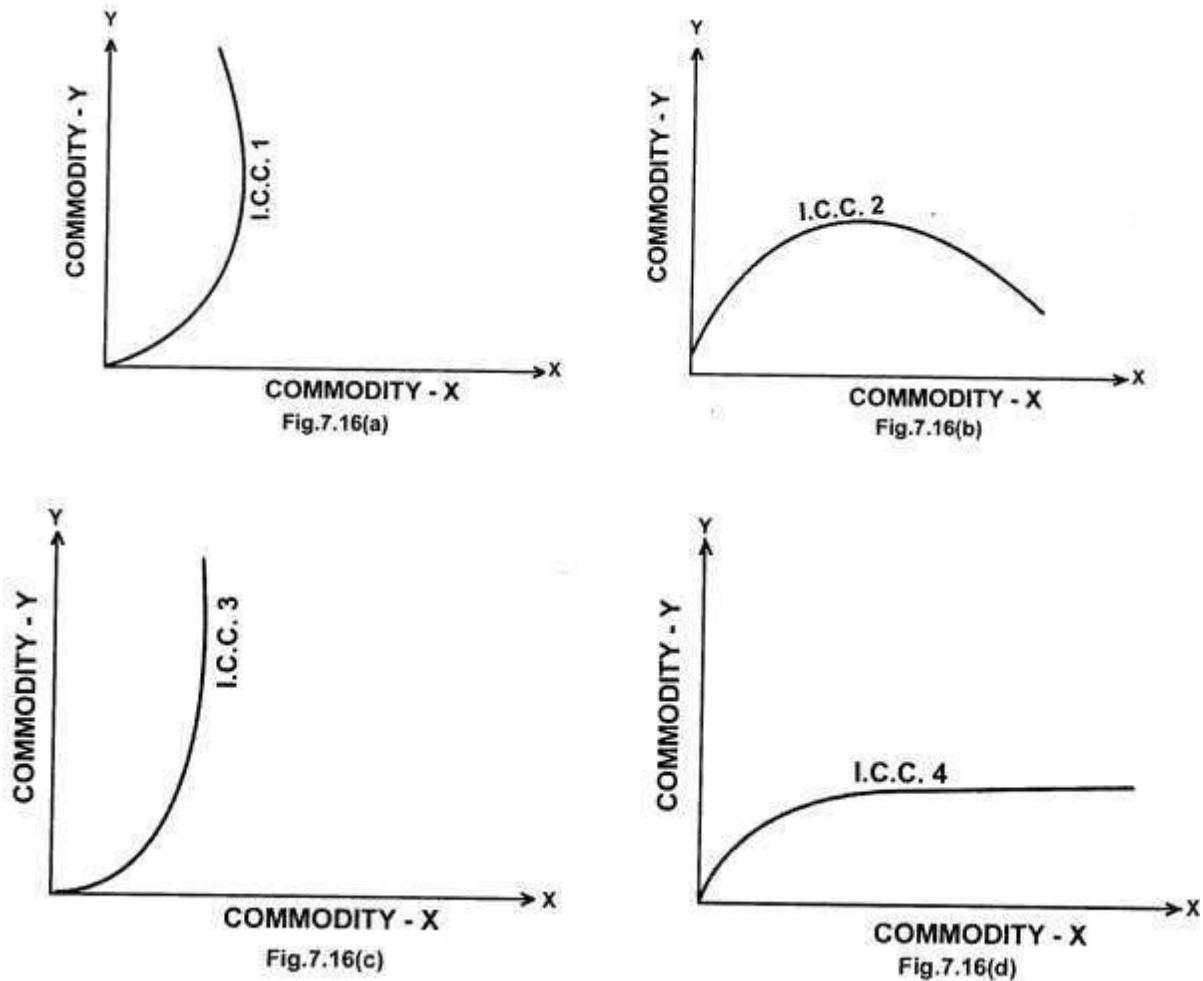
Self Assessment Questions

Q1. Define ICC and PCC.

C. Various Shapes of ICC

The income consumption curve, can, infact, have various other types of slopes too, it can slope, after some point upwards to the left or downwards to the right. It can also become vertical i.e. parallel to y-axis or horizontal i.e. parallel to X-axis as shown in the fig. 7.16.

In fig. 7.16 (a) we find that whereas for commodity Y, income elasticity of demand is positive (amount demanded increases with increase in income, it is negative for commodity X after a definite point. We can also say that the income effect for commodity X is negative after this point. In case of fig. 7.16 (b) the income effect is negative for commodity Y, therefore, income elasticity of demand for y is also negative and income effect as well as income elasticity of demand are positive for commodity X. In case of fig. 7.16 (c) income elasticity of demand for X is equal to zero and for commodity y the income elasticity of demand is positive and more than 1. In fig. 7.16 (d). Income elasticity of demand is positive and is more that for commodity X, and the income elasticity of demand Y is equal to zero.



SLOPES OF INCOME CONSUMPTION CURVE

Fig. 7.16

From the above discussion, it is clear that in some cases, it is quite possible that as the income of a consumer increases his consumption of one of the commodities in the combination may fall instead of rising. In other words income effect for such commodities can be negative. The goods for which income effect is negative are called inferior goods.

7.7.2 The Substitution Effect

Substitution effect indicates the change in consumption of a commodity when its relative price changes on the condition that real income of the consumer remains the same. This constraint is necessary in order to ensure that the substitution effect does not contain in itself the effect of change in income. In other words this condition will take care of the fact that substitution effect is not all mixed up with any element of income effect.

In other words with the change in relative prices the consumer is neither better off nor worse off than before. He simply has to rearrange his purchases. It is assumed when the price of X commodity falls, the price of Y rises. In this way whatever more he shall be buying because of the fall in price of X shall be nullified by the less purchase of Y commodity because of its rise in price. In fact the consumer remains on the same indifference curve. This can be seen in Fig. 7.17. In Fig. 7.17 the consumer in the beginning is in equilibrium at E on IC buying OX of X and

OY I of Y. Suppose relative prices change i.e. price of X falls and Y rises. The relative prices change in such a manner that new price line $A_1 B_1$ touches the same IC_1 at E_1 . This simply means fall in the price of X is fully cancelled out by rise in price of Y. The consumer simply read just his purchase i.e. he buys more of X and less of Y. The movement from E to E_1 is substitution effect.

The substitution effect can also be explained when price of only one commodity i.e. X falls while the price of Y remains the same. The consumer will naturally-substitute X for Y. This more of X for Y he shall be purchasing both because of income (with the fall in price his real income has also increased) as well as substitution effect. But for knowing substitution effect, we have to keep his real income constant. For finding out approaches have been given i.e. Hicksian and Slutsky's.

(a) Hicksian Approach

(b) Slutsky Approach

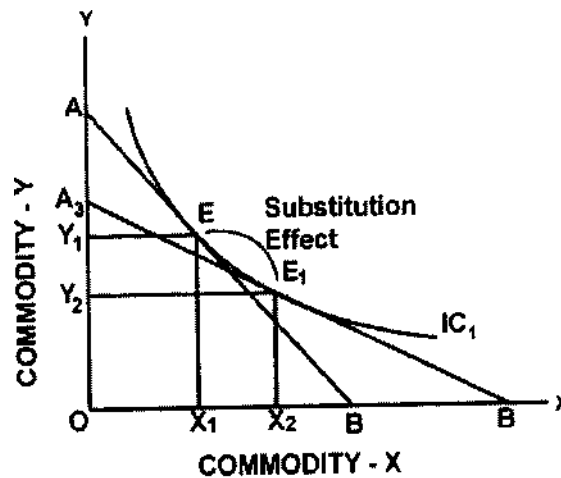


Fig.7.17

A. The Hicksian Substitution Effect

Suppose, with a given money income and given prices of commodity X and Y, the consumer is in equilibrium at point P (IC_1) in Fig.7.18. Suppose further that the price of commodity X falls. The new price line will start from A but will intersect X axis at some point say beyond B. The new price line is AL. Such a price line, will take the consumer onto a higher indifference curve. Such a change will not help us in knowing the meaning of substitution effect because the consumer has now a different real income as he is on a different indifference curve. For measuring the substitution effect, we must draw a straight line MQ parallel to the new price line AL and tangent to the original indifference curve IC_1 at some point touching IC_1 . This point is N in figure 7.18. We can say that the increase in the real income of the consumer due to the fall in the price of X has been just nullified by taking away from him AM amount of money income. AM is the *compensating variation in income* which brings the consumer back to the origin all indifference curve. Without changing the relative price of X which equates the slope $AL=MQ$ ($MQ \parallel AL$). Now all our conditions necessary for measuring the substitution effect as suggested by Hicks are satisfied, viz. (a) the consumer is in equilibrium with the new lower relative price of X and (b) he is still having the original real income (due to compensating variation income). Before the price change, the

consumer was consuming OR of commodity X; after the change when the real income is made constant through a compensating variation in income so that the consumer, when in equilibrium, still remains on the same indifference curve, he consumes OS of commodity X, RS is the substitution effect of the given fall in the price of X.

It may be noted here that with the indifference map with properties as stated in the earlier lesson, any fall in price of X will mean a substitution of X for the other commodity. In other words, the substitution effect of a fall in the price of a commodity on its demand is always positive.

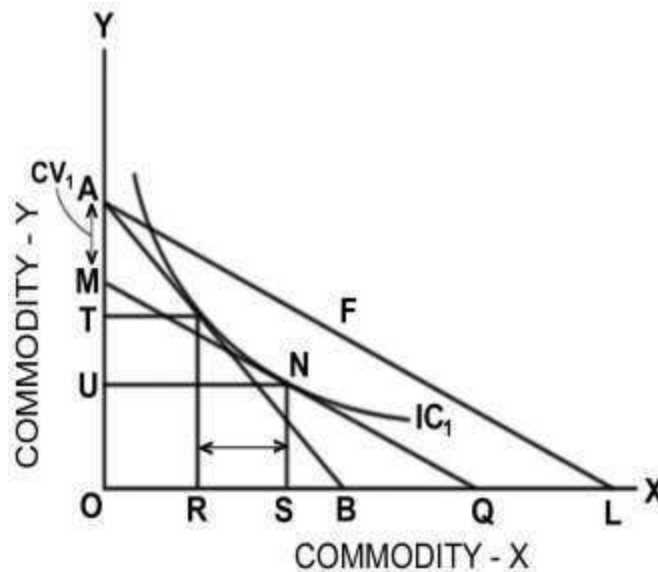


Fig. 7.18 Hicksian SE

B. Slutsky's Substitution Effect

As explained earlier, Slutsky's substitution effect refers to the effect of change in price of a commodity on its demand when the real income of the consumer after the change in its price is so altered that he is still able to purchase the same combination of commodities as he was purchasing before the price change. Diagrammatically, Slutsky's substitution effect is explained in fig 7.19.

AB is the original price line based upon the given money income of the consumer and the given price of commodities X and Y. The consumer is in equilibrium at point P. Suppose the price of X falls, the price of Y remaining the same, such that the price line takes the position AL. The new price line AL will be tangent to a higher indifference curve (not shown in the diagram) due to increase in real income caused by the fall in the price of X. Slutsky's method of nullifying this increase in real income is to reduce the money income to such an extent that the consumer is enabled to buy the original combination. This can be found out by drawing a straight line like RQ which is parallel to the new price line AL and is passing through the original equilibrium point P. This means that in our example the money income will have to be reduced by so much that with the reduced money income and at the new relative prices of X and Y as indicated by the slope of AL or RQ, the consumer is able to purchase either OQ quantity of X or OR quantity of Y. When the increase in real income is nullified thus, the consumer's equilibrium will take place at the point T where the price line RQ is tangent to the indifference curve IC_2 in the diagram. (See Fig. 7.19).

In other words, so far as the consumption of X is concerned with constant real income, as defined by Slutsky's the consumer will be consuming OS amount of commodity X instead of ON. Thus NS will be the substitution effect according to Slutsky. The substitution effect is again positive.

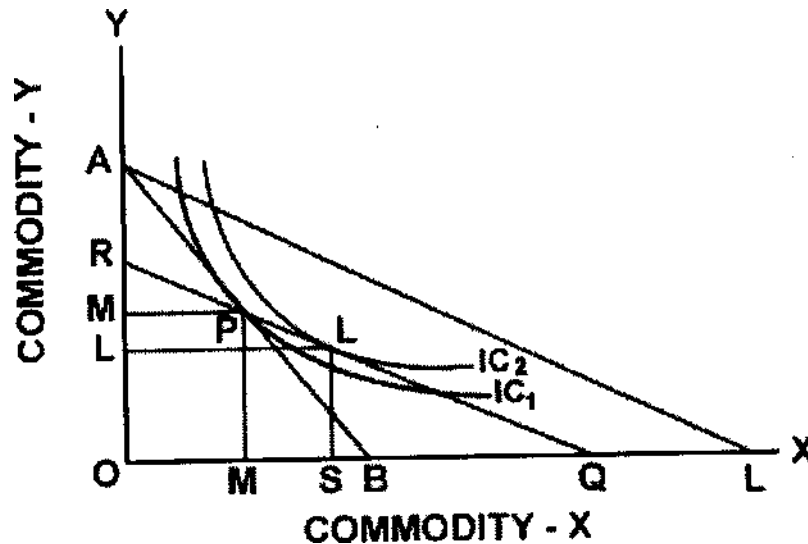


Fig. 7.19 Slutsky's SE

7.7.3 The Price Effect

The amount of change in demand as a result of a change in price of the given commodity is called the price effect. If, for example, the price of a commodity X falls by a particular amount and as a result, the demand for X increase by Z unit, then the increase by Z units, will be called the price effect. If, with a fall in price, there is an increase in the demand for the commodity, we say that the price effect is positive. If the demand for the commodity falls when its price falls then price effect will be considered negative. Negative price effect appears in certain exceptional cases as in the case of Griffen goods. Normally, the price effect is positive.

Why is price effect generally positive, that is the amount of commodity demanded by a given consumer increases with a fall in its price? This is because of two reasons : (1) The fall in price of the commodity means an increase in the real income of the consumer. The consumer is able to purchase more of the commodity because of a rise in his real income. (2) Fall in the price of a commodity, when prices of other commodities remain the same makes this commodity relatively cheaper. The consumer has a tendency or substitute a relatively cheaper commodity for a relatively dearer commodity, his real income remaining the same. The tendency will also increase the demand for the commodity for a relatively dearer commodity when its price has fallen.

A. Slope of Price Consumption Curve

The price consumption curve can have different types of slopes. We shall be discussing the nature of these slopes on the assumption that it is the commodity X (shown on X-axis in the indifference map) whose price is supposed to change. The P.C.C. may have negative, positive, zero or infinite slope indicating nature of the commodities i.e. whether they are superior, inferior or neutral.

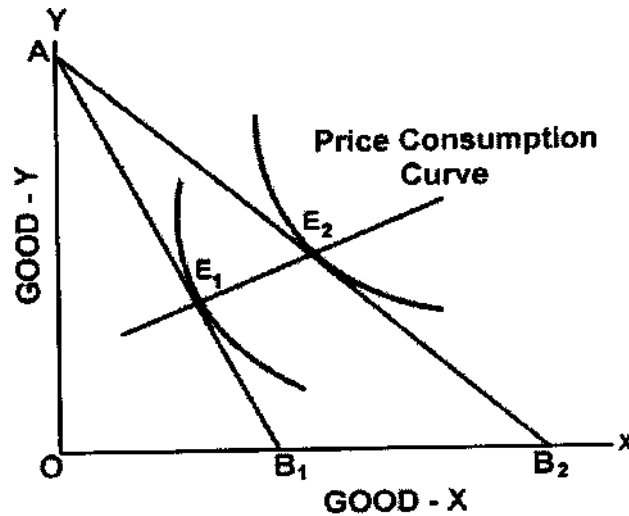


Fig.7.20

B. Price Consumption Curve : Various Shapes

(a) Price Consumption Curve Moving Upwards towards Right Throughout

In this case, we are going to see the effect of change in price on demand directly. The change in demand via income i.e. (indirect increase in demand) will be discussed later. Here we shall be assuming that consumer's income remain constant and price of other commodity too remain unchanged. This we can see from fig. 7.20.

Now, if the price of commodity X falls. This will bring change in price line. The original price line is AB and new price line becomes AB₂. The consumer shifts from initial equilibrium E to the new equilibrium E₁. If we join these two points then the resulting curve is known as P.C.C. Such a curve will imply that consumer purchases more of not only commodity X when its price falls but shall be purchasing more of Y commodity too with the fall in price of X. The consumer can have more of Y commodity only if he spends part of saving with the fall in price of X on Y commodity too. This is possible only when the Price Elasticity of Demand for commodity X is less than unity at each price.

(b) Price Consumption Curve which is parallel to the X-axis or the Y-axis

A price consumption curve parallel to X-axis implies that amount spent on commodities other than X remains unchanged. This also means that the amount spent on Y is unchanged. This would imply that the price-elasticity or demand of X is equal to unity.

A price consumption curve which is parallel to Y-axis will emerge only, when the demand for X remains unchanged even after the fall in the price of X and the whole of the amount saved due to the fall in the price is used for purchase of Y commodity. This is possible only when price elasticity of demand for x is zero i.e. the demand for X is completely inelastic.

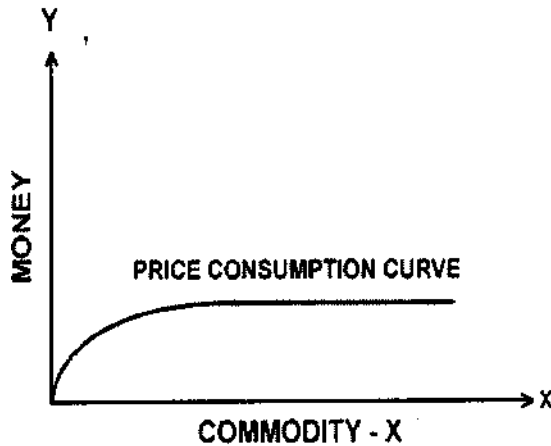


Fig. 7.21 (a)

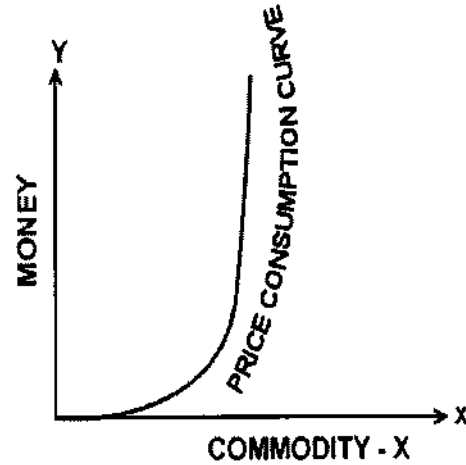


Fig. 7.21 (b)

(c) PCC : Other Shapes

The price consumption curve can also have other types of slope. After sloping upwards to the right, it can be sloping upwards to the left or downwards to the right. The pair of the price consumption curve moving upward to the left will mean that with a fall in price, the demand for the commodity whose price has fallen has started decreasing instead of increasing. This will only show that commodity in question is a "Giffen goods" inferior commodity or had only prestige value (you will read more about this point in later section). If the price consumption curve starts moving downwards to the right this only shows that the consumer is spending less on commodities other than X (their amount in the combination has declined despite their price remaining the same) and more on X whose price has fallen. This implies that price elasticity of demand for X within this range of the price consumption curve is more than unity. The fig. 7.21 shows the different types of Price Consumption curves, Fig. 7.21(a) shows that price elasticity of demand for commodity is equal to 1, (for the range where P, C, C, is

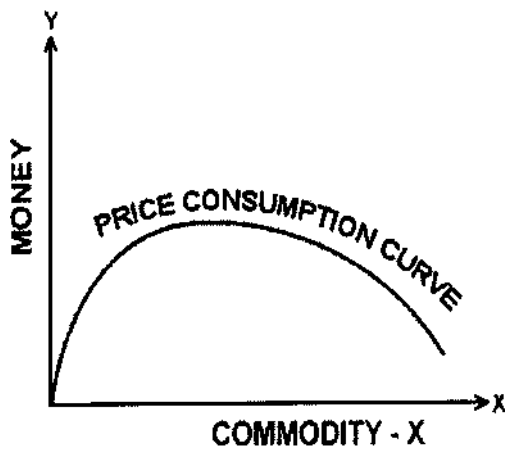


Fig. 7.21 (c)

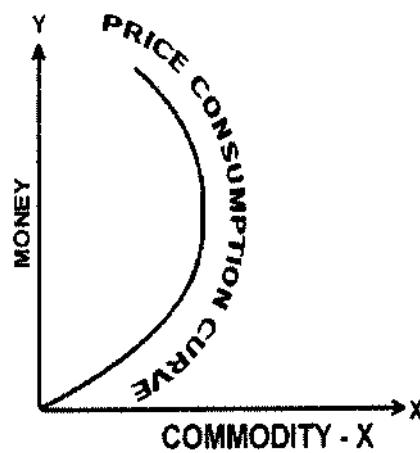


Fig. 7.21 (d)

Fig. 7.21

parallel to X-axis). Similarly, fig. 7.21(b) shows that price elasticity of demand for X is equal to zero the range where P.C.C. is parallel to Y-axis, fig. 7.21(d) shows that X is an inferior commodity and fig. 7.21(c) shows that price elasticity of demand for X is more than unity (for the range when price consumption curve is sloping downwards).

Proponents of the indifference curve approach have thus suggested that price effect is made up of two components, namely, the income effect and the substitution effect and one of the major achievements of the indifference curve approach is its' ability to split up the price effect into its two constituent parts, namely income effect and the substitution effect something that could not be attempted by the followers of Marshall. We shall, see how the price effect can be split into the income effect and the substitution effect.

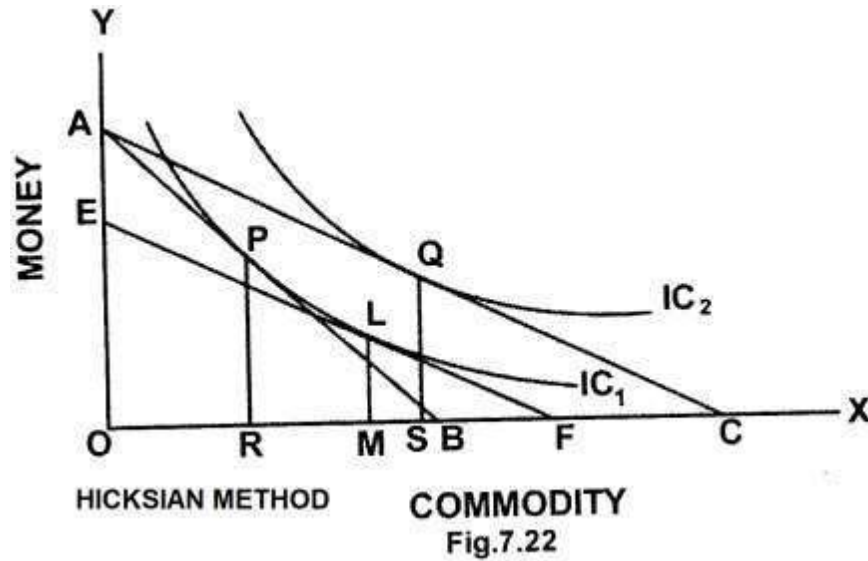
7.7.4 Decomposition of Price Effect (Hicksian Method) i.e. $PE=IE+SE$

(A) Compensating Variation in Income

As we have studied if the price of commodity X falls prices of other commodities, money income of the consumer remains the same, consumer shall purchase more of this commodity. He can purchase less or same of X commodity only if commodity X is Giffen or a neutral commodity. This more he shall be buying of the price effect. But price effect is a combination of income and substitution effect. This can be understood from the simple example. When the price of X commodity falls consumer's real income increases and he shall be buying more of X commodity. On the other hand with the fall in price of X, price of Y remaining constant, X commodity becomes relatively cheaper, so he shall be purchasing more" of X commodity because of substitution effect. Now we want to isolate income effect from substitution effect i.e. we want to know how much more he is buying because of Income effect as well as substitution effect. To separate Income from substitution effect two different approaches are given. They are called Hicksian as well as Slutsky's approach.

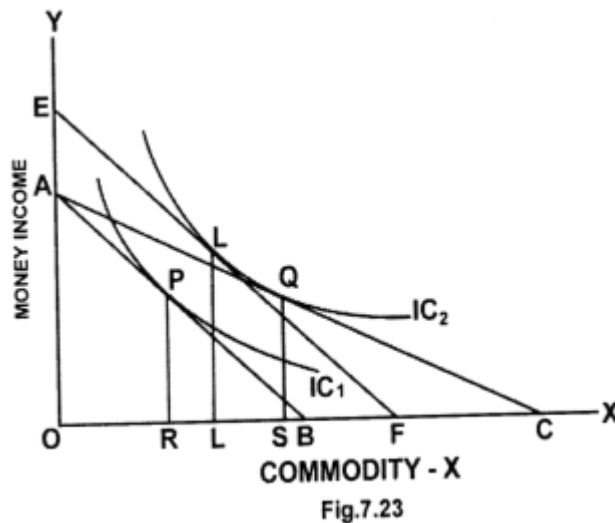
According to Hicksian approach we should reduce his money income to that extent that his is just able to attain to the original indifference curve. This we can do by drawing a price line parallel to new price line touching the indifference curve 1. This we can explain with the help of fig. 7.22.

In fig. 7.22 on X-axis we have shown commodity X and on Y-axis we show Money as representing the second commodity. In the beginning consumer is in equilibrium on AB price line at Point P where indifference curve, is tangent to price or budget line. Suppose price of X falls such that the new price line is AC. Consumer is in equilibrium at point Q. Before the change in the price of X, the consumer was consuming OR units of commodity X. So RS is the price effect. After the price change, he consumes OS of commodity X. The price effect, as we know, is made up of two effects namely, the income effect and the substitution effect. For knowing the substitution and income effect according to the Hicksian Method, the consumer should be in equilibrium at the original indifference curve. Thus we can find out if we draw a price line EF parallel to the new price line AC such that EF, is tangent to the original indifference curve IC, at L (According to Hicks constant real income is represented by the same indifference curve). At this point of equilibrium, the consumer will be consuming OM units of commodity X. Therefore RM measures the Hicksian substitution effect of the given fall in the price of X on its demand. Now, as price line EF is parallel to the price line AC and is also tangent to original indifference curve, we can say that it has taken away all the income effect of the price change on the consumption of the commodity X. It has brought the consumer back to the level of original real income. So, we can say that MS is the income effect of the given fall in the price of X on its demand.



(B) Equivalent Variation of Income Method

Hicks has adopted another method also for measuring the substitution effect. In this case the substitution effect is measured with reference to the new curve which the consumer reaches after the price change. A new price line is drawn parallel to the old price line. The new price line being tangent to the new indifference curve as shown by EF II AB in fig. 7.23. The consumption of X indicated by the old equilibrium is P (OR) and the consumption of X indicated by the new equilibrium point (OU) obtained by the new price line, EF, parallel to the original price line AB, will indicate the income effect. The balance of the price effect (US) is the substitution effect. Whereas Hicks calls the split up of price effect into as the method based on "compensating variation of income" concept he calls the present method described is based upon the concept of equivalent variation of income. His method has one similarity with the Slutsky approach. It is that both go back to the original real income for finding out the income effect and the substitution effect of price changes. The meaning of real income, of course, is different for the two economists. Moreover, Hicks, in his later writing has attached greater importance to the first method.



Self Assessment Questions

Q. 1 What is Compensating Variation in Income?

Q. 2 What is Equivalent Variation in Income?

(C) Slutsky's Method Approach

Let us now see how price effect will be split up into income and substitution effect according to Slutsky. According to him we should take away his income to that extent which enables him to purchase the same original combination if he so likes. Thus we hypothetically reduce his income to the extent which forces him back to old combination. This we can show with the help of Fig. 7.24.

In fig. 7.24 we have shown commodity on x-axis and money income on y-axis. In the beginning consumer is in equilibrium at point P where IC_1 is tangent to budget line. With the fall in price of X, budget line becomes AC. If the income effect of price change has to be eliminated according to Slutsky's method, we should draw a price line EF parallel to AC. As we did in the earlier case, but now it need not be tangent to the original indifference curve IC_1 but it should pass through P the original equilibrium point, as is shown in the following diagram 7.24.

Income represented by the price line EF is that income which just ensures that the consumer has reached the old level of real income. In Slutsky's terms EF is now tangent to IC_3 at Point L, i.e. with income represented by price line EF.

The consumer is in equilibrium at point L implying that he will be purchasing OY of commodity X. YS in this case will be income effect and RY will be the Slutsky's substitution effect.

The comparison between the split up of the effect adopted by Hicks will show that for normal commodities the same fall in price will create a smaller substitution effect and a great income effect than created by the Slutsky's approach.

There has been a staunch criticism of this approach. It is said that in this approach only apparent real income is made constant and not the real income of the consumer. Because with this approach consumers succeeded in moving to higher indifference curve.

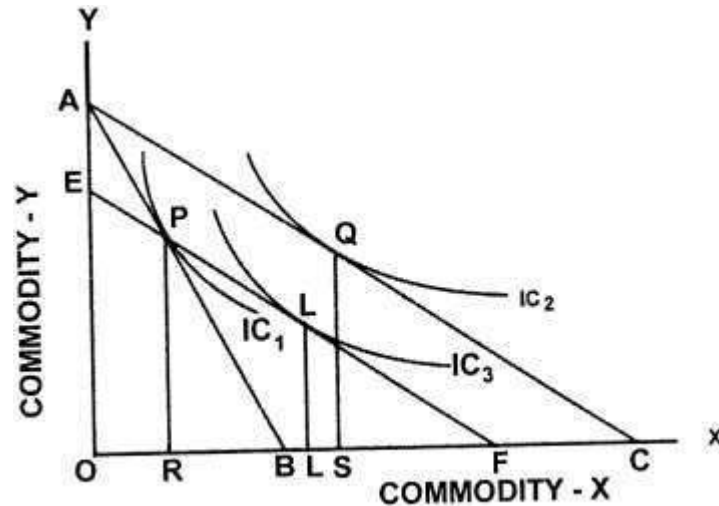


Fig.7.24

SLUTSKY METHOD

Now as regards the comparative importance of the two methods. Hicks method seems to be more scientific than Slutsky's method. Because under Hicksian Method his real income remains the same. He is neither better off nor worse off than before. He remains on the same indifference curve. On the other side in Slutsky's method consumer succeeds in moving to higher indifference curve. This means his real income is not kept constant. What remains constant is only his apparent real income therefore. Hicks approach is more reliable than Slutsky's from interpretation point of view.

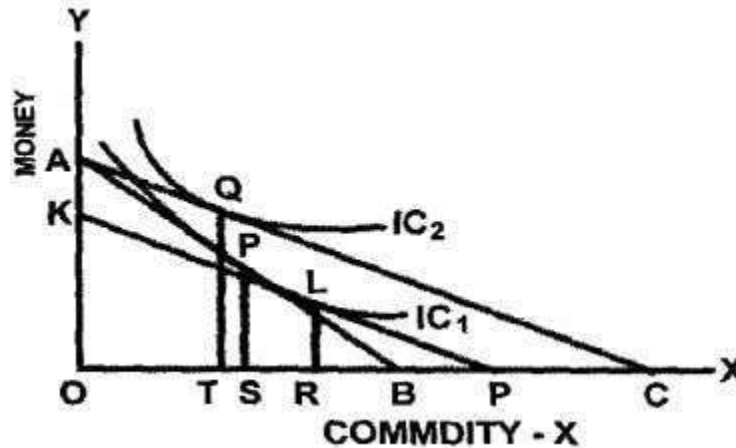
Self Assessment Questions

Q. What is the basic differences between Hicksian substitution effect and Slutsky's Substitution effect?

7.8 THE GIFFEN'S PARADOX AND DECOMPOSITION OF PE

We will discuss one more point in this lesson. It relates to the case of commodities, the demand for which falls down with a fall in their prices and rises with an increase in their prices something that does not happen normally. These commodities are called Giffen's goods after the name of Dr. Giffen who was the first to draw attention of the economists to such goods. Demand curve is case of such commodities slopes up wards to the right, Marshall could not explain the reason for such a slope of demand curve for these commodities and placed such a demand curve in the category of exceptional demand curves. Proponent of indifference approach have been able to explain the reason for the fall in the demand for such commodities when their prices fall. They explain this tendency with the help of income and substitution effects.

We have already pointed out that substitution effect of a fall in price is always positive (whether viewed from the point of view of Hicks or Slutsky). While studying the income effect we have also shown that in case of certain types of indifference maps, the income effect can be even negative that is an increase in the income of the consumer may bring about a fall in the demand for a particular commodity. Such goods are described as 'inferior' goods.



HIAKSIAN METHOD FOR GIFFEN GOODS

Fig. 7.25

Now it is quite possible in case of some commodities that income effect generated by the fall in the price of commodity is negative and also very large. In fact, it may be so large that it over neutralizes the positive substitution effect created by the fall in price of the commodity. The over-all result in such a case will be that the price effect which is the sum total of substitution effect and income effect becomes negative. This phenomenon is diagrammatically explained in fig. 7.25.

In fig. 7.25, the consumer is originally in equilibrium at P (IC), with A B as the given price line. He demands OS of commodity X. With the fall in price of X, the new price line AC and the consumer is in equilibrium at point Q (IC₂). Now, the demand for X is OT that is less than the previous quantity demanded (OS). If we find out the income effect of the fall in price of X on its demand by drawing a line EF parallel to AC, and tangent to IC (the original curve), it will be discovered to be negative and equal to TR. SR is the substitution effect (we are splitting the price effect into its two parts by the Hicksian approach) SR (substitution effect) is positive but, is less than RT (income effect) which is negative. **This over all effect ST is thus negative.**

If we split the above price effect into income and substitution effect according to the method followed by Slutsky, the result is the same i.e. negative income effect is more than the positive substitution effect. The only difference is now that of quantity of positive substitution effect as well as that of negative income effect undergoes a change. The sum of the negative income effect, and positive substitution effect i.e. **the over-all price effect still remains the same in the indifference map the original price line and the fall in price of X remains the same.** This is clear from fig. 7.26.

In fig. 7.26 we find that the income effect according to Slutsky's method is negative equal to TR and SR is the substitution effect which is positive. TS is the negative price effect.

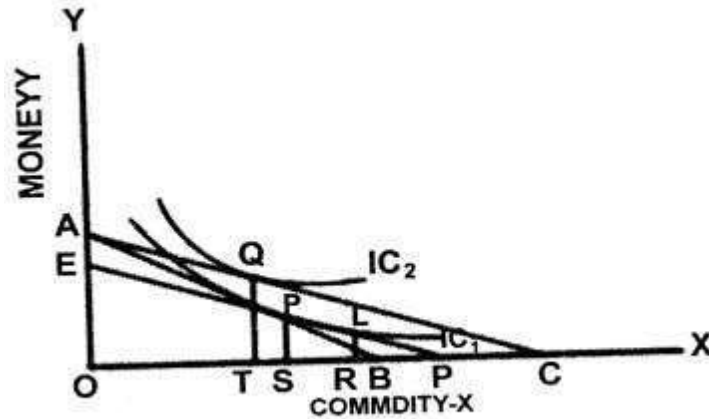


Fig.7.26

The above discussion enables us to give a precise definition of Giffen good. **It is a particular kind of inferior good in the case of which the *negative income effect is stronger than the positive substitution effect of all in its price.***

7.9 DIFFERENCE BETWEEN HICKSIAN APPROACH AND SLUTSKY'S APPROACH

The above discussion reveals one important difference between the Hicksian and Slutsky's method of splitting the price effect into its two parts.

It is that whereas in the Slutsky approach, the constant real income means the power to purchase the same old combination of two commodities, in the Hicksian approach, the combination undergoes a change. This assumption made by Slutsky has enabled him to arrive at certain conclusions mathematically about the relationship between price effect, income effect and the substitution effect. We reproduce below the relevant mathematical formulation from the book of Economic Theory by Bell and Todaro, Bombay (1973, page 72).

7.9.1 Mathematical Formulation

If X denotes quantity purchased, and this a function of price P_x and real income (M) while real income is, in turn a function of price (since the change in price will change real income). We can write :

$$(i) \quad X = f_1 (P_x, M) \text{ and } (M = f_2 P_x). \quad \text{_____ Eq (1)}$$

Differentiate the first expression with respect to P_x we obtain.

$$(ii) \quad \frac{dX}{dP_x} = \frac{\partial X}{\partial P_x} + \frac{\partial X}{\partial M} \frac{dM}{dP_x} \quad \text{_____ Eq (2)}$$

But the 'change in real income is equal to the initial quantity x , times the change in price, so that

$$(iii) \quad dM = -P_x X \text{ or } \frac{dM}{dP_x} = -X \quad \text{_____ Eq (3)}$$

$$(iv) \quad \frac{dX}{dP_x} = \frac{\partial X}{\partial P_x} + \frac{\partial X}{\partial M} \frac{dM}{dP_x} \quad \text{_____ Eq (4)}$$

Substituting, then, for dM/dP_x in (2) we obtain the famous Slutsky question And multiplying all three terms $P_x \times$ we obtain :

$$(v) \quad \frac{dX}{dp_x} = \frac{\partial X}{X} + \frac{\partial X}{\partial X_x} - \frac{\partial X}{\partial X} - \frac{P_x}{X} \quad \text{——— Eq (5)}$$

But now the first term in equation (5) is the 'total' price elasticity of demand (n'), while the second term is the *pure substitution elasticity: (in x)* i.e. the proportional change in price when real income is unchanged as shown by the partial derivative. The third term is *the marginal propensity to 'consume' good X (C_x)* i.e. it is the change in expenditure on X as a result of a change in real income when price is unchanged. Thus, we can rewrite Eq (5) as

$$(vi) \quad \eta X = \eta^{1-C_x}$$

This turns out to very useful expression, in terms of our discussion of normal, inferior, and Giffen type goods, we see that this expression can be used to show that the following conditions will hold.

- (i) For a 'normal' good both n_x and $-C_x$ terms will be negative, and therefore, the n_x will be negative - i.e. when price falls, quantity demand increases.
- (ii) For an inferior good, which is also a normal good, n_x will be negative $-C_x$ will be positive but since n_x will be great in absolute value than C_x n_x will still be negative.
- (iii) For a Giffen type good n_x will be negative but it will be overcome by a larger positive $-C_x$ will the net result that n_x is Positive, i.e. when price falls quantity demand will also fall.

7.10 MARKET DEMAND, BANDWAGON EFFECT, SNOB EFFECT AND VEBLEN EFFECT

The demand for product is said to have Bandwagon effect when an *individual purchases a large amount of it because others are also purchasing it.*

Snob effects are present when an individual's *demand for the commodity is smaller than it would otherwise be simply because others are also buying the commodity.*

Most people would like to consume those goods as early as possible which are consumed by their neighbours (keep up with Joneses). With a slight fall in the price they rush to the market for such goods. The *demand curve* for a commodity having **Bandwagon effects** will be more elastic as compared with commodities having no such effect. A lower price, increase the quantity demanded, not only through the price effect but also as a result of larger purchases by others. In short, the price effect is strengthened by a bandwagon effect.

Conversely, some rich people suffering from snob effect would like to differentiate themselves from others by purchasing very costly and/or rare products. A commodity becomes attractive to a snobbish individual only if others purchase less of it. The demand curve for snobs is less elastic than the demand curve when there is no snob effect. The reason is that increase in demand due to fall in price is counter-balanced in part by some snobs leaving the market because of the increased consumption by others.

Last, some goods may be purchased for conspicuous consumption i.e. their high price makes them suitable for display. Preferences here are definitely related to price rather than

to the consumption of others. Demand curve in such cases shows Veblen effect. The quantity demanded is higher at higher price than it would otherwise be because the higher price makes the commodity better for purposes of conspicuous consumption.

Self Assessment Questions

Q. What is the bandwagon effect? How it does affect the Market Demand Curve?

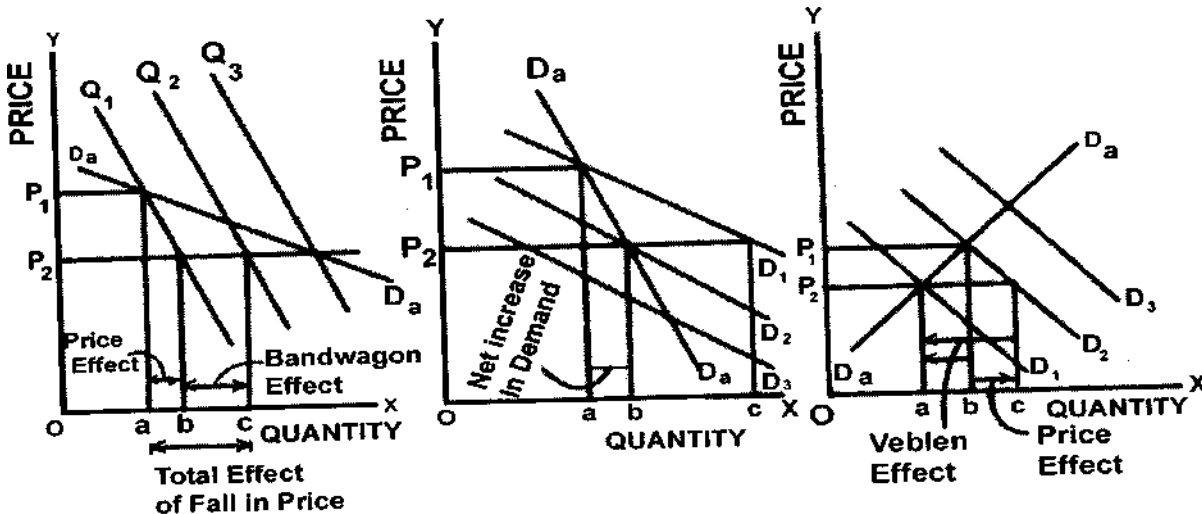


Fig.7.27

In Panel - A, The curve labelled as Q_1 shows the quantities of X the consumer would purchase at various prices, given the total quantity (Q_1) purchased by all other consumers. The curve Q_2 lies to the right of Q_1 and Q_3 lies still further to the right, since these points represent increasingly large quantities purchased by others. For deriving the aggregate demand curve for the commodity having Bandwagon effect, the relevant demand curve is D_a . This is more elastic than the curve derived under the assumption of fixed purchase by others. However on account of Bandwagon effect demand increases to OC . Therefore from a to b is the price effect from b to c is Bandwagon effect and from a to c is the total effect of a fall in price.

In Panel - B as the price of the snob good falls from P_1 to P_2 , net increase in quantity demanded is only ab . However, if snobs had expected no increase in the quantity demanded by others, then the total quantity demanded would have been OC . Actually, the more extreme snobs leave the market due to increase in the quantity demanded by others. Hence, the net result is an increase in demand by ab only.

Panel - C shows the fall in price for P_1 to P_2 reduces the quantity demanded by ab . The price effect is to increase the quantity demanded by ac i.e. the amount that would be demanded if there were no change in the conspicuous price would be OC (conspicuous price is the price other people think the consumers leave the market as the commodity). However at the lower price a number of consumers leave the market as the commodity loses its conspicuous value. The viable effect is therefore cb .

Self Assessment Questions

Q. Define Snob effect.

7.11 SUMMARY

let's recapitulate what we have studied in this lesson :

- The **tastes of consumers** can be represented by **indifference curves**. These are based on the assumptions that the consumer can rank baskets of goods according to individuals preferences, tastes are consistent and transitive and the consumer prefers more of a good to less.
- An **indifference curve** shows the various combinations of the two goods that give the consumer equal satisfaction. Higher indifference curve refers to more satisfaction and lower indifference curve to less. Indifference curves are negatively sloped, can not intersect and are convex to the origin.
- The **Marginal Rate of Substitution (MRS)** measures how much of a good the consumer is willing to give up for one additional unit of the other good and remains on the same indifference curve. Indifference curves also generally exhibit diminishing MRS.
- The **budget line** shows the various combinations of two goods (say x and y) that a consumer can purchase by spending all income on the two goods at the given prices (P_x, P_y). The budget line shifts upwards if income increases and downwards if income decreases but the slope remains unchanged. The budget line rotates upward if P_x falls and downwards if P_x rises.
- A **rational consumer** maximizes utility by reaching the highest indifference curve possible with the budget line. This occurs where an indifference curve is tangent to the budget line so that their slopes are equal i.e. ($MRS_{xy} = P_x/P_y$)
- If **indifference curves** are either flatter or steeper than the budget line or if they are concave, utility maximisation requires the consumer to spend all income on either Y or good X. These are called corner solutions.
- The **Income Consumption Curve (ICC)** joins consumers optimum points when only the consumer's income is varied.
- A **normal good** is one of which the consumer purchases more with an increase in income. An inferior good is one of which the consumer purchases less with an increase in income. The ICC is positively sloped for normal goods and negatively sloped for inferior goods.
- The **Price Consumption Curve (PCC)** joins consumers optimum points resulting when only the price of the good varies.
- **PE = IE + SE: Diff cases** When the price of a good falls consumers substitute the good for other goods and their real income rises. If the good is normal the income effect

reinforces the substitution effect in increasing the quantity purchased of the good. If the good is inferior, the substitution effect tends to increase while the income effect tends to reduce the quantity demanded of the good. Because the former usually exceeds the latter, the quantity demanded of the good increases and the demand curve is negatively sloped.

- Only if the income effect overwhelms the opposite substitution effect for an inferior good will the quantity demanded of the good decrease when its price falls and the demand curve will slope upwards. This is called Giffen good.
- **Snob effect** means decrease in the consumption of a commodity by rich people when it becomes a commodity of common consumption.
- **Bandwagon effect** when a consumer demands more of a commodity because others of his class and his superiors consume more of that commodity, it is called Bandwagon effect.

7.12 GLOSSARY

- **Ordinal measurement** : In ordinal measurement the magnitude in question is only rank-ordered. Even if the numbers are assigned they do not convey the size of the magnitude.
- **Non-satiation** : It is a situation wherein a consumer always prefers more of a good to less of a good.
- **Preference set** : It is a set of preferences indicating what the consumer wants to go.
- **Marginal Rate of substitution** : It is the rate at which the consumer is willing to substitute one good for another in consumption.
- **Indifference curve** : It is a curve capturing a set of combinations which yield the same level of satisfaction and hence, the consumer is indifferent between them.
- **Perfect substitutes** : Two goods, the marginal rate of substitution for which remains constant at all levels of consumption are called perfect substitutes.
- **Perfect complements** : Two goods that can be consumed only together and in a fixed proportion are categorized as perfect complements.
- **Consumer's equilibrium** : It is a situation reached by the consumer from which he would not like to deviate.
- **Price Consumption Curve (PCC)** : This is the curve connecting points of optimum combination for changes in relative price ratios.
- **Income Consumption Curve (ICC)** : This is the curve connecting points of optimum combinations for changes in income.
- **Inferior goods** : Goods that have a negative income effect or a negative income elasticity are called inferior goods.
- **Giffen goods** : These are goods that have a strong non-normal income effect leading to a non-normal demand curve with a positive relationship between price and quantity.

7.13 REFERENCES

- Koutsiyannis, A (2013). *Modern Micro Economics*. McMillan Press.

- Ahuja, H.L. (2015). *Advanced Micro Economics*. S Chand Pvt. Ltd., New Delhi.

7.14 FURTHER READING

- Koutsiyannis, A (2013). *Modern Micro Economics*. McMillan Press.

7.15 MODEL QUESTIONS

1. Derive the conditions for a consumers equilibrium using ordinal utility approach?
2. Discuss Income effect, Substitution effect and Price effect. Using the Hicksian method, illustrate graphically the decomposition of the substitution and income effects due to change in the price of a commodity.
3. Illustrate the difference between the Hicksian and Slutsky's methods of separating the income and substitution effect of price change of a normal good. Which method, gives in your opinion a better measure of the two effects and why? (Differentiate between Ordinary and Compensated Demand Curves)
4. What is a Giffen good? Assuming a two commodity case show that in case of a Giffen good the substitution effect is more powerful than the price effect.
5. "All Giffen goods are inferior goods but all inferior goods are not Giffen goods". Explain this statement showing graphically the difference between the substitution effect and income effects of a price change on the demand for two type of goods.

APPLICATIONS OF INDIFFERENCE CURVE ANALYSIS

Structure

- 8.0 Objective
- 8.1 Introduction
- 8.2 Measurement of Consumer's Surplus
 - 8.2.1 Change in Price
 - 8.2.2 Change in Income
- 8.3 Application to Household Life
- 8.4 Division of Income and Supply of Labour
- 8.5 Direct Vs Indirect Tax : Which is better
- 8.6 Explaining Welfare Effects of Subsidies
- 8.7 Efficiency and Equity in Rationing
- 8.8 Measuring Effects of Excise and Income Subsidies
- 8.9 Measuring the Financial Cost of Lump-sum Income Subsidy
- 8.10 Derivation of Labour Supply Curve
 - 8.10.1 Wage Labour offer Curve
 - 8.10.2 Labour Supply Curve
- 8.11 Inter-temporal Choice of Consumption
- 8.12 Summary
- 8.13 Glossary
- 8.14 References
- 8.15 Further Readings
- 8.16 Model Questions

8.0 OBJECTIVES

After going through this lesson, you shall be able to :

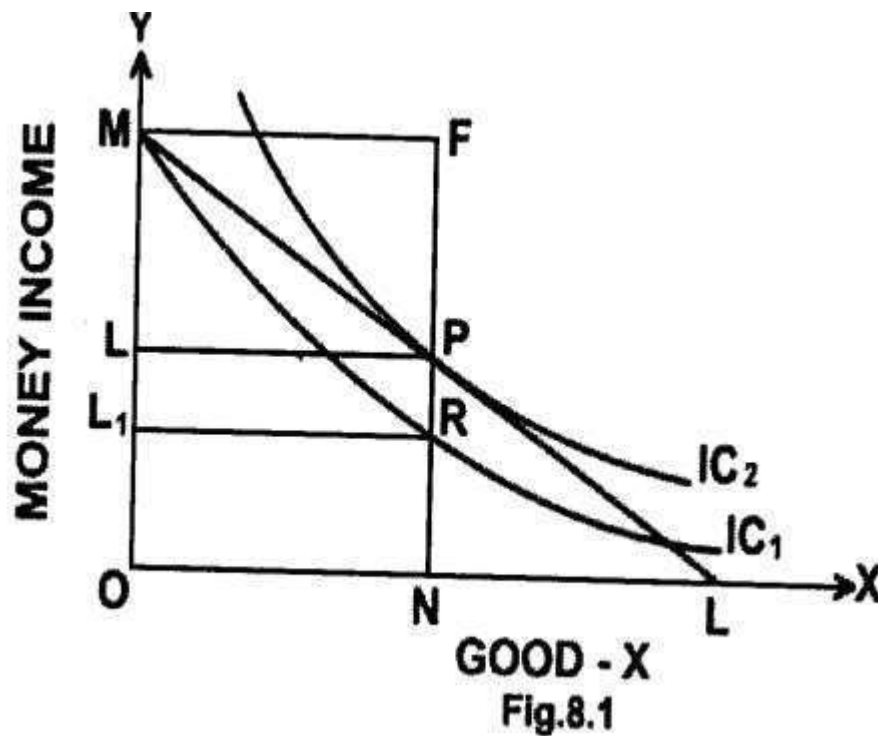
- explain various applications of indifference curves
- discuss division of income/budget, division of time between work & leisure, division of income into saving and expenditure, choice between direct and indirect income tax, choice between present and future consumption etc.
- measure consumer surplus, effect of excise and income subsidy, financial cost of lumpsum income subsidy.

8.1 INTRODUCTION

In the previous lesson we have studied in detail about IC analysis i.e. indifference curve and its properties, consumer's equilibrium, decomposition of price effect into income effect and substitution effect-using Hick's and Slutsky's analysis etc. This lesson is a step future and deals with application of concept of IC to various domains of measurement (i.e. consumer surplus, excise subsidy, income subsidy, financial cost of income subsidy etc.) and division of variables into two uses i.e. income, work-leisure, present-future consumption etc.

8.2 MEASUREMENT OF CONSUMERS SURPLUS

In your undergraduate stage, you have studied how consumers surplus is measured with utility analysis. But that assumes utility is cardinally measurable. Now that modern economists have called in question this assumption, the technique of indifference curves has been applied for the measurement of consumer's surplus. How consumer's surplus can be measured with the help of indifference curves is explained here.



In Fig 8.1 on OX we measure commodity and on OY we take up money. IC_1 and IC_2 are two indifference curves of the consumer. Let us assume that our consumer has OM of money income. If he spend his entire income on X commodity, he shall be in a position to buy OL units of a commodity. Thus ML is the price line which touches the IC_2 at point P. At point P he gets ON units of X commodity, and OL amount of Y commodity. In other words for buying ON units of commodity, he spends LM amount of money income or PF. Now let us assume that consumer does not know the price of X. In the absence of price line, imaginary IC_1 indicates that for ON commodity of X, the consumer is willing to spend ML_1 amount of money income and would like to remain at point R on IC_1 . But actually he has to spend ML amount of money for buying ON units of commodity. Thus the difference LL_1 or PR is consumer surplus. The advantage of this method of measurement of consumer surplus over that given by Marshall is that we do not have to assume the marginal utility of money to be constant.

8.2.1 Change in Price and Consumer Surplus

When price of X-commodity falls, real income of the consumer increases but money income remains unchanged. Due to fall in the price of X, the price line shifts from ML to ML_1 i.e., he buys more of X commodity because his real income has increased (see Fig. 8.2). This means now with the same money income OM he shall be in a position to buy more of this commodity at a lower price. Originally he was at an equilibrium at point P on IC_2 . He was having combination of ON of units commodity and LM amount of money income. In other words, for buying ON units, he was ready to spend ML amount of money. But now for consumer does not know the price of X. In the absence of price line, the imaginary indifference curve (IC_1) indicates that for buying ON units, consumer is willing to spend ML_1 amount of money income. But actually he spends ML . Hence LL_1 is consumer surplus. In the situation when price of X decreases it enables the consumer to attain an equilibrium of P_1 on IC_3 . In other words he spends only ML_2 amount for ON units. Hence his surplus increases from LL_1 to L_2L_1 .

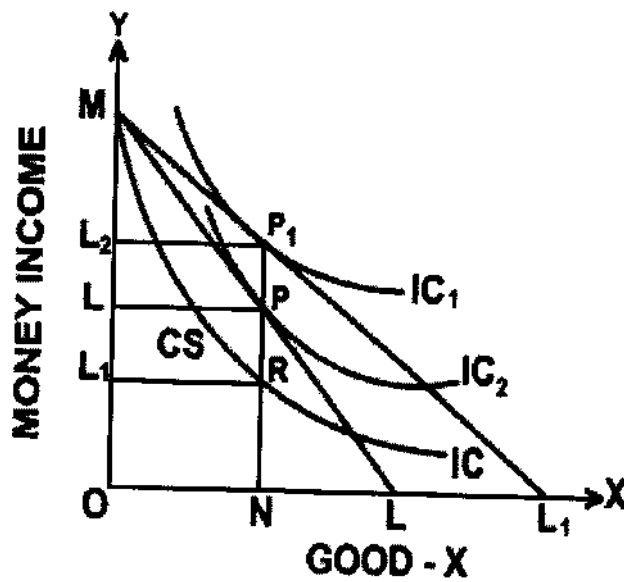


Fig.8.2

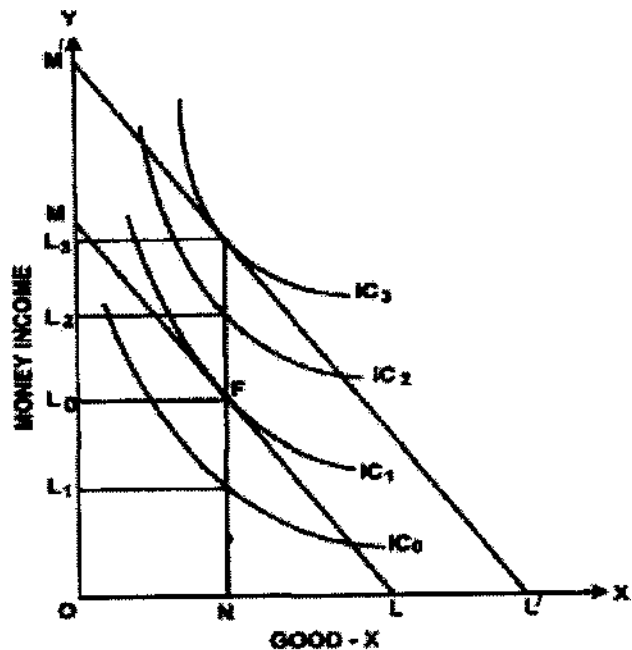


Fig.8.3

8.2.2 Change in Income and Consumer Surplus

Now we assume that money income of the consumer changes and price, remains constant. The increase in money income takes our consumer to higher indifference curve and decrease in money income takes our consumer to a lower difference curve. Due to increase in money income price shifts from ML to M_1L_1 in Fig. 8.3.

The original price line was ML and consumer Surplus was equal to LL_1 with imaginary IC_0 . Now with the increase in money income the price line shifts up to M_1L_1 and his surplus is now L_3L_2 with imaginary indifference curve IC_2 . This new price line tells us that consumer is now willing to pay M_1L_2 amount for ON number of goods. But he actually pays M_1L_3 . Hence, L_3L_2 is consumer surplus.

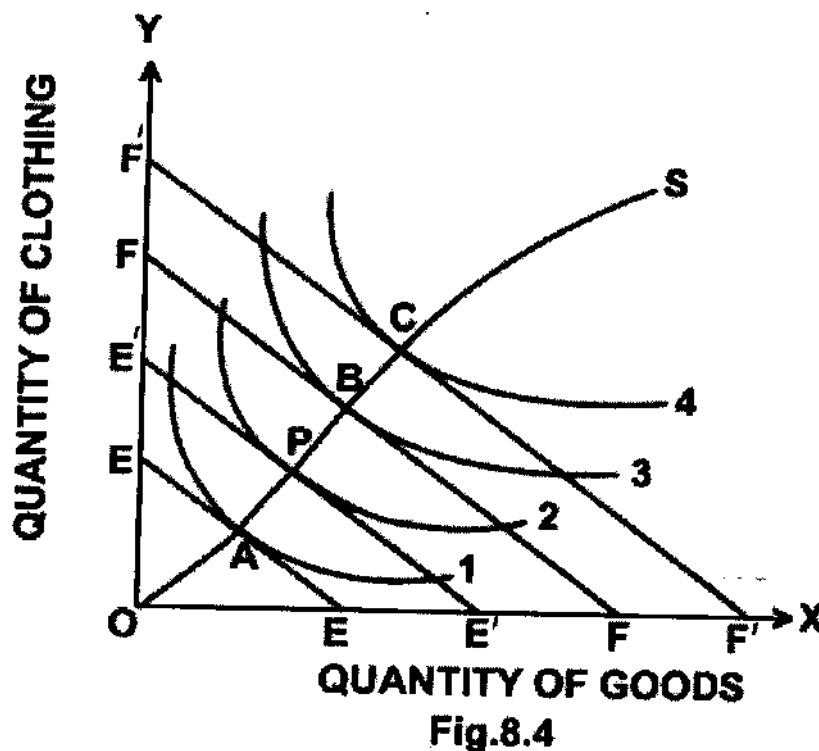
The consumer surplus above explained the difference between imaginary price and actual price. But, later on Hicks explained consumer surplus in such a manner, that consumer's income should be taken away either by taxation or by some other method. That it does not lead our consumer to higher indifference curve either due to fall in price or increase in money income, this whole increase be taxed in such a manner that it brings back our consumer to old IC or in other words which keeps him neither better off nor worse off than before.

Self Assessment Questions

Q. What is consumer Surplus.

8.3 APPLICATION TO THE HOUSEHOLD LIFE - THE BUDGET PROBLEM

The next-application of the indifference curve technique concerns itself with the division of consumers fixed income competing lines of expenditure in an optimum manner. Let us assume that these are only two types of goods - food and clothing to facilitate diagrammatic representation in Fig. 8.4.



In Fig. 8.4 we measure food on the horizontal axis and clothing on the vertical axis. As has already been explained in the preceding lesson, the consumer will arrive at an optimum combination of food and clothing at points like A, P, B, and C etc. Where the price lines EE, E'E', FF, F'F' are tangent to the indifference curves 1, 2, 3, 4, respectively. IOAPBCS - the locus of such points of equilibrium can be called the income consumption curve or the

standard of living curve, for it depicts the optimum combination of goods and clothing at different levels of income or standard of living. Thus, if we know the total income, the market prices of the given pair of goods and the difference map of a house-holder, we can determine the optimum allocation of the house holder's income between food and clothing or any other pair of goods. For more than two commodities we will need a diagram whose dimensions will be equal to the number of commodities. Since there are not more than two dimensions therefore, indifference curve analysis can at the most be applied to the three commodity case in which case we have indifference surfaces instead of usual indifference curve as such.

8.4 APPLICATION TO INCOME EARNING AND SUPPLY OF LABOUR

Income can be obtained by the following methods: (1) by selling labour, (2) income from assets, (3) gifts, etc.

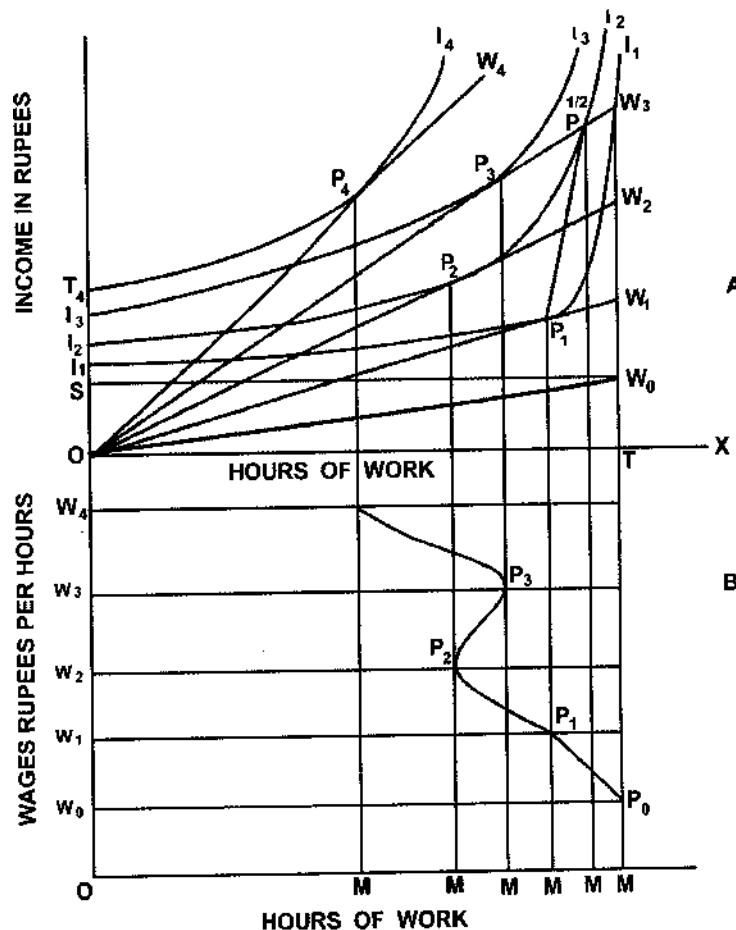


Fig.8.5

(1) Supply of Labour

Let us first consider the determination of income or earnings from work, i.e., income of type (1) I.C. by selling labour, Fig. 8.5 is divided into two parts, A and B. In part A, we measure hours of work on the horizontal axis and total income on the vertical axis. We assume, that a person can work as much as he wants within a maximum limit of time available to him per day. This limit cannot exceed 24 hours but in practice it is obviously

much lower. In the above Fig 8.5, it is assumed to be OT as the total working hours I_1I_1 , I_2I_2 , I_3I_3 , I_4I_4 are indifference curves between income and hours worked. These curves slope upwards to the right, because labour of work is regarded as a disutility, (on the assumption that one does not like to work) and therefore, as one increases one's hours of work, one requires increasing amounts of income to compensate for the disutility of increased work OW_0 , OW_1 , OW_2 , OW_3 , OW_4 are wage lines. Their slope represents difference value of hourly wage rates and as one moves to OW_1 , OW_2 , and so on up to OW_4 . The wage rate increases, because the slope of the successive wage lines goes on increasing.

The slope of OW_0 represents the subsistence wage rate below which no work will be offered. Therefore, all indifference curves lie above the line OW_0 .

As we know, P_1 , P_2 , P_3 , P_4 the points of tangency between the Indifference Curve I_1 , I_2 , to I_3 , I_4 and the wage lines OW_1 , to OW_4 respectively represent the optimal combination of work and income at different levels of the hourly wages rate. The slope of each indifference curve represents the marginal rate of substitution of work for income, and it increases as shown in the diagram.

With the help of the above analysis we can derive the supply curve of labour. In part B of Fig -8.6 we measure the wage rate on the vertical axis and the number of hours worked on the horizontal axis. The wage rate corresponding to the slope of OW_0 in Figure-5A is shown by OW_0 in Fig 8.6 along the vertical axis, and so on for OW_1 , OW_2 , OW_3 , etc. OM_1 , OM_2 , OM_3 , etc. represent the number of hours worked at the respective wage rates. In other words if the wage rate is OW_4 , OP_4 hours of work will be offered and so on. Therefore, the curve P_1 , P_2 , P_3 , etc. is the supply curve of labour. As the wage rate increases from OW_1 to OW_3 the hours of work offered decline, but then we have turning point at P_3 where the hours of work offered begin to increase as the wage rate increases. Then we have another turning point at P_3 where once again hours of work offered begin to decline with an increase in the wage rate.

(2) Division of Income into saving and Expenditure

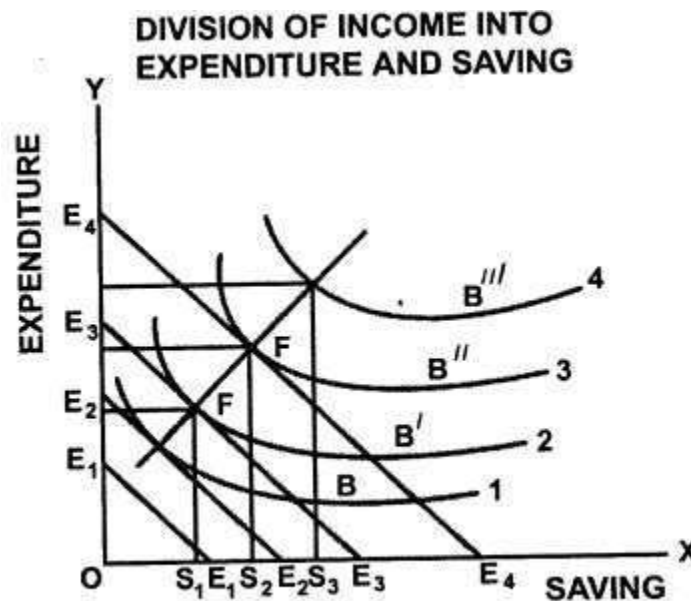


Fig.8.6

With the help of Fig.8.6 we can show the optimum division of income into expenditure and saving. We measure savings on the horizontal axis and expenditure on the vertical axis 1, 2, 3, 4, are the indifference curves between expenditure and saving. Their slope declines initially as one moves from left to right implying that one is willing to sacrifice expenditure for saving. But once expenditure reaches a certain minimum say at B on curve 1 or B on the curve 2 etc. then the slope becomes positive, because after these points saving becomes a "discommodity" i.e., now as one increases one's saving one is not willing to decrease one's expenditure but would like to increase expenditure along with saving, E_1, E_1, E_2, E_2 are the various possibility lines, each one of them relating to a given level of income. Suppose E_4 if the relevant possibility line, or the line which shows the income which is to be divided into expenditure and saving. If saving is zero, then expenditure is OE_4 and if expenditure is zero then saving is OE_4 . The optimum point is F_4 the point of tangency between E_4 and the indifference curve 3. At this income, the individual will save OS_2 and OE_3 of this income.

8.4 DIRECT VS. INDIRECT TAX : WHICH IS BETTER?

Under certain specified assumption, we can show with the help of indifference curves that *direct tax* of an equal amount is better than *indirect tax*. If government wants to raise its income, it can do so with the help of two methods i.e., by imposing taxes directly or by raising the prices of commodities indirectly. This is hard fact whether it is direct tax or indirect tax, both impose a burden on the people. The finance minister after reading the pulse of people decides which tax is felt least by customers. This we can explain with the help of Fig. 8.7.

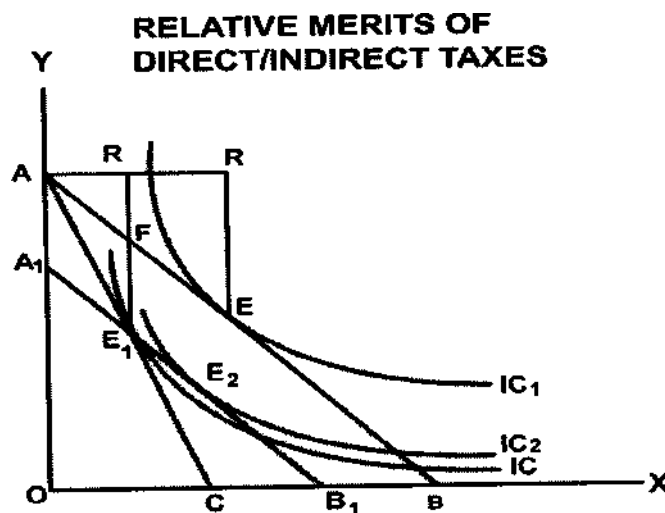


Fig.8.7

Fig. 8.7 represents commodities on X axis and money income on Y axis. We now draw a price line AB, whose slope is P_x/P_y . In such a situation consumer is in equilibrium at E where he is in a position to enjoy AR amount of commodity by spending RE amount of money income. If tax is imposed in the form of excise duty, then our consumers shall be in a position to buy lesser units of that commodity i.e., now with money income OA he shall be buying AC amount of commodity. Now consumer is at an equilibrium at E_1 i.e. he is buying AR_1 amount of X commodity with ER amount of money. Out of this money income FE_1 goes to the government as an excise duty. If this amount is collected directly by imposing direct

tax i.e. their income is reduced by imposing an income tax. Income will now be reduced from OA to OA_1 . The price of commodity remains the same i.e. slope of the price line remains the same. The new price line $A_1 B_1$ is lower than original price line but parallel to original price line AB . The consumer is now at equilibrium at E_2 which is on higher indifference curve. It proves that consumer will now be on a higher indifference curve. If a certain amount of money is taken from him by a personal income tax rather than by means of indirect tax.

Self Assessment Questions

Q. Which tax reduce consumer's satisfaction lesser. Direct tax or Indirect tax?

8.6 EXPLAINING WELFARE EFFECTS OF SUBSIDIES

In Fig. 8.8 we measure food on horizontal axis and money on vertical axis. Before the payment of subsidy, the price line is AB . With the payment of subsidy the price of food will fall, the price line will now be AD . At this new price after the subsidy has been paid. The consumer will be in equilibrium at H , where he will buy OL and AG units of money. If there were no subsidy, the consumer had to spend AJ amount of money to acquire the same OL amount of food. Therefore the magnitude of subsidy is $AJ - AG = GJ$ or HK .

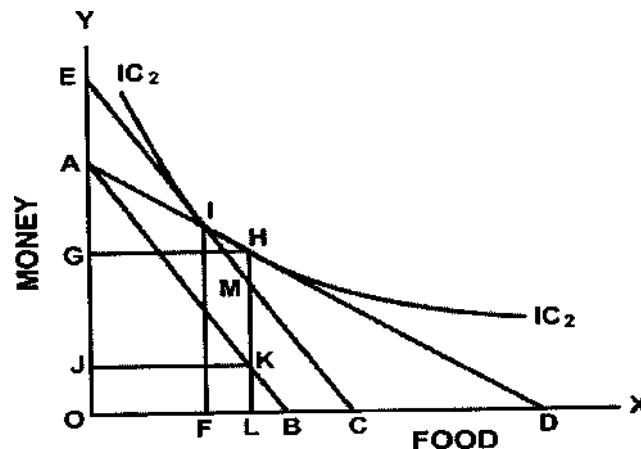


Fig.8.8

Now we have to find out the money value of this food subsidy to the consumer. We draw a new price line EC paralleled to AB which is tangential to indifference curve IC_2 at I . Thus, if we pay AE amount of money to the consumer we can make him reach the same indifference curve as he would have reached if GJ amount of money were paid by the Government as subsidy on food. But AE is less than GJ because

$$AE = MK$$

$$MK < HK$$

$$HK = GJ$$

$$AE < GJ$$

Thus it would be more efficient to make a cash payment to the consumer rather than giving a subsidy on food. But we can justify food subsidy from their welfare point of view.

Because whom food subsidy is given, they will consume more. This will improve their health and ultimately efficiency is also improved.

Self Assessment Questions

Q. What is a Subsidy? Give Examples

8.7 EFFICIENCY AND EQUITY IN RATIONING

It has become more necessary in undeveloped countries to ration certain commodities because of its scarcities. In buying these various goods in the market each individual consumer gives weight to his budget – In other words budget becomes the constraint with every consumer. In this process not all consumers obtained equal shares. Some get more and some get less depending upon their relative income. The extent to which system is equitable depends to what extent income is equally distributed. This is successful more there where income is equally distributed.

The rationing no doubt generally is accompanied by black marketing: very rarely does it occur without black marketing. We can take a specific example of fuel shortage in our country. Government is to reduce fuel consumption, so that we may escape from huge unfavourable balance of trade. The government can intervene by a special tax on fuel which will reduce its consumption or rationing can be enforced for reducing consumption. We explain it with help of Fig. 8.9 how rationing affects rich as well as poor.

In Fig. 8.9 on OX we measure commodity i.e. fuel and on axis OY we measure Money Income A_1B_1 is budget constraint of low income group. This budget line is tangent to IC_L^1 at F_L^1 . At this point 5 gallon of fuel is consumed by low income person A_hB_1 is the budget line of high income group persons. This is tangent to IC_k^1 at E_h^1 point he consumes 20 gallons. The total fuel consumed by both is 25 gallons. These both groups have attained their respective equilibrium after seeing this budget constraints. Now government takes up a decision not to allocate more than 10 gallons to each family. This restriction can be explained with the help of vertical line R. The effect of this restriction is more real on rich person than on poor. Because this restriction forces him to move E_1 to lower point i.e. E on IC_2H . Now rich man is forced to purchase less, i.e. from 20 gallons to 10 gallons. Now the total fuel consumed is 15 gallons rather than 20 gallons of both the groups. Because poor was already purchasing only 5 gallons. Now he is allowed to buy more but he does not because of his budget constraints. This will encourage black marketing. The poor will try transact his quota of surplus i.e. 5 gallons with rich.

Now if government allowed free exchange of ration coupons, what will be its impact? Now rich person can have additional fuel at much higher prices.

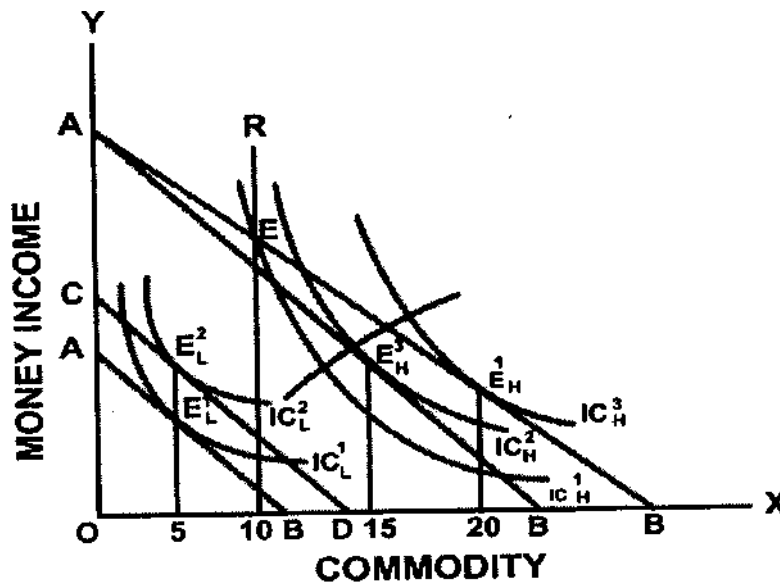


Fig.8.9

The poor persons succeeded in getting their incomes raised. This will take a poor person to higher IC_2 and higher budget constraint is shown by CD line. The price for high income group would be raised. This will restrict the budget line for person. Now his budget line will become AHB_2 . The rich man can move to higher IC_3H . This will help him in buying the surplus fuel equal to 5 gallon. In this way free exchange rationing seems to be more efficient because it helps in subsidising poor and creates less incentive for the black marketing.

8.8 MEASURING EFFECTS OF EXCISE AND INCOME SUBSIDIES

Indifference curves can also be used to measure the effects of alternate government policies i.e. to analyse and compare the effects of cash and kind subsidies or excise and income subsidy. Suppose that the government is planning to raise the levels of living of the poor families and has to make a choice between.

1. Income subsidy in the form of lumpsum money grant, and
2. Excise subsidy in the form of food subsidy, rent subsidy and loan subsidy.

The relevant question that arise in this regard are:

1. Which of these measures cost less to the government i.e. relative cost of these policies to the government.
2. Which of these measures would be preferable to the people who are intended to benefit from these policy measures.
3. The effect of these policies on the consumption pattern of the weaker sections of the society.

There issue can be resolved with the aid of indifference curves analysis. Let us analyse a simple case of choice between excise subsidy on the commodity (say x) and a lumpsum income subsidy i.e. cash subsidy granted is a single consumer.

Measuring the Financial cost of Excise subsidy

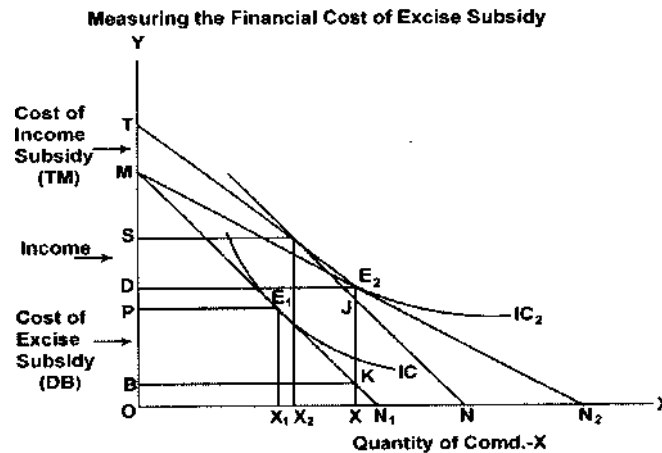


Figure-8.10

In Fig 8.10 vertical axis (OY) measures income and horizontal axis (OX) measures quantity of commodity-X, consumers budget line is shown by MN_1 which represent consumers budgetary options in the absence of excise or income subsidy. Initially the consumer is in equilibrium at point E_1 where he consumes OX_1 units of X and pay MP of his income and thus he is left with OP money income for other goods.

Now suppose, the government subsidizes commodity X by 50 percent of its price so that the price which consumer pays is reduced to half. As a result, budget line shifts to MN_2 and the consumer moves to equilibrium position E_2 , here he consumes OX_3 units of x and pays MD portion of his money income. In the absence of excise subsidy, consumer would have paid MB money income for OX_3 , Thus $MB-MD$ i.e. DB is the cost of subsidy to the government.

Thus, In case the government adopts a policy of subsidy (kind subsidy or price subsidy) we will have following effects.

1. The market price of product-X (subsidized product) remains constant, unchanged. However, a part of market price will be paid by the government to the producers, so that consumers pay the remaining part of the market price.
2. The financial cost of excise subsidy to the government is DB .
3. The subsidy on good-x has a tendency to impose a pattern of consumption in favour of good-x i.e. its consumption increases.
4. It is certain that the section of society receiving subsidy on good-x will consume more of good-x. Thus the subsidy benefits not only the consumers but also the producers.
5. Subsidisation of product is also useful where there is surplus of good x in the economy. Increased consumption will exhaust surplus.

8.9 MEASURING THE FINANCIAL COST OF LUMP SUM INCOME SUBSIDY

Now, let us consider what happens if the government replaces excise subsidy by income subsidy or cash subsidy. The effect of cash subsidy is shown in Figure-8.10

Suppose that the government supplements consumers income by an amount that makes him to move from $1C$, to $1C^2$, where he had reached after subsidization of commodity-

x that is, consumer is given so much of income subsidy which is just sufficient to maintain the levels of consumers utility with the price subsidy. The effect of cash subsidy or income subsidy can be obtained by drawing a budget line parallel to the original budget line MN_1 and tangent to IC_2 as shown by the budget line TN . With new budget line drawn, the consumer reaches the equilibrium point E_3 on IC_2 , where he consumes OX_2 of commodity-x for which he pays TS of his income including income subsidy of TS paid by the consumer TM is income subsidy. Thus, cost of income subsidy to the government is TM .

On comparison of the two kind of subsidies, it may be seen that cost of excise subsidy ($DB=E_2K$) is greater than the cash/income subsidy ($TM=JK$) though both the policy measures achieve the same goal of increasing consumers satisfaction to the level shown by IC_2 .

The conclusion that may be drawn from the foregoing analysis may be summed up as follow.

1. It the level of consumers satisfaction under both subsidy scheme is maintained at the same level, cost of income/cash subsidy will be lower than that of excise subsidy. Therefore, income subsidy is more efficient from the governments point of view.

8.10 DERIVATION OF LABOUR SUPPLY CURVE

The labour supply curve shows the relationship between supply of labour and wage rate. Labour supply curve is a backward bending curve. The backward bend in the supply curve is the result of labours choice between leisure and work (income). The indifference curves can be applied to show labours choice between income and leisure to define the supply curve of labour.

Income-Leisure Choice

Let us assume that utility function of an individual worker is given as: $U=f(M, L)$, Where M = Money income from work and L = leisure, 'We also assume that an individual divides his daily time between work and leisure so as to maximize his utility function. Given the number of hours at his disposal, if he increases his hour of work, his income increases but his hours of leisure decreases and vice-versa. Labour treated income and leisure as substitutes for one another. A utility maximizing labour has find a leisure-income combination that maximizes his total utility.

Let us see how a labour makes his choice between leisure and income to maximize his utility function by applying the indifference curves.

The income-leisure choice of the labour is shown in Figure 8.11 in which x-axis measures the hour available to the workers and y-axis measures his money income.

Let us assume that total hours available to the labour are OH and that hourly wages are fixed at \bar{W} . If he works for OH hours and enjoy no leisure, his total income will be $OM = OH$. If the labour enjoys his whole time (OH) as leisure, he will be at point H with zero income. By the points M and H we get his income-leisure line MH . This line shows income-leisure combination at a given wage rate \bar{W} . It may be noted that the slope of income-leisure line is $OM/OH = \bar{W}$. Assume that indifference curve of an individual labour between income and leisure is given by IC in diagram 8.11. This curve is known as income-leisure trade-off curve. Its slope measures the $MRSLM$, between income and leisure $\Delta M/\Delta L$. The labours equilibrium takes place at point E , where income-leisure line is tangent to income-leisure trade-off curve. It implies that an individual workers is in equilibrium at point E , which is

labour's optimum combination of income and leisure, with OP of income and ON leisure-hours and NH work-hours. Thus, he maximizes his utility function at point E where $MU_m = MU_L$, given the wage rate.

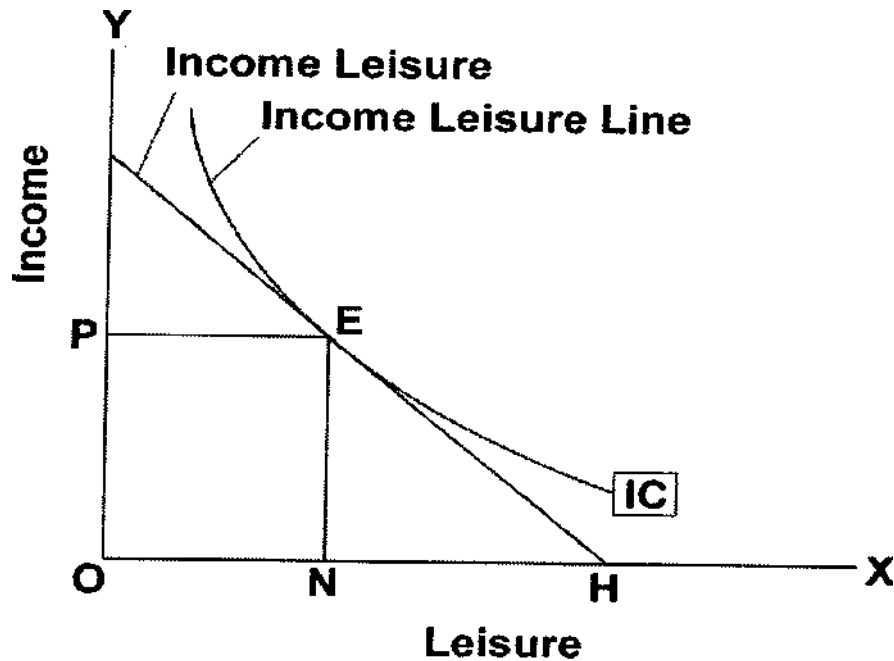
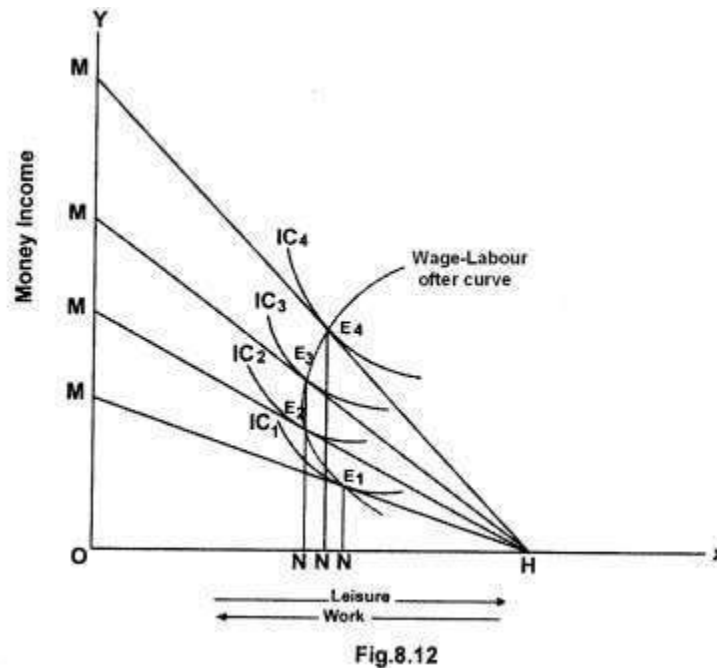


Fig.8.11

However, with a change in wage rate and consequent increase in wage income the equilibrium combination of labour and income goes on changing. When wage rate continue to increase, the labour cuts his leisure and works for large number of hours for higher income, but beyond a certain level of income, but beyond a certain level of income this trend is reversed. This kind of labour behaviour is shown by a wage-labour offer curve. The derivation of wage-labour offer curve and labour supply curve is shown below.

8.10.1 Wage-Labour offer curve and Labour Supply curve

Figure-8.12 shows labours equilibrium under static conditions. Under dynamic conditions wage rates tend to change, with the change in wage rate, labours preference for work and leisure changes. For example if wage rate increase, labour's preference for working large number of hours increases to earn higher income and his preference for leisure decreases---upto a point of course. This kind of behaviour of the labour from the basis of the labour supply. Labour supply curve is derived from the wage-labour offer curve. The *wage-labour offer curve* may be derived by introducing changes in wage rate into above analysis. The process of deriving wage-offer curve is shown in Figure-8.12.



Suppose that a labour is initially in equilibrium at point E_1 , where his income-leisure line M_1H is tangent to his income-leisure trade-off curve IC_1 . At this equilibrium point, the labour optimizes his income-leisure combination. He enjoys a leisure of ON_1 hours and he works for N_1H hours. By working for N_1H hours, he earns an income of E_1N_1 . Let the wage rate increase so that his income-leisure line shifts upwards to M_2H and he moves to equilibrium point E_2 . It may be seen that his leisure hours decrease and work hour increases. As a result his income increases to E_2M_2 . This trend continues until he reaches equilibrium point E_3 . But beyond this point preference for leisure increases with increase in his income. If we join equilibrium points E_1, E_2, E_3, E_4 by a curve we get the wage-labour-offer curve which forms the basis of the labour supply curve.

Self Assessment Questions

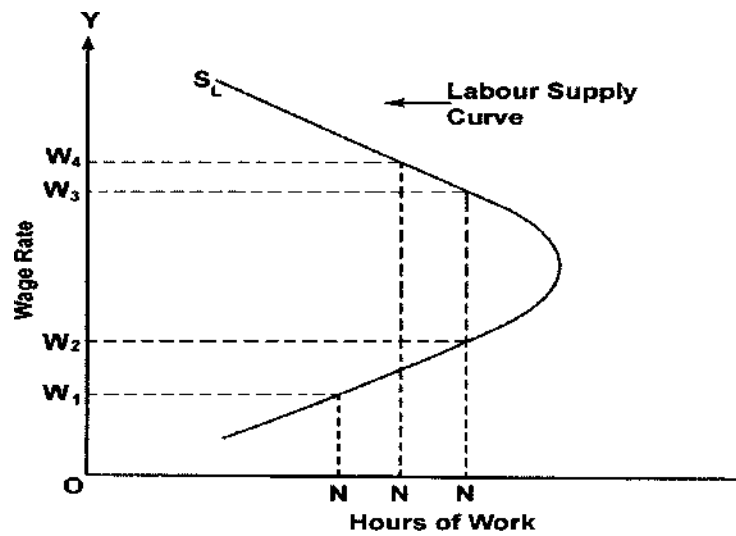
Q. What is the Wage-Labour offer curve?

Figure 8.12 provides data required for drawing the labour supply curve. To draw the labour supply curve we need the wage rate and labour supplied, i.e., hours of work at different wage rates. The wage rate is given by the slope of the income-leisure lines. For example, the slope of the income-leisure line M_1H equals $OM_1/OH = \text{wage rate}$. We denote this wage rate by W_1 . At wage rate W_1 , labour is in equilibrium at E_1 and his labour supply is HN_1 . Similarly, wage rates can be obtained and corresponding labour supply, i.e., preference for labour-hours, for other equilibrium points as given in the following table.

Table-1-Wage Rate and Labour Supply

Equilibrium Points	Wage Rate	Labour Supply
E ₁	$OM_1/OH = W_1$	HN ₁
E ₂	$OM_2/OH = W_2$	HN ₂
E ₃	$OM_3/OH = W_3$	HN ₃
E ₄	$OM_4/OH = W_4$	HN ₄

By plotting the wage rate and labour supply given in the table we get labour supply curve as shown in Figure. 8.13.

**Fig.8.13**

As the figure shows, the labour supply curve has a backward bend beyond a certain wage rate. This shows that labour supply curve is backward bending.

Self Assessment Questions

Q. What is the slope of Labour Supply Curve for an Individual?

8.11 INTERTEMPORAL CHOICE OF CONSUMPTIONS:

Intertemporal choice of consumption refers to the way how the consumers rearrange their consumption over time. Consumers do this by way of saving or borrowing, saving means consuming less out of current income which means consuming more at a later date. Borrowing means consuming more than the current income but in this case, future consumption should be less than future income so that loans can be repaid. It is clear from above that intertemporal consumption means a decision of consumer to rearrange consumption between various time periods. Let us assume that life time span for a consumer

is two years i.e. year 1 (Current year) and year 2 (Next Year). In year 1 his income is 10000 which would fall to 2200 in year 2 let us further assume that there is no inflation and the interest rate at which consumer can borrow funds is 10 percent. This information is shown diagrammatically through budget line and indifference curve. In diagram 8.14, year 1 consumption is shown on vertical axis and year 2 consumption is shown on horizontal axis. The budgeted line shows the different combinations available to the consumer. For example, at point A, the consumer has a consumption mix which contains Rs 10000 consumption in year 1 which is equal to the first year earning of Rs. 10000 and Rs. 2200 is 2nd year consumption which is equal to the 2nd year earning of Rs. 2200. This point 'A' shows the consumption mix in the absence of saving or borrowing. Let us identify the another point on budget line. Suppose all income of Rs. 10000 is saved in year 1, then this year, consumption would become zero but in year 2 consumption would increase to Rs. 13200 i.e. income saved in year one (10000) + 10% interest on that saving (Rs 1000) + earning of 2nd year (2200) which becomes equal to Rs. 13200.

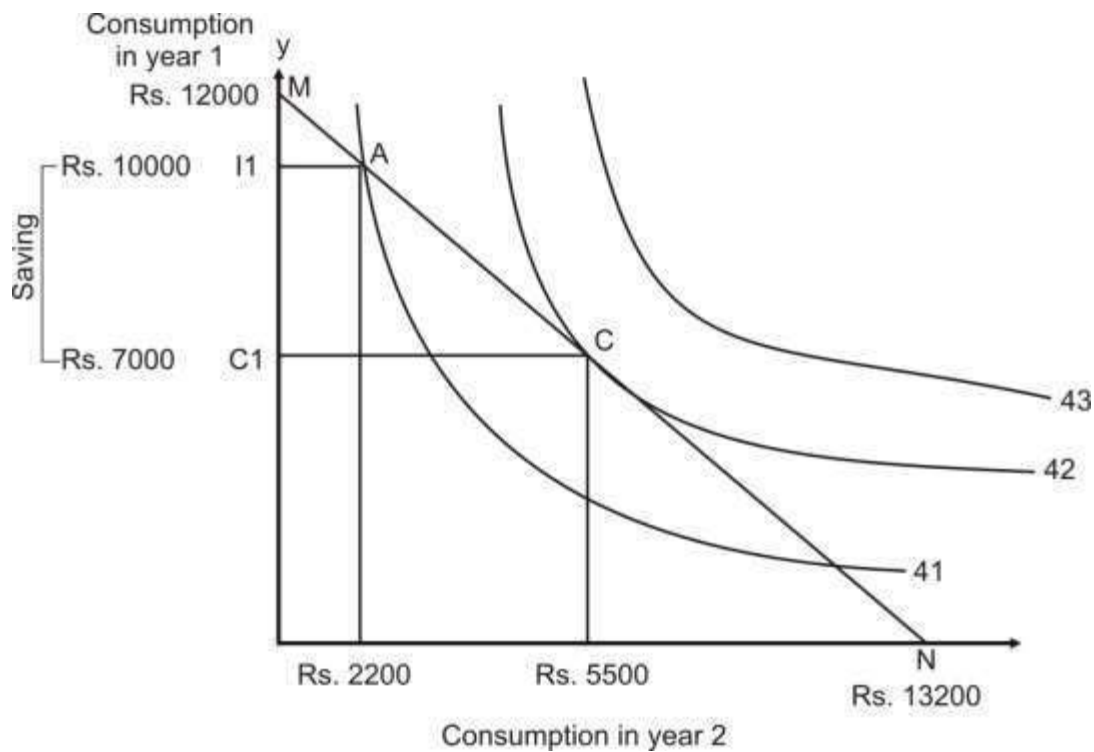


Figure 8.14

This is represented by point N which shows zero consumption in year 1 and Rs. 13200 consumption in 2nd year. The vertical intercept shows the consumption of 12000 at point M. It is the maximum consumption in year 1 which is achieved by borrowing of Rs. 2000. Since Rs. 2000 plus 10 percent interest i.e. Rs. 2200 must be repaid in the next year and this amount equals total earning of 2nd year with nothing left for consumption. All these points A, M and N represent three points on budget line. MN is the budget line. Any point along the line AN shows consuming less than earnings in year 1 and consuming more than earning in year 2. But 'MA' part shows borrowing in year 1 and repaying loan in year 2. Let us assume that consumer's preferences come in the picture. As consumption in both years is desirable the IC shows, the MRS between consumption in year one and consumption in year two. With indifference curve, equilibrium occurs at point E where consumption in year one is Rs. 7000

and in second year it is Rs. 5500. It must be noted that consumer saves some of year one earnings as indicated by the choice to consume less than Rs. 10000 in year one. This amount of saving in year one is the difference between income and consumption in that year which is shown by the distance $I'C'$ or Rs. 3000. In year two the individuals' consumption is Rs. 3300 which is greater than year two earnings. This sum is equal to the amount saved (Rs. 3300) plus interest on saving. In this way intertemporal choice of consumption is made clear with the help of indifference curve.

Self Assessment Questions

Q. What do you know about intertemporal choice of consumption?

8.12 SUMMARY

The newly flourished field of Behavioral Economics has broadened and enriched the study of micro economics. It has highlighted some examples of consumers behaviour that can not be easily explained with the basic utility-maximizing assumption that we have relied on so far. It has improved our understanding of consumer demand as well as the decision of firm by incorporating more realistic and detailed assumptions regarding human behaviour.

Behavioral economics seeks to enrich traditional economic analysis by offering a fuller picture of how individuals and other economic agents actually behave or operate in the market place.

Where does this leave us? Should we dispense with the traditional consumer theory. Not at all. In fact the basic theory that we learned upto now works quite well in many situations of helps us to understand and evaluate the characteristics of consumers demand and to predict the impact on demand of changes in prices or incomes. Although it does not explain all consumers decisions, it shed light on many of them. The developing field of behavioral economics tries to explain and to elaborate on those situations that are not well explained by the basic consumer models.

8.13 GLOSSARY

- **Consumer Surplus** : It refers to difference between expected satisfaction and actual satisfaction.
- **Direct Tax** : The tax is levied on a person and is paid by the same person eg. income tax.
- **Indirect Tax** : The tax is levied on a producer for producing good and he shifts it to consumer. It is a type of indirect tax eg excise duty.
- **Subsidy** : The monetary benefit received for producing to good. Tax is paid, subsidy is benefit received.
- **Behavioral economics** : It is the study of how people actually make choices in the real world by drawing an insights from psychology and economics.

8.14 REFERENCE

- Koutsoyiannis, A. (1977). *Modern Micro Economics*. McMillan Hall, London.
- Ahuja, H.L. (2014). *Advanced Micro Economic Theory*. S. Chand Pvt. Ltd..

8.15 FURTHER READING

- Koutsoyiannis, A. (1977). *Modern Micro Economics*. McMillan Hall, London.

8.16 Model Question

1. Using indifference curve analysis show that income subsidy provided to the poor people involves lower financial cost to the government than excise subsidy for a given increase in the consumption of poor families.
2. Suppose a labour has his utility function given as $U = f(M, L)$ where M is labour income and L is leisure. What is the condition for the labour to optimize his income and leisure. Illustrate the equilibrium position of the labour.
3. Using indifference curve analysis, illustrate the derivation of labour supply curve. Why is the labour supply curve backward bending.
4. Discuss the important applications of Indifference Curve Analysis.

Note: Using Hicksian and Slutsky's Substitution effect studied in this lesson, the derivation of Compensated Demand Curves have been discussed in Lesson-10.

DERIVATION OF MARSHALLIAN AND SLUTSKY'S COMPENSATED DEMAND CURVES

Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Marshallian Demand Curve and Ordinal PCC
 - 9.2.1 Derivation of Market DD Curve
- 9.3 Comparative Demand Curve
 - 9.3.1 Marshall's Version
 - 9.3.2 Hicksian Version
 - 9.3.3 Slutsky's Version
- 9.4 Superiority of IC Analysis over Marshallian Utility Analysis
- 9.5 Limitations of IC Analysis
- 9.6 Summary
- 9.7 Glossary
- 9.8 References
- 9.9 Further Readings
- 9.10 Model Question

9.0 OBJECTIVES

After going through this lesson, you shall be able to :

- elaborate how Marshallian demand curve is drawn with the help of indifference curves analysis.
- explain compensated demand curve.
- differentiate between ordinary demand curve and compensated demand curve.
- discuss how comparative demand curves are drawn.
- draw difference among Marshallian, Hicksian and Slutsky's demand curves.

9.1 INTRODUCTION

In this lesson, you shall study about derivation of demand curve with the help of indifference curve analysis; compensated demand curves of Hicks and Slutsky; and shall learn differences among Marshallian, Hicksian and Slutsky's demand curves.

9.2 MARSHALLIAN DD CURVE AND ORDINAL PCC

In Marshallian utility analysis approach demand curve was derived on the assumption that (a) utility is a cardinal subject (b) utility is measurable (c) Marginal Utility of money remains as 'constant, whereas in indifference approach demand curve is derived without

taking these; assumption. This difference between these two i.e. conventional price quantity demand curve and price consumption curve is as follows

- The Price Consumption Curve takes quantity on X axis and money, income on Y axis, while conventional demand curve is drawn with price on Y axis and quantity demanded on X-axis
- In Prices Consumption Curve price is not directly mentioned rather price line indicates the ratio of price between two whereas in conventional demand curve price is clearly mentioned
- Price Consumption Curve clearly tells us the split between Income and substitution effect, i.e. how much increase is due to Income and substitution effect, whereas conventional demand curve does no do so.
- The Price Consumption curve also tells us the size of the Income of the consumer, while conventional demand curve does not provide this information.

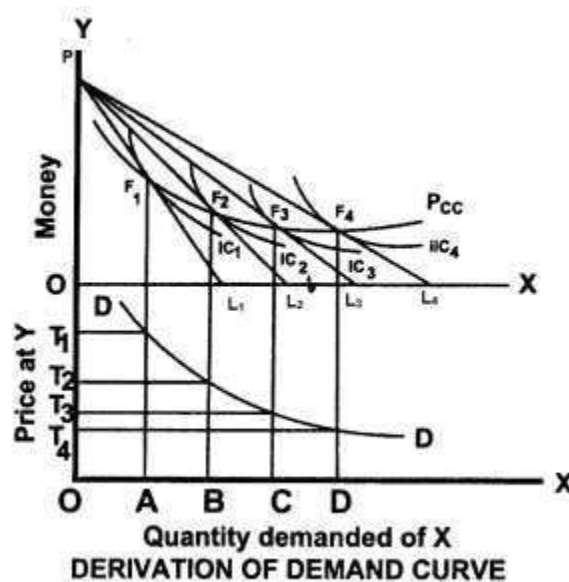


Fig. 9.1

The derivation of demand curve from Price Consumption Curve can be done by containing both conventional demand curve and the price consumption curve.

In fig. 9.1 money is measured on Y axis and quantity demanded on X axis. An indifference map of the consumer is drawn along with various price lines showing different prices of good X. Price line PL_1 tells us that price of good X is OTF_1 . As the price of good X falls from OF_1 to OF_2 . The price line shifts to P_4 . When price falls to OF_4 . The price line shifts to PL_3 . When price further falls to OF_4 the price line shifts to PL_4 . The Price Consumption Curve is derived after joining tangency points between price lines and indifference curves. At various tangency points consumer has been at an equilibrium at F_1 (with price line PL_1) F_2 (with price line PL_2) F_2 (with price line PL_3) It is thus clear from price consumption curve that we get information when it is required to draw the demand curve-showing directly the amount demanded of the good X at various prices.

In figure 9.2 we show commodity on X-axis we have shown money as representing all other commodities. The price or all these commodities are assumed to be fixed. Price of X falls and every fall in the price of X gives rise to new price line. (The indifference map is independent of the income and price of the various commodities). It is based upon tastes

and preferences of the consumer. These are assumed to be fixed. So nothing happens to the indifference curves in the indifference map as the price of X changes. Their positions in all respects remain unchanged). With the fall in the price of X as is clear from the fig. 10.2, the point of consumer's equilibrium undergoes a change. From G, it has moved to H, I and M with each successive fall in the price of X. These equilibrium points indicate the combinations of the commodity X and other commodities (represented by money) which consumer will buy in order to maximise his satisfaction. For knowing what happens to demand for when price of X falls we have to see only to the amount of commodity X in each of these combinations. We need not try to know what happens to other commodities in the combinations at the equilibrium point. So, we shall be concentrating our attention on the consumption of commodity X in fig. 9.2.

It is easy to prepare the demand curve for X from the Fig. 9.2.

Let us, first of all, take up the price line AB, we know that, if the given income is OA, the consumer **can purchase ON units** of X with it. In other words, the price of X as indicated by the slope of the price line AB is OA/OB . With this price line equilibrium of the consumer is at point G. The consumption of X at this point of equilibrium is ON. So we can say that at OA/OB price of X, demand for commodity X is ON. Similarly, at price line AC demand for commodity X is OP at (equilibrium point H (i.e. OA/OC) we, thus, find that as the price of X falls the demand for it goes on increasing as shown by points I and N.

We can, in fact, geometrically derive the demand curve straight from the fig. 15 as follows :

Take, first of all, the price line AB, Make one unit X to the right of N (the amount demanded with AB as the price line) at point T. Draw a line parallel to AB from this point T, (on OY, passing the J and touching OX), cutting NG at J.

$$\text{Now as TJ is parallel to AB} = \frac{AO}{OB} = \frac{JN}{NT}$$

Price of X as NT is equal to I (by construction NJ will be equal to the price of X). In other words, points J shows price of X and the amount demanded (ON) at this price.

Similarly, other points indicating the price at amount OP OR and OS can be found out. These points are, V, K and Z. If we join J, V, K and Z, we get the required demand curve. The demand curve as we can see, is sloping downwards to the right.

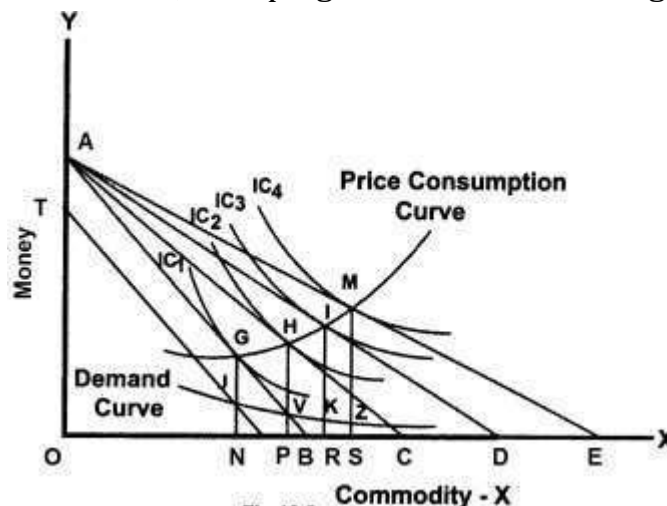


Fig. 9.2

10.2.1 Derivation or Market Demand Curve (With the Help of Indifference Curves)

When we combine the demand curves of individuals, we get the market demand curves. This summation of demand curve we show with the help of an example and fig. 10.3. Supposing there are three consumers who are buying the goods at given price. If price for any good is OP. demand for consumer A is OX, B is OY, C is OZ.

If we combine the demand curves of three i.e. $(D_a + D_b + D_c)$ we get the market demand curve D abc. The market demand curve normally slopes downwards from left to right.

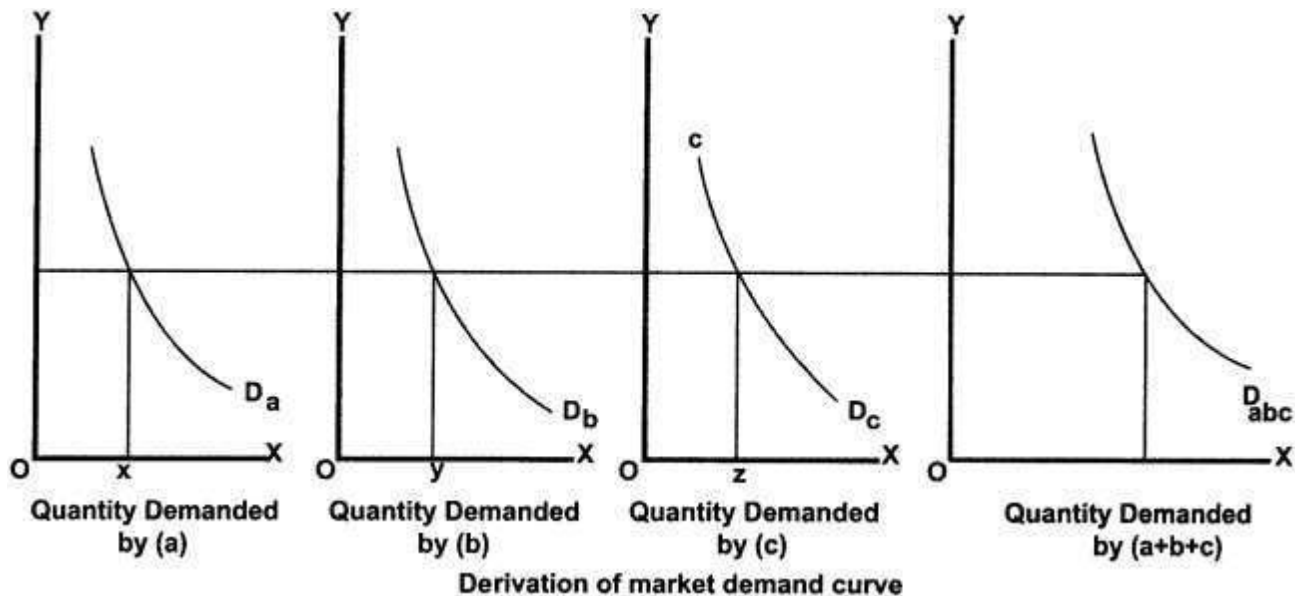


Fig. 9.3

It is probable that with the change in price. A consumer buys more, and B may not buy more on account of inferior commodity. But ultimately Market demand curve will slope downwards from left to right. This may happen because a good is Giffen for an individual but not for whole market. This downward sloping demand curve is due to various factors (a) when price falls many new consumers enter the market and start buying goods at a lesser price. At lower price good will be substituted more. Normally consumer buys more of cheaper goods. A fall in the price of goods will also result in an increase in real income. With an increase in his real income he shall be in a position to buy more of the goods. Lastly, we can say to equate Marginal Utility with price, at lower price goods must be bought more.

9.3 COMPARATIVE DEMAND CURVES

In the first instance it must be remembered that all the three types of substitution effects are based on different assumptions of Marshall, Hicks and Slutsky :

- (i) Dr. Marshall's price effect which is a combination of income and Substitution effects, is based on the assumption that money income remains constant. In this case the substitution effect is not isolated from the real-income effect of a price change.
- (ii) Hicksian and Slutsky substitution effects are quite exclusive of income effect and they are based on the constancy of real income of the consumer.

Based upon these assumptions, we can show the geometric relationship among the three types of demand curves or the nature and extent of the substitution effects in terms of Marshall's Hick's and Slutsky's analysis, when there is (i) a fall in the price of the commodity and (ii) when there is a rise in the price of commodity.

The three figures below (9.4 to 9.6) depict the substitution effects of a fall in price as conceived by Marshall, Hicks and Slutsky respectively.

9.3.1 Marshall's Version

Of course, Marshall's substitution effect is a crude one as it includes the real income effect also which Marshall could not conceptually eliminate to arrive at the pure substitution effect

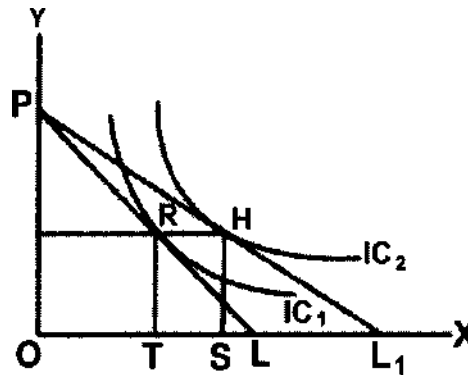


Fig. 9.4

Marshall's Version

When price of the commodity falls and price line changes from PL to PL₁, no distinction is made between the price effect and substitution effect. The whole of the change in demand (=TS) is treated as substitution effect or price effect.

9.3.2 Hicksian Version

Here KM or FW is the substitution effect. (refer Fig.10.5) It is less elastic than Marshall's for the obvious reason that does not include the income effect as Marshall's version does.

9.4.3 Slutsky's Version

Here GB or JQ is the substitution effect (refer Fig.10.6) which is more elastic than Hick's but less elastic than Marshall's.

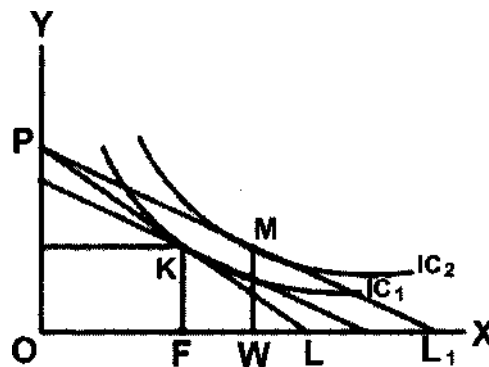


Fig. 9.5

Hicksian Version

To put the whole analysis in a nutshell.

- (i) Marshall does not separate the income effect from the substitution effect, therefore, in his case, the consequence of a price fall is that demand rises more, and if the price rises, the demand decreases more than in the case of Hicks and Slutsky.
- (ii) Since Slutsky's substitution effect is larger than Hicks' for a fall in price, the increase in demand will be more for Slutsky than for Hicks. Likewise, since Slutsky's substitution effect is smaller than Hicks' for a rise in price, the

Marshall's demand curve is more elastic than Slutsky's which is more elastic than Hicks'

decrease in demand will be less for Slutsky's than for Hicks.

If we translate these conclusions in the form of one diagram, we get fig. 9.7 which depicts the relative elasticities of the demand curves of Marshall, Hicks and Slutsky for a fall in price.

Similarly, the path or extent of substitution effects when price rises can be traced in all three versions. The combined picture of effects would be as shown in fig. 10.8. Here Marshall's demand curve is, again, more elastic than either of Hicks' and Slutsky's but now Hicks' demand is more elastic than Slutsky's.

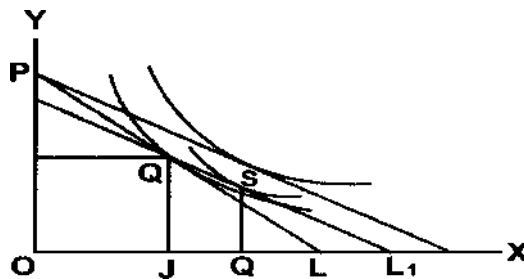


Fig. 9.6

Slutsky's Version

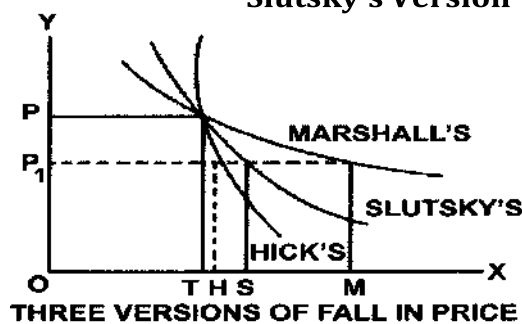


Fig. 9.7

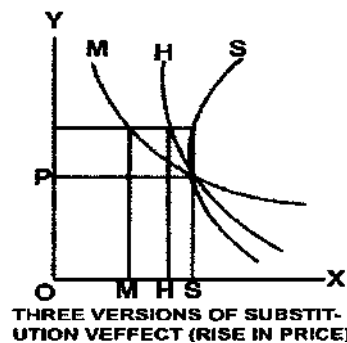


Fig. 9.8

9.4 SUPERIORITY OF INDIFFERENCE CURVES OVER THE MARSHALLIAN UTILITY ANALYSIS

However, despite their identical results, indifference analysis is regarded to be superior. The indifference curve approach is said to be superior to the Marshallian utility approach mainly on account of two reasons;

First, it arrives at the same results with regard to consumer's equilibrium at the Marshallian utility approach with less restrictive assumptions. Secondly, the Marshallian approach cannot explain why the demand for certain goods falls when its, price falls. This is known as the Giffen Paradox. This Paradox could not be explained by Marshall because it failed to isolate the Income effect and the substitution effect of a price change. Indifference curve analysis is superior because it is able to isolate the income effect and substitution effect of a price change and is thus able to explain the case of Giffen goods also.

Second, Marshallian analysis assumes that marginal utility or demand for a commodity is independent of that for other goods. Thus he confines himself to a single good model and is unable to analyse multi-good models. But indifference curve Technique helps in analysing such situation by using an extra division.

The indifference curve technique enables us to translate the welfare consequences of price changes into changes in income. For instance if the price falls the consumers move to higher level of satisfaction (higher indifference. curve) in the same way as he would do if his income goes up. This is how a price change causes a change in welfare. This fact is brought out by the indifference curve technique.

It succeeds successfully discarding Marshallian approach which is based on cardinal utility. In fact, utility is an ordinal object. Hence indifference curve technique is less restrictive and more realistic.

Similarity of Indifference Curve and Marshallian Utility Approaches

If there are two commodities A,B, with price A and B under the indifference curve approach the consumer will be in equilibrium, when

$$\text{MRS of X for Y} = \frac{\text{Price of X}}{\text{Price of Y}} \quad \text{-----(1)}$$

MRS of X for Y is defined as the ratio between the marginal utilities of X and Y. i.e. =

$$\text{MRS}_{XY} = \frac{\text{MU of X}}{\text{MU of Y}} \quad \text{Where MU stands for marginal utility. -----(2)}$$

$$\text{i.e.} \quad \frac{\text{MU of X}}{\text{MU of Y}} = \frac{\text{Price of X}}{\text{Price of Y}} \quad \text{(From 1 and 2)}$$

$$\text{or} \quad \frac{\text{MU of X}}{\text{Price of X}} = \frac{\text{MU of Y}}{\text{Price of Y}}$$

This is the condition of equilibrium postulated by Marshall. This shows the similarity of the indifference curve and the Marshallian approach. The results in both the theories are the same.

9.5 LIMITATIONS OF INDIFFERENCE CURVE ANALYSIS

However the indifference curve analysis has its own limitations as follows :

- (i) It makes the assumptions that the, consumer possesses a complete knowledge of his indifference map, which is highly unrealistic assumption therefore any theory based on them will be non-operational.

- (ii) In dealing with more than two goods, the indifference curve technique becomes highly complicated, because we have to use a more than two dimensional diagram, the dimensions depending upon the number of commodities. We can at best draw three dimensional diagrams.
- (iii) It makes the assumption of continuity, while there are discontinuities in the real world, because there are few goods, in the real world, which possess perfect divisibility.
- (iv) It also makes the assumption of transitivity which may be violated in the real world. Transitivity of choice implies that if a consumer is indifferent between A and B and also between B and C then he must be indifferent between A and C. But if he is indifferent between A and B and between B and C because the difference between the two alternatives in each pair is imperceptible, the difference between A and C may become perceptible and he may either prefer A to C or C to A. Choices then, become non-transitive become meaningless.
- (v) This technique breaks down, if risk and uncertainty are present in the economy. It ignores dynamic consideration like speculation etc. For under speculation if the price of a commodity falls, its demand also declines since people expect the price to fall further and will want to purchase it only when they no longer expect the price to fall any further.

Self Assessment Question

Q. Define ICC and PCC.

9.6 SUMMARY

The basic purpose of the analysis of consumers behaviour is to derive a consumer's demand curve. The logic of consumer equilibrium provides a convenient basis for the derivation of individual demand curve. Using it we derived market demand curve. Then using the concept of substitution effect, we studied about Hicks and Slutsky's compensated demand curve. The diagrammatic analysis of the comparative demand curves depicts the relative elasticities of the Marshall's Hicks and Slutsky's demand curve for a fall in price. Marshall's demand curve is more elastic than Slutsky's which is more elastic than Hicks.

Hicks and Slutsky's compensated demand curve only incorporates the substitution effect. Since Slutsky's substitution effect is larger than Hicks for a fall in price, the increase in demand will be more for Slutsky than for Hicks. Like-wise since Slutsky's substitution effect is smaller than Hicks for a rise in price, the decrease in demand will be less for Slutsky's than for Hicks's.

9.7 GLOSSARY

- **Price Consumption Curve** : PCC for a good joins consumer's optimum points resulting when only two prices of the good vary. The curve shows the amount of the good that the consumer would purchase per unit at various prices of the good while holding everything else constant. The individual's consumer demand curve for a good is negatively sloped reflecting the law of demand.

- **Market Demand Curve** : The horizontal summation of individual consumers demand curves helps us to derive the market demand curve.
- **Ordinary Demand Curve** : incorporates both income and substitution effect. If the good is normal, the income effect reinforces the substitution effect in increasing the quantity purchased of the good. Consequently Marshallian demand curve slopes downward from left to right.
- **Compensated Demand Curve** : The decomposition of the price effect into its constituents i.e. income effect and substitution effect provides a basis for the derivation of compensated demand curve.

9.8 REFERENCE

- Koutsyannis, A (1977) : Modern Micro Economics, McMillan Press.

9.9 FURTHER READING

- Koutsyannis, A (1977) : Modern Micro Economics, McMillan Press.

9.10 Model Questions

1. Define the term 'compensated demand curve' How does it differ from an ordinary demand curve for a commodity. Derive and compare Marshallian, Hicksian and Slutskys demand curve for a normal commodity whose price has fallen.
2. What do you mean by a price consumption curve? What does it show? Is it possible to derive the price-Quantity demand curve from the price-consumption curve.
3. While ordinary demand curve may or may not slope downwards, compensated demand curve always slope downward, Explain and illustrate.

CONSUMER'S SURPLUS HICK'S AND MARSHALLIAN APPROACH

Structure

- 10.0 Objectives
- 10.1 Introduction
- 10.2 Consumer's Surplus : Marshall
- 10.3 Marshallian Measure of Consumer Surplus
 - 10.3.1 Diagrammatic Explanation
 - 10.3.2 Assumptions
 - 10.3.3 Criticism
- 10.4 Hicksian Measure of Consumer Surplus
- 10.5 Change in Price and Consumer Surplus
- 10.6 Hicks Reformulation of Consumer Surplus
 - 10.6.1 Quantity Equivalent Variation in Income
 - 10.6.2 Quantity Compensating Variation in Income
 - 10.6.3 Price Equivalent Variation
 - 10.6.4 Price Compensating Variation
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 - 10.7.2 Laws of Cost and Subsidy to Industries
- 10.8 Summary
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- 10.10 References
- 10.11 Further Reading
- 10.12 Model Questions

10.0 OBJECTIVES

After going through this lesson, You shall be able to :

- explain the meaning of consumer surplus
- discuss Marshallian method of measuring consumer surplus;

- describe Hicksian method of measuring consumers surplus.
- apply the concept of consumer surplus to evaluate some policy effects.

10.1 INTRODUCTION

Consumer surplus is an important concept used especially in measuring the positive and negative effects of the government policy. In this lesson we shall study about Hicksian and Marshallian formulation of Consumer Surplus.

10.2 CONSUMER'S SURPLUS : MARSHALL

The doctrine of consumer's surplus is one of the important contributions by Marshall to economic theory. This concept was originally given by classical economists and later formulated and corrected by Jevons and Dupuit. Marshall improved upon it and popularised it in 1879.

It is common experience when we buy a commodity, we gain some utility by consuming it. At the same time we lose some utility in terms of price which we pay for it. In the beginning utility gained is much higher than price which we pay for it. The difference between two is called consumer surplus. This normally happens in case of necessities of life. For example price of salt is Rs. 2 per kg. But we for example are ready to pay much more for it. The difference between two is called consumers surplus.

In the words of Dr. Marshall, "the excess of price which the consumer would be willing to pay rather than go without the thing over that which he actually does pay is the economic measure of surplus satisfaction.....It may be called Consumer's Surplus." It can be written thus : Consumer's Surplus = price that a consumer is ready to pay for a commodity- (minus) price what he actually pays for it. Suppose we are willing to pay Rs. 450 for a table fan. But we get it for Rs. 425 from the market, Rs. 25 is our surplus satisfaction or Consumer's Surplus. In real life there are several commodities from which the consumer attains surplus satisfaction or Consumer's surplus. In case of cheap commodities or necessities of life consumer's surplus is high.

10.3 MARSHALLIAN MEASURE OF CONSUMER SURPLUS

The Marshall has derived the idea of consumer surplus from Diminishing Marginal Utility Analysis Approach. It can therefore, be explained in terms of utility also. A person will go on buying mangoes till the point his utility of money spent is equal to the utility derived from the last mango. From this marginal unit of mangoes there is no surplus satisfaction. Hence the consumer stops there, because if he goes beyond his point, the utility of money paid will be more than the utility derived from it. It can, therefore, be said that there is no surplus on marginal unit, and above the margin he enjoys a surplus. For the units above margin, the consumer would have been willing to pay higher price. These provide him surplus satisfaction.

The concept of consumer's surplus can be better understood with the help of an example. Suppose a consumer can measure the marginal utility of a commodity than the consumers and can also decide about his willingness to pay for a unit according to his marginal utility of that unit of the commodity. (All this is possible according to the utility theorists). Suppose, the consumer in question feels that for one unit of utility carries a price of one paise.

For example his marginal utility from first mango is 25. On the basis of this we can say that he is willing to pay 25 paise for it.

Let us now consider the following table.

Table of Consumer Surplus

Units of Mangoes	Marginal Utility	Willingness to pay (paise)(one unit of utility = one paise)	Market Price	Consumer's Surplus
1	25	25	10 Paise	$25 - 10 = 15$
2	20	20	10 Paise	$20 - 10 = 10$
3	16	16	10 Paise	$16 - 10 = 6$
4	13	13	10 Paise	$13 - 10 = 3$
5	11	11	10 Paise	$11 - 10 = 1$
6	10	10	10 Paise	$10 - 10 = 0$
Total	95	95	60 Paise	$95 - 60 = 35$ Paise

According to the above table the utility of the first mango is 25 i.e. the consumer would have paid 25 paise for it rather than go without it. But he actually pays 10 paise. In this case his consumer's surplus is $25 - 10 = 15$. Utility of the second mango is 20 and he pays 10 paise and accordingly his consumer's surplus = 10 paise. Sixth mango will be the marginal unit because the utility on the sixth mango is equal to the price. There is no surplus on this unit, but on other units above margin there is a surplus. For all the six mangoes he would have paid 95 paise but actually he pays 60 paise. Thus, the consumer enjoys a surplus which measured in terms of money is equal to $95 - 60 = 35$ paise. This is the consumer's surplus.

Consumer's surplus is mathematically expressed as follows :

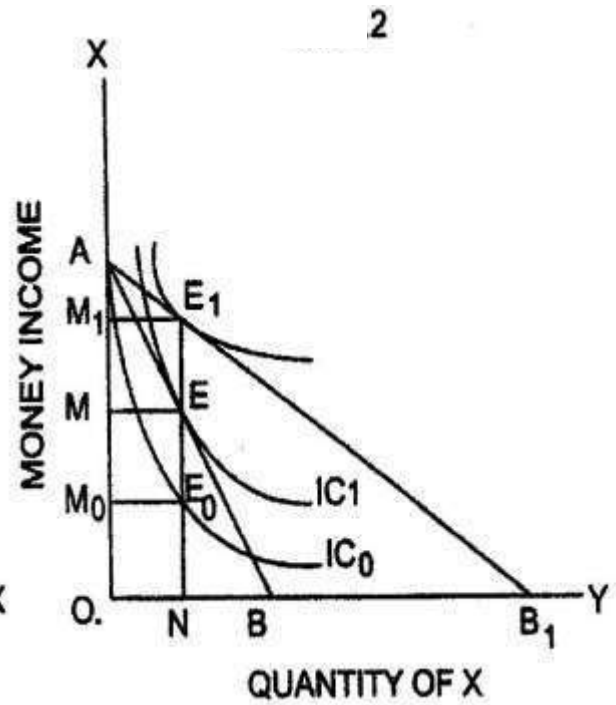
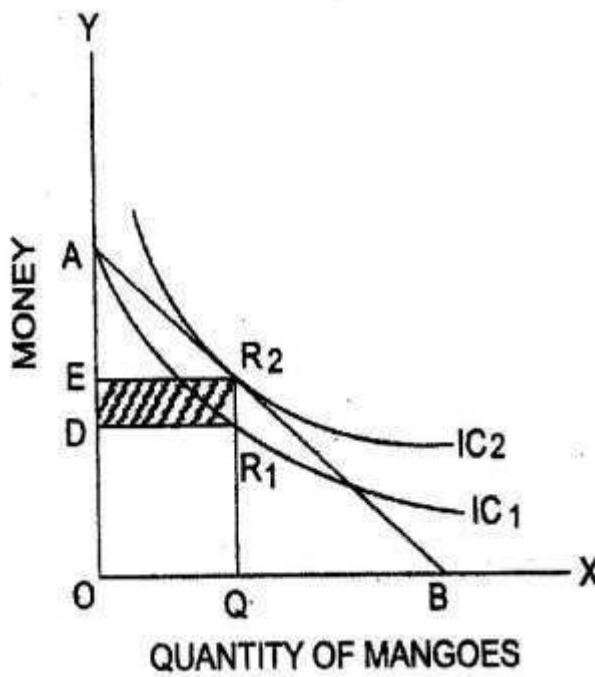
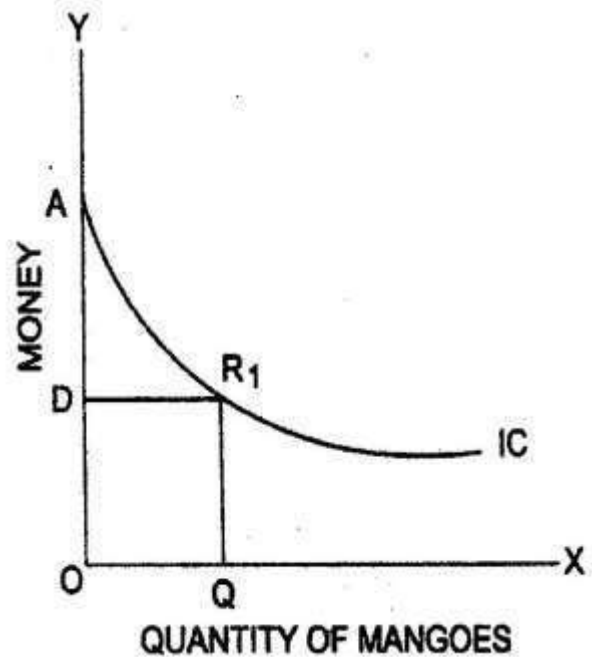
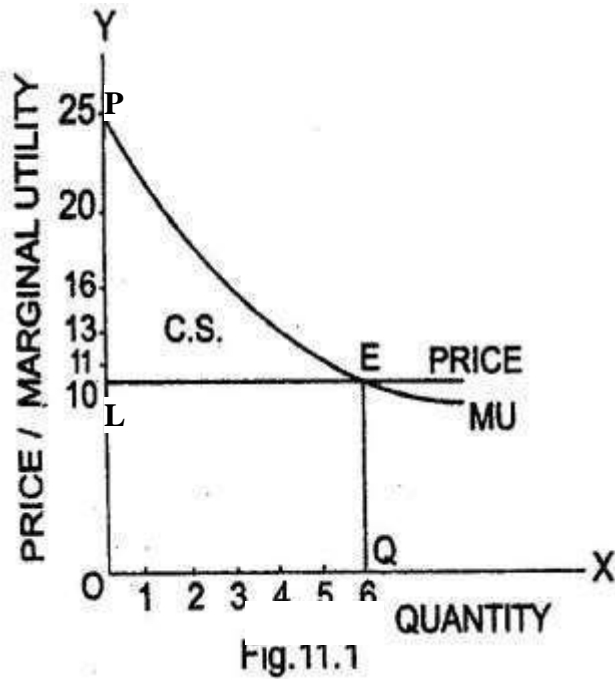
In terms of utility, Consumer's Surplus = Total Utility – Marginal Utility (utility of the last units consumed) \times No. of units purchased. In the above table, Consumer's Surplus = $95 - 10 \times 6 = 35$ Units of utility. In money terms, it is 60 paise.

Consumer's Surplus derived from different commodities is different. But generally greater surplus is derived from cheap and useful commodities like postcard, match box, salt, newspaper etc. For all such commodities consumer would be willing to pay much higher price, if they are not available at the market price.

10.3.1 Diagrammatic Explanation

This concept can also be explained with the help of Fig. 10.1.

In Fig. 10.1 units of commodity are measured along OX-axis and the price the consumer is willing to pay or marginal utility of the commodity is measured along OY-axis. NU is the diminishing marginal utility curve, sixth unit is the marginal unit where the marginal utility of the commodity is equal to the price and there is no surplus on this unit. On all other above margin there is surplus. In this case consumer is willing to pay OPEQ while he has to pay OQEL. Consumer surplus = OPEQ—OLEQ = OLE.



10.3.2 Assumptions of Marshall's Consumer Surplus

- (1) Utility is a cardinal subject.
- (2) Utility is measurable.

- (3) It assumes each commodity as an independent commodity.
- (4) Marginal utility of money remains as constant.
- (5) It assumes that there are no differences in the income, fashion, habits and tastes of different consumers.
- (6) There is fixed relationship between utility and satisfaction.

Self Assessment Question

Q. Define Consumer Surplus as given by Marshall.

10.3.3 Criticism of Marshalian Concept of Consumer's Surplus

The Marshalian concept of Consumer's Surplus has been strongly criticised by economists like Cannon, Nicholson, Robinson, Davenport and others. Many writers consider it completely hypothetical, or a mere figment of imagination. Even if it is accepted as theoretically correct, the writers argue that it cannot be measured. They argue that "the moment, we recognise that utilities are not quantitatively measurable the notion of Consumer's Surplus becomes misleading." The measurement presents difficulties and the concept is considered as hypothetical on the following grounds :

- (1) It is not theoretically valid. The assumptions do not hold good and so the theory cannot be correct. Marginal utility of money cannot be constant because if we spend more on one commodity, less money is available for other goods. Naturally the utility of remaining money will increase and it will not remain constant. The second assumption regarding the absence of substitutes is unthinkable in practice. The utility of substitutes is sometimes higher than the original commodity. The commodity cannot be considered as independent. The consumer spends on commodity, keeping in view other commodities to be purchased. Moreover, tastes, fashions, habits etc., do not remain constant.
- (2) The concept is imaginary. It is difficult to say what amount we will be prepared to pay for a commodity. It can only be imagined. Therefore, the concept becomes purely imaginary. Moreover, some people are rich, while others are poor. For the same commodity the rich may be prepared to pay much more than the poor. How, then about the exact measurement. To say that the person is ready to pay, Rs. 1 lakh for a glass of water in desert, when he actually pays only 10 paise for it, looks rather ridiculous.
- (3) Consumer's surplus is not measurable because utility is a subjective term and cannot be measured. Consumer's surplus depends on the measurement of utility. Utility is a psychological state of mind and it varies from individual to individual.
- (4) It is also said that consumer's surplus from articles of fashion or of luxury is obtained only so long as they continue to be fashionable or costly. If fashionable things go out of fashion or articles of luxury become cheap, the consumer's surplus derived from them will considerably decline. As such it is not permanent.

- (5) Prof. Taussig points out the consumer's surplus in the case of articles possessing prestige value such as diamonds is indefinite. If the price of diamonds falls too much, their utility would disappear because their utility is due to high prices. If prices are low, utility will fall and so does the consumer's surplus. This is not in accordance with the definition of consumer's surplus.
- (6) It has also been pointed out that as a person goes on purchasing more units of a commodity, the intensity of his desire for earlier units diminishes. This means that as he increases his purchases, his willingness to pay for earlier units falls along with his satisfaction from their consumption. It becomes necessary, therefore, to redraw the demand schedule for earlier purchase at a low level of prices.
- (7) According to Patten there is no consumer surplus on necessary goods. Consumption of necessary goods, according to him, only removes the pain. To say that it gives surplus satisfaction to a consumer is ridiculous. It is only in the case of luxury goods that we can talk of a surplus satisfaction.

For all the reasons given above, it can be said that consumer's surplus cannot be measured and it is hypothetical and an arbitrary concept.

10.4 HICKSIAN MEASURE OF CONSUMER SURPLUS

Recently, attempts have been made by modern economists like Prof. J.R. Hicks, to measure Consumer's Surplus with the help of indifference curves. In this technique, there is no need to assume that marginal utility of money remains constant or utility is measurable, or that there are no substitutes. The method adopted by Hicks is given below.

We know that each point on an indifference curve represents a combination of two commodities which give a particular consumers the same amount of satisfaction.

Now, suppose a consumer has got some money with him. This represents the purchasing power which he can use for purchasing any one of more commodities he likes. He gets a particular amount of satisfaction from this amount of money. Suppose we are able to persuade this consumer to exchange this money with one commodity say mangoes and ask him to let us know the various combinations of money and mangoes that gives him as much satisfaction as he was getting when he possessed only the given amount of money. In other words, we draw for the consumer an indifference curve with the amount of money originally possessed by him as one of the points on this curve. Suppose the indifference curve in question is as follows.

In **Fig. 10.2**, OA represents the original amount of money that the consumer possesses. Let us now read this curve. From OA money, he gets some satisfaction. From any other points on the curve, say, R_1 , he gets an equal amount of satisfaction. In other words from a combination of OD money and OQ mangoes ($= D_{R1}$) he gets the same satisfaction as he gets from OA money.

That is to say, he would have no hesitation in parting with AD money if he is given OQ mangoes. In other words the consumer is willing to pay AD money to get OQ mangoes. In this way, this indifference curve can tell us how much money he is willing to give out of OA for any other quantity of mangoes.

Now we have to know, given a certain price of mangoes, how many mangoes a consumer buys and how much he actually pays for the mangoes purchased. Obviously, he will purchase so many mangoes and keep so much balance of money with him that he gets

the maximum satisfaction from this new combination (of money and mangoes). In other words he has to be at the highest possible indifference curve that he can approach. As we know it will be that combination of money and mangoes of an indifference curve in the indifference map where the price line is tangent to that curve. Diagrammatically it is shown in **fig. 10.3**.

If the consumer had OA money with him and price of the mangoes was such that AB were the price line, he would be in equilibrium at point R₂ on indifference curve IC₂ i.e. he will have a combination of OE money and OQ mangoes. In other words he will, at the given price of mangoes, give up AE money to purchase OQ mangoes AE is thus his actual payment for OQ mangoes.

Now let us assume consumer does not know the price of X commodity. In the absence of price line imaginary indifference curve IC₁ tells us that for buying OQ of x commodity our consumer is ready to pay AD amount of money but he actually pays AE amount of money. Thus the difference between two is called consumers surplus which is equal to ED.

Self Assessment Question

Q. Define Hicksian Consumer Surplus.

10.5 CHANGE IN PRICE AND CONSUMERS SURPLUS

Let us see what happens to consumer surplus when price changes. This we can explain with the help of Fig. 10.4.

In **Fig 10.4** on OX we take quantity and on OY we measure Money Income. We first assume consumers in the beginning has OA money Income. Price of the X commodity is known to us. Now we can easily find out how much units of X he can buy with given income. For example consumer has Rs. 10/- as his money Income and price of X commodity is Re. 1/- per unit. Now we can easily say that with Rs. 10/- consumer can buy 10 units of X i.e. B units. Now AB is the Price Income line and consumer on this price Income line is on equilibrium at point E where Indifference curve is tangent to budget line at point E. This means consumer is buying ON units by spending AM amount of Money Income. Now let us assume that the consumer does not know the price of X. In the absence of Price line, the imaginary indifference IC₀ indicates that for ON units of X consumers is willing to spend AM₀ amount of money Income and would like to be at EO₀ point of equilibrium of IC₁. But actually he has to spent AM amount of money. Thus the difference between AM and AM₀ i.e. MMO is consumer surplus. Now suppose price of X commodity falls and his money income remains the same. Now our consumers shall be in a position to purchase more of X commodity with the same money income. Now our budget line will shift from AB to AB₁. Now our consumer shall be in Equilibrium at point E₁. Now our consumer actually spends AM₁ amount of money income for buying the same units i.e. ON. This implies his consumer surplus has further been increased. Similarly we can show it with rise in price too.

10.6 HICKS REFORMULATION CONCEPT OF CONSUMER SURPLUS

In the above analysis of consumer surplus Prof. Hicks has defined consumers surplus as the *difference between the imaginary price and actual price of the commodity*. But in his Reformulation approach Prof. Hicks has defined the concept of consumer surplus in a

slightly different manner. According to him consumers surplus is, **“That sum of money which must be either paid or taken away from the consumer consequent upon change in his economic position in such a manner as to leave his total satisfaction unaffected.”** The change in his economic position may take place via (a) the change in quantity of the commodity or (b) the price of the commodity.

There are two types of changes in the quantity of commodity (a) Quantity Equivalent variation (b) Quantity compensating variation.

10.6.1 (a) Quantity Equivalent variation in income

We can explain it with the help of **Fig. 10.5**. In Fig. 10.5 on OX we measure commodity X and on OY we measure money Income, we just assume consumer has OA amount of money with him. With this he has to buy X commodity whose price is known to us. Now we can easily draw price income line or we can tell with OA money Income consumer can buy OB amount of X commodity. The *consumer is in equilibrium* at point *e* where IC_2 is tangent to budget line AB. At the point of equilibrium consumer is buying ON of commodity X with OM of money Income. If we now first assume that commodity X has completely been withdrawn from the market. Now how much money should be paid to the consumer to compensate him for the loss of the opportunity to buy X commodity in order to keep him on the same level of satisfaction or in other words he should remain on the same level of indifference curve i.e. IC_2 . If we just give him *AQ amount of money Income* only then he can remain on the same indifference curve i.e. IC_2 . Now Q is the point where he does not buy any unit of commodity X and at the same time possesses OQ of money Income. *Prof. Hicks calls it Quantity Equivalent variation in Income.*

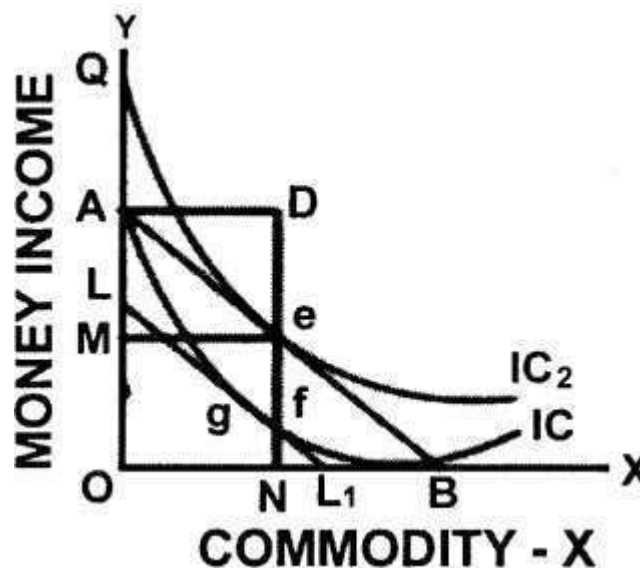


Fig. 10.5

10.6.2 (b) Quantity Compensating Variation in Income

Now we explain through the same Fig i.e. Fig. 10.5 Quantity compensating variation, we assume initially consumer is at point. A where he has only money income with him but no unit of X-commodity. But if he is allowed to purchase same units of X commodity, then he can have ON units by spending DF amount of money. But the price of x commodity is represented by AB line. Therefore he actually spends DE amount of money for buying ON of x

commodity. Now at point E consumer is better than before because he has move to higher indifference curve i.e. on IC_2 , lieu of IC . To keep the consumer at the same level of satisfaction i.e. on IC , we should take away AL amount of money income. Hicks calls it as Quantity compensating variation in income. If we first take away AL amount of money income then our consumer is at an equilibrium at point S on IC i.e. on his initial position of satisfaction.

Self Assessment Question

Q. Differentiate between Quantity Equivalent and Quantity Compensating Variation in Income.

10.6.3 (a) Price Equivalent Variation

We explain this with the help of Fig. 10.6. In this Fig. on OX we measure X -commodity and on OY , we measure Money Income. We in the beginning assume consumer has OA money income price of the X -commodity is known. Now with the given Money Income he can buy OB amount of X -commodity the price Income line is represented by AB . Indifference curve IC_2 is tangent at point e . At this point he buys ON of X by spending De amount of money we first assume price of X rises, then his budget line will rotate AB to AC . Now he is at an equilibrium on lower indifference curve i.e. on IC_1 at point g . Now how much money income should be given so that he remains on the same IC_2 . We should give our consumer AQ amount of money which will take our consumer to old indifference curve i.e. IC_2 . Now our consumer moves to point h on IC_2 . Thus AQ is the price equivalent variation in income.

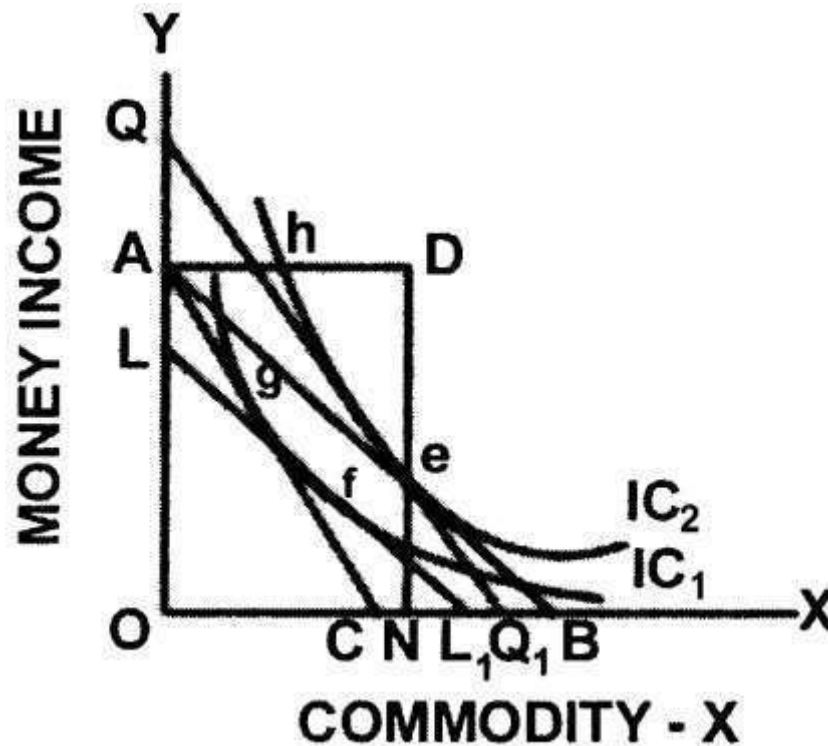


Fig. 10.6

10.6.4 (b) Price Compensating Variation

We first assume original price line is AC where consumer is on Equilibrium at point g on IC_1 . Now we take reverse of it i.e. price instead of rising it falls. The price Income line becomes AB. Now consumer is at an equilibrium on point e on IC_2 . Now the question is how much money should be taken away from the pocket of the consumer which brings back our consumer on the same indifference curve i.e. he is neither better off nor worse off than before. If we just take away AL Income from the pocket of our consumer, this will bring back our consumer on the same difference curve i.e. IC_1 . Now our consumer will be in equilibrium at point f on IC_1 . Now this AL amount according to Hicks is the price compensating variation in Income.

Indivisibilities and Consumer's Surplus

There are quite a few situations where the amount of a thing bought or produced can only be varied in jumps or in other words we can say there are indivisibilities present. It is not possible to apply the marginal analysis. Divisibility of the unit is a necessary condition for the application of the marginal analysis. But there are instances when consumer buys so few of such things as motorcars, refrigerators and wireless sets that it does not really make such sense to speak of the rate at which he is willing to substitute one for the other. Similar is the case when we consider different jobs. One clearly cannot speak of the marginal rate at which a man is willing to exchange being a sweeper for being a dustman. The same is true of money consumption goods of luxury or semi-luxury kind where indivisibility is present to a marked degree. Few consumers will ever buy none than a very few identical units of such goods. Naturally an individual does not plausibly bring the rate at which he is willing to exchange a car for a radiogram into line with their relative prices. If this were so a small rise in the price of radiograms would result in more being sold. Equally it is not absolutely certain that one would get rid of an employee by reducing his wages a little.

Yet another example where marginal analysis cannot be applied is where the effective unit of production is so large that no single consumer would buy it e.g. new roads, railway line, parks or museums. Here the goods may be divisible in the sense that the consumption of it can be shared but the existence of external economic and diseconomies make the marginal analysis rather unworkable. And the unit of production is too large for the decision whether to produce it or not to be considered marginal. In other words the Price which would equate supply and demand for the goods would be such that many people would have been willing to pay far more than they in fact have to pay. Thus we find the applicability of consumer's surplus in all these cases indivisibilities where things cannot be divided into penny-packets or where the variation takes place in jumps of in things that are so large to produce such as roads or dams or museums.

Self Assessment Question

Q. Mention all types of consumer surplus as reformulation by Hicks.

10.7 IMPORTANCE OF CONSUMER'S SURPLUS OR POLICY IMPLICATION

The concept of Consumer's surplus is of great values both in theoretical and practical fields.

The Concept of Consumer Surplus

Helps the government in the formulation of policies.

It occupies an important place in welfare economics. We make use of the concept in taxation and price discrimination. Some of the important uses of the concept consumer's are illustrated below :

10.7.1 Real and Money Income

It is possible to make a comparative study of the satisfaction derived by different classes of individuals with the help of consumer's surplus. People get their incomes in the shape of money but the satisfaction that may get out of this income indicates the real income that they enjoy. Consumer's surplus helps us to give an idea of the real income. A man working on a wage of Rs. 100 in a small village may enjoy more consumer's surplus than a working on the same wage in the city. A comparative study of the welfare of the people can be made with the help of consumer's surplus and any change in consumer surplus due to taxation and subsidy can be decided.

10.7.2 The concept of consumer's surplus is very useful in the field of taxation. The government should endeavour to collect the maximum revenue with the least possible sacrifice on the part of the people.

We know whenever commodity tax is levied, it raises the price of that commodity and thus reduces demand and consumer surplus. On the other hand tax brings revenue to the govt. A commodity tax is justified when gain to govt. is greater than resulting loss to consumers. We can show it diagrammatically under different cost Industries.

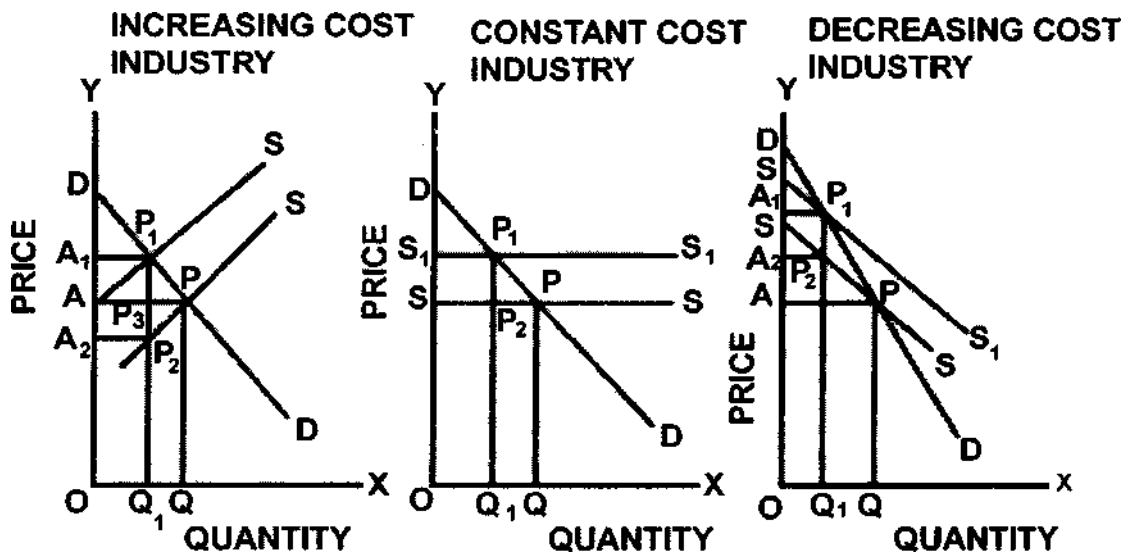


Fig. 10.7(a)

Fig. 10.7(b)

Fig. 10.7(c)

10.7.2 a Law of Costs and Taxation on Industries

In Fig. 10.7(a), DD is the demand curve and SS is the supply curve of Increasing cost Industries. In it consumer surplus is indicated by DAP because consumer is prepared to pay OD for OQ commodity but he actually pays OA for OQ commodity. Therefore consumer surplus is DAP. Now suppose govt. imposes a tax, then SS curve shifts to S_1S_1 . Price will rise from OA to OA_1 and demand for output will decrease from OQ to OQ_1 . The consumer surplus is reduced from DAP to $DA'P'$. The loss to consumer is $AK'P_3P_1$. But gain to govt. is equal to $A_1A_2P_1P_2$. The gain to govt. is more than loss to consumers. In this Increasing cost Industry tax is justified.

In Fig. 10.7(b) in constant cost Industry in the beginning consumer surplus is DSP when tax is levied it raises the price from OS to OS₁ and reduces the quantity from OQ to OQ₁. Now consumer surplus is reduced to DS₁P₁. Loss of consumer surplus is SS₁PP₁ and gain to govt. is SS₁P₁P₂. Here loss to consumer is more than gain to govt. In this case it puts a more burden on consumers than gain to the govt.

In Fig. 10.7(c) in decreasing cost Industry in the beginning consumer surplus is DAP. Now when tax is imposed it raises the price and reduces the output. The consumer surplus is reduced from DAP to DA₁P. The loss to consumer is AA₁PP₁ and gain to govt. is A₁A₂P₁P₂. The loss to consumers is more than gain to govt.

It is only in the increasing cost Industry tax is justified because it gives more gain to govt. than loss to consumers.

10.7.3 Law of Costs and Subsidies to Industries

Similarly whenever subsidy is given to seller to reduce the price of commodity so that consumers could easily buy goods. A subsidy shall be justified only if gain or consumer surplus is more to consumer than resulting loss to the govt. Whenever Govt. gives a subsidy to seller, price of the commodity comes down. The amount of subsidy is loss to govt. Generally govt. gives a subsidy to decreasing cost Industries. Because in it gain to consumers is more than loss to govt. This we can explain with diagrams.

In Fig. 10.8(a) DD is demand curve, SS is downward sloping supply curve. These intersect at point P. The consumer is prepared to pay OD price for OQ quantity. But he actually pays OA price. Therefore consumer surplus is DAP when govt. subsidises the product, then SS curve will shift downwards. Because price will come down from OA to OA₁ and output will increase from OQ to OQ₁. Now consumer surplus shall be DA₁P₁. The gain to the govt. shall be AA₁PP₁. The subsidy paid shall be equal to A₁A₂P₁P₂. The gain to the consumer shall be more than cost to the govt.

**DECREASING COST
INDUSTRY**

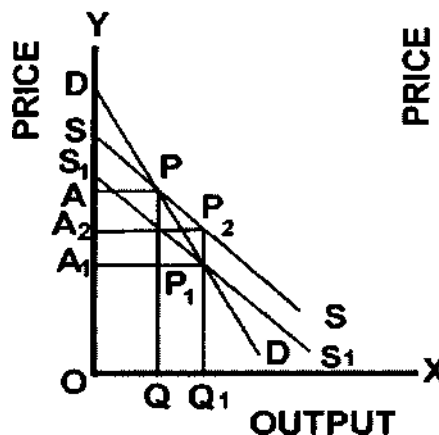


Fig. 10.8(a)

**CONSTANT COST
INDUSTRY**

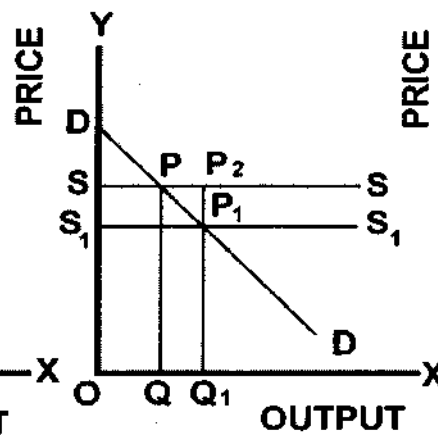


Fig. 10.8(b)

**INCREASING COST
INDUSTRY**

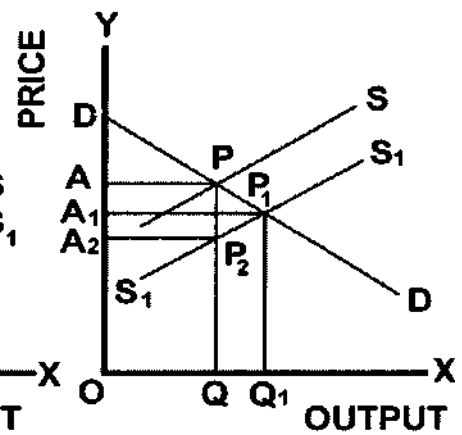


Fig. 10.8(c)

In Fig. 10.8(b) DD is the demand curve SS is the supply curve. They both intersect at point P. At P consumer surplus is DSP. Now if govt. subsidises the product, then SS curve will shift downwards. Now consumer surplus will be DS₁P₁. Hence gain in consumer surplus is equal to SS₁PP₁. But loss to govt. is SS₁P₁P₂. Here loss to govt. is much more than gain to consumer.

In Fig. 10.8(c) DD is the demand curve and SS is the supply curve. They both intersect at point P. At this point consumer surplus is DAP. Now if govt. gives subsidy, price falls from OP to OP_1 and output increases from OQ to OQ_1 . Now consumer surplus is DA_1P_1 . The gain in consumer surplus is equal to AA_1PP_1 . But loss to govt. is equal to AA_2PP_2 . Here also loss to govt. is more than gain to consumers.

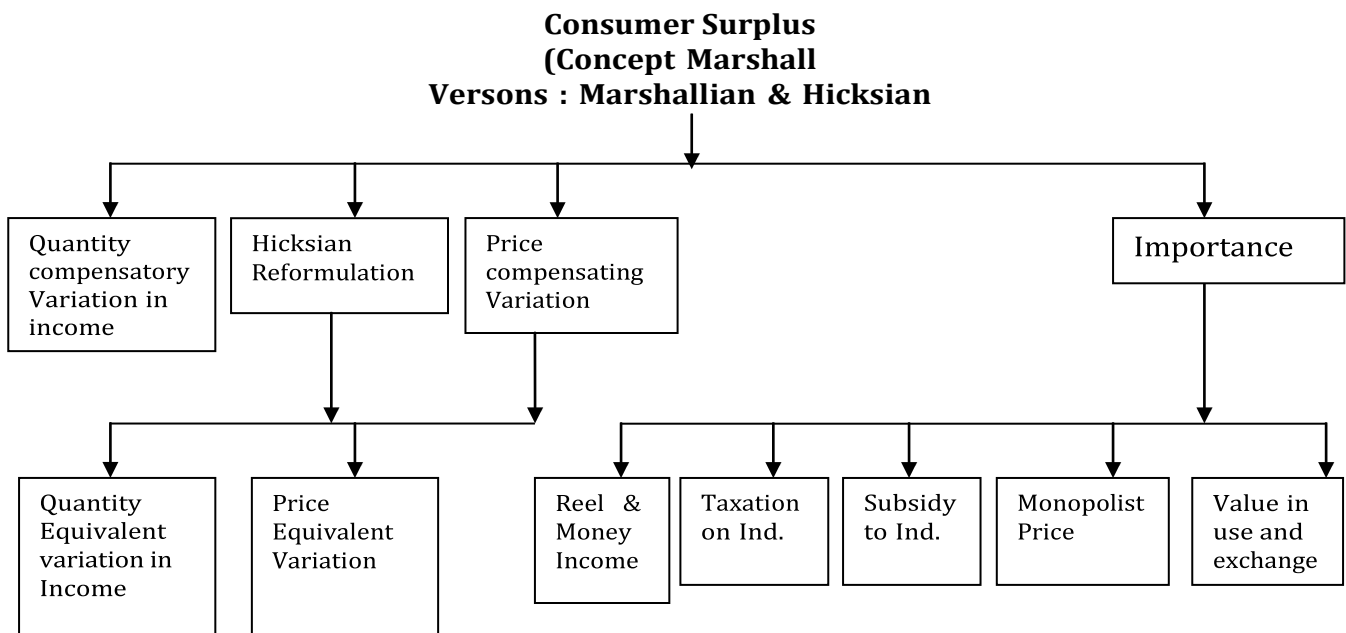
Hence subsidy is justified only in case of decreasing cost Industries. Because only in decreasing cost Industries gain to consumer is more than cost to govt.

10.7.4 A monopolist also takes advantage of the **concept of consumer's surplus in fixing its price**. He can possibly raise his prices for the product sufficiently high in case the consumer is enjoying a larger consumer's surplus. A monopolist can also indulge into price discrimination and divide his consumer's into two markets. He will charge higher prices from those where the consumer's surplus is more and lower prices from those where the consumer's surplus is small.

10.7.5 The concept of consumer's surplus shows the valuable **distinction between value in use and value in-exchange**. Items of daily use that are so essential like match box, postcard, salt, newspaper are available at much lower prices than what we are prepared to pay for these. Besides consumer's surplus makes us compare that living conditions in one country with that of the other or the living conditions in one period with that of the other.

10.8 SUMMARY

The concept of consumers surplus was originally given by classical economists and later formulated by Jevons and Dupints. Marshall improved upon it and popularized it in 1879. Consumer surplus derived from different commodities is different, But generally greater surplus is derived from cheap and useful commodities like salt, match box, newspaper etc. Marshallian measure of consumer surplus has been strongly criticized by economists like Cannon, Nichololson, Robinson, Devenport and others. Modern economists like J.R. Hicks has attempted to measure consumer surplus with the help of indifference curves tools. Later on in 1940's Hicks reformulated the concept of consumers surplus and presented 'four' measures of consumer's surplus.



10.9 GLOSSARY

- **Consumer Surplus** : may be defined as excess of utility obtained by the consumer over utility foregone or disutility suffered. It is measured by the difference between the maximum price which the consumer is willing to pay for a commodity rather than go without it and the price which he actually pays for its.
 - **Marshall Consumer Surplus** : Marshall measured consumer surplus in terms of utility. In terms of utility,
 $\text{consumer surplus} = \text{Total utility} - \text{marginal utility of the last unit consumed} \times \text{no of units purchased}.$
 - **Hicks' Consumer Surplus** : Under ordinal utility analysis, Hicks defined consumer surplus similar to that of marshallian measurement i.e. difference between imaginary price (willing to pay price) and the actual price (market price of the product).
 - **Hicks' Consumer Surplus Four Variants** : Four variants as per Hick's rehabilitation, Consumers surplus is that sum of money which must either be paid or taken away from the consumer consequent upon a change in his economic position in such a manner as A change in consumers economic position to leave his total satisfaction unaffected may take place via
 - (i) change in quantity of the commodity
 - (ii) change in the price of the commodity.
- (i) The *change in quantity* could be
- (a) Quantity Equivalent Variation in Income Case I.
 - (b) Quantity Compensating Variation in Income Case II.
- (ii) Similarly, the *change in price* could be
- (c) Price Equivalent Variation in Income Case III.
 - (d) Price Compensating Variation in Income Case IV.

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10.11 FURTHER READINGS

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10.12 MODEL QUESTIONS

1. What is Hicksian method of measuring consumers surplus? Will there be any difference in consumer surplus if marginal utility of money is assumed to remain constant and to be variable?
2. Explain briefly the Hicksian measure of consumer surplus under (i) The quantity variation (2) the price compensating variation, (iii) the quantity equivalent variation (iv) the price equivalent variation.
3. Elucidate Hicks reformulation of the concept of consumer surplus in terms of indifference curves analysis.

REVEALED PREFERENCE THEORY

Structure

- 11.0 Objectives
- 11.1 Introduction
- 11.2 Origin of Revealed Preference Theory (RPT)
- 11.3 An Outline of RPT
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- 11.4 Samuelson's Enunciation of Demand Theories
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11.0 OBJECTIVES

After going through these lesson, you shall be able to :

- understand the meaning and practice of revealed preference.
- explain how consumers reveal preference for goods and services they consume.
- discuss how demand curve can be derived by using consumer's revealed preference.
- describe how the indifference curve can be derived from consumer's revealed preference.

11.1 INTRODUCTION

You know, that Marshallian approach to the analysis of consumers behaviour is based on cardinal utility and Hicksian approach is based on ordinal utility. Measurability of utility continues to remain a debatable issue. However, Samuelson has developed a theory known as "Revealed Preference Theory" based on consumers preferences about goods revealed in the market. This theory does not involve the problem of, measuring utility. The Revealed Preference Theory is a subject matter of this lesson.

11.2 ORIGIN OF REVEALED PREFERENCE THEORY

The logical demand theory has been derived from three different roots popularly referred to as marginal utility analysis, indifference curve analysis and revealed preference

hypothesis. The theories based on the former two hypothesis have already been dealt with in the earlier lessons. In this lesson, an effort has been made to explain the third approach of theory of demand namely, the Revealed Preference Approach.

There is not even the slightest doubt that the indifference curve analysis had scored over the marginal utility analysis in so far as the former required fewer assumption about the behavior of the consumer than did the cardinal utility theory. Moreover, the assumptions "on which marginal utility analysis was based were more restrictive and less realistic. No consumer, howsoever intelligent and calculating he may be, can be expected to exactly quantify the utilities which he gets from different commodities.

The charges made against marginal utility analysis contained some truth. But even indifference curve analysis had its own limitations. The construction of indifference map required a lot of *introspective information* about the behavior of the consumer. Marginal Utility Analysis as well as Indifference curve analysis, both were psychological. And this information is not easy to locate. It is not possible for a given consumer to state his preference among all possible combinations of commodities.

Dissatisfied with both of these interpretations of the theory of consumer's behavior, Samuelson has expounded yet another alternative approach to the theory of demand. He discarded the earlier two approaches because they were too psychological introspective in nature. He shifted from the psychological to the behaviouristic explanation of consumer's behavior. His own theory does not require the consumer to supply any data for his preferences. The theory has been framed by simply observing the behavior of the consumer in the market, i.e. the way he makes his purchases in the market is observed conclusions are drawn there from. That is why Samuelson's theory is called a *behaviourist theory*.

11.3 AN OUTLINE OF THE THEORY OF REVEALED PREFERENCE

Suppose a given consumer is faced with problem of making a choice between two combinations, A and B, of different commodities. Suppose further that he actually purchases combination A. The choice of A may be due to either of two reasons. Either A combination is cheaper than B, or A is really superior to B. This uncertainty regarding the motive behind the purchase of a two combination can be very easily removed by getting information about the prices of two combinations in the market. If marked information shows that A is not cheaper than B then the only reason as to why the consumer purchased A could be that he liked it better than B. If this is so, then we will conclude that A has been revealed to be preferred to B or conversely B has been revealed to be inferior to A. *Thus, it is the choice which reveals preference.* This is the basic assumption of Samuelson's Revealed Preference Theory.

Taking in more general terms, if there are ten different combinations, A,B,C,D etc. which are within the reach of the budget of the consumer, and the consumer purchases B rather than anyone of the other nine, and if from the market it is found that B is not cheaper of all the ten, then we should have no hesitation in concluding that B has been revealed to be preferred to the other nine combinations or the other nine have been revealed to be inferior to B.

11.3.1 Assumption of the Theory

The assumptions of *rationality and continuity* which formed the basis of both the earlier versions of theory of demand have been discarded by Samuelson. In the first formulation of the theory of revealed preference, Samuelson adopted the following assumptions:

- (i) The quantities demanded of each commodity is a single-valued function of all prices and income, i.e., when the set of prices and income are given, the consumer will always choose the same set of commodities.
- (ii) That the above-mentioned function is homogeneous of zero degree in the variables, prices and income, i.e., if we multiply all the prices and income by the same quantity (positive) the quantities demand will remain the same. It means consumer behavior is consistent i.e., his choices are transitive.
- (iii) That if a consumer selects combinations A rather than B then he does not select B in preference to A in any other situation when A & B are again available to him.
- (iv) The consumer will always prefer more to less commodities.
- (v) The Revealed preference is popularly known as the Consistency Postulate' which is equivalent to the '*maximising' behavior assumption of the older*. The consistency assumption means that the consumer will never behave in an inconsistent manner. The assumption will stand violates if the consumer buys A when it is more expensive and then as a result of a rise in the price of B he shift to B. Suppose there are two brands of cars A & B. A costs of Rs. 4,50,000/- and B Rs. 4,30,000/- and consumer buys A brand. But if there is rise in Price of B from Rs. 4,30,000/- to Rs. 4,60,000/- the consumer should not shift his choice to B, otherwise this assumption will be violated.

Self Assessment Question

Q. Differentiate between weak ordering and strong ordering?

11.3.2 Explanation of the Theory

On the assumptions of a given money, income and a given set of prices of X and Y commodities, the price line PP' in (Fig. 11.1) has been drawn, which yields the triangle POP₁. The triangle POP' is called the "choice triangle" of the consumer, because the consumer can choose from amongst only these combinations of the given pair of goods X and Y which are either within this triangle or on it.

Suppose further that the consumer has purchased the combination of X and Y represented by A in the market situation depicted by the choice triangle POP₁. From this following conclusions can be drawn.

- (a) All the points (combinations of X & Y) lying within the triangle POP' are less expensive than A, because they lie on the price lines which are to the left of PP' and thus represent a lower income, for example point B lies on a lower price line (RR' and therefore less expensive than A.
- (b) All the combinations lying on the price line PP' are as expensive as A. From (a) and (b) Samuelson concludes that combination has been revealed to be preferred to any combination lying within the triangle POP' or lying on the price line PP'. In other words this implies the assumption of "strong ordering" of choices.
- (c) All the combinations lying to the right side of the price line PP' are more expensive than A because they will lie on a higher price line representing higher

level of income. So none of the consumption (Like C) lying on the right side of the price line PP can be revealed preferred to A.

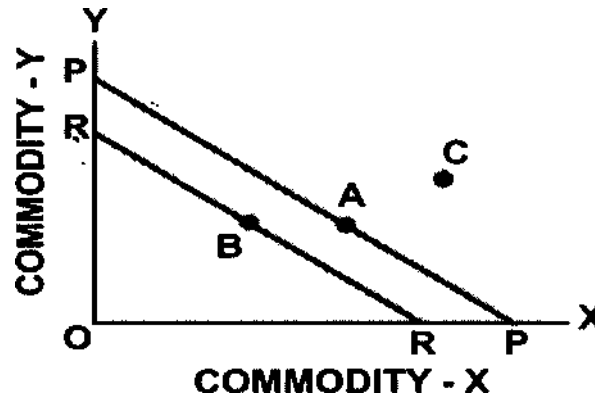


Fig. 11.1

11.4 SAMUELSON ENUNCIATION OF DEMAND THEOREM

In his article, "Consumption Theorems in terms of Over-compensation rather than indifference Consumption" (*Economic*, Feb, 1953), Samuelson has tried to prove the Marshallian proposition that "An increase in the price of commodity leads to shrinking of demand for it and vice versa assuming the income and other prices to be constant." In his own words, "Any good (simple or composite) that is known always to increase in demand, when money income alone rises must definitely shrink in demand, when its price alone rises." This statement is based on the assumption of positive income elasticity (which is the implication of the second part of the above statement).

This proposition can be explained with the help of Fig. 11.2.

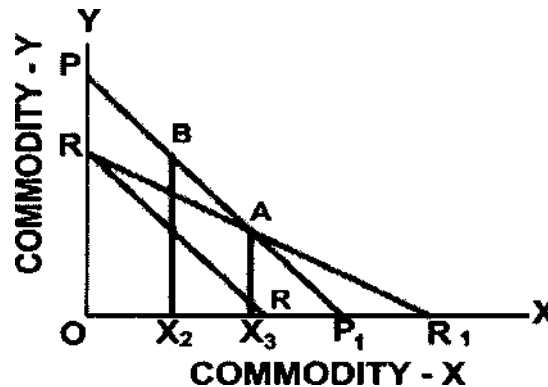


Fig. 11.2

11.4.1 Rise in Price of Product-X

Let us suppose that with the given money income and a given set of prices of the two given commodities, X and Y, the consumer can buy OP of Y or OP₁ of X when he spends whole of his income on either of the two commodities, so that PP₁ is the budget or the price line. Suppose further the in this given income-price situation, he has purchased the combination represented by A. Since choice is assumed to reveal preferences, we can conclude that A has been revealed to be preferred to all the combinations lying on the triangle POP₁ or on the price line PP₁. Further suppose that price of X commodity rises so that PR is the relevant price line now, and POR is the new choice Triangle.

Let us now compensate the consumer for the loss in purchasing power, due to the rise in the price of X by increasing his money income by such an amount that he is able to purchase the original combination A at the new higher relative price of X as depicted in the slope of PR. This amount can be found out by drawing a straight line which is parallel to PR and passes through A. This increase in money income will amount to KP in terms of Y is equal to RS in terms of X. After this "**over-compensation effect**" (using **Samuelson's phrase**) has taken place, KS becomes the relevant price line which passes through A so that if the consumer is interested to purchase this combination in the new income price situation, he can do so. Now, KOS is the choice triangle of the consumer. Since before the rise in the price of X, A was chosen as preferred combination to any other combination lying on triangle POP₁ or on the price line PP₁. Therefore, an alternative lying on SA portion on the price line KS must be rejected in favour of the combination A, if any combination on KA portion except A is purchased, it will show that the purchase of X must contract; e.g., at point B which lies on KA portion of the price line, the consumption of X decreases from OX₁ to OX₂. Thus the rise in the price of X has resulted in the contraction of demand for it (when income effect is removed).

It may be observed that this over-compensation effect enables the consumer to travel to a higher indifference curve as in the **Slutsky's substitution effect**. But if he chooses A again, this would imply no shrinkage of demand. However, if the additional money income given to the consumer to compensate him (or the loss of his purchasing power due to the rise in the price of X, is taken away, he must purchase a quantity less than OX₁ because income elasticity of demand is assumed to be positive.

Self Assessment Question

Q. What is meant by over-compensation effect?

11.4.2 Fall in Price of Product-X

In Fig. 11.3 POP₁ is the choice triangle of the consumer. This is drawn on the assumption of a given money income and a given set of prices of X and Y commodities A is the chosen combination,

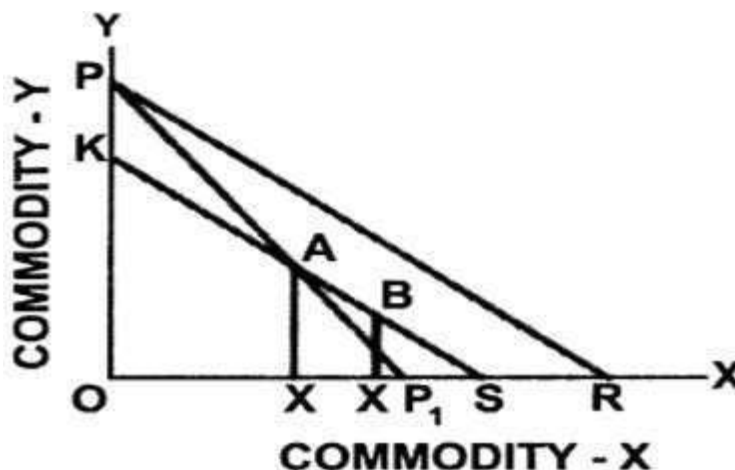


Fig. 11.3

and therefore, as explained earlier, A is revealed to be preferred to any combination lying in triangle POP_1 or on price line PP_1 . Now suppose that the price of X falls so that PR is now the relevant price line and POR is the relevant choice triangle. The fall in the price of X (that of Y remaining constant) leads to an increase in his real income. Since we want to remove the income effect. We neutralize this increase in purchasing power by decreasing his money income by an appropriate amount. This appropriate amount (PK in terms of Y commodity and SR in terms of X commodity) is found by drawing a line parallel to the new price line PR and passing through the original combination A. This line is KS which is now the relevant price line and KOS is the relevant choice triangle.

Since before the fall in the price of X, A was the preferred combination lying on the triangle POP_1 or lying on price line PP_1 . Therefore, any alternative combination lying on KA portion of the price line KS (e.g. D) must be rejected in favour of the A combinations lying on SA portion of the Price line KS (e.g., B) can be chose. If any combination in SA portion is selected (e.g., B) then the purchase of X commodity is shown to increase from OX_1 (when he bought A) to OX_2 . Thus the fall in the price of X results in an increase the demand for it (when income effect has been removed). But, if he again chooses A the choice is still consistent. However if the money income taken away from the consumer is given back to him, he is sure to purchase a larger quantity of X than OX, because income elasticity of demand is assumed to be positive.

11.5 DERIVATION OF INDIFFERENCE CURVES WITH THE HELP OF REVEALED PREFERENCE

The Revealed Preference technique is helpful to us in deriving the downward sloping indifference curve. This we can derive by making real income constant. All the properties of indifference curve can be inferred from constant real income assumption. We can explain it with the help of Fig. 12.4.

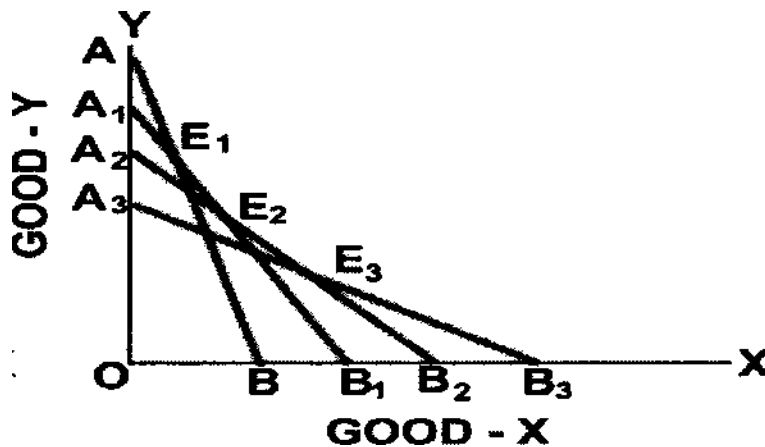


Fig. 11.4

Revealed Preference and Indifference Curve Analysis

Suppose in figure 3b.1 we are confronted with the set of budget constraints for two goods. In the beginning level of money income, relative prices and real income is given, we can easily draw a budget line represented by AB. If the consumer chooses E' combination, on it, then, he rejects all other combinations in favour of E'. In no other circumstances he can choose a combination other than E'. This simply means preference has been revealed for it.

This certifies his consistency postulate too. Now, if we change relative prices without changing real income while money income is constant. Both prices must be changed in the same proportion so that his real income remains constant. This can happen when both prices change in "such a way that real income increase deriving from the price decrease will just offset the real income decrease deriving from the price increase. We do it by raising the price of Y and lowering the price of X in such a way that budget constraint passes through point E_1 on original budget constraint. Such a change is shown by the budget line $A'B'$ in Fig. 6.4. This budget constraint can be divided into two parts. The first part is represented by E_1A_1 which lies within the range. Any combinations on E_1A_1 have already been rejected in favour of E_1 in the original budget line. The second part is represented by E_1B_1 . These combinations were not available with him with the original budget line. The consumer will either remain at the old combination represented by E_1 or he will buy some combination on budget line represented by E_1B_1 . Let us suppose that he moves to combination E_2 . The consumer's real income is same at E_2 . We can repeat this process for as many different combinations as we desire. As long as we maintain the offsetting real income effect, we will retain the constant real income and money income with which we began. We can now obtain a set of Budget lines and combinations. Real income is constant on all the alternative points i. e., at E_1, E_2, E_3 etc. This is similar to indifference curves, it is locus of various points at which satisfaction is constant. It is meeting the other properties of indifference curves too i.e. downward sloping and convex to the origin. Lastly, we can say when more of X commodity is being demanded, Y is demanded less.

With the help of the Revealed Preference Hypothesis, we can draw the indifference map of the consumer making adequate number of observation of his purchase in the market. This has been done in the Fig. 11.5.

Let us start with the assumption that in the income-price situation defined by the price line PP_1 in Fig. 11.5, B is the chosen combination. As has already been explained B combination is then revealed to be preferred to any combination lying in the choice triangle POP_1 or lying on the price line PP_1 .

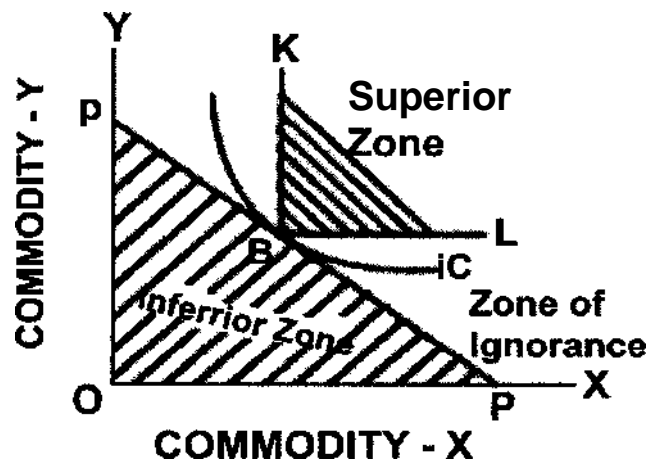


Fig. 11.5

Similarly, we can show that any combination lying in area KBL (which is above and to the right side of B, is superior to B; i.e. combination M is superior to B because if (M) represents more of both X and Y commodity as compared to B.

Combination L is superior to B because it represents more of X commodities, but the same quantity of Y commodity as compared to B.

Combination K is superior to B because it contains more of Y and the same amount of X as compared to B.

Thus, we conclude that shaded area POP_1 is inferior to B and shaded region KBL is superior to B. And we are ignorant about the unshaded area lying to the left and right side of B (that is why this is known as the Zone of Ignorance). It is understood that if we want to draw an indifference curve which passed through B, it will remain in the zone of ignorance, (i.e., above price line PP_1 and below the area KBL). If this is conceded then two basic properties of an indifference curve, i.e., its negative slope and its convexity to the origin are automatically proved.

If it is not negatively sloping, it will be either positively sloping or parallel to X-axis or parallel to Y-axis.

(a) *If it is positively sloping*, then it will enter the region POP_1 (which has been revealed inferior to B), which is impossible, because on an indifference curve all the points represent equal amount of satisfaction and are, therefore, equally preferred.

Similarly, if an indifference curve is parallel to X-axis or Y-axis, it will coincide with BL and enter the choice triangle POP_1 or it will coincide with KB and again enter POP_1 . This is impossible due to the reason explained in the preceding paragraph. Thus we come to the conclusion that an indifference curve will always be negatively sloping.

Now the question arises as to why an indifference curve will always be convex to the origin? Again the reason is the same as explained above. It is so because if we draw an indifference curve which is concave to the origin, it will enter the area POP_1 which has been revealed to be inferior to B.

But this is not all, for finding the precise shape of an indifference curve we will have to go much further. So far we have become certain that an indifference curve can remain anywhere in the zone of ignorance. What we have to do is to gain further knowledge by going on reducing this zone of ignorance. This can be done by making further observations about the behavior of the consumer in the market and going on extending the shaded area by chopping away, the zone of ignorance and thus coming closer and closer to find the precise shape/location of the indifference curve. Some area in the zone of ignorance are inferior to B, while some are superior to B. In the following paragraphs we show the process to find those areas which are inferior to B and also those which are superior.

In Fig. 11.6 POP_1 is the choice triangle drawn in the given income-price situation, B is the chosen combination, which is thus revealed to be preferred to all other combinations lying on or below PP_1 . Consider any other point A (on price line PP_1) which is revealed to be inferior to B. By watching the consumer purchasing, at different prices of X and Y, the two commodities represented by A, we draw a new price line RR_1 which passes through A. By the same reasoning as given above, we can say that A is superior to any combination lying within the triangle ROR_1 or lying, on the price line RRI . Since A has already been revealed inferior to B, so we come to the conclusion that B is revealed to be preferred to and combination lying in triangle ROR_1 . So the shaded area $AP_1 R_1$ is revealed to be inferior to B and is, therefore, chopped away from the zone of ignorance. Similarly consider any other point C on price line PP_1 which is observed to be chosen in different price situation in the market. Draw any other

price line QQ_1 passing through C and with a slope equal to the new relative price of X and Y, C is then superior to any combination lying in triangle OQQ_1 , or lying on price line QQ_1 .

Since B has already been revealed to be superior to C and C is superior to the shaded area QPC, so we conclude that the B is revealed preferred to the shaded QPC. In the like manner, by making more and more observation about the behaviour of the consumer in the market, we can continue chopping away from the zone of ignorance those regions which are inferior to B.

Upper portion of the zone of ignorance which is superior to B can also be hacked away little by little. In fig. 6 we consider another income-price situation represented by price line VV_1 which passes through point B. In this new situation, let us assume that W is the chosen combination. Since at the new relative price W and B are equally expensive. So we conclude that W is revealed to be preferred to B. Any area above and to the right side of W (TWN) is preferred to W (by the same reasoning by which we showed that area above and to the right of B is superior to B). Hence the region TWN is revealed to be superior to B. This includes the additional area which is shaded in the diagram. This shaded area is also hacked away from the zone of ignorance. If we repeat infinitely these two processes of finding the regions which are inferior to B and the regions which are superior to B, we can narrow down the region possible location of the indifference curve passing through B.

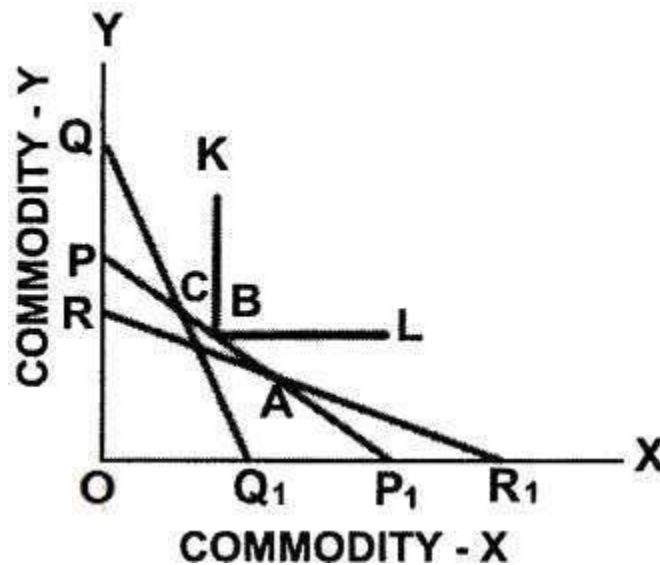


Fig. 11.6

The proof that the upper and lower chopping away processes coverage and thus exactly narrow the zone of ignorance down to a single IC is quite difficult and requires quite a last of advance mathematics. However, the basic method of drawing in indifference curve with revealed preference hypothesis should be sufficient clear from the above explanation.

Self Assessment Question

Q. What is merit of deriving IC curve using revealed preference action ?

11.6 CRITICAL EVALUATION OF REVEALED PREFERENCE HYPOTHESIS

Credit goes to Samuelson's being the first to apply the behaviouristic method to explain the theory of consumer's behavior. In contrast the versions of the theory of demand

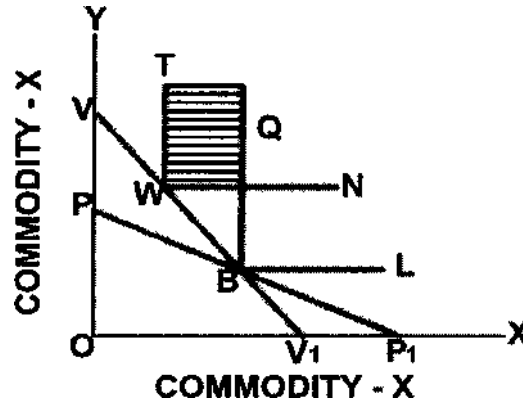


Fig. 11.7

were psychological, and explain the theory of consumer's behavior. In contrast the versions of the theory of demand were psychological or introspective in nature. The question may arise as to *whether the psychological or behaviouristic method is more adequate to explain the theory of demand*. Samuelson and his followers consider the behavior method to be the only correct method while Prof. Knight and others who belong, to psychological schools of thinking have their reservations about the behaviouristic method and still endorse the views of psychological. All the same, it must be said in favour of behaviouristic method that there is very little possibility of its leading to correct conclusion, *since it is based upon the observed behavior of the consumers and there is little likelihood that observation can go wrong*. In the words of Tapas Majumdar, "Behaviour has certainly great advantages of treading on observed ground; it cannot go wrong." (*Measurement Utility* by Tapas Majumdar P. 26.)

Whatever be the result of the controversy as to whether introspective or behaviouristic method is better, the fact remains that Samuelson's method has won wide support from the economists and has undoubtedly become more popular.

Secondly, Revealed Preference Hypothesis eschews some of the assumptions on which the earlier two versions of the theory of demand were based. It has dispensed with both the assumptions of rationality and continuity. In both the earlier theories, the Marshallian Utility Analysis and Hicks-Allen indifference Curve Analysis, the rationality was assumed to mean the utility maximizing behaviour, on the part of the consumer. But it is being realized that this assumption is much more restrictive and less realistic comparatively to the assumption of consistency (explained in detail earlier) which has been employed by Samuelson to derive the Demand Theorem from his Revealed Preference Hypothesis.

Similarly the assumption of continuity has also been rejected by Samuelson, because it lacked realism. This assumption in fact, meant that the goods are perfectly divisible, for only then we can draw continuous Indifference Curves. But, in real life, goods are not generally perfectly divisible. That is why it is said that real world represents discontinuity and not continuity. That explains as to why *even J.R. Hicks* had to relax this assumption in his later book *"A Revision of Demand Theory"*. In this modified or this assumption which might actually be under his consideration.

It is true that Revealed Preference Hypothesis has the, above mentioned achievements to its credit, but even a casual observer cannot fail to notice certain important gaps in this theory.

In the first place, Samuelson has ruled out the relation of Indifference in the behavior of consumer. This rejection of the possibility of indifference on the part of consumer is the direct result of Samuelson's very firm belief in the *strong order* in principle, rather than the principle of *weak ordering* and that the preference is to reveal from a *single act of choice*. If however, revealing of preference is to be judged from a large number of observations rather than one, then it becomes very difficult to rule out the relation of Indifference; e.g., if a consumer prefers a combination I to another combination II every time he has to choose between these two alternatives, only then the combination I will be revealed to be preferred to combination II. But if the consumer is not very clear in his mind about the choice of combination II or vice versa, then we cannot escape the conclusion to be indifference between the two alternatives. It is only because Samuelson regards a single act of choice as sufficient enough in leading to reveal the consumer's preference that the possibility of indifference has been ruled out by him.

That the possibility of indifference cannot be ruled out so easily has been explained by Mr. Tapas Majumdar. "It may be remembered that in all forms of welfare theory, indeed in any integral view of human activity, we have to assume that the individual can always compare his ends (wants). If, this axiom is not granted the whole of welfare economics falls to the ground. If, this axiom is granted then the idea of remaining on the same level of welfare while sacrificing something of one commodity for something else of another will emerge automatically" - (*Measurement of Utility* by Tapas Majumdar page 90).

If it is conceded that a consumer can be indifferent between a number of alternatives than the Revealed Preference Hypothesis cannot be used to derive the demand Theorem as shown in Fig. 11.8.

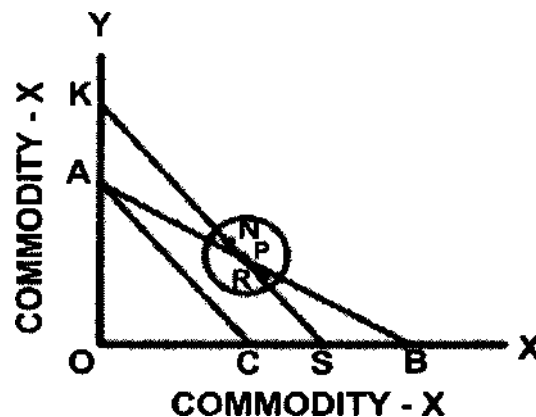


Fig. 11.8

In fig. 11.8 AB is the original price line. Combination A is consumer's actual choice in this income-price situation. AC is the price line after the price of X has risen and KS is the price line after the consumer has been 'over-compensated' with a 'gift-money' for the loss in satisfaction due to rise in the price of X (Please refer to Fig. 12.8 given above). Let us now assume that the consumer is indifferent between the combinations lying in shaded circle. We can always pick a P rather than R (on PS portion) N (on PK portion) but R lies in triangle

AOB in which all the points have been revealed inferior to A. This nullifies the proof of Law of Demand given by Samuelson.

It has been alleged that since the possibility of indifference has been ruled out by Samuelson, therefore, the theory of revealed preference has ignored the substitution effect which is considered to be the result of indifference hypothesis. Moreover, it has been argued that the theory of Revealed Preference has been based upon the observed behavior of the consumer and through observation it is not possible to separate the income and substitution effect of a price change. The responsiveness of demand to a change in price is the aggregate of income and substitution effects. So Samuelson's explanation of demand to a change in price is the aggregate of income and substitution effects. So Samuelson's explanation of demand theorem is only partial. But this allegation seems to carry very little weight, since in his article, *"Consumption Theorems in Terms of Over-compensation rather than indifference comparison,"* to which a reference has already been made above. Samuelson clearly drawn distinction between income effect and what he calls, "over-compensation effect" as a result of change in the price of commodity. It is true that this "over-compensation effect is more similar to Slutsky's substitution effect rather than Hicksian one. The former involves the movement from a lower I.C. to a higher. I.C. after the income effect removed but the latter it involve the movement along the same I.C. So what Samuelson has ignored is Hicksian substitution effect and not Slutsky's.

Further, Samuelson's enunciation of demand theorem is based on the condition of positive income elasticity or, in other words, the cases of negative income elasticities have been ignored. That is why Giffen's paradox cannot be explained by the Revealed Preference Hypothesis. Indifference Preference Hypothesis did explain this paradox by separating the income and substitution effect of a change in the price of a commodity. From this point of view Hick-Allen formulation has an advantage over the Samuelson's interpretation.

E.J. Mishan ("Theories of consumer's Behaviour: A Cynical View" Economic, Feb, 1961) has objected to Samuelson's interpretation of 'choice' as 'preference'. In his own words "indeed this recklessly non-operational interpretation has long been abandoned by those concerned to preserve their Methodological chastity". But as, H.K. Manmohan Singh has pointed out, "the fact that the consumer chooses A while he could have chosen any of several alternative open to him in a given price-income situation, may be interpreted as revealing his preference is a direct inference from the assumption of consistent behavior (raised on 'strong ordering). Whether it is also a true one is a different matter." (Demand theory and Economic calculation in a mixed Economy by H.K. Manmohan Singh page 75).

Conclusion :

However, it may be concluded that the superiority of Samuelson's theory lies in his applying scientific or behaviouristic methods to the theory of demand and his enunciation of preference hypothesis. Though it is incapable of explaining the exceptional cases like Giffen's paradox. As has been well-observed by an author, "Samuelson's horse- "Revealed preference" was a wonderful performer on the flat but was unable to jump fence. But Hicksian horse "indifference analysis" - requires certain luxury foods called continuity assumption which his own (Samuelson's hardier animal) can do without".

11.7 SUMMARY

In this lesson we moved a step further after Marshallian utility analysis and Hicksian IC analysis. Samuelson's analysis is based on the actual purchase made by the consumer i.e.

preferences revealed in the market. With lesser number of assumptions, Samuelson proved demand theorem and derived indifference curve also. It was too criticised by many economists.

11.8 GLOSSARY

- **Revealed Preference** : The behaviour of consumer is observed in the market. The purchases made by the consumer in the market reveals preference of the consumer.
- **Strong Ordering** : Choice is revealed in single act and it reveals the actual behaviour of the consumer (i.e. Revealed Preference Theory).
- **Weak Ordering** : In Hicks IC analysis, we have a number of combinations of goods X and Y, amongst which consumer is indifferent. This is called weak ordering,

11.9 REFERENCES

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11.10 FURTHER READING

- Koutsyiannis A (1977). *Modern Micro Economics*. McMillan Press.

11.11 MODEL QUESTIONS

1. What is the main proposition of "Revealed Preference Theory". What are its basic assumptions and axioms. In what way is revealed preference theory an improvement over indifference curve analysis.
2. One of the main problems of consumers analysis has been the measurement of utility. How does revealed preference theory analyse consumers behaviour without involving the problem of measurement of utility.
3. Marshallian demand curve can be drawn straightway from observed market behaviour of consumer. Do you agree with this statement? if yes, illustrate the derivation of demand curve from the revealed preference axiom.
4. It is claimed that even indifference curve can be drawn by using revealed preference axioms. Do you agree? if yes, illustrate the derivation of indifference curve from the revealed preference axioms.

UNIT – III

Lesson – 12

CONSUMER'S CHOICE UNDER UNCERTAINTY

Structure

- 12.0 Objectives
- 12.1 Introduction
- 12.2 Failure of Traditional Theories under Risk
- 12.3 Consumer Behaviour /Choice under Risk and uncertainty
 - 12.3.1 Bernoullis Theory
 - 12.3.2 Neumann Morgenstern Theory
- 12.4 Construction of utility Index : N-M Theorem
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 - 12.4.2 Risk Lover and Uncertainty
 - 12.4.3 Risk Neutral
- 12.5 Friedman-Savage Hypothesis
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- 12.7 Risk - Return Tradeoff
- 12.8 Ways to Mitigate Risk
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- 12.9 Summary
- 12.10 Glossary
- 12.11 Reference
- 12.12 Further Reading
- 13.13 Model Questions

12.0 OBJECTIVES

After going through this lesson, you shall be able to :

- differentiate between 'choice in the face of risk' and 'choice in the absence of risk'.
- describe how risk is measured.

- explain why some individuals buy insurance and also gamble.
- consumers attitude towards risks
- know how risk and uncertainty can be reduced.

12.1 INTRODUCTION

Traditional demand theory as examined until now implicitly assumed a riskless world. It assumed that consumers face complete certainty with regard to prices, incomes and other variables. However, many of the choices that people make involve considerable uncertainty. Thus, the applicability of the traditional economic theory is limited to the fact that it is based on the assumption of a riskless world while most economic decisions are made in the face of risks or uncertainty. In this lesson we extend traditional demand theory to deal with choices subject to risk or uncertainty.

12.2 FAILURE OF TRADITIONAL THEORIES UNDER RISK

We have already discussed Marshallian Utility Analysis Hicksian Indifference Curve, as well as Revealed Preference approaches. The Cardinal Utility approach was designed to give information about the psychological state of the consumer, the magnitude of his desire and the psychic gains and losses incurred by the alternative actions which are available to him. In other words this approach is based on cardinal number i.e. 1, 2, 3, etc. or we can say utility is a quantifiable entity and measurable. Similarly in Indifference curve approach a large class of decision process can be explained, with the aid of information about the individuals preferences with no attempt to assign magnitudes to them. In other words this approach was based on ordinal numbers i.e. A, B, C, etc. or we can say utility is comparable. Samuelson also gave his Revealed Preference Theory on the assumption of ordinal approach but based on actual behaviours of the consumer. These traditional approaches were based on the assumptions of certainty of Income. Tastes etc. and they also assumed that consumers will always make a rational choice. He shall try to choose that combination which gives him or her the maximum satisfaction based on the principle of Diminishing Marginal Utility and proportionality rule. In other words these approaches were based on the assumption of certainty and risk less situations. According to "modern Economists in fact consumers face uncertainties and risky situations about future income, Returns of Investment and future demand for certain products etc. in day to day life."

12.3 CONSUMER BEHAVIOUR UNDER RISK AND UNCERTAINTY

The traditional approaches have failed to answer consumer's behavior under uncertain and risky situations. Therefore an alternative approach known as modern approach was given by Neuman Morgenstern. They developed a new approach known as N-M approach. They explained consumer's behavior under risky and uncertain situations. They were of the opinion that under risky and uncertain situations the outcome of alternative choices are known in a probability form. Therefore they explained consumer's behavior by assuming that utility is a cardinal in lieu of ordinal.

12.3.1 Daniel Bernoulian Utility Theory

This modern utility theory or analysis is sometimes known as **Daniel Bernoulian Utility Theory**. This Daniel Bernoulian was a known mathematician of 18th century who became interested in knowing **ST. Peterbergs Paradox** that why people are reluctant to have bets at better than at 50-50 odds? When their expectation of winning money in a particular type of gamble is greater? He tried to give convincing explanation to solve this Paradox.

According to him a rational individual shall take decisions under risky and uncertain situations on the basis of expected utility rather than expected monetary value. Marginal Utility of money to individual declines as he has more of money. Therefore, a consumer behaves on the principle of expected utility which generally falls when he gets more Income. Therefore, a consumer believes on the principle of expected utility which generally falls when he gets more Income. Therefore, a consumer will not go in for gambling because he knows even if he wins money in gambling. M.U. of money will decline. Hence, he will not play the gamble. This can be explained with the help of diagram.

In Fig. 12.1 on OX we measure money in thousands and on OY we measure M. U. of money. Suppose a person got Rs. 20 thousands with him and can make a bet at 50-50 odds of winning or losing Rupees one thousand. If he wins, money with him will increase to 21 thousands. No doubt money has increased but M.U. of money has declined. Earlier at Rs. 20 thousands M.U. of money was equivalent to O. But when money has increased with him from 20 thousands to 21 thousands. The MU of money has declined. This can be seen from the point Q. If as a result of an increase in money with him, the expected marginal utility of one thousand which is depicted by the point Q is less than the marginal utility of previous one thousand which was equivalent to O. In other words the gain in utility in case of his winning the bet is less than the loss of utility in case of his loosing the bet. Though the loss and gain is same in monetary terms. Thus given the diminishing Marginal utility of money expected gain in Utility is less than the expected loss of utility from one thousand rupees involved in the bet. A rational person shall therefore not make a bet at 50-50 odds.

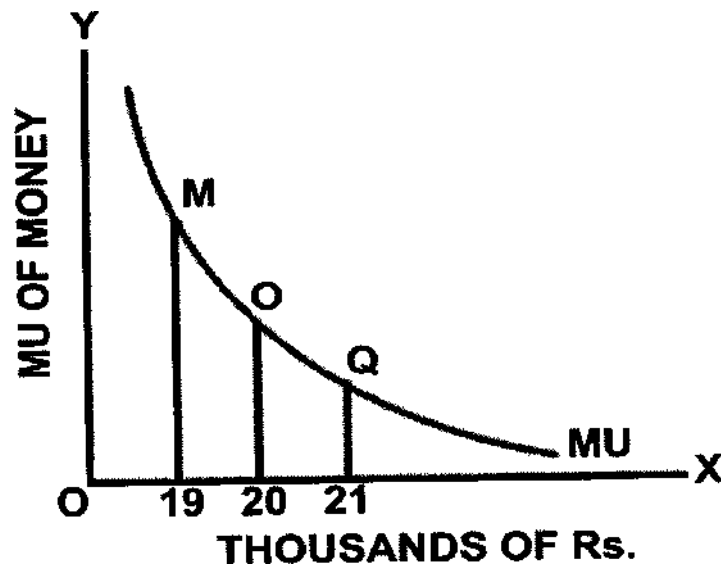


Fig. 12.1

NEUMANN-MORGENSTERN METHOD

12.3.2 Neumann Morgenstern Theory

Neumann and Morgenstern discovered the method of measuring utility in the case of risky and uncertain situations from the Bernoullians idea of gambling and purchase of lottery tickets etc. Which has been explained above. They suggested in their well known book. *Theory of Games and Economic Behaviour* (Princeton University Press, 1947) that it is possible to built up an index showing the magnitude of utility obtained by a person playing a game

involving loss and gain of money. The measurement they suggested was only conceptual. Its practical measurement is confined to the respected utilities which determine to be operational. It is practical measurement in the sense that it is guide to a making rational decisions.

12.4 CONSTRUCTION OF UTILITY INDEX : N-M Theorem

The Neumann Morgenstern method of measuring utility involves the construction of a utility index. Before we study the construction of the so called N-M utility index. It must be remembered that analysis is based on three important assumptions.

1. The consumer possesses a scale of preference. The scale preference here refers to the choice of 'events'. Events here mean the acts of choosing uncertain combinations involving money with probabilities attached to them.
2. The person can always tell us whether he prefers one event to another or whether he is indifferent between them. It implies that the person concerned can compare alternative events with regard to their probabilities.
3. It is assumed that the individual's choices are consistent. He does not choose one event in one situation and then reject in another.

Given the assumptions stated above, we can easily mow the steps in building this index.

- (1) *The first step* is to record the numerical probabilities of losing and winning money. Take the example of a person who faces sixty to forty odds in the choice of lottery ticket whose first prize is Rs. 5000 if he wins and the consolation price of Rs.10 if he loses. The probability of winning is 0.6 and that loss is 0.4.
- (2) *The second step is* : The Neumann and Morgenstern is more concerned with expected utility, from monetary gain than expected value. The formula for the same is:

$$= P(W) + (1 - P)F$$

P stands for probability of winning, W stands for monetary amount of first prize and 1-P stands for probability of his losing, F stands for monetary value of his consolation prize.

$$= 0.6(5000) + 0.4(10)$$

$$= 3000 + 4 = 3004$$

But we have said above that N.M: is interested more in expected utility rather than expected monetary value. Now this monetary gain is converted into monetary utility with the following formula

$$= P.U(W) + (1 - P) U(F)$$

Where U(W) is the expected utility of the first prize and U(F) is the utility of the consolation prize. In that example given above, the expected utility of the monetary gain from the lottery ticket is

$$0.6 \times U(\text{Rs. } 5000) + 0.4 \times U(\text{Rs. } 10).$$

- (3) *The third step* is to assign utility numbers to Rs. 5000 and Rs.10 in the event of the risky choice of the lottery ticket. We have to do it as arbitrarily so as to begin work on the utility index. Just as is the case with index number construction where 100

is chosen as the base. Let the utility of winning Rs. 5000 be put at 500 units. Therefore, Rs. 10 will be equal to one unit only. Thus the expected utility of the lottery ticket equals. .

$$\begin{aligned} &0.6 \times 500 + 0.4 \times 1 \text{ utils} \\ &= 300 + 0.4 \text{ utils.} \\ &= 300.4 \text{ utils.} \end{aligned}$$

The objective N.M. is to evaluate the utility of a certain sum of money. For this tool of certainty equivalent is used. To know certainty equivalent of the consumer, we further have to enquire his mind. This is called fourth step.

- (4) We have already discussed the first prize of lottery, ticket is Rs. 5000, if he wins i.e. 0.6 and if he loses he will get consolation price of Rs.10 i.e. 0.4. Now if we ask individual with how much sure sum of money and the above lottery ticket with a given prize and probabilities he would be indifferent. Suppose, he tells us that he is indifferent between the amount of Rs. 3000 and the lottery ticket with 60-40 odds. We call Rs. 3000 in this case the certainly equivalent of the uncertain risky lottery ticket.

Since the person is indifferent between the lottery ticket and the sure amount of Rs. 3000. We can take it that the expected utility of Rs. 3000 to the person. This helps us in finding out the cardinal utility measure of Rs. 3000.

Utility of Rs. 3000 = Expected utility of the lottery ticket

$$\begin{aligned} \text{Rs. 3000} &= P.U. (W) + (1-P) U. (F) \\ &= 0.6 \times 500 + 0.4 \times 1 \text{ utils} \\ &= 300 + 0.4 \text{ utils.} \\ &= 300.4 \text{ utils.} \end{aligned}$$

In the same manner we can find out the utility numbers in cases of other lottery tickets with different odds or probabilities of winning. In this way a set of Utility indices can be prepared which can be plotted to obtain a utility curve. This curve can be used to predict the individual's choice in situations involving different degree of risks. In short the Neumann Moregonstern utility analysis was developed to apply it to the theory of games which individual would like to play. The utility measure obtained permits us to prediction the absence of the player which of several risky propositions the player will prefer. The analysis has encouraged some theoretical contributions in explaining the behavior or marginal utility of money for different persons. The N.M. utility index has been criticized on the terms expected utility values and thus it provides no justification to a change in Marginal utility of money.

The utility as cardinal in N-M theory has been used in a restrictive sense. It has been used for making predictions.

12.4.1 Attitudes Towards Risk

(a) Risk Averter Vs Risk Lover

Consumers differ considerably in their attitude towards risk. As per Bernoulli's hypothesis, a person whose marginal utility of money declines will refuse to accept a fair

gamble. A fair gamble or gain is one in which the expected value of income from a gamble is equal to the same amount of income with certainty. The consumer who refuses a fair gamble is known as risk-averter. Thus a risk averted is one who prefers a given income with certainty to a risky gamble with the same expected value of income. Risk aversion is the most common attitude towards risk. It is because of the attitude of risk aversion that people buy insurance against various kind of risk such as house insurance, sudden illness, car accident etc. and also prefer jobs with stable income to occupations with uncertain income. This attitude of risk – aversion can be explained with N – M method of measuring expected utility. It may be noted that marginal utility of income of a risk – averted diminishes as his income increases.

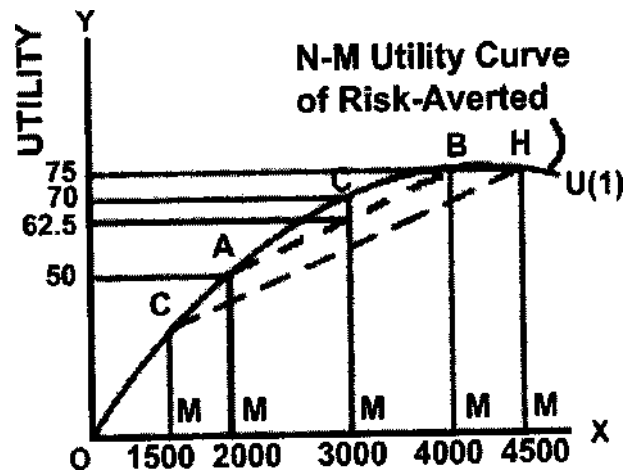


Fig. 12.2

In the above diagram N - M utility function curve $U(1)$ has been drawn. It starts from the origin and has a positive slope throughout showing that an individual prefers more income to less. Further the N - M utility curve shown in the above diagram is concave which indicates that marginal utility of income of an individual diminishes as his income increases. Therefore, the utility curve in the above diagram represents the case of a risk averted i.e. attitude of risk aversion. With Rs. 2000/- income an individual's utility is 50 which increases to 70 as income increases to Rs. 3000/- with a further increase in income to Rs. 4000, his utility rises to 75.

Suppose, a consumer's present income is Rs. 3000 and he is offered a fair gamble in which he has 50:50 chances of winning or losing Rs. 1000. Thus the probability of his winning is 0.5. If he wins his income increases to Rs. 4000 and if he loses, his income will fall to Rs. 2000. The expected money value of his income in this situation of risky/uncertain outcome is given by:

$$E(V) = 1/2 \times 4000 + 1/2 \times 2000 = \text{Rs. } 3000$$

If he rejects the game he will have his present/current income of Rs. 3000 with certainty. Through the expected value of his uncertain income prospect is equal to his income with certainty a risk averted will not play the game because he acts on the basis of expected utility of his income in risky situations i.e. Rs. 4000 if he wins and Rs. 2000 if he loses, can be obtained as under: '

$$\text{Expected utility (EU)} = \pi U(\text{Rs. } 4000) + 1 - \pi U(\text{Rs. } 2000)$$

It may be seen in the above diagram that utility of a consumer from Rs. 4000 is 75 and utility from 2000 is 50. The expected utility from this uncertain prospect will be.

$$E(U) = 1/2 (75) + 1/2 (50)$$

$$= 37.5 + 25 = 62.5$$

In the N - M utility curve $U(I)$, the expected utility can be found by joining point A and B by a straight line AB and then reading a point on it corresponding to the expected value of the gamble Rs. 3000 the expected value of the utility is M_{2D} 62.5 which is less than M_{2C} or Rs. 70 which is the utility of income of Rs. 3000 with certainty. Therefore a person will refuse to gamble and it is due to diminishing marginal utility of money. The gain in utility from 1000 in case he wins is less than the loss in utility from Rs.1000 if he loses the game. That is why his expected utility from the uncertain income prospect has been found to be lower than the utility he obtains from the same income with certainty.

It follows from the foregoing analysis that in case the marginal utility of money income diminishes an individual will avoid a fair game such a person is known as risk averse as he prefers an income with certainty. Let us illustrate it with another example. .

Suppose to an individual with a income of Rs. 3000 two fair gambles are offered. First a 50:50 chances of winning or losing Rs. 1000 and second a 50:50 chances of winning or losing Rs.1500. With the even chances of winning & losing the expected value of income in the second game will be.

$$1/2 (1500) + 1/2 (4500) = \text{Rs. } 3000$$

On the N - M utility curve $U(I)$ we draw a straight line segment GH joining point G & H, corresponding to income of Rs. 4500. It will be seen from this straight line segment GH that expected utility from the expected money value of Rs. 3000 from the second gamble is M_{2L} which is less than M_{2D} which is less than M_{2D} of the first gamble.

Thus an individual will prefer first game which has lower variability to the second gamble which has a higher degree of variability of outcome. In the first gamble the degree of variability of outcome is less and therefore the risk is less and in the second gamble the degree of variability is greater which makes it more risky. And in case of income with certainty there is no variability of outcome and therefore involves no risk at all. A risk averter therefore prefers the income with certainty to any gamble with the same expected money values as the income with certainty. .

12.4.2 Risk Lover and Uncertainty

Now let us take up the case as to how a risk - lover will react to a fair gamble. A risk lover is one who prefers a risky game or a gamble with the same expected value of income to the equivalent income with certainty. In the following diagram the N - M utility curve of a risk lover has been drawn.

The N - M utility curve is convex. The convexity implies that marginal utility of money income of an individual increases as his income increases and he is offered a game with 50:50 chances of winning or losing Rs. 1000. If he wins his money income will rise to 4000 and if he loses, his income will fall to Rs. 2000. The expected money value of the gamble will therefore be equal to $1/2 (4000) + 1/2 (2000) = \text{Rs. } 3000/-$ and the expected utility from the expected value of income of Rs. 3000 will be M_{2D} or OU_2 which is less than M_{2C} or OV of income of Rs. 3000 with certainty.

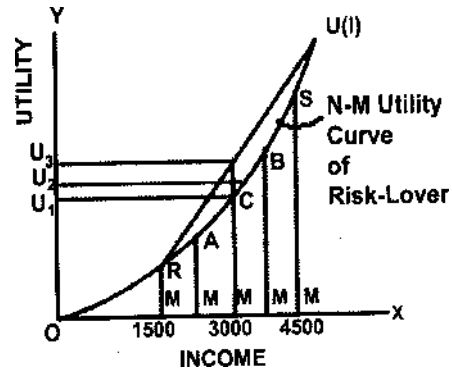


Fig. 12.3

Since the expected utility from the gamble is greater than that from his income with certainty he will be willing to accept the gamble. Rather it can be shown that a risk-lover will prefer a gamble having greater risk i.e. the gamble which has a large variability of, outcome - 91 to a gamble with less risk.

Suppose an individual with increasing marginal utility of money income is offered two fair gambles. One with 50:50 chances of winning or losing Rs. 1500. Given the present income (Rs. 3000) the expected value of the two gambles is the same.

$$E(V) \text{ of game - I} = 1/2 (4000) + 1/2 (2000) = \text{Rs. } 3000/-$$

$$E(V) \text{ of game - II} = 1/2 (4500) + 1/2 (1500) = \text{Rs. } 3000/-$$

However, the expected utility of the two gambles differs as is clear from the above diagram. The expected utility of game - I is N_2T or OU_2 which is greater than M_2D or OU_2 of the first gamble with less variability or risk of outcome. It therefore follows that the risk lover will prefer the second gamble with greater risk and variability of outcome.

12.4.3 Risk Neutral

It may be mentioned that a limited case of attitude towards risk may occur which is the case of being a risk neutral. A risk neutral person will be indifferent between an income with

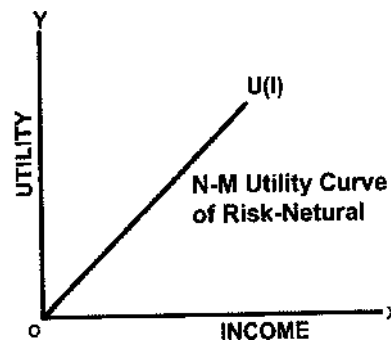


Fig. 12.4

MARGINAL UTILITY OF MONEY INCOME

certainty and the gamble with an equivalent expected money value. The N - M utility curve of a neutral person will be straight line from the origin showing that marginal utility of income of a risk natural individual remains constant with the increase in income.

Self Assessment Question

Q. Define a) risk lover b) risk neutral?

Marshall has assumed that the law of diminishing marginal utility must apply to money also. In recent years it has been established that even if the marginal utility of each and every commodity which money can purchase diminishes, 'it does not necessary follow that marginal utility of money income also declines. Since people gamble (take risks) and insure (avoid risks) at the same time the marginal utility of income to people rises and falls depending on the level of income. Economists have tried to rationalize the taking of insurance and gambling with the help of utility analysis. There are two main contributions made to solve the problem of the seemingly contradictory behavior. These are:

- (1) The Friedman Savage Hypothesis and
- (2) The Markowitz Hypothesis

We take brief explanation of the two contributions after explaining the possible shape of the total utility of money curve.

Marshall had not included involving uncertainty in his principle of utility maximization. In his opinion, gambling was "a sure way to loss utility", without going into the questions of measurement of the utility of additions to money income, he assumed that the marginal utility of money to the consumer remains constant for small purchases.

The first person to define **utility function for money** was **Bernoulli**, a mathematician. He did this while observing the people's common behavior towards risk. He noted that people buy insurance thus choosing certainty over uncertainty, but they also engage in gambling choosing uncertainty over certainty. He explained this as "rational behaviour" suggesting that people are guided not by the probabilities being weighted, by the utility of income. Given diminishing marginal utility of money income, people will insist on a large gain to compensate them for the risk of given loss Bernoulli thus hypothesised that total utility curve of money income slopes from left upwards to the right and is concave from below (or that the marginal utility curve of money income falls from left down to the right). Thus, in Bernoulli's opinion the total utility curve of income was concave throughout as it rises.

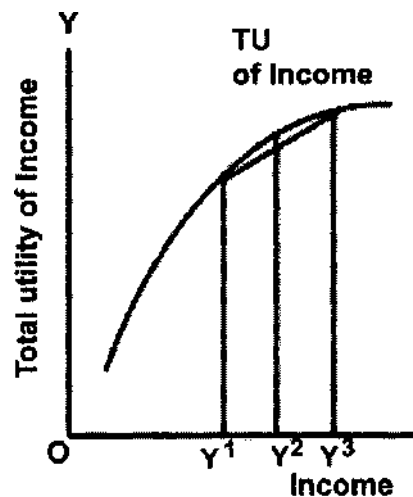


Fig. 12.5(a)

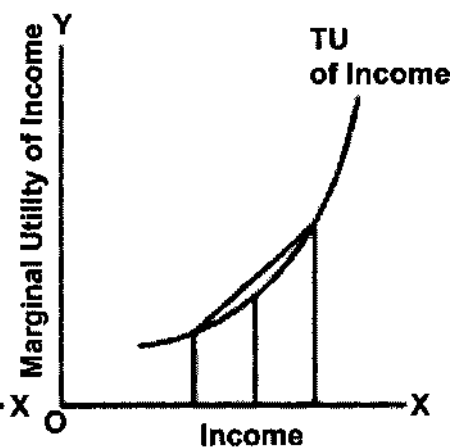


Fig. 12.5(b)

Let us analyse the implication of the Bernoulli hypothesis with the help of figure 13.5(a). In this figure, an individual is having the income level shown by Y_2 . He is supposed to maximize the expected utility of income with reference to this diagram a "fair bet" is given by the condition.

$$PU(y_1) + (1-P)U(y_3) = U(y_2)$$

Where P is the probability of winning the bet and u is the total of income. The individual compares the utility of y_2 with the weighted average utility from the gamble, the weights being probabilities. He will accept "fair bets" if.

$$PU(y_1) + (1-P)(U y_3) = U(y_2)$$

In geometrical language it means that the individual whose total utility curve is given in Fig. 12.5(a) will not accept "fair bets" since the line connecting the utility curve at point corresponding to incomes y_1 and y_2 passes below the point meant for the level of income y_2 . He will accept insurance, however, if his present income is y_3 , the possible loss $y_1 y_2$ and the insurance premium is equal to $y_3 y_3$, he will accept the certainty of y_2 over the chance of failing to y_1 . Thus, as a curve having falling *marginal utility* of income shows the individual's refusal to accept "fair bets."

Now, let us explore the implication of a total utility curve which is convex from below throughout such a curve is shown in Fig. 12.5(a). The curve shows increasing marginal utility of income. It implies that the individual, would gamble but would refuse to take out "fair" insurance. In other words, starting from his present income of y_1 , he would pay $y_1 y_2$ of income for a lottery ticket in the hope of winning $y_3 y_2$ but he would not pay a premium of $y_2 y_3$ to insure against the possibility of his income falling from $y_1 y_2$.

The difference between figure 12.5(a) and 12.5(b) is that figure 13.5(a) shows diminishing marginal utility of income for increments of income, and therefore *increasing marginal* disutility with every increments of income, while fig. 12.5(b) shows exactly the opposite, that is *increasing marginal utility* for increments of income.

Self Assessment Question

Q. What is the crux of N-M Theorem

Q. What is the contribution of Bernoulli's Theory towards TU curve?

12.5 THE FRIEDMAN-SAVAGE HYPOTHESIS

We so far have studied that M.U. of money diminishes. If we accept this as a universal statement, then according to Friedman we shall not be in a position to get reply why people go in for gambling?

Professors Friedman and Savage have proposed that the total utility curve of income for individuals is generally first concave, then convex and finally concave again as shown in Fig. 12.5 upper portion. They believe that at low levels of income, the utility curve is concave showing the poor men have increasing marginal utility for increments income and that they will accept "fair" bets and avoid insurance. At high levels of income, the curve is once again concave. In the *middle range*, the curve is convex showing *diminishing marginal utility of increments income*. The *S-shaped total utility curve* explains both the tendency to buy

insurance and the tendency to buy lottery tickets; it all depends, firstly, on whether one is "poor" or "rich", and secondly, on how large is the intended gamble or loss against which one is securing. Let us study the **Friedman Savage hypothesis in detail**.

Friedman and Savage started by assuming (a) that the total utility of money curve for each individual has the shape shown in the upper portion of figure 12.5 and (b) that the individual seeks to maximize his cardinal utility, the marginal utility curve consistent with the Friedman Savage total curve is shown at bottom of figure 12.5.

In Fig. 12.5 the total utility of income curve goes up from left to right. There are three segments of the curve which are first concave downward, then concave upward and again concave downward. The points J and K are called inflection points because at these points of the curve it changes its direction. The lower part of the diagram shows the curve of marginal utility derived from the total utility curve in the upper portion. We find that the marginal utility of income to the individual first diminishes again. Friedman and Savage believed that the three segments of the utility curve represent the utility function of the three social groups: the poor the middle income group and the rich. Referring to the total utility curve Friedman and Savage explained the behavior of different income groups in purchasing insurance and lottery tickets at the same time as follows:

- (1) A poor man for whom marginal utility of income diminishes will be willing to buy a fair insurance against any kind of risk. He will not be prepared to go in for small fair gambles. He will, however, be attracted by fair gambles which offer a small chance of a large gain.
- (2) A middle income consumer shall be induced to go in for a fair gamble. He does not like to insure against small losses, but he may be attracted by insurance against relatively large losses.
- (3) A high income man may be prepared to insure against small losses but will be unwilling to insure against rather large losses. He will be averse to gambles of the lottery type, but may be attracted to gamble which offers reasonably sure, though fairly small, gains with a small probability of sizeable losses.

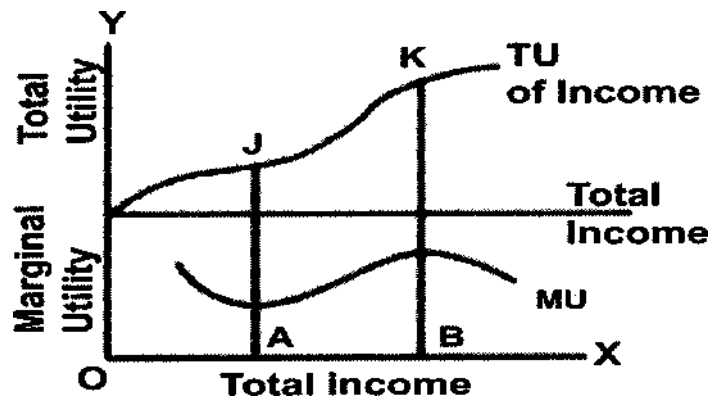


Fig. 12.6

12.6 THE MARKOWITZ HYPOTHESIS

The Markowitz considered the Friedman Savage hypothesis as one of the major contributions to the theory of the consumer behavior involving risk. But he found that the hypothesis contradicts common observations in many ways. (1) It seems peculiar behavior on

the part of a poor man being unwilling to go in for a fair gamble, shown in Fig. 13.6. It seems strange that a rich person should insure against small losses not caring for the insurance of large losses. (3) Both poor and rich people purchase lotteries and gamble on horse races. Similarly rich and poor play the same games and gamble alike in the stock market. Markowitz suggested we can avoid these contradictions. For this he proposed a slightly different form of a total utility curve shown in Fig. 12.7.

Markowitz's total utility curve shown in the upper portion of the diagram has three inflection points. The marginal utility curve of income derived from the total utility curve is shown in the lower portion of Fig. 12.7.

According to Markowitz, the middle inflection point O is the present or customary level of income. The curve is concave upward: immediately above the present income level, concave downward immediately below the first inflection point F lies quite below the customary income level and the third inflection' point T substantially above that level of income. The middle inflection point O shows the present level of income for all income groups. The distance between the first and third inflection points will be farther for the rich people and closer for the poor class.

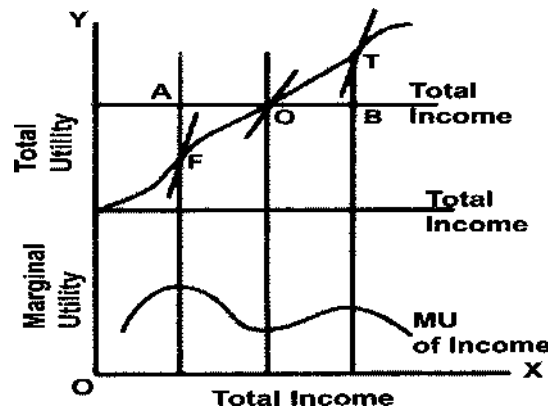


Fig. 12.7

Markowitz's hypothesis is definitely an improvement over then given by Friedman and Savage. It is consisted with the existence of fair insurance and fair lotteries. The same individual will buy insurance and lottery tickets. He will take a large change of small loss for a small, chance of a large gain (lottery prize). The hypothesis suggests that a person will behave essentially the same way whether he is rich or poor. Only the meaning of large and small will be different.

Conclusion

The underlying idea of the development of modern utility analysis is to indicate that diminishing marginal utility of money income is a very different thing from diminishing marginal utility for a specific commodity. Having established this, economists have gone forward to rationalize the behavior of different income groups in their choice involving risk. The progress has been limited. But this field of enquiry seems to be very promising for developing fruitful, hypothesis.

12.7 RISK-RETURN TRADE OFF

The concept of choice under risk and uncertainty is also relevant in case of an investor who can invest his savings in different types of assets. Those assets can vary so far as degree

of risk is concerned. If the investor is a risk averter he will invest in the deposits of nationalized banks and will earn a fixed rate of interest. If he is a risk lover, then he will buy shares from stock market whose dividend can vary. With the stock market going well he will get much higher return and vice versa. He has to make a choice whether to go in for assured fixed return or to take debentures of reputed companies with some equity shares to arrive at optimum portfolio of investment. The concept of risk return trade off is represented by indifference curves between degree of risk and rate of return from investment. Expected return is measured along the vertical axis and degree of risk (as measured by standard deviation) is shown on horizontal axis. Each indifference curve of risk return trade off curves shows all the combinations of degree of risk and expected rate of return that gives same level of utility to an investor. As more risk gives less satisfaction therefore, as we move rightward indicating greater risk or standard deviation of the variability of return the investor should receive higher expected return to give him equal satisfaction. This is the reason that risk return trade off curve is positively sloped.

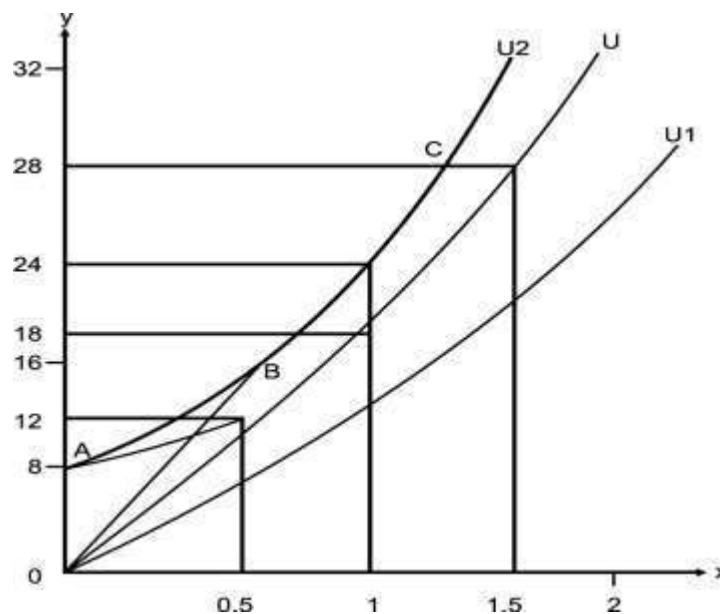


Figure 12.8

The concept of risk return trade off is explained in figure 13.8 where on X axis, risk in terms of standard deviation of probability distribution is measured. The rate of return is measured on the vertical axis. The AU curve (upward sloping) is drawn from point A. point A represents risk free return of 8 percent. The curve further shows that 4 percent extra return over and above risk free return is required to compensate him for the degree of risk given by $\sigma = 0.5$. One-point worth noted is that at 8% risk free return, standard deviation is zero. The difference between required rate of return on a risky investment and the return on risk free investment is called risk premium. In the risk return trade off curve, rate of return of 4% is required with a risk of 0.5. Similarly for taking an investment with a risk of $\sigma = 1.0$, 18% return is required with risk premium equal to 10. In the same way 28 percent rate of return is required on risky investment with $\sigma = 1.5$.

For a person who is a risk averter, higher rate of return is required for risky investment with a given standard deviation, It would lead to more steep risk return trade off curve. With AU2 risk return trade off curve, to compensate for risky investment with $\sigma = 1.0$,

24 percent return is required. In this case, the risk premium is 16 percent as compared to 10 percent of the previous individual.

Similarly for a less risk averter the tradeoff would be less steep (U1 in the figure 12.8). To compensate him for risky investment with $\sigma = 1.0$, return of 12 percent is needed. It is clear from above information that individuals who are highly risk averters have more steep risk return trade off curves. Those who are less risk averse will have flatter risk return trade off curves.

12.8 WAYS TO MITIGATE RISK

It generally happens that people sometimes choose risky alternatives. They become risk lovers but certainly they want to mitigate risk. These are different ways by which managers as well as consumers can reduce risks. These are:

12.8.1 Diversification of Portfolios

This is the most important method to reduce risk. Diversification means reducing the risk by allocating resources to a variety of activities whose outcomes are not closely related. Here the producers invest in different lines of business. In the same way, individuals investors also choose a portfolio of assets to reduce over all risk of their investment. Diversification is a way for the minimization of risk ie the producers produce and sell two or more products rather than a single product. Suppose there is a fifty percent probability of being a hot year and 50% of being a cold year. If the investor invests only in air conditioners or heaters than his actual income would be less. But if he diversifies by dividing his time evenly between two products then income would certainly be high and risk would also be eliminated. One serious limitation of this is that diversification is not an easy task. As in the above mentioned example, sale of air conditioners and heaters is negatively correlated, that is, they tend to move in opposite direction. But even then so long as producers allocate his resources towards a variety of activities whose outcomes are not closely related, he can reduce the risks. For a stock market, diversification is an important tool. At one particular day the price of an individuals stock can go up or down. But some stocks rise in price and others fall in price. By investing all money in single stock means taking more risk than is necessary. It is better to invest in the portfolio of Fifteen to twenty different stocks. In this case mutual funds can be an attractive offer where the investors can diversify by buying their shares.

12.8.2 Buying Insurance:

Risk averse people are willing to pay to avoid risks. People buy insurance when they are faced with risky and uncertain situations. If the cost of insurance is equal to the expected loss, then risk averse people will buy enough insurance to recover fully from any financial loss they might suffer. By buying an insurance policy a person becomes assured of having the same income whether or not there is a loss. Since the insurance cost is equal to the expected loss, the certain income is equal to the expected income from the risky situation. For a risk avertor, the guarantee of the same income regardless of the outcome generates more utility than would be the case if the person had a high income when there was no loss and a low income when a loss occurred. It is the tendency of the consumers to buy insurance from those companies who are specialized in selling insurance. The insurance companies face little risks because they sell large number of policies. Their ability to avoid risk is passed on the inertia of large numbers which tells that although single event is random but the average outcome of many similar events can be predicted. By operating on large scale, it is an

assurance to the insurance companies that over a large number of events, total premium paid will be equal to the total amount of money paid out.

12.8.3 Obtaining more information about choices:

It is the tendency of the people to make decisions based on limited information. But risk can be reduced when more information is available. Then people can make better predictions. Since information is a valuable commodity people will pay for it. The value of complete information is the difference between the expected value of a choice when there is complete information and expected value when information is incomplete.

12.9 SUMMARY

Consumers and managers frequently make decisions in which there is uncertainty about the future. This uncertainty is characterized by the term risk which applies when each of the possible out comes and its probability of occurrence is known. Consumers and investors are concerned with the expected value and the variability of uncertain outcomes. It depends on their natures whether they are risk cover, risk averter or risk neutral.

12.10 GLOSSARY

- **Expected value** : It is a measure of the central (Central) tendency of the values of risky outcome.
- **Variability** : It is frequently measured by the standard deviation of outcomes, which is the square root of the probability weighted average of the squares of the deviation from the expected value of each possible out come. Or Extent to which possible outcomes of an uncertain event differs.
- **Probabilities or Weights** : Facing uncertain choices, consumers maximize their expected utility an average of the utility associated with each outcome-with the associated probabilities serving as weights.
- **Risk Averter** : A person who would prefer a certain return of a given amount to a risky investment with the same expected return is risk-avorter. The maximum amount of money which a risk-avorter would pay to avoid taking a risk is called risk premium. Or Condition of preferring a certain income to a risky income with the same expected value, is risk averse.
- **Risk Neutral** : A person who is indifferent between a risky investment and certain receipt of the expected return on that investment is risk-netural. Or It is Condition of being indifferent between a certain income and an uncertain income with the same expected value.
- **Risk Lover** : A risk loving consumer would prefer a risky investment with a given expected return to the certain receipt of that expected return. Or It is Condition of preferring a risky income to a certain income with the same expected value.
- **Risk Reduction** : Risk can be reduced by (a) diversification (b) insurance and (c) additional information.
- **Probability** : Likelihood that a given out come will occur.
- **Expected Value** : Probability-weighted average of the payoffs associated with all possible outcomes.

- **Payoff** : Value associated with a possible outcome.
- **Deviation** : Difference between expected payoff and actual payoff.
- **Standard Deviation** : Square root of the weighted average of the squares of the deviations of the pay offs associated with each out come from their expected values.
- **Expected utility** : Sum of the utilities associated with all possible outcomes weighted by the probabilities that each outcome will occur.

12.11 REFERENCE

- Koutsyiannis A (1977). *Modern Micro Economics*. McMillan Press.
- Ahuja HL (2014). *Advanced Micro Economic Theory*. S. Chand Publications Pvt. Ltd., New Delhi
- Theory of Games and Economics Behaviour, 1947. Princeton University Press.

12.12 FURTHER READING

- Koutsyiannis A (1977). *Modern Micro Economics*. McMillan Press.

12.13 MODEL QUESTIONS

1. What does it mean to say that a person is risk averse? Why are some people likely to be risk averse while others are risk lovers.
2. Explain Neuman and Morgenstern method of measuring utility under uncertainty and with the help of this framework define the term (a) Risk Lover (b) Risk averter (c) Risk Neutral.
3. Explain the concept of risk-return trade-off.
4. Discuss Neuman-Morgenstern method of measuring utility.
5. Explain briefly the theory about risk aversion and risk preference.

ANALYSIS OF CONSUMERS BEHAVIOUR UNDER ASYMMETRIC INFORMATION

Structure

- 13.0 Objectives
- 13.1 Introduction
- 13.2 Asymmetric Information-Meaning
- 13.3 Quality uncertainty and Market for Lemons
- 13.4 The Market of Used Cars
- 13.5 Implication of Asymmetric Information
- 13.6 Market for Insurance
- 13.7 Market for Credit Card
- 13.8 Other Markets : Importance of Reputation and Standardisation.
- 13.9 Market Signaling
 - 13.9.1 Job Market Signaling
 - 13.9.2 Other Markets : Guarantees and Warranties
 - 13.9.3 Working Harder and Longer
- 13.10 Moral Hazard
- 13.11 Principal Agent Problem
 - 13.11.1 Principle Agent Problem in Private Enterprises
- 13.12 Network Externalities
 - 13.12.1 Bandwagon Effect
 - 15.12.2 Snob Effect
- 13.13 Summary
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- 13.15 Reference
- 13.16 Further Reading
- 13.17 Model Questions

13.0 OBJECTIVES

After going through this lesson, you shall be able to :

- explain the meaning and importance of asymmetric information and adverse selection.
- discuss adverse selection how the problem of adverse selection can usually be resolved by market signals

- elaborate on how moral hazard can arise in insurance market and how its can be overcome.

13.1 INTRODUCTION

So far, we have assumed that consumers and producers have complete information about the economic variables that are relevant for the choices they face. Now we will see what happens when some parties know more than others i.e. when there is asymmetric information. This field of study is becoming increasingly important in economics. Thus in this lesson. We study the economics of information. The chapter goes on to discuss asymmetric information and the market for lemons ie defective products, the insurance market and adverse selection, market signaling etc.

13.2 ASYMMETRIC INFORMATION : MEANING

So far, we have assumed that consumers and producers have complete information about the economic variables that are relevant for the choices they face. Let us see what happens when some parties know more than others i.e. when there is asymmetric information. Asymmetric information is a characteristic of many business situations. For example a seller of a product knows more about its quality than buyers does. Workers usually know their own skill and abilities better than employers. Business managers know more about their firms' costs, competitive positions and investment opportunities than business owners.

Asymmetric information explains many institutions arrangement in our society. It is on reason - why automobile companies offer warranties on parts & service for new cars. Why firms & employee sign contracts that included incentives and rewards. And why shareholders of corporations must monitor the behavior of managers. Let us begin by examining a situation in which the sellers of a product have better information about its quality than buyers have? We will see how its kind of asymmetric information can lead to market failure.

13.3 QUALITY UNCERTAINTY AND THE MARKET FOR LEMONS

Suppose, a buyer has purchased a new car for Rs. 7, 00,000 drive its 500 miles and then decided to sell realizing that he really did not need it. There is nothing wrong with the car. It performed well and met all your expectation. The only reason for selling it is, that the buyer felt he could do without it and it would be better to use this money for other needs so he decided to sell off the car. How much he expects to get for, it perhaps not more than Rs. 5,00,000, even tough the car is brand new and has been drives only 500 kilometers, has a warrant which is transferable to the new buyer. And if you are a prospective buyer, you probably would not pay more than Rs. 5, 00,000 yourself.

'Why does the mere fact that the car is second hand reduced its value so much? As a prospective buyer you would perhaps wonders, why this car is for sale? Did the owner really change his mind about just like that? Or Is there something wrong with it? Is this car a lemon? '

Used cars sell for much less than new cars because there is asymmetric information about their quality. The seller of a used car knows much more about the car than the prospective buyer does. The buyer can hire a mechanic to check the car but the seller has had experience with it and will know more about it.

Further more, the very fact that the car is for sale indicates that it may be a "lemon". Why sell a reliable car. As a result, the prospective buyer of a used car will always be suspicious of its quality.

The implications of asymmetric information about product quality were first analysed by George Akerlof in "Journal of Economics" published in 1970 in his article. The market for lemons, *Quality uncertainty and market mechanism*. Akerlof's analysis goes beyond the market for used cars. The market for *insurance financial credit* and even *employment* are characterized by asymmetric quality information. To understand the implication of asymmetric information. Let's start with the market for used cars. Later we will see how the same principles apply to other markets.

Self Assessment Questions

Q. Give examples of some markets where asymmetric information may prevail.

13.4 THE MARKET OF USED CARS

Suppose two kinds of used cars are available in the market (a) high quality cars (b) low quality cars. Also suppose that both buyers & sellers are aware of the quality & can tell which kind of car is which. There will be then two markets i.e. high-quality cars market and low-quality cars market. As illustrated in the following figures.

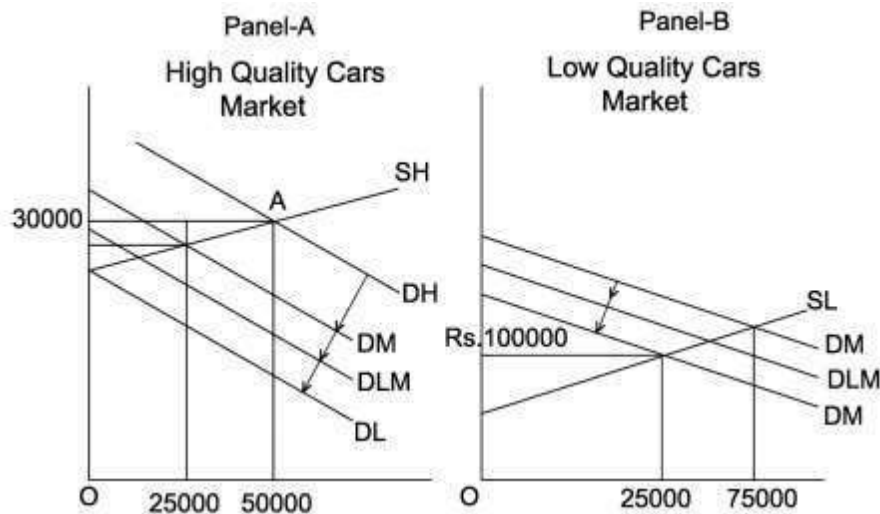


Fig. 13.1

In panel- A, SH is the supply curve for high-quality cars and DH is the demand curve. Similarly, SL and DL are the supply and Demand curves of low-quality cars in Panel-B.

For any given price SH lies to the left of SL because owners of high-quality cars must get higher price to sell their cars. Similarly DH is higher than DL, which shows that buyers are willing to pay more for a high-quality car. As shown in the above diagrams market price for high quality cars is more (\$ 10,000\$) and less for low quality cars (5,000\$) and 50,000 cars or each quality are sold.

As a matter of fact, the seller of a second-hand car known much more about its quality than the buyer does. Buyers discover the quality only after they buy a car and drive it. If the seller knows the quality of cars, but the buyers do not what happens, buyers may think that the chances (odds) are 50:50 that a car they buy will be of high quality. When purchasing a car buyers would therefore view all cars as "medium-quality". The demand for cars perceived to be medium-quality is DM in the above panels, which is below DH in Panels-A and above DL in Panel-B. As a result fewer high-quality (25,000) and more low quality (75,000) cars will now be sold.

As most cars sold (about 3/4) are low-quality, the Perceived demand curve of the consumers shift to DLM, which implies that on the average cars are perceived to be of low to medium quality. As a result the perceived demand curve shifts further to the left pushing the mix of cars even further towards low-quality. This shifting continues until only low-quality cars are sold. At that point the market price would be too low to bring forth any high-quality cars for sale.

So, the consumers correctly assume that any car they purchase will be low quality and the only relevant demand curve will be DL. The situation in the above figure is extreme. The market may attain equilibrium at a price that brings forth at least some high-quality cars. But the fraction of high quality cars will be smaller than CH would be if consumers could identify quality before making the purchase. That is the reason that brand new second-hand cars in perfect condition sell for much less. It is because of asymmetric information that *low quality cars drive the high quality cars out of the market*. This phenomenon is referred to as the lemon problem.

13.5 IMPLICATION OF ASYMMETRIC INFORMATION

The above analysis of second-hand (used) cars shows how asymmetric information can result in market failure. Consumers would be able to choose between low quality and high quality cars. Some will choose low quality cars because they cost less, others will prefer to pay more for high quality cars unfortunately, consumers cannot easily determine the quality of second-hand cars until they actually purchase it and drive it. As a result, the price of used cars falls and high-quality cars driven out of the market. Market failure arises, therefore, because there are owners of high-quality cars who value their cars less than potential buyers of high-quality cars. As a result both parties can enjoy gains from trade but the lack of information presents this mutually detrimental trade.

Second-hand cars (used) are just a stylized example to illustrate an important problem that affects many markets. ***The problem of adverse selection.*** Adverse selection arises when products of different qualities are sold at a single price because buyers or dealers are not sufficiently informed to determine the true quality at the time of purchase. As a result too much of low-quality products and too little of the high quality product are sold.

Let us look at some other examples of asymmetric information and adverse selection. We will also see how the government or private firms respond to the problem.

13.6 THE MARKET FOR INSURANCE

Why do people over 65 have difficulty buying medical insurance at almost any price. Older people do have a much higher risk of serious illness, but why does the price of insurance rise to reflect higher risk? Again the reason is asymmetric information. People who buy insurance know much more about their general health than any insurance company can hope to know even if it insists on a medical examination. As a result adverse selection arises as it does in the market for the used cars, because unhealthy people are more likely to get insured. As a result of unhealthy people in the pool of insured people increases. This forces

the price of insurance to rise, so that more healthy people, aware of their low risks elect not to be insured. This further increases the problem of unhealthy people among the insured which forces the price of insurance up more. This process continues until nearly all people who want to buy insurance are unhealthy. At that point selling insurance becomes unprofitable.

Adverse selection can make the operation of insurance market problematic in other ways.

Suppose any insurance company wants to offer a policy for a particular event say an auto accident. It selects a target group say people under age 25 to whom it plan to sell this policy. The company also estimates the frequency of accident within this group for some of these people the probability of being in accident is low much less than .01 per cent. For others it is high much more than .01 percent. If the insurance company cannot distinguish between high or low risk people, it will base the premium for all men on the average experience i.e. an accident probability of .01 per cent. With better information some people, (those with low probability of accident) will choose not to insure while others raise the accident probability of those who choose to be insured above .01 per cent forcing an insurance company to raise its premium. In the extreme only those who are likely to be an accident will choose to insurance making its impractical to sell insurance.

This kind of market failure creates a role for the government. For health insurance it's provided an argument in favour of Medicare or related forms of government health insurance for the elderly. By providing insurance for all people above the age of 65 the government eliminates the problem of adverse selection.

13.7 THE MARKET FOR CREDIT CARD

By using a credit card we borrow money without providing any collectors most credit cars allow the holder to run a debit of fixed limited of several thousands and many people hold several credit cards. Credit card companies earn interest on the debit balance. But how can a credit card company or bank can distinguish high quality borrower (who pay their debt) from low-quality borrowers (who don't pay) clearly, borrower have better information i.e. they know more about whether they will pay the lender bank does. Again the lemon problem arise credit card companies must charge the same interest rate to all borrowers. This attract more the low-quality borrowers which forces the interest rates up, which increases the number of low quality borrowers which forces the interest rates up further & so on.

Infact credit card companies and bank can to some extent use computerized credit histories, which they often share with one, another, to distinguish low quality and high quality borrowers. Many people think that computerized credit histories invade their privacy should companies be allowed to keep these credit histories and share them with other lenders. Its hard to answer this question but it can be pointed out these credits histories perform an important function. They eliminate or at least greatly reduce the problem of asymmetric information and adverse selection which might otherwise prevent credit markets from operating.

13.8 OTHER MARKET : THE IMPORTANCE OF REPUTATION AND STANDARDIZATION

Asymmetric information is also present in many other markets. Here are just a few examples.

- (a) **Retail Store:** will the store repair or allow you to return a defective product? The store knows more about its policy than you do.

- (b) **Dealer in Rare Stamps, Coins, Books and Paintings:** whether these products are genuine or forged or imitation, the seller knows more about their authenticity than the buyer.
- (c) **Roofer's Plumbers and Electricians:** When these service providers renovate or repairs you cannot check the quality of the repairs or renovation done.
- (d) **Restaurants:** How often you go into the kitchen to check if the chef is using fresh ingredient in a hygienic surrounding.

In all these cases the seller knows more about the quality of the product than the buyer knows unless sellers provide information about the quality of the product to the buyers. Low quality products and services will drive out high-quality ones and these will be market failure. Sellers of high-quality products and services, therefore have a big incentive to convince customers that their quality is indeed better. In the examples given above the task is performed largely by reputation. You purchase at a particular shop, because it has a reputation for providing quality products, you hire a particular plumber or roofer because they have reputation for doing good work. You go to a particular restaurant because it has a reputation for using fresh ingredients.

Some times, it is impossible for a particular business to acquire reputation, for example highway restaurants or motels, because most of the customers of highway restaurants go there only once instead of frequent for their meals. As such these businesses have no opportunity to develop reputation. How can they deal with the "lemons problem"? One way is standardization in your hometown. You may not prefer to eat regularly at Pizza Hut may look more attractive when you are driving along a highway and want to stop for a breakfast or lunch. The reason is that these eating joints provide standardized products.

13.9 MARKET SIGNALING

We have seen that asymmetric information can lead to a 'lemon problem' because sellers know more about the quality of a product as compared to buyers. The buyers may assume that the quality of a second-hand product is poor so that its price falls and only low-quality products are sold in a market for second-hand product. We have also seen how government intervention or standardization i.e. to develop reputation can alleviate this problem. In this lesson we shall examine another mechanism via which the two parties involved that is sellers and buyers deal with the problem of asymmetric information. This mechanism is market signaling. The concept of market signaling was first developed by Michael Spence in 1974. It is a process by which sellers send 'signals' to buyers that convey information about a product's quality. In some markets seller of a product or a service do send signals to buyers about the quality of their product or service. How market signaling process operates, let us take the example of a labour market, which is a good example of a market with asymmetric information.

Suppose a firm is to hire some new workers. These workers who offer to sell their labour know much more about the quality of labour they can provide than the buyer of the labour i.e. firm in question. For example, the sellers of labour know how hard they tend to work? How responsible they are? What are their skills, and so forth. The hiring firm will learn about these qualities of the workers only after workers have been hired and have been working for sometime. At the time of hiring these workers the firm knows little about the productivity of these workers. Why do not firms simply hire workers, see their productivity

and release those with low productivity? But this policy is not workable in many countries and in many firms in the United States. It is difficult to hire workers who have been working more than a few months, the firms have to show just cause or pay severance pay. Moreover in many jobs workers do not become fully productive for at least a couple of months. In order to assess the full productivity of a worker, on-the-job-training may be required for which the firm must invest substantial resources. Thus the firm might not learn how good workers are for six months to a year. Clearly, firms would be much better off if they knew how productive potential workers were before they hired them.

What characteristics can firms examine to collect information about workers/employee's productivity before it hires them? Can potential workers convey information about their productivity? Dressing well for job interview might convey some information but even inefficient or unproductive workers sometimes dress well to get a job. Dressing well is thus a weak signal. It does not do much to distinguish high-productive employees from low productivity workers. To be strong, a signal must be easier for high productive workers to give than for low productive people to give, so that high productive people are more likely to give it.

For example - Education is a strong signal in the labour market. A worker's educational level can be measured by several things such as (a) the number of years of schooling (b) degrees obtained (c) the reputation of the university or college that granted the degree (d) the person's grade point average (e) and so on. Of course, education can directly and indirectly improve a person's productivity by providing information, skills and general knowledge that are helpful in work. But even if, education did improve productivity it would still be a useful signal of productivity because more productive people find it easier to attain high levels of education. Not surprisingly, productive people tend to be more intelligent, more motivated, more disciplined, more energetic and hard working. More productive people are therefore, more likely to attain high levels of education in order to signal their productivity to firms and thereby obtain better paying jobs. Thus firms are correct in considering education a signal of productivity.

13.9.1 A Simple Model of Job Market Signaling

To explain, how market signals work, let us examine a simple model of job market. Let us assume that there are only two groups of workers. Group - I, low productivity workers whose average and marginal product is 1 and Group-II, high-productivity workers, whose average and marginal product is 2. These workers will be employed by a competitive firm whose products sell for Rs. 10,000 and who expect an average of 10 years work from each employee. We also assume that half of the population are in group-I and remaining half in Group-II, so that average productivity of each worker is 1.5. Note that revenue expected to be generated from group-I workers is Rs. 10,000 per year and from group-II workers is Rs. 20,000/- year x 10 years.

If a firm could identify people by their productivity, they would offer them a wage equal to marginal revenue product. Accordingly, Group-I, Workers would be paid Rs. 10,000 per year and Group-II workers would be paid Rs. 20,000 per year.

On the other hand, if a firm could not identify productivity before they hired workers, they would pay all workers an annual wage equal to the average productivity i.e. Rs. 15,000 per year. Group-I workers would thus earn more Rs. 15,000 per year instead of Rs. 10,000 a year, at the expense of Group-II workers who would earn less instead of Rs. 20,000 Rs. 15,000 per year.

Now let us understand, what can happen with 'Signaling' via, education. Suppose all the attributes of an education (degree earned, grade point average etc.) can be summarized by a single index Y represent years of higher education. All education involves a cost and the higher the education level Y , the higher the cost. This cost includes tuitions and books, the opportunity cost of foregone, wages and the psychic cost of having to work hard to obtain high grades. What is important is that the cost of education is greater for the low productivity group. Than for the high productivity group. This could be for two reasons.

Firstly, low-productivity workers may simply be less studies.

Secondly, low productivity workers may progress more .slowly through degree program in which they enroll themselves. Suppose for Group-I workers, the cost of attaining educational level- Y given by

$$G(Y) = \text{Rs. } 40,000 y \text{ and for}$$

Group-II it is

$$G\text{-II}(Y) = \text{Rs. } 20,000 y.$$

Now, to keep things simple and to demonstrate the importance of signaling, suppose education does nothing to increase once productivity, its only value is as a signal. Let us see if we can find a market equilibrium in which different people obtain different levels of education and firms look at education as a signal of productivity.

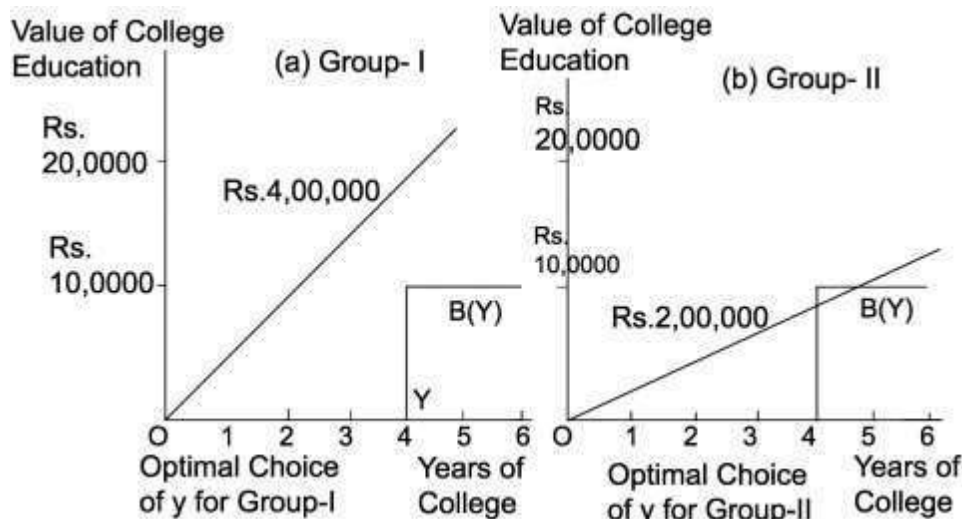


Fig. 13.2

Consider the following possible equilibrium. Suppose firms use this decision rule of anyone with an education levels Y or more is in Group II person and is offered a wage of Rs. 20,000 and anyone with an education level of Y , or less below Y is in Group-II person and is offered a wage of Rs. 10,000. The particular level Y that the firms choose is arbitrary, but for this decision rule to be a part of equilibrium, firms must have identified people correctly. Otherwise, the firms will want to change the rule. Will it work?

To answer this question, we must determine how much education the people in each group will obtain given that firms are using this decision rule.

The education allows one to get a better paying job. The benefit of education $B(y)$ is to increase the wages associated with each level of education as shown in the above diagram. It may be noted that $B(y)$ is initially zero which represents Rs. 1,00,000 base 10 years earning that are earned without any college education. For an education level less than Y , $B(y)$ remains 0 because ten years earning remain at 1,00,000 base level but when the education level reaches y or greater, 10 years earning increase to Rs. 20,000 so $B(y)$ becomes Rs.10,000.

How much education should a person obtain? Clearly, the choice is between no education i.e. $y = 0$ or/and an education level of Y . The reason is that any level of education less than Y results in the same base earning Rs. 1,00,000 so there is no benefit of obtaining an education at a level above 0 but below Y . Similarly there is no benefit of obtaining an education level above Y because Y is sufficient to allow one to enjoy the higher total earning of Rs. 2,00,000.

In deciding how much education to obtain, people compare the benefits of education with the cost; people in each work make the following cost-benefit calculations. Obtain the education Y the benefit i.e. increase in earning is at least as large as the cost of education. For both groups, the benefit is Rs. 1,00,000. The cost, however differ. For Group-I, the cost is Rs. 40,000 y but for Group-II is only Rs. 20,000 y . Therefore Group-I will obtain no education as long as.

$\text{Rs. } 1,00,000 < \text{Rs. } 40,000 Y$ or $Y > 2.5$ and Group-II will obtain education level Y as long as $\text{Rs. } 1,00,000 > \text{Rs. } 20,000 Y$ or $Y < 5$

These results give us equilibrium as long as Y is between 2.5 and 5. Suppose for example y^z is 4.0 as in the above diagram. Then people in Group-I will find that education does not pay and they will not obtain any. Whereas people in Group-II will find that education does pay and they will obtain the level $y = 4.0$: now, when a firm interview people for job, who have no college education, it correctly assumes that they have low productivity and offers them a wage of Rs. 10,000 similarly, when the firm interviews people, who have a number of years of college, it correctly assumes their productivity is warranting a wage of Rs. 20,000. We therefore have an equilibrium High productivity people will obtain a college education to signal their productivity, firms will need this signal and offer them a high wage.

This is a highly simplified model but it illustrates a significant point. Educational be an important signal that enables firms to sort workers according to productivity. Some workers will want to obtain a college education even if that education does nothing to increase their productivity. These workers simply want to be identified as highly productive i.e. to send signal. In the real world education does provide useful knowledge and does increase one's ultimate productivity, but education also serves a signaling function. For example many firms insist that a prospective manager have an MBA. One reason is that MBA's learn economics, finance, management and other useful subjects. But there is a second reason. To complete an MBA programme takes intelligence, discipline and hard work; and people with those qualities tend to be very productive.

13.9.2 Other Markets :

Guarantees and Warranties

Other than the labour market signaling can play an important role in many other markets in which there is asymmetric information consider the market for such durable products as televisions, stereos, Cameras and refrigerators many firms produce these

products but some brands are more dependable than others. If consumers could not tell which brands are more dependable than others, if the better brands could not have sold for higher prices? Firms that produce a high quality and more dependable products must therefore, make consumers aware of difference but how can they do it in a convincing way? The answer is *Guarantees and Warranties*.

Guarantees and Warranties effectively signal product quality because an extensive warranty is more costly for producer of a low-quality product than for the producer of a high quality item. The low-quality product is more likely to require servicing under the warranty, which the producer will have to pay for. As a result, producers of low-quality products will not offer extensive warranties. Thus consumers can correctly view an extensive warranty as a signal of high quality and they will pay more for products that offer one.

13.9.3 Working Harder and Longer

Job market signaling does not end when, one is hired. Even after a few years of employment a worker will still know more about his abilities than will the employer. Thus is especially true for workers in knowledge-based field such as Engineering, Computer programming, finance, law, management and consultancy. Although, an unusually talented computer programmer will be more skilled than his co-worker at writing programs that are efficient & bug-free, it may take several years before the firm fully recognizes his talent. Given this asymmetric information what policy should employer use to decide promotions and salary increases? Can workers who are unusually talented and productive signal this fact and thereby receive earlier promotions and large salary increases?

Workers can often signal talent and productivity by working harder and longer hours. Because more talented and productive workers tend to get more enjoyment and satisfaction from their jobs. It is less costly for them to send this signal than it is for other workers. The signal is therefore strong; it conveys information. As result employers can and do rely on this signal when making promotions and salary decisions.

This signaling process has affected the way many people work. Many young lawyers, accountants, consultants and computer programmers regularly work into the night and weekends putting in long hour of work. It is surprising that these people are working so hard. Not at all. They are trying to send signals that can greatly affect their careers. Employers rely increasingly on the signaling value of long hours as rapid technological change makes it harder for them to find other ways of assessing workers skill and productivity.

13.10 MORAL HAZARD:

Moral hazard refers to the tendency of insurance to discourage policy holders from protecting themselves from risks. The problem of moral hazard, a widely discussed problem for the market mechanism, is associated with *insurance*. Economists view insurance- which is the provision of protection against risk- as a useful commodity, like Shoes. But insurance encourages risk against which it provides protection. The phrase moral hazard refers to the risk or hazard of an appropriate or immoral behaviour by the agent. This problem is the temptation of imperfectly monitored workers to shirk their responsibilities. In such a situation, the principal tries various ways to encourage the agent to act more responsibly. In short, moral hazard is a problem when an insured party whose actions are unobserved can affect the probability or magnitude of a payment associated with an event. For example, if an individual has a valuable rare work of art that is fully insured against theft then the individual has little motivation to protect it against burglars. The individual may fail to lock it

up in a safe box. This problem, i.e. the tendency of insurance to encourage the source of risks is called moral hazard. It makes a free market in insurance difficult to operate. The concept of moral hazard applies not only to the problems of insurance but also to the workers who perform below their capabilities when employers cannot monitor their behaviour. Moral hazard is not only the problem of insurance companies and employers. It also alters the ability of market to allocate resources efficiently. Following Figure 15.3 illustrates this.

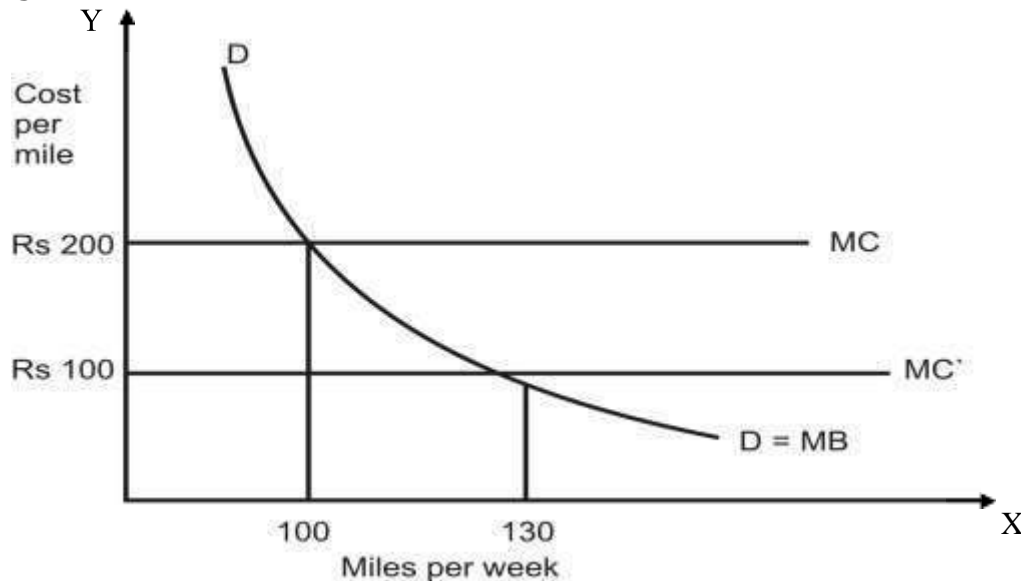


Figure 13.3

DD is the demand curve for automobile driving in miles per week. The demand curve also measures the marginal benefit of driving. This curve is downward sloping as some people switch to alternative transportation as the cost of driving increases. Initially the cost of driving includes the insurance cost and insurance companies can accurately measure miles driven. In this case, there is no moral hazard and the marginal cost of transportation (MC) is Rs. 200 per mile and the driver drives 100 miles. Now moral hazard problem arises when insurance companies cannot monitor individual driving habits, so that the insurance premium does not depend upon miles driven. In that, case, the driver perceives the cost per mile to be MC' i.e. equal to Rs. 100 and drives 130 miles. Here the inefficiency arises because the insured individual perceived either the cost or benefit of the activity differently from the true social cost or benefit. The employer can reduce the problem of moral hazard by paying their workers a wage above the level that equates supply and demand in the labour market. A worker who earns a wage rate above the equilibrium wage rate is less likely to shirk because if he is caught and fixed, he might not be able to find another high paying job. Moreover, employer can use many other combinations of measures to solve the problem of moral hazard.

13.11 THE PRINCIPAL AGENT PROBLEM:

The owner of the business always wants to ensure that productivity of the workers is costless. It is possible only when the managers and workers work efficiently. But in reality in most of the firms, owner cannot monitor everything that employers do. In some cases, employees are better informed than owners. It is known as principal agent problem. Principal is an individual who employs one or more agents to achieve an objective. Agent is an

individual employed by a principal to achieve the principal's objective. Principal-agent problem arises when managers (agents) pursue their own goals even when doing so entails lower profits for a firm's owners. (the Principal). In other words, the principal wants to induce another person, the agent, to take some action which is costly to the agent. The principal may be unable to directly observe the action of the agent but instead observes some output that is determined in part by the actions of the agent. The principal's problem is to design an incentive payment *from the principal to the agent* that induces the agent to take the best action from the view point of the principal.

The example is that of a *retail firm and consumer*. The firm wants the consumer to purchase its products but it is a costly activity for the customer. The firm charges his reservation price from each customer. The maximum he is willing to pay. The firm is not in a condition to charge this price directly but it observes the amount that consumers with different tastes purchase at different price. The problem of the firm is then to design a pricing schedule that maximizes its profits. The simplest example of principal agent problem is that of a manager and worker. The manager wants the worker to exert as much effort as possible, in order to produce as much output as possible while the worker wants rationally to make a choice that maximizes their utility given the effort and incentive payment scheme. The principal agent problem can be looked within private and public enterprises, as explained below :

13.11.1 The Principal Agent Problem in Private Enterprises:

Now days, maximum firms are multinational firms where individual stockholders have only a small percentage of a firm's total equity. So, it is difficult for them to know how were the firm's managers are performing as the firms are mainly controlled by the managers.

Since the monitoring is costly and to collect information is a costly affairs. Therefore, managers of private enterprises pursue their own objectives. They are more concerned with growth and larger market share as it provides more cash flows which in turn allow managers to enjoy more perks. But there are many limitations when managers are able to deviate from the objectives of owners. The owners can oust the current management. Sometimes, a takeover bid also becomes possible when the firm is poorly managed. But the ways by which stockholders can control the management are limited. As a result, it is important to look for solutions to the principal agent problem. When the manager's and owner's objectives are likely to differ within the principal agent framework then the owner design reward systems, so that managers and workers come as close as possible to meet owner's goals.

13.12 NETWORK EXTERNALITIES

Introduction: Generally, it happens that people's demand for a good is independent of one another. For example, the demand for Limca for one person depends upon his own tastes, preferences, income, price of Limca as well as price of its substitutes. It does not depend upon the income of other persons but the network externality says that the each individual's demand depends on the purchase of other individuals. In other words, when the demand for one person is affected by the number of other people who have purchased that commodity. For example, the demand for computers follow a network externality. Initially the demand for computers, through small grows slowly. Soon, however it grows rapidly, until finally nearly everyone likely to buy a product has done so, whereby the market becomes saturated. This rapid growth occurs because of network externality. As more and more organisations own computers and more and more software are developed then more and more people are

trained to use computers, then the value of having a computer increases. In this way this network externality is considered to be an important part of demand for computers.

Network externality is of two types:

- (a) Positive network externality.
- (b) Negative network externality.

A positive network externality exists when the quantity of a good demanded by a typical consumer increases in response to the growth in purchase of other consumers, whereas negative network externality occurs when the quantity demanded decreases.

In recent years, there has been an explosive growth in the use of E-mail. An E-mail can only be transmitted to another E-mail user. The value of using E-mail depends crucially on how much many other people use it.

13.12.1 Bandwagon Effect

This effect is introduced by Leibenstein in the theory of consumer's demand in 1946. Bandwagon effect is known as *positive externality* Bandwagon effect occurs when a person wants to possess a good because almost all the other people have it in their possession. In other words, this effect shows that consumer wishes to possess a good in part because others do. This effect arises in the case of Video games or other toy's like P.S.₁, P S₂ and Barbie toys. This is a major objective in marketing. This effect is shown in Fig. 15.4.

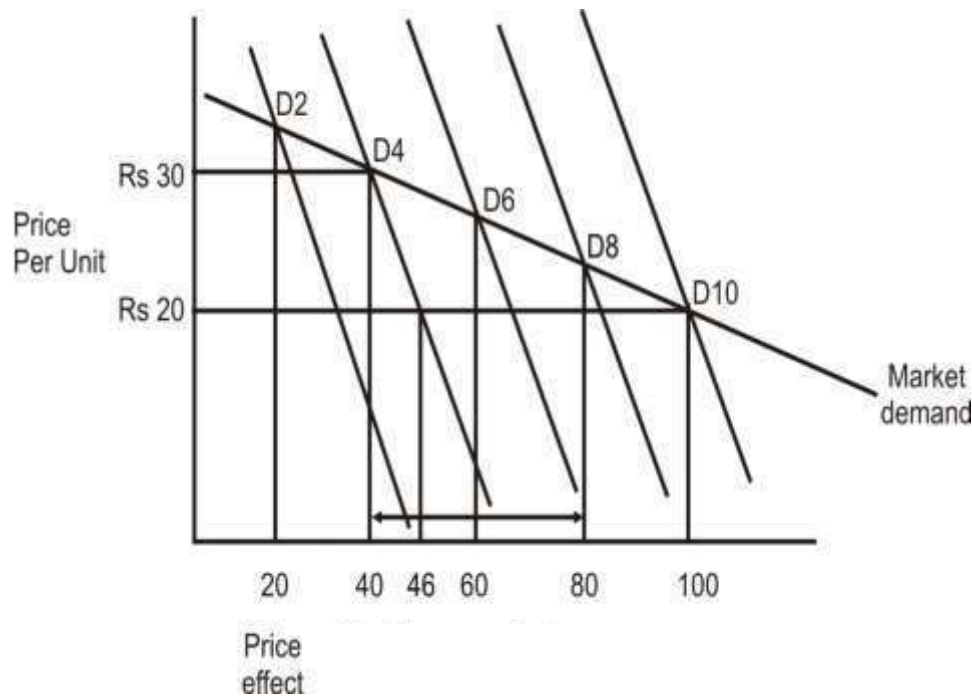


Figure 13.4 : Bandwagon effect

Sales of some fashionable goods are measured on horizontal axis. Initially, Let us assume that the consumers think that only 2000 people have purchased the good. Consumer considers it a small number. So they have little motivation to buy the good to be in style. No doubt, due to its intrinsic value some people buy it as given by the curve D₂. If consumers think that 4000 people have bought the good. It means now that good has become attractive to them and now they incline to buy more. Then demand curve is D₄ which is to the right of D₂. In the same way, if people think that 6000 consumers have purchased it, then Curve

would be D_6 . It means as more and more customers are buying the good, the curve would be shifting to the right. Ultimately, it would be known to the consumers that how much have bought the good. It would depend upon the price. If the price is 30, then 4000 people would buy that good. So the curve is D_4 . If the price is 20 then 8000 would be buying it and Demand Curve would be D_8 . The market demand Curve is found by joining the points on D_2 , D_4 , D_6 , D_2 and D_{10} . This curve is more elastic compared with D_2 . When the price drops from Rs. 30 to Rs. 20 the demand curve is D_4 . In the absence of bandwagon effect, quantity demanded would increase from 40 to Rs. 46 but as more people buy it, it becomes stylish to own it and the bandwagon effect increases the quantity demanded further. In this way, bandwagon effect increases the response of demand to price change.

13.12.2 Snob Effect:

The Snob effect is a part of *negative externality*. It refers to the desire of a consumer to choose a unique commodity. In this effect, the quantity demanded of a commodity would be higher only if few people buy that good. The example of snob goods is Luxury Car, rare paintings and made to order clothing etc. Here the value you get from work of an art or Car is in part the prestige and status ensuring from the fact that others do not possess it following diagram 15.5 illustrates it.

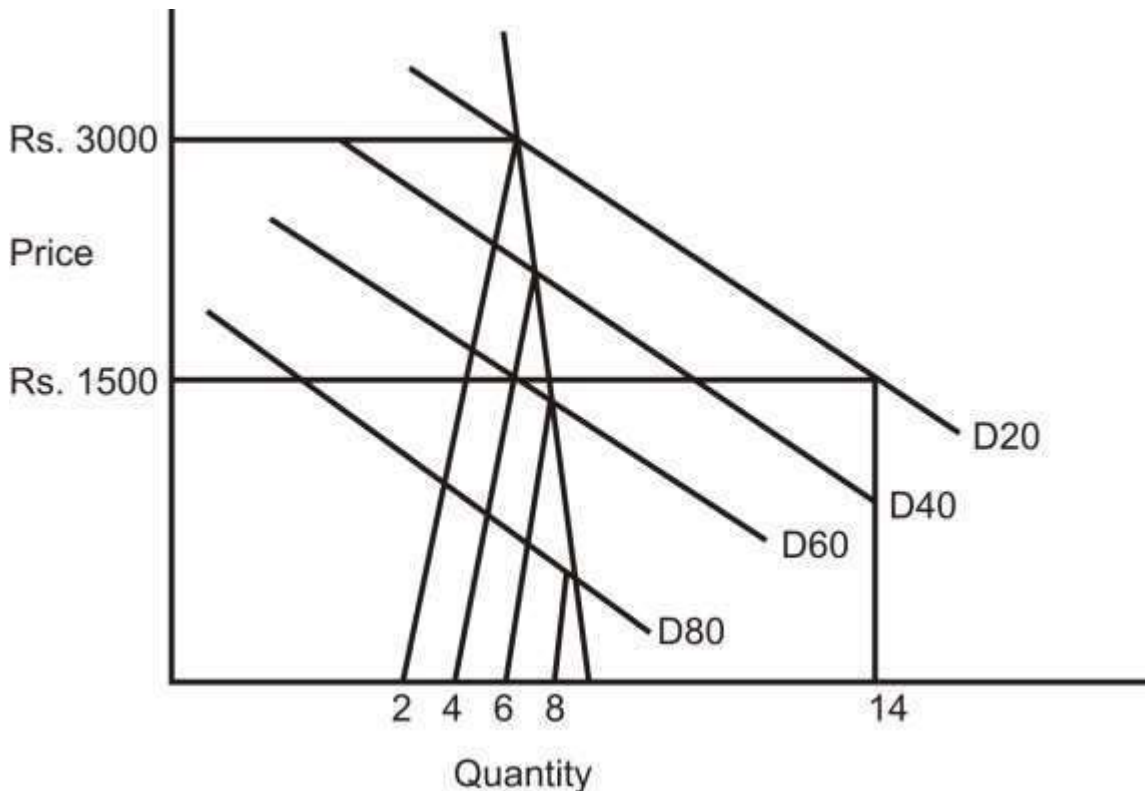


Figure 13.5

In the diagram D_{20} is the demand curve that shows that consumers think that only 2 people are the owners of the good. If people think that 4 people own the good it means that good is not exclusive and thereby the Snob value is reduced. So, the quantity demanded would be lower. Here the demand curve would be D_{40} . Similarly on the demand curve D_{60} when it is assumed that 6 people own it, the demand would be even smaller. Slowly, the consumers learn how widely owned the good actually is. The market demand is found by

joining the points on the curves D_2 , D_4 , D_6 , and D_8 . This effect means the market demand less elastic. To see why initial price of Rs. 3000 with 2 people purchasing the good, was lowered to 1500? If there was no Snob effect, the quantity demanded would increase to 14 (along the curve D_{20}). But as a snob good the value is highly reduced, if more people own it. The Snob effect dampens the increase in quantity demanded and cut it to 8 units. So the net increase in sales only 6 units. It is clear that snob effect is an example of negative externality in which the quantity of a good that an individual demands falls in response to growth of purchases by other firms. But sometime, Snob effect can arise for other reasons also. The value you obtain from a lift ticket at a Ski resort is lower as more people buy it because you prefer short lines and fewer skiers on the slopes.

Self Assessment Questions

Q. What is the basic difference between Bandwagon effect and Snob effect?

13.13 SUMMARY

- The seller of a product often has better information about its quality than the buyer. Asymmetric information of this type creates a market failure in which bad products i.e. low quality products or lemons will drive the high quality products out of the market. Market failure can be eliminated if sellers offer standardized products, provide guarantees and warranties or find other ways to maintain good reputation for their products.
- Insurance market frequently involves asymmetric information because the party buying insurance has better information about the risk involved than the insurance company. This can lead to adverse selection in which poor risks choose to insure and good risks do not. Another problem for insurance market is moral hazard in which the insured takes less care to avoid losses after being insured.
- Sellers can deal with the problem of asymmetric information by sending buyers signals about the quality of their products for example workers can signal high productivity by obtaining high levels of education.
- Asymmetric information may make it costly for the owners of the firm to monitor accurately the behavior of their managers. Managers may seek higher fringe benefits for themselves or a goal of sales maximization, even though share holders would prefer to maximize profits. **Key Terms** Asymmetric Information Asymmetric information is a situation in which a buyer and a seller possess different information about a transaction.
- Adverse Selection Form of market failure resulting when products of different qualities are sold at a single price because of asymmetric information, so that too much of the low-quality products and too little of the high-quality products are sold.

- Market Signaling Process by which sellers send signals to buyers carrying information about product quality. Moral Hazard When a party whose actions are unobserved can affect the probability or magnitudes of a payment associated with an event.

13.14 GLOSSARY

- **Asymmetric Information** : It is situation in which a buyer and a seller possess different information about a transaction.
- **Adverse Selection** : Adverse selection form of a market failure results when products of different qualities are sold at same price because of asymmetric information. As a result other too much of low quality products or too small of high quality products get sold.
- **Moral Hazard** : Moral Hazard occur when actions of one party are not observed but these affect the probability or magnitude associated with the event.
- **Market Signaling Process** : The process by which sellers sent signals to buyers about the product quality.
- **Principal - Agent Problem** : Problem arising when agent (e.g. a firm's managers pursue their own goals seller then the goals of principals (e.g. the firms owners).
- **Agent** : Individual employed by a principal to achieve principal's objective.
- **Principal** : Individual (eg. a firm) who appoints one or more agents (eg manager) to achieve on objective.

13.15 REFERENCES

- Ahuja HL (2014). *Advanced Micro Economic*. S. Chand Publications Pvt. Ltd., New Delhi
- Pindyck, R.S., Rubinfeld; D.L. and Mehta P.L. (2011). *Micro Economics*. Pearson Prentice Hall, 2011

13.16 FURTHER READING

- Pindyck, R.S., Rubinfeld; D.L. and Mehta P.L. (2011). *Micro Economics*. Pearson Prentice Hall, 2011

13.17 MODEL QUESTIONS

- Q. 1 Why can asymmetric information between buyers and sellers lead to market failure when a market is otherwise perfectly competitive?
- Q. 2 Explain the difference between adverse selection and moral hazard in insurance market. Can one exist without the other?
- Q. 3 Why might a seller find its advantageous to signal the quality of a product? How are guarantees and warranties a form of market signaling?
- Q. 4 Adverse selection is the direct result of asymmetric information, explain. How can the problem of adverse selection be overcome?

Unit -IV

Lesson - 14

THEORY OF PRODUCTION

Structure

- 14.0 Objectives
- 14.1 Introduction
- 14.2 Objectives of Production Theory
- 14.3 Isoquants or Iso Product or Equal Product Curves
 - 14.3.1 Properties of Isoquants
 - 14.3.2 Marginal Rate of Technical Substitution
- 14.4 Iso - Cost Line
- 14.5 Producer's Equilibrium (or choice of Factor Proportion)
- 14.6 Change in Outlay or Expansion Path
 - 14.6.1 Factor Price Ratio Constant
 - 14.6.2 Factor Price Ratio Changes
- 14.7 Output and Substitution Effect
- 14.8 Choice of Product Mix (Multi-Product Firm)
- 14.9 Elasticity of Input Substitution
- 14.10 Choice of Technology
- 14.11 Law of Variable Proportion
- 14.12 Law of Variable Proportion with Isoquants
- 14.13 Production Function and Returns to Scale
 - 14.13.1 Increasing Returns to Scale
 - 14.13.2 Constant Returns to Scale
 - 14.13.3 Decreasing Returns to Scale
- 14.14 Causes of Increasing Returns to Scale
- 14.15 Causes of Decreasing Returns to Scale
- 14.16 Multi-Product Firms Equilibrium
- 14.17 Summary
- 14.18 Glossary
- 14.19 Reference
- 14.20 Further Reading
- 14.21 Model Questions

14.0 OBJECTIVES

After going through this lesson, you shall be able to :

- the meaning of production in economic sense of the term.
- describe how production takes place in the short run with only one variable input.
- decide the combination of inputs a firm will choose to minimise its cost of production.
- explain the choice of appropriate scale of production on the expansion path of the firm.
- explain the choice of appropriate product mix by a multi product firm.
- describe explain the choice of appropriate type of Technology.
- discuss explain how output changes when one factor of production changes and other factors remains constant (law of variable proportion).
- discuss the production process in the long run, thereby explaining the meaning and reasons for constant, increasing and decreasing returns to scale.
- elaborate on the concept of technical progress how it takes place and its importance.
- elaborate how output changes when all factors of production change proportionately.

14.1 INTRODUCTION

In this lesson, we move ahead from the theory of consumption to the theory of production. The objective of this lesson is to explain the basic concept used for the production analysis and to lay the foundation for understanding the nature of input-output relationship.

14.2 OBJECTIVES PRODUCTION THEORY

It will be useful to know what theory of production seeks to explain.

The pertinent question which a businessman faces is which factors of production should be employed so as cost is minimized. There are various technical possibilities open to a firm from which it has to choose i.e. there are various combinations of factors which can yield a given level of output and from which a businessman has to choose one technique of production. To explain this we must have a adequate knowledge of Equal Product Curves or Isoquants. An Equal Product map or Isoquant represents various technical possibilities of producing different levels of output.

We all know, businessman wants to maximize his profits or minimize its cost of production. He has a choice to choose a particular technology or combination of factors. The choice of a particular combination of factors by businessman depends upon (a) Technical possibilities of production, (b) Prices of factors used for the production of a particular factor. Technical possibilities of production are represented by Equal Product Curves.

We first discuss in brief. The meaning of Isoquant or Equal Product Curves and then their peculiarities or characteristics.

14.3 ISOQUANTS OR ISO PRODUCT OR EQUAL PRODUCT CURVES.

An isoquant may be defined as the locus of all such pairs of a given factor inputs at yield the same total output of a given commodity under a given and constant technology.

Supposing, again, That there are only two factors, labour (L) and capital (K), the quantities of labour are measured along the horizontal axis in fig. 3 and the quantities of capital are measured along the vertical axis. In this figure a, b, c, d, and e are supposed to be some of the combinations of labour and capital which help to produce a total output of 1000 units of the given commodity. When we join all such combination through a free hand curve, we get a curve like the one bearing the index 1000 in Fig. 14.1. Since all combinations of the given pair of factors which lies on this curve yield the some total product, it has been given the name of an *iso-quant* or an iso product curve rather easier to understand name of *equal product curve*.

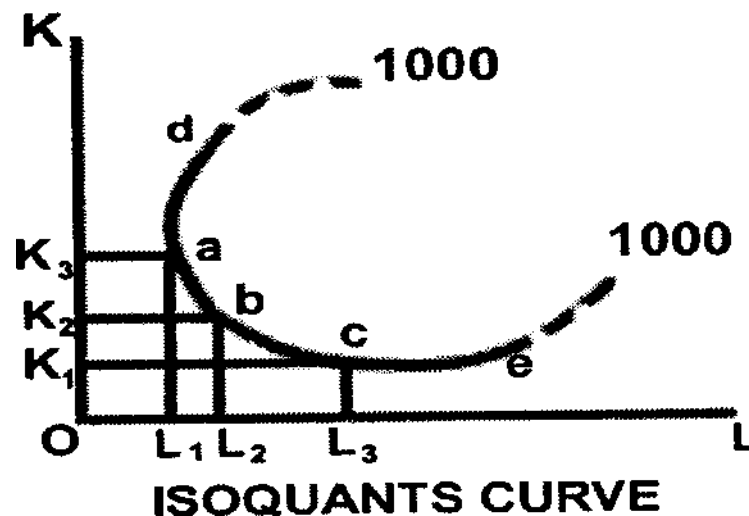


Fig. 14.1

It should be obvious that an isoquant is just like an indifference curve with just this difference that while in the case of indifference curve the two axes represent the given level of satisfaction which cannot be measured *quantitatively*, in the case of isoquants, the two axes in a diagram represent the quantities of a given pair of factor inputs and a given isoquant represents a given level of output which can be measured quantitatively. Except for this difference the properties of isoquants are similar to those of indifference curves. We shall now explain the properties of isoquants and the assumption underlying them in brief.

14.3.1 Properties of Isoquants (or Equal Product Curves)

(i) ***Iso-quant has a negative slope:*** The first property of isoquants is slope of isoquant like Indifference Curve is negatively sloped. This is so because as the firm employs more units of labour it has to give up some units of capital as the outlay spent on both the inputs is constant. This is based on this assumption that factors of production can be substituted for each other and thus the factor proportions are available. In other words, it is assumed that it is possible to produce the same output by employing more or one factor and less of the other. This assumption leads to the property that an *isoquant has negative slope* as

shown by the solid portion of the isoquant 1000 in our Fig. 14.1. We can, for the time being, forget about the dented portions of the either end of this isoquant where it has a positive slope. We shall explain it a little later.

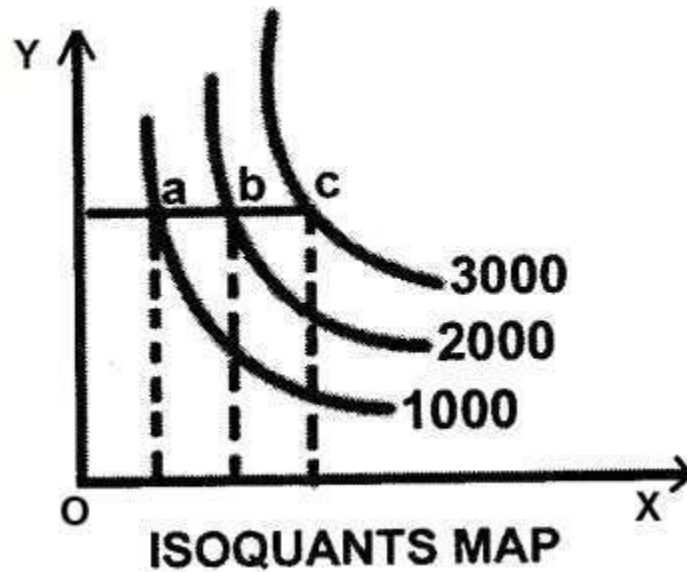


Fig. 14.2

(ii) **Convex to the origin (O).** This property is due to the assumption that the marginal product of the factor decreases as more of it is employed to produce a given commodity and its marginal product increases as less of it is employed. The assumption *further implies that the marginal rate of technical substitution (MRTS) between the given pair of factor diminishes as more and more of one factor is substituted in place of the other such that the total output remains the same.* (See MRTS in Section 14.3.2)

(iii) *The third property of isoquants is as we move away from the origin, greater is the output represented by it as shown in fig. 14.2 above.* It is because as compared to a combination on a lower isoquant as combination on a higher isoquant which contains the same quantity of one factor will contain a large quantity of the other factor as shown by points like a, b and c on isoquants 1000, 2000, and 3000 respectively in fig. 14.2 and it is assumed that the latter combination will thus yield a larger output.

(iv) *The fourth property of isoquants is that they do not touch or intersect each other,* for otherwise, it will simply mean that the same combination of factors can produce a large as well as a smaller output. This can happen only if factors are employed less efficiently in one case than in the other. But this is rule out of the assumption that factors are worked most efficiently in all situations.

(v) *The fifth property of isoquants is that they are oval shaped.* This property simply means that at some point it bends backward with positively sloped segments at both ends. The positively slope simply indicates that where both factors of production i.e. labour and capital are employed beyond limits, than a situation point comes when production starts diminishing. Therefore firm normally continues production till slope of isoquants is negative.

When we have a series of isoquants as in Fig. 14.2 it is said to be *Isoquants Map*.

Self Assessment Questions

Q. Mention any 4 properties of Isoquants.

14.3.2 Marginal Rate of Technical Substitution

But what do we mean by the marginal rate of technical substitution ? *It is defined as the quantity of one factor that can be replaced by employing one unit more the other factor such that the total output of the given commodity remain the same.* Thus the marginal rate of technical substitution of L for

$K = \frac{\partial K}{\partial L}$ is such that the total product

remains the same $\frac{\partial K}{\partial L}$ is the *slope* of the given isoquant.

Thus, by definition, the slope of an isoquant at a given point on it represents the MRTS between the given pair of factors. Diminishing marginal rate of technical substitution implies that as we go on substituting more and more of one factor in place of the other, smaller and smaller quantities of the other factor will have to be replaced due to the substitution if we have to remain on the same isoquant. That is, if we have more of one factor and less of the other. Due to the diminishing returns assumed, the factor whose quantity increases adds less, and less to the total product per unit of increase in its quantity. On the other hand, the other factor whose quantity is being decreased will subtract large and large quantity from the total product per unit of decrease in its quantity.

In technical language we say that the marginal physical product (MPP) of the former factor decreases while that of the latter increases. If the total product is to remain constant, smaller and smaller quantities of the latter factor. Whose MPP is increasing due to decrease in its quantity will have to be replaced by substitution in its place more and more units of the former. Diminishing marginal rate of technical substitution (MRTS) between the given pair of factor can be represented by a curve whose slope is diminishing as we move along it from left to right. This condition is satisfied only by a curve which is convex to the origin.

Now, since the marginal physical product of a factor goes on diminishing as more and more of it is employed, a stage comes when its marginal physical product becomes zero and if there is further increase in its quantity, its marginal physical product becomes negative. In such situations; it is obvious that if the total product is to be kept constant, larger and larger quantities of the other factor too will have to be employed to compensate for dented portions on either side of the isoquant 1000 in Fig. 14.8 represent such situations. Since a rational firm will not choose such a combination, for the same output can be had by choosing a combination which has the same quantity of one factor and less of the other factor as compared to a combination on the dented portions. The dented portions have only theoretical interest but no practical significance. This is why that solid portion which is convex to the origin is accepted to represent an isoquant.

$$MRTS_{2,k} = \frac{MPP_L}{MPP_K}$$

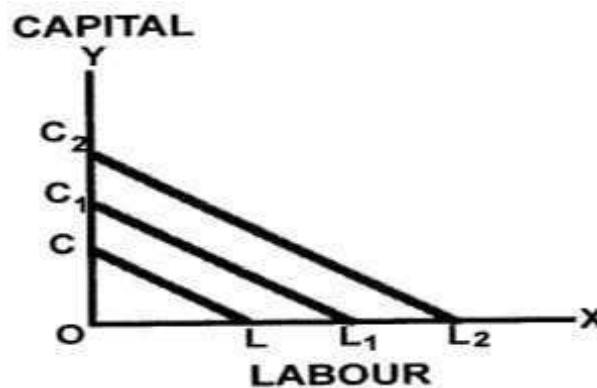
Self Assessment Questions

Q. Define MRTS.

14.4 ISO-COST LINE

After having discussed the meaning and properties of Equal Product Curves of Isoquants, now we will discuss the second part i.e. how the prices of inputs can be introduced. The prices of factors are represented by *Iso-Cost Line*.

An Iso-cost line shows various combinations of two factors that a businessman can buy with a given outlay. We can draw the Iso-cost line if three things are given i.e. (a) total outlay, (b) Price of X factor, (c) Price of Y factor. If supposing we know that total outlay is Rs.100 and price of factor i.e. labour is Rs. 10 and price of y factor i.e. capital is Rs. 20. Then we can easily say with the given outlay Rs. 100, we can buy 10 labours and 5 units of capital. This we can show with the help of Iso-cost line. This Iso-cost line tells us the numbers of inputs purchased with given outlay. We explain it below diagrammatically with the help of Fig. 14.3



ISO-COST LINE

Fig. 14.3

In diagram on OX we measure labour and on OY we measure capital. The C.L. tells us that with Rs. 100 we can buy OL units of labour and OC units of capital. It is defined as locus of factor combinations that can be purchased with given outlay. Now suppose total outlay increases to Rs. 200 and price of X as well as Y factor remains constant. Then he can purchase double units of labour and capital. An Iso-cost line will shift from CL to C₁L₁. If outlay increases to Rs. 300 and then Iso-cost line shifts to C₂L₂. These Iso-cost lines will be parallel to each other. These will remain parallel so long as prices of X and Y factors remain constant. Suppose outlay remains as constant i.e. Rs. 100 but price of X factor falls but price of Y factor remains constant, then shape of Iso-Cost Line shall change. Now he shall be in a position to buy more of X factors with given outlay. Now it can be easily said that the slope of

Iso-cost line is like the price line in indifference curve. It is ratio of prices of two factors. Thus the **slope of Iso-cost Line CL** is :

$$\frac{\text{Price of Factor X}}{\text{Price of Factor Y}}$$

14.5 PRODUCER'S EQUILIBRIUM FOR CHOICE OF FACTOR PROPORTIONS

So far we had been discussing only the technological aspect of product. Now we come to consider *these technological aspects in combination with the economic factor*. One of the basic productions decisions that a firm has to undertake is with regard to the proportion in which the different factors of production are to be combined and the scale of production to be adopted. Thus decision will be taken by firm by taking into consideration the following factors (i) the nature of production function which is a technological factor; (ii) the prices of the factors of production; (iii) the size of the firm's financial budget; (iv) the price the commodity to be produced.

Optimum Combination with Iso-cost Lines

Now after having discussed both meaning of Iso-cost line and Iso-quant (Equal Product Curves), we can easily explain how a businessman can optimise his production and minimize his cost. This he can do where Iso-quant line is tangent to Iso-cost line. The slope of Iso-outlay indicates the marginal rate of technical substitution and slope of the Iso-cost line indicates the factor price ratio. Now the optimum combination will be indicated by point e where

$$MRTS = \frac{OL}{OC}$$

This we have shown below in Figure 14.4.

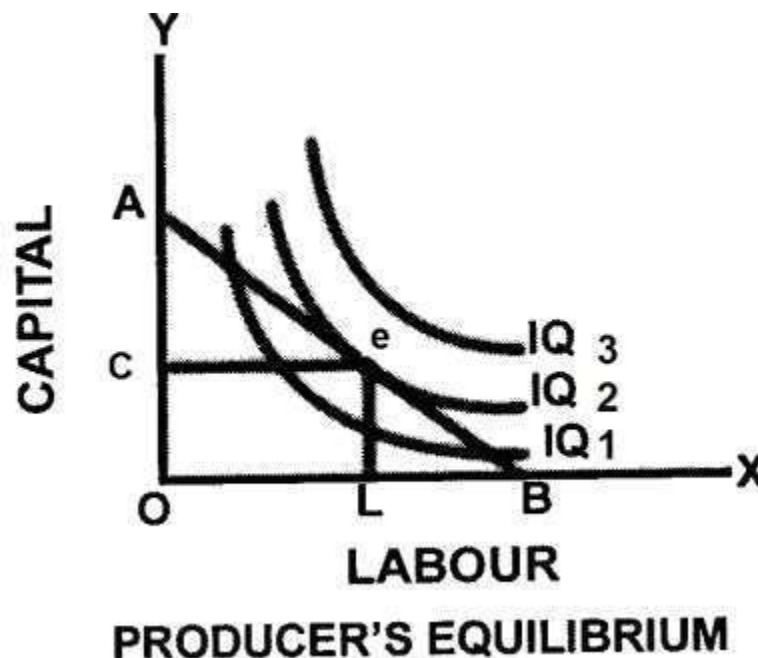


Fig. 14.4

14.5.1 Tools for Decision

To simplify matters at this stage we shall assume that the firm is operating in a perfectly competitive market with respect to both, the commodity it produces and the factors it employs. Therefore, an increase in the firm's production of commodity will not change the market price of the commodity and an increase in the employment of factor by itself alone will not change the market price of the factor.

(b) Budget Line/Iso Cost Line

Accordingly, the only constraint on the firm's operations will be the size of its budget, that is the total amount of financial resources that can devote to the employment of factors. We shall, to start, with assume these resources to be given and constant. For the sake of simplification we shall also assume only two factors, say labour and capital.

If the firm spends the whole of its budget on the employment of labour. Let us suppose that the market price of it is such that it is able to purchase at the maximum only OB quantity of Labour as shown in Fig. 14.4. Similarly, if it spends the whole of its budget on the employment of capital, then it is able to purchase OA quantity of Capital as shown in Fig. 14.4.

If we join the two points A and B through a straight-line, the line AB will be *budget constraint* of the firm. Any combination of the two factors, which lies either on the budget line or under it can be purchased, but any combination which is to the right of it cannot be purchased. Therefore, the firm first can choose a combination which at the most lies on it. The chosen combination will lie only on *budget* line, if the whole of the budget is to be spent and no saving is to be done out of it.

We should note that all combination of labour and capital which lie on a given budget line have the same cost for the employer. Therefore, such a budget line is also called an iso-cost line. So AB in our Fig. 16.4 is an iso-cost line indicating a given total cost. If the factor prices do not change. The slope of a budget or iso-cost line indicates the ratio between the prices of the given pair of factors in the same manner in which it indicates in the ratio between the prices of the given pair of consumption goods in the theory of consumption. Therefore, so long as the relative prices of the factors do not change. The slopes of the budget or iso-cost lines will remain the same, that is they will remain parallel to one another as shown in Fig. 14.5 ($AB // A_1B // A_2B$).

If as we assumed, AB represents the budget constraint of the firm the rational firm will like to produce the maximum possible output with the help of the resources indicated by AB in the given factor price situation. The relative prices of the factors are indicated by the slope of the budget line AB. In the situation the firm will be able to get at the point of tangency between its given budget or iso-cost line. It will achieve its objective at point E on where Iso-quant line is tangent to Iso-cost line.

(2) Isoquant Map

Our producers cannot maximise its profits either on IQ_2 or on IQ_3 isoquants. That isoquant will be the highest that can be reached by the firms with its budget constraint (here AB). This condition is satisfied at point e_3 in Fig. 14.5 where the budget line AB is tangent to this isoquant IQ_2 .

Our firm, in the first instance cannot afford any other combination on iso-quant IQ_3 due to its budget constraint. Secondly, even if it could afford it, it is obviously cheaper to produce the output IQ_3 with the help of the factor combinations shown by e_1 . Hence, under *our* assumption, point E gives the optimum combination of factors and, therefore, only this combination will be chosen. This means that the firm will employ OA quantity of labour in combination with OB quantity of capital. This is the best of the optimum factor proportion for the firm to produce the commodity under the given conditions.

$$\text{Here MRTS} = \frac{OL}{OC}$$

Since the *optimum* factor proportion or combination is determined at the tangency point of the firm's budget line with one of the isoquants. It is obvious that the *optimum* combination condition decides the equilibrium of the firm with respect to choice of factor proportions, (i.e. the slope of the isoquant concerned at the point of tangency).

We had earlier, in this lesson pointed out that the slope of an isoquant of at any given point represents the marginal rate of technical substitution (MRTS) between the given pair of factors. We also know that the slope of the budget line equals the ratio between the prices of the given pair of factors. It follows, therefore, that at the optimum factor proportion where the firm is in equilibrium with regard to choice of factor proportions, the following condition is satisfied, *the marginal rate of technical substitution between the factor equals their relative prices*. Since (the MRTS between a pair of factors equals the ratio between their respective marginal physical products. This condition can also be written in the form of an equality between the ratio between the marginal physical products and the ratio between the prices of the two factors, as follows :

Slope of Isoquant = Slope of Iso-cost Line

$$\text{Slope of MRTS}_{L,K} = \frac{\text{Price of Labour}}{\text{Price of Capital}}$$

$$\text{or } \frac{\text{MPP of Labour}}{\text{MPP of Capital}} = \frac{\text{Price of Labour}}{\text{Price of Capital}}$$

It will be interesting to know that the 'optimum' combination mentioned here is not necessarily the technological optimum that we mentioned while explaining the law of Variable Proportions; in an earlier section. There is only purely *technological optimum* under a given technology; it is the factor proportion at which the average return is maximum. But the optimum that we have explained here is determined, apart from technology, by the economic factor of the relative prices of the factor inputs too.

Secondly, it can be seen that Fig. 14.4 determines not only the choice of factor proportions but also the choice of scale. When the firm chooses combination it automatically chooses the level of the scale at this particular point.

14.6 CHANGE IN OUTLAY AND EXPANSION PATH

We have explained above which combination a businessman will choose to maximize his profits or minimize his cost when total outlay is fixed. We are now interested in knowing how the businessman will employ his factor combinations as he expands his output or total outlay assuming that factor price remain constant.

14.6.1 Factor Price Ratio Remains Constant

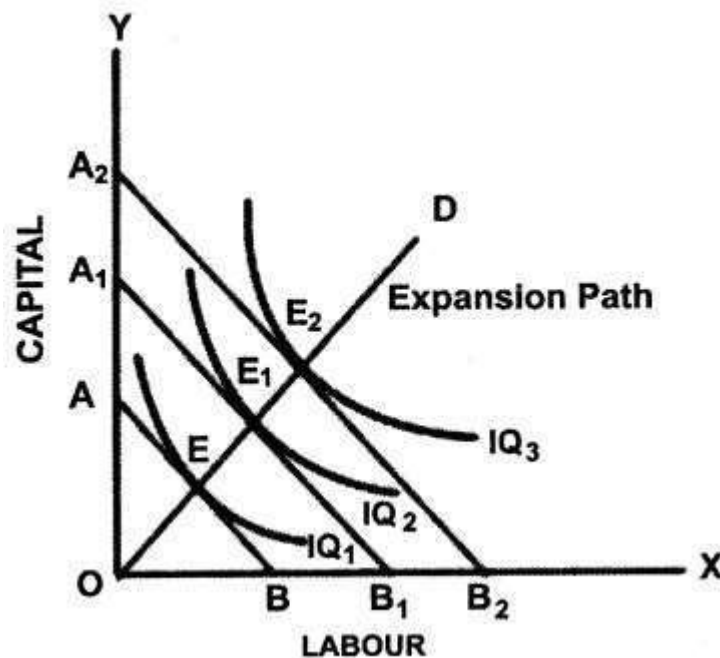


Fig. 14.5

We assume in the beginning prices of two factors i.e. labour and capital are such that we represent them with AB cost line. In Figure 14.5 we have drawn three Iso-Cost Lines i.e. AB, A_1B_1 , A_2B_2 which represents different levels of total cost or outlay. All the Iso-cost lines are parallel to each other indicating prices of factors remain constant. Now every increase in cost outlay will enable the firm to raise the level of employment of both inputs i.e. labour and capital and thus produce higher levels of output. If the firm wants to produce output level denoted by IQ_1 , then it will choose the factor combination denoted by E where Iso-quant is tangent to Iso-cost line. Similarly if the firm wants to produce higher level of outputs, then it will choose higher points of equilibrium such as E_1 and E_2 etc. The line joining these points is called expansion path.

Hence an expansion path indicates different points of least cost combinations of Labour and Capital required to produce different levels of output.

In other words expansion path curve shows the various Input-optima as the firm expands the size of output. The expansion path or Homogeneous Production Function is always a straight line through the origin. The expansion path curve will not be a straight line if total outlay is followed by varying proportion of labour and capital.

Self Assessment Questions

Q. What is an expansion path?

14.6.2 FACTOR PRICE RATIO CHANGES (OR RELATIVE PRICE CHANGE)

We may also inquire as to what would have happened to the expansion path of the firm if the relative prices of given factors inputs had been different. If the prices of labour had been relatively less than that of capital the budget on its cost lines would have been flatter than they are in fig 14.5. They would have thus become tangent to the various isoquants at points lower than E_2 i.e. E and E_1 in the case of each respective isoquants. If we join all these tangency points, we should have again got straight line like OS passing through the origin but having a smaller slope than OS . This scale would have a factor proportion more labour intensive than the scale line OS has. The *scale effect* would have, in that case created more employment for labour than for capital in absolute terms, even though the proportion between them would have remained the same.

If on the other hand, the price of capital had been relatively less, the expansion path would have laid above the OS line indicating a capital-intensive factor proportion and a greater scale effect on the employment of capital in absolute terms.

But what would happen, if the budgetary resources of the firm remain the same but the relative factor prices change. We can explain this effect along the lines of the analysis price effect in the theory of consumer's demand.

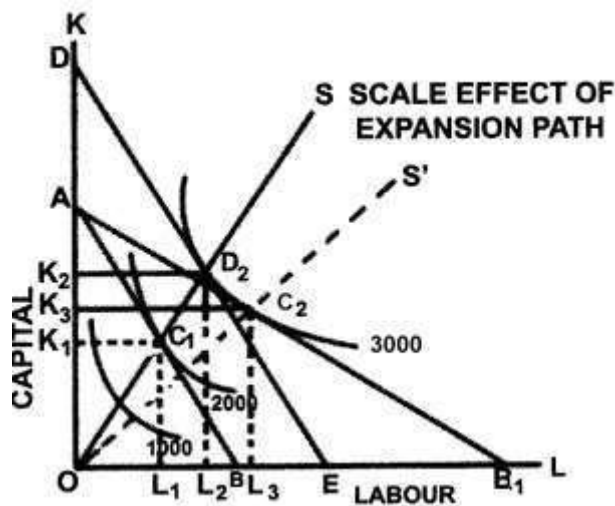


Fig 14.6

We assume the budgetary resources to be indicated by the budget or iso cost AB in the initial price situation in Fig. 14.6. The initial equilibrium of the firm will be at C_1 where AB is tangent to the isoquant 2000. Now we assume the price of labour to fall such that with the same total cost as before, OB of it (instead of OB_1 of it) can be purchased, but we assume the price of capital to remain constant. The budget or iso-cost line now rotate at A and take the position AB_1 which is tangent to the higher iso-quant 3000 at D_2 . Therefore, the firm will now choose D_2 combination.

Due to the change in the relative factor prices, two things have happened :

- (i) the real resources of the firm have increased; and
- (ii) labour has become cheaper in relation to capital. Due to increase in the real resources, the firm is able to increase the scale of its operations and thus would go over to at the combination D_2 on the higher isoquant 3000. This is *the scale effect* of the change in the

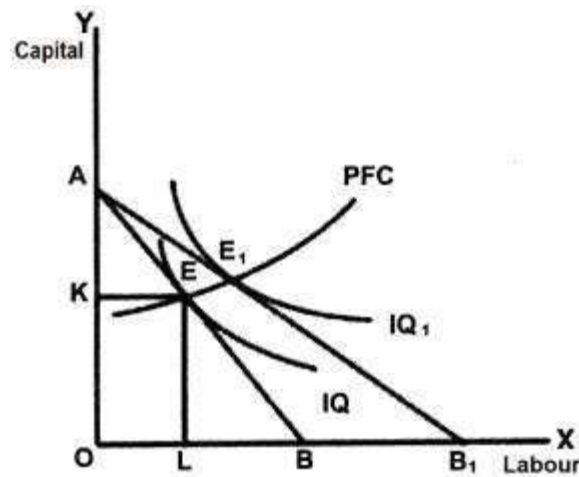
relative factor prices in our example, As a result of it there is a proportionate increase in the employment of both, labour and capital, because D_2 lies on the same scale line as the initial combination D_1 . But, since labour is now cheaper than capital and the negatively sloping convex shape of isoquant assumes, labour and capital to be substitutes, more of labour will be substituted in place of capital. The firm will thus move from D_2 to C_2 . This movement will be due to the *Substitution effect*.

As the result of the *scale effect*, the employment of both the factors increases. Employment of labour increases from L_1 to L_2 and capital from K_1 to K_2 . But the result of the substitution effect the employment of capital, which is near relatively costlier is reduced from K_2 to K_3 and the employment a labour which has become relatively costlier, is further increase from L_2 to L_3 . The extent of the *substitution effect* depends upon the elasticity of substitution between the factors. In the case of perfect substitutes, the *elasticity of substitution* is infinite. This happens when isoquants are not actual curves but straight lines falling to the right.

The other extreme case is of perfectly complementing factors when the proportion between them is fixed and not variable. This happens when consists of single points lying on a scale line. In this case the substitution elasticity is zero. However, actually this elasticity lies somewhere within these two limits. The greater is this elasticity of substitution, the larger will be the increase in the employment of the factor whose relative prices fall and the larger will be the fall in the employment of the factor whose relative price rises (even though its *absolute price* may remain constant or even falls) as the result of the substitution effect. Nevertheless, since the scale effect on the employment of both the factors in positive change in the relative factor prices.

Change in Input Prices

Now we try to see the effect on quantity of factor used when there is change in relative price of two factors. We explain it with the help of Figure 14.7.



Price Factor Curve

Fig. 14.7

We in the beginning assume AB is the cost line and IQ is the Iso-quant line. IQ is tangent to Iso-quant line AB at point E. The firm will, choose a combination of labour and capital denoted by point E. He will employ OL labour and OK capital. Now supposing price of factor X i.e. labour becomes cheaper than capital, so his Iso-cost line will shift from AB to

AB_1 . The entrepreneur will now like to produce with the factor combination denoted by E_1 where Isoquant IQ_1 is tangent to Iso-cost AB_1 . Thus with fall in price factor X where price of factor Y as well as total outlay remaining as constant, the entrepreneur has switched from factor combination represented by E to E_1 . This is known as **factor price effect**. When we join these two points we get **price factor curve**. When PFC curve slopes upwards as given in Fig. 14.7, then with the fall in price of factor X, we use more of both the factors i.e. Labour and Capital. When it slopes downwards, it means entrepreneur shall be using more of factor X and less of factor Y with the fall in price of factor X.

Self Assessment Questions

Q. What are factor price effect and Price Factor Curve? Explain each in a line.

14.7 OUTPUT AND SUBSTITUTION EFFECT OF A FALL IN PRICE OF ONE INPUT i.e. LABOUR

We know that with fall in price of labour we be in a position to use labour more assuming price of Capital remaining constant. The change in price of factor X i.e. labour effects the demand for labour via Income. Effect and Substitution Effect. We show it with Figure 14.8.

In Figure 14.8, we have drawn AB Iso-cost line. IQ_1 is the Iso-quant Curve. The entrepreneur in the beginning is in equilibrium at point E. Now supposing price of factor X falls. Then factor price line becomes AB_1 . This fall in price of factor X enables our entrepreneur to move to higher Iso-quant curve i.e. IQ_2 . The new equilibrium now is at point E_2 which shows a firm now uses more of labour. Earlier he was using OQ_1 amount of labour. Now with the fall in price of factor X i.e. labour he uses OQ_3 . This increase in quantity used is due to income and how much is due to substitution effect. Now we are to see how much increase is due to Income and how much is due to substitution effect. The whole increase is due to price effect. Something more he shall be employing due to substitution effect because labour has become relatively cheaper. Because of this fact, he shall employ more labour. Secondly, with the fall in price of factor X, i.e. labour his total income has increased. Hence he shall spend more on labour because of the income effect. To know how much more he is buying labour because of the income effect and how much more he is buying because of the substitution effect. Hicks says, we should reduce his income to that extent which brings back our entrepreneur to old Iso-quant curve i.e. IQ_1 . We should draw a line parallel to AB_1 touching the old IQ_1 . Now we can easily separate the income and substitution effect. We can say from Q_1 to Q_2 is due to the substitution effect because our producer remains on the same IQ_1 , Q_2 to Q_3 is due to Income effect because our producer has come down from IQ_2 to IQ_1 . Earlier, he had gone to IQ_2 because of the increase in his Income due to fall in factor price of X. Now when his increased Income has been taken from our produces. This has brought our consumer down to IQ_1 .

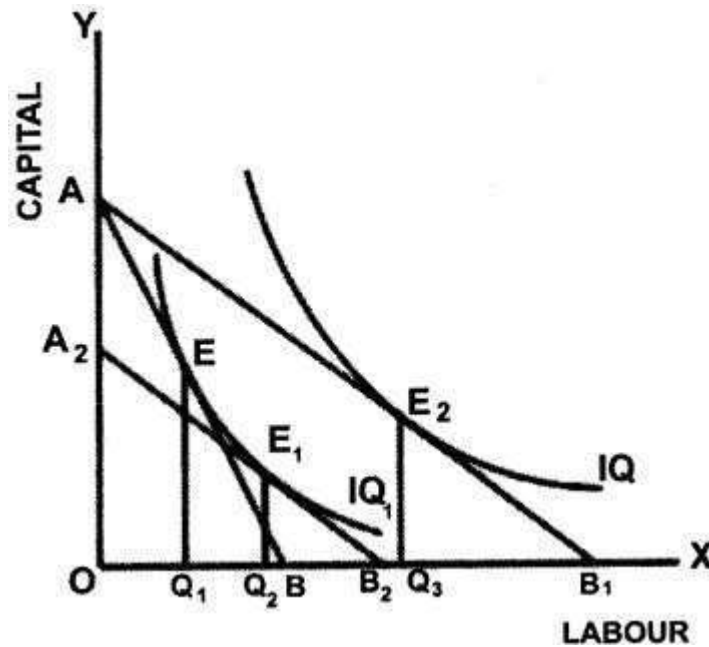


Fig. 14.8

14.8 CHOICE OF PRODUCT MIX (MULTI - PRODUCT FIRM)

In above given analysis it has been assumed that firm produces only one commodity. Obviously, it was a mere simplification, for in real life, most of the firms produce more than one product each. The problem that we are going to discuss in the present section is how an individual multi-product firm decides the proportion in which it should produce the various products.

Lets describe it in detail using different tools as explained below:

To keep analysis at a simple level, we shall assume that a firm produces only two products (say, product X and product Y) with the help of a given amount of resources and technology. This production possibility curve can be drawn with the help of table given below.

PRODUCTION POSSIBILITY SCHEDULE AND CURVE

Table : Production Possibility Schedule

Production (combination) possibility	Product X (Hundred) Units	Product Y (Hundred) Units
A	0	15
B	1	14
C	2	12
D	3	-
E	4	5
F	5	0

If all resources are utilized by the firm either for producing exclusively X commodity, then he can produce 5 hundred units of X product or for producing Y commodity, then he can produce 15 hundred units of Y commodity. These are two extremes. In between there are many possibility curves. In any other combination he can have more of X, and less of y or vice versa. But one thing is certain when he will have more of X, he will reduce product of Y and vice versa. It is clear from above table. The above table shows that for getting one unit of X his sacrifice of product Y goes on increasing.

PRODUCTION POSSIBILITY SCHEDULE AND CURVE

We suppose that the technology is such that if all the resources are devoted to the production of good X, OC^1 quantity of it is the maximum that can be produced. On the other hand if all the resources are wholly devoted to the production of Y, good, OC quantity is the maximum that can be produced. These quantities are shown along the horizontal and the vertical axis respectively in Fig. 14.9. But it is also possible to devote a part of the resources to the production of one product and the rest of the resources to the production of the other product. Thus, there is the possibility that the given resources can produce *alternative* combination of two products. The curve CC' in Fig. 14.9 indicates all such combinations of X and Y which can be produced with the help of the given resources and the given technology. This curve is commonly known as the *production possibility curve* or the *transformation curve*.

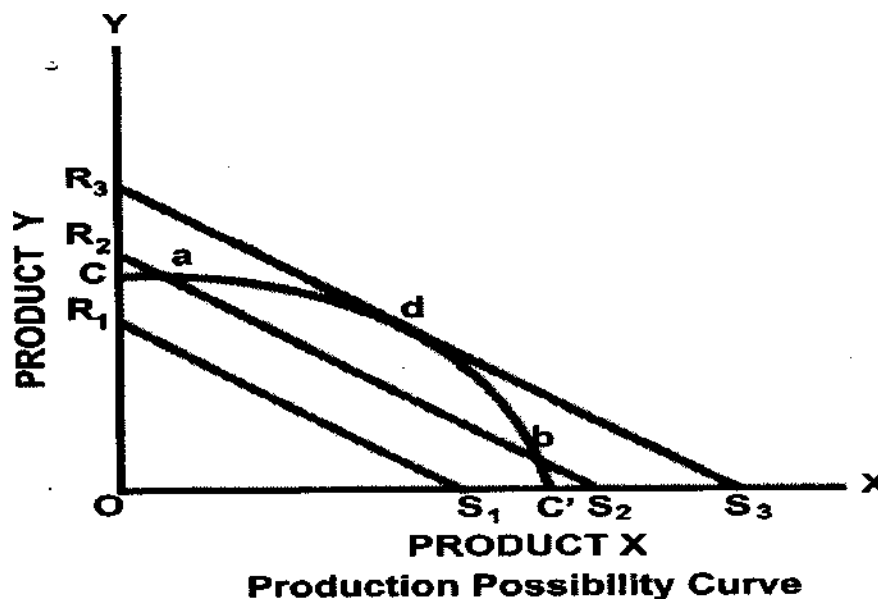


Fig. 14.9

Marginal Rate of Transformation : The slope of Production Possibility Curve is called marginal Rate of Transformation, which increases (as it is concave to origin).

The increasing Marginal Rate of Transformation makes the production possibility concave to the origin. However, the point which we want to stress in the context of the problem in hand is that whatever combination on it is assumed to be produced would fetch the same amount of resources. Therefore, the production possibility curve can also be treated as an **iso cost curve**.

Iso Revenue Line :

We also assume that the market prices of the given products X and Y are given and constant. Then, any straight line like R_1S_1 , R_2S_2 , R_3S_3 in Fig. 14.9 will represent given level of revenue which the firm can earn by producing and selling any combination of X and Y which lies on this line. It is just like the budget on the total expenditure line or indifference curve analysis of consumer's equilibrium. Since what is *expenditure from the point of view of buyers* is *revenue from the point of view of the seller*, a straight line like R_1S_1 in Fig. 16.9 is the iso revenue line of the firm; all combinations of the given pair of the goods will bring into the firm the total revenue at the prevailing prices of these goods. The slope of this line indicates the ratio between the prices of the given goods. In other words, it equals the ratio of price of X and price of Y. And other such straight line which is parallel to it and also to the right of it like R_2S_2 and R_3S_3 in Fig. 14.9 will represent a higher level of total revenue at the given price of X and thus, the *higher is an iso-revenue curve, the larger is the total revenue represented by it*.

Equilibrium Point

Now because a firm is assumed to be seeking maximum profits and maximised when the firm is able to earn the maximum possible revenue from the sale of goods produced at a given cost, it will be able to achieve its objective by producing such a combination of the given products with the help of its given resources that it is able to reach the highest possible iso-revenue line. In terms of the diagram given in Fig. 14.9 the firm will choose the combination 'd', on its production possibility curve. It is simply not possible for our hypothetical firms to go over to an iso-revenue line which is above R_3S_3 on which 'd' lies because the firm's resources are such that it cannot produce a combination that lies outside the production possibility curve CC' (which is also an *iso-cost* curve for the firm as already explained). The firm can produce, at the same total cost, combination like *a* and *b*. But it can be seen in the diagram that all these combinations will lie on some iso-revenue line which is lower than R_3S_3 . Hence the combination 'd' is the only profit maximising and therefore, the *optimum* combination for the firm under the given conditions. Therefore, the firm will choose the combination.

Self Assessment Question

Q. Define ISO Revenue Line

Q. Define Marginal Rate of Transformation.

Equilibrium Condition :

If we look at a point 'd' carefully, we notice that at this point, the slope of the iso-revenue line and the slope of the production possibility or iso cost curve are equal. But the revenue line and the slope of an iso revenue line represent the ratio between the price of the given pair of products and the slope of a production possibility curve indicates the ratio between the marginal costs of the given pair of products.

From this we derive the proposition *That a profit maximizing firm will produce such a mix of products that the ratio between the marginal costs of any pair of them equals the ratio between their respective price.*

A change in the relative prices of the given products will induce the firm to change the proportion in which they are being produced. Let us suppose that the firm is initially producing the *optimum* product mix so that the following condition is satisfied:

$$\frac{MC_x}{MC_y} = \frac{P_x}{P_y}$$

Where MC refers to marginal cost and production and P refers to price and the subscripts X and Y refers to the produce concerned.

$$\frac{MC_x}{P_x} = \frac{MC_y}{P_y}$$

Now, if the price of X falls, while the price of Y remains the same, the above equality will turn into the following inequality.

$$\frac{MC_x}{P_x} > \frac{MC_y}{P_y}$$

Therefore, in order to establish once again, the equality between the two ratios which is the necessary conditions for profit maximization, the firm will change the composition of its product mix in such a manner that MC_x falls and MC_y rise. Since production is subject to diminishing returns which implies the marginal cost rises with increase in production and falls with decrease in production. The firm will never try to have less of X and more of Y till, Once again, the two ratios are equal.

$$\frac{MC_x}{MC_y} = \frac{P_x}{P_y}$$

Thus a firm tends in response to a change in the relative prices of its product, to change to composition of its product mix in favour of the product. The relative price of which rises and against the product, the relative price of which falls.

In terms of Fig. 14.9 the change in it as a result of a fall in the price of X, the price of Y remaining the same, will be as follows :

A larger quantity of X will have to be produced and sold in order to get the same revenue from it, while no such change of adjustment will be made in the case of Y. According the points S_1, S_2, S_3, \dots of the respective iso revenue lines will shift to the right, while the corresponding R_1, R_2, R_3, \dots points will not change their respective position. In other words the iso revenue lines will rotate at their ends touching the vertical axis. This will make each iso revenue line flatter than before showing a fall in its slope due to fall in P_x/P_y . Thus the $R_3 S_3$ line will move away from the production possibility or the iso-cost curve CC' . But a lower iso-curve line like $R_3 S_3$ may rotate sufficiently at its upper end to become tangent to the production possibility curve CC' . However, it can be imagined that a flatter iso revenue line will become tangent to CC' at some point above the initial point of equilibrium 'd' in Fig. 14.9 which clearly implies that in the changed situation, the firm will now produce less of X and more of Y than before. If the price of X had risen instead of falling the iso-revenue lines would

have rotated at their respective upper ends to the left making all the iso-revenue lines steeper than before. A steeper iso-revenue line will be tangent to the production possibility curve at some point lower than in Fig. 14.10 showing that now more of X and less of Y will be produced.

Self Assessment Question

Q. Define Transformation Curve.

14.9 ELASTICITY OF INPUT SUBSTITUTION

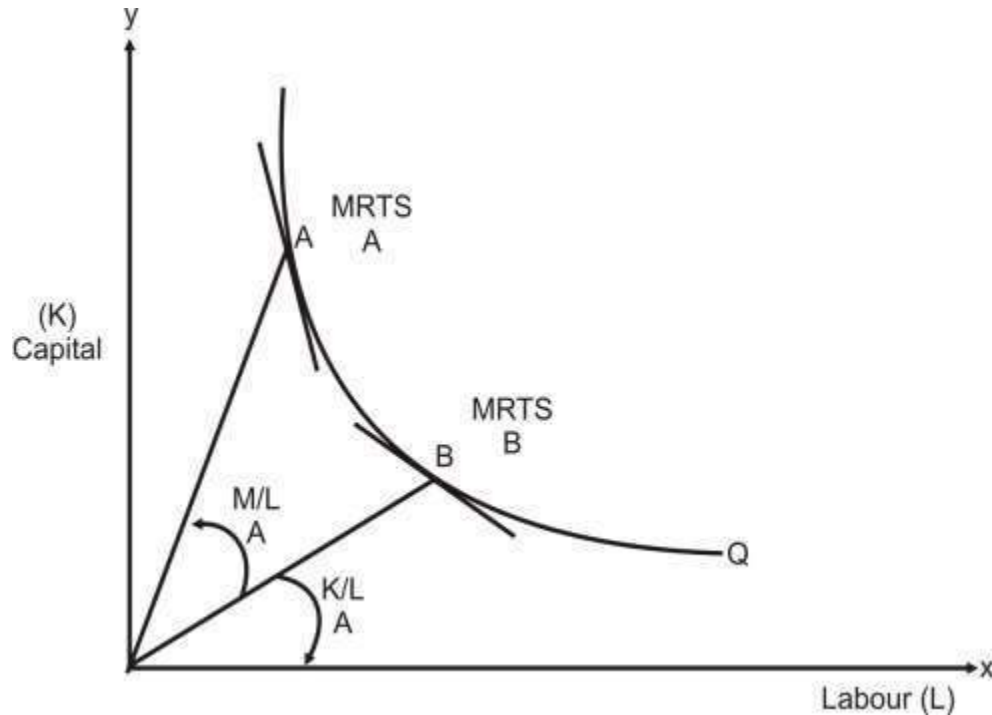
The elasticity of substitution between inputs is an important part of theory of production. With the help of concept of elasticity of substitution, it is easy to show how different or easy it is to substitute one input for another. This concept is more pragmatic rather than marginal rate of technical substitution (MRTS) which is the slope of isoquants i.e. the ratio of only marginal changes in the inputs. The concept of elasticity of substitution has been widely discussed in economics, so far as the substitution between labour and capital is concerned. It is a method of measuring the degree of substitutability of factors. The elasticity of input substitution is known as relative change in the factor proportions (input ratios) as a consequence of relative change in the marginal rate of technical substitution. Finally, it is defined as percentage change in the capital labour ratio (K/L) divided by the percentage change in the marginal rate of technical substitution (MRTS).

$$\sigma = \frac{\text{Proportionate change in the ratio of inputs used}}{\text{proportionate change in the marginal rate of technical substitution of L for K.}}$$

$$\sigma = \frac{\text{Proportionate change in } K/L}{\text{proportionate change in MRTs LK}}$$

$$\begin{aligned}\sigma &= \frac{\partial \left(\frac{K}{L} \right)}{\left(\frac{K}{L} \right)} \div \frac{\partial (MRTS_{LK})}{MRTS_{LK}} \\ &= \frac{\partial \left(\frac{K}{L} \right)}{\left(\frac{K}{L} \right)} \times \frac{MRTS_{LK}}{\partial (MRTS_{LK})} \\ &= \frac{\partial \left(\frac{K}{L} \right)}{\partial (MRTS_{LK})} \times \frac{MRTS_{LK}}{\left(\frac{K}{L} \right)}\end{aligned}$$

Since along an isoquant, K/L and MRTS move in the same direction, the value of σ is always positive. Moreover it is independent of unit of measurement of K and L. The concept of elasticity of input substitution is presented graphically in Fig.-14.10.



Elasticity of Input Substitution

Figure 14.10

A slight movement from A to B, along with the isoquant Q gives the ratio of change in marginal rate of technical substitution. There are two techniques of production represented by two rays OA and OB but their factor intensities are different. OA process is capital intensive while OB is labour intensive process. A shift from OA to OB indicates a change in factor intensity. The ratio between the two changes measures the elasticity of substitution. The magnitude of elasticity of substitution varies inversely with the Curvature of the isoquant. The greater the convexity of isoquant, the less will be the elasticity of substitution and vice versa. When the factors are perfect complements then isoquants are two straight lines with a right angle bend, then substitution elasticity between them is zero. If the two factors are perfectly substitutes, then the isoquants are straight lines downward sloping, then elasticity of substitution is equal to infinity. To conclude, the value of elasticity of substitution varies between zero (0) and infinity (∞), depending on the nature of production function which determines the curvature of various kinds of isoquants.

14.10 CHOICE OF TECHNOLOGY

The whole of the neo-classical theory of production which we have explained so far is based upon the assumption that at any given line there is one technique available for producing given commodity. Therefore, the problem of choosing the optimum technology does not arise within the neo classical marginal theory factors labour and capital, are given and constant and the price of commodity to be produced is also given and constant. We further assume that there are three alternative technologies A, B, C available such that if only 100 units of the commodity are to be produced, this particular output can be produced by working technology A at the scale level A_1 or by working technology B at the Scale B or by working technology C at the scale level C. Therefore, the kinked curve a, b, c. in Fig. 14.11 just like an isoquant with which we had made ourselves familiar in previous pages. However,

there is a slight difference. While the iso-quant of the neo classical theory that we dealt with in the previous pages were smooth curves, this a kinked curve. Moreover, the isoquant a, b, c in Fig. 14.11 are only the points which lie on the lines representing the various technologies such as A, B and C.

It follows from the basic assumption of **linear programming approach** that if output is to be doubled say from 1000 to 2000 units, it can be by doubling the scale along any given technology. In terms of our example as depicted in Fig. 14.11 this unit can be done either at A_2 or b_2 or c_2 joining these points we get another isoquant 2000. In this way a series of isoquants can be drawn.

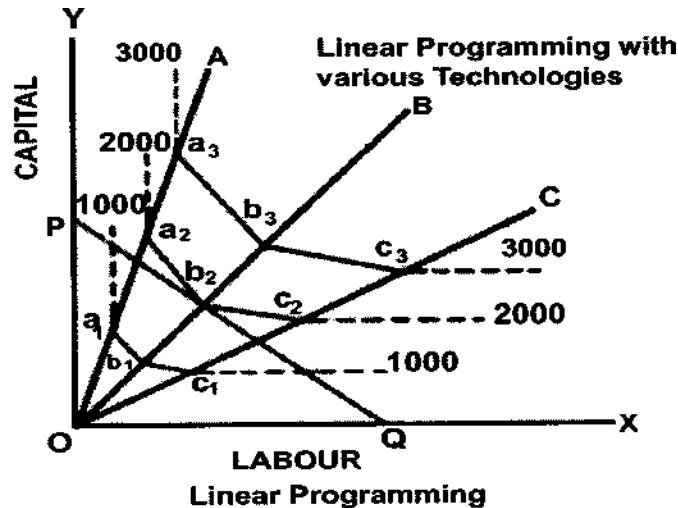


Figure 14.11

If we suppose that the total budgetary resources of our hypothetical firm are such that when fully combinations of labour and capital which lie on budget or the iso-cost line PQ in Fig. 14.11, then the firm will be in equilibrium where iso-budget or iso-cost line hits a corner of an isoquant as it does in Fig. 14.11 at b_2 on the isoquant 2000. Thus firm will be maximising its profits when it produces 2000 units of the given commodity and choose technology B to produce this output.

One of the **basic difference between the marginal approach of neo-classical theory and the linear programming approach** is that while in the former a slight change in the relative factor prices will cause a change in the firm's equilibrium position, this does not happen in a linear programming approach. A small change in the relative price of labour and capital in our example will change the slope of the budget or the iso-cost line slightly and if we suppose, for the sake of argument, that the firm still wants to produce 2000 units (a compensating variation in income may be assumed to enable the firm to remain on the isoquant 2000), the new budget or the iso-cost line will still hit corner b_2 . Hence neither the technology employed nor the factor proportion in this technology will change.

However, it can be seen that if the price of labour had been so low compared to the price of capital than the budget on the iso-cost line because almost horizontal, it would have hit the corner C_2 . If the desired output had been again 2000, in that case, the most labour intensive technology C would have been chosen. On the other hand if labour had been rather too scarce and dear while capital had been abundant and very cheap, the budget or the iso-cost lines would have been almost vertical and, again supposing the desired output to be

2000, it would have hit the isoquant 2000 at the corner a_2 indicating the choice of the most capital-intensive technology A.

14.11 LAW OF VARIABLE PROPORTION

The production function of the firm can be studied by holding the quantity of one factor fixed varying the amount of other factors. This is done with law of variable proportion. The production function of the firm can be studied by varying the amount of all factors of production i.e. returns to scale.

One of the laws of economics which has quite a long history and great analytical importance is the famous law of Diminishing Returns. It was, first of all, highlighted in what now is described as the Ricardian Theory of Rent. The idea suggested there in was that under a constant technology, as more and more doses of labour and capital are applied in the cultivation of a given piece of land, the addition made to the total output of a commodity on that piece of land goes on diminishing. It is important to grasp the meaning of a 'doses' of labour and capital. It refers to a given proportion which labour and capital are combined. This proportion between labour and capital was assumed to remain constant in the Ricardian statement of the *Law of Diminishing Returns* as a matter of fact, even Marshall's statement of this law was given in the Ricardian mould, when he stated this law as follows:

"An increase in the capital and labour applied in the cultivation of land causes in general a less than proportionate increase in the amount of produce raised, unless it happens to coincide with an improvement in the Arts of Agriculture."

Due to this implicit assumption of constant proportion between labour and capital the factors were, in effect converted in to the one *composite* fact, or labour and capital. When the "doses" of labour and capital are increase in cultivation of a given piece of land. The *factor proportion* between land and labour and labour and capital is disturbed, as a result of which the total output increases less than proportionately which implied diminishing marginal returns. Thus law of Diminishing Returns is in fact, only one aspect of a particular type of production function.

There are two points worth nothing in the Ricardian and Marshallan statement of the Law of Diminishing Returns. **In the first place**, this form of the statement of the law creates rather false impression that it is valid only in agriculture. The classical economists like Ricardo did, in fact, suffer from this fallacy and mentioned it explicitly and frequently. **Secondly**, it also falsely suggests that the diminishing returns set in at the vary start and there is no prior stage in which inspite at the constant technology as "arts" the marginal returns to the variable factor might be increasing.

The modern approach is to look upon the so called Law of Diminishing Returns only as a *phase of the general law of production* which is now usually referred to as the Law of Variable Proportions. If we look back at the nature of production function that we have already discussed it should be clear that the totals output will change whenever the quantity of one or more factor inputs changes. When the quantity of one or more factor inputs change while the quantity of some other factor or factors remains constant of changes in a different proportion from the former, there will be a change in the *proportion* in, which the factor inputs are combined. *The way in which the total output behaves in response to change in factor proportions is known as the returns "to factors proportions"* and the law of Variable Proportion specifies the way the total output behaves in response in the factor productions.

It is convenient to understand this law by assuming that only one factor input changes while all other factor inputs remain fixed, with this simplification the law of Variable Proportion may be started thus. *As the quantity of one factor in a combination of factors goes on increasing while the other factors remains fixed, the total output increase more than proportionately up to a point after which it increases less than proportionately, provided the technological remains constant.*

More than proportionate in total output in response to increasing quantities of the variable factor being employed with the fixed quantities of the other factors implies increasing marginal and average returns to the variable factor. Marginal return on the marginal physical product of a variable factor is the addition made to total output by adding one more unit of that factor while other factors are kept constant. It is thus the partial derivative of the given production function with respect to the particular factor which is made to vary and can be written as $\frac{\partial O}{\partial V}$

where O is total output and

V is the quantity of the variable factor involved. The average return or the average physical product of a variable factor is the output per unit of the factor employed and is generally indicated as $\frac{O}{V}$. APP of variable factor = $\frac{O}{V}$ where O is output and

V is the total quantity of factor concerned.

The modern way of stating the law of production in the form of the law of variable proportions or, alternatively, in the form of Law of Non-proportional output has the advantage of bringing more general covering as it does not only concerns all fields of production but also all the phases of the law production.

We may now explain the law of Variable-Proportion's with the help of the diagram. But we should, firstly, understand the *basic assumption* underlying the law (i) The most fundamental assumption is that factors of production are substitutable; only thus factors of production will be, variable. The law does not apply to those cases where the factors must be used in fixed proportion to yield a product... Where factors of production are rigidly *used in fixed 'proportion'* then increase in one factor would not lead to any increase in output. (ii) Factors are assumed to be homogeneous so that each unit of a factor is of one' and the same quantity and therefore, increasing or decreasing *returns cannot be the result of any difference in the quantity of individual units of a factor.* (iii) *The individual factors of production are assumed to be perfectly divisible* so that any individual factors becomes freely variable. (iv) The technology is assumed as constant in addition to these basic assumptions of the law, we may also emphasize. Though this should have been quite obvious from the discussion we have already done, that returns in his law refer to *physical* returns and not to monetary returns.

Supposing now that there are only two factors say capital (K) and labour (L), of which Capital is fixed while labour is variable the total product, according to the law of Variable Proportions, will increase more than proportionately up to a point as more and more of labour is employed with the constant quantity of capital, but this point is *eventually* reached after which an addition to a labour will cause a less than proportionate increase in the total product. This behaviour of production of returns to factor proportions is depicted in Fig. 14.12.

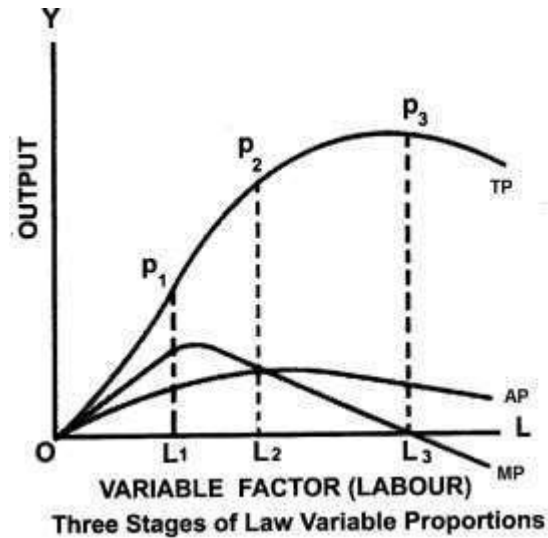


Figure 14.12

The quantities of the variable factor (Labour in our example) are depicted along the horizontal axis while the vertical axis depicts the total output in physical units. The TP curve depicts the behaviour of the product in response in change in the variable factor. As the quantity of labour, the variable factor, increases from zero onward upto OL_3 the total output goes on increasing therefore. The total output, TP has positive slope over this range. But as soon as the quantity of labour is increased beyond OL_3 the total output begins to decrease and hence the TP curve dips and its slope becomes negative.

In stage I total production upto OL_1 increase at an increasing rate which means **MP** rises. After OL_1 total production increases at a diminishing rate. The **MP** falls but is positive. But the stage I ends where **AP** is highest i.e. at L_2 . During stage I **MP** rises in part and then fall. **AP** rises through out. In stage I, quantity of fixed factors is too much in relation to variable factors.

In stage II **TP** continues to increase at a diminishing rate until it reaches its highest point i.e. up to OL_3 . In this stage both **MP** and **AP** are diminishing but are positive. The stage II ends where **MP** is zero and **TP** is maximum i.e. at LO_3 level.

In stage III **TP** declines. As a result **MP** of variable factors is negative. In this stage variable factor is too much relative to fixed factors.

Why do we get Increasing Returns ?

- (1) In the beginning fixed factor is too much relative to variable factor. Therefore, in the beginning when we go on employing more and more variable factors, fixed factor is utilized more efficiently.
- (2) The second reason which is given is indivisibility of factors. There are certain factors which are indivisible. If our demand is smaller, we can't break up these factors therefore, for fewer output costs will be more. But when our demand increases and we employ more labourer, then production increases more than proportionately and cost per unit shall also decrease.
- (3) The third reason which is given is division of labour. When we employ more labour, division of labour takes place. Efficiency increases and production will also increase.

But there is limit to employment of more and more labour. **This stage is known as optimum stage i.e. fixed factors has fully been exhausted.** If we go on employing labour beyond this then we shall start getting diminishing returns.

Why do we get Diminishing Returns ?

- (1) We get diminishing Returns because after reaching an optimum point. After reaching this optimum stage if we increase our production, we shall get diseconomies in lieu of economies. Therefore, production starts diminishing.
- (2) Factors of production are imperfect substitutes.
- (3) Factors of production differ in efficiency or Fertility.

14.12 LAW OF VARIABLE PROPORTION WITH ISOQUANTS

The law of variable proportion can be explained with the help of Iso-quants. This is given in fig. 14.13. In this figure we take capital as fixed factor and labour as variable factor. When we go on making changes in variable factor i.e. labour by keeping capital as fixed, output in the beginning increases more than proportionately, then at a constant rate and later at less than proportionately. We have shown family of Isoquants depicting a level of output. We shall be seeing from these Isoquants curves that in the beginning total productivity increases more than proportionately up to 3rd labourer, then remains constant up to 4th, after 4th T.P increases at a diminishing rate. In lower part of the Fig.16.14 we have derived the MPP of labour. This curve also tells us that when we employ more labour, productivity in the beginning increases and then falls downwards.

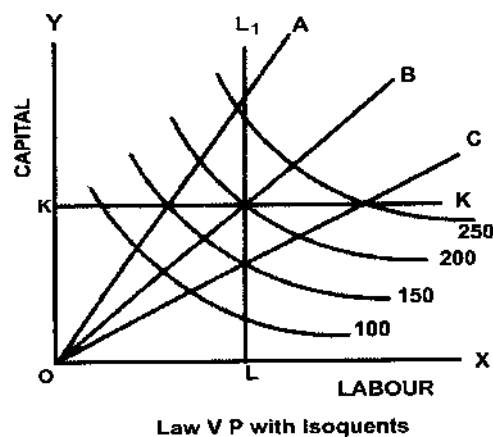


Figure 14.13

An increase in scale means all factors are variable in the same proportion. Before we explain Returns to Scale in detail it will be better first to understand the distinction between change in scale and change in factor proportion. The distinction between two shall become clear from Figure 14.13.

In Figure 14.13 on OX we take up labour and on OY we take up capital. We further assume that there are only two factors which we require for production i.e. labour and capital. An Iso-quant curves having been drawn. We have drawn two lines. One horizontal line from OY i.e. KK and second vertical line from OX i.e., LL₁. In horizontal line KK we find one factor i.e, capital is fixed and other factor labour is variable. Similarly when we take the vertical line LL₁ which have been drawn on OX i.e. LL₁. Here we take labour as fixed and

capital as variable. In other words we can say proportion between two factors is variable. Now we draw three straight lines OA, OB, and OC. We find, in OA straight line the ratio between two factors will remain same throughout and is called 'ray'. Labour and capital shall increase in the same proportion. Similarly, we can find the same thing on other straight lines i.e. OB and OC, where proportion between two factors will remain the same.

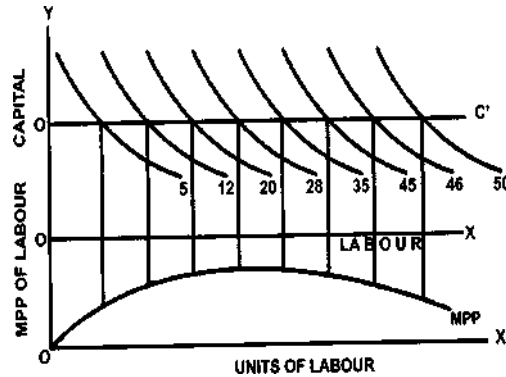


Figure 14.14

Now we will explain how Returns vary with the change in Scale i.e. when all factors of production are increased in the same proportion. Some economists are of the view that production function must necessarily exhibit constant Returns to Scale if the factor of production are doubled. Their argument is if all inputs are doubled, then what is there to prevent the output from being doubled, Robinson, Kaldor, Lerner and Knight hold the view that if we build two exactly same type of factors by using the same number of Labour and Capital, the output shall be doubled. According to them constant Returns to Scale must prevail. According to them if Constant Returns to Scale does not prevail in some industries it is because we cannot increase inputs in the same proportion. They give two arguments in support of their view point :

- (i) There are some factors which are scarce and their supply cannot be increased proportionately.
- (ii) Some factors are indivisible.

The above arguments has been criticised by Chamberlin. According to him constant Returns to Scale shall never prevail even if all factors inputs are in plenty or all factors are divisible. According to him there is always going to be increasing or decreasing Returns to Scale because at a larger scale :

- (1) Great specialisation of labour becomes possible.
- (2) Superior technology is used.

14.13 PRODUCTION FUNCTION AND RETURNS TO SCALE

We have studied the production function with law of variable proportion where one factor i.e. labour is variable and other factor of production are fixed. But now we shall be studying production function with Returns to scale where all the factors are variable, no factor is fixed.

Some economists have challenged the concept of Returns to scale on the ground that all factors can't be increased or decreased in a fixed ratio and therefore proportion between two factors can't be kept constant. For example, an entrepreneur is a factor which can't be

varied in a single firm. But Economists say an entrepreneurship is variable in the sense greater the other inputs greater the entrepreneurial work to be performed.

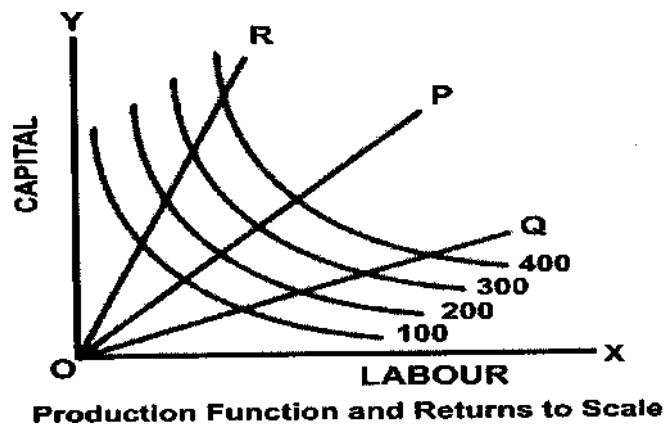


Figure 14.15

Returns to scale may be constant. Increasing and or decreasing. If we increase all factors in a given proportion and output increases in the same proportion Returns to Scale is said to be constant. But if increase in output is more than proportionate then it will be Increasing Returns to scale and vice versa. In mathematical term constant returns to scale is called Linear homogenous production function of the first degree. We explain it below diagrammatically.

The difference between the succession Equal product. Curve is the same. This represents the Equal product curves.

Some economists are of the view that production function must necessary exhibit constant Return to Scale, if the factors of production are perfectly divisible. This we can see from the above given diagram. **If constant Returns to scale does not occur, then two reasons are given for that :**

- (1) The supply of certain factors can't be increased proportionately because of the scarcity of factor of production.
- (2) Indivisibility of some factor of production.
- (3) Efficiency of some factors also differs.

But Chamberlin is of the view even if factors are not scarce and factors are perfectly divisible and efficiency of all factors is homogeneously even, then **production will increase disproportionately i.e. in the beginning output increases more than proportionately than at a constant rate and at the end less than proportionately.** This is due to the following, reasons.

- (1) Greater specialisation of labour.
- (2) Introduction of specialised machinery.

14.13.1 Isoquants and Increasing Returns to Scale

We now have discussed above that output in the beginning will necessarily increase more than proportionately then proportionately and lastly less than proportionately. This we

can see from the following diagram 14.16. In the diagram we have shown Increasing Returns to Scale through Equal product or isoquant curves.

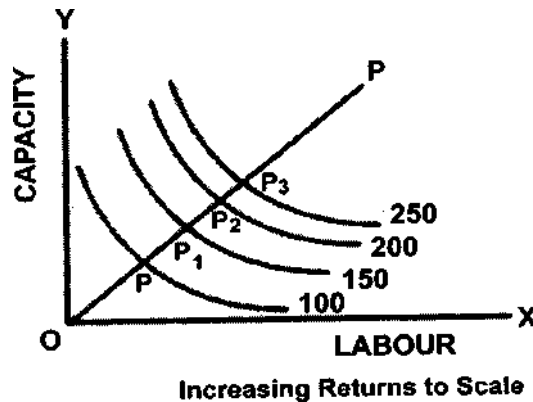


Figure 14.16

As factors of production are increased, Returns to outlay will increase in the beginning. The distance between Isoquants curve goes on diminishing because increase in output is obtained by smaller and smaller increase in inputs. The increase in outlay indicated by gradual decrease in the distance between Isoquant. For a given increase in output say from 100 to 150 and so on, cost outlay on labour and capital increases but at a diminishing Rate. This is shown in Fig. 14.16.

14.13.2 Isoquants and Constant Returns to Scale

In this diagram distance between Isoquants is constant. This happens when factors of production are changed in given proportion, output also changes in the same proportion in it when output is doubled, cost of factor inputs is also doubled. This is shown in Fig. 14.17.

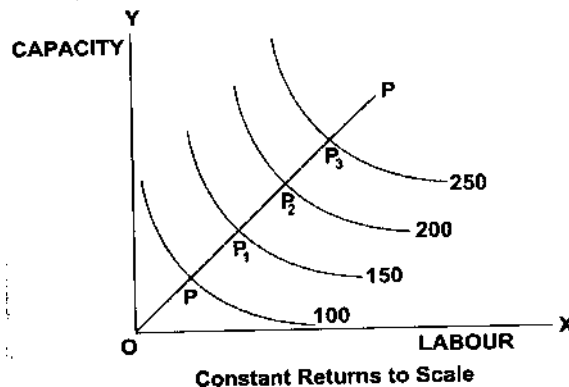


Figure 14.17

14.13.3 Isoquants and Diminishing Returns to Scale

In this diagram distance between Isoquants is diminishing. Diminishing Returns to Scale means for a given increase in output larger increase in quantity of factors of production is required. In other words proportionate increase in factor input will be more than proportionate increase in output. This is shown in Fig. 14.18.

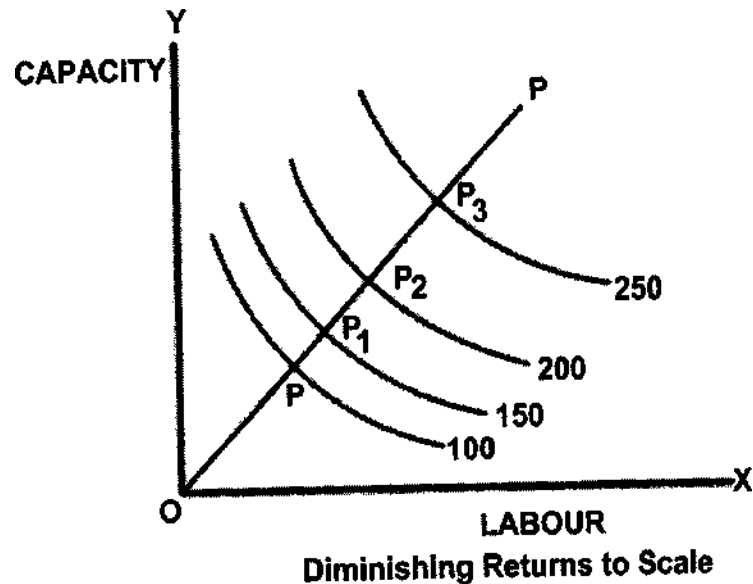


Figure 14.18

14.14 CAUSE OF INCREASING RETURNS TO SCALE (ECONOMIES OF SCALE)

Economies that occur due to increasing the scale of production are called economies of scale. They can be internal economies or External economies.

I. Internal Economics : Internal Economics arise due to following reasons :

A Technical Economies : When the size of the productive unit is increased, many economies of technical nature appear and reduce the cost of production. Technical economies arise in the following ways:

- i) **Economies due to increased dimension.** A large plant sometimes is more economical to operate as compared with a smaller plant. For example, cost of installing a 10 horse power electric motor is not twice the cost of installing a 5 horse power motor. Similarly, cost of operating large railway engine is not as large as its capacity is, as compared with a small railway engine. Both types of engines require almost the same staff to operate them.
- ii) **Economies due to superior technique.** As the scale of production increases, it becomes possible to introduce machinery with better technique of producing the commodities. For example, a small factory may use a rickshaw for sending goods to various places in the town but a big factory may employ a truck-tempo for the distribution of goods. Even if the total cost of operating the truck will be higher than the operating cost of a rickshaw, but the average cost per unit of goods transported will be much less because of a large number of goods that have been transported.
- iii) **Technical economies due to linked process.** When production is on small scale, it is quite possible that the two jobs necessary for completing the work may be done at separate places. For example, a weaver may be only weaving whereas spinning may be done at another place. When however, the weaver sets a textile mill, he may set up a spinning plant in the mill itself. The linking of the two processes will bring about saving in costs.

iv). Technical economies due to specialisation. We know large scale production makes the introduction of division of labour possible. When there is division of labour, we can have best men for each job. The cost of production will go down due to the fact that each man is most suitable for the job he is carrying on.

B Managerial Economies. In a small concern, the same individual may be working as a worker and the manager. All types of jobs will be done by him. For some of them, he may be best suited whereas for others he may not be. When the scale of production is enlarged, the owner can only work as a manager and more labourers can be employed for producing the commodities. In fact, as the scale becomes still large, even the managerial functions can be subdivided. For example, one person may head the sales department and the other, the purchase department. Still another may be in charge of the advertisement section. Such a specialisation at the managerial level will increase the efficiency of the firm and reduce the cost of production.

C Commercial Economies. A large business enjoys many advantages while purchasing raw materials or selling finished products. It enjoys many bargaining advantages. It can purchase goods at concessional rates and can get many concessions from the railway and other transport agencies for transporting goods. Even when it is having its own transport, it enjoys economies due to large scale production. Transporting a full truck load of goods at a time is more economical than transporting half truck load but twice.

D Financial Economies. A large concern can get credit on a large scale and at cheaper rates of interest as compared with a small concern. The lending agencies have much confidence in the repaying capacity of a large concern.

E Risk Bearing Economies. A large concern can produce a variety of goods. If due to some reasons, demand for one of its products falls, it will still be able to carry on. It is quite possible that demand for its other products goes up and the possible loss is eliminated. The fact that a large concern is engaged in diversified production helps it to bear risk more easily. In fact, the risk itself is reduced. A small concern on the other hand, specialises in the production of one commodity only. If its demand falls the concern may be completely ruined. We all know that it is dangerous to keep all our eggs in one basket. In case of production also, we can say that it is a mistake to depend upon the production of one commodity only to earn our income.

F Economies of Scale due to Indivisibilities. Indivisibility of certain factors of production has also been referred to in explaining the presence of increasing returns to scale.

Certain factors of production possess this property, that their size cannot be reduced below a certain minimum. For example, railway engines, electricity generation equipment, come in certain minimum sizes and correspondingly, certain minimum capacities. Another example is that an electric generator has a capacity of 100 kilowatts. Now, when a firm installs it, it will have the capacity to produce 100 kilowatts of electricity. But its immediate needs may be less than 100 kilowatts. Let's say 40 kilowatts. Thus by installing this equipment, the firm has an excess capacity of 60 kilowatts. Now if in the future the firm has to expand, then for the next 60 kilowatts, the firm will not incur a very heavy cost for it has the capacity to expand production by 60 kilowatts, output will expand more than

proportionately with respect to cost and thus the average and marginal costs will decline. This decline in costs are called economies of scale due to the presence of indivisibilities.

Indivisibilities can also cause diseconomies of scale. For example, when the firm installs the 100 kilowatts plant it does not expand output by 100 kilowatts, for the demand for its output has increased by less than 100 kilowatts. Here the cost will increase more than proportionately with respect to output, thus raising the average and marginal costs, causing diseconomies of scale. The firm has to buy the 100 kilowatts plant for this is the minimum size available in the market. The plant size is not divisible beyond 100. The plant is indivisible.

II. External Economies : External economies are of the following types:

- A. Economies of Concentration:** When many firms are located in one place, it leads to many economies. These economies are due to the availability of skilled labour, cheap credit, better transport facilities, setting up of subsidiary industries etc. If all the firms belonging to an industry are located at one place they can make joint effort to solve some of the problems facing the industry. For example, negotiations with the government concerning taxes on the industry; the price fixed by government, supply of raw materials, etc. can be more easily conducted if the industry is concentrated at one place.
- B. Economies of Information:** When industry consists of a large number of firms; it can jointly take up certain research projects. Such research products may not be within the reach of one individual firm, even when its own scale of production is very large. The industry can also start its own technical journal a step which will benefit each one of its members.
- C. Economies of Disintegration :** Sometimes it is not possible for a firm, even if its own size is quite large, to carry out economically some processes connected with the line of production in which it is engaged. If in a given locality, the number of such firms increases, a new firm may be started for taking up that process alone. For example, when a large number of cotton mills are located at one place a calendering plant may be set up in the locality.

16.15 CAUSES OF DECREASING RETURNS TO SCALE (DISECONOMIES OF SCALE)

We must note that there is a limit upto which these economies can be reaped. If the size of the firm goes on increasing, a time will come when it will no longer be able to reap more internal economies. It may become difficult to supervise the workers effectively. Additional factors of production may not be as efficient as the earlier ones. Cost of producing a unit output thus may rise instead of falling as the size further increases. In the same manner, costs may start rising because external economies can not be reaped any more. Excessive concentration of firms in one place gives rise to excessive rents, higher- wages and even a higher rate of interest.

Thus, we find that though large scale production brings about certain internal as well beyond this point, it will lose most of the internal diseconomies instead. Similarly, if the industry as the whole expands beyond a certain point, the external economies enjoyed by a firm will give place to external diseconomies.

Limits to the Expansion of a Business

We have discussed above the economies that a firm will reap when its size increases. This however, does not mean that in actual practice, the firm will be able to reap all such

economies. Expansion need not be smooth. The firm faces many difficulties when it tries to increase its size. The main difficulties are as follows :

1. **Financial Difficulties** : For increasing the scale of production a firm needs more finances. It may not be possible for a firm to make arrangements for the finances it needs. Money lending institutions will never lend to an unlimited extent to an expanding firm.
2. **Managerial Difficulties** : For sometimes, the expanding business benefits from managerial economies. But ultimately, the business can become unmanageable. Supervision will become difficult. Cost of production will begin to rise because of indiscipline and - carelessness on the part of the workers.
3. **Market Difficulties** : Even if it is possible to reap certain economies by expanding the business, condition of the market may not favour such an expansion. If the demand for the commodity is very small, there is no point in expanding business. Its demand for the commodity is limited and the firm enlarges its scale of production, it will have to sell the commodity at a very low price so that all the units of the commodity that have been produced are sold. This may cause losses to the firm. Similarly, heavy cost of transportation of the commodity produced as well as the working of trade cycles will limit the size of the market.

14.16 MULTI-PRODUCT FIRM'S EQUILIBRIUM

We have already considered production function (a) with one variable input and one output, (b) with two variable inputs and one output. Now we shall consider the equilibrium of a multi - product firm - with two inputs and two outputs. This model is widely applicable not only for the theory of operations to a business enterprise but also for general equilibrium analysis and theory of international trade. In other words, the model can be applied to the country as a whole as also to the international economy in a broad way.

The Production Possibility curve

A firm has two factors labour (L) and capital (K) and produces two products say x and y. For each product, the production function is :

$$X = f_1 (L, K)$$

$$Y = f_2 (L, K) \text{ .}$$

These production functions can be presented by act of isoquant curves with their usual characteristics. We can obtain the production possibility curve of the firm by using the devise of Edgeworth Box diagram 14.19. Let us assume that the firm has total quantities of factors OL of labour and OK of capital measured along the sides of Edgeworth Box. Any point of the Edgeworth Box shows a certain combination of quantities of X. and Y produced by the available factors of production. The production of commodity is represented by the set of iso quants denoted as $A_2 A_3$ etc. which are cover to origin O. The production function for commodity Y is represented by the set of iso-quants denoted as $B_1 B_2 B_3 B_4$ etc. which are cover to origin O^1 .

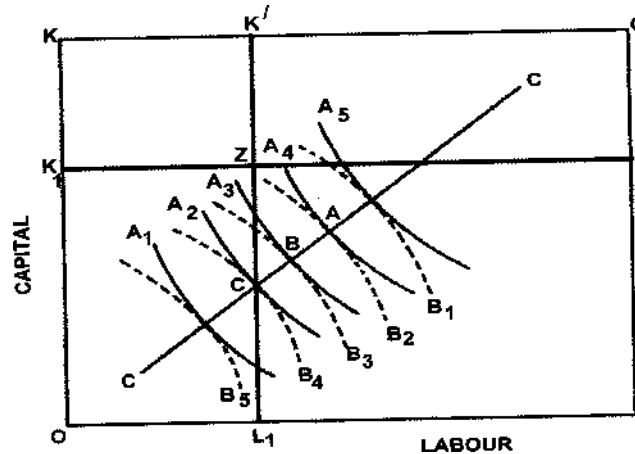


Figure 14.19

The further down an isoquant B lies the higher the quantity of y it represents. The two sets of isoquants have points of tangency which when joined formed the contract curve CC only points lying on the contract curve are efficient in the sense that any other point shows that use of all the resources for producing a combination of outputs which include less quantity of atleast one commodity. For example suppose that initially the firm produces at point Z at which Q_1 of x products A^3 and q^1 of y is B_2 . The production of the level of A^3 absorbs OL_1 of labour and OK^1 of capital. The remaining resources are used in the production of y product.

It can be shown that the firm can produce more of either product x or y or both by reallocating its resources so as to move to any point between C, B and A on the contract curve CC. If the firm moves to A, it produces the same level of y (B_2) but a higher level of X (A_1). If the firm produces at B, it produces the same level of x (A_3) but a higher level of y (B_3). At C, output of y further increases to B_4 although of x comes down from A_3 to A_2 . Thus points on the contract curve are efficient. Any other point away from the curve implies a smaller level of output of at least one commodity. The choice of the actual points on the contract curve depend on the ratio of the price of the two commodities.

In order to determine the choice level of x and y we have to derive the production possibility curve of the firm.

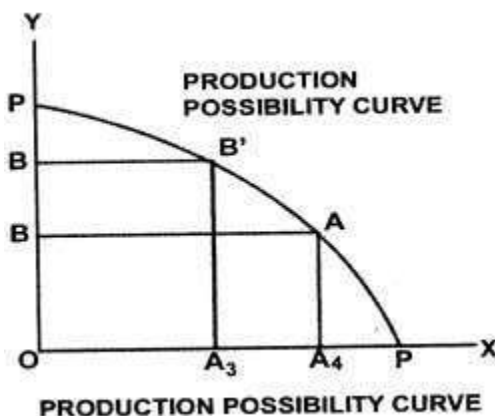


Figure 14.20

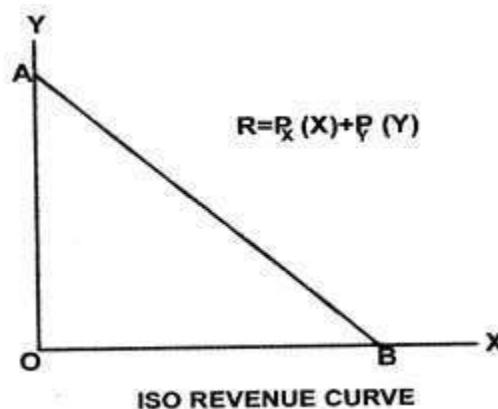


Figure 14.21

This shows the locus of points of levels of x & y which use up all the available resources of the firm. The production possibility curve is derived from the contract curve. Every point of tangency between iso-quants defines a combination of X and Y level of output which lies on the production possibility curve. For example point B on the contract curve representing the output combination of A_3 of X and B_3 of Y is point B^1 on the Production Possibility curve. Similarly, point A on the contract curve is point A^1 on the production Possibility curve. The optimum output combination is one which yields the highest revenue given the production possibility curve.

To find equilibrium of the multi-product firm we need to know the iso-revenue curve as well. An iso-revenue curve is the locus of points of various combinations of quantities of y and x whose sale bring the same revenue to the firm. The slope of the iso-revenue curve is equal to the ratio of the prices of the commodities.

$$\text{Slope of iso-revenue} = \frac{OA}{OB} = \frac{P_x}{P_y} \quad (\text{see fig. 14.21})$$

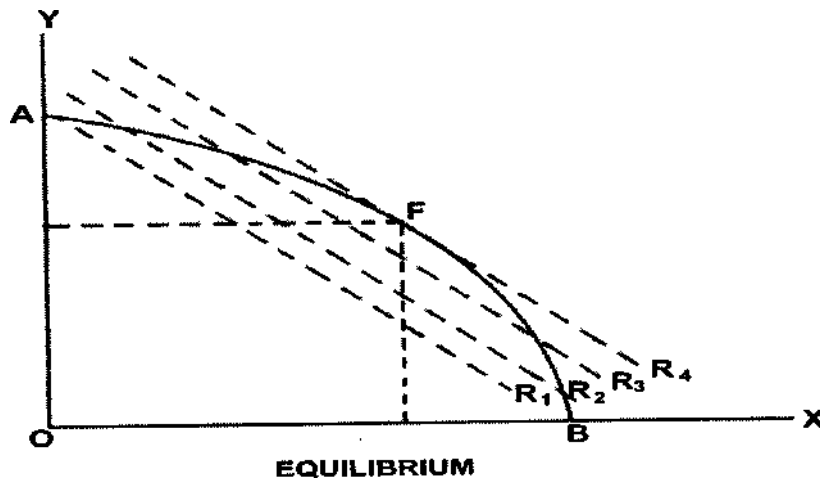


Figure 14.22

In the same way we may define the whole set of iso-revenue curves by assigning to R various values shown as R_1, R_2, R_3, R_4 in Fig. 14.22. The further away from the original an iso revenue curve is the larger the revenue of the firm will be. The firm wants to maximize its profits given (1) The constraints set by the factors of production, (2) The production possibility curve and (3) The prices of the commodities (P_x, P_y) and prices of the factors of production (i.e. wages and rate of interest).

Having Assumed that the quantity of the factors and their prices are given, The maximization of profit is achieved by maximizing the revenue.

Graphically, the equilibrium of the firm is defined by the point of tangency of the given production possibility curve and the highest iso-revenue curve such as R_4 in the above diagram 14.22. At point of tangency the slope of the Production Possibility Curve and the iso-revenue curves are equal. Thus the condition for equilibrium is that the slopes are equal.

$$\frac{\partial Y}{\partial X} = \frac{MP_{LY}}{MP_{LX}} = \frac{MP_{KY}}{MP_{KX}} = \frac{P}{P_y}$$

14.17 SUMMARY

Lets recapitulate what we have read :

- **Production** refers to the transformation of resources or inputs into outputs of goods and services. A firm is an organization that combines and organizes resources for the purpose of producing goods and services for sale at a profit. In general the aim of firms is to maximize profits.
- **Profits** refer to the revenue of the firm from the sale of the output after all costs have been deducted.
- **Inputs** can be broadly classified into labour capital and land and into fixed and variable. The time period during which at least one input is fixed is called the short run. In the long run, all inputs are variable.
- **The production function** is a unique relationship between inputs and outputs. It can be represented by a table, graph or equation showing the maximum output or total product (TP) that can be produced per time period with each set of inputs.
- **Average product (AP)** is total product divided by the quantity of the variable inputs used.
- **Marginal product (MP)** is the change in total output per unit change in the variable input.
- **Shape of AP and MP:** The MP is above the AP when AP is rising, MP is below the AP when AP is falling and $MP=AP$ when AP is at a maximum. The declining portion of the MP curve reflects the law of diminishing returns.
- **An isoquant** shows the various combinations of the two inputs that can be used to produce a specific level of output. From the isoquant map, we can generate the total product curve of each input by holding the quantity of the other input constant.
- **Isoquants are negatively** sloped in the economically relevant range convex to the origin and do not intersect.
- The absolute value of the slope of the isoquant is called **Marginal Rate of Technical substitution (MRTS)**. As we move down along an isoquant MRTS declines and the isoquant is convex. With right angled or L-shaped isoquants, inputs can only be combined in fixed proportions in production.
- Constant, increasing and decreasing **returns to scale** refers to the situation where output changes respectively, by the same, by a large and by a smaller proportion than to inputs.

14.18 GLOSSARY

- **Factors of Production:** Inputs in to the production process e.g. Labour, capital and materials.
- **Production Function:** Function showing the highest output that a firm can produce for every specified combination of inputs.
- **Short run :** Period of time in which quantities of one or more production factors can not be changed.
- **Fixed input :** Production factor that can not be varied.
- **Long run :** Amount of time needed to make all production inputs variable.
- **Average Product :** Output per unit of a particular input.

- **Marginal Product** : Additional output produced as an input is increased by one unit
- **Law of Diminishing marginal returns**: Principle that as the use of an input increases with other inputs fixed the resulting additions to output will eventually decrease.
- **Isoquant** : Curve showing all possible combinations of inputs that yield the same output.
- **Isoquant map** : Graph combining a number of isoquants used to describe a production function.
- **Marginal Rate of Technical Substitution**: Amount by which the quantity of one input can be reduced when one extra unit of another input is used so that output remains constant.
- **Returns to Scale** : Rate at which output increases as inputs are increased proportionately.
- **Increasing Returns to Scale** : Situation in which output more than doubles when all inputs are doubled.
- **Constant Returns to Scale** : Situation in which output doubles when all inputs are doubled.
- **Decreasing Returns to Scale** : Situation in which output less than doubles when all inputs are doubled.

14.19 References

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- Pindyck et al (2011). *Micro Economics*. Prentice Hall.
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14.20 Further Readings

- Koutsiyannis, A (1977). *Modern Micro Economics*. McMillan Press.
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14.21 Model Questions

- Q.1 How will you distinguish production with one variable input from production with the variable inputs? Does the difference between the two techniques of production make any difference in the laws of production.
- Q. 2 Explain the term Marginal Rate of Technical Substitution what is the MRTS between two inputs that are (a) perfect substitutes (b) and perfect complements?
- Q. 3 Isoquants can be convex, linear or L-shaped what does each of these shapes tell you about the nature of production function? What does each of these shapes tell you about MRTS.
- Q. 4 Can a firm have a production function that exhibits increasing returns to scale constant returns to scale and decreasing returns to scale as output increases. Discuss.
- Q. 5 What is meant by economic region of a production plane? Illustrate graphically the determination of economic region assuming that two inputs are imperfect substitutes.

THEORY OF COSTS

(Short and Long Run Costs Curves, Learning Curve Analysis etc.)

Structure

- 15.0 Objectives
- 15.1 Introduction
- 15.2 Importance of Cost Concepts
- 15.3 Costs : Meaning and Concepts
- 15.4 Types of Money and their Behaviour
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 - 15.4.4 Relationship between AC and MC
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- 15.6 Derivation of Long Run Cost Curves (LAC and LMC)
 - (A) Indivisibility Thesis
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- 15.13 Economies of Scope
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15.0 OBJECTIVES

After going through this lesson, you shall be able to :

- discuss various cost concepts of cost analysis.
- derive short run and long run cost curves of a firm.
- explain cost behaviour of firm i.e. how TC, MC, and AC change with change in output under short run production conditions-(i.e. short run theory of cost).
- discuss nature and pattern of long run cost-output relationship (i.e. longrun theory of cost).
- discuss the meaning and importance of economies of scope and learning curves.

15.1 INTRODUCTION

We move on to this lesson from the theory of production to discuss the theory of cost which analysis the cost incurred on production. Theory of cost also deals with cost-output relationship i.e. how cost of production changes with changes in production. The Theory of cost has been formulated under short run and long run conditions. We shall study the cost concepts, their nature under traditional and modern theories.

15.2 IMPORTANCE OF COST CONCEPTS

The analysis of the equilibrium of a firm is based on the cost curves and revenue curves (or functions) with which a firm is faced. A firm is in equilibrium when it is maximising its profit. Total profit with a given output is the difference between total revenue and total costs. In order to find out position of output and price of a firm with maximum profit, we must know the behaviour of its revenue curves and cost curves. They are among the basic tools of analysis in the theory of the firm and indeed in the entire price theory.

The theory of cost seeks to explain how the costs of a firm behave in response to variations in its output under a given technology.

15.3 COSTS : MEANING AND CONCEPT

Before we try to investigate the behaviour of costs of a firm it is necessary to be clear about the meaning of cost in economics. There is a difference between the accountant's way of looking at cost and the economist's way of looking at them. To an accountant, the costs of given output of a commodity is the sum total of the actual money expenses incurred by the firm in hiring the services of the factors of production in order to produce that output. Such costs are, in fact, the explicit cost of a given output. But an economist includes in the costs of a given output not only explicit costs but also the implicit or the imputed costs. If the entrepreneur uses some factors of production which belong to himself, he will not be making any payment to any one on that account. Therefore, the accountant does not take note of these and consequently he underestimates the actual costs. These are also known as implicit costs.

Costs to an economist refer to the total cost of all factors, whether hired or supplied by the entrepreneur himself which are actually employed to produce a given output. The costs of the factors supplied by the entrepreneur himself are imputed at the current market prices of those factors and the imputed costs are added to the costs in order to arrive at the costs of production as the economist sees them.

A question is generally raised as to what lies behind the money cost of production. The early neo-classical economists had tried to answer this question in terms of the so called “**real costs**”. Even Marshall had put forward this type of reasoning in his principles. By “real costs” was meant the subjective costs of supplying various factors of production that help to produce a given commodity. The irksomeness of work and the abstinence from consumption, for example, are the subjective costs of supplying labour and capital respectively.

However, due to the various difficulties in working with this type of concept it was abandoned as a “dubious hypothesis” (Henderson) and was substituted by the concept of the “**opportunity costs**”. The opportunity costs of a commodity is the best alternative foregone. If a given commodity of factors can help to produce either 10 units of commodity or 15 units of commodity Y, then the opportunity cost of producing 10 units of X is the 15 units of Y which could have been produced instead of the 10 units of X. Similarly, the opportunity costs of producing 16 units of Y is the 10 units of X which could have been produced instead of the 15 units of Q with the same combination of factors.

In the above example, we have assumed only two alternatives.

But in real life, there will usually more than two alternative uses to which any given factor combination can be put. In that case to the opportunity cost of producing any given commodity is defined as the best alternative foregone, that is the alternative which yields the highest income. This definition of the concept of the opportunity cost has been cast in real terms rather than in money terms.

The real concept shall be illustrated with the help of a production possibility curve PP in Fig 15.1. Under the given technology, a given amount of productive resources factors of production are assumed to produce, at the maximum either OP quantity of commodity X or OP quantity of commodity Y. Suppose the firm is operating at point P on this curve thus indicating that it is producing only Y. Now let us suppose, that the firm decides to produce (OX₁) quantity of commodity X. It will have to withdraw some amount of the productive resource from the production of Y in order to devote that amount to the production of the desired quantity (OX₁) of X. The firm will then operate C₁ on the production possibility curve. This means that the firm will have to forego Y₁P quantity of Y in order to produce OX₁ quantity of X. Hence Y₁P of Y is the opportunity cost of producing OX₁ quantity of X.

This real concept of **opportunity cost** can be translated into the money concept of opportunity cost by assuming an exchange economy which always operates at full employment. If anybody is to produce a given goods which is not being already produced, or an additional quantity of some goods which is being already produced, he will have to attract the required factors of production from some other industry or industries. These factors will not be attracted unless they get a remuneration which they are earning in their industry or industries. If factors of production are homogeneous and competition is perfect any given factor will be earning the same remuneration in all the industries in which it is employed. This determines the minimum price which will have to be paid to the supplier of that factor in order to attract it to the new production contemplated. The sum total of all such factors payments will make up the money costs of producing the new commodity or the

additional quantity of the commodity which is already being produced as the case may be.

It can be easily seen that under the assumption of full employment, the money costs of production are likely to be somewhat higher, because the factor will not move out of one industry into another unless they are tempted by a somewhat higher reward in the industry to which they are to be attracted. But once his movement of factors has taken place and the new equilibrium has been attained, there will be uniform factor price; though at a relative higher level, in all the industries, provides there is perfect competition.

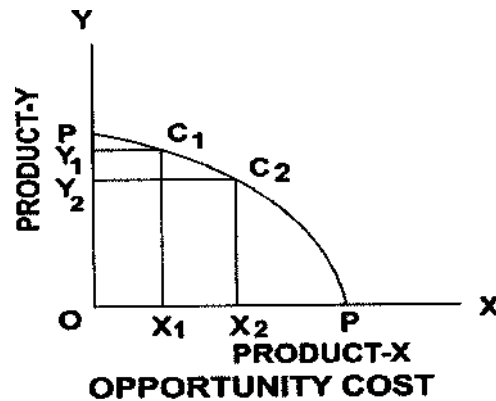


Fig. 15.1

Thus, what lies behind the money costs is the opportunity costs.

15.4 TYPES OF MONEY COST AND THEIR BEHAVIOUR

For the purposes of analysis money costs are classified into **fixed costs and variable costs**.

15.4.1 Fixed costs of production : Fixed costs are those costs which do not change in the output of a firm. These are the costs of fixed factors such as machines and factory building. At any given time a firm has given size of the plant comprising a definite number of machines. No doubt, given a sufficiently long period of time, the size of the plant as well as of the factory building can be changed, but there is a certain period of time which is so short that it is not possible for the firm, during this period to change these factors. Therefore, from the point of view of such a short period there are some factors which remain fixed, whatever be the level of the firm's output. Costs of such fixed factors employed in the production of a commodity are described as fixed costs.

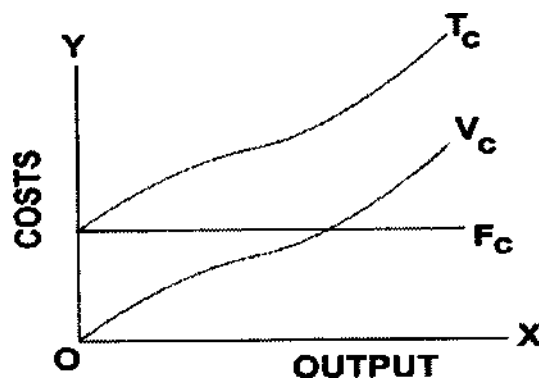


Fig.-15.2

One should not be under this impression that costs incurred on plant and buildings are the only fixed costs. Since, whatever the level of output, a firm has usually one manager, therefore management will also be considered as a fixed factor and the salary of the manager, will be treated as a fixed cost. Thus, while labour is generally treated as a variable factor, nevertheless, there may be some special types of workers, particularly the salaries personnel who are part of the fixed factors and therefore, their salaries which are not at all linked to the level of output should be regarded as a component of fixed costs.

It follows from the very definition of fixed costs as explained above that the fixed costs remain constant and are independent of the firm output as shown by the horizontal line FC in Fig. 15.2.

15.4.2 Variable Costs : Variable costs are those costs of production which change with a change in a firm's total output. There are some inputs which are required in increasing quantities, when the firm wants to increase its output. Those inputs will of course, not be required in decreasing quantities, when the firm wants to decrease its output. Such inputs are described as the variable input or the variable factors. The costs of the variable factors are described as the variable costs. Raw materials and labour are examples of variable factors, because their requirements change directly with changes in the total output. Therefore, the expenses on these factors are examples of the variable costs.

How are the variable costs expected to behave with changes in output ? One aspect of their behaviour, which, in fact, defines them, has already been mentioned. It is that they change directly with change in total output : they rise with an increase in output and fall with a decrease in output. Thus a curve showing the variable costs and function of output, like the curve Vc in Fig. 15.2, will have a positive slope, that is it will rise towards the right.

If increase or decrease of variable factors bring the proportional increase or decrease in output, then variable cost curve would be a straight line passing through the origin. It may be mentioned here that throughout this analysis of costs, it is assumed that the factor prices remain constant regardless of the change in the level of firm's total output, though it is a condition which in practice is likely to be fulfilled only under perfect competition. There is quite a vocal opinion among empirical economists that in actual world the variable costs do change proportionately, and in the same direction, with a change in a firm's total output.

15.4.3 Nature of Cost Function

However, for the time being we shall be concerned with **explaining the nature of the logical or text book of costs functions**. According to the logical or theoretical economists, the variable costs tend to rise at a falling rate up to a point after which they tend to rise at a rising rate as shown by the curve Vc in our Fig. 15.2. To start with the Vc curve concave to the horizontal output axis. Over this portion of it, its slope is falling showing a falling rate of increase in the variable costs. But, after a point, the Vc curve becomes convex to the horizontal output axis, thus showing as increasing slopes and implying that the variable costs now rise at an increasing rate with an increase in total output.

Which of the two types of behaviour of the variable costs, referred to above is more plausible depends upon **the nature of the production function** that is no precise technological relationship that prevails between the variable factor inputs and the total output. Variable costs will increase in proportion with an increase in output, if the following conditions are satisfied :

- (i) there are only variable factors required to produce the commodity ;

- (ii) the variable factors are required in fixed proportion ; and
- (iii) there are no independent economies or dis-economies of scale.

In the absence of anyone of the above mentioned conditions the total output is likely to increase more than proportionately up to a point and less than proportionately with the variable factors, the factor prices remaining the same, the variable costs will increase less than proportionately with the output. **This tendency is depicted in the concave portion of the Vc curve in Fig. 15.2.**

When the output increases less than proportionately with the variable factors, the factor prices remaining the same, VC will increase more than proportionately with the increase in output. This tendency is depicted in the convex portion of the VC curve in Fig. 15.2.

The usual textbook or “logical variable cost curve is of type VC in our Fig. 15.2 which is obvious based upon the hypothesis of a production function that yields nonproportionate returns to the variable factors.

15.4.2 Total, Marginal and Average Cost

In this section we shall study various concepts of cost, as formulates under traditional theory.

- **Total costs of production (TC) of a given** level of output are, of course, the sum total of the fixed costs and the variable costs associated with the level of output. The behaviour of the total costs can thus be derived from the behaviour of the *fixed costs*, and the *variable cost*.

Total Fixed Costs (TFC) are the costs incurred on fixed factors like capital in short run while Total Variable Costs (TVC) are incurred on the whose quantity can not be increased in the short run

At the zero level of output, there will be only the fixed costs, and on variable costs. Therefore, the total costs curve will start at the level equalling the fixed costs, as shown by the TC curve in Fig. 15.2 and, therefore, the only change being in the variable costs component of it, it will have the same behaviour pattern as the variable costs curve. In other words total costs equal fixed costs at the zero level of output but thereafter they rise at a falling rate upto a point after which they rise at an increasing rate.

- **Average and Marginal Costs:**

In micro economics analysis we have to make a greater use of the **concepts of average costs and marginal costs than of the** concept of total costs. Therefore, we shall now explain the meaning of these concepts and the behaviour of the variable quantity to which these concept refer.

- (i) **Average Costs (AC)** at any given level of output are defined as the total costs (fixed costs plus variable costs) divided by the given level of output (Q) so that they are total costs per units output. So

$$AC = TC/Q$$

- (ii) **Average Variable Costs (AVC)** at any level of output are defined as the total variable costs divided by the given level of output (Q) so that they are variable costs per unit of

output. So

$$AVC = \frac{TVC}{Q}$$

$$AC = \frac{TC}{Q} = \frac{FC + VC}{Q} = \frac{F}{Q} + \frac{VC}{Q} = AFC + AVC$$

15.4.3 AC, AVC and AFC

- **Average Fixed Costs (AFC)** at any level of output are defined as the total fixed costs divided by the given level of output (Q) so that they are fixed costs per unit of output. So

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

Thus average costs at any given level of output (Q) is the sum of the average fixed costs and the average variable costs at that level of output.

- **Marginal Costs (MC)** at any given level of output refers to the rate at which the total costs change per unit of change in the total output (Q). So

$$MC = \frac{\Delta TC}{\Delta Q}$$

Where ΔTC = change in total costs, and

ΔQ change in the total output.

15.4.2 Shapes of Average and Marginal Costs

Since by definition Marginal Costs at any given level of output equal the rate at which the total cost changes at the level of output, they equal the slope of the total costs curve at the given level of output.

Since $AFC = \frac{TFC}{Q}$ and TFC remains constant whatever be the value of Q (Output) AFC will tend to approach infinity as the output approaches zero and it will tend approach zero as the output approaches infinity. Thus AFC curve will be asymptotic curve.

Shapes of AFC & AVC

Moreover since $AFC = \frac{TFC}{Q}$ where TFC = Total Fixed Cost (and is constant) Q = Output (and increases).

Therefore Q the AFC curve must be a rectangular hyperbola which, apart from being an asymptotic curve has the property that all rectangles drawn under it have the same area. The area of a rectangle under the AFC curve equals average fixed costs (AFC) times output (Q) which equal total fixed costs (FC) which, definition, remains constant. Thus, the curve AFC, in Fig. 15.3. which is a rectangular hyperbola represents the behaviour of the average fixed costs in response to change in output of a firm.

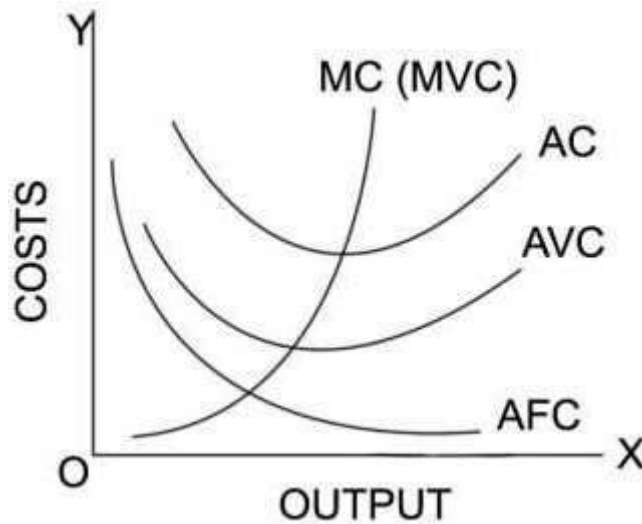


Fig. 15.3 : AC, AFC, AVC and MC (MVC) Curve

Self Assessment Questions

Q. Define MC, AC, AFC and AVC.

Shape of AVC

Since it was assumed that variable costs, to start with increase at diminishing rate increase in output, it is obvious that, to start with the marginal costs and the average costs will fall as shown by the MC curve and the AVC curve in Fig. 15.3. But after a point, the variable costs increase at an increasing rate which implies that now the marginal costs begin to rise. The average variable costs will now begin to rise as soon as the marginal costs begin to rise because the latter measures the total change in variable costs per unit of additional output while the former measures the average change in costs per units of total output.

However, soon the average variable costs (AVC) will begin to rise as shown by AVC curve in Fig. 15.3. It may be pointed out here that the change in total costs that takes place per unit of change in total output is entirely due to the change in variable costs. Therefore, whether we refer to this change as a change in total costs and describe it as marginal costs, or as a change in variable and describe it as marginal variable costs, it is immaterial for both will be equal at all levels of output so that one and the same curve like MC in Fig. 15.3 will describe the behaviour of both the Marginal Costs and the Marginal Variable Costs.

• Shape of AC

The Average Cost Curve under Traditional theory is U-shaped due to following reasons:

(i) As regards the average costs (AC), its behaviour pattern can obviously be derived from the behaviour patterns of the AVC and AFC, for AC shows the combined effect of AFC and

AFC (since $AC=AFC+AVC$). The fixed costs remain same throughout so initially they are high and later decline. As variable factor is being used in increasing quantities, it makes utilisation of fixed factor better enhanced and AC falls. But after reaching the optimum capacity of AC fixed factor, Further utilisation raised AVC (Pl. sec. 15.5)

- (ii) In the beginning both AFC and AVC are falling with increasing output. Therefore, over this phase, the AC will also be falling. But when AVC begins to rise as it does at point A in Fig. 15.3 the AFC still continues to fall. Consequently, AC will not begin to rise as soon as the AVC rises. Only when the AVC rises more then the AFC falls that AC will also begin to rise as it does at point B in Fig. 15.3.

Thus AC rises later than AVC with increasing output. Since $AC=AFC+AVC$, it follows that $AC-AVC=AFC$. Therefore, the vertical distance between the AC curve and the AVC curve must equal the AFC at any given level of output (Q), since AFC decreases continuously, the vertical distance between the AC curve and AVC curve must go on decreasing as we move to the right the horizontal output axis.

15.4.4 Relationship between AC and MC

Here it will be useful to remember some basic points with regard to the mutual relationship between the average costs and the marginal costs. (See Fig. 15.3) First, as long as the average costs are falling, the marginal costs will be less than the average costs; therefore the MC, curve, whether it is falling or rising, will stay below the AC curve. Second, when the average costs are rising the marginal costs are also rising and are greater than the average costs: therefore MC curve over this phase must be rising and also be above the AC curve. Third, the point at which the rising MC curve cuts the AC curve B is the minimum point over the AC curve. These relationships will hold good between the marginal variable costs and the average variable costs also. These mutual relationships can be observed in Fig. 15.3. As a matter of fact, these relationship will hold between any average quantity and its corresponding marginal quantity, because these are mathematical relationships.

15.5 COST CURVES AND TIME PERIOD

Another way of classifying costs of production is to classify them with reference to the factor of time. It was Marshall who first introduced this type of classification in the theory of the costs as well as theory of price of which the former is only an adjunct, though an important adjunct. Marshall made us of the concepts or there different periods of time, namely, the market or the extremely short period, the short period and the long period.

The market period was conceived by Marshall as a period so short that it is not possible within this period to change the production of a firm. Since the production or the output of the firm in the market period is given and fixed the question of behaviour of costs in this period does not arise.

The short period is a period of time which is so short that it is not possible for firm to change the size of its plant, though it can change its output by combining more or less quantity of the variable factor inputs with the fixed plant. The number of machines and the size of the factory buildings, for example, cannot be changed in this period, but the firm can still increase or decrease its output by employing more or less quantities of labour and raw materials on the same plant.

It follows, then that, in the short period the firm is able to change its output by changing the factor proportions only, for in this period, some factors like the plant remain

fixed while the other factors like labour and raw materials can be varied in quantities. Thus, in the short periods, we have both types of costs, the fixed costs and the variable costs which we have already discussed. The average fixed costs, as already explained, fall with increasing output. This follows mathematically from its definition of the average fixed costs. But we are interested not merely in a mathematical argument but also in an economic explanation of this tendency of AFC. The economists, explain this tendency in terms of economies of indivisible factors. An indivisible factor is one which cannot be sub divided into smaller units. Therefore, which output is too small, such a factor cannot be full made use of it cannot be exploited to its optimum capacity. Consequently, as the output increases, the firm is able to make fuller and still fuller use of it, while its total cost remains the same. The economies following from making fuller use of an indivisible factor are described as economies of indivisible factors.

- *Economies of indivisible factors* may broadly be classified into technical, marketing, marginal and advertising economies.
- (i) **Technical Economies** are due to the fact that because of the technical factors, there are generally some minimum costs which must be incurred regardless of the size of the output. To start a bus, for example, its engine has to be warmed up, the process costs some minimum amount by the way of the consumption of fuel. But once the engine has been warmed up the bus may be made to run for one kilometre or one hundred kilometres this minimum cost will remain the same. Therefore, with every increase in the distance covered; costs of warming up bus engine per kilometer of distance covered over a journey will go on diminishing. These economies are also due to the fact that there is minimum size of the machines in which they are available. When the output is too small the machines are not fully exploited, but the increase in output a fuller use of them becomes possible and hence their cost per unit of output falls.
 - (ii) **Marketing Economies** : Similarly there is a minimum size of the marketing department which a firm has to maintain. A doubling of the output dose not generally lead to the doubling of this department in all respects. In fact it may lead to little or on increase in the size of marketing department. The economies which follow from this type of indivisibility are known as marketing economies.
 - (iii) **Managerial Economies** : It should be quite obvious that there are some types of personnel; such as a manager or an accountant, who partake of the nature of indivisible factors. Doubling of a output of a firm does not lead to the employment to managers instead of one nor does they having of output results in the employment of half a manager only. The services of the manager are utilised to a fuller extent as the output of the firm increases. Economies following from this kind of indivisibility are known as managerial economies.
 - (iv) **Advertising Economies** : Similarly there is a minimum amount of advertising which a firm must undertake if it is not to be lost as completely infructuous. As the output of the firm increases from zero onwards, this cost is spread over a large output with the result that the advertising cost per unit of output produced and sold fall. These economies are termed as the advertising economies.

So we can repeat for emphasis that the average fixed costs go on falling on account of the economies of indivisible factors.

The average variable costs in the short period fall up to a point after which they

begin to rise. The explanation of the falling tendency of the AVC is that as the output increases calling for the employment of large number of workers, it becomes possible to introduce division of labour and to reap the various economies of division of labour made so famous by Adam Smith in his *Wealth of Nations*. There are economies of specialisation, time, tools, raw materials and so on. Due to these economies, the total output increases proportionately more than the amounts of the variable factor inputs like labour and raw materials in consequence of which the marginal as well as the average variable costs decline with increasing output as is shown in Fig. 15.3.

- *Diseconomies* : However, as it is known to all students of economies division of labour, when carried too far, leads to a preponderance of diseconomies mainly due to the difficulties of supervision and control leading to wastage of resources. When diseconomies of division of labour outweigh its economies, the marginal and average variable cost begin to rise.
- *Net Effect of Economies and Diseconomies* : The falling tendency of the average fixed cost due to the economies of the indivisible factors and the falling tendency of the average variable costs due to the economies of division of labour and specialisation combine together to make the short period average cost also to fall with increasing output up to a point. But when the diseconomies of division of labour and specialisation begin to outweigh the economies of indivisible factors the short period average costs begin to rise.

An additional cause of the average costs rising after a point is that the indivisible factors begin to be stretched too far with the result that there are frequent break downs leading to frequent interruption of work and wastage of resources. In this sense we can speak of there being also diseconomies of indivisible factor which are reflected not in the average fixed costs but in the rising tendency of the average variable costs and the rising tendency of the total average costs which are sum total of the average fixed costs and the average variable costs.

The diagram drawn in Fig. 15.3. can be taken to illustrate the behaviour pattern of the various types of costs in the short period. The MC curve in that figure may be taken to mean short period marginal costs and the AC curve to mean the short period average costs.

It can be seen that the behaviour pattern of the short period average costs, short period marginal costs and the average variable costs as explained and picturised in Fig. 15.3 is the result of non proportionate returns to variable factor. In the short period, output can be increased or decreased only by changing the proportion in which the fixed factors are combined with the variable factors. Due to the economies of various types explained above which together are also known as internal economies of a firm, there are more than proportionate returns to the variable factors. This result is diminishing marginal and average costs.

But, as we know from the law of variable proportions explained in the previous lesson that after a certain point, which must be reached sooner or later, there are less than proportionate returns to the variable factors as a result of which there are diminishing marginal and average returns. This happens when the variable type of diseconomies referred to above. Which together are also known as the internal diseconomies of a firm, exceed the economies. Diminishing marginal and average returns to the variable factors imply increasing marginal costs, increasing average variable costs and increasing (total) average costs.

15.6 DERIVATION OF LONG-RUN COST CURVE (AND RETURNS TO SCALE)

The second school of thought on the behaviour of long-run costs believes that as the

scale of the plant is increased at first, there are increasing returns to scale, which means falling costs, reaching minimum and later start rising. Figure 15.4 illustrates this case, SAC_1 , SAC_2 , SAC_3 and SAC_4 are four different sizes of the plant shown in the diagram. In fact, an infinite number of plant sizes exists from among which the firm has to choose.

The three sizes of the plant SAC_1 , SAC_2 , SAC_3 have the same long run average cost M_1P_1 , M_2Q and M_3R , different sizes of the plant have their optional output points P , Q and R on the horizontal straight line which is the long run average costs (LAC) curve. Since LAC is straight line. LMC is also a straight line coinciding with it. Average costs in the long period equals marginal cost whatever the size of the plant. This is the case of constant Returns to scale.

Since there are increasing returns to scale, the minimum points of SAC_1 , SAC_2 and SAC_3 lie horizontally at lower and lower levels successively. Cost of producing output OM_2 is much lower than that of CM_1 . As plant size is increased beyond the output level OM_2 there are decreasing returns to scale. The minimum points of the successive SAC_1 curves after SAC_2 lie vertically higher and higher. All this means that the long run average costs LAC must be U-shaped although flatter than the SAC_1 .

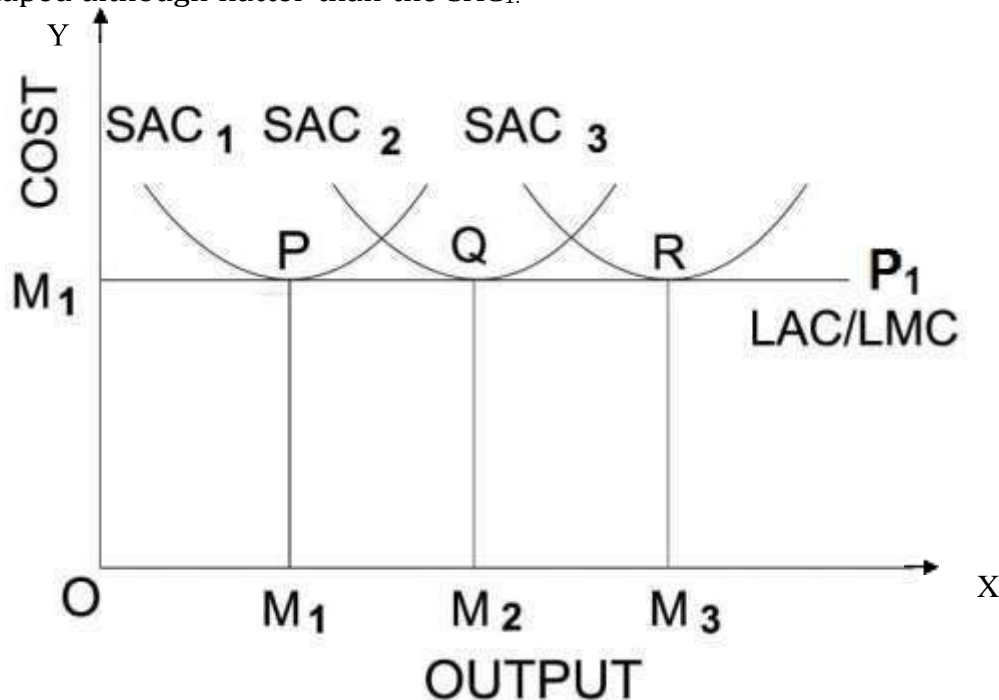
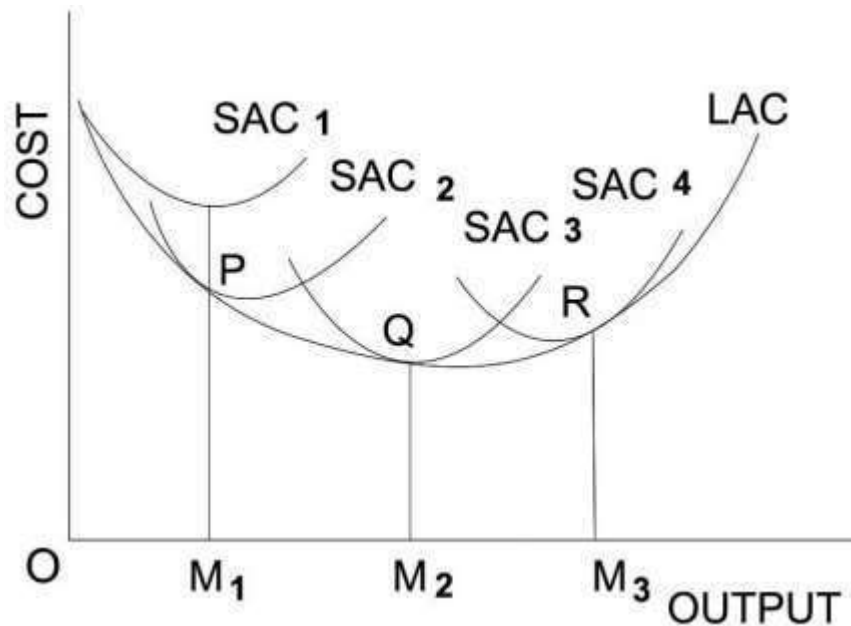


Fig. 15.4

But how to obtain the LAC ? One thing is sure, it is that the LAC curve must be an envelope. That is it must touch each SAC curve at some point. The LAC cannot touch the SAC's at their minimum points except when the LAC itself is the least. This should be clear from Fig. 15.5. Only horizontal lines can touch SAC's at their minimum points. The LAC is horizontal only for output OM_2 obtained for the plant size SAC_3 . Therefore, point Q is on the LAC curve. Point P is also on the LAC. However, this Q does not coincide with the minimum SAC_2 this is to the left of the minimum point of SAC_2 . It means that in the long run the firm chooses the plant size SAC_2 to operate it at less than its capacity output. To produce the required output OM_1 the firm can as well choose the size represented by SAC_1 . But it does not do so because the average cost in that case would be M_1S which is higher than M_1P .

Similarly, for output greater than OM_2 the firm will choose scale of plant which are actually operated at more than their capacity. For example, output OM_2 is produced by the plant represented by SAC_1 at the average cost M_2R . The minimum point of SAC_4 lies to the left of R .



Long Run Average Costs with Varying Returns to Scale

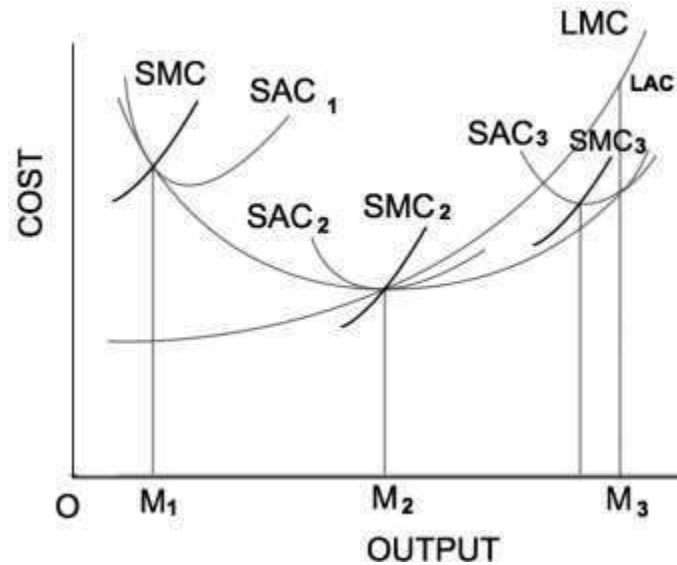
Fig. 15.5

The LAC curve is having the following relation with the SAC's. Each point on the LAC shows a size of the plant which will be represented by the SAC. LAC is also U-shaped but flatter than the SAC_1 is because long run costs fall more slowly or rapidly than short run costs. For any given output level, the LAC cannot be higher than the SAC. This is because what is possible in the short run is surely possible in the long run also. Having known the nature and shape of the LAC we now come to the long run marginal cost curve. Long period marginal cost is generally written as LMC. LMC has the same relationship with LAC as the SMC, has with SAC. As LAC falls LMC also falls at first and lies below the LMC as long as LAC is falling. LMC intersects the LAC at the latter's minimum point. As LAC starts rising LMC lies above it and rises faster than the LAC.

Just as LAC is related to SAC's so is LMC related to SMC's. We can study two such relationship here.

- (I) Whereas SAC touches the LAC, the corresponding LMC and SMC intersect each other at a point vertically below it for all levels output less than optimum output OM_2 of the optimum plant. This is the case for output OM_1 in Fig. 15.6.
- (II) Likewise for outputs with plants sizes greater than the optimum size, LMC intersects the corresponding SMC at a point vertically above the point of touch of the SAC with LAC. This is the case at output level OM_2 in Fig. 15.6.

All the four curves, the LAC, the SAC, the LMC and the SMC intersect one another at one point. That is the point where LAC is a minimum.



Relationship Between The LAC, LMC, SAC and SMC

Fig. 15.6

A straight line LAC is an extremely simple construction. But any economists takes it to be unrealistic. They insist on U-shaped long run average cost. How to account for the economies and diseconomies of scale? What theorising is there to explain the U-shaped of the LAC? There are two schools of thought. The first school believes in what is called the proportionally or indivisibility thesis. The second is Chamberlin's economies of size argument.

(A) The Indivisibility Thesis

Take the indivisibility thesis. The traditional reasoning for economies of scale is that more factors of production are not perfectly of infinitely divisible. The imperfection in factor divisibility gives rise to non perfectly returns. The argument can be stated as under. There is in optimum proportion of factors. Since factors are indivisible, they are available only in discrete, lumpy units. There is an optimum proportion in which factors of production are combined. The optimum proportion cannot be obtained unless the aggregate amount of the factors employed is large. The inefficiency of small scale production is due to the failure to obtain the lumpy factor in fractional units having proportionate efficiency. If there were perfect divisibility, the optimum proportion could be secured for any output of scale of production. Hence economies of scale are due to indivisibilities.

The same argument can be given for diseconomies of scale resulting from the existence of some indivisible agent such as marginal coordination or entrepreneurial capacity.

Professor Frank H. Knight stated the thesis as follows : "If the amounts of all elements in combination were freely variable without limit and the product also continuously divisible, it is evident that its one size of combination would be precisely similar in working to any other similarly composed."

Other eminent economists holding the indivisibility arguments are AP. Lesne and Nicholas Kaldor.

Criticism: Professor Edward H. Chamberlin considers the indivisibility of factors argument

tautological. In his view, it states an obvious truism. To define and divisibility of factors in such a way as to mean constancy of efficiency of the firm and then to say, on the basis of this definition, that if all factors were perfectly divisible, returns to scale would be constant is to state a fact that follows the assumption logically. After all, a perfectly divisible, homogeneous factor of production is defined as a class of units of productive things that are perfect substitutes for one another. From this definition it automatically follows that increments in the amount of a factor are of the same unit efficiency. Hence the efficiency of factor units is invariant with respect to scale. This is clearly tautological. We do not really know how efficient a factor would be if an indivisible factor were to become divisible. Professor Chamberlin has remarked : "In the same way if horses cannot fly, there is no way of finding out how high they could fly if they could. In other words, the definition of indivisibility is so framed so to rule out loss of efficiency. This is beginning the question. Something other than the optimum proportion idea must explain the variability of the returns to scale.

(B) Economies of Scale Argument: Now we can review professor Chamberlin's economies of scale argument. According to Chamberlin, it is very likely that a firm's efficiency is affected by absolute amount of the inputs combined in production. In other words, it is very much like that the very changes of scale causes changes in returns to it. We find in practice of non-proportionalities. It may well be that physical production is characterised by similar properties.

Professor William Baumol cites two cases of economies in physical production. In the first place, if a farm doubles of its scale output, its expenditure on optimal inventory is not doubled. It is less than double. The second example is that of warehouse construction. Baumol writes: "Suppose work in building a rectangular warehouse is in proportion to the number of bricks used in its construction and that, within limit the number of bricks depends strictly on the wall area of building. It is a matter of elementary geometry that the wall area will increase as the square of the perimeter of the warehouse but the volume of the building (the storage area) will increase as the cube of the perimeter. In other words, double both the bricks and the brick laying labour and one more than doubles warehouse capacity".

In short, Chamberlin maintains that economies and diseconomies of scale would exist even when all the factors are divisible at will. Size in itself is responsible for economies to the firm on two counts: (1) as more resources are used, there is greater opportunity for specialisation; (2) the large firm can choose superior techniques and better machines. But there is limit to the expansion and specialisation set by the difficulties of management. There is to the delegation of power. An increase in the firm's plant beyond a certain size means more red tape and lengthening of the chain of communication and command between the top economies of specialisation and the LAC curve starts rising.

15.7 DERIVATION OF LONG RUN COST CURVES FROM EXPANSION PATH.

Cost curves and expansion path in production theory has a close relation. All the costs of productions can be derived from the expansion path. In fact, costs are the inverse of productivity of the firm at the given level of output. Expansion path shows the various levels of production of a firm which can be produced with given technology at the least cost, given the prices of two factors of production. After deriving the long run total cost from expansion path, it becomes easy to derive long run marginal cost and long run average cost curves. It is assumed that two factors of production with two factors labour and capital are taken. For cost minimization the producer will use that much capital labour ratio where marginal rate of technical substitution becomes equal to the factor prices ratio. It will be shown by the point

of tangency between iso quant and isocost curve. To derive the long run total cost curve, it is necessary to see how the total cost changes when output is expanded by the entrepreneur along the expansion path. In Fig. 15.7 there are three iso quants Q_1 , Q_2 , and Q_3 ,

These represent three different levels of output. Minimum cost combination of capital and labour to produce Q_1 level of output is derived by drawing an isocost line which becomes tangent to Q_1 at point P. It is observed from Figure 15.7 that isocost line is AB. It would enable us to find total cost incurred to produce Q_1 level of output, which in the diagram is called expansion path.

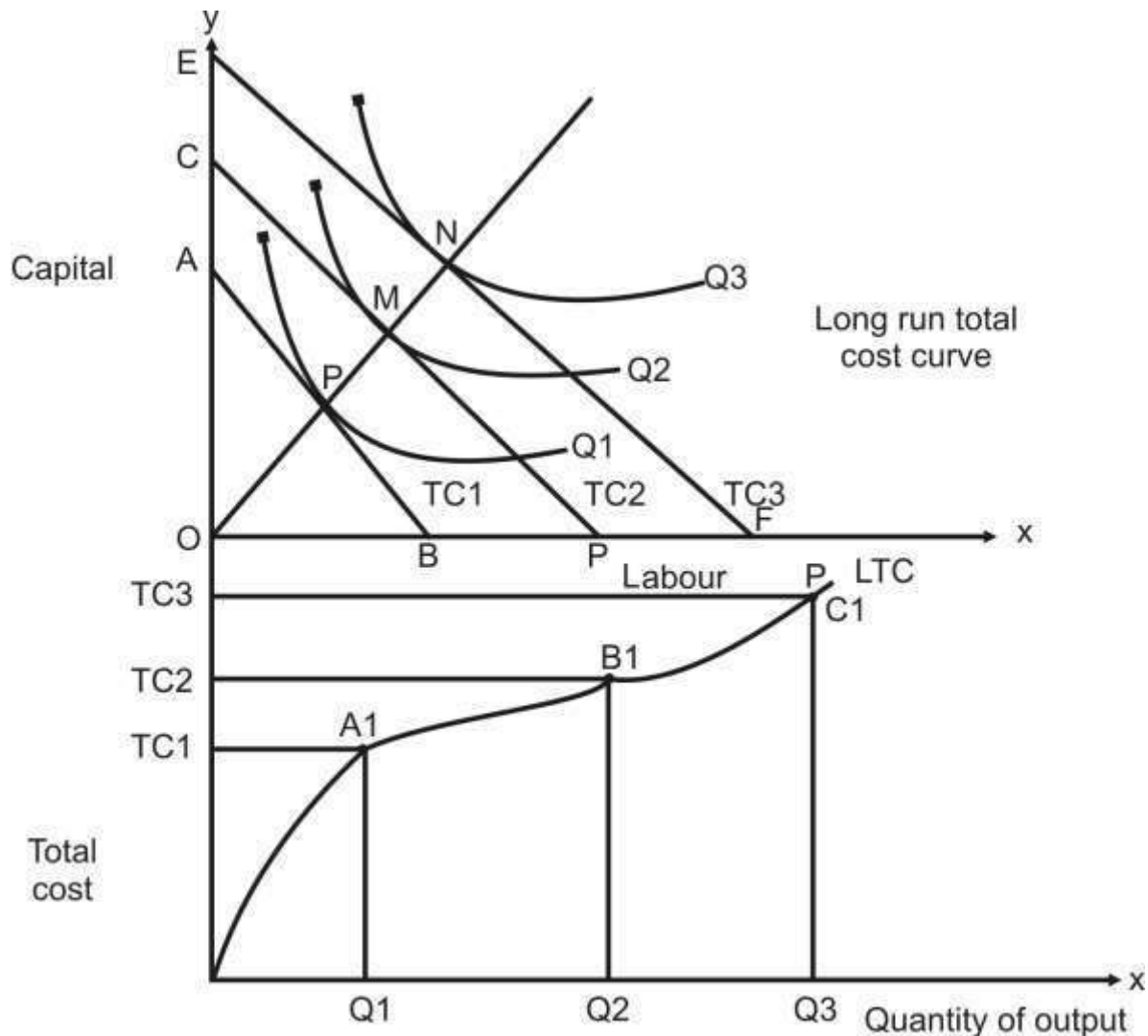


Figure 15.7

Derivation of Long Total cost curves from expansion path.

At an iso quant Q_2 (Factor Factor prices remaining the same the isocost line is tangent to isoquant Q_2 at point M. This isocost line CD gives us total cost equal to TC_2 . In the same way, EF isocost line is tangent to Q_3 , thereby giving us TC_3 . When we join all the tangency points P, M, N, we get expansion path. It is observed from the diagram that at the level Q_1 , the minimum cost is TC_1 whereas at output Q_2 , it is TC , but when the output expands to Q_3 cost also rises to TC_3 when we plot TC_1 , TC_2 and TC_3 , against output levels of Q_1 , Q_2 , and

Q_3 we get a curve which is known as Total cost curve. When we know the long run total curve, we can easily find long run marginal and average cost curves. It is done by measuring the slopes of the rays drawn from the origin to various points on LTC curve corresponding to different levels of output. By measuring the slope of LTC curves by drawing tangents at various points corresponding to different levels of output, we can derive the long run marginal cost curve. It is explained in figure-15.8.

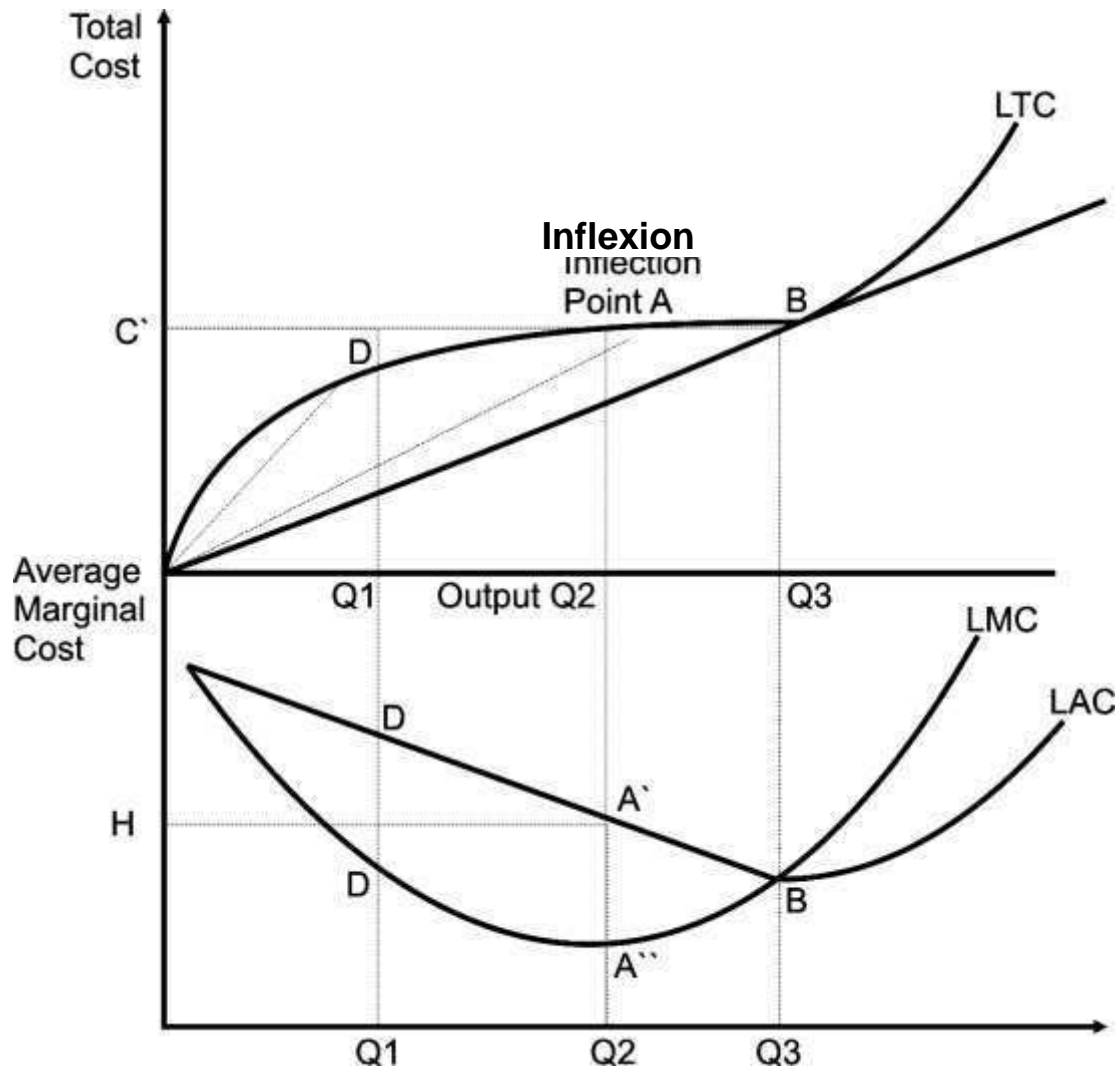


Figure 15.8

It shows not only the relationship between LAC and LMC curve with LTC curve but also between LAC and LMC curves. The relationship between LAC and LMC is the same as between SAC and SMC curves. One important point worth noted in that is the long run, the firm is in a condition to change both capital and labour. Hence capital labour ratio is liable to change at different levels of output (at different points of expansion path. But when the production function is linear homogeneous of degree one, then the expansion path is straight line from the origin. In that case, capital labour ratio would remain the same at different levels of output.

15.8 THE LEARNING CURVE

As a firm gains experience in the production of a commodity or service, its average cost of production usually declines. In other words for a given level of output per time period the increasing cumulative total output over many time periods often provides the manufacturing experience that enable the firm to significantly lower its average cost of production. The learning curve shows the decline in the average cost of production with rising cumulative total output of the firm over times. For example, it might take 1000 hours for an aircraft manufacturer to assemble its 100th aircraft but only 700 hours to assemble 200th aircraft because as managers and workers gain production experience they usually become more efficient especially when the production process is relatively new. Contrast this with economies of scale which refers to declining longrun average cost as the firms output per time period increases.

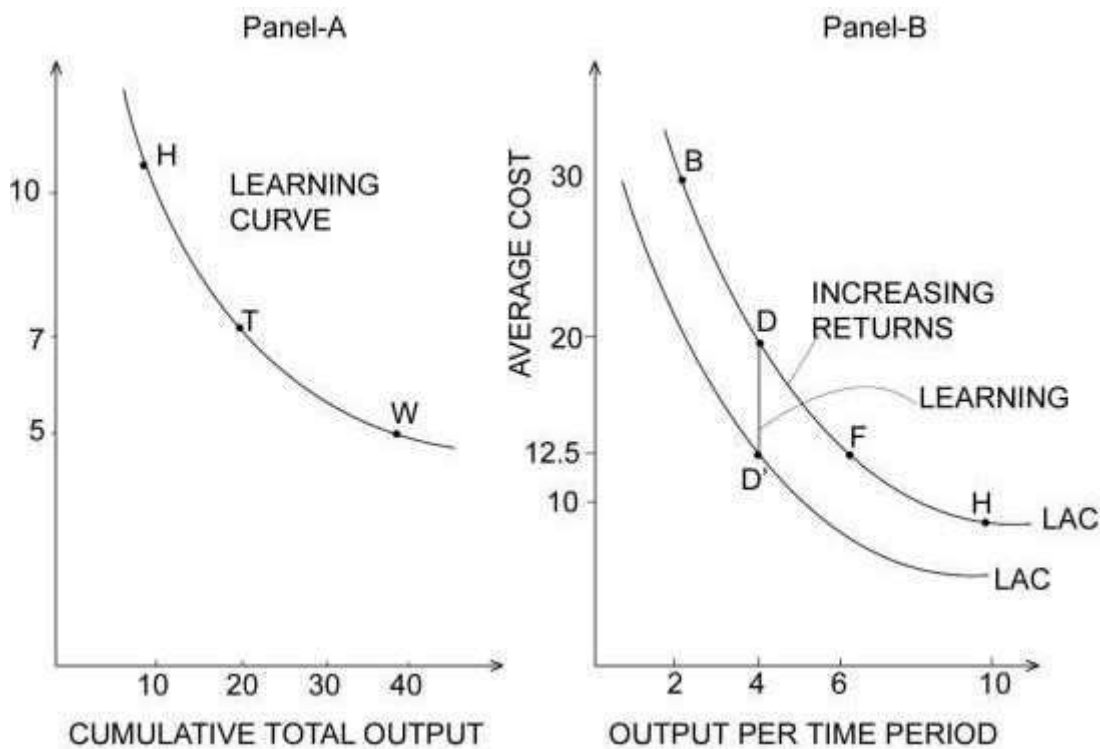


Figure 15.9

Panel-A shows that as the total cumulative output of the firm doubles from 10 to 20 units over time. The average cost declines from Rs 10 to Rs 7. (The movement from H to T on the learning curve) Panel-B, shows that (AC declines from Rs 20 to Rs 15 as output increases from 4 to 6 units per time period. (The movement from D to F along (AC) due to increasing returns to scale. But (AC falls from Rs 20 to Rs 12.50 to produce 4 units of output per time period as the firm learns from large cumulative total output. The downward shift of LAC to LAC₁ from point D to D¹.

The learning effect manifest in several ways of experience factor such as

1. Perfection and precision reached due to constant practice of managerial

decision making.

2. Findly more and efficient production and business procedure.
3. Knowing better ways to use tools and equipments.
4. On account of familiarization with the production activity its becomes easy and quick to give required instructions to worker in handling the job and thus reducing waste from defects and disruptions.
5. Right placement of right people.
6. Better coordination and control.
7. Improved operational sequences facilitating more skillfal movement of workers in completing the assigned jobs with proven integration.
8. Better project management and time scheduling taught by experience enable to have more time saving and less chances of disruption.

Self Assessment Questions

Q. What is Learning Curve?

Learning effect is different from the scale economy effect. Learning curve effect is seen assuming periodic scale of output, technological projections and input price being constant. The learning effect is measured as the difference between actual average cost and estimated average cost. It implies saving in costs. In a technical way, economies of scale are measured through a given LAC as a change in level of output per time period. The learning effect is measured by the shift in the LAC with respect to cumulative output change.

15.9 MODERN THEORY OF COSTS : RESERVE CAPACITY

The concept of Reserve capacity assumes a prominent role in the *modern theory of cost*. It is due to the concept of reserve capacity that U shape of the short run cost curves has been questioned by many economists, mainly on empirical grounds. The recent empirical studies have shown a Saucer type shape of short run average variable cost curves rather than U shape. This shape implies a flat stretch over a range of output. This flat stretch corresponds to built - in plant reserve capacity. This reserve capacity is consciously built in the plant size, while designing it. The firm will start its planning with a figure for the level of output which it anticipates selling. It will choose the size of plant which will allow it to produce the level of output more efficiently. The plant will have a capacity larger than the expected average level of scales because the firm wants to have reserve capacity with a view to impart flexibility in production. So that firm can expand output over a certain range without a rise in unit cost to meet any demand for its output. The businessman wants to have reserve capacity due to the following:

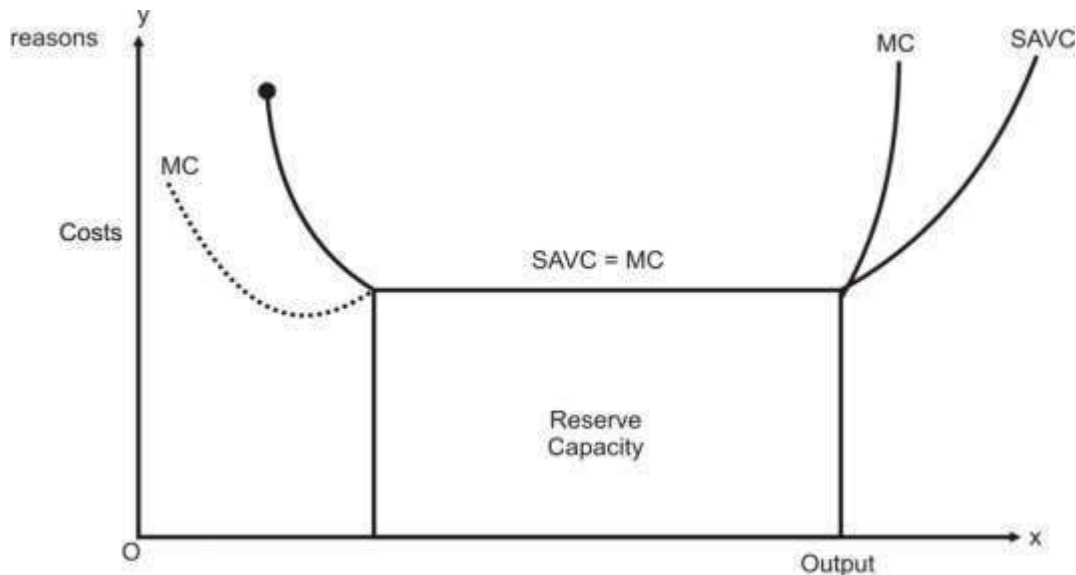


Figure 15.10

- The seasonal and cyclical fluctuations can be easily met efficiently by a stock inventory policy. With reserve capacity the entrepreneur can work with more shifts and lower costs than a stock piling policy.
- With Reserve Capacity, it is easy for businessman to repair broken down machinery without disrupting the smooth flow of production process.
- The businessmen also build reserve capacity with hope for growth as well as anticipated increase in demand.
- Reserve capacity is also needed for making minor alterations in product in view of changing income, fashion and tastes of the consumers.
- Technologically, some reserve capacity is also needed in the plant. Some machinery is so specialized that it is available only at order. Therefore, such machinery has to purchase in excess of the minimum required at present as a reserve.
- Even land and building also requires some capacity reserved. If the new land and building is to acquire, then expansion of operation is seriously limited.
- Finally some reserve capacity is also required at the organizational and administrative levels. The administrative staff will be hired at such numbers as to allow some increase in the operation of the firm.

To conclude the concept of reserve capacity allows the producer to produce the level of output more effectively.

15.10 DERIVATION OF SHORT PERIOD COST CURVES FROM PRODUCTIVITY OF VARIABLE FACTORS:

There are several factors which influence the cost of production of any good or Service like size of the plant, level of output, input prices and technology etc. But out of all these determinants of cost the most important component is the rate of output. It is further assumed that the determinants other than the rate of output are held constant while deriving the cost curves from the productivity. Analysis of productivity of variable factors and costs

are closely related. Cost function is simply the production function expressed in money units. The short run cost functions operates under the same limitations as the short run production function. Table-15.1 illustrates the relationship between production and costs in the short run. The cost of using variable input is determined by multiplying the units of variable inputs (labour) by its price. The table shows that productivity of factor increases initially at an increasing rate and then subsequently at a decreasing rate. Correspondingly total variable cost first increases at a decreasing rate and then at increasing rate. The Figure also shows that total variable cost and total product are mirror image of each other.

Table 15.1 : Productivity of Variable Factor and Costs in the short run

Units of Variable Factor	Total Product (Q) in Qtls	Total variable Cost (L x W) (Rs)	Marginal cost $\Delta \text{TVC} / \Delta Q$ (Rs)	Marginal Product $(\Delta Q / \Delta L)$ (Rs)
0	0	0	-	-
1	10	100	10.00	10
2	22	200	8.33	12
3	40	300	5.55	18
4	55	400	6.67	15
5	62	500	14.33	15
6	65	600	33.33	3
7	60	700	-(20.00)	(-5)

The relationship can be stated between cost and production in terms of marginal product and marginal cost. The diagram shows that when MP is increasing the MC is decreasing and when MP is decreasing, MC is increasing. MC increases in the ranges where production experiences diminishing returns. The relationship is also proved algebraically.

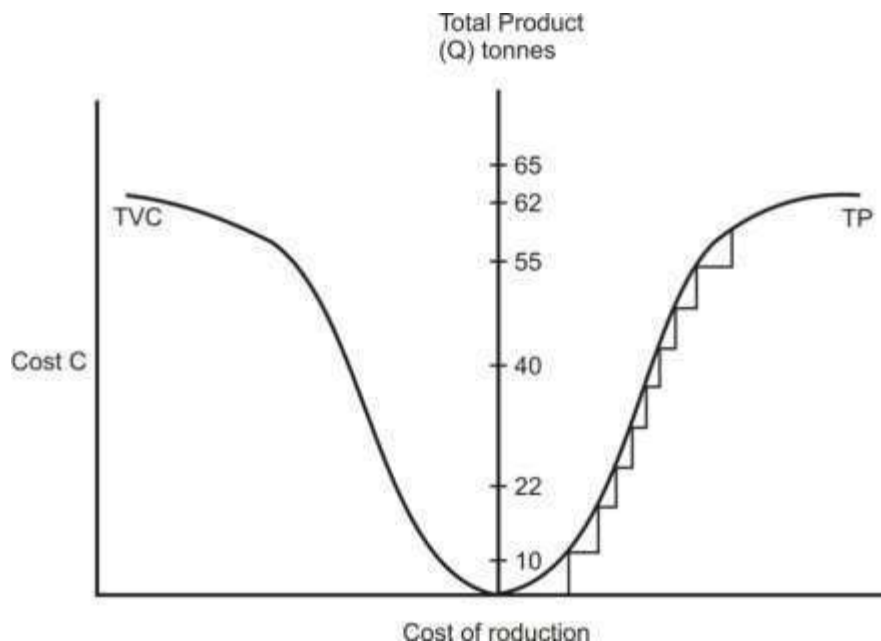


Figure 15.11

Suppose Labour is the only variable input and wage rate is given. We can state that:

$$\Delta \text{TVC} = \Delta L \times W$$

$$\text{MC} = \Delta \text{TVC} / \Delta Q$$

$$\therefore \text{MC} = \frac{\Delta L \times W}{\Delta Q} = \left(\frac{\Delta L}{\Delta Q} \times W \right) = \left(\frac{1}{\text{MP}} \times W \right) = \frac{W}{\text{MP}}$$

Thus proves that given wage rate MC and MP move in the opposite direction.

15.11 ECONOMIES OF SCALE

Prof. Stigler defines economies of scale as synonymous with returns to scale. Economies of scale occurs when there is a change in the scale of production. A firm may enjoy these economies up to a point after some time these economies are converted into diseconomies of scale. Economies of scale are divided into two parts

(i) Internal Economies (ii) External Economies

15.11.1 Internal Economies

In the words of Cairn Cross, "Internal Economies are those which are open to a single factory or firm independent of action of other firms. They result from an increase in the scale of output of the firm and cannot be achieved unless output increases."

Internal Economies occurs only to that firm which expands its scale of production.

A firm may reduce its cost of production upto the optimum point. A firm may get different types of benefit in the form of division of labour, Purchasing raw material in/bulk quantity etc. In the words of Stonier and Hauge, "*These are Economies in Production*". These cause reduction in Production costs-which can be created within the firm itself when output increases. Prof. Kout Soyannis has divided internal economies into two parts :

A. Real Economies B. Pecuniary Economies

(A) **Real Economies:** Following are the main types of real Economies:

1. **Technical Economies:** Technical Economies include use of better 'Plant,'. Machinery, equipment and technique of production. All these help in reducing cost of production. These economies may be in the form of
 2. **Superior Technique:** Use of superior technique decreases per unit cost of production because with the use of sophisticated technology output can be produced in large quantity.
 3. **Linked Process Production :** A Large sized firm may develop its own sources of raw material, means of transportation and distribution system etc. Firm may produce output in a linked process with this firm may avoid the wastage of resources and can produce large quantity of output.
 4. **Economies of the use of by Product.** A large scale firm may use waste material to produce another product e.g. sugar mill can install a strawboard plant to make use of the sugar cane pulp or power alcohol out of molasses left over after manufacturing sugar.
 5. **Economies of Specialisation:** A large sized firm may use technique of division of labour. In this process each group of labourers will become specialized in his/her field. This will reduce per unit cost of production.

6. Economies of Increased dimension: A large sized firm may enjoy Economies of increased dimension. e.g. If a firm manufactures bus it requires one engine, body, four tyres etc. But when it manufactures double decker bus then firm has no need of extra engines, extra tyres, etc. the cost of production will decrease due to the increased dimensions of Production.

7. Inventory Economies : A firm may purchase raw material or other inputs for production of goods at cheap rates. When shortage of raw material arise then firm need not worry as it has already in its stock a good quantity of raw material. Then there will be no fear of shortage of production.

8. Managerial Economies : A manager has to look all function of business in a small organisation. But in a big organisation a firm can employ different Executives or professionals for different departments such as, finance, marketing, HRM etc This functional specialisation of business personnel increases the productive efficiency of the firm.

9. Marketing Economies : A large size firm can create its own departments for marketing of product With this a firm can save money which it has to pay for marketing executive outside of the firm in the absence of marketing department A firm can afford large sum of money on advertisement, publicity, showrooms etc. A large size firm can give grant and concession to wholesale and retail dealers and customers and captures large size of market for its product

10. Financial Economies: A firm may raise financial resources by using shares, debentures, and, inviting public deposits. The cost is very low when funds are raised through public issues.

11. Risk bearing economies:

The ability of a larger firm to bear risks of business is much better. Every firm has to face some particular and some general risks in order to continue production. The common risks are those which all firms have to face equally irrespective of their size. For example, during depression market prices fall for every firm. There is some particular risk to be borne by a particular firm when the price of a particular product falls in the market. Whether risks are general or of the particular type, a small firm has less ability to face them because of less financial resources and a smaller area of the market for sale. But bigger firms are able to face risks due to the stronger financial position. These risk bearing economies are also called survival economies because these help the bigger firm to survive the business crisis while the smaller firm fails.

The examples of internal economies given above are also particular to a firm. Hence they are called internal. These partly help us to explain the increasing returns to scale and partly serve to account for the fall in average cost as the size of the firm increases. Internal economies are connected with a particular firm. Therefore, they are relevant to particular equilibrium analysis.

(B) Pecuniary Economies

Pecuniary economies are those which can arise after payment of fewer prices for the factors used in the process of production and distribution. Big firms can get raw material at the low price because they buy the same in the large bulk. In the same way, they enjoy a lot of concessions in bank borrowing and advertisements.

These money or pecuniary economies occur to a large firm in the following ways :

- i. The firms producing output on a large scale purchase raw material in bulk quantity. As a result of this, the firms get a special discount from suppliers. This is a monetary gain to the firms.
- ii. The larger-scale firms are offered loans by the banks at a lower interest rate and other favourable terms.
- iii. The large-scale firms are offered concessional transportation facilities by the transport companies because of the large scale transportation handling.
- iv. The large scale firms advertise their products on large scale and they are offered advertising facilities at lower prices by advertising firms and newspapers.

15.11.2 External Economies

External economies refer to all those benefits which accrue to all the firms operating in a given industry. Generally, these economies accrue due to the expansion of industry and other facilities expanded by the government. According to Cairncross,

“External economies are those benefits which are shared in by a number of firms or industries when the scale of production in any industry increases.” Moreover, the simplest case of an external economy arises when the scale of production function of a firm contains as an implicit variable the output of the industry. A good example is that of coal mines in locality.

(A) Prof. Cairncross has divided the **external economics** into the following parts as.

1. **Economies of concentration.** As the number of firms in an area increases each firm enjoys benefits like, transport and communication, availability of raw materials research and invention etc. Further, financial assistance from banks and non-bank institution easily accrue to firm. We can therefore, conclude that concentration of industries lead to economies of concentration.
2. **Economies of Information.** When the number of firms in an industry expands they become mutually dependent on each other. In other words, they do not feel the need of independent research on individual basis. Many scientific and trade journals are published. These journals provide information to all the firms which relates to new markets, sources of raw materials, latest techniques of production etc.
3. **Economies of Disintegration.** As an industry develops, all the firms engaged in it decide to divide and sub-divide the process of production among them. Each firm specialises in its own process. For instance in case of moped industry, some firms specialise in rims, hubs and still others in chains, pedals, tyres etc. it is of two types, horizontal disintegration and vertical disintegration. In case of horizontal disintegration each firm in the industry tries to specialize in one particular item whereas, under vertical disintegration every firm endeavours to specialize in different types of items.
4. **Economies of Localization.** The localisation of an industry means the concentration of firms producing, identical product in a particular area. In such an industrial area, railways establishes an outer parcel agency, post and telegraph department sets up the post office, state electricity department installs a powerful transformer and transport companies also establish their goods booking offices. As a result all the firms get these facilities at low prices. Consequently, the average cost of production in the industry declines.

5. Economies of By-products. The growth and expansion of an industry would enable the firms to reduce their costs of production by making use of waste material. The waste material of one firm may be available and useable as raw materials in the other firms. Thus, wastes are converted into by products. The selling firms reduce their costs of production by realising something for their wastes. The buying firms gain by getting other firms' wastes as raw materials at cheaper rates. As a result of this, the average cost of production declines.

6. Physical factors. As the size of an industry expands some physical factors may work to reduce the costs of all the firms working in the industry. An example shall make this point clear. Suppose a few firms are working in an area of coal mining. As they mine coal from underneath the surface earth. They have to pump water out of the coal mines which seeps from the side of the mines. Now if the number of firms, mining coal in the area increase, the costs of pumping out water of each firm shall go down because the share of seeping water needing pumping out for each firm shall be less than before. Similarly in many other industries such physical factors work to reduce costs as industry's size expands.

(B) Reversible and irreversible external economies

Reversible external economies are those which expand with the expansion of the industry and contract with the industry's contraction. There are many examples of such external economies. The causes of external economies given above are all of reversible external economies. These are examples of a static nature. Such economies are few and far between. Irreversible external economies are dynamic in nature. These are not linked to the size of an industry. We find many such examples of external economies. An important example is a change in technological knowledge itself. The full benefit of an invention and innovation is not easily captured by the originator himself, even with stringent patent and copyrights. Emulators have a number of ways of adopting technical progress and avoiding legal action. Another example is of learning by doing: An employer trains a labourer in his work as he performs his job. The full benefits of labour training accrue over the life time service of the trainee, but the private benefit to the trainer employer stops when the trained worker leaves his firm and joins that of his competitor. Many other such examples of *irreversible external economies can be found*.

About the internal and external economies a, crucial question arises, how these economies of scale influence a typical business firm. Firstly, economies of scale tend to increase the speed of production. They enable a firm to secure increase in product proportionately at a greater rate than the rate of increase in factor inputs. Secondly, external economies bring about a substantial increase in the demand for the products. As the external economies promote the growth of linked or complementary industries, they create the demand for the products of a large number of industries and have a strong stimulating effect upon them. Thirdly, the economies of scale ensure more than proportionate increase in the total product and consequent fall in the per unit cost. Fourthly, the economies of scale encourage production, strengthen the product demand and lower costs, there is an increase in the profits of a typical business firm.

15.12 DISECONOMIES OF SCALE OF PRODUCTION

The word diseconomies refer to all those losses which accrue to the firms in the industry due to the expansion of their output to a certain limit. These diseconomies arise due to the use of unskilled labourers, outdated methods of production etc.

Like economies, diseconomies are also of two types:

1. Internal Diseconomies
2. External Diseconomies

15.12.1 Internal Diseconomies. Internal diseconomies implies to all those factors which raise the cost of production of a particular firm when its output increases beyond the certain limit. These factors may be of the following two types:-

(a) **Inefficient Management.** The main cause of the internal diseconomies is the lack of efficient or skilled management. When a firm expands beyond a certain limit, it becomes difficult for the manager to manage it efficiently or to co-ordinate "the process of production. Moreover, it becomes very difficult to supervise the 'work spread all over, which adversely affects the operational efficiency.

(b) **Technical Difficulties.** Another major reason for the onset of internal diseconomies is the emergence of technical difficulties. In every firm, there is an optimum point of technical economies. If a firm operates beyond these limits technical diseconomies will emerge out. For instance, if an electricity generating plant has the optimum capacity of 1 million Kilowats of power, it will have lowest cost per unit when it produces 1 million Kilowats. Beyond, this optimum point, technical economies will stop and technical diseconomies will result.

(c) **Production Diseconomies.** The diseconomies of production manifest themselves when the expansion of a firm's production leads to rise in the cost per unit of output. It may be due to the use of inferior or less efficient factors as the efficient factors are in scarcity. It happens when the size of the firm surpasses the optimum size.

(d) **Marketing Diseconomies.** After an optimum scale, the further rise in the scale of production is accompanied by selling diseconomies. It is due to many reasons. Firstly, the advertisement expenditure is bound to increase more than proportionately with scale. Secondly, the overheads of marketing increase more than proportionately with the scale.

(e) **Financial Diseconomies.** If the scale of production increases beyond the optimum scale, the cost of financial capital rises. It may be due to relatively more dependence on external finances.

To conclude, diseconomies emerge beyond an optimum scale. The internal diseconomies lead to rise in the average cost of production in contrast to the internal economies which lower the average cost of production.

Q1. List Internal Economics & Diseconomies of scale of production.

15.12.2 External Diseconomies

External diseconomies are not suffered by a single firm but by the firms operating in a given industry. These diseconomies arise due to much concentration and localization of industries beyond a certain stage. Localisation leads to increased demand for transport and, therefore, transport costs rise. Similarly, as the industry expands, there is competition among firms for the factors of production and the raw-materials. This raises the prices of raw materials and other factors of production. As a result of all these factors, external diseconomies become more powerful.

Some of the external diseconomies are as under:

(a) **Diseconomies of Pollution.** The localisation of an industry in a particular place or region pollutes the environment. The polluted environment acts as health hazard for the labourers. Thus, the social cost of production rises.

(b) **Diseconomies of Strains on Infrastructure.** The localisation of an industry puts excessive pressure on transportation facilities in the region. As a result of this, the transportation of raw materials and finished goods gets delayed. The communication system in the region is also overtaxed. As a result of the strains on infrastructure, monetary as well as the real costs of production rise.

(c) **Diseconomies of high Factor prices:** Due to over concentration of Industry in an area there may be a competition among the firm for the factors of production. As a result, prices of the factors increase which lead to increase in cost of production.

15.13 ECONOMIES OF SCOPE(S)

In contrast to the concept of economies of scale we have the concept of economies of scope this concept is of recent development. In the literature on applied economics. The basic argument is that cost-efficiency in production process is brought about by variety rather than volume. Thus product diversification which is incorporated within the given scale of the plant offers better cost advantages to manufactures. It is suggested that a single firm can produce a given level of each product line relatively more cheaply than a combination of separate firms producing exclusively single products. Thus there are positive economies of scope because of joint utilisation of inputs. Such economies-of-scope or multiproduct diversification may also accrue due to sharing of common intangible assets such as research and goodwill or due to free accessibility to public goods such as power plants.

Economics-of-scope (s) are measured by the ratio of average costs (AC) to marginal (MC) when production turns out joint products or multiple products. Thus in the joint product case that we have presented earlier.

$$C = C(Q_1, Q_2) = C(Q)$$

$$S = \frac{AC}{MC} = \frac{C(Q)}{Q \cdot \left| \frac{dC}{dQ} \right|}$$

We may measure the marginal costs by way of partial derivatives.

$$\frac{\partial C}{\partial Q_1} = \frac{\partial C}{\partial Q_2}$$

But it is not possible to measure the average costs in the joint product case because product aggregation of separate products may not be feasible. Such material, problems may be overcome by using value rather than volume of output produced in the computation of economies of scope.

Self Assessment Questions

Q. What are Economies of Scope?

15.14 IMPORTANCE OF THE ECONOMIES OF SCALE

The main significance of economies of scales is :

- **Nature of the Industry:** Economies of scale plays an important role in the determination of the nature of an industry i.e. whether it is increasing, constant and decreasing cost industry
- **Analysis of cost of production:** When an industry expands then it tastes both external economies and diseconomies. External economies are helpful to reduce the cost of production. External diseconomies tend to increase the cost. If economies occur then industry will flourish every day.

15.15 EMPIRICAL EVIDENCES ON THE SHAPES OF COSTS

So far as empirical studies about the shapes of cost curves are concurred, it is not an easy question to answer.

The empirical analysis of costs is fraught with special statistical problem and then problems of integration attached to each approach. According to Koutsoyiannis there are five approaches :

1. Statistical cost studies (cross section and time series)
2. Questionnaire based
3. Engineering cost studies
4. Statistical production functions
5. The survivor technique

A larger majority of the empirical cost studies suggest that the U shaped cost curves postulated by the traditional theory are not observed in reality. These studies brought forth two prominent results. Firstly, the TVS in the short run may be a positively sloping straight line. Consequently MC and AVC remain constant over a quite wide range of output. Secondly, the long run average cost curve is L shaped and not U shaped only very few studies recognized the diseconomies of scale, those too at very high levels of output.

Of course, all the sources of evidence can and have been attacked on various grounds, some justified and others unjustified. However, the fact that so many diverse sources of evidence point in general to the same direction (that is, lead to broadly similar conclusions) regarding the shape of costs in practice, surely suggests that the strictly U-shaped cost curves of traditional theory do not adequately represent reality.

We will examine the different types of cost studies in some detail.

1. Statistical cost studies

Statistical cost studies apply regression analysis to time series or cross-section data. Time-series data include observations on different magnitudes (output, costs, prices, etc.) of a firm over time. Cross-section data give information on the inputs, costs, outputs and other relevant magnitudes of a group of firms at a given point of time.

We may estimate a short-run cost-function either from time-series data of a single firm over a period during which the firm has a given plant capacity. Due to the difficulties in obtaining across-section sample of firms fulfilling the above requirements, short-run cost

functions are typically estimated from time-series data of a single firm whose plant has remained the same during the period covered by the sample.

We may estimate a long-run cost function either from a time-series sample including the cost-output data of a single firm whose scale of operations has been expanding or a cross-section sample of firms with different plant size, each being operated optimally.

After collecting the data, a linear function is fitted to cost output observation.

$$C = b_1 X_1 + U$$

It implies constant AVC & MC

$$MC \frac{\partial C}{\partial x} = b_1$$

$$AVC \frac{C}{x} = b_1$$

The evidence from most statistical studies is that the AVC is constant in the short-run over a considerable range of output and in the long-run, the average cost curve is, in general, L-shaped curve. The statistical studies have been attacked on account of interpretation problems, data deficiencies in respect of depreciation expenses, cost allocation and cost function: of multi-product firms and mis-specification of most of cost function.

Interpretation problems

(a) **The nature of the data.** Statistical cost studies are based on accounting data which differ from the opportunity costs required for the estimation of theoretical cost functions. Accounting data do not include several items which constitute costs in the economist's view. For example, profit is not included in the accountant's costs, and the same holds for all imputed costs, which do not involve actual payments.

(b) **The length of the time period** Another difficulty that comes up is the length of the time period. Ideally the length of the time period should cover the complete production cycle of the commodity. However, the time period of the accountants does not coincide with the true time period over which the production cycle is complete.

(c) **Coverage of cost studies.** Statistical cost studies refer mostly to public companies, which are completely different to companies in the competitive industries.

(d) **Data deficiencies in respect of depreciation expenses**

Among the variable costs one should include the user's cost of the capital equipment. Accounting data give full depreciation figures which include not only the user's cost but also the obsolescence (or time) costs of the equipment. Furthermore, in general accountants use the linear depreciation method, while in the real world depreciation and running expenses of fixed capital are non-linear: they increase as the age of the machinery increases.

Cost functions of multiproduct firms. With multiproduct firms one should estimate a separate cost function for each product. However, the required data either are not available or are not accurate due to the usually ad hoc allocation of joint costs to the various products. Thus researchers tend to estimate an aggregate cost function for all the products of the firm. Such functions are not reliable because of the 'output index' which is used as the dependent variable.

Friedman argues that statistical studies have failed to specify cost functions. These do not tell the extant cost of output of different size but only about the efficiency of capital market in revealing assets.

Although Friedman's arguments are sound the literature has side- stepped the issue and continues to consider various ways of attempting to estimate LRAC curves - or more precisely to establish the presence of economies of scale. For instance, statistical cost analysis postulates a total cost function

$$C=C(q,u)$$

where q is output per period and u is a random variable. Standard statistical techniques are then applied. But we must keep in mind the economic assumptions. Such data usually comes from different technologies, especially if the data is over time and there is no guarantee that input prices are constant. Furthermore, if c denotes average costs ($c = C/q$) then such a technique assumes that (q, c) observations actually trace out the LRAC curve. There is no presumption for this. These and other deficiencies, have been well documented in Johnston's classic study on Statistical Cost Analysis.

2. Among the studies based on Questionnaires, The most prominent study is the one conducted by Eiteman and Guthrie. The questionnaires were sent to the selected firms to elicit their opinion about the shape of their cost curves. Most of the firms reported that their costs would not rise in the long run. According to them, costs remain constant over some range of output. Thus these studies supported what was suggested by the statistical studies.

3. Engineering cost studies. Another group of empirical studies is termed as engineering cost studies. These are based on the technical relationship between inputs and output levels included in the production function.

The engineering- approach obtains cost curves in two stages. The first stage is to construct, for each process at different scales, input-output relations and to combine these to give overall input-output relations. In other words, an 'engineering production function' is obtained. The second stage is the introduction of input prices which can then be used to obtain 'engineering cost curves', - by obtaining the least cost input-output combination. It is important to realise that this approach obtains only production costs and hence an estimate of the long-run average production costs. Those costs arising from other sources, especially management, are excluded from the analysis. Contribution were made by H. Chenery and L. Cookeboo Jr. The researchers attempted to decide the optimal input combinations for producing any given level to output. The cost function is concerned with the cost of the least cost or optimal method of producing varying levels of output. Such studies concluded that long-run costs fall continuously over the range of output covered in the study. Since these studies excluded the managerial, administrative and distributional costs, they could not seriously challenge the U-shaped long-run average cost curve of the traditional theory. Although engineering cost studies have been found - to be useful in estimating the cost function of chemical industrial processes; oil-refining, nuclear power generation etc., yet they suffer from a serious shortcoming that they tend to under-estimate the costs of large scale plants.

Besides ignoring management costs by design they cannot supply information outside the range on which they were estimated. More significant is their limited usefulness in manufacturing generally.

4. Statistical Studies : The writers like A.A. Walters attempted the statistical studies of production functions. Most of these studies indicated that the production is governed by constant returns to scale. It led to the conclusion that costs remain constant over at least certain ranges of scales. Limited though statistical and engineering cost studies are, the evidence reveals that long run average cost curves are L shaped while long run average production cost curves are inverse J shaped.

5. Survivor techniques A special technique for establishing economies of scale proposed is the survivor techniques discussed by Stiger (1958) This technique attempts to avoid the problem of valuation, typical of statistical cost studies, and lack-of information faced in typical engineering studies. It is based on a simple idea, is that the most efficient size of a firm or plant will perform best in the market place and so over time, other things being constant will increase a firm's market share.

In applying the techniques the first problem is to classify firms or plants into size classes at two dates. Market shares are then calculated and if this share falls for a given class size then this is - taken to be inefficient while if the share rises it is taken to be an efficient size given the size of the market. Ideally plant size should be in terms of capacity but studies conducted in the U.K. using census data, have classified size according to employment, e.g. Rees (1973). Stigler's results on the US steel industry indicated that small-size firms hold their market share. This, he concluded, indicated a LRAC curves having a substantial flat section.

Although this approach is empirically simplistic it has shortcomings that are obvious. Its two basic shortcomings are that it is difficult to apply to firm and as such information can be obtained on only a few industries, often the least important.

The conclusion is that although the technique supplies useful information. It is superior to statistical & engineering cost studies yet it is of little use in estimating shape of LRAC curve.

15.16 SUMMARY

Let's recapitulate what we here studied :

- In economics costs include explicit and implicit costs. Explicit costs are the actual expenditure of the firm to purchase or hire inputs. Implicit costs refer to the value of the inputs owned and used by the firm in its own production process.
- The opportunity cost to a firm in using any input is what the input could earn in its best alternative use.
- Costs are also classified into private and social costs. Private costs are those incurred by individuals and firms, while social costs are those incurred by society as a whole.
- In the short run, we have fixed variable and total costs. Total fixed cost (TFC) plus total variable cost (TVC) equal total cost (TC). The shape of TVC curve follows directly from the law of diminishing returns. Average fixed cost (AFC) equals TFC/Q where Q is output average variable cost (AVC) equals TVC/Q average total cost equals TC/Q . $ATC = AFC$ plus in TC or in TVC per-unit change in output. The AVC, ATC and MC curves first fall and then rise i.e. they are U-shaped. AVC and MC are inversely related to AP_L and the MP_L respectively.
- The U-shape of the long run average cost curve of the firm results from the operation of increasing, constant and decreasing returns to scale respectively. Empirical studies

seems to indicate that in many industries. The LAC curve has a very shallow bottom or is nearly L-shaped. This means that economies of scale are quickly exhausted and constant or near constant returns to scale prevail over a considerable range of output.

- Economies of scope are present if it is cheaper for a firm to produce various products jointly than for separate firms to produce the same product independently. The opposite situation refers to the diseconomies of scope.
- The learning curve shows the decline in the average cost of production with rising cumulative total output over time by the firm.

15.17 GLOSSARY

- **Opportunity cost** : Cost associated with opportunities that are foregone when a firm's resources are not put to their best alternative use.
- **Total cost (TC)** : Total economic cost of production consisting of fixed and variable costs.
- **Fixed cost (FC)** : Cost that does not vary with the level of output and that can be eliminated only by shutting down.
- **Variable cost (VC)** : Cost that varies as output varies.
- **Marginal cost (MC)** : Increase in cost resulting from the production of one extra unit of output.
- **Average Total cost (ATC)** : Firm's total cost divided by its level of output.
- **Average Fixed cost (AFC)** : Fixed cost divided by the level of output.
- **Average Variable cost (AVC)** : Variable cost divided by the level of output.
- **Long run Average cost curve (LAC)** : Curve relating average cost of production to output when all inputs including capital are variable.
- **Short run Average cost curve (SAC)** : Curve relating average cost of production to output when level of capital is fixed.
- **Long run marginal cost curve (LMC)** : Curve showing the change in long run total cost as output is increased incrementally by one unit.
- **Economies of scale** : Situation in which output can be doubled by less than doubling a cost.
- **Diseconomies of scale** : Situation in which a doubling of output requires more than doubling of cost.
- **Economies of Scope** : Situation in which joint output of a single firm is greater than output that could be achieved by the different firms when each produces a single product.
- **Diseconomies of scope** : Situation in which joint output of a single firm is less than could be achieved by separate firms when each

produces a single product.

- **Degree of Economies of scope** : Percentage of cost savings resulting when two or more products are produced jointly rather than individually.
- **Learning Curve** : Graph relating amount of inputs needed by a firm to produce each units of output to its cumulative output.

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15.20 MODEL QUESTIONS

1. Derive short run and longrun cost curves from the production function.
2. Given inverted 'U' shaped MP curve derive shortrun MC, AVC, AC, AFC curves and draw them in a single diagram. Also point their inter-relationship if any?
3. Draw 'U' shaped average cost (AC) and total cost (TC) curve in the same diagram.
4. If there is no change in AP as production expands, can AC fall? If so then what are the underlying economies of scale.
