M.COM.

SEMESTER - I (CBCS)

ECONOMICS FOR BUSINESS DECISIONS

SUBJECT CODE : 71802

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Preamble

This course is designed to equip the students with basic tools of economic theory and its practical applications. The course aims at familiarising the students with the understanding of the economic aspects of current affairs and thereby prepares them to analyse the market behaviour with economic way of thinking. In addition to providing an insight into application of economic principles in business decisions, it also intends to widen analytical ability of the students and to provide them a foundation for further study of economics. In order to make the study practical oriented, the paper requires discussion of some cases involving the use of concepts of business economics.

Unit I: Basic principles in Business Economics: (5 lectures)

Meaning and scope of Business Economics –twin principles of scarcity and efficiency; incremental and Marginal principle; profit maximisation principle; market economy and invisible hand; production possibility frontier; Opportunity cost - accounting profit and economic profit; market failure, externality, public goods and economic role of Government

Unit II: Demand and Supply analysis: (10 lectures)

- Determinants of demand – market demand function - theory of attributes, snob appeal, band wagon and Veblen effect and demand function. Law of supply- elasticity of supply
- Applications of elasticity of demand and supply to economic issues : Paradox of bumper harvest- tax on price and quantity - minimum floor and maximum ceilings : minimum wages controversy and Administered price control
- The theory of consumer choice - Consumer preference and budget constraint - equilibrium position of tangency with the help of Indifference curve analysis- effect of changes in price and income on consumer equilibrium

Unit III: Production decisions and Cost analysis: (5 lectures)

- Production function - short run and long run - Law of variable proportion, returns to scale, scale economies, scope economies- least cost factor combination for a given output- Expansion path and Multiproduct firm- cost reduction through experience - learning curve
- Economic analysis of Cost: Classification of costs, short run and long run cost functions.

Unit IV: Market structure analysis:

- Difference between perfectly and imperfectly competitive markets - Perfect competition and Monopoly as limiting cases of market imperfections - Sources of market power - profit maximisation of simple and discriminating monopolist- methods of measuring monopoly power - Public policy towards monopoly power
- Different forms of imperfect competition - Monopolistic competition and Oligopoly - Strategic decision making in oligopoly markets- collusive and non collusive oligopoly- colliding oligopoly : rivalry among few, price war and kinked demand curve- collusive oligopoly models of price leadership and cartel - basic concepts of game theory - Using Game theory to analyse strategic decisions - application of model of prisoner's dilemma in market decisions

Suggested Readings:
Core Readings

1. Salvatore, D.: Managerial Economics in a global economy (Thomson South Western Singapore, 2001)
2. Frank Robert.H, Bernanke. Ben S., Principles of Economics (Tata McGraw Hill (ed.3)
3. Gregory Mankiw., Principles of Economics, Thomson South western (2002 reprint)
4. Samuelson & Nordhas.: Economics (Tata McGraw Hills, New Delhi, 2002)
5. Hirchey .M., Managerial Economics, Thomson South western (2003)
6. Mehta, P.L.: Managerial Economics – Analysis, Problem and Cases (S. Chand & Sons, N. Delhi, 2000)

Additional Readings

1. Koutsyiannis, A., Modern Microeconomics, Macmillan Press Ltd (1998 Reprint).
2. Varian, Micro-Economic Analysis (ed. 3), Norton, 1992.
3. Dean, Joel: Managerial Economics (Prentice Hall of India, N. Delhi, 2002)
4. Gupta, G.S.: Managerial Economics (Tata McGraw Hill, N. Delhi, 1997)
5. Sen Anindya, Micro -Economics: Theory and Applications, Oxford University Press, New Delhi, 1999.

Current Readings

Economic and Political Weekly
Indian Economic Review
Financial Dailies

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UNIT - I

UNIT- 1

BASIC PRINCIPLES IN BUSINESS ECONOMICS

Unit Structure

1.0 OBJECTIVES

- To understand the Meaning and scope of Business Economics
- To study the Twin principles of scarcity and efficiency
- To understand the concepts of Incremental and Marginal principle
- To study Profit maximization principle
- To understand the concepts of Market economy and invisible hand
- To study the Production possibility frontier
- To study the concept of Opportunity cost
- To study the difference between Accounting profit and economic profit

1.1 MEANING

Business or managerial economics involves application of economic principles to the problems of the firm or business enterprise which are productive economic units operating in an economy. Business economics assumes micro-economic character. As a specialized branch of economics, it adopts and adapts economic models in the problem solving and decision making process of a firm. It studies the problems and principles of individual firms or an industry and helps the business firm in forecasting and evaluating market trends. It is normative in nature and therefore it is prescriptive in character i.e., it is concerned with what firm should do under the given conditions in which it operates. It determines the objectives of the enterprise and then develops the means to achieve the laid down objectives. It deals with future planning, policy making and decision making.

Business economics also draws upon macro-economic principles and theories because though the firm is a micro-economic unit, it operates in a macro-economic environment. The macro-economic environment constitutes monetary and fiscal policies, industrial policy, price and distribution policies, wage policies, trade cycles and the international economy.

Business economics as a subject became popular in USA when Joel Dean wrote his book "Managerial Economics" in 1951, with a view to fill the gap between economic theory and business management. Since then Business economics as a specialized discipline has advanced a great deal. Today, economists are not only employed in Universities, Colleges and financial institution but also a large number of business firms operating all over the world. The Business economist has become an important agent in the decision-making process of a business enterprise. The meaning of Business economics will become clear with the study of a few important definitions.

Spencer and Siegelman, *"Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision-making and forward planning by management."*

Evan J. Douglas, "*Managerial economics is concerned with the application of economic principles and methodologies to the decision making process within the firm or organization under the conditions of uncertainty."*

Dominic Salvatore, "Managerial economics refers to the application of economic theory and the tools of analysis of decision science to examine how an organization can achieve its aims or objectives most efficiently." (Ref. Managerial Economics in a Global Economy, 2003, p.4).

All these definitions have one thing in common i.e., the involvement of economics and business management in the study of Business economics. Thus Business economics is the synthesis of economics and business management. It is a process of application of the principles, techniques and concepts of economics to solve the Business problem of decision making in a firm or business enterprise. Evan Douglas refers to the conditions of uncertainty because the macro-economic environment is unstable and uncertain. The variables of the macro-economic environment are beyond the control of a firm or business enterprise. Business economics helps the firm to respond to the changes in the macro-economic environment and also forecast the futuristic changes given the existing economic environment, so that the firm or business enterprise is able to adjust to the changes and then develops the means to achieve the laid down objectives. It deals with future planning, policy making and decision making. The decision sciences that Dominic Salvatore is talking about are statistics, mathematics, operations research, econometrics, accounting and the theory of decision making.

Business economics also draws upon macro-economic principles and theories because though the firm is a micro-economic unit, it operates in a macro-economic environment. The macro-economic environment constitutes monetary and fiscal policies, industrial policy, price and distribution policies, wage policies, trade cycles and the international economy.

1.2 SCOPE OF BUSINESS ECONOMICS

The scope of business economics includes the following:

1. Demand Analysis and Forecasting
2. Cost Analysis
3. Market Structure
4. Price determination in different markets
5. Profit analysis
6. Capital budgeting

1.2.1 DEMAND ANALYSIS AND FORECASTING

Demand is defined as “Desire backed by willingness and ability to pay.” The concept of demand has three aspects, namely; (i) the desire to buy, (ii) the willingness to pay and (iii) the ability to pay. These three aspects combined together constitute demand. The absence of any one of these three aspects will nullify demand. For instance, the consumer may have the desire to buy but is not willing to pay or the consumer has both the desire and willingness to pay but do not have the ability to pay or the consumer has the ability to pay but not the willingness and desire to buy. All these situations or instances do not constitute demand. India is believed to be self-sufficient in her food requirements. The go-downs of Food Corporation of India are overflowing. However food self-sufficiency in India is true only from the economic or the demand point of view as 14 percent of India’s population is living below the poverty line according to World Bank figures for the year 2011. If demand for food is generated by 100 percent of the population, India would become a food deficit country and may have to depend upon food imports to satisfy domestic food demand. Mere desire to buy and the willingness to pay without the ability to pay cannot and does not constitute demand.

The demand determinants for a given product are in a constant flux. They never remain constant over long periods. Prices of substitutes, complementary goods, income, taste, habit, preferences of the consumers, population, the macro-economic environment both national and international, everything undergoes a change over the long run. These variables create an environment of risk and uncertainty.

A business firm, although a micro-economic unit, operates in a macro-economic environment. Demand forecasting is essentially required to ascertain the viability of its operations in the market. The economic viability of a firm not only depends upon the market demand for its product/s in the present but also in the future.

Futuristic demand projection is required to calculate the breakeven point of a firm i.e., the operational point when the revenues are equal to cost. The firm begins to enjoy pure business profits only after breaking even. Such a breakeven point differs from industry to industry. Industries with smaller gestations lag will breakeven earlier than industries with longer gestation lag. While the consumer goods industries have a smaller or shorter gestation lag, the capital goods industries have a longer gestation lag. Hence, demand forecasting can vary from a very short period such as a week, a month or a quarter up to a period of one year to longer periods over and above one year to about twenty years. Broadly, demand forecasting in terms of the time period can be classified into short term and long term forecasting. However, in a free market economy, any projection beyond a period of five years is likely to go wrong because firms no longer operate in a protected environment. There is not only competition from within but also competition from without. This is true in the case of rapidly globalizing national economies, where-in the firms need to be big, bold and beautiful to operate in the international market. For an international firm, demand forecasting needs to be undertaken on an international scale and given the scale of operations. Such forecasts are logically long term forecasts.

1.2.2 COST ANALYSIS

The concept of cost is central to business decision-making. Cost consciousness contributes to cost minimization or cost optimization which leads to cost effectiveness and business expansion. A firm which produces its goods and services at a comparatively lower cost with a qualitative edge over its competitors will not only survive but also prosper. The micro-economic effect of cost consciousness will be the prosperity of individual firms. When cost effective firms in different industries and sectors of the economy produces its goods and services by minimizing cost and maximizing quality, the macro-economic effect would be increase in economic welfare of the largest possible number of people.

The business economist must be aware of the short run costs because they are important in deciding price and output of the firm. The long run costs are also important. However, their importance lies in deciding the investment and growth policies of the firm. In the business context, the importance of cost in managerial decision making can be explained in terms of price and output decisions, entry barriers, market-structure and growth policy. It is also important for the government to understand the cost and cost structure of the industry because it is the regulatory and law-making body which governs the industry.

Prices are no doubt determined by costs in all market structures, be it be market determined prices or administered prices as in the case of public enterprises. Costs determines price and output in both the time periods i.e. the short run and the long run because the profit maximizing equilibrium condition (MC = MR) do not change with the change in the time period. The manager of a monopoly firm can simply add a margin to the cost in order to determine the price but the manager of an oligopoly firm can only compete on the basis of cost. One of the leadership models in oligopoly is based on low cost known as the low cost price leadership model.

Costs determine the height of entry barriers in imperfect markets. The lower the cost of production, the greater will be the entry barrier raised by the firm and the more difficult will it be for a new firm to find foothold in the industry. Costs also determine the structure of the market. Large economies of scale can only be reaped by large firms and hence their cost of production will be lower. Larger the size of the firms, fewer will be the number operating in an industry and the market form that may emerge will be the oligopoly market. The direction of growth of a firm is also determined by cost. A firm facing a ‘U’ shaped average cost curve will decide to set up new production facilities as part of its expansion plans in a growing market. In other circumstances such as a saturated market, the firm may aim at diversification. The decisions on vertical and horizontal integration are based on cost considerations. Post liberalization, the attempts made by larger firms in terms of take-over and mergers both friendly and hostile is also based on cost considerations. Finally, the administrative apparatus of the government must be aware of the cost structure of the various industries in the country to put in place a proper regulatory mechanism.

In order to make effective business decisions, the business economist needs to be aware of a number of cost concepts and their respective uses such as actual and opportunity cost, incremental and sunk cost, historical and replacement cost etc.

1.2.3 MARKET STRUCTURE

A Market may be defined as any place or process that brings buyers and sellers together with an objective to enter into a transaction at an agreed price. The functions of a market economy are carried out through the market mechanism. Markets are therefore the very basis of an economy. Markets may be found in different forms such as the organized markets for commodities like oil, sugar, wheat, rice, gold, copper, iron, rubber and what have you, financial markets for stocks, shares, currencies of the world and financial instruments of various types, goods markets consisting of various goods and services which are traded through the market mechanism, factor markets through which factor inputs like land, labour, capital and enterprise are traded.

The market structures with their important characteristic features are shown in Table 1.1 below.

Table 1.1 - Market Structures

Market Structure	**Seller Entry Barriers**	**Number of Sellers**	**Buyer Entry Barriers**	Number of Buyers
Perfect Competition	No	Many	No	Many
Monopolistic Competition	No	Many	No	Many
Oligopoly	Yes	Few	No	Many
Monopoly	Yes	One	No	Many
Duopoly	Yes	Two	No	Many

In economics **market structure** is also known as **market form**. The word market structure describes the state of a market with respect to competition. Markets can be distinguished by the number of firms in the market and the type of product that they sell. Market structure is determined by a number of factors. The presence or absence of these factors will determine the nature of the market. Thus a market with differentiated products with some entry barriers and large number of sellers would be known as **monopolistically** competitive market and one with the same features but with few sellers would be known as an **Oligopoly** market. Ideal markets are full with economic freedoms and they are the most competitive markets. Such markets are known as perfectly competitive markets. The competitiveness of the market depends upon the power of individual firms to influence market prices. The less power an individual firm has to influence the market in which it sells its product, the more competitive that market is. The extreme form of competitive market structure comes into existence when each firm in the market has zero market power. Market structures are therefore either perfect or imperfect. Between perfect and imperfect competition, the two ends of market structure, a number of markets will be found. The nature of these markets will be determined by a combination of factors. These factors or the determinants of market structure are as follows:

1. Freedom of entry and exit.
2. Nature of the product i.e. whether the product is homogenous or differentiated?

3. Control over supply and output or the absence of it.
4. Control over price or the absence of control.
5. Barriers to entry and exit.

1.2.4 PRICE DETERMINATION IN DIFFERENT MARKETS

The firms that produce a given product and its close substitutes put together are known as an industry. The industry demand curve is the market demand curve for any firm in the industry. When firms decide their output, they must know as to what quantity of output will be sold at various prices. Hence, the firms are interested to know their individual demand curve. The structure of the market in which a firm operates determines the relationship between the market demand curve for the product and the individual demand curve of the firm in a given industry. Once the individual demand curve is known to the firm, it can easily determine its price and output policy. The ability of the firm to decide its price and output policy depends upon the nature of the market structure in which the firm is situated. Thus a competitive firm with zero market power can in no way influence the market price of the product that it produces. A competitive firm is a price taker and not a price maker. It simply has to accept the market price and once the market price is known, a competitive firm can only decide its equilibrium output.

In contrast, the monopoly firm has the maximum market power. Its demand curve is also the industry demand curve. It is therefore free to either decide its price or its output. However, a monopoly firm cannot decide both price and output simultaneously. If it decides the output, the price will be determined by the market demand curve and alternatively if it chooses to decide the price, the quantity of output will be determined by market demand. Between these two extreme forms of market structures, you may find market forms like monopolistic markets, duopoly and oligopoly markets. While the monopolistic firms are fairly independent in determining their price and output policies, the same cannot be said about duopoly and oligopoly markets because there is a fair amount of inter-dependence amongst the firms in these markets in determining their price and output policies.

A study of market structures helps us to understand the behavior of firms operating in different market structures. It helps us to know as to how price and output in different market structures is determined. The nature of competition is also determined by the market structure. Price and non-price competition are the two forms of competition. Price competition leads to price war and evaporation of super-normal profits under imperfectly competitive market structures positioned between perfect competition and monopoly. Non-price competition may assume the form of product differentiation and advertising. Non-price competition helps the firm to determine the shape and position of their market demand curves.

1.2.5 PROFIT ANALYSIS

The equilibrium condition of any firm under any market is (MC = MR). It is also the profit maximizing condition. However, the actual profit made by the firm depends upon, amongst other things, the position of the cost and revenue curves. Greater the difference between these curves, greater will be the profit and vice versa. The profits made by a firm also depend upon the nature of the market. In a competitive market, the firm will make only normal profits in the long run. At the extreme other you have oligopoly wherein the profits made by a firm will depend upon the nature of oligopoly. In collusive oligopoly, there is market sharing and the price is determined by the market leader. The firms can make super normal profits. However, under non-collusive oligopoly, the firms will make only normal profits due to competition and price war. A monopoly firm will always make super normal profits. Firms under monopolistic competition may make super normal profits in the short run.

Profit maximization is not the sole objective of a firm in globalized markets. A firm may pursue sales maximization policy and hence take lower profits so that new markets are accessed. Yet another firm may pursue utility maximization or staff maximization as the objective.

1.2.6 CAPITAL BUDGETING

Investment decision making is known as capital budgeting. Amongst alternative investment avenues, the firm has to decide on the most profitable investment opportunity. The study of capital budgeting involves stages such as the search for investment opportunities, forecasting cash flows expected to flow from each investment opportunity, computing the cost of capital and identifying the most profitable investment opportunity. Firms may use various methods to evaluate investment decisions such as the payback period method, the net present value method or the internal rate of return method.

Check your progress:

1. Explain the meaning of Business economics.
2. Discuss demand and demand analysis in Business economics.
3. Discuss the relevance of concept of cost in business economics.
4. What are the different types of markets?
5. Explain how prices are determine in different markets?
6. What is the profit maximization condition?
7. What do you understand by capital budgeting?

1.3 CONCEPT OF SCARCITY

The productive resources like land, labor, capital and enterprise available for the human society are scarce or limited. **Land** refers to the fertility of the soil, climate, forests and the mineral deposits, water resources etc. **Labor** is the human resource that is used to produce goods and services. Labor involves both physical and mental labor. **Capital** refers to the machinery, factories, equipment, tools, inventories, irrigation and transportation and communication facilities. Capital is produced means of production and hence it is used to produce other goods and services. Money is only a medium of exchange and as **Alfred Marshall** said, money alone cannot produce a single blade of grass. However, money in the form financial capital is a productive resource. Finally, the **enterprise** or the entrepreneur is the most important productive or economic resource because the entrepreneur is the pivot around which all economic activities revolve. The entrepreneur is the decision maker in the economy. The big economic questions: what to produce, how to produce, how much to produce, for whom to produce, when and where to produce etc are answered by the entrepreneurs. Without entrepreneurs, there will be no surplus and without surplus there will be no trade.

Scarcity of resources is the driving force behind all human endeavors. If resources were unlimited, human beings would not exert and would have lived and died like sloths. While the resources are scarce, human wants are unlimited. However, these unlimited wants are gradable and can be postponed. Resources, although scarce, have alternative uses i.e. they can be put to different uses. Limited resources and unlimited human wants are reconciled through alternative use of resources and gradation of human wants. Choosing between military goods and food, one can allocate more resources to food and produce more food or allocate more resources to military goods and produce more military goods. Choice involves trade-off. If you chose to produce more military goods, you will have to sacrifice some food and vice versa. **Trade-off is the result of scarcity of resources.** Wants can be graded on the basis of importance. More important wants will be satisfied first and less important wants will be satisfied later.

Resources are cumulative. Overtime, the resource pool available to the human society increases and hence the production capacity also increases. Innovations and inventions leads to higher productivity and higher output leading to greater satisfaction of human wants. However, human wants are always greater than what the available resources can satisfy. Hence, resources will always remain scarce.

1.4 CONCEPT OF ECONOMIC EFFICIENCY

A free market economy is one in which the four economic functions of production, distribution, consumption and exchange are

carried out according to the forces of market demand and market supply. The free market forces determine both product and factor prices and results in the efficient allocation of resources. A free market economy can operate only in a democratic country with capitalist economic system. The economic system is the mirror image of the political system. Markets cannot be free if there is no democracy and markets cannot be efficient if they are not free.

Economic efficiency means that the economy's resources are used effectively to satisfy the maximum possible wants of the people. An economy must achieve both production and allocation efficiency to realize economic efficiency. **Production efficiency** occurs when an economy cannot produce more of one good without producing less of another good. It means that the economy is operating on the production possibility curve and goods and services are produced at the lowest possible cost. **When goods and services are produced according to the tastes and preferences of the people, allocation efficiency is achieved.** When both production and allocation efficiencies are achieved, economic efficiency is achieved. Economic efficiency is a situation in which optimum allocation of resources takes place. In the actual world, economic efficiency is scarcely achieved because of the uneconomic use of resources and the retrograde economic policies adopted by countries.

1.5 PRODUCTION EFFICIENCY AND PRODUCTION POSSIBILITY FRONTIER

The achievement of production efficiency is explained in Fig.1.1 below.

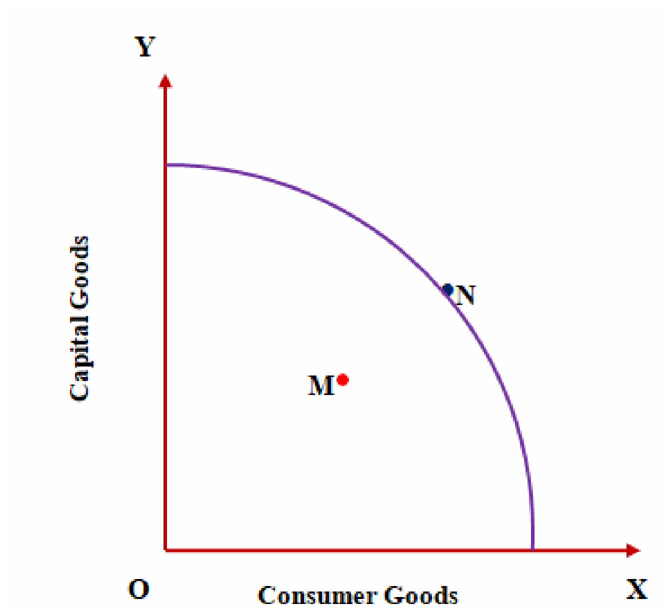

Fig. 1.1 Production Efficiency

Point M in Fig. 1.1 shows unemployment or under-utilization of productive resources in the economy. A movement from point M to point N shows that the economy is fully utilizing its productive resources and full employment is achieved. Production efficiency is achieved when the economy operates on the production possibility frontier. Any point on the PPC would show the achievement of production efficiency.

1.5.1 Production Efficiency and Average Cost Curves

Production efficiency can also be shown by using firm's cost curves. This is shown in Fig.1.2 which consists of three average cost curves. The least cost optimum output will be produced only on AC_3 at its lowest point or minimum point because it is the lowest average cost curve in the figure. Such a lowest point is point E on AC_3 and is known as the point of **technical efficiency.**

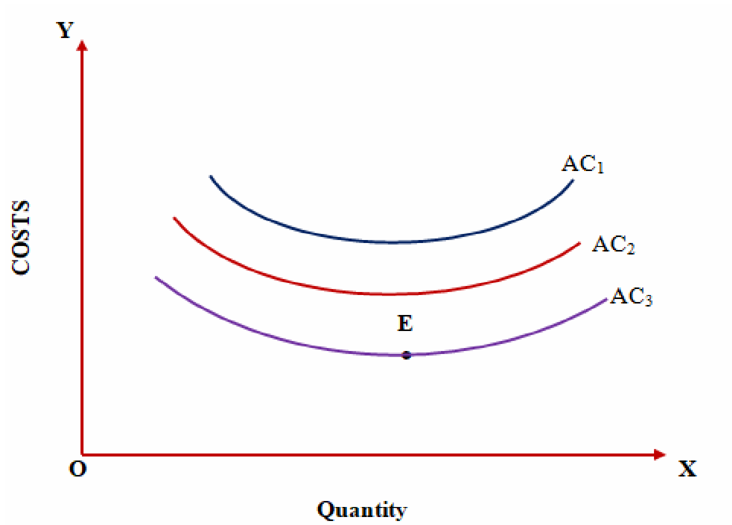

Fig.1.2: Production Efficiency (Point of Technical Efficiency).

1.5.2 Production Efficiency and Perfect Competition

Production efficiency can be achieved only under the conditions of perfect competition. Firms must produce at the lowest possible cost to maximize profits. Firms who are not able to achieve production efficiency will have to exit the market because other firms would be operating on the lowest point of the lowest average cost curve. Achievement of production efficiency in perfect competition is shown in Fig.1.3.

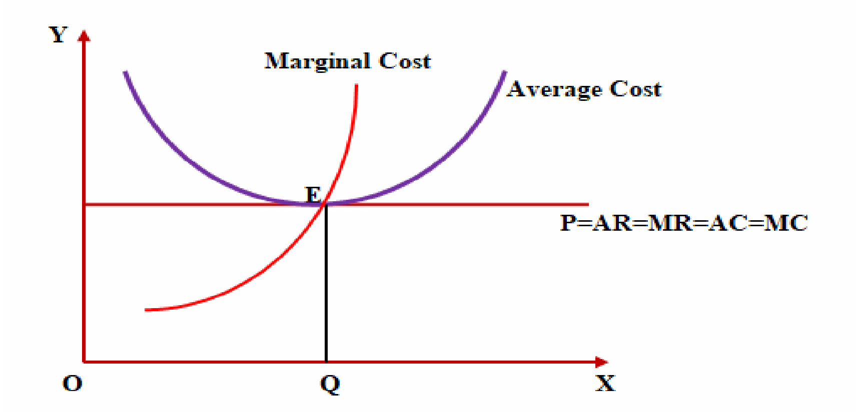

Fig.1.3 Production Efficiency and Perfect Competition

Fig.1.3 shows the long run equilibrium of a firm under perfect competition. Point E is the point of least cost maximum output. The equilibrium condition of the firm is MC = MR. At point E, the MC curve intersects the AC curve at its minimum point and the condition of technical efficiency is achieved. Point E is also the point where the MC curve intersects the MR curve from below and the AC curve is tangent to the AR = MR curve at point E. In this manner, under the conditions of perfect competition, the condition of Grand Equilibrium is achieved. Thus with production efficiency, economic welfare is also maximized under the conditions of perfect competition.

1.5.3 Allocation Efficiency

When goods and services are produced at the least possible cost and also according to the tastes and preferences of the consumers, allocation efficiency is achieved. Such a combination of goods and services should yield the greatest possible satisfaction to the consumers. **Technically, allocation efficiency will be achieved when the price of a product is equal to the marginal cost of the product.** When price is equal to MC, it represents the correct economic cost of producing the last unit of the product. Such a situation is also shown in Fig.1.3 where the condition of Grand Equilibrium is achieved by the firm under perfect competition in the long run. A numerical explanation of the concept of allocation efficiency is given in Table 1.2

The condition of equilibrium of a firm is MC = MR. The equilibrium condition is achieved when four units of output is produced because at this level of output, the price is equal to marginal cost. Since price or average revenue is also equal to marginal revenue under the conditions of perfect competition, it can be said allocation efficiency is achieved when Grand Equilibrium is achieved under the conditions of perfect competition.

Table 1.2				
Quantity (Q)	**Price (INR)**	**Total Utility (TU)**	**Marginal Utility ($MU_n = TU_n - TU_{n-1}$)**	**Price & MU**
1	10	15	15 – 0 = 15	MU > P
2	10	27	27 – 15 = 12	MU > P
3	**10**	**37**	**37 – 27 = 10**	**MU = P**
4	10	45	45 – 37 = 8	MU <P
5	10	50	50 – 45 = 5	MU < P

Check your progress:

1. What do you understand by scarcity in business economics?
2. What is the meaning of economic efficiency?
3. What is the role of Production Possibility Frontier in production efficiency?
4. What is the meaning of allocative efficiency?

1.6 INCREMENTAL AND MARGINAL PRINCIPLE

Economics as a science assume that people are rational and that individuals take decisions on the basis of valid reasons. The individual maximizes utility or satisfaction from the consumption of one or more goods. How many units of the good should be consumed or purchased by the individual at the given price? Every consumer or buyer has to face this question.

According to the law of diminishing marginal utility, the consumer will take the decision at the margin. For example, let us assume that the price of one chocolate is Rs. 10 and the first unit of the chocolate gives 15 utils of satisfaction. Since the satisfaction derived from the first unit of chocolate is greater than the price paid, the consumer will try to maximize his total satisfaction by buying one more unit of chocolate. The second unit of chocolate gives him 12 utils of satisfaction. The marginal utility of the second unit continues to be greater than the price paid. Hence, the consumer purchases the third unit of chocolate and receives only 10 utils of satisfaction. Now when the price paid by the consumer and the utility derived from the third marginal unit is equal, the consumer is in equilibrium and also gets maximum total satisfaction of 37 utils. From the following utility schedule, you will find that the fourth unit of chocolate gives only eight utils of satisfaction. Our consumer will not buy the fourth unit of chocolate because the marginal utility is less than the price paid (8 – 10 = -2). In this example, the consumer's decision to buy three units of chocolates has been taken on the margin.

Individuals make incremental decisions i.e. one more unit of chocolate at a time. Economists use the term marginal changes to describe incremental changes in the plan of buying chocolates. Margin means last or the edge. Marginal changes are therefore changes at the end or at the edge of what one does. Rational individuals make decisions by comparing marginal benefits and marginal costs. When you have your lunch or dinner, whether to have one more chapatti or not is the question that you have in your mind towards the end of your lunch or dinner. The question is therefore at the margin or at the end. We normally take decisions at the margin. Whether to buy one more unit of a trouser or a shirt, whether to drink one more glass of lassi, eat one more gulab-jamun etc are all questions at the margin and the decisions taken are also at the margin.

The firm or the producer also decides at the margin. The equilibrium of a firm in all markets is determined at the point of equality between marginal cost and marginal revenue. The total quantity of output produced by a firm is also taken at the margin. The producer will not produce additional units beyond the point of equality because that will lead to marginal loss (MC > MR). A rational producer or a consumer will produce or consume one more unit only if the marginal benefit is greater than the marginal cost and stop his action of production or consumption when the marginal benefit is equal to the marginal cost.

1.7 THE PROFIT MAXIMIZATION PRINCIPLE

Profits are maximized when the marginal cost of an additional unit of output is equal to the marginal revenue obtained by selling one additional unit of sale (MC = MR). The equality between marginal cost and marginal revenue is the profit maximizing condition in all types of markets. The principle of profit maximization is explained with the help of a cost and revenue schedule of the firm 'Ramji Dairy Farm'.

Table 1.3 – Profit Maximization (in INR)

Quantity (Liters)	Total Revenue	Total Cost	Profit	Marginal Revenue	Marginal Cost	Change in Profit
(Q)	**(TR)**	**(TC)**	**(TR – TC)**	**(MR = TR_n- TR_{n-1})**	**(MC = TC_n– TC_{n-1})**	**(MR – MC)**
0	0	20	-20	-	-	-
1	40	30	10	40	10	10
2	80	48	32	40	18	22
3	120	72	48	40	24	16
4	160	110	50	40	38	02
5	200	150	50	**40**	**40**	0
6	240	200	40	40	50	-10

In Table 1.3, column one, the number of liters of milk that the dairy farm will supply is shown. The second column shows total revenue that Ramji Dairy Farm will receive at various levels of output. The third column shows total cost which includes fixed cost. The fixed cost is Rs.20 and the variable cost will depend upon the units of output produced. The fourth column shows profit which is computed by subtracting total cost from total revenue (TR - TC). When the Dairy produces one liter of milk, it makes a profit of Rs.10. As the production of milk goes up, the profit also goes up. In order to maximize profits, the Dairy Firm will compare marginal revenue from each additional liter of milk with that of the marginal cost of producing one more liter of milk. The firm will continue to produce more milk as long as marginal revenue is greater than marginal cost. The MR and MC are computed in the fifth and sixth columns of the table. Since the price per liter of milk is held constant under the conditions of perfect competition, the marginal revenue remains constant. The marginal cost is obtained from the total cost column. When one liter of milk is produced, the total cost is Rs.30 (Rs. 20 + Rs. 10) and the marginal cost is Rs.10 (Rs.30 – Rs.20). When additional liters of milk are produced, the marginal cost goes on rising. When the fifth liter of milk is produced, both the marginal cost and marginal are equal i.e. Rs.40 and the change in profit is zero as shown in column seven. When the sixth liter of milk is produced, the marginal cost is Rs.50 and a result the profit falls by Rs.10. Hence Ramji Dairy Farm will not produce the sixth liter of milk. Profit is maximized when the fifth liter of milk is produced because, at this level of output, the marginal cost is equal to marginal revenue and the total profit made by the farm is maximized. Ramji Dairy Farm is rational in its decision making and therefore decides its profit maximizing output of five liters of milk at the margin. The marginal principle helps Ramji Dairy Farm in deciding its profit maximizing output.

1.8 MARKET ECONOMY AND INVISIBLE HAND

In a market economy, the economic decisions are taken by free consumers and producers. The consumers are known to be sovereign in a market economy. The choices and preferences of the consumers are taken into consideration by the producers or the firms in their decision making. What to produce? – is the question before the producer. What to consume? – is the question before the consumer. The choices made by the consumer translate into demand for goods and services and producers make their decisions on the basis of demand for various goods and services. Thus the questions: What to consume and how much to consume reveal the choices, preferences and the quantities of various goods and services that will be consumed by the consumers. The firms' decision on the question of how to produce is answered by the factor mix that the firm will have to employ in producing goods and services. Land, labor, capital and enterprise are the factor inputs. A given combination of these factors will be determined by factor prices i.e. rent, wages, interest and profits. Both factor prices and product prices are determined by the market forces of demand and supply. Price is the pivot around which the market economy revolves.

The price mechanism or the invisible hand helps in optimizing production and consumption. Only those goods and services are produced for whom demand has been registered. The markets register the choice and preferences of the people and accordingly goods and services are produced. The producers allocate their resources to their most profitable use in order to maximize profits. Consumers allocate their income to the consumption of various goods and services with the objective to maximum consumption or satisfaction. Profit maximization by the firms is reconciled by maximization of satisfaction by the consumers. Price mechanism is the signaling device in the market that leads to desirable outcomes. Market prices reflect the value of a commodity to the society and the cost to the society of producing the commodity. The price mechanism leads to maximum social welfare and also profit maximization.

1.9 OPPORTUNITY COST

Opportunity cost is the cost of next best opportunity lost. Every economic activity has an opportunity cost. The opportunity cost can be explained in terms of the Production Possibility Curve. As we move from left to right on the PPC, we produce more of commodity X and in order to produce more of commodity X, we sacrifice some units of commodity Y. The extent of sacrifice made of units of commodity Y to produce one more unit of commodity X is the opportunity cost of producing one more unit of Commodity Y. In the ordinary course of life, the concept may be explained by taking an example of a student who attends college. The opportunity cost of attending college can be explained in terms of the time that he or she could productively utilize by taking up employment and earn some money.

1.9.1 Opportunity Cost and the PPC

The resources available in an economy are limited and human wants are unlimited. Hence the problem of choice is created. The problem of choice is solved because wants are gradable. Wants can be graded into different categories on the basis of urgency or desirability. Thus most urgent and most desirable wants will be satisfied first and lesser order wants will be satisfied later. While the wants are classified and decided to be satisfied, individuals are actually making a choice between more important and less important wants. The true cost of any choice we make between alternatives is expressed by economists through the idea of opportunity cost. Opportunity cost is the cost of the next best alternative lost. The PPC also explains the incidence of opportunity cost while a movement is being made on it. Assuming that a society decides to produce two goods namely; motor cars and food with its available resources, the PPC will tell us as to how much of each good will be produced given a choice on the PPC. If we measure Motor Cars on the Y-axis and Food on the X-axis, a point chosen on the PPC intercept on the Y-axis would reveal that the society is allocating all its resources for the production of Motor Cars and no food is produced, thereby sacrificing food in its entirety. The PPC therefore shows opportunity cost of manufacturing motor cars in terms of food. Assuming that the society has chosen point N on the PPC, OC_1 Motor Cars and OF_1 food will be produced. Thus in order to produce OF_1 food the society has to sacrifice CC_1 of motor cars. CC_1 motor cars are therefore the opportunity cost of producing OF_1 food.

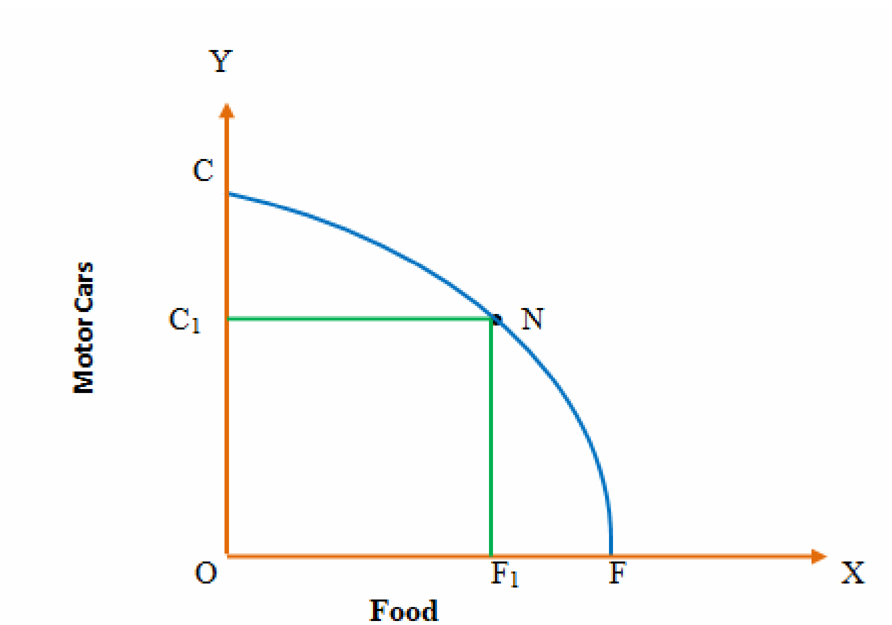

Figure 1.4 - Link between PPC and Opportunity Cost.

1.10 ACCOUNTING PROFIT AND ECONOMIC PROFIT

Accounting profit or residual profit is obtained by subtracting cost and expenses incurred from the revenue realized. In order to determine profit, the accountant subtracts the explicit or actual costs from the revenue. Accountants take retrospective view of the firm's financial statements and evaluate the trends in the performance of the firm. Accounting cost includes allowance for depreciation of capital equipment. The depreciation rates are determined by the tax authorities of the country. The accountant will not consider the opportunity cost of the sole proprietor or partner (imputed salary), the interest cost of the capital employed by the sole proprietor or the partner (imputed interest) and the rental cost of the land and building owned by the sole proprietor or the partner. The family members of the sole proprietor may also lend their labor in running the firm. Imputed salary for the labor provided by family member will not considered by the accountant. Thus the accountant's view of profit is a very narrow view.

The business economist takes a prospective view of the profitability of the firm. The economist is concerned with the optimal use of resources so that the average cost is minimized. The economist takes into consideration both implicit (opportunity cost) and explicit (actual) costs. Economic profit is the difference between accounting profit and imputed costs i.e. when imputed costs are subtracted from accounting profit, economic profit is obtained. Economic profit is more important for the business economist because it shows the true profitability of the enterprise. An enterprise making accounting profits may be making economic losses. Firms making economic losses cannot sustain in the long run and may have to exit the industry. The imputed costs include cost of entrepreneurial services in the case of sole proprietorship or a partnership firm, rent for self-owned land and building employed in the business and interest on self-owned capital.

Illustration.

Consider the case of M/s Mamta Stationery Stores. The owner has invested capital worth Rs.10 million. The yearly sales revenue of the store is Rs. 15 million. Making allowances for the expenses made by the Store, the accounting profit is shown in Table 1.4 below.

Table 1.4 Accounting Profit of M/s Mamta Stationery Stores (in Rs. millions)

1.	Sales		15,000,000
2.	Cost of Stationery sold	10,000,000	
3.	Salaries	2,000,000	
4.	Depreciation (10%)	1,000,000	13,000,000
5.	Accounting Profit		2,000,000

Let us now look at the economic profit made by the Store in Table 1.5. In the statement of economic profit, the opportunity cost of the owner of the store and the interest cost of the capital invested by the owner is taken into consideration. You will now find that the economic profit made by the firm is negative i.e. the store has actually incurred losses to the order of Rs. 0.7 million.

Table 1.5 Economic Profit of M/s Mamta Stationery Stores (in Rs. Millions)

1.	Sales		15,000,000
2.	Cost of Stationery sold	10,000,000	
3.	Salaries	2,000,000	
4.	Depreciation (10%)	1,000,000	
5.	Opportunity cost of the owner (salary)	1,200,000	
6.	Opportunity cost of capital (15%)	1,500,000	15,700,000
5.	Economic Profit		- 7,000,00

1.11 SUMMARY

1. Business economics is the synthesis of economics and business management. It is a process of application of the principles, techniques and concepts of economics to solve the Business problem of decision making in a firm or business enterprise.

2. The scope of business economics includes the following: Demand Analysis and Forecasting, Cost Analysis, Market Structure, Price determination in different markets, Profit analysis, Capital budgeting.

3. Economic efficiency means that the economy's resources are used effectively to satisfy the maximum possible wants of the people. When both production and allocation efficiencies are achieved, economic efficiency is achieved. Economic efficiency is a situation in which optimum allocation of resources takes place. In the actual world, economic efficiency is scarcely achieved because of the uneconomic use of resources and the retrograde economic policies adopted by countries.

4. Production efficiency is achieved when the economy operates on the production possibility frontier. Any point on the PPC would show the achievement of production efficiency.

5. Technically, allocation efficiency will be achieved when the price of a product is equal to the marginal cost of the product.

6. The equilibrium of a firm in all markets is determined at the point of equality between marginal cost and marginal revenue. The total quantity of output produced by a firm is also taken at the margin. The producer will not produce additional units beyond the point of equality because that will lead to marginal loss (MC > MR). A rational producer or a consumer will produce or consume one more unit only if the marginal benefit is greater than the marginal cost and stop his action of production or consumption when the marginal benefit is equal to the marginal cost.

7. Profits are maximized when the marginal cost of an additional unit of output is equal to the marginal revenue obtained by selling one additional unit of sale (MC = MR). The equality between marginal cost and marginal revenue is the profit maximizing condition in all types of markets.

8. The price mechanism or the invisible hand helps in optimizing production and consumption. Only those goods and services are produced for whom demand has been registered. The markets register the choice and preferences of the people and accordingly goods and services are produced. The producers allocate their resources to their most profitable use in order to maximize profits. Consumers allocate their income to the consumption of various goods and services with the objective to maximum consumption or satisfaction. The price mechanism leads to maximum social welfare and also profit maximization.

9. Opportunity cost is the cost of next best opportunity lost. The opportunity cost can be explained in terms of the Production Possibility Curve.

10. Accounting profit or residual profit is obtained by subtracting cost and expenses incurred from the revenue realized. In order to determine profit, the accountant subtracts the explicit or actual costs from the revenue.

11. Economic profit is the difference between accounting profit and imputed costs i.e. when imputed costs are subtracted from accounting profit, economic profit is obtained. Economic profit is more important for the business economist because it shows the true profitability of the enterprise.

1.12 QUESTIONS

(1) Explain the meaning and scope of Business economics.

(2) Define and explain the meaning of Business Economics.

(3) The market structure consists of different market forms. Explain.

(4) Explain the principle of scarcity.

(5) Explain the concept of economic efficiency.

(6) Explain the Incremental and Marginal principles.

(7) How does the consumer apply the principal of margin to achieve equilibrium?

(8) Explain the Profit maximization principle.

(9) Explain the role of invisible hand in a market economy.

(10) Explain the concepts of Market economy and invisible hand.

(11) Explain the concept of Production possibility frontier.

(12) Explain the concept of Opportunity cost and its link with PPF.

(13) Explain the concepts of Accounting profit and economic profit.

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UNIT - 1A

MARKET FAILURE AND THE ECONOMIC ROLE OF THE GOVERNMENT

Unit Structure

1A.0 OBJECTIVES

- To understand the concept of Market failure
- To study the concept of Externality
- To study Public goods and economic role of Government

1A.1 MARKET FAILURE AND EXTERNALITIES

A market economy is one in which all goods and services are voluntarily exchanged for money at market prices. A market economy without government intervention maximizes output and therefore maximizes economic welfare of the society. However, market mechanism does not always lead to efficient allocation of resources. Economic efficiency cannot always be achieved through market mechanism.

The term market failure describes the failure of the market economy to achieve an efficient allocation of resources. Prices must properly reflect the costs and benefits of production and consumption i.e. prices must include all the positive and negative externalities that are associated with production and consumption. However, in case of merit and demerit goods and in case of public goods, the price mechanism fails to register externalities correctly and hence State intervention in the market economy is warranted. If we assume that prices accurately reflect costs and benefits, decisions made by both producers and consumers will lead to an efficient allocation of resources and maximization of economic welfare or economic efficiency. Economic efficiency can only be achieved if resources are perfectly mobile between uses.

Market is said to be failing when the market forces lead to mal-allocation of scarce resources and fails to maximize economic welfare. The invisible hand of the market has some imperfections. These imperfections lead to market failure. The market mechanism fails when it leads to the following:

1. Overproduction of goods having negative externalities and underproduction of goods having positive externalities.
2. Under production of merit goods and overproduction of demerit goods.
3. Fails to provide public goods.
4. Creates monopolies.
5. Creates income inequalities.
6. Leads to Imperfect Information.

1A.2 THE PROBLEM OF EXTERNALITIES

An externality is said to arise if a third party is affected by the decisions and actions of others or when there is a divergence between social cost and social benefits, private costs and private benefits. For example, the social costs of private motorists can be explained in terms of road congestion, environmental pollution and possible car accidents. If the private motorists do not pay for these social costs, their private benefits will be higher than their private costs. In this case, the private motorists would be generating external costs or negative externalities. The market will fail to internalize the external costs and hence there will be overproduction of private motor cars. Hence government intervention would be necessary to control negative externalities and to internalize external costs. Similarly, certain goods and activities may generate positive externalities. The social and private benefits of vaccination against diseases such as polio, tuberculosis etc will be much greater than the social and private costs. The market, however, will fail to optimize the production of vaccines so that the entire population is vaccinated. The market will under produce vaccines and a large number of people who cannot afford to pay market prices for the vaccines will have to suffer from ill-health. The social cost of such ill-health will be much greater than the private cost of administering vaccines. Government intervention will be required to subsidize the production of vaccines or to have free distribution of vaccines so that social benefits are maximized.

Over production caused by negative externality is shown in Fig. 1A.1 below.

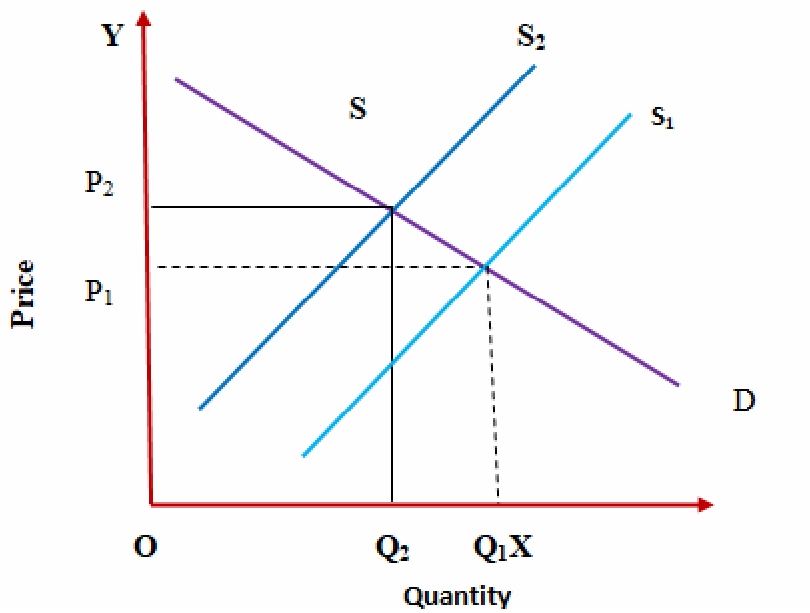

Fig. 1A.1: Over production caused by a negative externality.

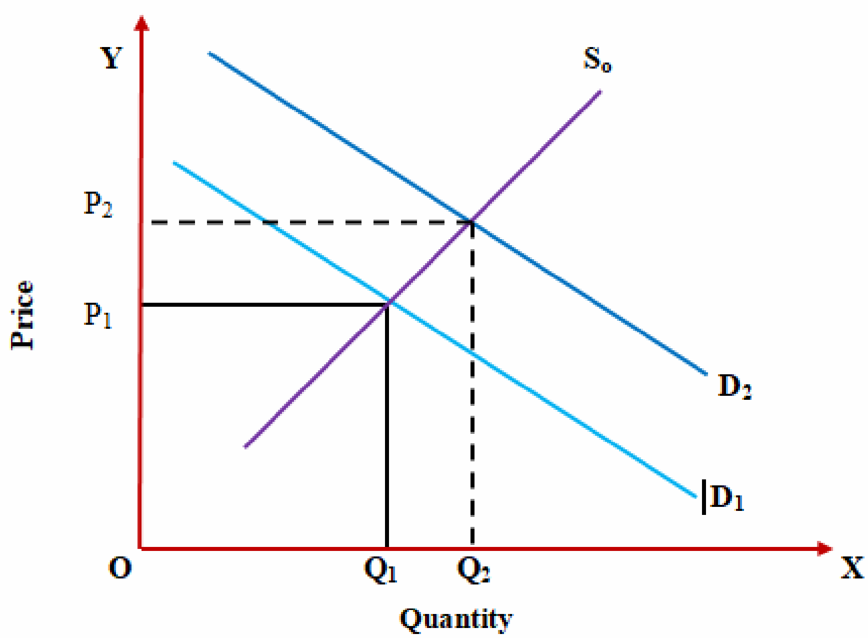

Fig. 1A.2: Under production caused by a positive externality.

The market fails to internalize negative externalities and hence the market price will be lower at P_1 where the supply curve S_1 showing private costs will be equal to demand and Q_1 output of motor cars will be produced. If the supply curve takes into account social costs, the total cost (private costs + social costs) will rise and it will shift to the left and a higher price P_2 with a lower output Q_2 will be determined. Failure to internalize social costs leads to mal-allocation of resources and over-production of a product which has negative externalities.

Similarly, Fig. 1A.2 shows under-production caused by a positive externality. In case of positive externality, the product will be under produced because only private benefits will be taken into account and the market demand will be shown by demand curve D_1. Accordingly, at price P_1, the quantity demand and supplied will be Q_1. If social benefits are recognized, then the demand curve will shift to the right and will be represented by D_2. The price will go up to P_2 and the quantity demanded and supplied will be Q_2. However, in the absence of government intervention, at P_1 price only Q_1 quantity will be demanded and supplied. The market therefore fails to optimize the production of goods having positive externalities.

1A.3 THE PROBLEM OF MERIT AND DEMERIT GOODS (INFORMATION FAILURES)

Market fails in both the cases of merit and demerit goods. A merit good has positive externalities. For example, education, vaccination etc are merit goods because others who do not consume these goods are also indirectly benefited. A demerit good has negative externalities. For instance, cigarettes and liquor are demerit goods because others who do not consume these goods are adversely affected. In addition to externalities, merit and demerit goods are associated with information failures. The over-consumption of a demerit good and the under-consumption of a merit good are caused due to the lack of relevant information with the consumer.

In the context of information failure, a merit good may be defined as a good that is better for a person than the person who may consume the good realizes. Education and health would be good examples of merit goods. While, a demerit good may be defined as a good that is worse for a person than the person who may consume the good realizes. Cigarettes and liquor would be good examples of demerit goods. In case of externalities alone, the benefit or loss is to others whereas in case of merit and demerit goods, the benefits and losses are to the individual who consume these goods in addition to others who do not consume.

Since the allocation of resources to the production of merit and demerit goods will not optimal as a result of information failure, the market is said to be failing in producing the right quantity of these goods. Thus merit goods will be under-produced and demerit goods will be over-produced. Inadequate resources will be allocated to the production of merit goods. Less than optimum demand for merit goods will be registered due to the lack of adequate information. This is shown in Fig.2.3. The correct level of demand for a merit good will is represented by the demand curve D_1 if the consumers have sufficient information about the merit of the product. And the equilibrium price and quantity demanded will be P_1 and Q_1. However, since the consumers fail to realize the value of the product, a lesser quantity Q2 is demanded at a lower price

P_2. Lower equilibrium price P_2 and quantity demanded Q_2 is below the optimum level and therefore the market has failed.

Fig.1A.4 shows the problem of a demerit good. In this case, the correct demand should be Q_1 and the price P_1. Since the consumers over-value the demerit good, a higher demand is registered and therefore a higher equilibrium price P_2 and quantity Q_2 is determined. More than optimum quantity of resources are allocated to the production of demerit good and therefore the market has failed. Thus in the case of merit and demerit goods, the market mechanism fails to optimally allocate resources due to information failures.

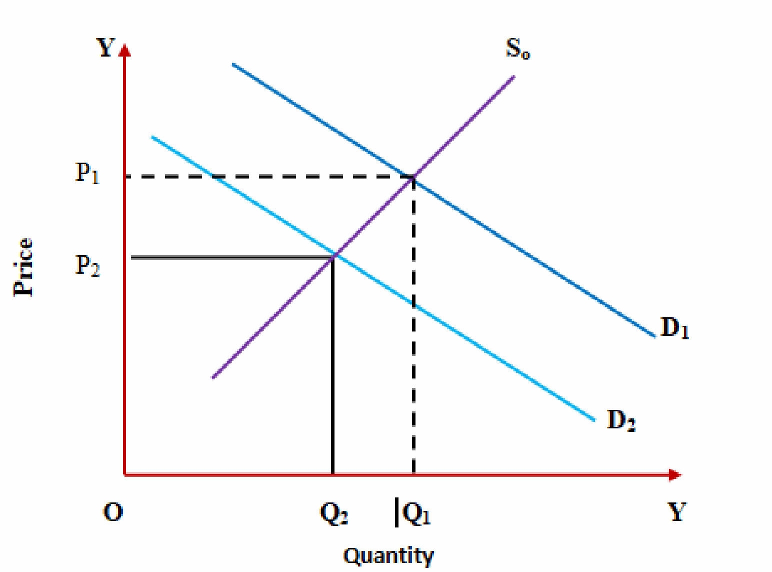

Fig. 1A.3: Under production of a merit good by the market.

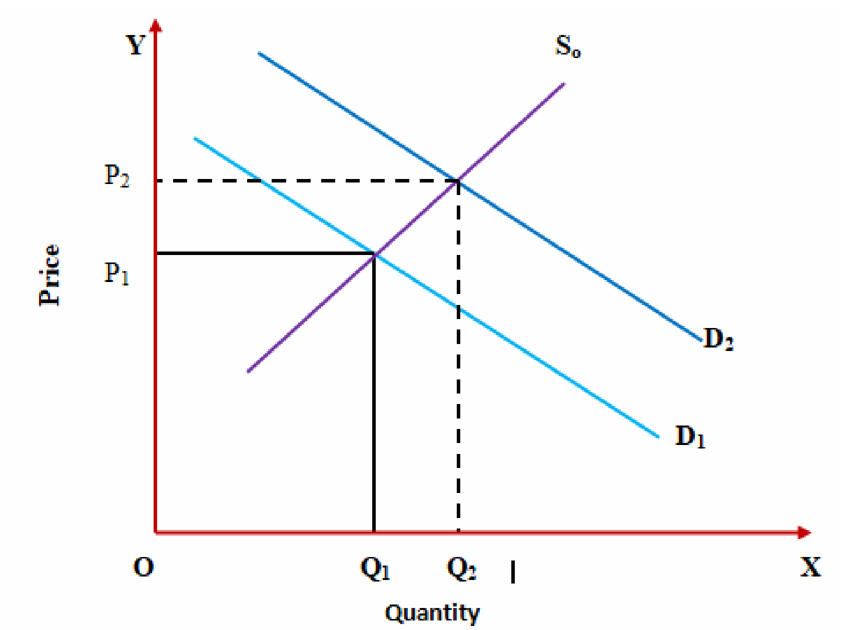

Fig. 1A.4: Over-production of a demerit good by the market.

Check your progress:

1. Explain the term market economy.
2. What do you understand by market failure?
3. When externality is said to arise?
4. Distinguish between merit and demerit goods.

1A.4 THE PROBLEM OF PUBLIC GOODS.

According to Paul Samuelson and William Nordhaus, "Public goods are those goods whose benefits are indivisibly spread among the entire community, whether or not people desire to purchase it". For example, the police machinery extends equal protection to all the members of the society whether or not people desire to make use of the machinery. Similarly, defense services, roadways, the judicial system etc are examples of public goods. Public goods have two important characteristics. They are non-rival in consumption and they are non-excludable.

A good is non-rival in consumption when more than one person can consume the same thing without reducing the consumption of any other person. Public goods like defense, police machinery, roads, judicial system etc are all non-rival in consumption because people can consume these services to the extent of their needs without reducing the consumption of others. A good is non-excludable when people cannot be prevented from enjoying its benefits. For example, a public garden, public health, public education etc. These goods and services are available to all even if no payment is made.

In contrast to public goods, private goods are rival in consumption. For example, if one person is working on a personal computer, the other person cannot use it at the same time without reducing the consumption of the first person. There is a trade-off involved in private goods. Similarly, if one person is drinking a can of beer, the other person cannot drink beer from the same can. Thus private goods are divisible in consumption and somebody has to pay for it. Private goods are also excludable. For instance, a person will be admitted into a movie theatre only if he has a valid ticket. A private good is therefore rival or divisible in consumption and is also excludable.

The problem caused by public goods is that the market will fail to provide public goods due to the problem of free riders. The market will therefore not allocate resources for the production of public goods although public goods are highly desirable from the society's point of view. Due to the problem of free riding, the market fails to register the correct demand for them.

1. THE PROBLEM OF MONOPOLIES AND DEADWEIGHT LOSS

A monopoly market is dominated by a single firm. A monopoly market is inefficient and fails to allocate resources in an optimum manner. A comparison of price and equilibrium output of a monopoly and a perfectly competitive firm will clarify market failure caused by a monopoly firm. This is shown in Fig.1A.5. In a competitive market, the equilibrium price and quantity demanded is determined at the point of intersection between the market demand and supply curves. The average revenue curve AR is the industry demand curve the marginal cost curve is the industry supply curve under perfect competition. Thus the equilibrium quantity demanded and supplied is Q_1 and the price is P_1. In a monopoly market, the monopoly firm can determine either the price or the quantity. If he decides the price, the quantity of output will be determined by market demand and if decides the quantity of output, the price will be determined by market demand. The monopoly firm will aim at maximizing profits and therefore determine equilibrium output at the point of equality between marginal cost and marginal revenue (MC = MR).

Accordingly, the monopoly market will produce a lesser output Q_2 and charge a higher price P_2 than a competitive market. Since the price set by the monopoly firm is higher than the marginal cost, there is no allocation efficiency. Since optimum output is not produced and cost of production is not minimized due to the absence of threats, there is no productive efficiency. Further, the equilibrium of a monopoly firm is determined to the left of the minimum point of the average cost curve. Hence there is no technical efficiency. Thus under the conditions of monopoly equilibrium, economic efficiency cannot be achieved.

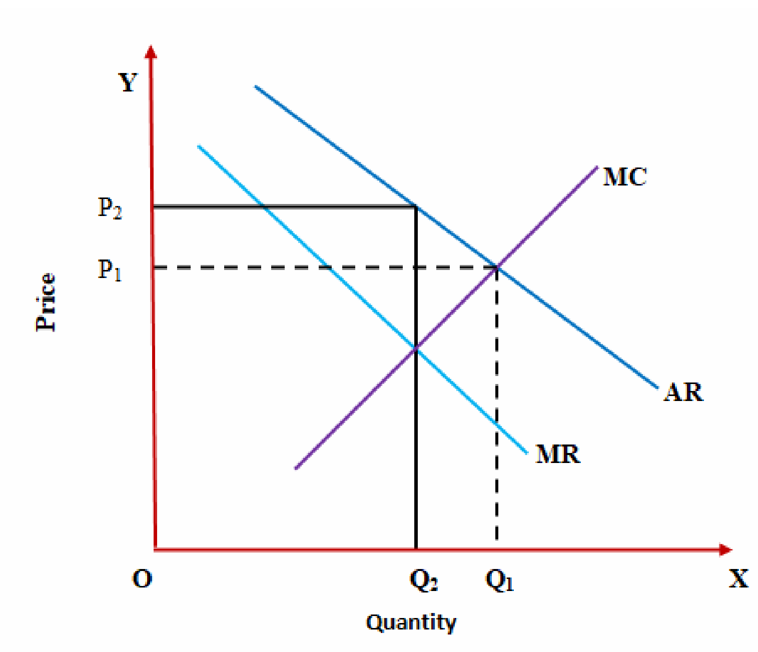

Fig. 1A.5: A comparison of monopoly and a competitive market. Deadweight Loss.

Monopoly market and the problem of market failure can also be explained with the economic concept of deadweight loss. Deadweight loss refers to the loss of economic welfare caused by market imperfections such as a monopoly market. The loss of both consumer and producer surplus is known as Deadweight loss. This is shown in Fig.1A.5. The competitive price is shown as P_1 and output as Q_1. This represents optimum production and consumption. However, the monopoly price is P_2 and quantity produced is Q_2. There is over-pricing, under-production and under-consumption in a monopoly market. The shaded triangle in the figure shows the loss of economic welfare or the existence of deadweight loss.

Deadweight loss may emerge when the government imposes an indirect tax on a product. This is shown in Fig1A.6. The initial equilibrium point is determined at the intersection of the market demand supply curves and the equilibrium price and quantity demanded is P_1 and Q_1. After the tax is imposed by the government, the supply curve shifts to the left because the imposition of a tax is equal to increase in the cost of production. As a result, a higher price P_2 is determined and a lower quantity Q_2 is demanded and supplied. Desirable production and consumption is discouraged because of the higher price. The resulting loss of economic welfare is shown by the shaded triangle. It shows the amount of deadweight loss due to the imposition of tax.

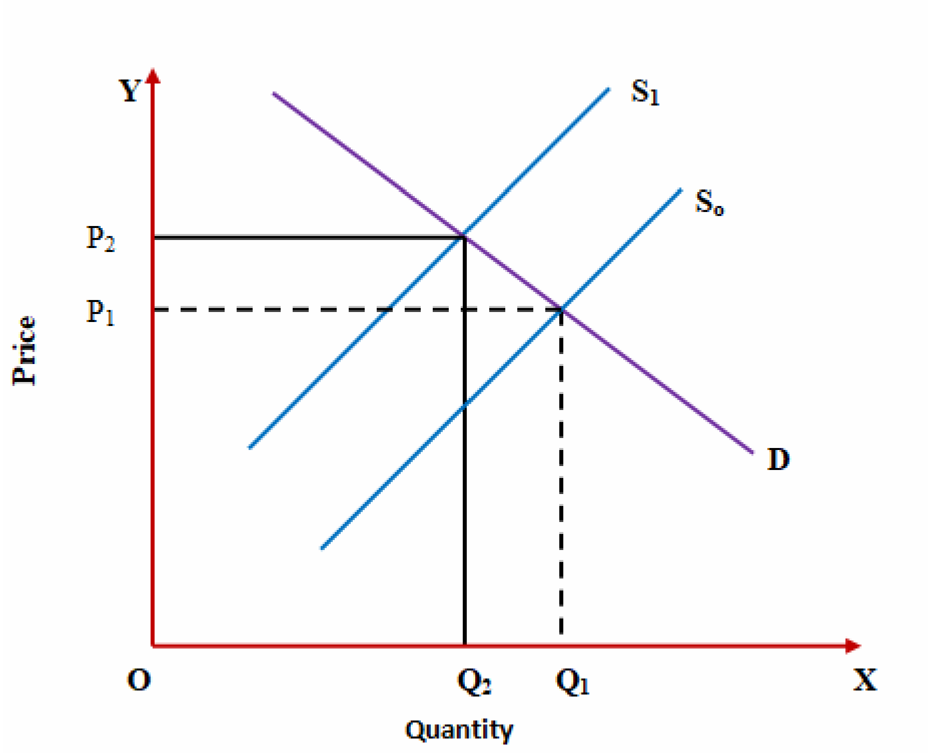

Fig. 1A.6: Imposition of indirect tax and the emergence of Deadweight Loss.

2. THE PROBLEM OF INCOME INEQUALITIES

Market economies tend to generate wide income inequalities. There is a problem of plenty amidst penury. For instance, even after six decades of planned economic development and growth, India continues to have about 26 per cent of its population living below the international poverty line with the top twenty per cent of the population having a share of 46 per cent in the national income and the bottom 20 per cent with only eight per cent share in the national income. Wide income inequalities may lead to a range of social and economic problems.

3. THE PROBLEM OF IMPECTFECT INFORMATION

Imperfect information leads to shortages and surpluses in the economy. For instance, theoretically, in a free market economy, unemployment should not occur because wages would adjust to absorb the surplus labor. However in reality, wages may not adjust downwards to absorb the surplus labor. Further, there may be a number of factors that may prevent labor from moving from one occupation to another i.e. to say that labor is not perfectly mobile between uses or occupations and between regions.

4. STATE INTERVENTION IN THE MARKET ECONOMY

Governments intervene in the market because the market fails in providing public goods, it over-produces demerit goods and under-produces merit goods. Government intervention in the market helps to correct market failures and achieve an equitable distribution of resources in the economy.

Government policy and methods of intervention can be grouped under four broad headings. They are regulation, financial intervention, production and transfer payments. The method chosen will depend on whether the reason for intervention is concerned with market failure or with the desire to achieve equity.

5. REGULATION

The government uses many methods of regulation as a means of controlling a market. Legal and other methods are used to control the quality and quantity of goods and services that are produced and consumed. For example, the government may regulate the sale of certain drugs by making them only available on prescription from a qualified doctor. Hygiene laws set standards for the production of foods. There may be controls on shop opening hours or the setting of a minimum age at which a person can buy certain products such as alcohol, cigarettes and lottery tickets.

6. FINANCIAL INTERVENTION

Financial instruments such as taxes and subsidies are also used by the government to influence production, prices of commodities, incomes or the distribution of wealth in an economy. Price subsidies may vary. They might in the form of partial subsidy in the case of public transport or total as in the case of free eye tests for children in full time education. Tax instruments may also vary. For example, vehicle excise duty is paid once every six months or year unless the vehicle is more than 25 years old. The same amount is paid whether the car is used daily or only once a month. In addition, vehicle users pay a tax on petrol. In this case, the amount of tax paid rises with the number of miles driven. The first type of tax may deter ownership of a vehicle while the second deters use of the vehicle. Governments also provide finance that is needed to produce a good or service. For example, the government could finance education but all schools, colleges and universities could be privately owned and run. Health care may be provided free but the drugs used in prevention and cure of illness could be privately produced.

Use of Indirect Taxes and Subsidies by the Government to Deal with the Problem of Externalities.

The use of taxes and subsidies to deal with the problems of market failures caused by externalities is a case of financial intervention. A tax is imposed on the firm which creates externality. Once tax is imposed, the externality is internalized or the external cost of production is added to the private cost. The following figure shows how taxation is used by the government to internalize external cost.

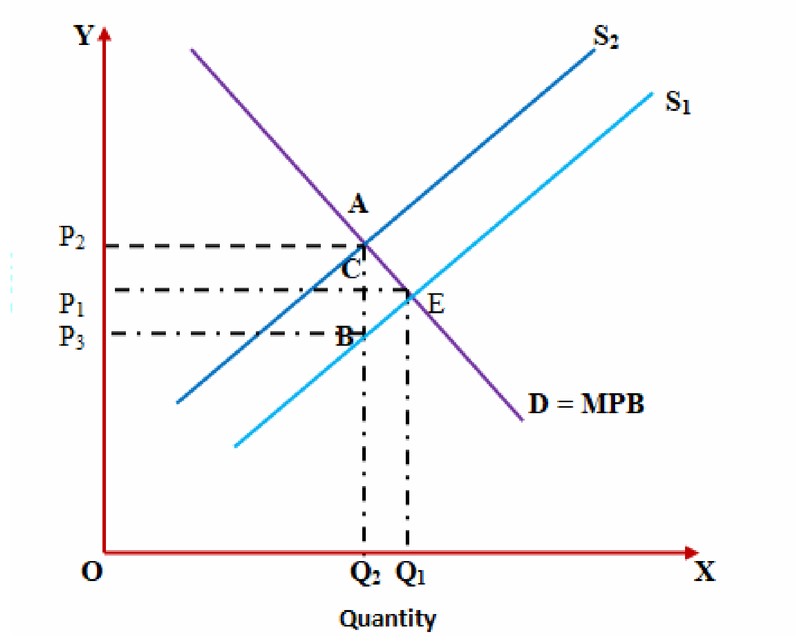

Fig. 1A.7 - External Cost and Use of Taxation.

Before the imposition of tax, the marginal private benefit curve D = MPB intersects the supply curve at point E. Accordingly, price P1 and quantity Q1 are determined. However, when the tax is imposed to cover the external cost, the supply curve shifts to the left and now intersects the demand curve at point A. As a result, the new price is P2 and quantity demanded is Q2. At Q2 level of output, the actual tax is P2P3 which is divided between the buyer and the seller in equal proportion because the price elasticity of demand is equal to one. The burden of tax shared by the buyer is AC and that of the seller is CB.

Financial intervention by giving subsidies to correct market failure caused by external benefits or positive externalities can be explained as under.

The equilibrium before government intervention is at point F where MPB = MPC or Demand is equal to supply. When marginal external benefit is added to the MPB curve, the MPB curve shifts to the right and D_2 = MSB curve is obtained. The MSB curve represents society's demand for the product. If the government subsidizes the production of this product then the supply curve moves to the right from S_1 = MPC to S_2 = MPC – Subsidy. The marginal cost of supplying the good is reduced by the amount of subsidy and the vertical distance GH is equal to the value of the subsidy. The equilibrium after the subsidy is given by point H where D_1 intersects the supply curve S_2 and the optimal amount of goods Q_2 is sold by the market.

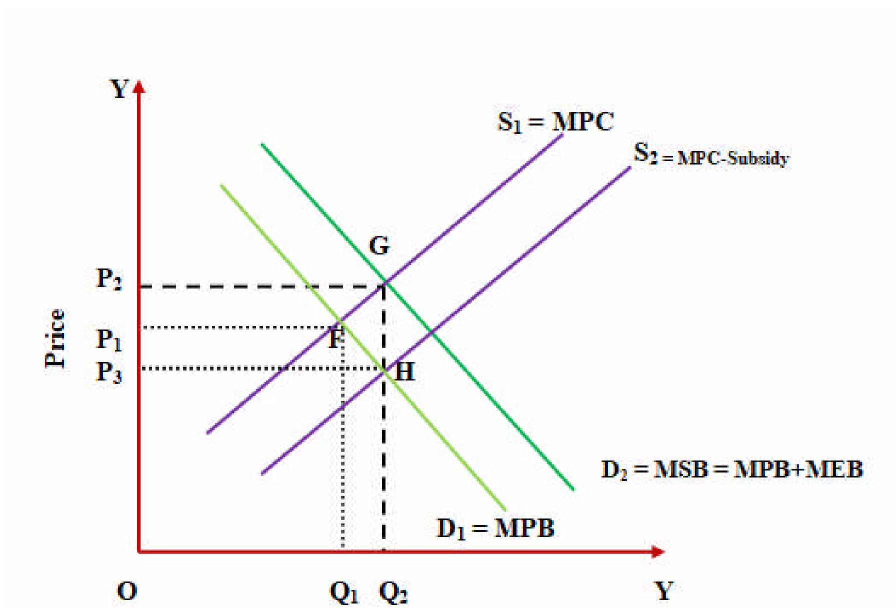

Fig. 1A.8: External Benefits and Use of Subsidies.

7. STATE PRODUCTION

Government may take over the production of a good or service either in whole or in part. Industries such as the electricity, coal mining and railway are entirely owned and managed by the State in many countries. It is also very common to find some goods and services being produced by both the State and the private sectors. Education and health care, for example, are provided both publicly and privately.

8. INCOME AND OTHER TRANSFERS

Income transfers are used by governments as a means of redistributing income or transferring income from one group in society to another group for example from people in work to those who are retired or from relatively rich people to those who are in poverty. The justification for these transfers is to achieve fairness or equity in an economy. These transfers of income may be in the form of a cash benefit paid by the government to someone with a low income. Income transfers may also be used to cover the unexpected loss of income when a person is not working due to illness or unemployment. These cash transfers include social security benefits such as income support, job seeker's allowance or a State pension.

1A.5 SUMMARY

1. A market economy is one in which all goods and services are voluntarily exchanged for money at market prices. A market economy without government intervention maximizes output and therefore maximizes economic welfare of the society. The term market failure describes the failure of the market economy to achieve an efficient allocation of resources.
2. An externality is said to arise if a third party is affected by the decisions and actions of others or when there is a divergence between social cost and social benefits, private costs and private benefits.
3. Market fails in both the cases of merit and demerit goods. A merit good has positive externalities. A demerit good has negative externalities.
4. Public goods have two important characteristics. They are non-rival in consumption and they are non-excludable. In contrast to public goods, private goods are rival in consumption and divisible in consumption and are also excludable.
5. The problem caused by public goods is that the market will fail to provide public goods due to the problem of free riders. The market will therefore not allocate resources for the production of public goods although public goods are highly desirable from the society's point of view. Due to the problem of free riding, the market fails to register the correct demand for them.

6. Monopoly market and the problem of market failure can also be explained with the economic concept of deadweight loss. Deadweight loss refers to the loss of economic welfare caused by market imperfections such as a monopoly market. The loss of both consumer and producer surplus is known as Deadweight loss.

7. Market economies tend to generate wide income inequalities. Wide income inequalities may lead to a range of social and economic problems.

8. Imperfect information leads to shortages and surpluses in the economy.

9. Government intervention in the market helps to correct market failures and achieve an equitable distribution of resources in the economy.

10. The government uses many methods of regulation as a means of controlling a market. Legal and other methods are used to control the quality and quantity of goods and services that are produced and consumed.

11. Government may take over the production of a good or service either in whole or in part.

12. Income transfers are used by governments as a means of redistributing income or transferring income from one group in society to another group for example from people in work to those who are retired or from relatively rich people to those who are in poverty.

1A.6 QUESTIONS

1. Explain the concept of Market failure.
2. Explain the problem of externalities.
3. Explain the problem of merit and demerit goods.
4. Explain the problem of monopolies and deadweight loss.
5. Explain the concept of Externality.
6. Explain financial intervention by the Government to correct market imperfections.
7. Explain the concept of Public goods and economic role of Government.

❖❖❖❖

UNIT - II

UNIT - 2

DEMAND AND SUPPLY ANALYSIS

Unit structure

2.0 OBJECTIVES

- To study various Determinants of Demand
- To study the Market Demand Function
- To study the Theory of Attributes
- To understand the concepts of Snob Appeal, Bandwagon and Veblen Effects and Demand Function

- To study the Law of Supply
- To understand the concept of Elasticity of Supply
- To understand the Application of Elasticity of Demand Supply to Economic Issues
- To study the concept of Paradox of Bumper Harvest
- To study the Tax on Price and Quantity
- To understand Minimum Floor and Maximum Ceilings concepts
- To study the Minimum Wages Controversy and Administered Price Control

2.1 DETERMINANTS OF DEMAND

Demand can be studied in terms of individual demand and market demand. Those factors which influences or determines individual demand also go into determining market demand which is the sum of individual demands. However, the same cannot be said of the factors which determine market demand. For instance, factors such as income and wealth distribution, common habits, tastes and preferences of communities, market size and population growth rate, business cycles, etc. exclusively determine market demand. Factors such as prices of the given products, disposable income of the individual, future expectations, advertisement and sales propaganda, prices of substitutes and complementary goods influence individual demand. However, these factors with a greater magnitude also influence market demand.

A firm which is in the business of producing and selling niche products and customized products which are targeted at certain categories of people or communities and individuals should take into consideration those factors which determine community specific and individual demands for estimating market demand. While estimating demand for generalized products or products for secular consumption, the following demand determinants which influence market demand must be taken into consideration.

(1) **Price of the Product:** The law of demand states **"other demand determinants remaining constant, when the price of a given product falls, demand rises and vice-versa"**. It means, if the price of a given product falls, the market demand for the given product will rise and if the price rises, the market demand for the product will fall. However, the product under consideration should be a normal product i.e. the consumers should not perceive the given product as an 'inferior good' or a 'Giffen good' or a 'Veblen good'. The law of demand is applicable to only normal goods and normal people.

(2) **Size and the Rate of Growth of Income:** The absolute size of the income determines the quantum of goods and services produced in an economy. Thus greater the size of income of the people, greater will be the demand for goods and services and vice-versa. In addition, the rate of growth of incomes will determine the incremental growth in demand for goods and services. Thus higher the rate of growth of incomes, higher will be the quantity demanded by the people.

(3) Tax Exempt Level of Income and Tax Structure: The tax structure and the tax exempt level of income determines the disposable income of the people. It is the disposable income of the people that determines market demand. Higher the tax exempt level of income and less steeply graded the tax structure, greater will be the disposable income of the people and greater will be the market demand. For instance, in India the tax exempt level of income is Rs. 2, 50,000 i.e., individuals with an annual income up to Rs. 2, 50,000 are exempt from paying income tax. Between 2.5 lakh and 5.0 lakh, the tax rate is 05% and between 5 and 10 lakh the tax rate is 20%. The marginal rate of taxation is 30% which is applicable to annual incomes above Rs. 10 lakh. The changes in the income tax structure were announced in the Union Budget 2020-21. If the government raises the tax exempt limit in the next budget, individuals in each income category will save more money and their disposable income will accordingly rise.

(4) Level of National Income and its Distribution in the Community: A more equitable distribution of national income and wealth in the community means that the lower sections of the society have sizeable purchasing power and since the low and middle class people has a greater propensity to consume than the upper class people; the demand for goods will be high. The relatively poor will be spending a larger proportion of their income on consumption and hence a more equitable distribution of national income ensures higher level of demand for goods and services produced in an economy by the firms. However, equitable distribution alone will not determine the level of demand. The size or the level of national income is also important. For instance, the Gini Index for India and the United States were 33.6 and 41.1 respectively in the years 2012 and 2013. The Gini index measures the extent to which the distribution of national income deviates from a perfectly equal distribution. A Gini index of zero represents perfect equality and an index 100 represents perfect or maximum inequality. The Gini index reveals that income distribution in India is more equal than the United States. However, the national income of India and United States for the year 2016 was US $ 2.29 trillion and US $ 18.55 trillion and the per capita income for the two countries was US$ 1820 and US $ 57,220 respectively. While the national income of US was 8 times higher than India in 2016, the per capita income was 31.4 times higher than that of India. Now that explains why the average American is well dressed and well fed and that also explain the size of demand in both the countries.

(5) Spending Habits, Customs and Preferences: A spend thrift society, high on consumerism and believing in enjoying the material comforts and luxuries of life will not only produce more but also consume more. A society which is well clad, eats well, drinks well and enjoys life will generate more demand for goods and services. A thrifty and conservative society will not be interested in the consumption of value-added goods and services. If the consumption pattern of the society is determined by customs and traditions, the level of demand will be less and the demand will be for goods with low value addition. For instance, in a country like India, a considerable amount of income is generated without going through the market or exchange mechanism. This can be explained in terms of peoples' preference for food items made at home (by self or other family members). The labor that goes into making food and managing the household is not transacted through the exchange mechanism. This leads to a much lower level of national income and spending. A society which prefers ready to eat food, ready to wear clothes and ready to live house and enjoy the weekends will generate more demand.

Paradoxically, in a poor country like India, the demand for gold is not only huge but also ever increasing, making India the largest consumer of gold in the world. The demand for gold in India is driven by stupid customs and gold worth Trillions of rupees is hoarded by households. Money that should otherwise go into accelerating economic growth is left to rot like deadwood in the 200 million jewel boxes of the approximate 200 million households in India.

(6) Market Size and Growth rate of Population: The number of buyers for a given product constitutes the size of the market. Larger the number of buyers, larger will be the market size and greater will be the demand for a given commodity. Market size depends upon the growth rate of population and the age structure of a society. The goods and services demanded by a young population will be different from that of an ageing population. For instance, population in India can be characterized as young because it has the largest number of persons in the age-group 15-59 whereas Japan can be said to have an ageing population because it has a considerable number of people in the 59 + age group.

The sex ratio i.e. the number of females per 1000 of male population will also determine both pattern and the quantum of demand. Economically independent and empowered women will determine the quantum of demand for female specific goods. For instance, the number of females per 1000 male population in Kerala in 2011 was 1084 whereas the all India average was only 943. In order to ensure sustained growth in demand for goods and services, it is not enough to have a sustained growth in income but also a sustained growth in population. However, increasing population in poverty stricken populous countries like India is undesirable where economic prosperity of the available people is the key to sustained rise in demand. Thus, the size and growth of population, the level and spread of economic prosperity, the age structure and the extent of individual economic empowerment will determine the extent of demand and the pattern of demand in an economy.

(7) Price Related Expectations: Price stability leads to stable expectations. For instance, if the current rate of inflation or general price rise is 5 percent and the expected inflation rate in the future or subsequent year is also 5 percent, there will be no fluctuation in demand on account of expectations. However, if people expect that future inflation rate will be substantially higher than the present rate, the demand will rise even when the prices are rising. Similarly, if the future expected price rise is less than the present one or if the people expect the prices to fall in the future, the demand will continue to contract even when the prices are actually falling.

Expectations, though, psychological and sometimes objective have an important role in determining the present level of demand. For instance, during the real estate boom of 1985-95, the demand for real estate was continuously rising in-spite of the sky-rocketing real estate prices. However, during the post 95 real estate bust, the prices began to fall absolutely until the year 2000 by which time the real estate prices were half the prices in 1995 which was the peak of the boom. Demand continued to be sluggish in-spite of the stable real estate prices and housing loans being available on demand in the years 2014, 2015 and 2016 because the real estate prices had peaked and the market was expecting a correction in the prices. The same is true in the post-Corona times that we are living in.

(8) Prices of Substitutes and Complementary Goods: The demand for a commodity will be not only determined by its own price but also the prices and changes therein of substitutes and complementary goods. Tea and coffee, fountain pens and ball pens, sugar and jaggery beef and mutton or beef and chicken or mutton and chicken, vegetable ghee and vegetable oil, diesel and petrol, etc. are examples of substitute goods. Tea and sugar/milk, coffee and sugar/milk, fountain pen and ink, ball-pen and refill, car and petrol, bread and butter, etc are examples of complementary goods. In case of substitute goods, the cross price elasticity of demand is greater than zero i.e. for instance, if we take two substitute goods tea and coffee and assume that the price of tea remains constant but that of coffee rises, the result will be in the form of rise in demand for tea, although the price of tea did not change, and fall in the demand for coffee. Similarly, if petrol prices rise and diesel prices remain constant, the demand for petrol will fall and that of diesel will rise.

The change in demand for substitutes and complementary goods is price-initiated. In the case of complementary goods, the demand for either of the commodities will fall with a rise in the price of one of the commodity, the price of other commodities remaining constant and vice-versa. For instance, if price of sugar rises, the demand for sugar, tea and milk will fall or if the price of butter falls, the demand for both butter as well as bread will rise.

(9) Business Cycles: Cyclical fluctuations cause fluctuations in demand. Both recession and prosperity can be industry wide or economy wide. Even when the economy as a whole is passing through a recessionary phase of the business cycle, some industries may experience prosperity and sometime the economy may be prospering but some industries may be in the grip of recession. However, broadly speaking, during the prosperity phase, business is booming and market demand is rising, whereas during a recessionary phase, there is a general slump in the business activity and there is a continuous fall in market demand leading to sustained fall in the growth rates of the economy as well as the firms. In the aftermath of the 1991 economic crisis in India and with the adoption of the new economic policy, the government's capital expenditure was considerably reduced which resulted in a recession in the capital goods industry. The growth in GDP since 1998-99 has been on the decline until 2000-01 indicating a recessionary trend in the Indian economy. Thereafter, there has been a spectacular increase in the growth rate of GDP, particularly after 2003-04 and up to 2007-08. The Global Financial Crisis of 2008-09 affected the growth rate in India and the growth rates fell in 2008-09 and 2009-10. The growth rates continued its downward trend till 2013 with an all-time low of 5.1 per cent. Thereafter the growth rate has once again assumed an upward trend until 2016-17 when it peaked at 8.26%. After 2016-17, the growth rate began its downward spiral and in the year 2019-20, the GDP growth rate reached a new low of 4.18%.

(10) Inventions and Innovations: Both inventions and innovations generate additional market demand. While inventions bring in entirely new products to the market, create a new need and generate new demand, innovations result in more convenient, and more useful and more efficient products. For instance, the advent of the personal computer has practically finished the typewriter manufacturing firms. Today fresh demand for typewriter is nil. The introduction of cable TV created the demand for multiple channel TV sets. As a result, TV sets with few channels and few functions become obsolete. The electronics industry is continuously innovating, thereby increasing the rate of obsolescence and simultaneously generating new demand for the innovated products.

(11) Climate: Market demand for certain products changes along with the change in the climate. While the demand for soft drinks changes or rises dramatically in the hot summers, the demand for wine increases during the winters. Seasonal products like the woolen wear and rain wears will have demand only during their respective seasons and almost nil demand when the season is over. The demand for tea increases during the winters and the demand for cotton fabrics go up during the summers. Climatic changes, does influence market demand.

(12) Advertisement: There is no perfect competition in reality. The food grain and vegetable market, the meat or fish market may be near perfect and hence they need not advertise. A large number of goods and services that we consume in the modern times are either produced by monopolistic or oligopolistic firms. Product differentiation, price discrimination and advertising are the distinguishing features of the firms operating under these market structures. Without advertising these firms will never grow and their products will never be known for their distinct identities. Advertising creates brand consciousness. It creates demand where it doesn't exist. It creates new needs when people actually may not need it. It creates brand loyalty and it shifts brand loyalty. Advertising keeps the capitalist markets in a continuous flux. Even a top line product will have very little or no demand, if the product is not advertised. Advertisement keeps the market demand growing and ever growing.

To this list of determinants, one may add the general state of medical health in a given economy. If a country or a great of the country is affected by bad health condition such as disease and epidemic, the demand for goods and services will be adversely affected. For instance, in the post-Corona times, the projected growth rate of GDP by Moody's Investor Service for India for the year 2020-21 is zero per cent. Other agencies such as Goldman Sachs, Fitch and ICRA has also projected a contraction of five per cent in the economy which means growth rate of GDP in 2020-21 is going to be negative. The only agency which has clearly stated that Indian growth rate will be minus five per cent is CRISIL. The Indian economy will be in the grip of recession and therefore there will be less demand.

2.2 DEMAND FUNCTION

The quantity demanded of a given commodity is not only an inverse function of the price but also a number of other factors. These factors are income of the consumer, prices of substitutes and complementary goods, taste and preference of the consumer, expected future prices and other factors. A simple demand function can be stated as $D_x = - f(P_x)$. It reads that quantity demanded of commodity 'x' (D_x) is a negative function of price (P). However, the demand function must factor in all possible demand determinants and therefore a more comprehensive demand function can be stated as follows:

$$D_x = f\,(P_x, P_y, P_c, P_s, Y, E, T, A, U)$$

Where D_x = Quantity demand of commodity 'x'
P_x = Price of commodity 'x'
P_s = Price of substitutes
P_c = Price of complementary goods
Y = Income of the consumer
E = Price expectation of the consumer
T = Taste and preference of the consumer
A = Advertisement expenditure
U = Other factors.

The impact of demand determinants on the quantity demanded of a given commodity is explained in the section on demand determinants.

The simple demand function Dx = – f (Px) does not reveal the change in the quantity demanded of commodity 'x' as a result of a percentage change in the price. It does not reveal the quantitative relationship between Dx and Px. It only reveals the functionally inverse relationship between Dx and Px. When you are aware of the quantitative relationship between independent variable Px and the dependent variable Dx, the demand function can be written in the form of an equation: Dx = a – bPx, where 'a' is a constant denoting the total demand when price is zero and 'b' is also a constant which refers to the change in the quantity demanded of commodity 'x' as a result of change in the price of 'x' ($\Delta D/\Delta P$).

The equation Dx = a – bPx represents a linear demand function. A demand function is said to be linear when it gives a linear demand curve. For instance, if we substitute the values of 'a' and 'b' with 200 and 10 respectively, the demand equation can be stated as:

$$Dx = 200 - 10\,Px$$

The above demand equation reveals that Dx = 200 when Px = zero and Dx = Zero when Px = Rs. 20/– per unit of 'x'. These are the two extreme ends of the demand curve and they are obtained as follows:

$$Px = 200 \div 10 = 20$$

$$\therefore Dx = 200 - 10(20) = \text{Zero}$$

i.e., when Px = Rs. 20/– Dx = Zero.

Similarly, when Px is Zero, Dx = 200 i.e. Dx = 200 – 10(0) = 200. The demand equation also reveals that for every one rupee rise in the Px, Dx will fall by 10 units i.e., when Px = Re. 1, Dx = 190 and this can be obtained as follows:

$$Dx = 200 - 10(1) = 190$$

In this way, between the two extreme ends of the demand curve, the different price and quantity relationships can be established. By substituting the numerical values of Px, a demand schedule can be prepared as follows:

Table 3.1: Demand Schedule

Px	Dx = 200 – 10 Px	Dx
0	200 – 10(0)	200
5	200 – 10(5)	150
10	200 – 10(10)	100
15	200 – 10(15)	50
20	200 – 10(20)	0

When the data obtained in the above table is plotted on a graph, a linear demand curve will be obtained as shown in figure 2.1:

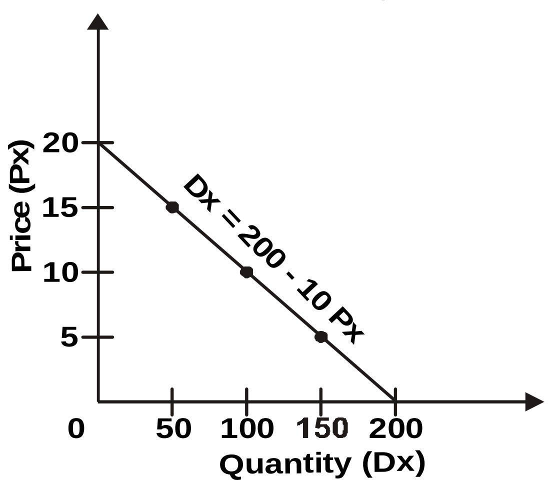

Fig. 2.1 Linear Demand Function

You will notice from the above figure that the linear demand curve has a constant slope (ΔPx/ΔDx). The price function can be obtained from the demand function as follows:

$$Px = \frac{a - Dx}{b}$$

or

$$Px = \frac{a}{b} - \frac{1}{b} Dx$$

Substituting the values of a, Dx and b in the above equations, the values of Px can be obtained as follows:

(1) Px $= \frac{200 - 200}{10} = \frac{0}{10} = 0$

or

Px $= \frac{200}{10} - \frac{1}{10}(200)$

$= 20 - 20 = 0$

(2) Px $= \frac{200 - 150}{10} = \frac{50}{10} = 5$

Or

Px $= \frac{200}{10} - \frac{1}{10}(150)$

$= 20 - 15 = 5$

(3) Px $= \frac{200 - 100}{10} = \frac{100}{10} = 10$

Or

Px $= \frac{200}{10} - \frac{1}{10}(100)$

$= 20 - 10 = 10$

(4) Px $= \frac{200 - 50}{10} = \frac{150}{10} = 15$

Or

Px $= \frac{200}{10} - \frac{1}{10}(50)$

$= 20 - 5 = 15$

(5) Px $= \frac{200 - 0}{10} = \frac{200}{10} = 20$

Or

Px $= \frac{200}{10} - \frac{1}{10}(0)$

$= \frac{200}{10} = 20$

If we assume $\frac{a}{b} = a_1$ and $\frac{1}{b} = b_1$, then the price function can be restated as:

$$Px = a_1 - b_1 Dx$$

Case study 1:

M/s. Pietermaritzburg Cookies conducted a survey to find out the daily demand for cookies and found that the average daily demand for cookies was given in the form of the following demand equation:

$$D_C = 10{,}000 - 50\ P_C$$

Questions:

(1) How many kilograms of cookies will be sold daily, if the price of cookies per kilogram is Rs. 120/–?

(2) What price should be fixed if M/s. Pietermaritzburg cookies want to sell 7500 kgs of cookies per day?

(3) What will be the price if the daily average demand for cookies is 5000 kilograms?

(4) At what price the daily average demand for cookies will be zero?

(5) Draw a demand curve on the basis of the demand equation:

$$D_C = 10{,}000 - 50\ P_C$$

Solution:

(1) At Rs. 120 per kg, the total demand for cookies will be:

$$D_C = 10{,}000 - 50(120) = 4000$$

Ans. 4000 kilograms per day.

(2) In order to sell 7500 kilogram of cookies per day, the price per kilogram can be obtained as follows:

$$P_C = \frac{a - D_C}{b}$$

$$\therefore\ P_C = \frac{10{,}000 - 7500}{50} = \frac{2500}{50} = 50$$

Thus at Rs. 50 per kilogram, demand for cookies will be 7500 kilograms per day.

(3) At an average daily demand of 5000 kilogram of cookies, the price of cookies per kilogram will be:

$$P_C = \frac{10{,}000 - 5000}{50} = \frac{5000}{50} = 100$$

Thus at Rs. 100 per kg, the demand for cookies will be 5000 kilograms per day.

(4) The average daily demand for cookies will be zero, when the price of cookies per kilogram is:

$$P_C = \frac{10{,}000 - 0}{50} = \text{Rs. } 200$$

Thus at Rs. 200 per kg, the demand for cookies will be zero.

(5) In order to draw a demand curve, a demand schedule on the basis of the given demand equation needs to be constructed. Let us therefore, construct a demand schedule.

(6)

Table 2.2: Demand Schedule

P_C	$D_C = 10{,}000 - 50\ P_C$	D_C
0	$10{,}000 - 50 \times 0$	10,000
50	$10{,}000 - 50 \times 50$	7,500
100	$10{,}000 - 50 \times 100$	5,000
150	$10{,}000 - 50 \times 150$	2,500
200	$10{,}000 - 50 \times 200$	0

When we plot this demand schedule on a graph, we obtain a linear demand curve as shown in figure 2.2:

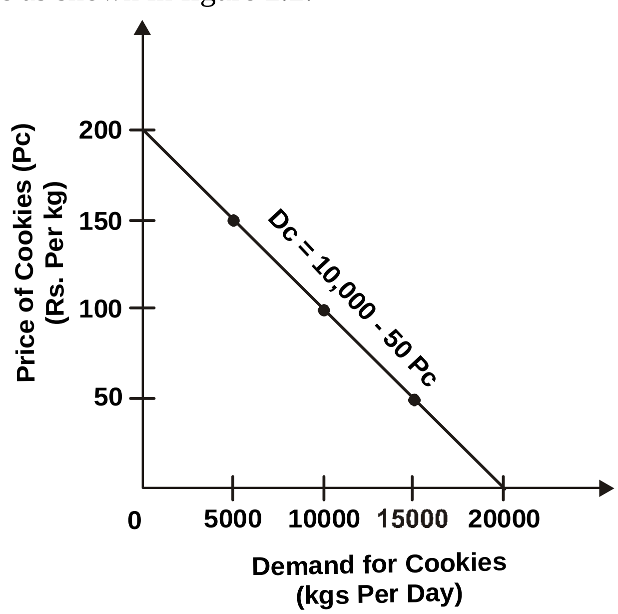

Fig. 2.2 Linear Demand Function

2.3 MARKET DEMAND FUNCTION

Market demand for a given product is the sum of individuals demand for the said product given the price, place and time. The market demand function can be stated as follows:

$M_{D_x} = f(P_x, Y, P_{sc}, T, A, N, U)$

where M_{D_x} = Market demand for commodity 'x'
P_x = Price of commodity 'x'
Y = Income
P_{sc} = Prices of substitutes and complementary goods
T = Tastes and preferences
A = Advertising outlay
N = The size of the population or the consumers
U = Other factors

In order to estimate the market demand for a given product, a linear market demand function is used. Such a linear market demand function is stated below:

$M_{D_x} = C + b_1P_x + b_2Y + b_3P_{sc} + b_4P_c + b_5T + b_6A + b_7N + b_8U$

Here, C is a constant term which is the intercept of the market demand curve on the x - axis. b_1, b_2, b_3, etc. are coefficients which show the quantitative relationship of the independent variables with the market demand. These coefficients show the extent of change in market demand as a result of a change in variables such as price, income, taste, population, etc. A simplified version of the market demand function can be stated as below:

$M_{D_x} = C + b_1P_x$

Here 'C' is the constant term which shows the intercept of the market demand curve on the x-axis and b_1 is the coefficient indicating the extent of change in the market demand for commodity 'x' as a result of change in the price of commodity 'x'. In this simplified version, we have assumed that only P_x is the variable factor and all other factors such as the income, tastes, habits, preference, population, advertising, etc are constant. In effect we can say that it is the short run market demand function although advertising expenditure does influences market demand irrespective of the time period. A market demand schedule is given in table 2.3 which shows the price and quantity demand of a given commodity at various prices.

Table 2.3: Market Demand Schedule.

Price of Potatoes Rs./kg	Quantity Demanded by Consumers (in kgs)			Market Demand (ΣABC)
	A	B	C	
1	2	3	4	5
12	1.00	0.75	0.25	2.00
10	1.50	1.00	0.50	3.00
08	2.00	1.25	0.75	4.00
06	2.50	1.50	1.00	5.00
04	3.00	2.50	1.50	6.00

We have assumed that there are three consumers in the market, namely, A, B and C. As can be seen that the market demand is only a summation of individual demand of A, B and C at the given prices of potatoes and the demand function is clearly negative i.e. the inverse relationship between prices and quantity demanded can be seen all over the table. Individual demand curves can be drawn for individuals A, B and C on the basis of available information in Table 3.3. In order to draw the market demand curve, we plot the data on prices given in column 1 and the data on market demand given in column '5' of Table 3.3. A market demand curve drawn on the basis of these data is given in figure 3.3 below.

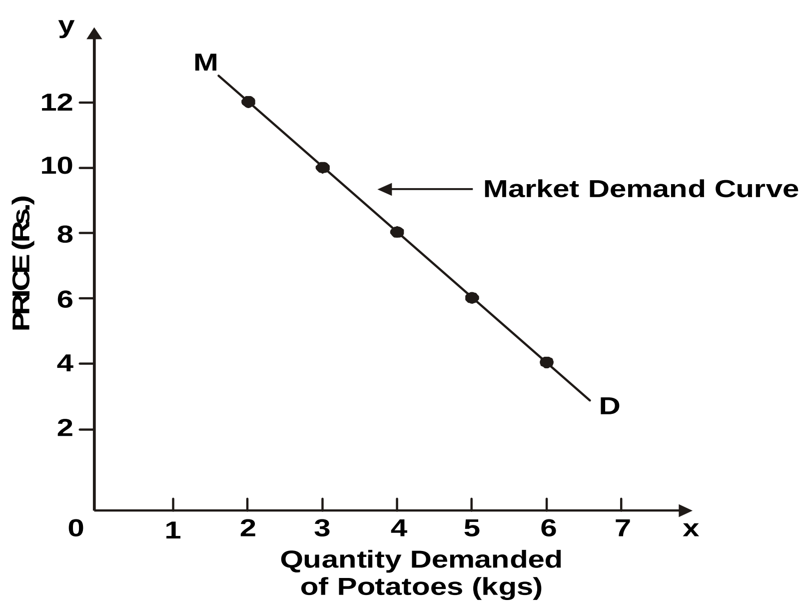

Fig. 2.3 Market Demand Curve

The market demand curve in Fig. 2.3 slopes downwards from left to right as in the case of individual demand curve in Fig.2.2.

Check your progress
1. bring out the relationship between demand and its determinants.
2. Explain the concept of demand function.
3. What do you understand by market demand function?

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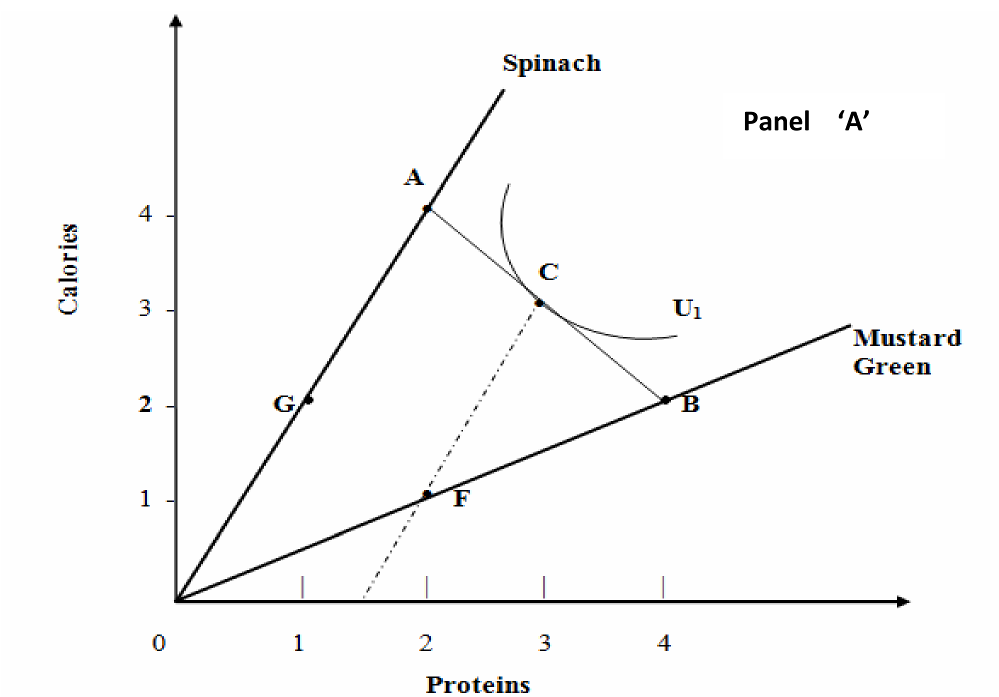
2.4 THE THEORY OF ATTRIBUTES

Kelvin Lancaster (Consumer Demand: A New Approach, New York, Columbia University Press, 1971) put forward the characteristic or attributes approach to consumer theory. Kelvin says that consumers demand a good because of the characteristics, properties and attributes of the good which give rise to utility. For example, a consumer does not demand eggplant for itself but because egg plants satisfy the demand for calories and proteins. Calories and proteins contained in a food product are the direct source of utility rather than the product itself. However, proteins and calories are provided by other vegetables such as spinach and cauliflower also. A commodity has more than one attribute and any given attribute is present in more than one commodity.

The consumer theory of attributes can be shown as in figure 2.4.



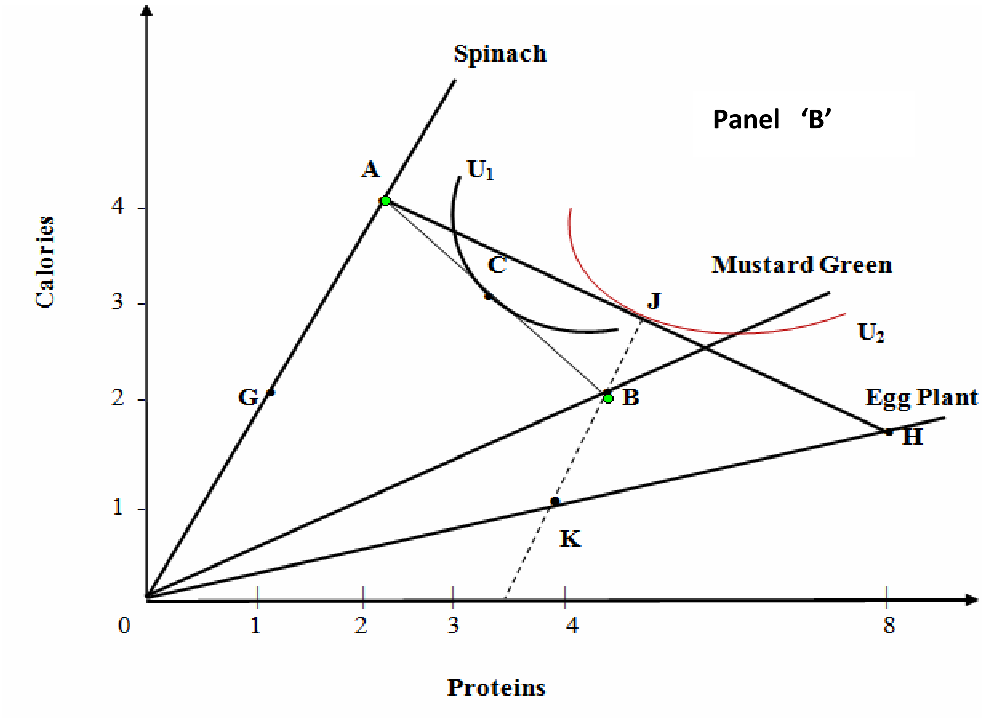


Figure 2.4 The Attribute Theory of Consumer Demand.

In Panel 'A' of Figure 2.4, the X-axis measures the attribute of protein and the Y-axis measures calories. Let us assume that the consumer's income is Rs.100 and that Rs.50 worth of Spinach provides the combination of protein and calories given by point A (A unit of spinach protein is assumed to provide four times calories as much as a unit of Mustard Green protein because the slope of the Spinach ray is four times larger than the Mustard Green ray) and Rs.50 worth of Mustard Green gives the combination at point B. The budget line is AB and Area OAB is called the feasible region and budget line AB is the efficiency frontier. The consumer can purchase any combination of protein and calories in AOB. In order to maximize utility, the consumer will choose a combination on budget line AB. If U_1 is the indifference curve in the attributes space, the consumer maximizes utility at point C where indifference curve U_1 is tangent to budget line AB. The consumer reaches point C by obtaining OF attributes by spending Rs.50 on Mustard Green and FC attributes by spending Rs.50 on Spinach. OF = ½ OB and OG = ½ OA. FC equals OG both in length and direction be noted.

In Panel B, egg-plant, a new commodity is introduced. Egg-plant has half as many calories per unit of protein as Mustard Green. If Rs.100 worth of egg-plant provides the combination of protein and calories given by point H, the budget line or efficiency frontier becomes AH. The consumer now maximizes utility at point J where indifference curve U_2 is tangent to budget line AH. The consumer reaches point J by obtaining OK attributes by spending Rs.50 on egg-plant and KJ = OG attributes by spending the balance Rs.50 on Spinach. The consumer ignores Mustard greens.

A fall in the price of a commodity is shown by a proportionate outward movement along the attributes ray of the commodity. An increase in income is shown by a proportionate outward shift of the entire budget line. A shift in the budget line allows the consumer to reach a higher indifference curve.

2.4.1 Advantages of the Attribute Theory

The Attributes theory of consumer behavior has many advantages over the traditional theory of demand. These advantages are as follows:

1. The substitution between goods can be explained in terms of some common attributes of the goods. For example, spinach and mustard greens are substitutes because they both have the common attribute of being protein rich. And if you are looking for proteins as an attribute then Egg-plant becomes a distant substitute because egg-plant is a fleshy vegetable whereas spinach and mustard green are leafy vegetables.

2. A new commodity can be easily introduced in the model by drawing a new ray from the origin reflecting the combination of the two attributes of the new commodity as shown by the introduction of egg-plant in Panel B. However, egg plants will be purchased only if its price is adequately low. If Rs.100 worth of egg-plant had provided only the combination of protein and calories given by point K on the attributes ray for egg-plant, the budget line would become ABK and the consumer would maximize utility by remaining at point C. The consumer would not purchase egg-plant in that case.

3. A change in the quality of the product can be shown by rotating the attributes ray clockwise. For example, the introduction of a new variety of spinach with less calories per unit of protein.

4. By comparing the price of two goods that are identical except for a particular attribute, the attributes theory allows for the estimation of the implicit price of the attribute. For example, by comparing the prices of identical houses with differences in attributes such as away from the railway station and the market place, peaceful neighborhood with good schools, parks and transportation facilities, the implicit price of each of these attributes can be estimated. Thus if the price of a house away from the railway station and the market place with the aforesaid attributes is 10% more than the price of another identical house that is near the railway station, then the house with the attribute of a peaceful neighborhood and other facilities is worth 10% of the price of the house that is around the railway station.

The attributes theory of consumer behavior cannot measure attributes such as taste and style which are subjective in nature. The theory cannot measure the attributes of services. However, the attributes approach to consumer behavior is useful because it allows for the implicit measure of the different attributes of a commodity. (Reference: p103-105, Ch.4 – Consumer Behavior and Individual Demand, Principles of Microeconomics, 5th edition, Dominick Salvatore, Oxford International Student Edition).

2.5 SNOB, BANDWAGON AND VEBLEN EFFECTS AND DEMAND FUNCTION

The market demand curve for a commodity shows the various quantities of the commodity demanded in the market per unit of time at various alternative prices while other factors determining demand remains constant. The market demand curve is the horizontal summation of the individual demand curves only if the consumptions decisions of individual consumers are independent i.e. their decisions are not influenced by network externalities. Network externalities may be negative or positive. If the network externality is negative, consumers will demand less at the given price and the demand curve will become steeper. In case of positive network externality, the consumers will buy more of a commodity at the given price and the demand curve will become flatter. The effects caused by network externalities are classified into snob, bandwagon and Veblen effects.

1. **Bandwagon Effect.** Sometimes people demand a commodity because others are buying it. In order to keep with the consumer trends or fashion or because the commodity is more useful, more and more consumers buy the given product. As a result, the demand for the commodity rises at the given price. This is known as Bandwagon Effect or positive network externality. Due to the bandwagon effect, the market demand curve becomes flatter or more elastic.

2. **Veblen Effect.** Prof. Thorstein Veblen found that expensive goods have prestige value and hence their consumption increases along with the rise in price and vice-versa. Conspicuous or remarkable consumption is an exception to the law of demand. There are categories of people who do not like to be associated with cheap goods and services. Such people are believed to be indulging in conspicuous consumption. For instance, goods like precious stones and haute couture have a Veblen effect and are believed to be ostentatious. The demand curve for such goods is also steeper or less elastic.

3. **Snob Effect.** When consumers seek to be different and exclusive by demanding less of a commodity as more people consume it, the snob effect occurs. Snob effect is due to a negative network externality. The demand curve becomes steeper or less elastic.

A change in the future price expectations will affect the demand curve. For example, if future prices are expected to fall, less will be demanded at the current price and the market demand curve will shift to the left. Conversely, if future prices are expected to rise, more will be demanded at the current price and the market demand curve will shift to the right.

According to Dominick Salvatore, network-externalities do not make the demand curve positive sloping because there is no empirical evidence to the belief that snob, bandwagon and Veblen effects could lead the market demand curve to have a positive slope.

Check your progress:

1. Who advocated the Theory of Attributes?
2. What are the advantages of the Theory of Attributes?
3. Mention the effects caused by network externalities.

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2.6 THE LAW OF SUPPLY

Supply refers to the quantities of a commodity which the seller is willing and able to provide at different prices during a given period of time, other things remaining constant. Supply of a commodity is a direct function of its price. Ceteris paribus, higher the price, higher will be the quantity supplied and vice versa. This is known as the law of supply. It is based on the assumption that except price, all other supply determining factors such as cost of production, state of technology, production capacity, government policies, price level, prices of related goods etc remain constant. The law of supply can be explained in terms of individual and market supply curves. Both individual and market supply can be explained with individual and market supply schedules and the data in these schedules can be plotted on a graph to obtain individual and market supply curves. A hypothetical individual supply schedule is given in Table 2.4 and the individual seller's supply curve is shown in Figure 2.5.

Table 2.4

A Hypothetical Individual Supply Schedule for Bananas.

Price per Dozen (INR)	Quantity Supplied (Dozens/day)
10	10
15	20
20	30
25	40

The quantity of bananas supplied per day is directly related with the price. Higher the price of bananas, higher will be the quantity of bananas supplied by the individual seller. The individual seller is willing to supply more at a higher price because the cost of producing the marginal unit increases after a point. The law of diminishing marginal returns operate to increase the cost of production after a point and hence the operation of the law of supply. The law of supply states that, 'other things remaining constant, the quantity supplied of a commodity will be greater at a higher price and vice versa'. The individual supply curve drawn by using the data from Table 2.4 will have an upward or positive slope. The supply curve will slope from left to right in the upward direction. This is shown in Figure 2.5. The market supply curve is the sum of individual supply curves. Let us assume that there are three banana sellers in the market and given the prices these three sellers would be supplying various quantities of bananas to the market.

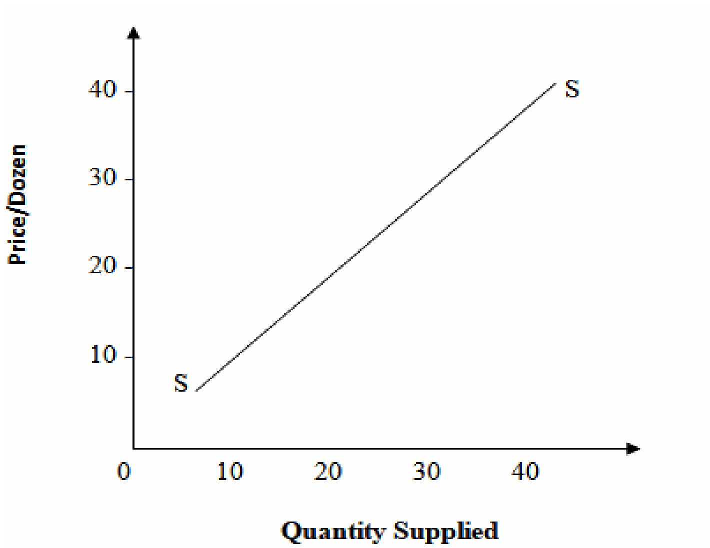


Fig 2.5 – Individual Supply Curve.

A hypothetical market supply schedule is given in Table 2.5.

Table 2.5
A Hypothetical Market Supply Schedule for Bananas.

Price per Dozen (INR)	Quantity Supplied (Dozens/day)			Market Supply
	A	B	C	MS = A+B+C
10	10	8	7	25
20	20	16	14	50
30	30	24	21	75
40	40	32	28	100

Based on the data given in Table 2.5 above, the market supply schedule is drawn in Figure 2.6.

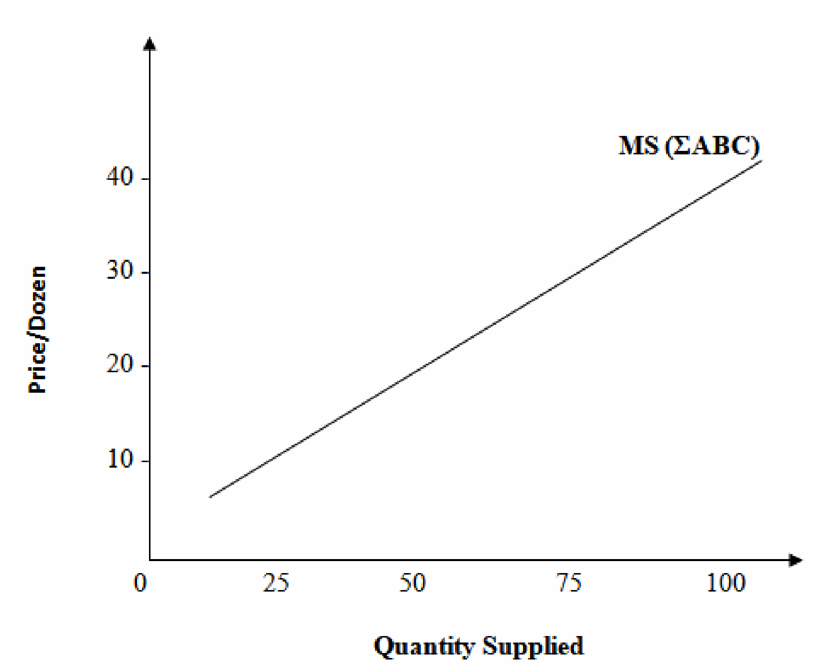


Fig.2.6 –Market Supply Curve.

Given the prices mentioned in Table 2.5, suppliers A, B and C supply various quantities of bananas according to their willingness and capacity to supply. The market supply at each of these prices is the sum of quantities supplied by individual suppliers. Thus at a price of Rs.10 per dozen, the market supply is 25 dozens and as the price goes up, the market supply also goes up to 100 dozens at a maximum price of Rs.40 a dozen. The market supply curve is a horizontal summation of individual supply curves. The market supply curve is flatter than the individual supply curve because more of a quantity is supplied at the given price. The movement along the supply curve as a result of changes in price is also known as extension and contraction in supply. Thus with a rise in price, there is an extension in supply whereas with a fall in price, there is a contraction in supply.

The law of supply, however, will not operate under the following circumstances. These circumstances are also known as exceptions to the law of supply.

1. When sellers expect future prices to fall, the present supply of commodities will increase. Conversely, if sellers expect future prices to rise, they will reduce present supply in order to profit from higher future prices.

2. The supply of factor inputs such as labor may fall when the wage rate rises beyond a point and the labor supply curve may assume a backward slope. Labor being a human factor of production may value leisure more than work at higher wage rates and hence would be willing to sell a smaller quantity of labor at high wage rates. The backward bending supply curve is depicted in Fig.3.7 below. At W_0 wage rate, L_0 hours of labor is supplied. When the wage rate rises to W_1, the hours of labor supplied also rises to L_1. However, when the wage rate rises to W_2, the hours of labor supplied falls to L_2 which is less than L_1 hours of labor supplied at a lower wage rate W_1. Note point 'b' as the point of inflexion on the labor supply curve SL. After point 'b', the labor supply curve SL assumes a backward slope indicating that any rise in wage rates after W_1 will lead to a fall in hours of labor supplied.

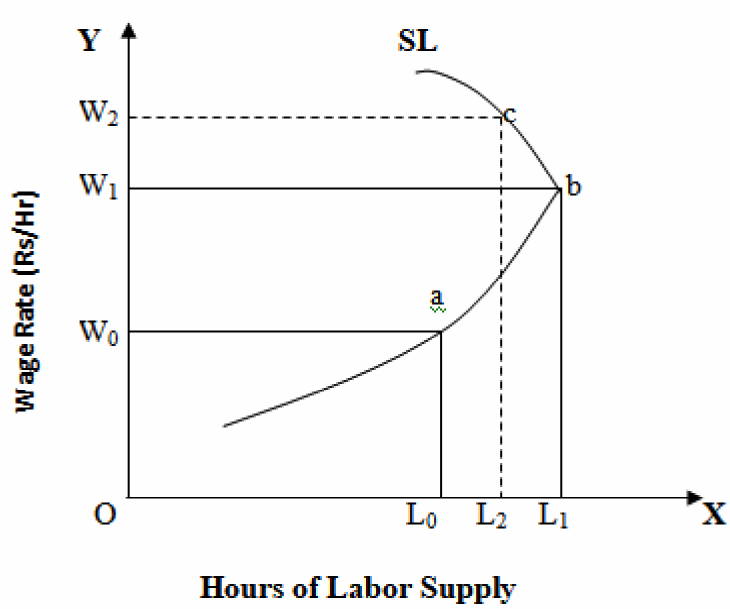


Fig.2.7 – Backward Bending Labor Supply Curve.

2.7 INCREASE AND DECREASE IN SUPPLY

A movement along the supply indicates rise and fall in the quantity supplied as a result of change in price. Price remaining constant, when other supply determining factors change, there is either an increase or a decrease in supply and as a result, the supply curve changes its position. Thus with an increase in supply, the supply curve will shift to the right and with a decrease in supply, the supply curve will shift to the left. The shifts in the supply curve are shown in Figure 2.8.

In Fig.2.8, the original supply curve S_0 shows that at price P_0, the quantity supplied is Q_0. When there is a positive change in the supply determining factors other than price, the supply curve shifts to the right and a larger quantity Q_1 is supplied at the original price P_0. However, when there is a negative change in the supply determining factors other than the price, the supply curve shifts to the left and a lesser quantity Q_2 is supplied at the original price P_0. Thus, a horizontal shift of the supply curve to the right indicates that a larger quantity of goods will be supplied at the original price, whereas a horizontal shift to the left indicates that a lesser quantity will be supplied at the same price.

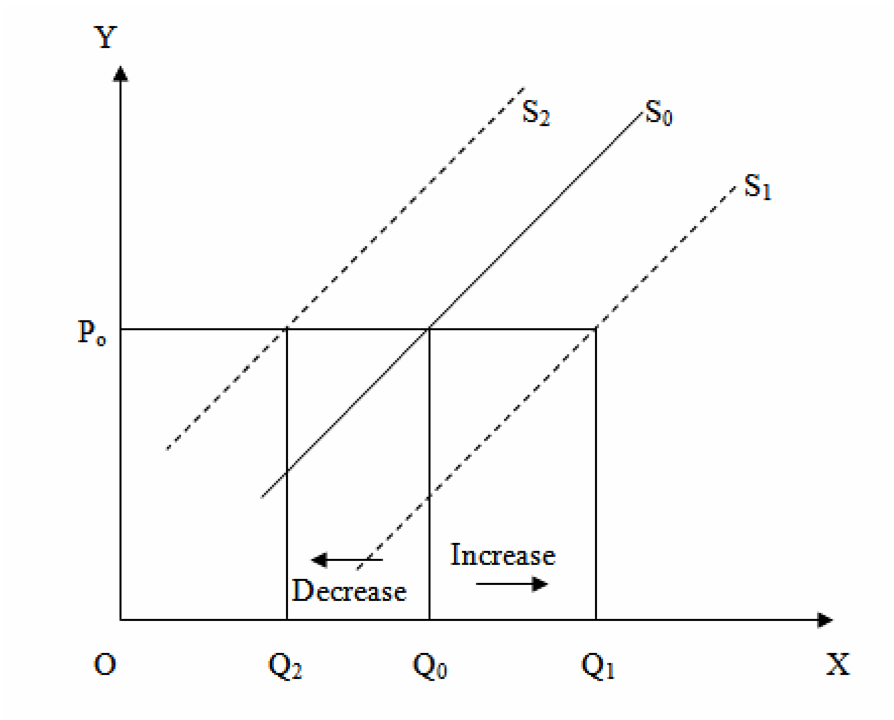


Fig.2.8 – Increase and Decrease in Supply.

2.8 VERTICAL AND HORIZONTAL SHIFTS IN THE SUPPLY CURVE

When the supply curve shifts its position, it also indicates that the firm would be willing to supply the same quantity at a higher price or a lower price. For instance, when the supply curve shifts to the left, the firm would be willing to supply the original quantity at a higher price or a lower quantity at the same price. A horizontal shift to the left would indicate that a lower quantity is being supplied at the same price, whereas a vertical upward shift would indicate that the same quantity would be supplied at a higher price. Conversely, when the supply curve shifts to the right, the firms would be willing to supply the original quantity at a lower price or a larger quantity at the same price. A horizontal shift to the right would indicate that the firms would be willing to supply a larger quantity at the same price, whereas a vertical downward shift would indicate that the firms would be willing to supply the same quantity at a lower price. This is shown in Figures 2.9 and 2.10. Figure 2.9 indicates that when the supply curve shifts to the left, the firm is willing to sell the same quantity at a higher price P_1 or a lesser quantity Q_1 at the original price P_0. Conversely, when the supply curve shifts to the right, the firm is willing to supply the same quantity at a lower price P_1 or a larger quantity Q_1 at the original price P_0.

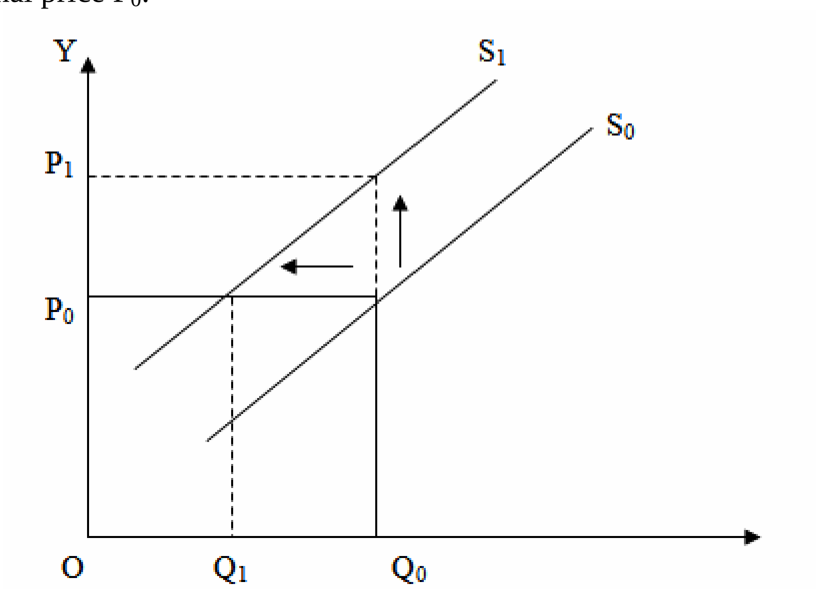


Fig.2.9 –Horizontal Shift to the left and Vertical Upward shift in the Supply Curve.

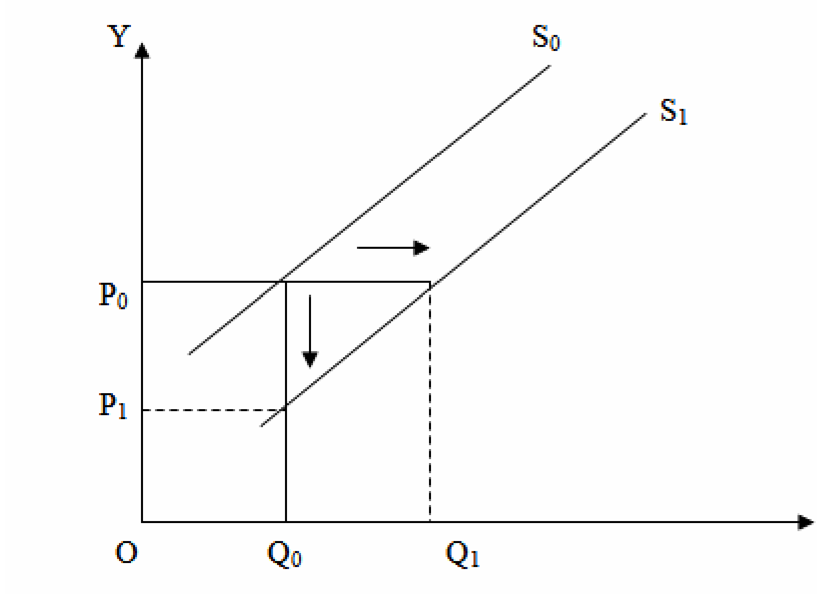


Fig.2.10 –Horizontal Shift to the Right and Vertical Downward Shift in the Supply Curve.

2.9 ELASTICITY OF SUPPLY

Elasticity of supply refers to the responsiveness of quantity supplied of a commodity to a change in supply determinant. The Price Elasticity of Supply can be defined as a percentage change in the quantity supplied of a commodity as a result of percentage change in the price of the commodity. Symbolically, the price elasticity of supply can be stated as follows:

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

The co-efficient of price elasticity of supply can be derived with the help of the following formula. This formula measures point price elasticity of supply. The co-efficient of price elasticity denotes only small or marginal changes. It thus measures elasticity at a point on the supply curve.

$$PES = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{OP} \times \frac{P}{Q} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

Where Q = Original quantity supplied,

P = Original price,

ΔQ = Change in quantity supplied ($Q_2 - Q_1$), and

ΔP = Change in price ($P_2 - P_1$)

The price elasticity of supply is a numerical measure of the responsiveness of the quantity supplied of given product ‘X’ to a change in price of product ‘X’. It is the measure of the way quantity supplied reacts to a change in price. For instance, if, in response to a 15% rise in the price of a good, the quantity supplied increases by 15%, the price elasticity of supply would be 15%/15% = 1. When there is a relatively *inelastic* supply for the good the coefficient is low. For example, if, in response to a 10% rise in the price of a good, the quantity supplied increases by 5%, the price elasticity of supply would be 5%/10% = 0.5. When supply is highly *elastic*, the coefficient is high. For instance, if, in response to a 10% rise in the price of a good, the quantity supplied increases by 20 per cent, the price elasticity of supply would be 20%/10% = 2. Supply is normally more elastic in the long run than in the short run for produced goods. As spare capacity and more capital equipment can be utilized the supply can be increased, whereas in the short run only labor can be increased. Goods that have no labor component and are not produced cannot be expanded. Such goods are said to be "fixed" in supply and do not respond to price changes. The quantity of goods supplied can, in the short term, be different from the amount produced, as manufacturers will have stocks which they can build up or run down.

The determinants of the price elasticity of supply are as follows:

1. The existence of the naturally occurring raw materials needed for production. Greater the availability of naturally occurring raw materials, higher will be the elasticity of supply and vice versa. Firms would be able to respond to rise in prices by quickly increasing the production and hence the supply of commodities. Thus countries and regions with abundant supply of naturally occurring raw materials will have a relatively elastic supply curve and those countries and regions with relatively less natural resources will have a relatively inelastic supply curve.

2. The length of the production process or the production time required to produce commodities. The production time required for producing consumer goods is relatively lesser than producer or capital goods. Thus consumer goods industry will be able to respond more quickly to higher prices than capital goods industry. Similarly, perishable goods will have inelastic supply because they cannot be produced on a large scale and stored for a longer time, whereas durable goods can be produced on a large scale and also stored. Since supply is a part of the stock, greater the stock, greater will be the responsiveness of supply to a change in price. The supply curve for perishable goods will be relatively inelastic and for durable goods, it will be relatively elastic.

3. The production spare capacity or excess capacity in the industry. The more the spare capacity there is in an industry, the easier it should be to increase output if the price goes up. Thus, if there is more excess capacity, the elasticity of supply would be high. In the absence of

excess capacity and if the firms in an industry are operating at their full capacity, the price elasticity of supply would be zero and the supply curve will assume a vertical slope.

4. The mobility of factors of production also determines the elasticity of supply. If factors of production such as labor, capital and enterprise are perfectly mobile between the industries, the elasticity of supply would be higher. If factor inputs are relatively less mobile, the price elasticity of supply would be low. Further, the time required for factor inputs to move from one industry to the other will also influence the elasticity of supply. Lesser the time required for factor inputs to move from one industry to the other, greater will be the elasticity of supply and vice versa.

5. The storage capacity of producers and traders will influence the price elasticity of supply. If they have more goods in stock, they will be able to respond to a change in price more quickly.

2.10 TYPES OF PRICE ELASTICITY OF SUPPLY

The numerical co-efficient of price elasticity of supply is between zero and infinity. Thus there can be five possibilities of price elasticity, namely PES = 1, PES< 1, PES > 1, PES = 0 and PES = ∞. These five values of co-efficient assume the following five types of price elasticity. Normally, supply curves have positive slopes and hence supply elasticity is normally positive.

1. Perfectly elastic supply (PES = ∞).
2. Perfectly inelastic supply (PES = 0).
3. Unitary elastic supply (PES = 1).
4. Relatively elastic supply (PES > 1).
5. Relatively inelastic supply (PES < 1).

1. Perfectly Elastic or Infinitely Elastic Supply

When supply is infinite or unlimited at the given price, it is said to be perfectly elastic or infinitely elastic supply. The numerical co-efficient of perfectly elastic supply is infinity (PES = ∞). In this case, the supply curve is a horizontal straight line as in shown in figure 2.11(a). Such a supply curve implies that with a small change in the price, the quantity supplied will be infinite. Perfectly elastic supply is a theoretical extremity.

2. Perfectly Inelastic Supply

Supply is said to be perfectly inelastic when changes in price has a zero impact or influence on the quantity supplied i.e. the quantity supplied remains constant irrespective of the rise or fall in prices. Hence, the co-efficient of perfectly inelastic supply is zero (PES = 0). In this case, the supply curve is a vertical straight line indicating constant supply as shown in fig. 3.11(b). Perfectly inelastic supply is also a theoretical extremity.

3. Unitary Elastic Supply

When the change in quantity supplied is equal to the change in price, supply is said to be unitary elastic. The numerical co-efficient of unitary elastic supply is one (PES = 1). In this case, the supply curve is a normal positive sloping one indicating proportionate or equal relationship between price and quantity supplied as shown in figure 2.11(c).

4. Relatively Elastic Supply

When change in quantity supplied is greater than the change in price, in percentage terms, supply is said to be relatively elastic. The numerical value of relatively elastic supply is greater than unity (PES > 1) and the supply curve is gradually sloping upwards as shown in figure 2.11(d).

5.Relatively Inelastic Supply

When percentage change in the quantity supplied of a commodity is less than the percentage change in price, supply is said to be relatively inelastic. The numerical co-efficient relatively inelastic supply is less than one (PES < 1). In this case, the supply curve is steeply sloping upwards as shown in fig. 2.11(e).

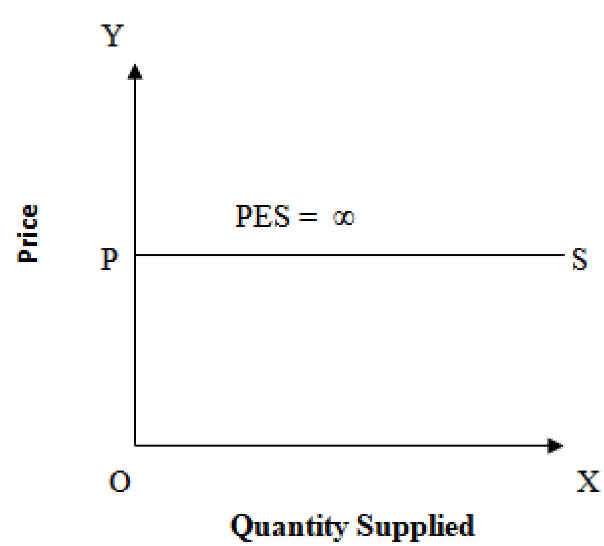


Fig.2.11 (a) Perfectly Elastic Supply.

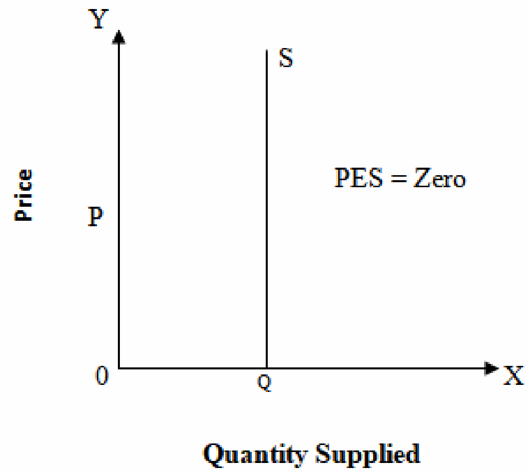


Fig.2.11 (b) Perfectly inelastic Supply.

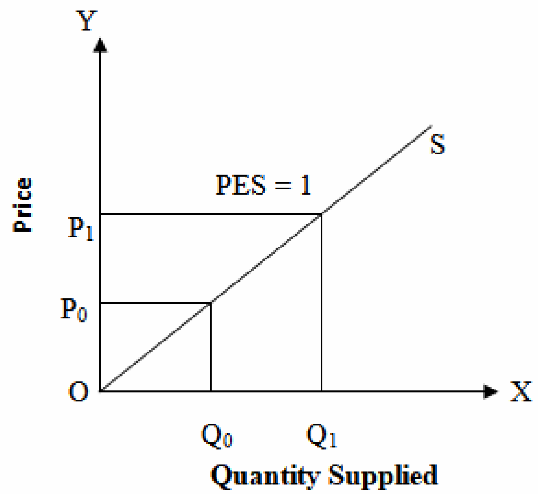


Fig.2.11 (c) Unitary Elastic Supply.

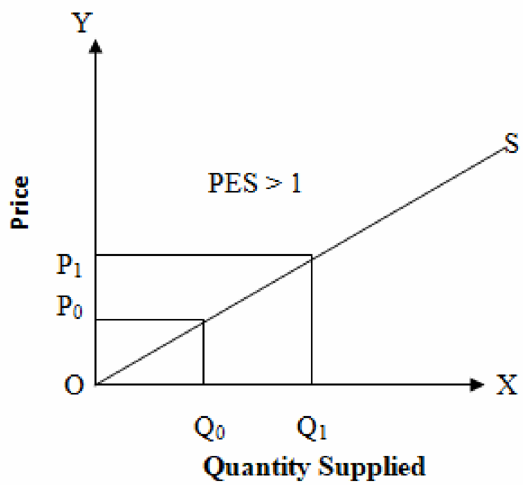


Fig.2.11 (d) Relatively Elastic Supply

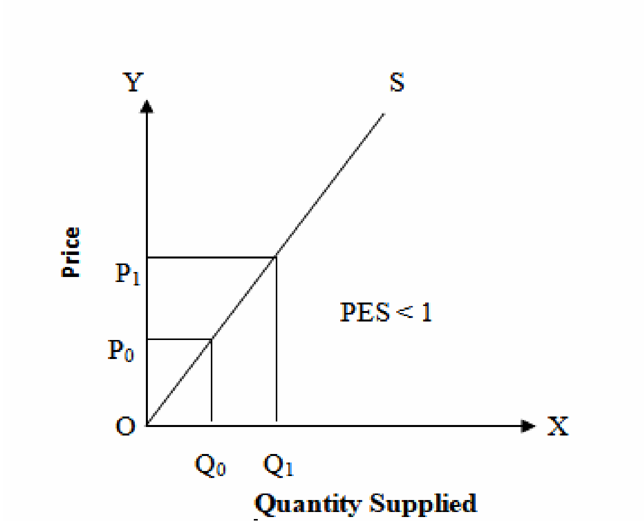


Fig.2.11 (e) Relatively inelastic Supply.

Price elasticity of supply, the coefficients of price elasticity of supply and impact on supply is given in Table 2.6.

Table 2.6 – PES, Coefficients of PES & Impact on Supply.

SNo	Price Elasticity of Supply	Coefficient of PES	Impact on Supply
1.	Perfectly elastic supply.	PES = α	At the given price, an infinite quantity is available for sale. However, with a small fall in the price, the quantity supplied is zero. The supply curve assumes a horizontal slope.
2.	Perfectly Inelastic Supply.	PES = 0	There is no change in the quantity supplied irrespective of the changes in price. Rise and fall in price has zero impact on the quantity supplied. The supply curve assumes a vertical slope.
3.	Relatively Elastic Supply.	PES > 1 < α	Percentage change in the quantity sold by the sellers is greater than percentage change in price. The supply curve assumes a flat slope.
4.	Relatively Inelastic Supply.	PES < 1 > 0	Percentage change in the quantity sold by the sellers is less than percentage change in price. The supply curve assumes a steep slope.

5.	Unitary Elastic Supply.	PES = 1	With a change in price, the sellers make a proportionate change in the quantity supplied. The supply curve is drawn at 45^o angle with a slope of one.

2.11 DETERMINANTS OF SUPPLY

The general determinants of supply are as follows:

1. **Price of the Commodity.** Ceteris paribus, higher the price of a commodity, higher will be the quantity supplied of that commodity. Supply and price are directly related to each other. A higher quantity is supplied at a higher price because the marginal cost of supplying a larger quantity increases and the total profits of the supplier also increase. The seller is motivated by profits and higher prices means higher profits to the seller.

2. **Prices of related Commodities.** Given the rise in the prices of related goods, the supplier will shift his production from a low price commodity to a high price commodity. Thus if prices of plasma television sets rise due to change in consumer preferences, the electronic goods producer will produce more of plasma television sets than the space consuming and less elegant looking ordinary television sets. The demand for cars is ever increasing in the Indian automobile market, particularly, in the small car segment. The launch of TATA Motors' 'Nano', the lowest price small car has already induced other car manufacturers to also launch their respective lowest priced small cars.

3. **Prices of Factor Inputs.** A rise in the price of a given factor input will bring about a change in the relative prices of factor inputs such as land, labor, capital and enterprise and will lead to a change in the relative use of factor inputs. A producer will substitute more of a factor whose price is relatively lower than the one whose price is relatively higher. For instance, if labor prices are going up relative to capital, a producer may shift to capital intensive lines of production and hence the change in supply of different goods. However, given the rise in the prices of factor inputs, the quantity supplied of a commodity will fall as the cost of production goes up.

4. **State of Technology.** Technological change, innovations and inventions brings about a change in the supply of various goods and services. Technological changes reduce the amount of inputs needed to produce a given quantity of output. The number of automobiles produced on a given day in an automobile factory is far much greater than what used to be produced in yester years.

On line banking services, helps the banks to reduce their operational cost. The internet and electronic mail has replaced the traditional method of written communication. The supply of letter writing material such as plain paper, post cards, inland letters, envelopes, telegraphic services etc has to fall as a result of change in technology. The cellular phone has become an ICE box because it can be used for information, communication and entertainment and hence has clearly replaced the traditional telephone instrument, radio and the portable music player. The relative prices of electronic products have fallen due to rapid change in technology and hence there has been a tremendous increase in the supply of electronic goods. Technological change, inventions and innovations increases the use of the product and reduces the cost of production. From single use product to multiple use product and from a high price product to a low price product is the result of technological change, inventions and innovations.

5. **Objective of the Firm.** The supply of a commodity is influenced by the objective of the firm. If the objective of the firm is maximizing sales, the firm may trade off some profits to achieve larger sales and hence the supply would be higher than when profit maximization is the objective.

6. **Nature of the Market.** If the market is perfectly competitive, the quantity supplied of a commodity will increase with more firms joining the industry. Similarly, the quantity supplied will also increase if the market is monopolistic. However, in oligopoly markets, with the number of firms more or less fixed, there may not be any change in supply.

7. **Government Policy.** Taxes and subsidies influence the supply of a commodity. While taxes increase the prices of the commodity in the hands of a consumer, subsidies do the opposite. Imposition of an indirect tax such as sales tax and excise duty on domestically produced goods will raise the price of a commodity and hence the supply will fall. Conversely, reduction or elimination of custom duties and other indirect taxes will lead to lower prices and increase in the supply of goods and services. Further, subsidies will increase the supply of a commodity because its price in the hands of a consumer is reduced. Environmental and health issues determine the kind of technology that will be used to produce commodities. The government may impose rules to use environmental friendly technologies and hence the cost of production may go up. The government may either ban or may make rules to adequately educate the consumers of tobacco and tobacco related products about the ill-effects of tobacco consumption on health grounds. As a result, the supply of such commodities would either vanish or fall due to lower consumer demand. Minimum-wage legislation would increase the labor cost

and hence the supply of goods may fall. A change in the trade policy of the government would also influence supply. For instance, if custom duties are either eliminated or reduced, the supply will increase. After the adoption of the new economic policy in 1991, the Government of India has followed a free trade policy and hence the variety and quantity of imports have increased tremendously.

8. **Other Factors.** Other factors such as weather, market structure, expectations about future prices, infrastructural facilities also affect the supply of goods and services. Heavy rains may impede the supply of farm products to cities. Poor infrastructure may increase the supply time of a product. Monopoly markets will always supply less than what is demanded and competitive markets will always supply more than what is demanded. If suppliers expect future prices to rise, they may reduce the present supply in expectation of higher profits in future.

Check your progress:

1. State the Law of Supply.
2. Explain the exceptions to the Law of Supply.
3. Discuss increase and decrease in supply.
4. Discuss horizontal and vertical shift of supply curve.
5. Explain different types of elasticity of supply.
6. Mention various determinants of supply.

2.12 APPLICATIONS OF PED AND PES TO ECONOMIC ISSUES

1. PRICE ELASTICITY OF DEMAND

Price elasticity of demand is the responsiveness of demand for a commodity to the changes in its price. It is the ratio of percentage change in quantity demanded to a percentage change in price. Price elasticity of demand (e_p) can be stated as follows:

$$e_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

The co-efficient of price elasticity of demand can be derived with the help of the following formula.

$$e_p = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{OP} \times \frac{P}{Q} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

where Q = Original quantity demanded,
P = Original price,
ΔQ = Change in quantity demanded ($Q_2 - Q_1$), and
ΔP = Change in price ($P_2 - P_1$)

The price elasticity of demand is calculated without a minus sign because of the obvious inverse relationship between price and quantity demanded. It is therefore advised to ignore the negative sign either in the numerator or the denominator in the formula for price elasticity of demand. The formula given above measures point price elasticity of demand. The co-efficient of price elasticity denotes only small or marginal changes. It thus measures elasticity at a point on the demand curve.

MEASUREMENT OF PRICE ELASTICITY OF DEMAND

(1) Percentage of Ratio Method: Price elasticity of demand according to this method can be measured by dividing the percentage change in quantity demanded by percentage change in price. The formula for percentage method can be stated as follows:

Price Elasticity of demand =

$$\frac{\text{Percentage or proportional change in quantity demanded}}{\text{Percentage or proportional change in price}}$$

Algebraically, the formula for price elasticity of demand can be stated as follows:

$$e_p = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

where Q = Original quantity demanded.
P = Original price.
ΔQ = Change in quantity demanded ($Q_2 - Q_1$), and
ΔP = Change in price ($P_2 - P_2$).

Let us solve some hypothetical problems and find out the price elasticity of demand according to the percentage or ratio method. The problems are given in exercise 1.

Exercise No. 1: Find the price elasticity of demand for the following problem.

S. No.	**Original price Rs./kg**	**New price Rs./kg**	**Original quantity demanded of Apples per day (kgs)**	**New quantity demanded of Apples perday (kgs)**
1	100	15	100	70
2	100	12	80	60
3	100	80	50	60

Solution:

(1) In case of problem No. 1, the original price is Rs. 100 per kg of apples and the original quantity demanded is 150 kgs. When the price rises to Rs. 150 per kg, the quantity demanded falls to 70 kilo-gram.

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

$$= \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

Substituting the values for Q_1 Q_2 and P_1 P_2, we get

$$= \frac{70 - 100}{100 - 100} \times \frac{100}{100}$$

$$\text{i.e. } \frac{30}{50} \times \frac{100}{100} = \frac{3}{5} = 0.6$$

$$\therefore ep = 0.6$$

The price elasticity of demand is 0.6. Hence demand is relatively inelastic ($e_p < 1$). In this case, the percentage change in quantity demanded is less than the percentage change in price. You will notice that while the price rose by 50%, the demand fell only by 30%.

(2) In case of problem No. 2, the data pertaining to price and quantity is as follows:

$P_1 = 100, \quad P_2 = 120$

$Q_1 = 80, \quad Q_2 = 60$

By substituting the value of P_1 P_2 and Q_1 Q_2, we get,

$$\frac{60 - 80}{120 - 100} \times \frac{100}{80}$$

$$\frac{20}{20} \times \frac{100}{80} = \frac{5}{4} = 1.25$$

Then the co-efficient of price elasticity of demand is 1.25. In this case, percentage change in quantity demanded is greater than percentage change in price. Hence, the price elasticity of demand is greater than one (e_p>1). The percentage fall in quantity demanded is 25 percent and the percentage rise in price is 20 percent.

(3) In case of problem No. 3, the data pertaining to price and quantity is as follows:

P_1 = 100 P_2= 80

Q_1 = 50 Q_2= 60

Substituting the values of P_1 P_2 and Q_1 Q_2 we get,

$$\frac{60 - 50}{80 - 100} \times \frac{100}{50} = \frac{10}{20} \times \frac{100}{50} = \frac{5}{5} = 1$$

In this case, the co-efficient of price elasticity of demand is one or unity i.e., demand is unitary elastic. Demand is said to be unitary elastic where percentage change in quantity demanded is equal to percentage change in price. Hence, the percentage rise in quantity demand is 20 percent and the percentage fall in price is also 20 percent.

(2) ARC METHOD. The Arc method is used to measure price elasticity of demand when the changes in the price and quantity are substantially large and not infinitesimally small as in the case of measuring elasticity of demand at a point on the demand curve. The Arc method uses the average of the changes in the price and quantity demanded. The average price can be found by dividing the sum of the two prices by two i.e., $\frac{P_1 + P_2}{2}$ and the average quantity can be found by dividing the sum of the quantities by two i.e. $\frac{Q_1 + Q_2}{2}$ The Arc elasticity formula can therefore be stated as follows:

$$e_p = \frac{\Delta Q}{\frac{Q_1 + Q_2}{2}} \div \frac{\Delta P}{\frac{P_1 + P_2}{2}}$$

$$= \frac{\Delta Q}{Q_1 + Q_2} \times \frac{P_1 + P_2}{\Delta P}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P_1 + P_2}{Q_1 + Q_2}$$

Let us solve a numerical example by using the Arc method to find out the price elasticity of demand.

Example:

	Price (Rs.)		**Quantity Demanded (kgs)**
P_1	5.00	Q_1	250
P_2	10.00	Q_2	150

Let us state the Arc elasticity formula;

$$e_p = \frac{\Delta Q}{\frac{Q_1 + Q_2}{2}} \div \frac{\Delta P}{\frac{P_1 + P_2}{2}}$$

Here, $\Delta Q = 250 - 150 = 100$

$\Delta P = 10 - 5 = 5$

$$\text{Average price} = \frac{10 + 5}{2} = 7.5$$

$$\text{Average quantity} = \frac{250 + 150}{2} = 200$$

Substituting the value ΔQ, ΔP, Average Price (AP) and average quantity (AQ), we get

$$e_p = \frac{100}{200} \div \frac{5}{7.5}$$

$$\therefore = \frac{100}{200} \times \frac{7.5}{5} = \frac{1}{2} \times \frac{7.5}{5} = \frac{7.5}{10} = 0.75$$

Thus the price elasticity of demand is equal to 0.75 i.e. $e_p < 1$.

Alternatively, the co-efficient of price elasticity by the Arc method can be found by the formula.

$$e_p = \frac{\Delta Q}{\Delta P} \times \frac{P_1 + P_2}{Q_1 + Q_2}$$

By substituting the same values in the above formula, we get

$$e_p = \frac{100}{5} \times \frac{5 + 10}{250 + 150}$$

$$= \frac{100}{5} \times \frac{150}{400}$$

$$= \frac{3}{4} = 0.75 \; (e_p < 1)$$

2. CROSS ELASTICITY OF DEMAND

Cross price elasticity of demand deals with impact of change in the price of one commodity, say commodity ‘x’ on the quantity demanded of commodity ‘y’, where these goods are either complementary or substitute goods. The formula for cross price elasticity of demand can be stated as follows:

$$e_{xy} = \frac{\text{Percentage change in the quantity demanded of commodity 'x'}}{\text{Percentage change in the price of commodity 'y'}}$$

$$\text{i.e. } e_{xy} = \frac{\frac{\Delta Q_x}{Q_x} \times 100}{\frac{\Delta P_y}{P_y} \times 100}$$

$$= \frac{\Delta Q_x}{Q_x} \div \frac{\Delta P_y}{P_y}$$

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

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

where, e_{xy} stands for cross price elasticity of demand of commodity 'x' in relation to the price 'y'.

Q_x = Original quantity demanded of commodity 'x'.

ΔQ_x = Change in the quantity demanded of commodity 'x' i.e. ($Q_2 - Q_1$).

P_y = Original price of commodity 'y'.

ΔP_y = Change in the price of commodity 'y' i.e. ($P_2 - P_1$)

In case of substitute goods, the cross price elasticity of demand is positive. For instance, a rise in the price of mutton will lead to a rise in the demand for beef, price of beef remaining constant. A rise in the price of coffee will lead to rise in the demand for tea, price of tea remaining constant. A rise in the price of rice will lead to rise in the demand for wheat. In all these examples, the goods under consideration are substitutes. The demand for tea, beef and wheat rises because these goods have become relatively cheaper and mutton, coffee and rice have become relatively dearer or expensive. Before the rise in price, some of the people who consumed mutton, coffee and rice will now consume beef, tea and wheat. As a result, the demand for mutton, coffee and rice will fall and that of the demand for beef, tea and wheat will rise.

In the case of complementary or jointly demanded goods, the change in the quantity demanded of either of the goods takes place in the same direction. For instance, tea and sugar, cassette players and audio cassettes, car and petrol are all complementary goods. If the price of audio cassettes go up, the demand for both audio cassettes and cassette players will fall. Similarly, if the price of sugar in the Indian context goes up, the demand for tea as well as sugar will fall. Or if the price of petrol goes up substantially, the demand for cars as well as petrol will fall. Complementary goods thus, have negative cross price elasticity of demand.

The coefficient of cross price elasticity of demand varies from (+1) in case of perfect substitutes to (–1) in case of perfect complements. For example, fountain pen and ink are perfect complements, whereas fountain pen and ball point pen are perfect substitutes.

Let us find out the cross price elasticity of demand by solving the following problems.

(1) Let us assume that the original price of beef per kg is Rs. 50/– and the quantity demanded is 200 kgs. per day. Let us also assume that the price of mutton is Rs. 100/– per kg and the quantity demanded is 100 kgs. per day. Now when the price of mutton rises to Rs. 120/– per kg., the quantity demanded falls to 80 kgs. per day and the price of beef remaining constant, the quantity demanded rises to 220 kgs. per day.

Now let beef be commodity 'x' and mutton be commodity 'y'.

Here, P_{x1} = Rs. 50/– per kg.

Q_{x1} = 200 kgs/day.

P_{y1} = Rs. 100/– per kg.

Q_{y1} = 100 kgs/day.

when P_{y2} = Rs. 120/– per kg.

Q_{y2} = 80 kgs/day.

with P_x remaining constant.

Q_{x2} = 220 kgs/day.

Let us state the formula for cross price elasticity of demand.

$$e_{xy} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

Now let us substitute the given values in the above formula.

$$e_{xy} = \frac{Q_{x2} - Q_{x1}}{P_{y2} - P_{y1}} \times \frac{P_{y1}}{Q_{x1}}$$

$$= \frac{220 - 200}{120 - 100} \times \frac{100}{200}$$

$$= \frac{20}{20} \times \frac{100}{200} = \frac{1}{2} = 0.5$$

Thus, the coefficient of cross price elasticity of demand for beef is positive but less than one. Here e_{xy} = 0.5. Thus when the price of commodity 'y' i.e. mutton, increased by 20 percent, the quantity demanded of beef increased only by 10 percent i.e., the quantity demanded of commodity 'x' increased to the extent of 50 percent of the change in the price of commodity 'y'.

Alternatively,

$$e_{xy} = \frac{\% \Delta Q_x}{\% \Delta P_y} = \frac{10\%}{20\%} = 0.5$$

Hence (e_{xy} = 0.5)

In the Indian market, mutton and beef are not perfect substitutes and hence the cross price elasticity of demand for beef is positive but less than one.

(2) Let us find the cross price elasticity of demand in case of complementary goods such as tea and sugar in the India context. Let tea be commodity 'x' and sugar be commodity 'y' and let us assume the price quantity relationship to be as follows:

The original price of sugar is Rs. 15/– per kg and the original quantity demanded is 100 kgs of sugar per day. The original price of tea is Rs. 200/– per kg and the original quantity demanded is 100 kgs per day. Now when the price of sugar rises to Rs. 30/– per kg, the quantity demanded of sugar falls to 50 kgs per day. However, the price of tea remaining constant at Rs. 200/– per kg, the quantity demanded falls to 50 kgs per day. Now let tea be commodity 'x' and sugar be commodity 'y'.

Here, P_{x1} = Rs. 200/– per kg
Q_{x1} = 100 kgs per day.
P_{y1} = Rs. 15/– per kg.
Q_{y1} = 100 kgs/day.
when, P_{y2} = Rs. 30/– per kg.
Q_{y2} = 50 kgs per day.

However, P_x remaining constant at Rs. 200/– per kg, the quantity demanded of tea in Q_{x2} is only 50 kgs per day.

Let us state the formula for cross price elasticity of demand.

$$e_{xy} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

Now let us substitute the given values in the above formula:

$$e_{xy} = \frac{Q_{x2} - Q_{x1}}{P_{y2} - P_{y1}} \times \frac{P_{y1}}{Q_{x1}}$$

$$= \frac{50 - 100}{30 - 15} \times \frac{15}{100}$$

$$= \frac{-50}{15} \times \frac{15}{100} = \frac{-50}{100} = -0.5$$

Thus the coefficient for cross price elasticity of demand for tea is negative ($e_{xy} = -0.5$)

Thus we see that when price of sugar rises from Rs. 15/– to Rs. 30/– per kg, the demand for sugar as well as tea falls, although there is no change in the price of tea. Therefore, cross price elasticity of demand in case of complementary goods is negative. In our example; a hundred percent rise in the price of sugar has resulted in a fifty percent fall in the demand for both the goods 'x' and 'y'.

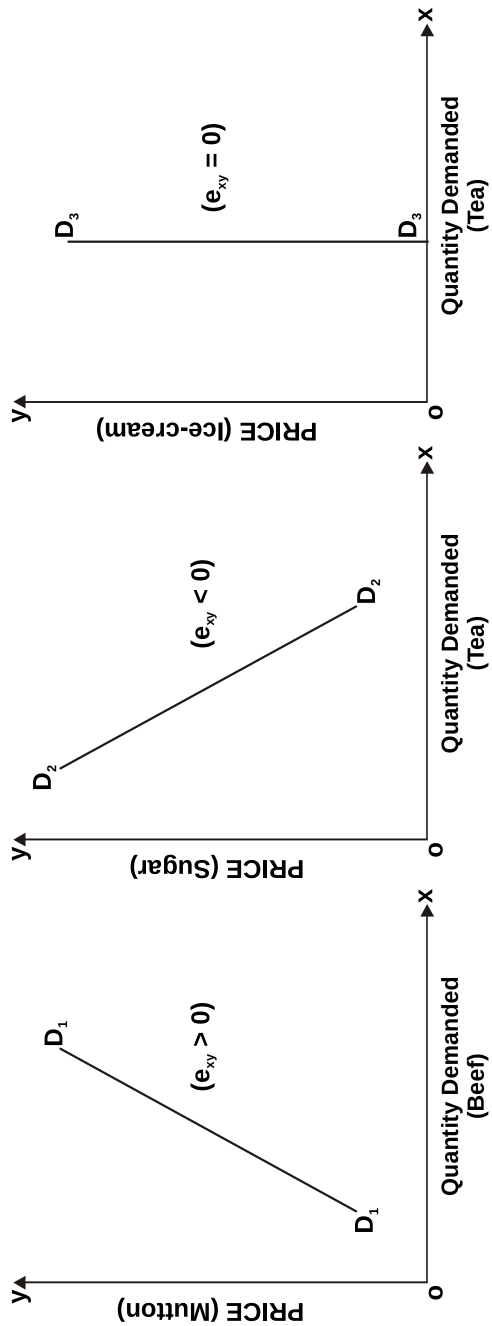


Fig. 2.12 Cross Price Elasticity of Demand

The cross price elasticity of demand in case of unrelated goods is equal to zero. It means that changes in the price of commodity ‘y’ will have no effect on the quantity demand of commodity ‘x’, both goods being unrelated. For instance, changes in the price of ice-cream will have no effect on the quantity demanded of tea. Thus when the impact on the quantity demanded of tea is zero, the cross price elasticity of demand is zero ($e_{xy} = 0$). The cross price elasticity of demand is diagrammatically represented in fig. 2.12 (a), (b) and (c) for substitutes, complementary and unrelated goods.

3. INCOME ELASTICITY OF DEMAND

Prices of the goods and services and the income of the consumer are the two most important objective factors that determine demand. Unlike prices, the relationship between quantity demanded and the level of income is direct and therefore. If we were to plot an income demand schedule, we will obtain an upward sloping or a positive sloping income demand curve. This positive relationship between income and demand can be algebraically expressed as under:

$$\frac{\Delta Qdx}{\Delta Y} > 0$$

A simple income demand function can be stated as Qdx = f(Y)

when Qdx = quantity demanded of commodity 'x'

Y = level of income.

It means, other demand determinants remaining constant, when income rises, quantity demanded also rises and when income falls quantity demand also falls. Income elasticity of demand measures the extent of rise or fall in demand as a result of change in income. The co-efficient of income elasticity of demand can be measured as follows:

$$e_y = \frac{\text{Percentage change in the quantity demanded}}{\text{Percentage change in income}}$$

$$\text{Symbolically } e_y = \frac{\Delta Q}{Q} \div \frac{Y}{\Delta Y} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

Where ΔQ = Change in the quantity demanded.

ΔY = Change in income.

Q = Original demand.

Y = Original income.

Alternatively, the income elasticity formula can be restated as:

$$e_y = \frac{\% \Delta Q}{\% \Delta Y}$$

where % ΔQ refers to percentage change in the quantity demanded, and % ΔY refers to percentage change in income.

Here % ΔQ can be obtained as

$$\frac{Q_2 - Q_1}{Q_1} \times 100, \text{ and}$$

% ΔY can be obtained as:

$$\frac{Y_2 - Y_1}{Y_1} \times 100$$

$$\text{Thus } e_y = \frac{\frac{Q_2 - Q_1}{Q_1} \times 100}{\frac{Y_2 - Y_1}{Y_1} \times 100} = \frac{\frac{\Delta Q}{Q_1}}{\frac{\Delta Y}{Y_1}} = \frac{\Delta Q}{\Delta Y} \times \frac{Y_1}{Q_1}$$

Let us take a numerical example and find out the income elasticity of demand.

Example 1:

Suppose a consumer's income is Rs. 5,000 per month and he purchases 5 kgs of Basmati rise per month. Now when his income rises to Rs. 6,000 per month, the quantity demanded of basmati rises to 7 kgs per month. The income elasticity of demand can be found as follows:

Let us state the formula for income elasticity of demand:

$$\frac{\Delta Q}{\Delta Y} \times \frac{Y_1}{Q_1}$$

In the given illustration,

Y_1 = Rs. 5,000 and Q_1 = 5 kgs.

Y_2 = Rs. 6,000 and Q_2 = 7 kgs.

Substituting these values in the given formula, we get:

$$\frac{7 - 5}{6{,}000 - 5{,}000} \times \frac{5{,}000}{5}$$

$$\frac{2}{1{,}000} \times \frac{5{,}000}{5} = \frac{10}{5} = 2$$

$$\therefore e_y = 2$$

The coefficient of income elasticity of demand is equal to 2 which indicate that the rise in demand for basmati rice is twice as much as the rise in income. In our example, while the income increased only by 20 percent, the demand for basmati rice rose by 40 percent. Using the formula:

$$e_y = \frac{\% \, \Delta Q}{\% \, \Delta Y}$$

$$\text{we get } e_y = \frac{40\ \%}{20\%} = 2$$

Check your progress:

1. What are the methods of measurement of Elasticity of demand?
2. Discuss Cross elasticity of demand.
3. Explain Income elasticity of demand.

2.13 ESTIMATION OF DEMAND: PROBLEMS AND APPLICATIONS.

Problem 1:

A telephone instrument manufacturing firm hires the services of an economist to determine the demand for the cordless instruments manufactured by it. The demand for the cordless instruments (Qx) is given in the form of the equation:

$$Qx = 12000 - 5000\ Px + 5\ I + 500\ Pc$$

where Px = Price of cordless phones.

I = Income per capita.

Pc = Price of substitute cordless phones manufactured by the competitors.

With this information, the firm wants to determine:

(1) The effect of a price increase on the total revenue.

(2) How sale of cordless phones would increase during a period of rising income.

(3) The probable impact, if competitors raise their prices.

The initial values of,

$$Px = \$5,\ I = \$10{,}000 \text{ and } Pc = \$6.$$

Solution:

(1) The effect of a price increase can be assessed by computing the point price elasticity of demand.

Substituting initial values:

$$Qx = 12000 + 5(10{,}000) + 500(6) + 5000\ Px$$

$$\therefore Qx = 65000 - 5000\ Px$$

i.e. 65000 - 5000(5) = 40,000.

At Px = \$5, quantity demanded of cordless phones is 40,000 units.

Using this data, the point price elasticity is:

$$ep = -5000 \times \frac{5}{40{,}000} = -0.625$$

Demand is therefore inelastic. Hence, raising the price would increase total revenue.

(2) The income elasticity determines whether a product is a necessity or a luxury. From the demand equation, the derivative

$$\frac{dQx}{dI} = 5$$

Thus income elasticity is:

$$em = 5 \times \frac{10{,}000}{40{,}000} = 1.25$$

Thus, em>1. The cordless phones are therefore perceived by the consumers as a luxury good. Thus as income increases, sales would increase more than proportionately.

The demand equation implies that:

$$\frac{dQx}{dPc} = 500$$

Thus the cross price elasticity of demand (cxy) is positive.

$$cxy = 500 \times \frac{6.00}{40{,}000} = 0.075$$

Hence a one percent increase in prices of other cordless phones would result in a 0.075 percent increase in demand for the phones manufactured by the firm under consideration.

Problem 2:

Everest Poultry Farm hires the services of an economist to determine the demand for eggs. The professional economist takes that the weekly demand for eggs will be the function of the following:

(a) Price of eggs.

(b) Consumer's annual aggregate income.

(c) Price of potatoes.

The demand for eggs (Q_E) is given in the form of the following equation:

$Q_E = 10{,}000 - 500\ P_E + 100\ I + 50\ P_P$…(1)

Where,

Q_E = Quantity of eggs demanded per week in dozens.

P_E = Price of eggs in Rupees per dozen.

I = Income of consumers in Rupees-crores per annum.

P_P = Price of potatoes per kilogram.

The demand equation given at (1) above reveals the following:

(a) The weekly demand for eggs is a function of price of eggs, consumers' aggregate income and the price of potatoes.

(b) A one rupee rise in the price of eggs results in a fall in demand for eggs by 500 Dozens per week.

(c) An increase of Rs. one crore in the annual income of the consumers results in increase in demand by 100 dozens per week.

(d) A one rupee increase in the price of potatoes increases demand for eggs by 50 Dozens per week.

The initial values of:

I = Rs. 100 crores.

P_P = Rs. 10 per kilogram.

Questions

(1) Draw a demand curve based on the demand equation.

(2) What will be the demand for eggs at various prices such as Rs. 40, Rs. 30, Rs. 20 and Rs. 10 per dozen?

(3) What will be the demand equation if the aggregate income of the consumers rises to Rs. 110 crores and the price of potatoes rises to Rs. 12 per kg.? Graphically show the shift in the demand curve as a result of changes in the values of 'I' and 'P_P'.

(4) What will be the demand equation if the price of potatoes goes up by Re. 1 with all other values remaining constant as in the original equation? Also state the quantity demanded of eggs when potatoes are sold at Rs. 11 per kg and eggs at Rs. 20 per dozen.

(5) Price of potatoes remaining constant at Rs. 10 per kg. and those of eggs at Rs. 20 per dozen, what will be the impact on the demand for eggs, if the aggregate income rises to Rs. 110 crores per annum?

Solution:

(1) Substituting the initial values of 'I' and 'P_P' in equation (1), we get:

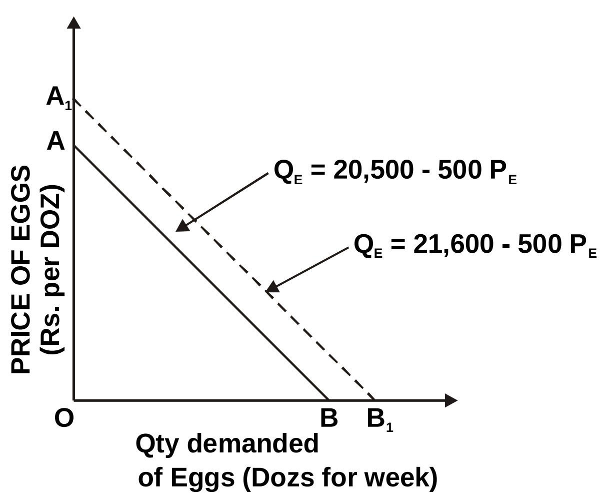
$Q_E = 10{,}000 - 500\ (P_E) + 100(100) + 50(10)$

$\therefore\ Q_E = 10{,}000 + 100(100) + 50(10) + 500\ P_E$

$\therefore\ Q_E = 10{,}000 + 10{,}000\ \ + 500 + 500\ P_E$

$\therefore\ Q_E = 20{,}500 - 500\ P_E$ … (2)

The demand equation at (2) above can be graphically shown as in figure 5.1 below.



Demand Curve and Shift in the Demand Curve

Point 'A' on the Y-axis in Fig. 1 reveals that when price of eggs is OA per dozen, the quantity demanded of eggs is zero dozens per week i.e., when price of eggs is Rs. 41 per dozen the quantity demanded is zero. (20,500 ÷ 500 = P_E i.e., Rs. 41). Similarly, when price of eggs is Rs. zero per dozen, the quantity demanded is 20,500 dozens per week. Between the two extreme ends of the demand curve AB, we have a series of points expressing the price-quantity relationship of eggs.

(2) The demand for eggs at various prices such as Rs. 40, 30, 20, 10 and Zero can be obtained as below:

(a) At Rs. 40 per dozen, the demand for eggs will be:

Q_{DE} = 20,500 - 500(40) = 500 Dozen per week.

(b) At Rs. 30 per dozen,

Q_{DE} = 20,500 - 500(30) = 5500 Dozens per week.

(c) At Rs. 20 per dozen,

Q_{DE} = 20,500 - 500(20) = 10,500 Dozens per week.

(d) At Rs. 10 per dozen,

Q_{DE} = 20,500 - 500(10) = 15,500 Dozen per week and

(e) At Rs. zero per dozen the demand for will be:

Q_{DE} = 20,500 - 500(0) = 20,500 dozens per week.

Note: The slope of the demand curve with reference to the price axis is - 500.

(3) If the aggregate income of the consumer rises to Rs. 110 crores per annum and price of potatoes goes up to Rs. 12 per kg. the demand equation will be as follows:

$$Q_E = 10{,}000 + 100(110) + 50(12) + 500\,P_E$$
$$\therefore\ Q_E = 10{,}000 + 11{,}000 + 600 + 500\,P_E$$
$$\therefore\ Q_E = 21{,}600 - 500\,P_E$$

As a result, at the changes in the values of 'I' and 'P_P', the demand curve will shift towards the right i.e., more of eggs will be demanded per week at the given prices. In Fig. 1 above, you will notice the demand curve AB have shifted towards the right to become A_1B_1. The demand equation Q_E = 21600 - 500 P_E shows that at Rs. 43.20 per dozen, the quantity demanded at eggs per week will be zero and at Rs. zero per dozen, the quantity demanded will be 21,600 dozen per week.

(4) If the price of potatoes goes up by Rs. one with all other values remaining constant, the quantity demanded of eggs per week will rise by 50 dozens. This can be obtained as follows:

$$Q_E = 10{,}000 + 100(100) + 50(11) + 500\,P_E$$
$$\therefore\ Q_E = 20{,}500 - 500\,P_E$$

Now let us find out the quantity demanded of eggs at Rs. 40 per dozen.

Q_E 20,550 - 500(40) = 550

Refer answer to question number two. When the price of potato was Rs. 10 per kg., the demand for eggs was 500 dozen per week. Thus one rupee rise in the price of potatoes results in the rise in demand for eggs by 50 dozens per week (550 - 500).

(5) If the aggregate income of the consumer goes up from Rs. 100 crores to Rs. 110. crores per annum, with all other values remaining constant, the quality demanded of eggs per week at Rs. 20 per dozen will be as follows:

Q_E = 10,000 + 100(110) + 50(10) + 500 P_E

$\therefore$ Q_E = 21,500 - 500 P_E

At Rs. 20 per dozen, the quantity demanded of eggs per week will be:

Q_E = 21,500 - 500(20) = 11,500

Note that when the aggregate income was Rs. 100 crores, the quantity demanded was 10,500 dozens per week at Rs. 20 per dozen. A one per cent rise in income would result in risk in demand for eggs by 100 dozens. Thus a 10 percent rise in income would result in rise in demand for eggs by 100 dozens (11,500 - 10,500). (Refer 2 (c)).

Problem 3:

Oriental Refrigerated Meat Products hires the services of an economist to determine the demand for mutton per week. The economist states that the demand for mutton will be the formation of the following:

(a) Price of mutton per kg.

(b) Consumer's annual aggregate income.

(c) Price of chicken per kilogram.

The economist stated the demand for mutton in the form of the following equation:

Q_M = 20,000 - 100 P_M + 100 I + 100 P_C

Where,

Q_M =Quantity demanded of mutton in kilogram per week.

P_M = Price of mutton in rupees per kg.

I = Aggregate Income of the consumers in rupees crores per annum.

P_C = Price of chicken in rupees per kilogram.

The initial values of 'I' and 'P_C' are Rs. 100 crores and Rs. 100 per kilogram.

Questions:

(1) Draw a demand curve based on the demand equation: $Q_M = 20{,}000 - 100\ P_M + 100\ I + 100\ P_C$ and state at what prices the quantity demanded of mutton will be zero and maximum.

(2) What will be the demand for mutton at various prices such as Rs. 300, Rs. 200 and Rs. 100 per kilogram?

(3) What will be the impact on demand for mutton, if the aggregate income of the consumers rises by 10 percent? Graphically show the shift in the demand curve along with the demand equation.

(4) If the price of chicken goes up by 10 percent, what will be the impact on the demand for mutton with price of mutton being Rs. 100 per kg. and the aggregate income being Rs. 110 crores.

(5) If the price of chicken falls by 10 percent with other values as in question number '4', what will be the impact on the demand for mutton. Also show the shift in the demand curve for mutton as a result of the rise in price of chicken.

Problem 4:

General Electrical Appliances Pvt. Ltd. hires an economist to determine the demand for toasters which it is planning to launch in the immediate future. The demand for toasters (Q_T) is given in the form of the following equation:

$$Q_T = 15{,}000 - 1000\ P_T + 100\ I + 100\ P_C$$

Where,

Q_T = the demand for electrical toasters

P_T = Price of electrical toasters

I = Income per capita per annum

P_C = Price of substitute electric toasters manufactured by the competitors.

The initial values of:

P_T = Rs. 175

I = Rs. 20,000

P_C = Rs. 200

Questions:

(1) The demand for electric toasters at the given price of Rs. 175 per piece.

(2) The point price elasticity of demand for electronic toasters of Rs. 175 per piece.

(3) If the per capita income (PCI) of the community rises by 10 percent, what will be the impact on the demand for toasters?

(4) At the given price of Rs. 175 per piece and PCI of Rs. 20,000, what is the income elasticity of demand?

(5) What will be the impact on demand for toasters if the price of the substitute goes up by 10 percent?

(6) What will be the cross price elasticity of demand for the electric toasters when the price of substitute is Rs. 210 per piece?

(7) Draw a demand curve on the basis of the initial equation and show the shift in the demand curve when the PCI rises.

2.14 MEASUREMENT OF ELASTICITY OF SUPPLY

The price elasticity of supply can be measured with the ratio method as shown in Figure 2.13. The price elasticity of supply at a point on the supply curve can be measured as follows:

$$\text{PES} = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{OP} \times \frac{P}{Q} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

Where $\Delta Q/\Delta P$ is the slope of the supply curve S_1 which is OB/BP and P/Q is equal to BP/OB. The elasticity of supply at point 'P' on the supply curve S_1 is OB/BP × BP/OB = 1 or Unity. The elasticity of supply at point 'P' is equal to one (PES = 1). On the supply curve S_2, the elasticity of supply at the same point 'P' is AB/BP × BP/OB =AB/OB < 1 or PES < 1. On supply curve S_3, the elasticity of supply at point 'P' is A_1B/BP × BP/OB = A_1B/OB > 1 (PES > 1).

It is clear that the price elasticity of supply on a given point on the supply curve depends upon the slope of the supply curve. Note that the supply curve S_3 has a relatively flatter slope, thereby showing relatively elastic supply. Recall that when supply is relatively elastic, percentage change in the quantity supplied is greater than the percentage change in price. Symbolically, the price elasticity of supply at point 'P' on supply curve S3 can be stated as follows:

$$\text{PES at point 'P' on } S_3 = \frac{\%\Delta Q}{\%\Delta P} > 1$$

S2 has a steeper slope and hence shows relatively inelastic supply. Symbolically, the price elasticity of supply at point 'P' on S_2 can be stated as follows:

$$\text{PES at point 'P' on } S_2 = \frac{\%\Delta Q}{\%\Delta P} < 1$$

S_1 has a constant slope with unitary elastic supply. The price elasticity of supply at point 'P' on the supply curve S_1 is equal to one. Symbolically, it can be stated as follows:

$$\text{PES at point 'P' on } S_1 = \frac{\%\Delta Q}{\%\Delta P} = 1$$

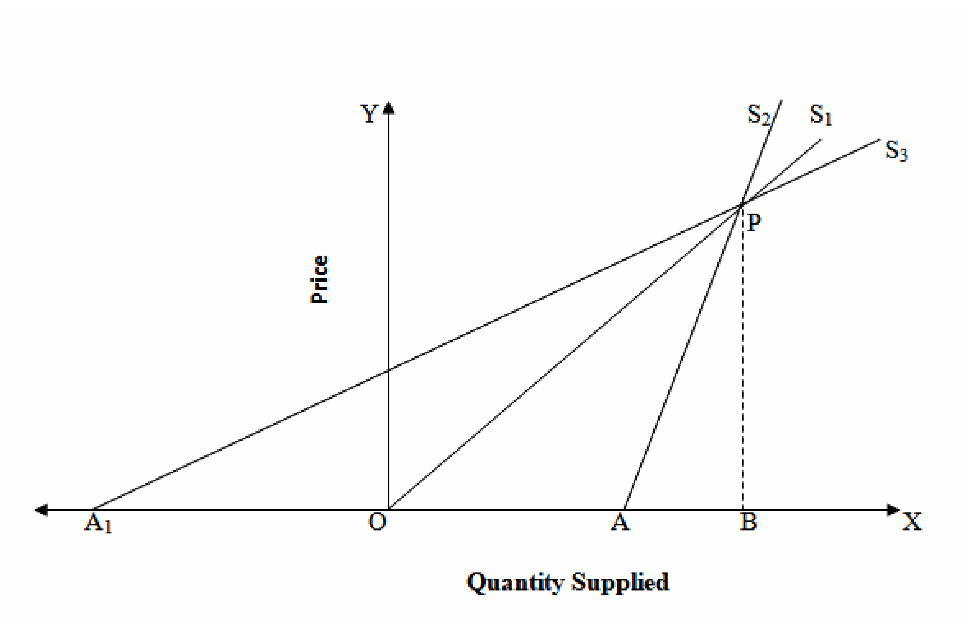


Fig.2.13 – Measurement of Price Elasticity of Supply.

2.15 PARADOX OF BUMPER HARVEST

In India, vegetable prices of onions and tomatoes have widely fluctuated between crop failures and bumper harvests. The demand for onions and tomatoes is relatively inelastic. If the onion or tomato crop failures, there will be a shortage in the market and the hence the market prices will go up substantially. In the last two decades, it has been found that onion prices have gone up from Rs.2/- per kilogram in the 1990s to Rs.100 per kg in the 2011s. The same has been true of the prices of tomatoes.

The output of tomatoes and onions may go up due to good rains or due to better and improved methods of farming and farm technology. Individual farmers do not think that if they continue with the same cropping pattern, there will be excess output and prices will fall. The farmer thinks that if the output is more, he or she will get more revenue. However, the demand for onions and tomatoes being inelastic, in times of a bumper harvest, the prices of these vegetables fall sharply than the rise in demand leading to a fall in revenue. Thus the farmers are poorer with a bumper harvest and richer with a poor harvest. The fall in revenue due to a bumper harvest is shown in the figure 2.14.

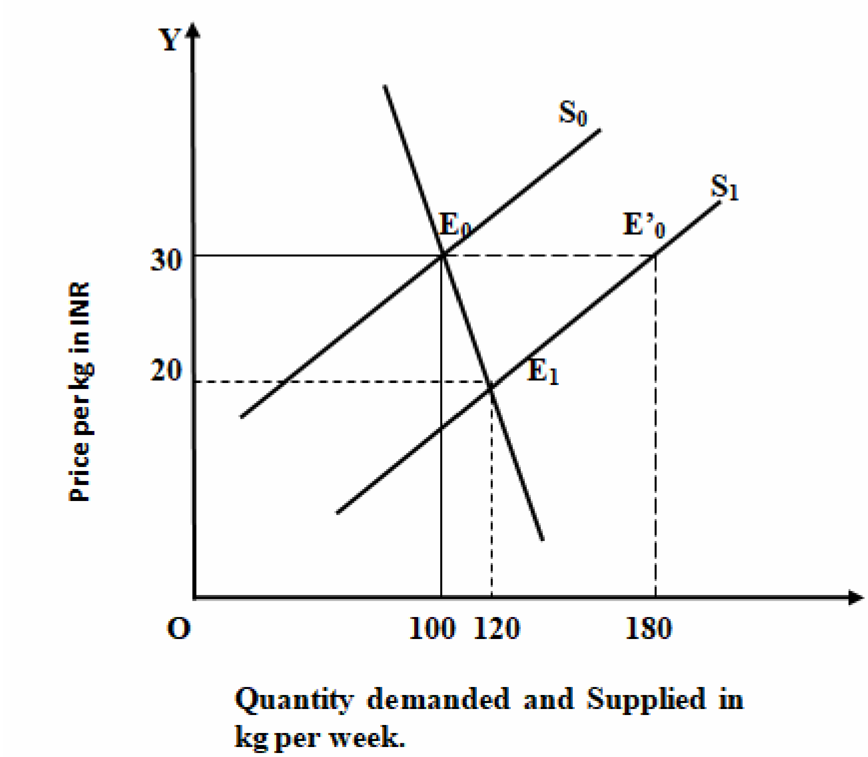


Fig.2.14 – The Paradox of a Bumper Harvest of Tomatoes.

At Rs.30/- per kg, the quantity demanded and supplied of tomatoes is 100 kg. When a good monsoon is predicted, farmers in India should go for a diversified crop and reduce the cropped area of tomatoes or onions because a bumper crop of onions and tomatoes or for that matter any other crop would bring down the prices. However, due to want of knowledge, the farmers decide to sow the available land with the tomato crop in the hope that they would sell the crop at the same price of Rs.30/- and earn a proportionately larger revenue. As a result of the bumper crop, the supply curve of tomatoes shifts to the right i.e. from S_0 to S_1. At the price of Rs.30/- per kg, there is an excess supply of tomatoes equal to 80 kg. Excess supply pushes down the price to Rs.20/- per kg as the original demand curve intersects the new supply curve at point E_1. Accordingly, 120 kg of tomatoes is the new demand. The farmers end up earning only Rs.2400/- at the new lower price as compared to Rs.3000/- when the price was Rs.30/- per kg.

The above example illustrates that when the demand is relatively inelastic, the farmers should restrict output to charge a higher price and earn larger revenue. Instead, the farmers with a bigger harvest have ended up becoming poorer by Rs.600/-. The situation is paradoxical because ordinarily with a bigger output, the revenue should be higher. However, in the case of tomatoes, a bigger output has yielded lower revenue.

Can we neutralize the paradox of Bumper Harvest?

The paradox of bumper harvest need not be true if the farmers either individually or collectively set up cold storage facilities. With the cold storage facilities in place, the farmers can go for a bumper harvest and still earn larger revenue. Cold storage facilities will allow the farmers to create a stock of tomatoes and supply them to the market according to the market conditions. Organizationally, the farmers can establish their co-operatives and become entrepreneurs rather than being mere peasants.

2.16 TAX ON PRICE AND QUANTITY

Tax is a fundamental source of revenue to the government. Any government will impose taxes on goods and services (indirect taxes) to generate revenue. Government may impose an indirect tax on the buyers or on the sellers. If a tax is imposed on the buyers, the demand curve will shift to the left. Similarly, if a tax is imposed on the sellers, the supply curve will shift to the left. When a tax is imposed either on the buyer or the seller, the burden of tax is shared by both the buyers and the sellers. The proportion of tax burden shared depends upon elasticity of demand and supply.

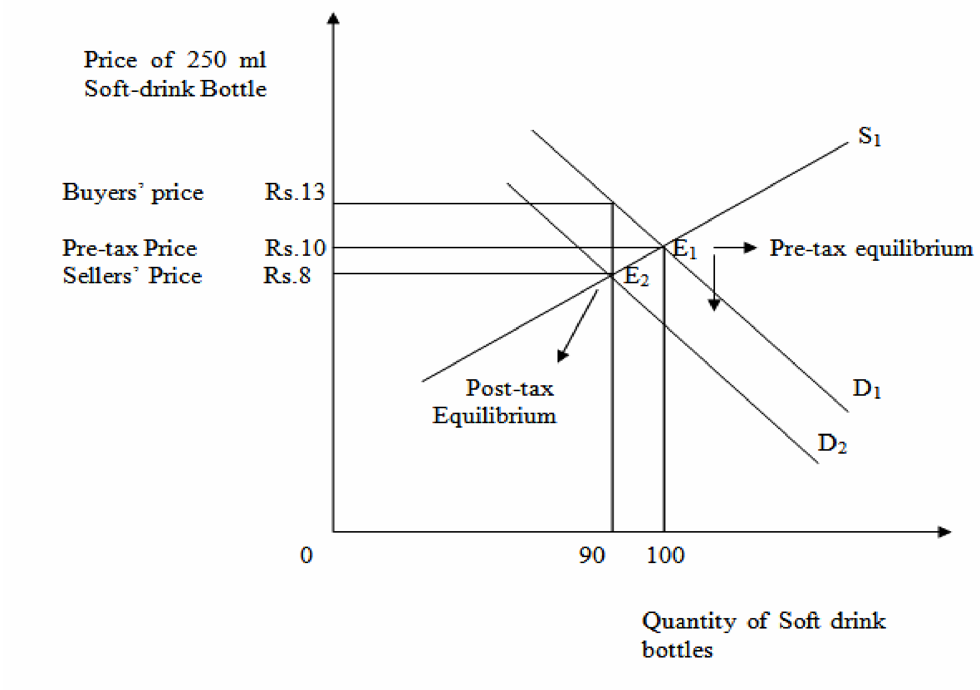


Fig. 2.15 Effect of Tax on Buyers

2.17 IMPACT OF TAX IMPOSED ON BUYERS

Let us look at the impact of a tax imposed on the buyers. Suppose the Government of Maharashtra imposes a sales tax of Rs.5/- on 250 ml soft drink bottle on the buyers. Since the tax is imposed on the buyers, the supply curve will remain constant. The buyers now will have to pay Rs.5/- more every bottle of soft drink. The demand for soft drinks will fall and as a result the demand curve will shift to the left by the extent of the tax as shown in Figure. Assuming the market price of a 250 ml soft drink bottle is Rs.10/-, the buyers will have to pay Rs.12/- due to the new tax. In order to make up for the effect of the tax, the market price must be lower by Rs.5/-. The new market price is Rs.8/- and the equilibrium quantity of soft drinks falls from 100 to 90 bottles. The sellers will now sell less and the buyers will also buy less as per the new equilibrium. The tax on soft drinks will therefore reduce the market size of soft drinks. However, the burden or the incidence of tax will be shared by both the buyers and the sellers. Since the market price of soft drink bottles come down by Rs.2/-, the sellers will receive Rs.2/- less for every bottle of soft drink sold and the buyers will pay Rs.3/- more and the soft drink bottle will now be sold for Rs.13/- i.e. Rs.8 + Rs.5 = Rs.13/- . A tax on the buyer makes both the buyers as well as the sellers worse off due to elastic demand.

To conclude, it can be said that taxes discourage market activity. When a commodity is taxed, the quantity of the commodity sold in the new equilibrium is lesser. The burden of tax is shared by the buyers as well as the sellers. In this case, the buyers share a larger burden because the supply curve is less elastic.

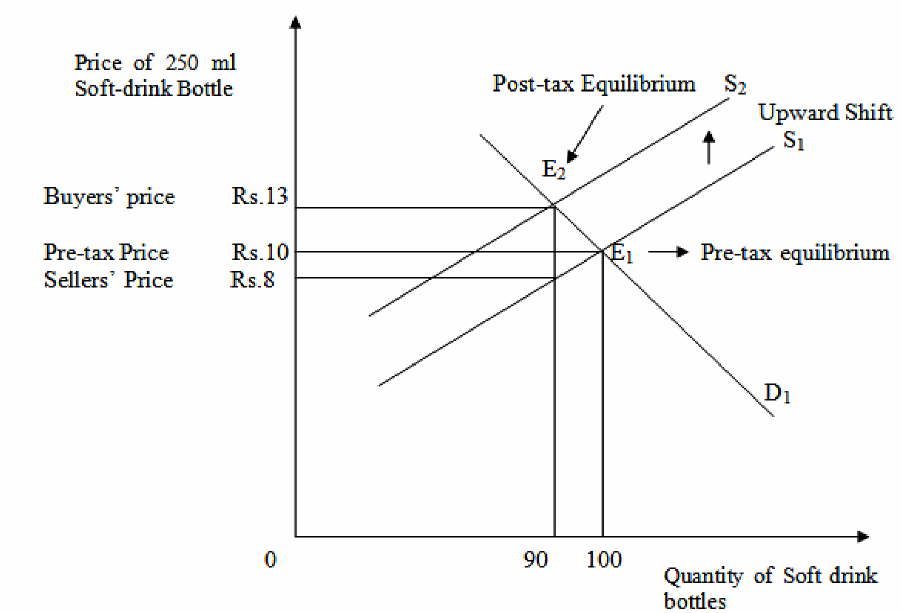


Figure 2.16 - Effect of Tax on Sellers

2.18 IMPACT OF TAX ON SELLERS

When a tax of Rs.5/- is imposed on the sellers of soft drinks, the profitability of selling soft drinks falls and hence the supply curve shifts upward or to the left. Given the market price of soft drink to be Rs.10/- per 250 ml bottle, the seller will receive only Rs.5/- per bottle after providing for the tax. In order to induce the sellers to supply the same quantity of soft drink bottles, the market price must be Rs.15/-. The supply curve shifts upward from S_1 to S_2 by the size of the tax (Rs.5/-). The figure shows that the equilibrium price of soft drinks rises from Rs.10 to Rs.13 and the equilibrium quantity falls from 100 to 90 soft drink bottles. Irrespective of on whom the tax is imposed, the size of the soft drink market is reduced. Since the market price rises, the buyers pay Rs.3/- more for each bottle of the soft drink. Sellers receive a higher price of Rs.13/- but the effective price after tax comes to Rs.8/- per bottle.

2.19 MAXIMUM PRICE CEILING

Governments intervene in the market by fixing maximum prices. During inflationary periods, the government may impose wage and price controls to arrest the spiraling prices. When a price ceiling is imposed, the maximum price of a product or a service is prescribed by the government. Price ceilings can be binding and non-binding. A binding price ceiling is imposed below the equilibrium price whereas a non-binding price ceiling is imposed above the equilibrium price.

Effect of Price Ceiling on the Market

Price ceiling places a legal maximum on prices. A price ceiling will be **non-binding** on the sellers if the equilibrium price is below the price ceiling as shown in the following figure. For example, the Government imposes a price ceiling of Rs.25/- per kg of sugar during the festival season. In this figure, the price determined by the market forces is Rs.20/- per kg and the price ceiling imposed by the Government is Rs.25. Such a price ceiling will not influence market price. However, the market price cannot go above Rs.25 per kg of sugar.

When the government imposes a price ceiling that is below the market price, it is called a **binding price ceiling.** In this case, the market price cannot rise above the price ceiling. In such a situation, the market demand will be greater than market supply and there will be shortage of sugar. This can be seen in Figure. Since the market price of Rs.20 per kg of sugar is above the price ceiling of Rs.15, the quantity supplied by the market is only 80 quintals of sugar whereas the market demand is 120 quintals of sugar. There is a shortage of 40 quintals. Forced shortages lead to rationing of the commodity. The rationing mechanism that develops under a binding price ceiling is not undesirable and unfair because the market imposes opportunity cost on the buyers. The buyers will have to stand in long queues to buy the goods and those who actually need sugar may not get sugar, thereby making the markets less efficient. The free market mechanism is much more efficient because at the equilibrium price, sugar will be available to all those who can pay the equilibrium price.

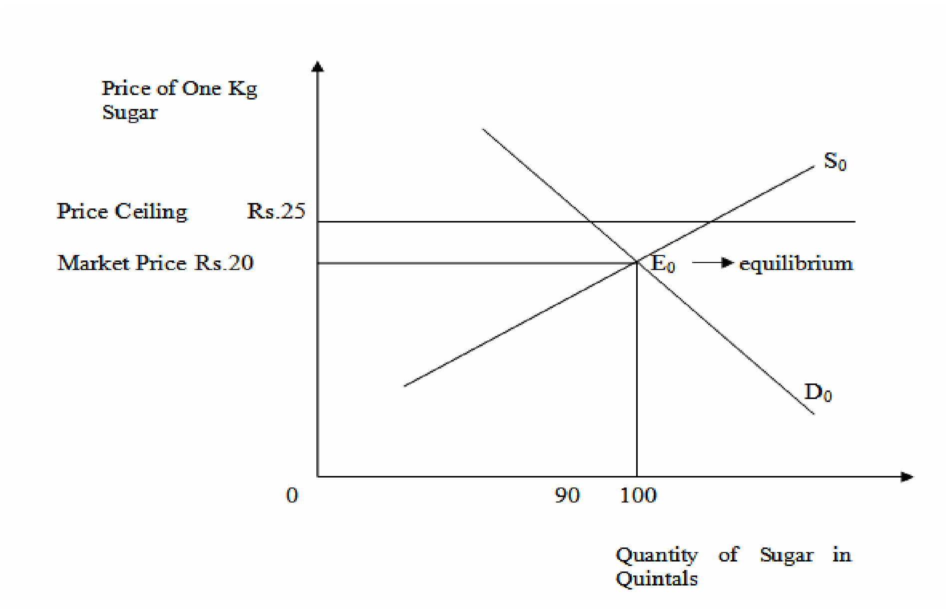


Figure 2.17 - Effect of Price Ceiling above the Market Price.

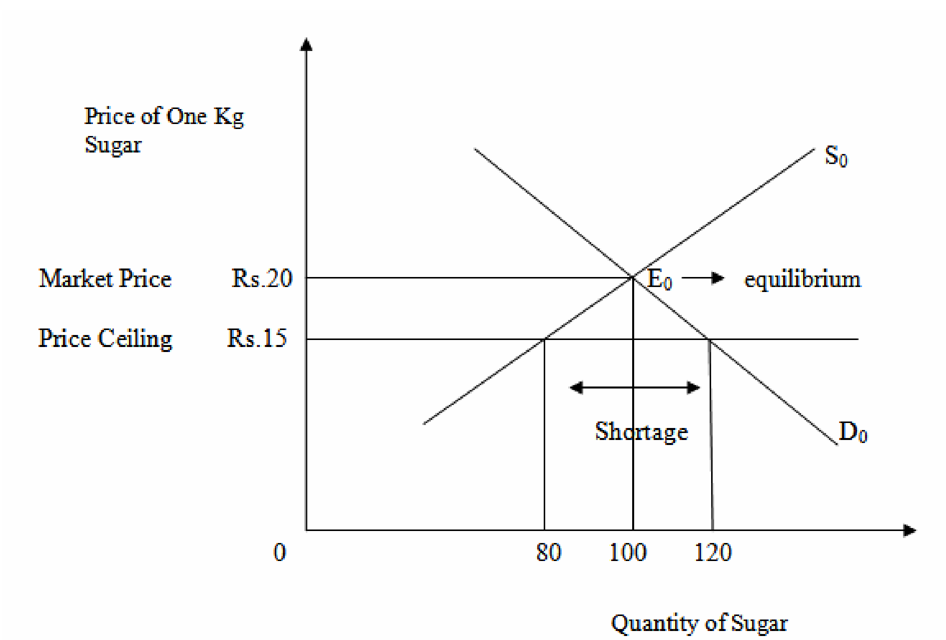


Figure 2.18 - Effect of Price Ceiling below the Market Price.

2.20 PRICE FLOORS AND MARKET OUTCOMES

Price floors place a legal minimum on the prices. Price floor may be classified into binding and non-binding price floors. When the government imposes a price floor which is above the equilibrium price, it is a binding price floor whereas a price floor imposed below the equilibrium price is a non-binding price floor. This is shown in Figures 3.19 and 3.20. In the case of a non-binding price floor, the equilibrium price is determined by the market forces and stays above the price floor. The price floor of Rs.15 per kg of sugar has no impact whatsoever on the equilibrium price of Rs.20 per kg of sugar. However, under no circumstances, the price can fall below the price floor. In India, the Committee on Agricultural Costs and Prices determine the minimum support prices of a number of agricultural goods such as wheat, jowar, bajra, chana, pulses, cotton, de-husked coconut, copra etc. These support prices ensure that the market price will not fall below the MSP of these goods. For instance, in 2015-16, the MSP of Wheat was Rs.1525 per quintal i.e. Rs.15.25 per kg. The market price of wheat in the commodity exchange market was Rs.1748 per quintal i.e. Rs.17.48 per kg.

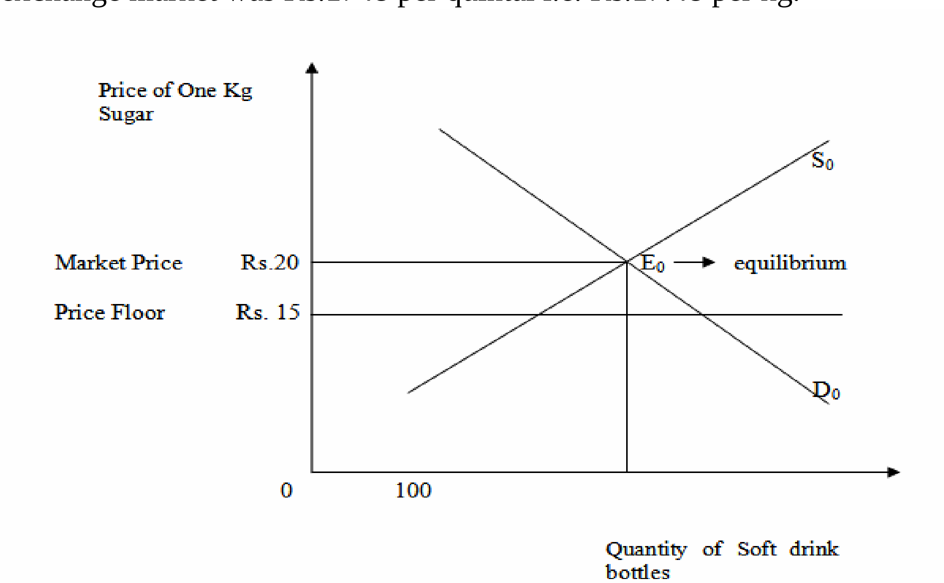


Figure 2.19 - Price Floor below the Market Price (non-binding).

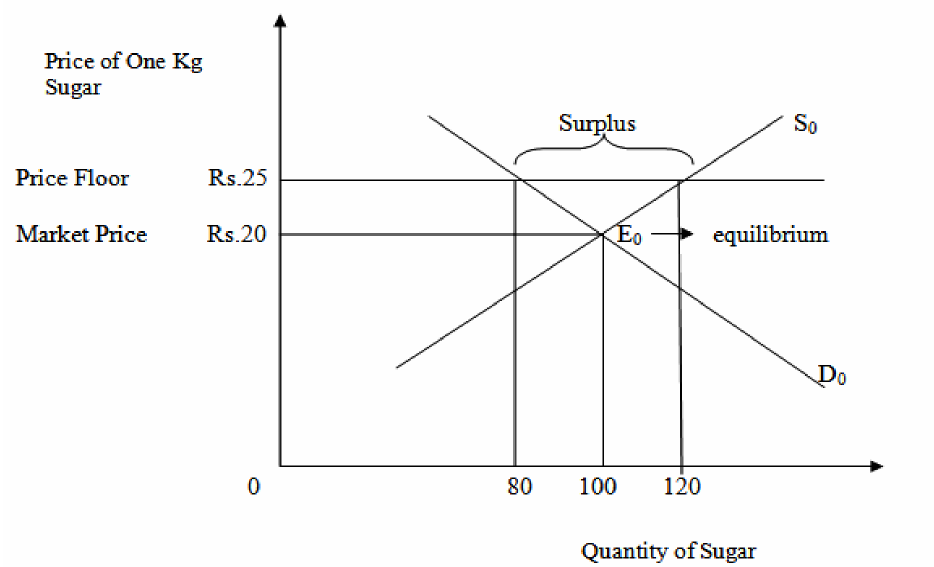


Figure 2.20 - Price Floor above the Market Price (Binding).

When the price floor is set above the equilibrium market price as shown in Figure.2.20, the price floor is binding on the market. As a result, there is a surplus of 40 quintals of sugar. Sellers willing to sell sugar at Rs.25/- per kg are unable to sell because there are no buyers for the surplus quantity of 40 quintals. A binding floor price therefore causes a surplus.

Price ceilings below the market price create shortages and price floor above the market prices creates surpluses. Price ceilings which are binding in nature i.e. set below the market prices create shortages and lead to rationing mechanism. Similarly, price floors above the market prices are binding in nature and create surpluses. Market mechanism is held hostage by such government interventions. Both production efficiency and allocation efficiency is not achieved on account of price ceilings and price floors.

2.21 THE MINIMUM WAGE CONTROVERSY

Minimum wage is an example of a binding price floor which is set above the equilibrium market wage rate. The Government of India has passed the Minimum Wages Act of 1948. Accordingly, minimum wages are set and revised periodically for a number of industrial and non-industrial trades. For reference, the minimum wages for a few trades in Maharashtra for the period January 2020 to July 2020 are given in the following table.

Table 2.6 - Minimum Wages in Maharashtra (Zone-I) for the period January 2020 to July 2020	
Employment	**Minimum wages (in INR)**
Automobile Repairing	
1. Skilled	11044.00
2. Semi-skilled	10644.00
3. Unskilled	10344.00
Bakeries	
1. Skilled	12778.00
2. Semi-skilled	11878.00
3. Unskilled	10928.00
Hair cutting Saloon	
1. Skilled	12236.00
2. Semi-skilled	11536.00
3. Unskilled	11036.00
Readymade Garments	
1. Skilled	13298.00
2. Semi-skilled	12598.00
3. Unskilled	12098.00
Reference: www.paycheck.in	

If the minimum wages are set above the market wage rates, there will be unemployment. In the absence of government intervention, the market forces will determine the equilibrium wage rate. Both the situations are shown in Figures 2.21 and 2.22. In Figure 2.21, the labor market clears at OW wage rate and ON level of equilibrium employment. However, when the government intervenes and set the minimum wage rate above the market determined wage rate, there will be disequilibrium in the labor market leading to surplus labor or unemployment. Figure 2.21 show that at the minimum wage rate fixed by the government, the market demand for labor is ON_2whereas the market supply of labor ON_3. Government intervention creates unemployment in the labor market by N_2N_3. However, if the minimum wages set by the government in various trades is below the market determined wage rate, they will have no influence on the equilibrium wage rate and hence any unemployment in the economy will not be attributed to the fixing of minimum wages.

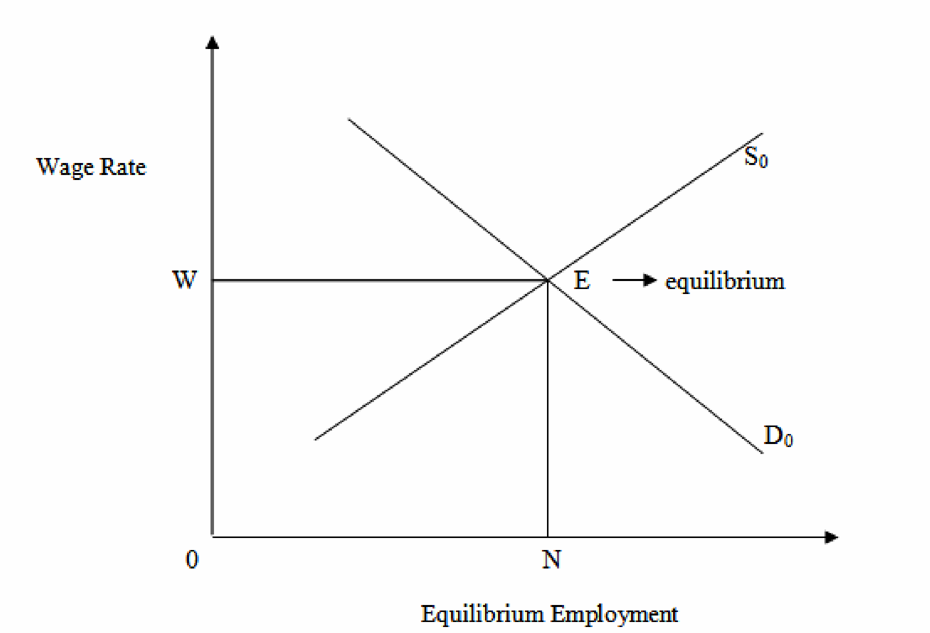


Figure 2.21 - Market Determined Wage Rate

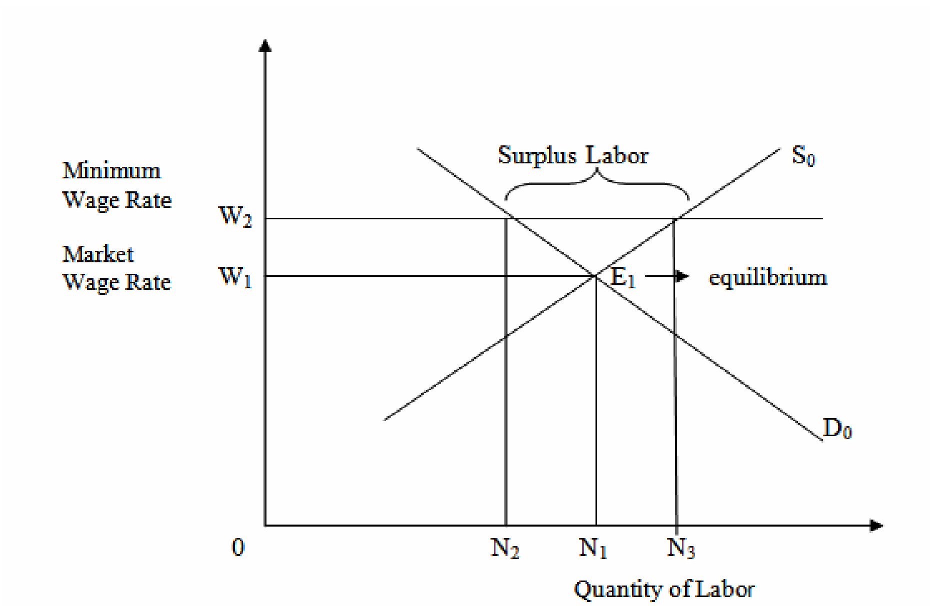


Figure 2.22 - Price Floor above the Market Price (Binding).

A look at Table 2.6 reveals that there are different labor markets for different trades and the wage rates vary across skill levels. The impact of minimum wage depends upon the skill and experience of the workers. Highly skilled and experienced workers will always get wages higher than the minimum wage. The minimum wages in Maharashtra as shown in the above table are much less than the market wages. As a result, poorly skilled workers may be paid the minimum wages as notified by the government from time to time.

The controversy over minimum wages is around the argument that a rise in minimum wages will reduce employment amongst the poor and their economic conditions will become miserable. The other argument is that a rise in minimum wages will improve the economic conditions of workers who come from the poor families. However, the actual impact of minimum wages on the labor market depends upon the level of minimum wages set. If the minimum wages are set below the market determined wage rates, it will have no impact whatsoever on the labor market. The minimum wages paid in Maharashtra in Zone-I range from a measly Rs.4056/- per month paid to cashew processing skilled workers to a moderate Rs.13224/- paid to skilled building/road construction workers. The highest minimum wage paid to a skilled construction worker is way below the wages paid to a sweeper in government employment. Wage rates in India in the unorganized labor market are closer to the subsistence levels because of the low minimum wage rates determined by the government.

2.22 ADMINISTERED PRICE CONTROL

In the year 1972, the Administered Price Mechanism came into existence in India in the oil sector. Under this system, the oil and gas sector was controlled at four stages. These stages are: **production, refining, distribution and marketing**. The supply of raw material to the refineries at the point of refining was done at a predetermined price called '**delivered cost of crude'**. The finished products were also made available at predetermined price called '**ex-refinery prices**'. The APM was based on the principle of compensating normative cost and allowing a pre-determined return on investments to the oil companies. For example, ONGC and OIL were compensated for their operating expenses and allowed a 15% post-tax return on the capital employed. Both ONGC and Oil India Limited (OIL) sold crude to refineries at $7-8 per barrel when the prevailing oil price was $17-19. The Government of India regulated sourcing and import of crude, its refining as well as its sale till it reached the end consumer.

The system developed by the government continued till the 1980s. In the 1980s, the demand for oil began to rise rapidly. The finances of the oil companies came under stress due to rising imports of crude oil at high prices. Consequently, the government deregulated and decontrolled the oil sector. The APM was abandoned in the late 1990s.

Liberalization, Privatization and Globalization were the three pillars of the New Economic Policy of 1991. Keeping the new policy, the government opened the refinery sector for private participation which led to the emergence of one of Reliance Refinery. The decision to liberalize the petroleum sector led to the dismantling of the Administered Price mechanism in April 2002. Under the liberalized system, Oil Marketing Companies (OMCs) were given the freedom to set retail product prices based on import parity pricing formula. The domestic refining and retail sector was also opened to private-sector firms, leading to the emergence of a small private-sector retailing presence in India consisting of firms such as Reliance India Limited. Due to the importance of LPG and kerosene, per unit subsidy funded from the government's budget were maintained on LPG and on a fixed proportion of supplied kerosene. This system continued till 2004 and thereafter the Central Government began to control upward price revisions. The government used to change the price of petrol and diesel, and the prices of LPG and kerosene prices have remained effectively fixed due to heavy subsidy on them. The prices of petrol and diesel were protected because of the importance of these products as transport fuels. Diesel is important, as it makes up over one-third of India's petroleum product consumption, and has uses outside transport, e.g., as an input into agricultural production.

The end of APM led to the rise of the private-sector in setting up retail operations. Many petrol pumps belonging to RIL, Shell and Essar were seen around the country. However, when the prices again came under the control of the government, these three private firms which had retail license in India were forced to close their retail outlets across India because of uneconomical business of retail trading of petrol and diesel. India maintained price controls on four "sensitive" petroleum products – petrol, diesel, liquefied petroleum gas (LPG), and kerosene. India's government-owned Oil Marketing Companies (OMCs) were tasked by the Government of India to sell these products in retail markets at a centrally determined sales price. Upward revisions to prices in response to higher global crude prices were rare. The upwards revisions were subject to all kinds of political implications as well. The objective of these controls was to insulate consumers against high global crude oil prices. But due to frequent ups and downs in the oil prices, the Oil Marketing Companies started recording significant "under-recoveries" on the sale of sensitive petroleum products. Under-recoveries are calculated as the difference between the cost price and the regulated price at which petroleum products are finally sold by the OMCs to the retailers after accounting for the subsidy paid by the government.

A large part of these under-recoveries is compensated for by additional cash assistance from the government (over and above the fiscal subsidy). Some part is also compensated by the upstream companies while remaining portion remains uncompensated to the OMCs. In 2008, prices of crude oil in the international market rose rapidly. As a result, the OMCs under-recoveries went up to USD 25 billion. The Government had to issue hundreds of billions of Indian rupees to OMCs to counteract mass under-recoveries since 2005 in order to maintain the solvency of these key companies. Most of this funding was done using the debt securities called Oil Bonds.

2.23 SUMMARY

1. Demand can be studied in terms of individual demand and market demand. Those factors which influences or determines individual demand also go into determining market demand which is the sum of individual demands. However, the same cannot be said of the factors which determine market demand.

2. A simple demand function can be stated as $D_x = - f(P_x)$. It reads that quantity demanded of commodity 'x' (D_x) is a negative function of price (P). However, the demand function must factor in all possible demand determinants and therefore a more comprehensive demand function can be stated as follows: $D_x = f(P_x, P_y, P_c, P_s, Y, E, T, A, U)$

3. Market demand for a given product is the sum of individuals demand for the said product given the price, place and time. The market demand function can be stated as follows: $M_{D_x} = f(P_x, Y, P_{sc}, T, A, N, U)$

4. Kelvin Lancaster put forward the characteristic or attributes approach to consumer theory. Kelvin says that consumers demand a good because of the characteristics, properties and attributes of the good which give rise to utility. A commodity has more than one attribute and any given attribute is present in more than one commodity.

5. The market demand curve is the horizontal summation of the individual demand curves only if the consumptions decisions of individual consumers are independent i.e. their decisions are not influenced by network externalities. If the network externality is negative, consumers will demand less at the given price and the demand curve will become steeper. In case of positive network externality, the consumers will buy more of a commodity at the given price and the demand curve will become flatter. The effects caused by network externalities are classified into snob, bandwagon and Veblen effects.

6. Supply refers to the quantities of a commodity which the seller is willing and able to provide at different prices during a given period of time, other things remaining constant. Supply of a commodity is a direct function of its price.

7. Price remaining constant, when other supply determining factors change, there is either an increase or a decrease in supply and as a result, the supply curve changes its position. Thus with an increase in supply, the supply curve will shift to the right and with a decrease in supply, the supply curve will shift to the left.

8. When the supply curve shifts to the left, the firm would be willing to supply the original quantity at a higher price or a lower quantity at the same price. A horizontal shift to the left would indicate that a lower

quantity is being supplied at the same price, whereas a vertical upward shift would indicate that the same quantity would be supplied at a higher price. Conversely, when the supply curve shifts to the right, the firms would be willing to supply the original quantity at a lower price or a larger quantity at the same price. A horizontal shift to the right would indicate that the firms would be willing to supply a larger quantity at the same price, whereas a vertical downward shift would indicate that the firms would be willing to supply the same quantity at a lower price.

9. The Price Elasticity of Supply can be defined as a percentage change in the quantity supplied of a commodity as a result of percentage change in the price of the commodity. Symbolically, the price elasticity of supply can be stated as follows:

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

10. The numerical co-efficient of price elasticity of supply is between zero and infinity. Thus there can be five possibilities of price elasticity, namely PES = 1, PES< 1, PES > 1, PES = 0 and PES = ∞. These five values of co-efficient assume the following five types of price elasticity.

11. Methods of Measurement of Price elasticity of demand: Percentage / Ratio Method, Arc Method

12. Cross price elasticity of demand deals with impact of change in the price of one commodity, say commodity 'x' on the quantity demanded of commodity 'y', where these goods are either complementary or substitute goods. The formula for cross price elasticity of demand can be stated as follows:

$$e_{xy} = \frac{\text{Percentage change in the quantity demanded of commodity 'x'}}{\text{Percentage change in the price of commodity 'y'}}$$

13. The relationship between quantity demanded and the level of income is direct. A simple income demand function can be stated as Qdx = f(Y) when Qdx = quantity demanded of commodity 'x' Y = level of income. The co-efficient of income elasticity of demand can be measured as follows:

$$e_y = \frac{\text{Percentage change in the quantity demanded}}{\text{Percentage change in income}}$$

14. The price elasticity of supply at a point on the supply curve can be measured as follows:

$$\text{PES} = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{OP} \times \frac{P}{Q} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

15. The paradox of bumper crop explains why the farmers are poorer with a bumper harvest and richer with a poor harvest.

16. Government will impose taxes on goods and services (indirect taxes) to generate revenue. Government may impose an indirect tax on the buyers or on the sellers. If a tax is imposed on the buyers, the demand curve will shift to the left. Similarly, if a tax is imposed on the sellers, the supply curve will shift to the left. When a tax is imposed either on the buyer or the seller, the burden of tax is shared by both the buyers and the sellers.

17. Governments intervene in the market by fixing maximum prices. During inflationary periods, the government may impose wage and price controls to arrest the spiraling prices. When a price ceiling is imposed, the maximum price of a product or a service is prescribed by the government. Price ceilings can be binding and non-binding. A binding price ceiling is imposed below the equilibrium price whereas a non-binding price ceiling is imposed above the equilibrium price.

18. Price floors place a legal minimum on the prices. Price floor may be classified into binding and non-binding price floors. When the government imposes a price floor which is above the equilibrium price, it is a binding price floor whereas a price floor imposed below the equilibrium price is a non-binding price floor.

19. The controversy over minimum wages is around the argument that a rise in minimum wages will reduce employment amongst the poor and their economic conditions will become miserable. The other argument is that a rise in minimum wages will improve the economic conditions of workers who come from the poor families. However, the actual impact of minimum wages on the labor market depends upon the level of minimum wages set. If the minimum wages are set below the market determined wage rates, it will have no impact whatsoever on the labor market.

20. In the year 1972, the Administered Price Mechanism first came into existence in India in the oil sector.

2.24 QUESTIONS

1. What is demand? Explain the determinants of demand.
2. State and explain the market demand function.
3. Explain the theory of attributes.
4. Explain the concepts of Snob appeal, bandwagon and Veblen effects.
5. Explain the law of supply and the determinants of supply.
6. Account for the shifts in the supply curve.
7. Explain the exceptions to the law of supply.

8. What is elasticity of supply? Explain the types of elasticity of supply.
9. What is elasticity of demand? Explain the types of elasticity of demand.
10. Explain the ratio and total outlay methods of measuring price elasticity of demand.
11. What is income elasticity of demand? Explain income elasticity of demand in case of normal goods, inferior goods and neutral goods.
12. What is cross price elasticity of demand? Explain the cross price elasticity of demand in case of substitutes, complementary goods and unrelated goods.
13. Explain the paradox of bumper harvest with suitable diagram.
14. Explain the impact of tax on price and quantity with suitable diagrams.
15. Explain the concepts of minimum floor and maximum ceilings.
16. Explain the minimum wages controversy with suitable diagrams.

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UNIT - 2A

THEORY OF CONSUMER CHOICE

Unit Structure

2A.0 OBJECTIVES

- To study the Theory of Consumer Choice
- To understand Consumer Preference and Budget Constraint concepts
- To study Consumer Equilibrium with Indifference Curve
- To understand the Effect of Changes in Price and Income on Consumer Equilibrium

2A.1 THE THEORY OF CONSUMER CHOICE

The theory of consumer choice provides a better understanding of demand. It examines the trade-offs that people face as consumers. When a consumer buys one commodity, he sacrifices another commodity. There is always a trade-off in every transaction that a consumer undertakes. The cause of the trade-off is the budget constraint and the prices of goods that the consumer wishes to buy. The theory of consumer choice examines how consumers facing trade-offs make decisions and how they respond to changes in their environment.

THE BUDGET CONSTRAINT – WHAT THE CONSUMER CAN BUY GIVEN HIS INCOME AND PRICES OF GOODS.

People attempt to satisfy more than one need at a time. In order to satisfy simultaneous wants, one has to allocate one's budget given the prices of goods that one wants to buy. Eating out every week end and go for a long drive can be a combination of want that a family wants to satisfy. Buying consumer utilities like Fridge, TV, Air-conditioner, Washing machine etc and spending on Diwali celebrations or Id celebrations. In the ordinary course of life, everybody is confronted with multiple requirements. Budgeting is required to allocate income to satisfy various requirements. Budgeting means spending less than what one desires. Budgeting also explains the link between income, prices and expenditure.

Budget constraint can be explained with an example in which a consumer wants to buy two goods: Burgers and Coffee. The consumer's income is Rs.600 per month. The price of burger is Rs.100 and the price of Coffee is Rs.50. Given his income of Rs.600, the consumer can purchase various combinations of burgers and coffee as shown in Table 2A.1.

Table 2A.1 – The Consumer's Budget Constraint

Number of Coffee Cups	Number of Burgers	Expenditure On Coffee	Expenditure On Burgers	Total Expenditure
0	6	0	600	600
2	5	100	500	600
4	4	200	400	600
6	3	300	300	600
8	2	400	200	600
10	1	500	100	600
12	0	600	0	600

The first row in Table 2A.1 shows that when the consumer purchases six burgers, he spends Rs.600 on burgers and hence he is not able to spend any money on coffee. The other extreme choice available before the consumer is 12 cups of coffee and zero burgers. The consumer may choose any other combination of burgers and coffee between these two extreme limits of the budget. The cost of each choice made in Table 2A.1 is Rs.600. Figure 2A.23 shows the consumption bundles that the consumer can choose. The vertical axis measures the number of coffee cups and the horizontal axis measures the number of burgers. All the combinations of burgers and coffee can be represented in the figure and the consumer can make any one choice. There are three points marked on the budget line. This budget line may also be called as the price line or the income line. At point A, the consumer buys zero burgers and 12 cups of coffee. At point B, the consumer buys six burgers and no coffee. At point C, the consumer spends an equal amount on Coffee and Burgers. He buys six cups of coffee and three burgers. The budget line is called the budget constraint because given his income and the prices of two goods, the consumer will have to be on the budget line. He cannot step out of the budget line and hence the budget line is the constraining factor on the consumer's choice. The budget constraint also shows the trade-off between burgers and coffee or the opportunity cost of making any one choice.

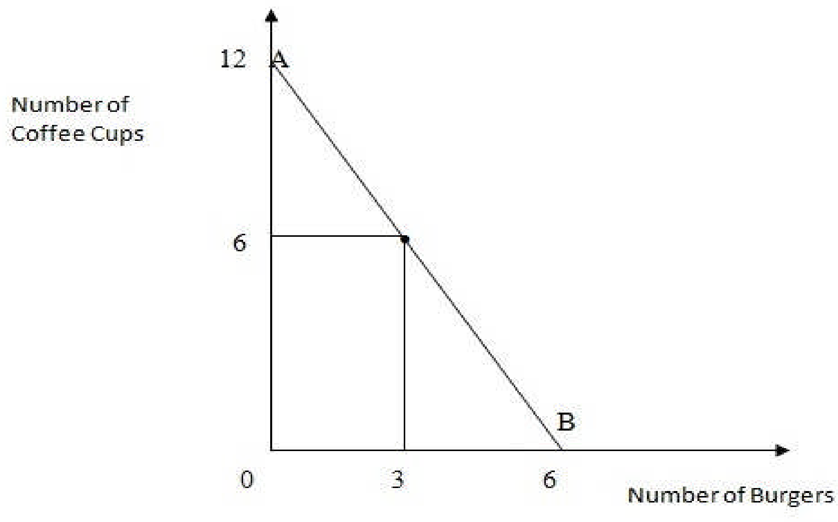

Figure 2A.1 – The Consumer's Budget Constraint.

The slope of the budget constraint measures the rate at which the consumer can trade one coffee for burgers. The slope between two points is calculated as the change in the vertical distance divided by the change in the horizontal distance i.e. rise over run. Front point A to point B, the vertical distance is 12 cups of coffee and the horizontal distance is six burgers. Thus the slope is two cups of coffee per burger. Each time the consumer makes a choice of buying one more burger, he will have to sacrifice two cups of coffee. The slope of the budget constraint equals the relative price of the two goods i.e. the price of one commodity as compared to the other commodity (100 ÷ 50). The budget constraint slope of 2 shows the trade-off the market is offering the consumer: one burger for two cups of coffee.

2A.2 CONSUMER PREFERENCES

The choice made by the consumer depends upon his income, prices of goods and preferences regarding the two goods. The consumer's preferences permit him to choose among different combinations or bundles of two goods: coffee and burgers. The consumer will be indifferent between the two goods if he or she has an equal liking for both the goods. The preferences of a consumer based on his liking can be represented graphically as shown in Figure 2A..2. The preferences are represented by a curve called the Indifference Curve (IC). The IC shows the combinations or bundles of consumption of two goods that make the consumer equally happy. The IC is therefore known as equal satisfaction curve or the Iso-utility Curve. In Figure 2A.2, there are two representative indifference curves of the consumer. In reality, the consumer may have a set of indifference curves showing his scale of preference. The consumer is indifferent between bundles of two goods represented by various points on a given indifference curve. On IC_1, there are points A, B and C. All these points represent the same level of liking or satisfaction. When the consumer shifts his position from point A to point B, he prefers more of burgers than coffee. A movement from point A to point B reduces the quantity of coffee and increases the quantity of burgers. The level of satisfaction enjoyed by the consumer remains the same because the loss of coffee units is compensated by the gain of burger units.

The slope of the indifference curve at any point equals the rate at which the consumer is willing to sacrifice or substitute one good for the other. This rate of substitution is called the marginal rate of substitution (MRS). In our example of burgers and coffee, the MRS will measure the number of units of burgers that needs to be compensated for one-unit reduction in coffee consumption. Since the indifference curve is bowed inwards or convex to the origin, the MRS is different at different points of a given IC. The MRS depends upon the amount of goods that a consumer is actually consuming. The rate at which the consumer is willing to trade coffee for burgers depends upon whether he needs more coffee or more burgers. The need for more coffee or more burgers depends upon how much of these two goods the consumer is actually consuming.

In Figure 2A.2, we have two ICs. The consumer will naturally prefer IC_2 to IC_1 because a higher indifference curve represents bigger bundles of two goods, here burgers and coffee. A consumer's set of ICs gives the scale of preference or the ranking of consumer preferences. Figure 4.2 show that the consumer will prefer point D on IC_2 than any other point on IC_1. Point D on IC_2 indicates a larger bundle of two goods but it shows that the consumer will have fewer cups of coffee than what he had at point C on IC_1. Yet the consumer will prefer point D because it will compensate the consumer with much greater quantity of burgers and the loss of satisfaction due to a lower quantity of coffee will be compensated by a much larger quantity of burgers.

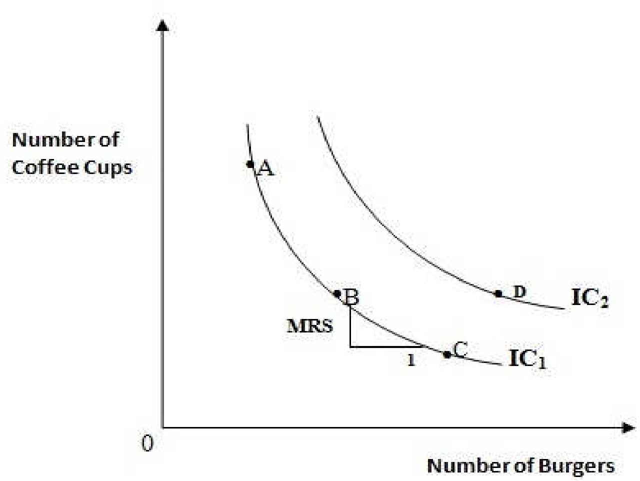

Figure 2A.2 – The Consumer's Preferences.

PROPERTIES OF INDIFFERNCE CURVE.

The indifference curves represent the preferences of consumers. The properties that represent consumer's preferences are four in number.

1. **Higher Indifference Curve is preferred to a lower one.** In the absence of prices and budget constraint, the consumer will like to consume a larger bundle of goods than smaller. A higher indifference curve represents a larger bundle of goods than a lower one and hence the consumer will prefer a higher IC to a lower IC. In Figure 4.2, the consumer will prefer IC_2 to IC_1.

2. **Indifference Curves are downward sloping.** The slope of the indifference curve shows the rate at which the consumer is willing to substitute or sacrifice one good for the other. In order to keep the satisfaction level same as before, the consumer will have to be compensated for the loss of consumption when he moves along the indifference curve. Thus if the quantity of burgers increases, the quantity of coffee must decrease.

3. **Indifference curves do not cross each other.** If indifference curves intersect or cross each other they will have common points indicating that the consumer is indifferent between points placed on a higher and lower curve. Such a conclusion will be in contradiction with the assumption that a rational consumer will prefer a larger bundle of goods to a smaller one. The contradiction can be seen in Figure 4.3. Points A and B are on IC_1 indicating that the consumer will get the same level of satisfaction at these two points and hence will be indifferent between them. Similarly points B and C are on IC_2 indicating that both points give equal satisfaction to the consumer. Since IC_2 is a higher indifference curve, a rational consumer must prefer point B to A. Further point C is also on IC_2 and clearly lying above IC_1. The consumer will have to be indifferent between points A and C either. Intersecting indifference curves are therefore a contradiction to the basic assumption of the theory of consumer choice.

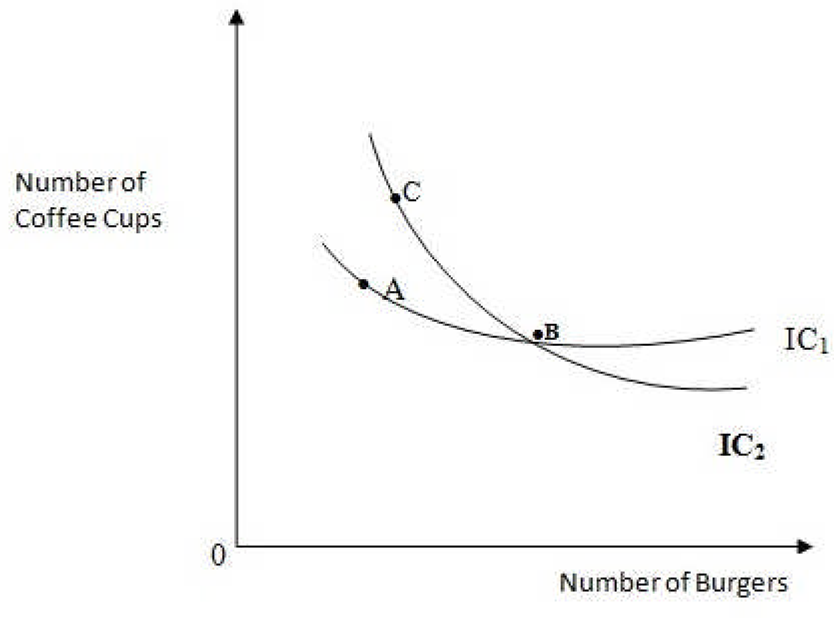

Figure 2A.3 – Intersecting Indifference Curves.

4. **Indifference curves are bowed inward or are convex to the origin.** The slope of the indifference curve is the marginal rate of substitution (MRS). The MRS must decrease as the consumer moves from left to right on the indifference curve. The MRS decreases because as the quantity of burgers increase, the quantity of coffee decreases and its relative importance increases. Decreasing or diminishing MRS is possible only when the IC is downward sloping and convex to the origin or bowed inward. Diminishing MRS can be seen in Figure 2A.4. Initially, the consumer is willing to give up one burger for four cups of coffee at point A and hence MRS is four. But at point B, the consumer is willing to sacrifice one burger for only one cup of coffee. His MRS falls to one. This is because at point B, the stock of burgers is much larger than at point A and the stock of coffee is much smaller at point B than at point A.

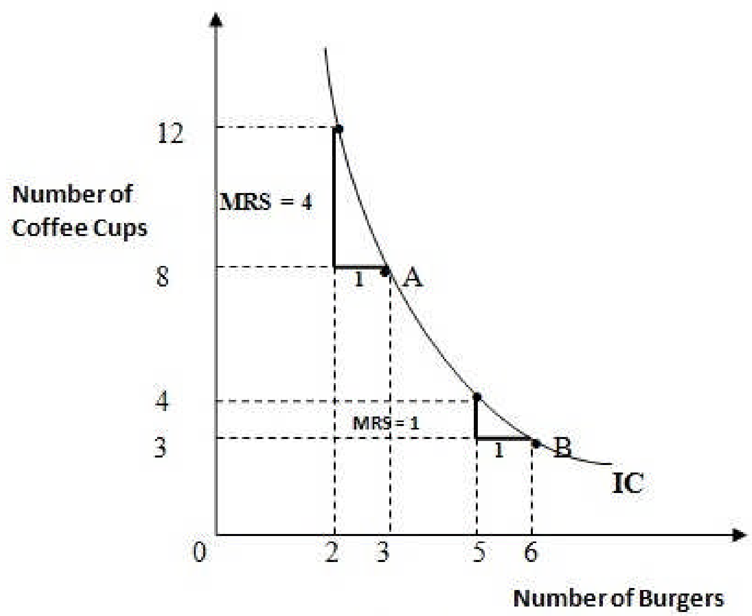

Figure 2A.4 – Convex or Inwardly Bowed IC.

Check your progress:
1. Explain the Theory of consumer choice.
2. State the properties of indifference curve.

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2A.3 THE CONSUMER'S OPTIMAL CHOICES OR EQUILIBRIUM

Given the number of indifference curves, the consumer would like to prefer the highest indifference curve because it has the largest bundle of two goods. But the budget constraint is the limit within which consumer can make a choice of his bundle of two goods. The budget constraint is a function of the income of the consumer and the prices of two goods that the consumer is willing to consume. The consumer's optimum choice or his equilibrium is shown in Figure 2A.5. The highest indifference curve that the consumer can reach given his budget constraint is IC_2 which touches the budget line or is tangent to the budget line at point B. Point C is on IC_3. The consumer cannot choose IC_3 because it is lying above the budget line. IC_1 is lying below the budget line and the consumer can afford IC_1 but it will give a lower level of satisfaction. Point B is the optimum choice because it represents the best combination of consumption of coffee and burgers. At point B, the slope of the budget line and that of IC_2 are equal. The slope of the IC shows the MRS between coffee and burgers and the slope of the budget line shows the relative price or the price ratio of coffee and burgers. The consumer chooses the combination of coffee and burgers in such a manner that the MRS is equal to the price ratio or the relative prices of two goods. The price ratio is the rate at which the market trades one good for another. In our example of coffee and burgers, one burger is traded for two cups of coffee. The MRS is the rate at which the consumer is willing to trade one good for another. At the optimum point B, the consumer's valuation of the two goods equals the valuation by the market. Due to consumer optimization, market prices of different goods show the value that consumers place on the combination of two goods.

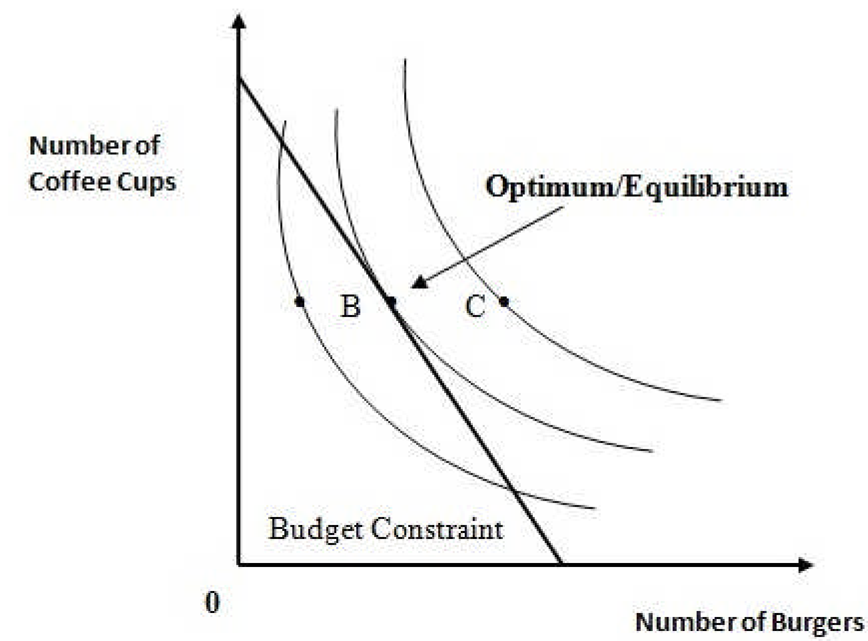

Figure 2A.5 – The Consumer's Optimum or Equilibrium.

2A.4 HOW CONSUMER'S CHOICE IS AFFECTED BY CHANGES IN INCOME

When the income of the consumer increases, he can afford a larger quantity of goods. Increase in income shifts the budget line to the right as shown in Figure 2A.6. Price remaining constant, the price ratio or the relative prices of two goods also remain constant. The slope of the new budget constraint is equal to that of the old budget constraint. There is a parallel shift in the budget line or budget constraint.

The new budget constraint allows the consumer to purchase more of coffee and burgers by reaching a higher indifference curve. The new budget line and the new indifference curve are tangent to each other at point B. Point B is the new optimum or equilibrium of the consumer. The optimum point reveals that the consumer has opted for a larger quantity of both coffee and burgers. This is because both coffee and burgers are normal goods.

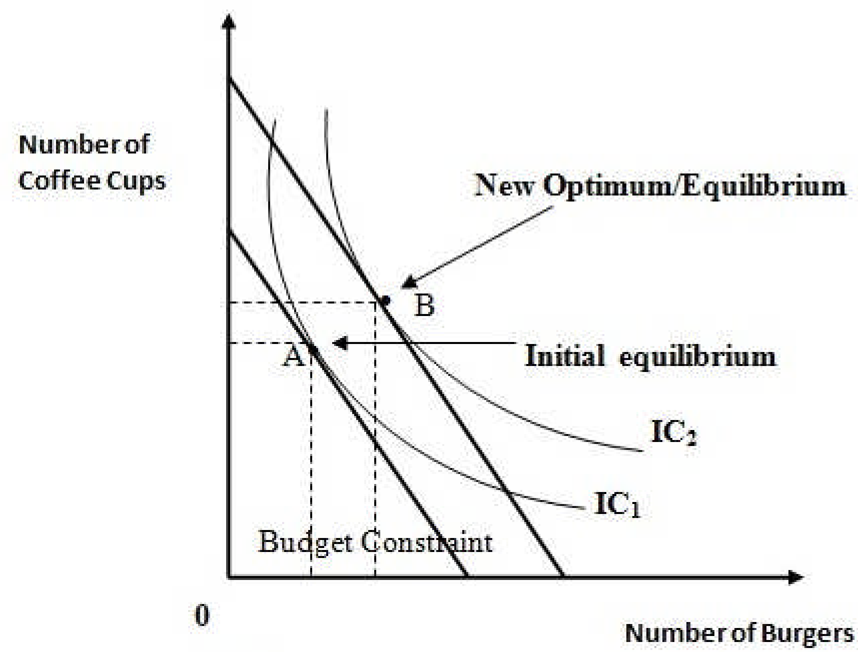

Figure 2A.6 – The Consumer's New Optimum or Equilibrium.

Figure 2A.7 shows how an increase in income causes the consumer to buy more of burgers but less of coffee cups. When a consumer buys less of a commodity when his income increases such a commodity is known as an inferior good. A good is not inferior in itself. Inferiority of a good is relative to the income of the consumer. A consumer may ascribe a normal status to a good at a lower level of income and when his income increases, he may ascribe an inferior status to the same good. Ascribing an inferior status to a good is not always objective. It is more often subjective because it is the monetary status of the consumer that makes a commodity inferior or normal. Thus at a lower level of income, hiring a taxi for your daily commute may be normal but at a higher level of income driving one's own car may be considered normal and at still further higher level of income, chauffer driven car may be considered normal.

In the vegetable market across the Mumbai city and suburbs, one may find a variety of tomatoes in terms of their size and skin texture. Well shaped red tomatoes of an average size can be objectively considered superior to ill-shaped yellowish tomatoes. It will be natural to a consumer to purchase better tomatoes with an increase in income and consider the yellowish unripe tomatoes to be inferior. The income effect in case of an inferior good is always negative i.e. a consumer will purchase a lesser quantity of an inferior commodity when his income increases.

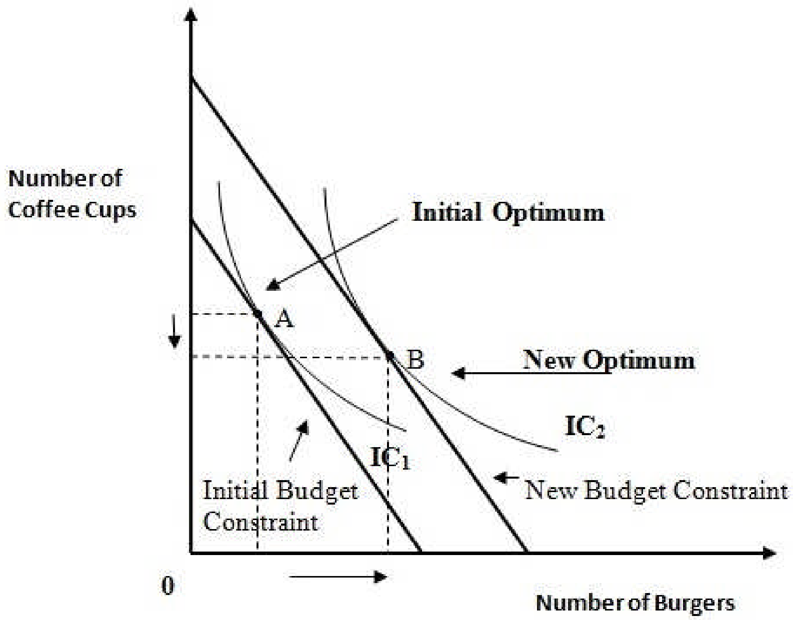

Figure2A.7 – Income Effect in case of Inferior Good.

2A.5 EFFECT OF CHANGES IN PRICES ON CONSUMER CHOICES

When the price changes, there is a change in consumer choice. If the price of coffee measured along the vertical axis falls from Rs.50 to Rs.25, the budget constraint or the budget line will shift outward with the pivot on the horizontal axis remaining constant. The consumer can now purchase 24 cups of coffee with his income of Rs.600. In order to reflect the new purchasing power in terms of coffee, the budget constraint moves from point A to C. The new budget constraint is now CB. The slope of new budget constraint has become steeper towards the vertical axis. With the change in the relative prices of coffee and burgers, the consumer can now trade one burger for four cups of coffee. However, the change in consumer choice will be determined by his preferences. The new optimum of the consumer is shown in Figure 2A.9 which is to the left of the original optimum. The new optimum indicates that the consumer has preferred a larger quantity of coffee and a lesser quantity of burgers.

INCOME AND SUBSTITUTION EFFECTS.

The impact of changes in price of a commodity on consumption can be divided into two effects, namely; the income effect and the substitution effect. When the consumer decides to buy a larger quantity of both the goods, it is known as income effect. However, the relative price of burger has risen i.e. now the consumer would need four cups of coffee to trade with one burger. The consumer would therefore choose to trade more burgers for coffee because coffee has become hundred per cent cheaper in real terms. This is known as the substitution effect.

Considering coffee and burgers to be normal goods, the income effect will be positive in both the cases i.e. the consumer will buy a larger quantity of both the goods because the purchasing power has risen. However, the substitution effect for coffee will be positive because the price of coffee has fallen and that of burgers will be negative because the relative price of burgers has risen. Since both the income and substitution effects are positive in the case of coffee, the total effect or the price effect is also positive. In the case of burgers, the income effect is positive but the substitution effect is negative. Hence the net price effect or total effect is not clear or is ambiguous.

Figure 2A.9 shows the distribution of price effect into income and substitution effects. When the price of coffee falls, the consumer moves from the initial optimum point A to the new optimum point C. This movement from A to C takes place in two steps. To begin with, the consumer moves along the initial indifference curve IC_1 from point A to point B. Since points A and B are on the same IC, these points give equal satisfaction to the consumer but at point B the MRS reflects the new relative price. The dashed line through point B shows the new relative price. It is drawn parallel to the new budget constraint. Since there is a rise in real income of the consumer, he moves from point B to point C which is on a higher indifference curve IC_2. Both points B and C have the same MRS because the slope of IC_1 at point B is equal to the slope of IC_2 at point C. The hypothetical line helps to separate the income and substitution effects which determine the consumer's new preference. The movement from point A to point B shows a pure change in the MRS without any change in the welfare of the consumer. The change from point B to point C represents a pure change in consumer's welfare without any change in the MRS. Thus the movement from point A to point B shows the substitution effect and the movement from point B to point C shows the income effect.

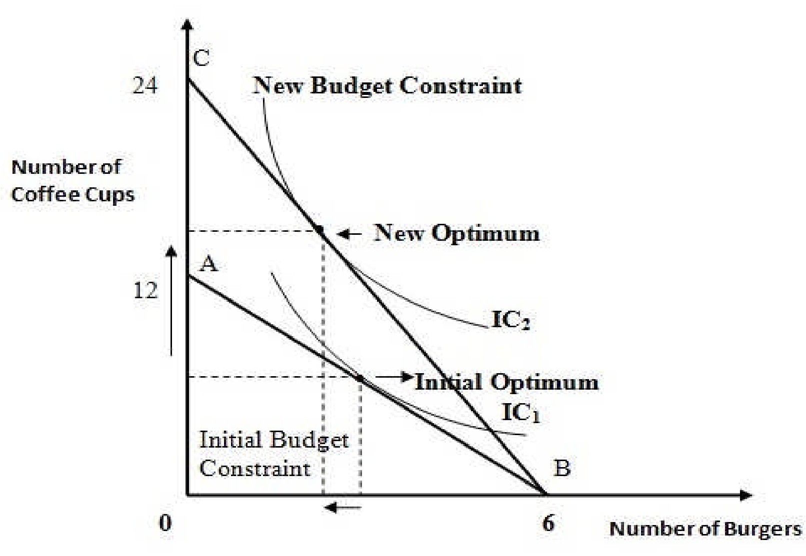

Figure 2A.8 – Price Effect.

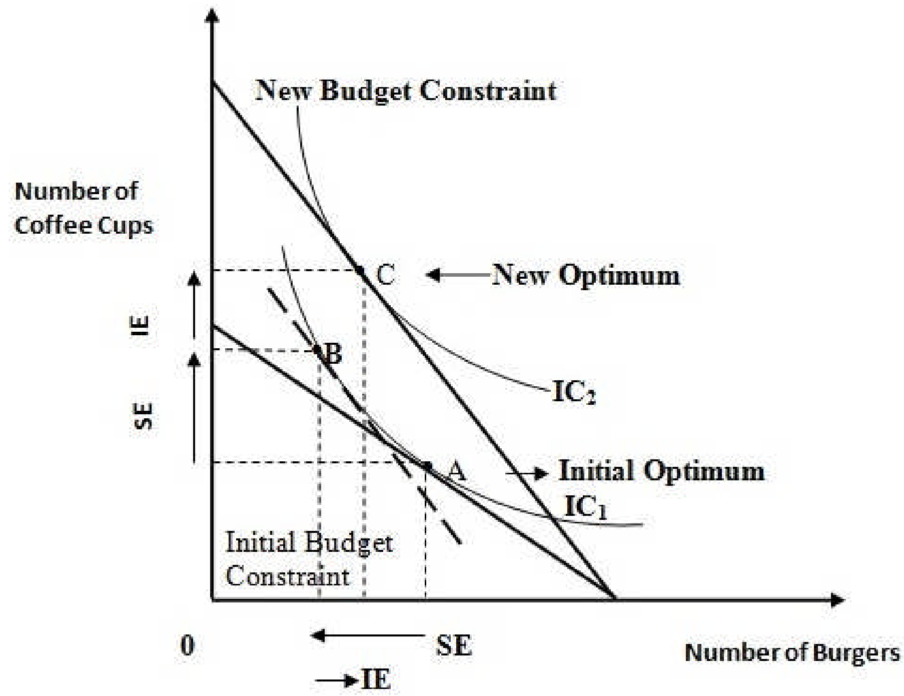

Figure 2A.9 – Income and Substitution Effects.

2A.6 DERIVATION OF THE DEMAND CURVE

The demand curve for goods reflects the consumption decisions of the consumer. The demand curve is a reflection of the optimal decisions taken by the consumer given his budget constraint and the indifference curves. For example, Figure 2A.10 considers the demand for coffee. Panel (a) shows that the price of coffee falls from Rs.50 to Rs.25 and the consumer's budget constraint shifts outward to become steeper towards the vertical axis. This outward shift indicates the increase in purchasing power of the consumer in terms of coffee. Since the price of burgers has not changed, the origin of the new budget constraint remains the same. Due to the positive substitution and income effects, the demand for coffee rises from 6 cups to 18 cups. Panel (b) shows the demand curve that is based on the new optimal decision taken by the consumer. The theory of consumer choice thus provides the theoretical foundation for the consumer's demand curve.

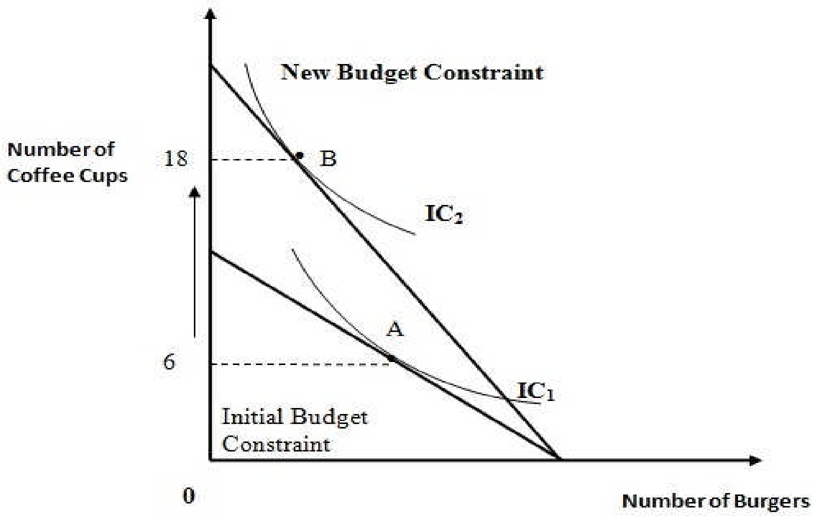

Figure 2A.10 (a) – The Consumer’s Optimum.

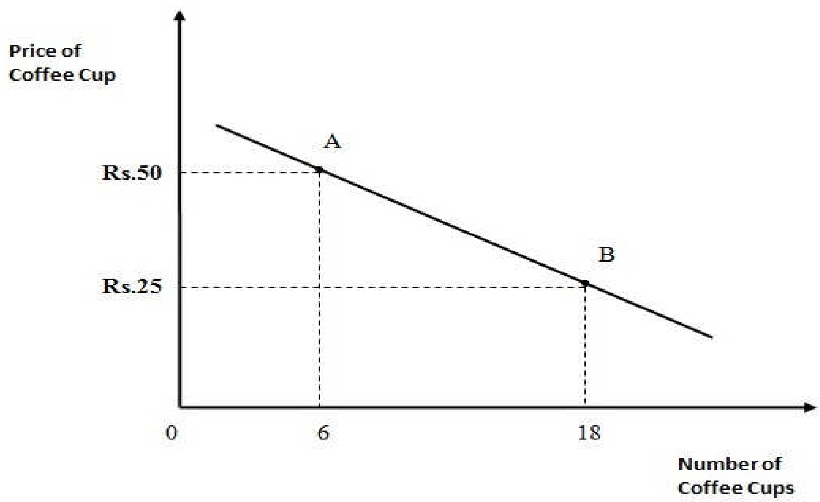

Figure 2A.10 (b) – The Demand Curve for Coffee.

2A.7 SUMMARY

1. The theory of consumer choice provides a better understanding of demand. It examines the trade-offs that people face as consumers. The theory of consumer choice examines how consumers facing trade-offs make decisions and how they respond to changes in their environment.

2. The consumer’s preferences permit him to choose among different combinations or bundles of two goods: coffee and burgers. The consumer will be indifferent between the two goods if he or she has an equal liking for both the goods.

3. The slope of the indifference curve at any point equals the rate at which the consumer is willing to sacrifice or substitute one good for the other. This rate of substitution is called the marginal rate of substitution (MRS).

4. Given the number of indifference curves, the consumer would like to prefer the highest indifference curve because it has the largest bundle of two goods. But the budget constraint is the limit within which consumer can make a choice of his bundle of two goods. The budget constraint is a function of the income of the consumer and the prices of two goods that the consumer is willing to consume.

5. The impact of changes in price of a commodity on consumption can be divided into two effects, namely; the income effect and the substitution effect. When the consumer decides to buy a larger quantity of both the goods, it is known as income effect. However, the relative price of burger has risen i.e. now the consumer would need four cups of coffee to trade with one burger. The consumer would therefore choose to trade more burgers for coffee because coffee has become hundred per cent cheaper in real terms. This is known as the substitution effect.

6. The demand curve for goods reflects the consumption decisions of the consumer. It is a reflection of the optimal decisions taken by the consumer given his budget constraint and the indifference curves.

2A.8 QUESTIONS

1. Explain the concept of consumer preference and budget constraint.
2. Explain the concept of consumer optimum with indifference curve.
3. Explain the effect of changes in price and income on consumer's optimal decision making in case of a normal good.
4. Explain the effect of changes in price and income on consumer's optimal decision making in case of an inferior good.
5. Derive the demand curve with the help of indifference curve.

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UNIT - III

UNIT - 3

PRODUCTION DECISIONS AND COST ANALYSIS

Unit Structure:

3.0 OBJECTIVES

- To familiar students with Concept of Production Function
- To acquaint the students with Nature of short run and long run Production Function
- To study the Law of variable proportion & Laws of Returns to scale Economies of Scale
- To understand the concept of Expansion path and Multiproduct firm
- To Study Cost reduction through experience - Learning curve

3.1 INTRODUCTION: PRODUCTION FUNCTION

Production is an activity of utter importance for any economy. In fact, a nation with a high level of productive activities spearheads the prosperity charts. This is because raw goods, surely are valuable, but production done upon these raw goods adds up to their value or their want-satisfying power.

Since the primary purpose of economic activity is to produce utility for individuals, we count as production during a time period all activity which either creates utility during the period or which increases ability of the society to create utility in the future. Business firms are important components (units) of the economic system.

They are artificial entities created by individuals for the purpose of organizing and facilitating production. The essential characteristics of the business firm is that it purchases factors of production such as land, labour, capital, intermediate goods, and raw material from households and other business firms and transforms those resources into different goods or services which it sells to its customers, other business firms and various units of the government as also to foreign countries.

3.1.1 Definition of Production:

According to Bates and Parkinson:

Production is the organized activity of transforming resources into finished products in the form of goods and services; the objective of production is to satisfy the demand for such transformed resources".

We now know the meaning of production, that production creates or adds utility. There are various processes through which we can achieve the aim of utility creation or addition to ultimately satisfy human wants. These processes are as follows:

The manufacturing processes that take physical inputs and produce physical outputs, eventually increasing the utility of the resource being manufactures, are integral branches in the production tree. These processes are the most obvious forms of production. They change the form of the goods under concern, in order to satisfy a greater human want.

For example, changing a log of wood into a table or chair is a manufacturing process. Further, such processes add to the *utility of form* of the raw materials.

3.1.2 Meaning of Production Function:

In economics, a **production function** gives the technological relation between quantities of physical inputs and quantities of output of goods. The production function is one of the key concepts of mainstream neoclassical theories, used to define marginal product and to distinguish allocative efficiency, a key focus of economics. One important purpose of the production function is to address allocative efficiency in the use of factor inputs in production and the resulting distribution of income to those factors, while abstracting away from the technological problems of achieving technical efficiency, as an engineer or professional manager might understand it.

In simple words, production function refers to the functional relationship between the quantity of a good produced (output) and factors of production (inputs).The production function of a firm depends on the state of technology. With every development in technology, the production function of the firm undergoes a change.

The new production function brought about by developing technology displays same inputs and more output or the same output with lesser inputs. Sometimes a new production function of the firm may be adverse as it takes more inputs to produce the same output.

Mathematically, such a basic relationship between inputs and outputs may be expressed as:

$Q = f(L, C, N)$

Where Q = Quantity of output

L = Labour

C = Capital

N = Land.

Hence, the level of output (Q), depends on the quantities of different inputs (L, C, N) available to the firm. In the simplest case, where there are only two inputs, labour (L) and capital (C) and one output (Q), the production function becomes.

$Q = f (L, C)$

The efficiency of this relationship depends on the different quantities used in the production process, the quantities of output and the productivity at each point. It can be shown algebraically:

$O = f (I_1, I_2, I_3, I_4 \ldots\ldots.. Z_n)$

Where, O = quantity of output

I_1, I_2, I_3 = Quantity of different inputs

It can be classified on the basis of the substitutability of the inputs by other inputs.

3.2 LONG-RUN VS SHORT-RUN PRODUCTION FUNCTION

What is that separates long-run from short-run in economic profession? No doubt, the answer is time a variable could take to vary. In this regards, factors of production are classified into long-run and short-run based on the variability i.e. time they take to be variable. Doing this is beneficial for us to thoroughly examine and understand the theories of production.

In fact, short-run in economics is a time interval, in which we cannot even change a single factor input. This way a production function is short-run when at least one factor input cannot be changed during the period. In other terms, when not all factors of production is variable then a production function is short-run, and called short run production function. Hence, at least one factor input must be fixed in the short-run production function.

On the other hand, all the factor inputs are variable in long-run production function. Long-run is defined as the time period in which all factor inputs, that are included in production function, can be changed. However, there is no specific law that stipulates the short- and long-run. It is all about the theory, but in practice, it depends on the nature of production activity that determines short- and long-run. That is why, a practical thinking of economists is that long-run is a planning period in which decisions regarding investment in new plant and machinery can be undertaken, whereas short-run involves the operations from existing plant and machinery.

3.2.1 Fixed vs Variable Proportion Production Function

Lets us first understand the concept of proportion before starting the topic. Proportion refers to the equality of two ratios, that is, connecting two ratios by equality sign results in proportion. This way ratios are the integral parts of proportion, and we mean proportion here to refers to the equality of different capital-labor ratios.

Also one more thing to consider here is a term called **technical coefficients of production**, which is the amount of factor inputs required to produce a certain commodity. For example, suppose that it needs 10 units of capital to produce 50 units of particular commodity, then technical coefficient of capital for production is 0.2. If we were to express it in percentage basis, it requires 20 percent capital to produce 50 units of commodity.

Now that we define proportion and technical coefficients of production, it is time to describe fixed and variable proportion production functions. Whether production function is variable or fixed proportion depends on the technical coefficients of production. If technical coefficients of factors are constant, then the production function is fixed or constant proportion production function, otherwise, variable proportion production function.

In fixed constant proportion production function, capital-labour ratio remains fixed no matter how large the scale of production is, as opposed to variable proportion production function. Likewise, there is zero marginal rate of technical substitution between factor inputs -capital and labor- in fixed or constant proportion production function, which means factors, are perfect complements. On the other hand, there might be limited factor substitutability or the perfect substitutes in case of variable proportion production function.

3.2.2 Linearly Homogeneous Production Function

If the multiplication of each factor inputs of a production function by a constant 'j' leads to the multiplication of output by j^r, then the production function is said to be homogeneous of degree r.

Mathematically, the general homogeneous production function of degree r is written as:

$j^r Q= F(jL, jK)$ where $j, r > 0$ …………………. (III)

where, Q is output, L is labor, K is capital, and j and r are constant greater than zero. However, j and r can take any value, but we take these value as positive from the aspect of economic variables which are rarely negatives. When the value of r in equation (III) is 1, then the homogeneous production function is of first degree, which is also the linearly homogeneous production function we refer to. That means $jQ= F(jL, jK)$ is linearly homogeneous production function and implies that multiplying factor inputs by constant j results in the multiplication of output by the same constant j. Thus it shows the constant returns to scale.

3.2.3 Characteristics of Homogeneous Production Function

General homogeneous production function $j^r Q= F(jL, jK)$ exhibits the following characteristics based on the value of r.

If $r = 1$, it implies constant returns to scale. In such a case, production function is said to be linearly homogeneous of first order.

If $r > 1$, it implies increasing returns to scale.

If $r < 1$, it implies decreasing returns to scale.

Due to it's simplicity and good approximation of real world situation, this production function is widely used in linear programming and input-output models.

3.2.4 Cobb-Douglas Production Function

This very famous Cobb-Douglas production function is a long-run production function, and is the result of combined efforts of professor of economics cum U.S. senator Paul Douglas and mathematician Charles Cobb. Douglas observed U.S. data and found that the shares of national income to labor and capital remained almost constant over the long time-period. Put another way, despite continuous growth in national income, proportionate share of labor and capital to national income almost grew at the constant rate. The very fact is depicted in the special case of Cobb-Douglas production function.

Mathematically, the general Cobb-Douglas production function is written as:

$Q = F(L,K) = A\ K\alpha\ L\beta$ where $A, \alpha, \beta > 0$ …………………. (IV)

where, Q is output, α is output elasticity of capital, β is output elasticity of labor, and A is productivity or total factor productivity measuring productivity of production function or technology or factor inputs in total. And, all of these parameters are positive. If production technique advances, it raises the value of productivity parameter, A. Raising value of total factor productivity, A, equally means that productivity of both labor and capital has increased.

The parameters α and β, which also measure the shares of national income to capital and labor, are distribution parameters. That is parameters α and β measure the contribution of capital and labor to total production or national income. Note that the usage of Cobb-Douglas production function here is in macro sense, that's why it is often called as aggregate production function. However, it can be used in the micro sense as well.

3.2.5 Characteristics of Cobb-Douglas Production Function

Lets observe the Cobb-Douglas production function $Q = A\ K\alpha\ L\beta$ supposing that we change capital and labor by some constant multiple of λ, which results the right side of function as:

$A\ (\lambda K)\alpha\ (\lambda L)\beta = \lambda\alpha{+}\beta\ A\ K\alpha\ L\beta = \lambda\alpha{+}\beta\ .\ Q$

which implies that increasing the factor inputs by multiple of some constant λ, output increase by the multiple of $\lambda\alpha{+}\beta$. That means coefficient $\lambda\alpha{+}\beta$ shows the joint contribution of capital and labor to output. More specifically, coefficient $\alpha+\beta$ is a measure of returns to scale. You can find more information on law of returns to scale.

If $\alpha+\beta = 1$, it implies constant returns to scale. In such a case, production function is said to be linearly homogeneous of first order.

If $\alpha+\beta > 1$, it implies increasing returns to scale.

If $\alpha+\beta < 1$, it implies decreasing returns to scale.

In case of linearly homogeneous production function of first order, the following features holds true:

- Cobb-Douglas production function exhibits constant returns to scale. That means doubling the factor inputs doubles the output by the same proportion.
- It demonstrates diminishing returns i.e. marginal product of factor diminishes. More precisely, marginal product of a factor input decreases as it is used more and more, holding constant the other factor inputs.
- It exhibits the unit elasticity of factor substitution (For more read here). Initially, the Cobb-Douglas production was used in manufacturing industry. Now, it is widely used in empirical studies as well.

3.2.6 CES Production Function

CES stands for constant elasticity of substitution. This latest CES production function is due to the joint effort of Arrow Chenery, Minhas and Solow. This CES production function is more general production function which yields the constant elasticity of factor substitution other than 1.

Mathematically, the general CES production function is written as:

$Q= A[\delta K^{-\rho} + (1-\delta)L^{-\rho}]^{-1/\rho}$ where $A > 0$, $0<\delta<1$, $-1<\rho\neq 0$ …………… (V)

where, Q is output, L is labor, K is Capital, A is efficiency parameter serving as state of technology as A in Cobb-Douglas production function, δ is distribution parameter showing relative factor shares as α and β is Cobb-Douglas production function, and ρ is substitution parameter which has no counterpart in Cobb-Douglas production and is determinant of constant elasticity of substitution in CES production function.

The elasticity of substitution between factors (σ) is given by $1/(1+\rho)$ in the CES production function i.e. $\sigma = 1/(1+\rho)$.

3.2.7 Characteristics of CES Production Function

CES production function is linearly homogeneous and exhibits the constant returns to scale. Based on the value of ρ, it produces the following results for σ :

When $-1<\rho<0$, then $\sigma >1$.

When $\rho = 0$, then $\sigma = 1$.

When $0< \rho < \infty$, then $\sigma < 1$.

Cobb-Douglas production function is special case of CES production function when there is unitary elasticity of substitution. This means that linearly homogeneous CES production function is Cobb-Douglas production function producing constant returns to scale.

3.3 ISOQUANTS

3.3.1 Definition and Meaning:

The word ***'iso'*** is of Greek origin and means equal or same and ***'quant'*** means quantity. An ***iso-quant*** may be defined as:

"A curve showing all the various combinations of two factors that can produce a given level of output. The iso-quant shows the whole range of alternative ways of producing the same level of output".

The modern economists are using iso-quant, or "ISO" product curves for determining the optimum factor combination to produce certain units of a commodity at the least cost.

3.3.2 Schedule:

The concept of iso-quant or equal product curve can be better explained with the help of schedule given below:

Table 3.1

Combinations	Factor X	Factor Y	Total Output
A	1	14	100 METERS
B	2	10	100 METERS
C	3	7	100 METERS
D	4	5	100 METERS
E	5	4	100 METERS

In the table given above, it is shown that a producer employs two factors of production X and Y for producing an output of 100 meters of cloth. There are five combinations which produce the same level of output (100 meters of cloth).

The factor combination A using 1 unit of factor X and 14 units of factor Y produces 100 meters of cloth. The combination B using 2 units of factor X and 10 units of factor Y produces 100 meters of cloth. Similarly combinations C, U and E, employing 3 units of X and 7 units of Y, 4 units of X and 5 units of Y, 5 units of X and 4 units of Y produce 100 units of output, each. The producer, here., is indifferent as to which combination of inputs he uses for producing the same amount of output.

The alternative techniques for producing a given level of output can be plotted on a graph.

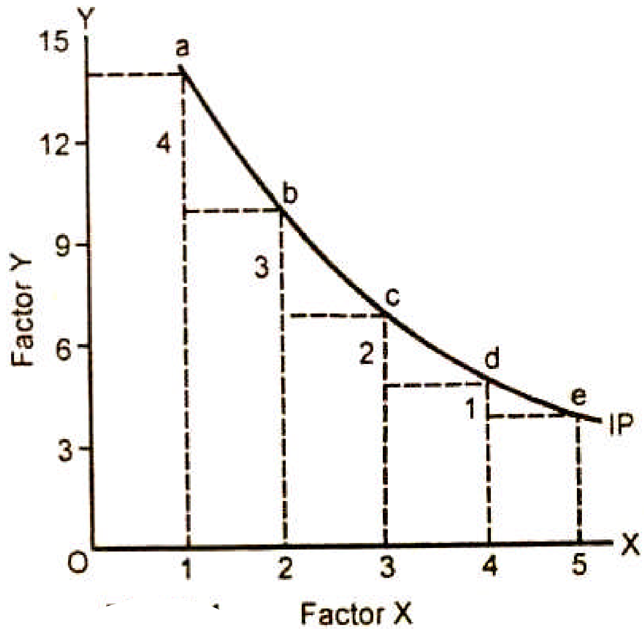


Figure 3.1

The figure 3.1 shows y the 100 units iso-quant plotted to ISO product schedule. The five factor combinations of X and Y are plotted and are shown by points a, b, c, d and e. if we join these points, it forms an 'iso-quant'.

An iso-quant therefore, is the graphic representation of an iso-product schedule. It may here be noted that all the factor combinations of X and Y on an iso-product curve are technically efficient combinations.

The producer is indifferent as to which combination he uses for producing the same level of output. It is in this way that an iso product curve is also called 'production indifference curve'. In the figure 12.1, ISO product IP curve represents the various combinations of the two inputs which produce the same level of output (100 meters of cloth).

3.4 ISOQUANT MAP

An iso-quant map shows a set of iso-product curves. Each iso-quant represents a different level of output. A higher iso-quant shows a higher level of output and a lower iso-quant represents a lower level of output.

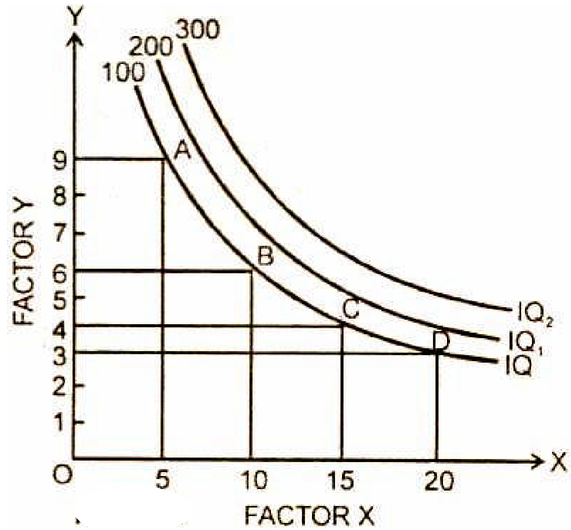


Figure 3.2

In the figure 3.2, a family of three iso-product curves which produce various level of output is shown. The iso product IQ^1 yields 100 units of output by using quantities of inputs X and Y. So is also the case with iso-quant IQ^3 yielding 300 units of output.

We conclude that an iso-quant map includes a series, of iso-product curves. Each iso-quant represents a different level of output. The higher the iso-quant output, the further right will be the iso-quant.

3.5 PROPERTIES OF ISOQUANTS

The main properties of the iso-quants are similar to those of indifference curves. These properties are now discussed in brief:

(i) An Iso-quant Slopes Downward from Left to Right:

This implies that the Iso-quant is a negatively sloped curve. This is because when the quantify of factor K (capital) is increased, the quantity of L (labor) must be reduced so as to keep the same level of output.

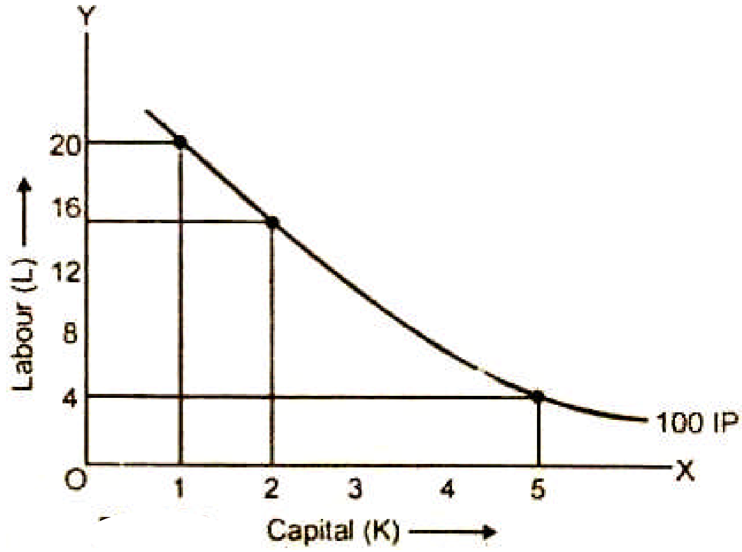


Figure 3.3

The figure (3.3) depicts that an iso-quant IP is negatively sloped curve. This curve shows that as the amount of factor K is increased from one unit to 2 units, the units of factor L are decreased from 20 to 15 only so that output of 100 units remains constant.

(ii) An Iso-quant that Lies Above and to the Right of Another Represents a Higher Output Level:

It means a higher iso-quant represents higher level of output.

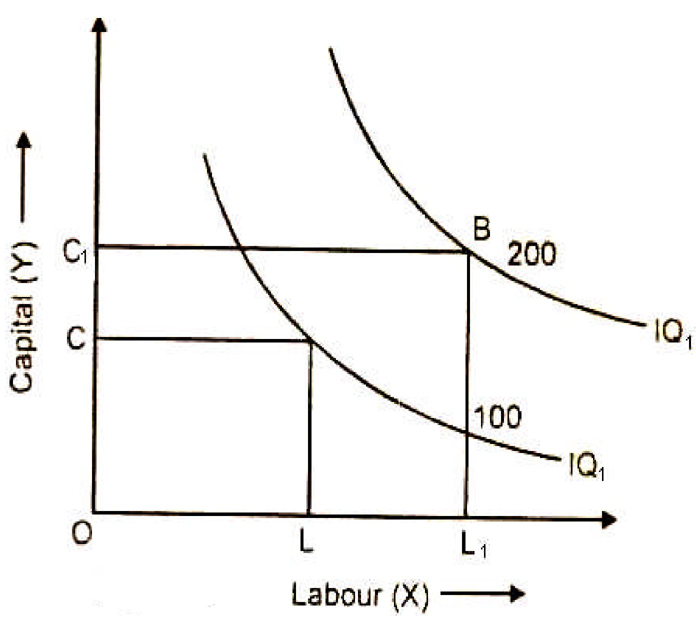


Figure 3.4

The figure 3.4 represents this property. It shows that greater output can be secured by increasing the quantity combinations of both the factors

X and Y. The producer increases the output from 100 units to 200 units by increasing the quantity combination of both the X and Y. The combination of OC of capital and OL of labor yield 100 units of production. The production can be increased to 200 units by increasing the capital from OC to OC_1 and labor from OL to OL_1.

(iii) Iso-quants Cannot Cut Each Other:

The two iso-quants cannot intersect each other.

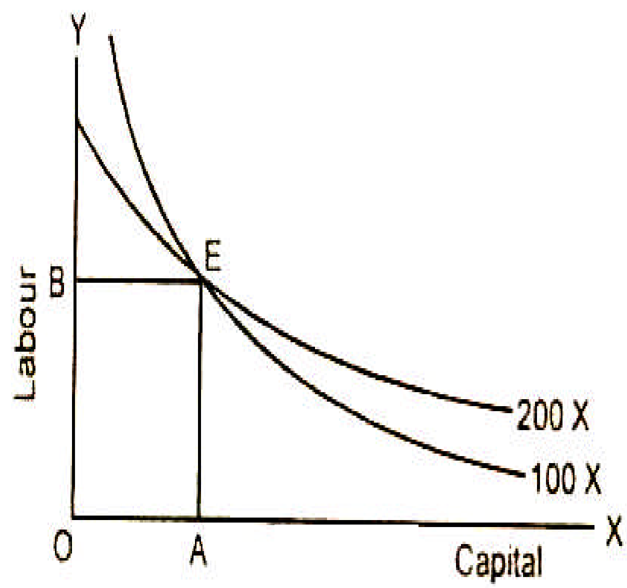


Figure 3.5

If two iso-quant are drawn to intersect each other as is shown in this figure 3.5, then it is a negation of the property that higher Iso-quant represents higher level of output to a lower Iso-quant. The intersection at point E shows that the same factor combination can produce 100 units as well as 200 units. But this is quite absurd. How can the same level of factor combination produce two different levels of output, when the technique of production remains unchanged. Hence two iso-quants cannot intersect each other.

(iv) Iso-quants are Convex to the Origin:

This property implies that the marginal significance of one factor in terms of another factor diminishes along an ISO product curve. In other words, the iso-quants are convex to the origin due to diminishing marginal rate of substitution.

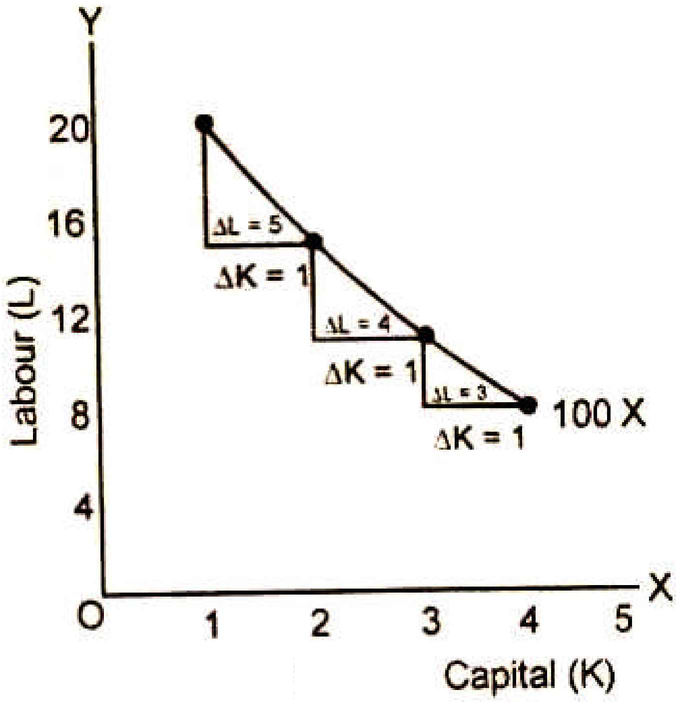


Figure 3.6

In this figure 3.6 MRS^{KL} diminishes from 5:1 to 4:1 and further to 3:1. This shows that as more and more units of capital (K) are employed to produce 100 units of the product, lesser and lesser units of labor (L) are used. Hence diminishing marginal rate of technical substitution is the reason for the convexity of an iso-quant.

(v) Each Isoquant is Oval Shaped:

The iso product curve, is elliptical. This means that the firm produces only those segments of the iso-product curves which are convex to the origin and lie between the ridge lines. This is the economic region of production.

Check your progress:

1. Explain the meaning of production function.
2. Distinguish between short run and long run production function.
3. State the characteristics of Cobb-Douglas production function.
4. Explain the meaning of Iso-quant.
5. Discuss the properties of Iso-quants.

3.6 ISO-COST LINES/OUTLAY LINE/PRICE LINE/FACTOR COST LINE

A firm can produce a given level of output using efficiently different combinations of two inputs. For choosing efficient combination of the inputs, the producer selects that combination of factors which has the lower cost of production. The information about the cost can be obtained from the iso-cost lines.

Explanation:

An iso-cost line is also called outlay line or price line or factor cost line. An iso-cost line shows all the combinations of labor and capital that are available for a given total cost to-the producer. Just as there are infinite number of iso-quants, there are infinite number of iso-cost lines, one for every possible level of a given total cost. The greater the total cost, the further from origin is the iso-cost line.

Example:

The iso-cost line can be explained easily by taking a simple example.

Diagram/Figure:

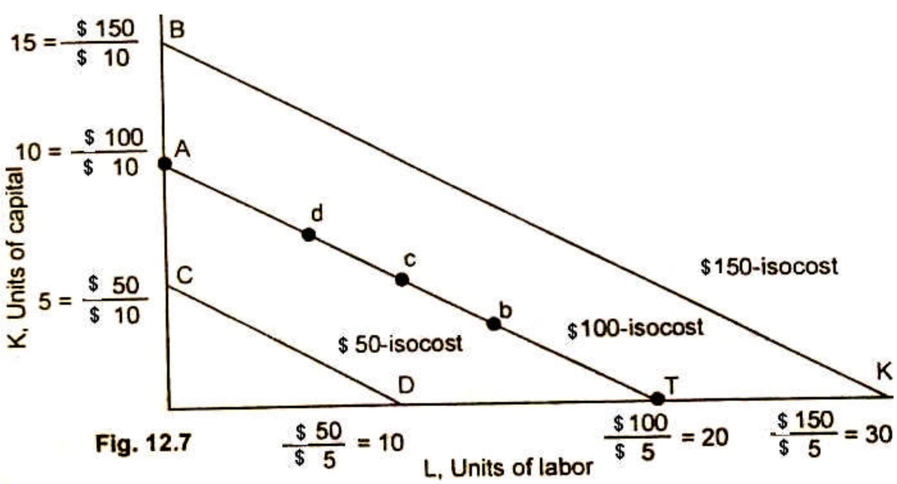


Figure 3.7

Let us examine a firm which wishes to spend $100 on a combination of two factors labor and capital for producing a given level of output. We suppose further that the price of one unit of labor is $5 per day. This means that the firm can hire 20 units of labor. On the other hand if the price of capital is $10 per unit, the firm will purchase 10 units of capital. In the fig. 3.7, the point A shows 10 units of capital used whereas point T shows 20 units of labor are hired at the given price. If we join points A and T, we get a line AT. This AT line is called iso-cost line or outlay line. The iso-cost line is obtained with an outlay of $100.

Let us assume now that there is no change in the market prices of the two factors labor and capita! but the firm increases the total outlay to $150. The new price line BK shows that with an outlay of $150, the producer can purchase 15 units of capital or 30 units of labor. The new price line BK Shifts upward to the right. In case the firm reduces the outlay to $50 only, the iso-cost line CD shifts downward to the left of original iso-cost line and remains parallel to the original price line.

The iso-cost line plays a similar role in the firm's decision making as the budget line does in consumer's decision making. The only difference between the two is that the consumer has a single budget line which is determined by the income of the consumer. Whereas the firm faces many iso-cost lines depending upon the different level of expenditure the firm might make. A firm may incur low cost by producing relatively lesser output or it may incur relatively high cost by producing a relatively large quantity.

3.7 MARGINAL RATE OF TECHNICAL SUBSTITUTION (MRTS)

Prof. R.G.D. Alien and J.R. Hicks introduced the concept of MRS (marginal rate of substitution) in the theory of demand. The similar concept is used in the explanation of producers equilibrium and is named as marginal rate of technical substitution (MRTS).

Marginal rate of technical substitution (MRTS) is:
"The rate at which one factor can be substituted for another while holding the level of output constant".

The slope of an iso-quant shows the ability of a firm to replace one factor with another while holding the output constant. For example, if 2 units of factor capital (K) can be replaced by 1 unit of labor (L), marginal rate of technical substitution will be thus:

$$MRS = \frac{\Delta K}{\Delta L} = \frac{2}{1} = 2$$

Explanation:

The concept of MRTS can be explained easily with the help of the table and the graph, below:

Schedule:

Table 3.2

Factor Combinations	**Units of Labour**	**Units of Capital**	**Units of Output of Commodity X**	**MRTS of Labour for Capital**
A	1	15	150	-
B	2	11	150	4:1
C	3	8	150	3:1
D	4	6	150	2:1
E	5	5	150	1:1

It is clear from the above table that all the five different combinations of labor and capital that is A, B, C, D and E yield the same level of output of 150 units of commodity X, As we move down from factor A to factor B, then 4 units of capital are required for obtaining 1 unit of labor without affecting the total level of output (150 units of commodity X).

The MRTS is 4:1. As we step down from factor combination B to factor combination C, then 3 units of capital are needed to get 1 unit of labor. The MRTS of labor for capital 3:1. If we further switch down from factor combination C to D, the MRTS of labor for capital is 2:1. From factor D to E combination, the MRTS of labor for capital falls down to 1:1.

Formula:

$$\mathbf{MRTS_{LK} = \frac{\Delta K}{\Delta L}}$$

It means that the marginal rate of technical substitution of factor labor for factor capital (K) ($MRTS_{LK}$) is the number of units of factor capital (K) which can be substituted by one unit of factor labor (L) keeping the same level of output. In the figure 12.8, all the five combinations of labor and capital which are A, B, C, D and E are plotted on a graph.

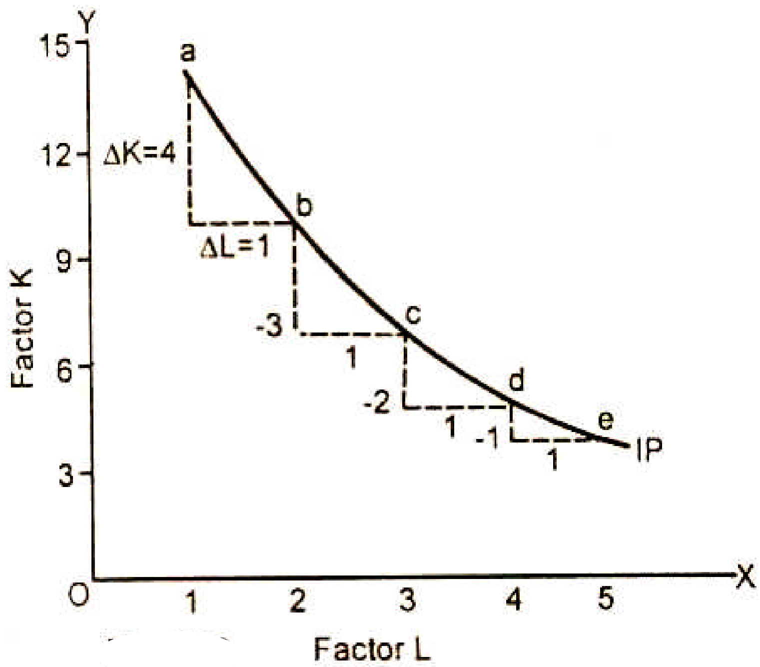


Figure 3.8

The points A, B, C, D and E are joined to form an iso-quant. The iso-product curve shows the whole range of factor combinations producing 150 units of commodity X. It is important to point out that ail the five-factor combination of labor and capital on an iso-product curve are technically efficient combinations. The producer is indifferent towards these, combinations as these produce the same level of output.

3.7.1 Diminishing Marginal Rate of Technical Substitution:

The decline in MRTS along an iso-quant for producing the same level of output is named as diminishing marginal rates of technical education. As we have seen in Fig. 3.8, that when a firm moves down from point (a) to point (b) and it hires one more labor, the firm gives up 4 units of capital (K) and yet remains on the same iso-quant at point (b). So the MRTS is 4. If the firm hires another labor and moves from point (b) to (c), the firm can reduce its capital (K) to 3 units and yet remain on the same iso-quant. So the MRTS is 3. If the firm moves from point (C) to (D), the MRTS is 2 and from point D to e, the MRTS is 1. The decline in MRTS along an iso-quant as the firm increases labor for capital is called ***Diminishing Marginal Rate of Technical Substitution.***

3.8 OPTIMUM FACTOR COMBINATION

In the long run, all factors of production can be varied. The profit maximization firm will choose the least cost combination of factors to produce at any given level of output. The least cost combination or the optimum factor combination refers to the combination of factors with which a firm can produce a specific quantity of output at the lowest possible cost.

Explanation:

There are two methods of explaining the optimum combination of factor:

(i) The marginal product approach.

(ii) The isoquant / iso-cost approach.

These two approaches are now explained in brief:

(i) The Marginal Product Approach:

In the long run, a firm can vary the amounts of factors which it uses for the production of goods. It can choose what technique of production to use, what design of factory to build, what type of machinery to buy. The profit maximization will obviously want to use that mix of factors of combination which is least costly to it. In search of higher profits, a firm substitutes the factor whose gain is higher than the other. When the last rupee spent on each factor brings equal revenue, the profit of the firm is maximized. When a firm uses different factors of production or least cost combination or the optimum combination of factors is achieved when:

Formula:

$$\frac{Mpp_a}{P_a} = \frac{Mpp_b}{P_b} = \frac{Mpp_c}{P_c} = \frac{Mpp_n}{P_n}$$

In the above equation a, b, c, n are different factors of production. Mpp is the marginal physical product. A firm compares the Mpp / P ratios with that of another. A firm will reduce its cost by using more of those factors with a high Mpp / P ratios and less of those with a low Mpp / P ratio until they all become equal.

(ii) The Iso-quant / Iso-cost Approach:

The least cost combination of-factors or producer's equilibrium is now explained with the help of iso-product curves and iso-costs. The optimum factors combination or the least cost combination refers to the combination of factors with which a firm can produce a specific quantity of output at the lowest possible cost.

As we know, there are a number of combinations of factors which can yield a given level of output. The producer has to choose, one combination out of these which yields a given level of output with least possible outlay. The least cost combination of factors for any level of output is that where the iso-product curve is tangent to an iso-cost curve. The analysis of producers equilibrium is based on the following assumptions.

3.8.1 Assumptions of Optimum Factor Combination:

The main assumptions on which this analysis is based areas under:

(a) There are two factors X and Y in the combinations.
(b) All the units of factor X are homogeneous and so is the case with units of factor Y.
(c) The prices of factors X and Y are given and constants.
(d) The total money outlay is also given.
(e) In the factor market, it is the perfect completion which prevails. Under the conditions assumed above, the producer is in equilibrium, when the following two conditions are fulfilled.

(1) The isoquant must be convert to the origin.
(2) The slope of the Isoquant must be equal to the slope of isocost line.

The least cost combination of factors is now explained with the help of figure 3.9.

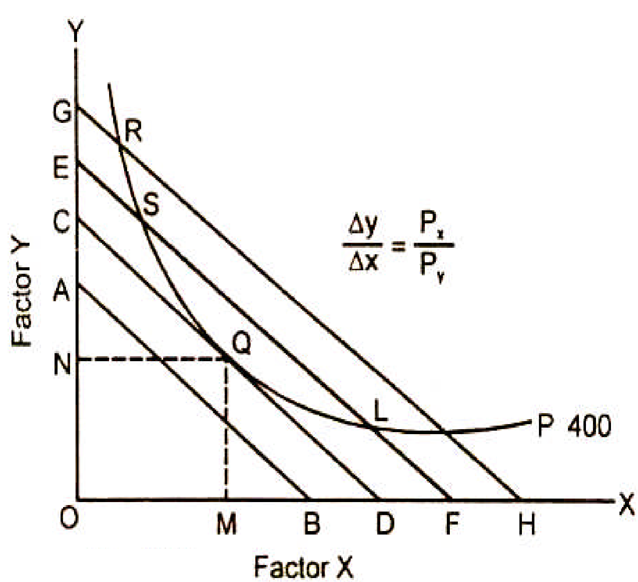


Figure 3.9

Here the iso-cost line CD is tangent to the iso-product curve 400 units at point Q. The firm employs OC units of factor Y and OD units of factor X to produce 400 units of output. This is the optimum output which the firm can get from the cost outlay of Q. In this figure any point below Q on the price line AB is desirable as it shows lower cost, but it is not attainable for producing 400 units of output. As regards points RS above Q on iso-cost lines GH, EF, they show higher cost.

These are beyond the reach of the producer with CD outlay. Hence point Q is the least cost point. It is the point which is the least cost factor combination for producing 400 units of output with OC units of factor Y and OD units of factor X. Point Q is the equilibrium of the producer.

At this point, the slope of the iso-quants equal to the slope of the iso-cost line. The MRT of the two inputs equals their price ratio. Thus we find that at point Q, the two conditions of producer's, equilibrium in the choice of factor combinations, are satisfied.

(1) The iso-quant (IP) is convex the origin.
(2) At point Q, the slope of the iso-quant $\Delta Y / \Delta X$ ($MTYS_{xy}$) is equal to the slope of the iso-cost in Px / Py. The producer gets the optimum output at least cost factor combination.

3.9 SUMMARY

1. In economics, a production function gives the technological relation between quantities of physical inputs and quantities of output of goods.

2. A production function is said to be short-run when at least one factor input cannot be changed during the period. In other terms, when not all factors of production is variable then a production function is short-run, and called short run production function. On the other hand, all the factor inputs are variable in long-run production function. Long-run is defined as the time period in which all factor inputs, that are included in production function, can be changed.

3. This very famous Cobb-Douglas production function is a long-run production function, and is the result of combined efforts of professor of economics cum U.S. senator Paul Douglas and mathematician Charles Cobb. Mathematically, the general Cobb-Douglas production function is written as:

Q= F(L,K) = A Kα Lβ where A, α, β > 0

where, Q is output, α is output elasticity of capital, β is output elasticity of labor, and A is productivity or total factor productivity measuring productivity of production function or technology or factor inputs in total.

4. CES stands for constant elasticity of substitution. This latest CES production function is due to the joint effort of Arrow Chenery, Minhas and Solow. This CES production function is more general production function which yields the constant elasticity of factor substitution other than 1.

5. The modern economists are using iso-quant, or "ISO" product curves for determining the optimum factor combination to produce certain units of a commodity at the least cost.

6. An iso-quant map shows a set of iso-product curves. Each iso-quant represents a different level of output. A higher iso-quant shows a higher level of output and a lower iso-quant represents a lower level of output.

7. Properties of Iso-quants are:

i) An Iso-quant Slopes Downward from Left to Right

ii) An Iso-quant that Lies Above and to the Right of Another Represents a Higher Output Level

iii) Iso-quants Cannot Cut Each Other

iv) Iso-quants are Convex to the Origin

v) Each Isoquant is Oval Shaped

8. An iso-cost line is also called outlay line or price line or factor cost line. It shows all the combinations of labor and capital that are available for a given total cost to-the producer. Just as there are infinite number of iso-quants, there are infinite number of iso-cost lines, one for every possible level of a given total cost. The greater the total cost, the further from origin is the iso-cost line.

9. Prof. R.G.D. Alien and J.R. Hicks introduced the concept of MRS (marginal rate of substitution) in the theory of demand. The similar concept is used in the explanation of producers equilibrium and is named as marginal rate of technical substitution (MRTS). It is "The rate at which one factor can be substituted for another while holding the level of output constant".

10. The least cost combination or the optimum factor combination refers to the combination of factors with which a firm can produce a specific quantity of output at the lowest possible cost.

3.10 QUESTIONS

1. Explain in brief the concept of Production function.
2. What are the different types of production function?
3. Write a note on Cobb-Douglas production function.
4. Discuss in brief Constant Elasticity of Substitution.
5. State and explain the properties of Iso-quant curve.
6. Explain the two approaches to derive Optimum Factor Combination.

❖❖❖❖

UNIT - 3A

LAWS OF PRODUCTION AND COST ANALYSIS

Unit Structure:

3A.0 OBJECTIVES

- To familiar students with Concept of Law of variable proportions
- To acquaint the students with Economies of Scale & Economies of Scope
- To understand the concept of Expansion path and Multiproduct firm

- To Study Cost reduction through experience - Learning curve
- To understand the significance of Costs

3A.1 LAW OF VARIABLE PROPORTIONS

Law of Variable Proportions occupies an important place in economic theory. This law is also known as Law of Proportionality. Keeping other factors fixed, the law explains the production function with one factor variable. In the short run when output of a commodity is sought to be increased, the law of variable proportions comes into operation.

Therefore, when the number of one factor is increased or decreased, while other factors are constant, the proportion between the factors is altered. For instance, there are two factors of production viz., land and labour. Land is a fixed factor whereas labour is a variable factor. Now, suppose we have a land measuring 5 hectares. We grow wheat on it with the help of variable factor i.e., labour. Accordingly, the proportion between land and labour will be 1: 5. If the number of laborers is increased to 2, the new proportion between labour and land will be 2: 5. Due to change in the proportion of factors there will also emerge a change in total output at different rates. This tendency in the theory of production called the Law of Variable Proportion.

Definitions:"As the proportion of the factor in a combination of factors is increased after a point, first the marginal and then the average product of that factor will diminish." Benham

3A.2 ASSUMPTIONS

Law of variable proportions is based on following assumptions:

(i) Constant Technology:

The state of technology is assumed to be given and constant. If there is an improvement in technology the production function will move upward.

(ii) Factor Proportions are Variable:

The law assumes that factor proportions are variable. If factors of production are to be combined in a fixed proportion, the law has no validity.

(iii) Homogeneous Factor Units:

The units of variable factor are homogeneous. Each unit is identical in quality and amount with every other unit.

(iv) Short-Run:

The law operates in the short-run when it is not possible to vary all factor inputs.

3A.2.1 Explanation of the Law:

In order to understand the law of variable proportions we take the example of agriculture. Suppose land and labour are the only two factors of production.

By keeping land as a fixed factor, the production of variable factor i.e., labour can be shown with the help of the following table:

Table 3A.1

Units of Land	Units of Labour	Total Production	Average Production	Marginal Production
10 Acres	0	–	–	–
,,	1	20	20	20 } 1st stage MP > AP
,,	2	50	25	30
,,	3	90	30	40
,,	4	120	30	30 } AP = MP
,,	5	140	28	20 } 2nd stage
,,	6	150	25	10
,,	7	150	21.3	0 MP=0 and TP Maximum
,,	8	140	17.5	–10 } 3rd stage MP < 0

From the table 3A.1 it is clear that there are three stages of the law of variable proportion. In the first stage average production increases as there are more and more doses of labour and capital employed with fixed factors (land). We see that total product, average product, and marginal product increases but average product and marginal product increases up to 40 units. Later on, both start decreasing because proportion of workers to land was sufficient and land is not properly used. This is the end of the first stage.

The second stage starts from where the first stage ends or where AP=MP. In this stage, average product and marginal product start falling. We should note that marginal product falls at a faster rate than the average product. Here, total product increases at a diminishing rate. It is also maximum at 70 units of labour where marginal product becomes zero while average product is never zero or negative.

The third stage begins where second stage ends. This starts from 8th unit. Here, marginal product is negative and total product falls but average product is still positive. At this stage, any additional dose leads to positive nuisance because additional dose leads to negative marginal product.

3A.2.2 Graphic Presentation:

In fig. 1, on OX axis, we have measured number of labourers while quantity of product is shown on OY axis. TP is total product curve. Up to point 'E', total product is increasing at increasing rate. Between points E and G it is increasing at the decreasing rate. Here marginal product has started falling. At point 'G' i.e., when 7 units of labourers are employed, total product is maximum while, marginal product is zero. Thereafter, it begins to diminish corresponding to negative marginal product. In the lower part of the figure, MP is marginal product curve.

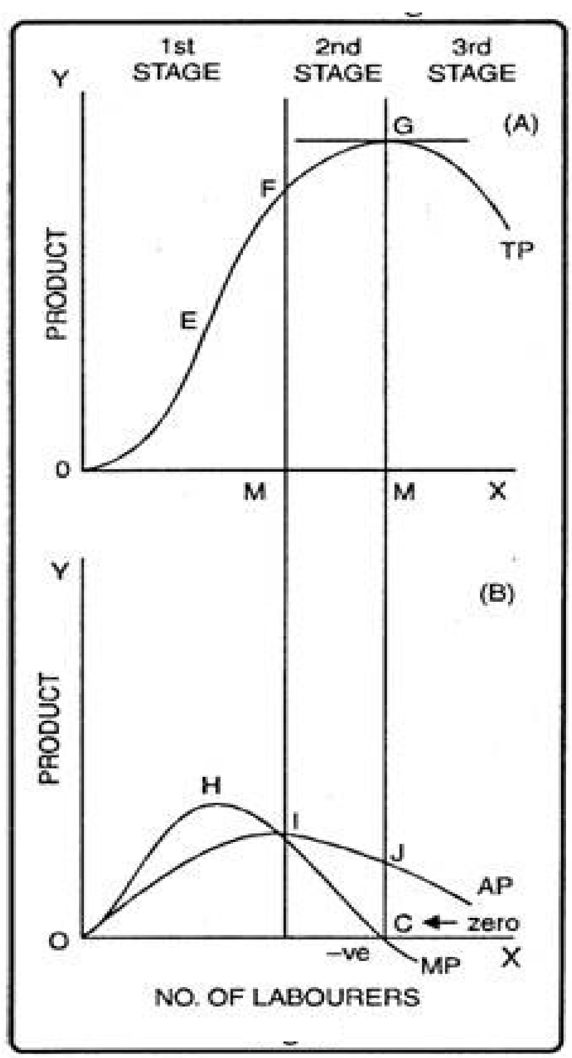


Fig. 3A.1

Up to point ‘H’ marginal product increases. At point ‘H’, i.e., when 3 units of labourers are employed, it is maximum. After that, marginal product begins to decrease. Before point ‘I’ marginal product becomes zero at point C and it turns negative. AP curve represents average product. Before point ‘I’, average product is less than marginal product. At point ‘I’ average product is maximum. Up to point T, average product increases but after that it starts to diminish.

3A.3 THREE STAGES OF THE LAW

1. First Stage:

First stage starts from point ‘O’ and ends up to point F. At point F average product is maximum and is equal to marginal product. In this stage, total product increases initially at increasing rate up to point E. between ‘E’ and ‘F’ it increases at diminishing rate. Similarly marginal product also increases initially and reaches its maximum at point ‘H’. Later on, it begins to diminish and becomes equal to average product at point T. In this stage, marginal product exceeds average product (MP > AP).

2.* Second Stage*:

It begins from the point F. In this stage, total product increases at diminishing rate and is at its maximum at point ‘G’ correspondingly marginal product diminishes rapidly and becomes ‘zero’ at point ‘C’. Average product is maximum at point ‘I’ and thereafter it begins to decrease. In this stage, marginal product is less than average product (MP < AP).

3. Third Stage:

This stage begins beyond point ‘G’. Here total product starts diminishing. Average product also declines. Marginal product turns negative. Law of diminishing returns firmly manifests itself. In this stage, no firm will produce anything. This happens because marginal product of the labour becomes negative. The employer will suffer losses by employing more units of labourers. However, of the three stages, a firm will like to produce up to any given point in the second stage only.

Total Product	Marginal Product	Average Product
Stage I		
First increases at increasing rate then at diminishing rate.	Increases in the beginning then reaches a maximum and begins to decrease.	First increases, continues to increase and becomes maximum.
Stage II		
Continues to increase at diminishing rate and becomes maximum.	Continues to diminish and becomes equal to zero.	Becomes equal to MP and then begins to diminish.
Stage III		
Diminishes	Becomes negative.	Continues to diminish but will always be greater than zero.

In Which Stage Rational Decision is Possible:

To make the things simple, let us suppose that, a is variable factor and b is the fixed factor. And a_1, a_2 , a_3….are units of a and b_1 b_2b_3…… are unit of b.

Stage I is characterized by increasing AP, so that the total product must also be increasing. This means that the efficiency of the variable factor of production is increasing i.e., output per unit of 'a' is increasing. The efficiency of 'b', the fixed factor, is also increasing, since the total product with 'b'$_1$ is increasing.

The stage II is characterized by decreasing AP and a decreasing MP, but with MP not negative. Thus, the efficiency of the variable factor is falling, while the efficiency of b, the fixed factor, is increasing, since the TP with 'b'$_1$ continues to increase.

Finally, stage III is characterized by falling AP and MP, and further by negative MP. Thus, the efficiency of both the fixed and variable factor is decreasing.

Rational Decision:

Stage II becomes the relevant and important stage of production. Production will not take place in either of the other two stages. It means production will not take place in stage III and stage I. Thus, a rational producer will operate in stage II.

Suppose b were a free resource; i.e., it commanded no price. An entrepreneur would want to achieve the greatest efficiency possible from the factor for which he is paying, i.e., from factor 'a'. Thus, he would want to produce where AP is maximum or at the boundary between stage I and II.

If on the other hand, “a” were the free resource, then he would want to employ “b” to its most efficient point; this is the boundary between stage II and III.

Obviously, if both resources commanded a price, he would produce somewhere in stage II. At what place in this stage production takes place would depend upon the relative prices of ‘a’ and ‘b’.

3A.4 CONDITION OR CAUSES OF APPLICABILITY

There are many causes, which are responsible for the application of the law of variable proportions.

They are as follows:

1. Under Utilization of Fixed Factor:

In initial stage of production, fixed factors of production like land or machine, is under-utilized. More units of variable factor, like labour, are needed for its proper utilization. As a result of employment of additional units of variable factors there is proper utilization of fixed factor. In short, increasing returns to a factor begins to manifest itself in the first stage.

2. Fixed Factors of Production.

The foremost cause of the operation of this law is that some of the factors of production are fixed during the short period. When the fixed factor is used with variable factor, then its ratio compared to variable factor falls. Production is the result of the co-operation of all factors. When an additional unit of a variable factor has to produce with the help of relatively fixed factor, then the marginal return of variable factor begins to decline.

3. Optimum Production:

After making the optimum use of a fixed factor, then the marginal return of such variable factor begins to diminish. The simple reason is that after the optimum use, the ratio of fixed and variable factors become defective. Let us suppose a machine is a fixed factor of production. It is put to optimum use when 4 labourers are employed on it. If 5 labourers are put on it, then total production increases very little and the marginal product diminishes.

4. Imperfect Substitutes:

Mrs. Joan Robinson has put the argument that imperfect substitution of factors is mainly responsible for the operation of the law of diminishing returns. One factor cannot be used in place of the other factor. After optimum use of fixed factors, variable factors are increased and the amount of fixed factor could be increased by its substitutes.

Such a substitution would increase the production in the same proportion as earlier. But in real practice factors are imperfect substitutes. However, after the optimum use of a fixed factor, it cannot be substituted by another factor.

3A.5 APPLICABILITY OF THE LAW OF VARIABLE PROPORTIONS

The law of variable proportions is universal as it applies to all fields of production. This law applies to any field of production where some factors are fixed and others are variable. That is why it is called the law of universal application.

The main cause of application of this law is the fixity of any one factor. Land, mines, fisheries, and house building etc. are not the only examples of fixed factors. Machines, raw materials may also become fixed in the short period. Therefore, this law holds good in all activities of production etc. agriculture, mining, manufacturing industries.

1. Application to Agriculture:

With a view of raising agricultural production, labour and capital can be increased to any extent but not the land, being fixed factor. Thus when more and more units of variable factors like labour and capital are applied to a fixed factor then their marginal product starts to diminish and this law becomes operative.

2. Application to Industries:

In order to increase production of manufactured goods, factors of production has to be increased. It can be increased as desired for a long period, being variable factors. Thus, law of increasing returns operates in industries for a long period. But, this situation arises when additional units of labour, capital and enterprise are of inferior quality or are available at higher cost.

As a result, after a point, marginal product increases less proportionately than increase in the units of labour and capital. In this way, the law is equally valid in industries.

3A.6 POSTPONEMENT OF THE LAW

The postponement of the law of variable proportions is possible under following conditions:

(i) Improvement in Technique of Production:

The operation of the law can be postponed in case variable factors techniques of production are improved.

(ii) Perfect Substitute:

The law of variable proportion can also be postponed in case factors of production are made perfect substitutes i.e., when one factor can be substituted for the other.

3A.7 LAW OF RETURNS TO SCALE

In the long run all factors of production are variable. No factor is fixed. Accordingly, the scale of production can be changed by changing the quantity of all factors of production.

Definition:

“The term returns to scale refers to the changes in output as all factors change by the same proportion.” Koutsoyiannis

“Returns to scale relates to the behaviour of total output as all inputs are varied and is a long run concept”. Leibhafsky

Returns to scale are of the following three types:

1. Increasing Returns to scale.
2. Constant Returns to Scale
3. Diminishing Returns to Scale

Explanation:

In the long run, output can be increased by increasing all factors in the same proportion. Generally, laws of returns to scale refer to an increase in output due to increase in all factors in the same proportion. Such an increase is called returns to scale.

Suppose, initially production function is as follows:

P = f (L, K)

Now, if both the factors of production i.e., labour and capital are increased in same proportion i.e., x, product function will be rewritten as.

$$P_1 = f(xL, xK)$$

1. If P_1 increases in the same proportion as the increase in factors of production i.e., $\frac{P_1}{P} = x$, it will be constant returns to scale.

2. If P_1 increases less than proportionate increase in the factors of production *i.e.*, $\frac{P_1}{P} < x$, it will be diminishing returns to scale.

3. If P_1 increases more than proportionate increase in the factors of production, *i.e.*, $\frac{P_1}{P} > x$, it will be increasing returns to scale. Returns to scale can be shown with the help of table 3A.2

Showing different stages of return to scale

Units of Labour	Units of capital	%age increase in Labour & Capital	Total Product	%age increase in TP	Returns to scale
1	3	–	10	–	
2	9	100%	30	200%	Increasing
3	9	50%	60	100%	
4	12	33%	80	33%	Constant
5	15	25%	100	25%	
6	18	20%	120	10%	Decreasing
7	21	16.6%	130	8.3%	

The above stated table explains the following three stages of returns to scale:

1. Increasing Returns to Scale:

Increasing returns to scale or diminishing cost refers to a situation when all factors of production are increased, output increases at a higher rate. It means if all inputs are doubled, output will also increase at the faster rate than double. Hence, it is said to be increasing returns to scale. This increase is due to many reasons like division external economies of scale. Increasing returns to scale can be illustrated with the help of a diagram 8.

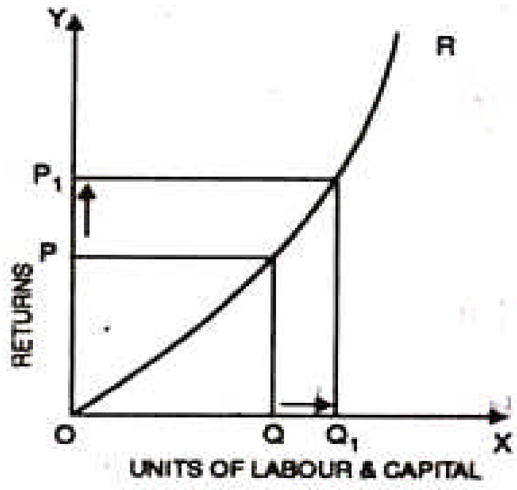


Fig. 3A.2

In figure3A.2, OX axis represents increase in labour and capital while OY axis shows increase in output. When labour and capital increases from Q to Q_1, output also increases from P to P_1 which is higher than the factors of production i.e. labour and capital.

2. Diminishing Returns to Scale:

Diminishing returns or increasing costs refer to that production situation, where if all the factors of production are increased in a given proportion, output increases in a smaller proportion. It means, if inputs are doubled, output will be less than doubled. If 20 percent increase in labour and capital is followed by 10 percent increase in output, then it is an instance of diminishing returns to scale. The main cause of the operation of diminishing returns to scale is that internal and external economies are less than internal and external diseconomies. It is clear from diagram 3A.3.

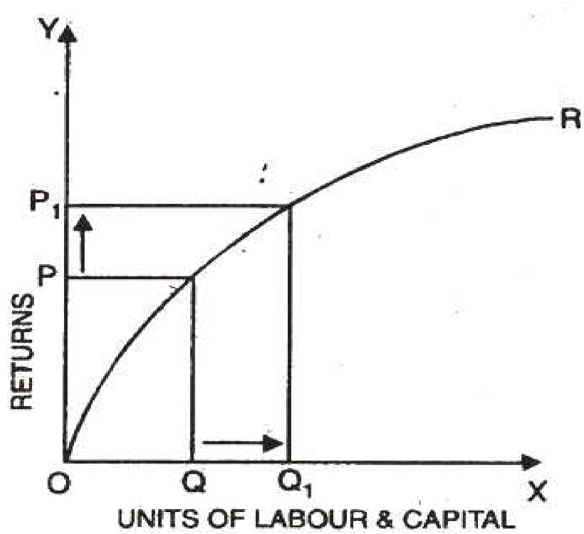


Fig. 3A.3

In this diagram 3A.3, diminishing returns to scale has been shown. On OX axis, labour and capital are given while on OY axis, output. When factors of production increase from Q to Q_1 (more quantity) but as a result increase in output, i.e. P to P_1 is less. We see that increase in factors of production is more and increase in production is comparatively less, thus diminishing returns to scale apply.

3. Constant Returns to Scale:

Constant returns to scale or constant cost refers to the production situation in which output increases exactly in the same proportion in which factors of production are increased. In simple terms, if factors of production are doubled output will also be doubled.

In this case internal and external economies are exactly equal to internal and external diseconomies. This situation arises when after reaching a certain level of production, economies of scale are balanced by diseconomies of scale. This is known as homogeneous production function. Cobb-Douglas linear homogenous production function is a good example of this kind. This is shown in diagram 3A.4. In figure 3A.4, we see that increase in factors of production i.e. labour and capital are equal to the proportion of output increase. Therefore, the result is constant returns to scale.

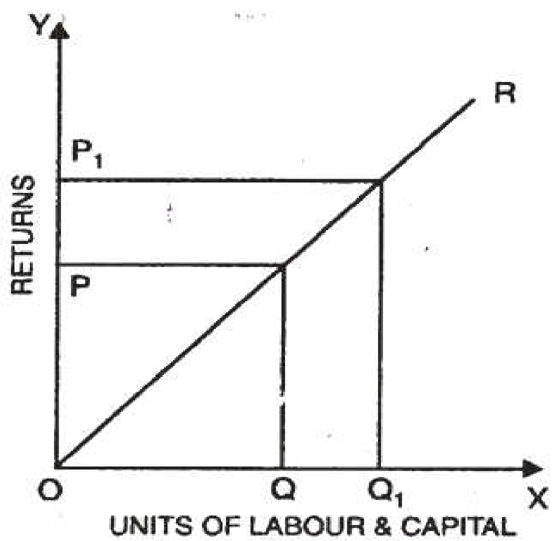


Fig. 3A.4

Check your progress:

1. State the Law of variable proportions.
2. Distinguish between First, Second and Third stage of Law of variable proportion.
3. What are the conditions / causes of Law of variable proportion.
4. State Law of Returns to scale.

3A.8 ECONOMIES OF SCALE

Economies of scale are cost reductions that occur when companies increase production. The fixed costs, like administration, are spread over more units of production. Sometimes the company can negotiate to lower its variable costs as well. Governments, non-profits, and even individuals can also benefit from economies of scale. It occurs whenever an entity produces more, becomes more efficient, and lowers costs as a result.

Economies of scale not only benefit the organization. Consumers can enjoy lower prices. The economy grows as lower prices stimulate increased demand. Economies of scale give a competitive advantage to large entities over smaller ones. The larger the business, non-profit, or government, the lower its per-unit costs.

Key Takeaways

- Economies of scale occur when a company's production increases, leading to lower fixed costs.
- Internal economies of scale can be because of technical improvements, managerial efficiency, financial ability, monopsony power, or access to large networks.
- External economies are ones where companies can influence economic priorities, often leading to preferential treatment by governments.
- Diseconomies of scale can occur when a company becomes too big, lowering its production.

3A.8.1 Types

There are two main types of economies of scale: internal and external. Internal economies are controllable by management because they are internal to the company. External economies depend upon external factors. These factors include the industry, geographic location, or government.

3A.8.2 Internal Economies of Scale

Internal economies result from a larger volume of production. We can typically see them in large organizations. For example, large companies can buy in bulk. This economy lowers the cost per unit of the materials they need to make their products. They can use the savings to increase profits. Or they can pass the savings to consumers and compete on price.

There are five main types of internal economies of scale.

Technical economies of scale result from efficiencies in the production process itself. Manufacturing costs fall 70% to 90% every time the business doubles its output. Larger companies can take advantage of more efficient equipment.

For example, data mining software allows the firm to target profitable market niches. Large shipping companies cut costs by using super-tankers. Finally, large companies achieve technical economies of scale because they learn by doing. They’re far ahead of their smaller competition on the learning curve.

Monopsony power is when a company buys so much of a product that it can reduce its per-unit costs. For example, Wal-Mart's "everyday low prices" are due to its huge buying power.

Managerial economies of scale occur when large firms can afford specialists. They more effectively manage particular areas of the company. For example, a seasoned sales executive has the skill and experience to get the big orders. They demand a high salary, but they're worth it.

Financial economies of scale mean the company has cheaper access to capital. A larger company can get funded from the stock market with an initial public offering. Big firms have higher credit ratings. As a result, they benefit from lower interest rates on their bonds.

Network economies of scale occur primarily in online businesses. It costs almost nothing to support each additional customer with existing infrastructure. So, any revenue from the new customer is all profit for the business. A great example is eBay.

3A.8.3 External Economies of Scale

A company has external economies of scale if its size creates preferential treatment. That most often occurs with governments.

For example, a state often reduces taxes to attract the companies that provide the most jobs. Big real estate developers convince cities to build roads to support their buildings. This government building saves developers from paying those costs. Large companies can also take advantage of joint research with universities. This partnership lowers research expenses for these companies. Small companies don't have the leverage to benefit from external economies of scale, but they can band together.

Small companies can cluster similar businesses in a small area. That allows them to take advantage of geographic economies of scale. For example, artist lofts, galleries, and restaurants benefit by being together in a downtown art district.

3A.9 DISECONOMIES OF SCALE

Sometimes a company chases economies of scale so much that it becomes too large. This overgrowth is called a diseconomy of scale.

For example, it might take longer to make decisions, making the company less flexible. Miscommunication could occur, especially if the company becomes global. Acquiring new companies could result in a clash of corporate cultures. This clash will slow progress if they don't learn to manage cultural diversity.

3A.9.1 How to Make Economies of Scale Work for You

You don't have to be a corporation to benefit from economies of scale. Think of it like how larger families typically buy in bulk. Each box of detergent costs less per wash because you can buy it in bulk. The manufacturer saves on packaging and distribution. It then passes the savings onto you. Bulk is also cheaper for you because you make fewer trips to the store.

3A.10 ECONOMIES OF SCALE VERSUS ECONOMIES OF SCOPE

Economies of scope occur when a company branches out into multiple product lines. They benefit by combining complementary business functions, product lines, or manufacturing processes.

For example, most newspapers diversified into similar product lines, such as magazines and online news. This expansion diversified their revenue away from declining newspaper sales. Their advertising sales teams could sell ads in all three product lines.

It's easy to confuse economies of scale with economies of scope because they are both found in larger companies. Just remember that economies of scale apply to one product line. Economies of scope refer to combining efficiencies from many product lines.

3A.11 WHAT IS ECONOMIES OF SCOPE?

Economies of scope is an economic concept that the unit cost to produce a product will decline as the variety of products increases. That is, the more different-but-similar goods you produce, the lower the total cost to produce each one.

For example, let’s say that you’re a shoe manufacturer. You produce men’s and women’s sneakers. Adding a children’s line of sneakers would increase economies of scope because you can use the same production equipment, supplies, storage, and distribution channels to make a new line of products. That will further reduce the cost of production on all your shoes.

The cost to produce all three of your different lines is lower than if three different companies each produced a line of men’s shoes, a line of women’s shoes, and a children’s line. Because you can extend the use of your resources to make more products to be sold to your same target market, you can continue to drive costs down.

3A.12 MEANING OF EXPANSION PATH

In economics, an **expansion path** (also called a **scale line**) is a curve in a graph with quantities of two inputs, typically physical capital and labour, plotted on the axes. The path connects optimal input combinations as the scale of production expands .https://en.wikipedia.org/wiki/Expansion_path - cite_note-Hirschey-2 A producer seeking to produce a given number of units of a product in the cheapest possible way chooses the point on the expansion path that is also on the iso-quant associated with that output level

Economists Alfred Stonier and Douglas Hague defined “expansion path” as "that line which reflects the least–cost method of producing different levels of output, when factor prices remain constant. The points on an expansion path occur where the firm's iso-cost curves, each showing fixed total input cost, and its iso-quants, each showing a particular level of output, are tangent; each tangency point determines the firm's conditional factor demands. As a producer's level of output increases, the firm moves from one of these tangency points to the next; the curve joining the tangency points is called the **expansion path**.

If an expansion path forms a straight line from the origin, the production technology is considered homothetic (or homoethetic).In this case, the ratio of input usages is always the same regardless of the level of output, and the inputs can be expanded proportionately so as to maintain this optimal ratio as the level of output expands. A Cobb–Douglas production function is an example of a production function that has an expansion path which is a straight line through the origin.

We know that the production function of the firm
$q = f(x,y)$ (8.21)
gives us the isoquant map of the firm, one isoquant (IQ) for each particular level of output, and the cost equation of the firm
$C = r_X x + r_Y y$ (8.54)
gives us the family of parallel iso-cost lines (ICLs), given the prices of the inputs r_X and r_Y, one ICL for one particular level of cost. The IQ-map and the family of ICLs have been given in Fig. 8.14. If we now join the point of origin 0 and the points of tangency, E_1, E_2, E_3, etc., between the IQs and the ICLs by a curve, then this curve (OK in Fig. 3A.5) would give us what is known as the expansion path of the firm.

The expansion path is so called because if the firm decides to expand its operations, it would have to move along this path. Let us note that the firm may expand in two ways.

First, it may want to expand by successively increasing its level of cost or its expenditure on the inputs X and Y, i.e., by using more and more of inputs, and, consequently, by producing more of its output.

Second, the firm may decide to expand by increasing its level of output per period. This the firm may do by increasing the expenditure on the inputs, i.e., by using more and more of them.

The two approaches to expansion apparently appear to be the same, for both involve an increase in expenditure. However, there is a fundamental difference. In the first case, decision is taken initially at the point of cost. Cost levels are made higher and higher and then efforts are made to maximize the level of output subject to the cost constraint.

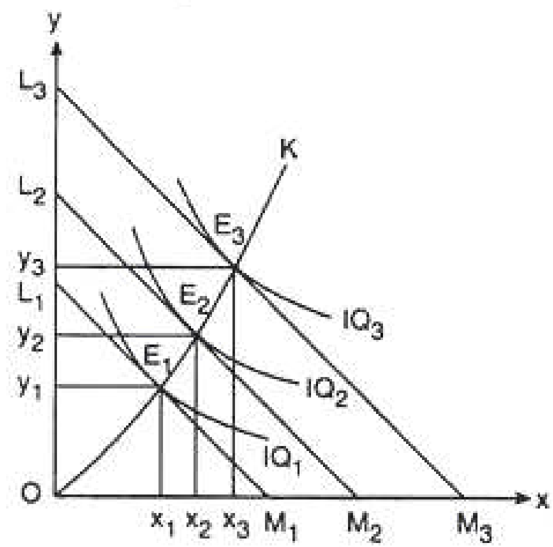


Fig. 3A.5 The expansion path of a firm

On the other hand, in the second case, decision-making occurs initially and directly at the point of output. Here the firm first decides to produce more of output and then efforts are made to produce the output at the minimum possible cost.

3A.13 LEARNING CURVE

A learning curve is a concept that graphically depicts the relationship between the cost and output over a defined period of time, normally to represent the repetitive task of an employee or worker. The learning curve was first described by psychologist Hermann Ebbinghaus in 1885 and is used as a way to measure production efficiency and to forecast costs.

In the visual representation of a learning curve, a steeper slope indicates initial learning translates into higher cost savings, and subsequent learnings result in increasingly slower, more difficult cost savings.

KEY TAKEAWAYS

- The learning curve is a visual representation of how long it takes to acquire new skills or knowledge.
- In business, the slope of the learning curve represents the rate in which learning new skills translates into cost savings for a company.
- The steeper the slope of the learning curve, the higher the cost savings per unit of output.

3A.13.1 Understanding Learning Curves

The learning curve also is referred to as the experience curve, the cost curve, the efficiency curve, or the productivity curve. This is because the learning curve provides measurement and insight into all the above aspects of a company. The idea behind this is that any employee, regardless of position, takes time to learn how to carry out a specific task or duty. The amount of time needed to produce the associated output is high. Then, as the task is repeated, the employee learns how to complete it quickly, and that reduces the amount of time needed for a unit of output.
That is why the learning curve is downward sloping in the beginning with a flat slope toward the end, with the cost per unit depicted on the Y-axis and total output on the X-axis. As learning increases, it decreases the cost per unit of output initially before flattening out, as it becomes harder to increase the efficiencies gained through learning.

3A.13.2 Benefits of Using the Learning Curve

Companies know how much an employee earns per hour and can derive the cost of producing a single unit of output based on the number of hours needed. A well-placed employee who is set up for success should decrease the company's costs per unit of output over time. Businesses can use the learning curve to conduct production planning, cost forecasting, and logistics schedules.

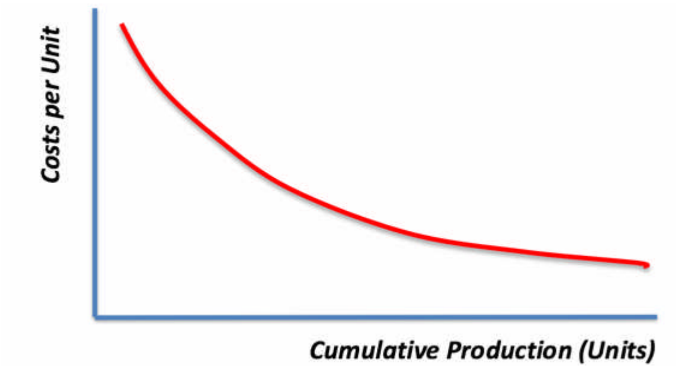


Fig. 3A.6

The learning curve does a good job of depicting the cost per unit of output over time.

The slope of the learning curve represents the rate in which learning translates into cost savings for a company. The steeper the slope, the higher the cost savings per unit of output. This standard learning curve is known as the 80% learning curve. It shows that for every doubling of a company's output, the cost of the new output is 80% of the prior output. As output increases, it becomes harder and harder to double a company's previous output, depicted using the slope of the curve, which means cost savings slow over time.

Check your progress:

1. State the various types of Economies of scale.
2. Explain the concept of Diseconomies of scale.
3. Write a note on Economies of scope.
4. Explain the meaning of Expansion path.
5. Derive a Learning curve.

3A.14 CONCEPT OF COSTS

1. Accounting costs

Accounting costs are those for which the entrepreneur pays direct cash for procuring resources for production. These include costs of the price paid for raw materials and machines, wages paid to workers, electricity charges, the cost incurred in hiring or purchasing a building or plot, etc. Accounting costs are treated as expenses. Chartered accountants record them in financial statements.

2. Economic costs

There are certain costs that accounting costs disregard. These include money which the entrepreneur forgoes but would have earned had he invested his time, efforts and investments in other ventures. For example, the entrepreneur would have earned an income had he sold his services to others instead of working on his own business

Similarly, potential returns on the capital he employed in his business instead of giving it to others, the output generated by his resources which he could have used for others' benefits, etc. are other examples of economic costs.

Economic costs help the entrepreneur calculate supernormal profits, i.e. profits he would earn above the normal profits by investing in ventures other than his.

3. Explicit and Implicit or Imputed Costs:

Explicit costs refer to those which fall under actual or business costs entered in the books of accounts. The payments for wages and salaries, materials, license fee, insurance premium, depreciation charges are the examples of explicit costs. These costs involve cash payments and are recorded in normal accounting practices.

In contrast with these costs, there are not certain other costs which do not take the form of cash outlays, nor do they appear in the accounting system. Such costs are known as implicit or imputed costs. Implicit costs may be defined as the earning expected from the second best alternative use of resources. For instance, suppose an entrepreneur does not utilize his services in his own business and works as a manager in some other firm on a salary basis.

If he starts his own business, he foregoes his salary as manager. This loss of salary is the opportunity costs of income from his own business. This is an implicit cost of his own business; implicit, because the entrepreneur suffers the loss, but does not charge it as the explicit cost of his own business. Thus, implicit wages, rent and interest are the highest wages, rents and interest which owner's labour, building and capital can respectively earn from their second best use.

Implicit costs are not taken into account while calculating the loss or gains of the business, but they form an important consideration in whether or not a factor would remain in its present occupation. The explicit and implicit costs together make the economic cost.

4 . Outlay costs

The actual expenses incurred by the entrepreneur in employing inputs are called outlay costs. These include costs on payment of wages, rent, electricity or fuel charges, raw materials, etc. We have to treat them are general expenses for the business.

5 . Opportunity costs

Opportunity costs are incomes from the next best alternative that is foregone when the entrepreneur makes certain choices.

For example, the entrepreneur could have earned a salary had he worked for others instead of spending time on his own business. These costs calculate the missed opportunity and calculate income that we can earn by following some other policy.

6 . Direct costs

Direct costs are related to a specific process or product. They are also called traceable costs as we can directly trace them to a particular activity, product or process.

They can vary with changes in the activity or product. Examples of direct costs include manufacturing costs relating to production, customer acquisition costs pertaining to sales, etc.

7. Indirect costs

Indirect costs, or untraceable costs, are those which do not directly relate to a specific activity or component of the business. For example, an increase in charges of electricity or taxes payable on income. Although we cannot trace indirect costs, they are important because they affect overall profitability.

8 . Incremental costs

These costs are incurred when the business makes a policy decision. For example, change of product line, acquisition of new customers, upgrade of machinery to increase output are incremental costs.

9 . Sunk costs

Suck costs are costs which the entrepreneur has already incurred and he cannot recover them again now. These include money spent on advertising, conducting research, and acquiring machinery.

10 . Private costs

These costs are incurred by the business in furtherance of its own objectives. Entrepreneurs spend them for their own private and business interests. For example, costs of manufacturing, production, sale, advertising, etc.

11. Social costs

As the name suggests, it is the society that bears social costs for private interests and expenses of the business. These include social resources for which the firm does not incur expenses, like atmosphere, water resources and environmental pollution.

3A.15 CONCEPT OF PRODUCTION COSTS

1. Fixed costs

Fixed costs are those which do not change with the volume of output. The business incurs them regardless of their level of production. Examples of these include payment of rent, taxes, interest on a loan, etc.

2. Variable costs

These costs will vary depending upon the output that the business generates. Less production will cost fewer expenses, and vice versa, the business will pay more when its production is greater. Expenses on the purchase of raw material and payment of wages are examples of variable costs.

3A.13.1 Total, Average and Marginal Costs:

Total cost represents the value of the total resource requirement for the production of goods and services. It refers to the total outlays of money expenditure, both explicit and implicit, on the resources used to produce a given level of output. It includes both fixed and variable costs. The total cost for a given output is given by the cost function.

Average cost:

Average cost (AC) is of statistical nature, it is not actual cost. It is obtained by dividing the total cost (TC) by the total output (Q), i.e.
AC = TC / Q = average cost

Marginal cost:

Marginal cost is the addition to the total cost on account of producing an additional unit of the product. Or, marginal cost is the cost of marginal unit produced. Given the cost function, it may be defined as
MC = TC/ Q

These cost concepts are discussed in detail in the following section. Total, average and marginal cost concepts are used in economic analysis of firm's production activities.

Total costs

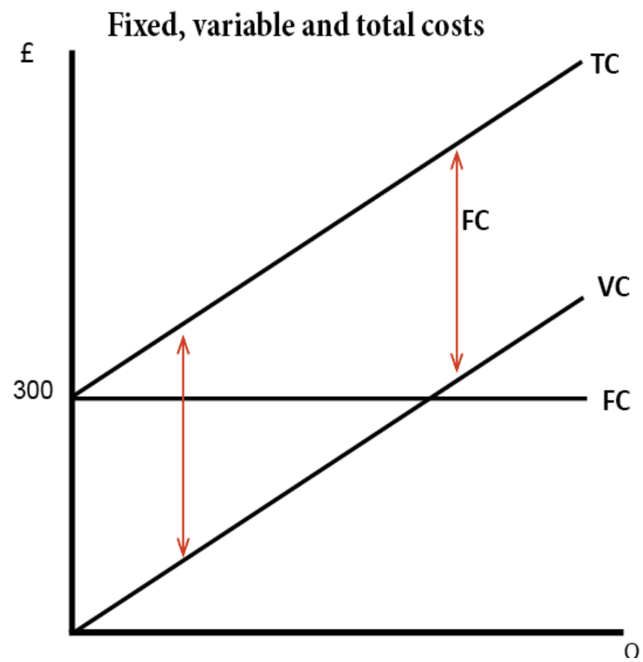


Fig. 3A.6

Total cost (TC) = Variable cost (VC) + fixed costs (FC)

3A.13.2 Relation Between Marginal Cost(MC) and Average Cost(AC): The relationship between MC and AC may be explained as follows:

1. When MC falls, AC also falls but at lower rate than that of MC. So long as MC curve lies below the AC curve, the AC curve is falling.
2. When MC rises, AC also rises but at lower rate than that of MC. That is, when MC curve lies above AC curve, the AC curve is rising.
3. MC intersects AC at its minimum. That is, MC = AC at its minimum.

3A.13.3 Short-Run and Long-Run Costs:

Short-run and long-run cost concepts are related to variable and fixed costs respectively, and often marked in economic analysis interchangeably. Short-run costs are the costs which vary with the variation in output, the size of the firm remaining the same. In other words, short-run costs are the same as variable costs. Long-run costs, on the other hand, are the costs which are incurred on the fixed assets like plant, building, machinery, etc. Such costs have long-run implication in the sense that these are not used up in the single batch of production.

Long-run costs are, by implication, the same as fixed costs. In the long-run, however, even the fixed costs become variable costs as the size of the firm or scale of production increases. Broadly speaking, 'the short-run costs are those associated with variables in the utilization of fixed plant or other facilities whereas long-run costs are associated with the changes in the size and kind of plant.'

Average Cost Curves

- ATC (Average Total Cost) = Total Cost / quantity
- AVC (Average Variable Cost) = Variable cost / quantity
- MC = Marginal cost.
- AFC (Average Fixed Cost) = Fixed cost / quantity

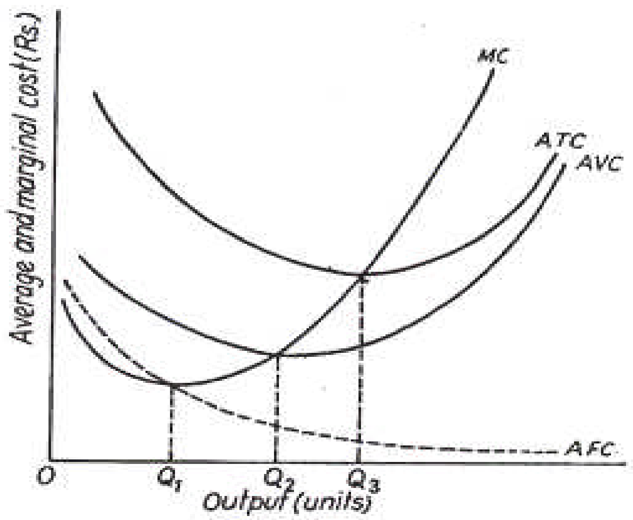


Fig. 3A.7 Short run average and marginal cost curves

3A.16 COMPONENTS OF ECONOMIC COSTS

Economic cost takes into account costs attributed to the alternative chosen and costs specific to the forgone opportunity. Before making economic decisions, there are a series of components of economic costs that a firm will take into consideration. These components include:

- Total cost (TC): total cost equals total fixed cost plus total variable costs (TC = TFC + TVC).
- Variable cost (VC): the cost paid to the variable input. Inputs include labour, capital, materials, power, land, and buildings. Variable input is traditionally assumed to be labour.
- Total variable cost (TVC): same as variable costs.

- Fixed cost (FC): the costs of the fixed assets (those that do not vary with production).
- Total fixed cost (TFC): same as fixed cost.
- Average cost (AC): total costs divided by output (AC = TFC/q + TVC/q).
- Average fixed cost (AFC): the fixed costs divided by output (AFC = TFC/q). The average fixed cost function continuously declines as production increases.
- Average variable cost (AVC): variable costs divided by output (AVC = TVC/q). The average variable cost curve is normally U-shaped. It lies below the average cost curve, starting to the right of the y axis.
- Marginal cost (MC): the change in the total cost when the quantity produced changes by one unit.
- Cost curves: a graph of the costs of production as a function of total quantity produced. In a free market economy, firms use cost curves to find the optimal point of production (to minimize cost). Maximizing firms use the curves to decide output quantities to achieve production goals.

Table 3A.3

Short-run cost Schedules of a hypothetical firm

(1) Output Rs.	(2) Total cost Rs.	(3) Fixed cost Rs.	(4) Variable cost Rs.	(5) Average fixed cost Rs.	(6) Average variable cost Rs.	(7) Average total cost Rs.	(8) Marginal cost (per unit) Rs.
100	6,000	4,000	2,000	40.00	20.00	60.00	20.00
200	7,000	4,000	3,000	20.00	15.00	35.00	10.00
300	7,500	4,000	3,500	13.33	11.67	25.00	5.00
400	9,000	4,000	5,000	10.00	12.50	22.50	15.00
500	11,000	4,000	7,000	8.00	14.00	22.00	20.00
600	14,000	4,000	10,000	6.67	16.67	23.33	30.00
700	18,000	4,000	14,000	5.71	20.00	25.71	40.00
800	24,000	4,000	20,000	5.00	25.00	30.00	60.00
900	34,000	4,000	30,000	4.44	33.33	37.77	100.00
1,000	50,000	4,000	46,000	4.00	46.00	50.00	160.00

3A.17 CLASSIFICATION OF COST ACCORDING TO THE ELEMENT

In according to element cost can be divided into two main categories. It is also known as **classifications of cost by nature**.

Direct cost:

It is such a cost that is able to mark directly any particular cost such as raw materials, labor included operating expenses and some other costs are belongs to the direct cost. These costs are bind in a unit. For example, we can say a total cost of an advertisement for several products. The direct cost has some subcategories.

- **Direct element:** Direct element refers to that material which is related all of the finished product. This material is a part to complete any product. It can have imposed conveniently on the particular product. The purchased and upcoming requisite products are including in direct element. As like, all kinds of initial packing material.
- **Direct labour:** Direct labour means the paid salary to the employee who is directly engaged in manufacturing, handling and processing a product. Actually, they are responsible for the observation and maintenance of the product also.
- **Direct expense:** Which cost is directly related to any particular expenses is called direct expense. If a company needs to buy some specific product, equipment or tools are the examples of direct expense.

Indirect cost:

Indirect cost means the opposite side of direct cost. Which cost is related to a unit or department and can't trace for any specific product is called indirect cost. The indirect cost has also some subcategories.

- **Indirect element:** Some example of indirect materials is cleaning chemicals, small tools, glue, and maintenance work. Fuel etc. These element costs are incurred as a unit.
- **Indirect labour:** Indirect labour is covering the supervisors and the inspector's salary. The worker of cleaner and storekeeper wages is also including in the indirect labour.
- **Indirect expenses:** Indirect expenses are house rent, hospital service, lighting, insurance, and welfare trust.

  Indirect cost and the overhead cost is often the same. It follows the indirect labor cost formula.

- **Factory overheads:**

  It is related to all kinds of indirect costs like manufacturing products and time keeper's salary.

- **Selling and distribution overhead:**

This overhead is included with advertising expense and packing materials costs such as free advertising, marketing on the field.

- **Administration and office overhead:**

  Administrative expenses is an expense of office works related expenses such as office lighting, rent welfare trust are including here.

<u>3A.17.1 Cost classification according to function:</u>

Cost is classified by the following categories. The main four categories of functional costs are given below-

- **Prime cost:** Prime cost is the adjustment of the direct material, direct labour, and direct costs. It is actually the result of these three elements.
- **Product cost:** It means the factory cost with administrative and office overheads
- **Factory cost:** Factory cost is also known as work cost. It is combined with work cost and work expenses

<u>3A.17.2 Cost classifications depending on behaviour:</u>

By behavior or variability cost is classified as Variable cost, Fixed cost and Mixed cost which is explained below.

- **Variable cost:** Variable cost is such a cost which proportion is changing with the amount of production. Such as direct material and changeable costs
- **Fixed cost:** This cost won’t change with the proportion of production. It is maximum time fixed. But it is notable that this cost may be changed after a long time. For example, office rent, insurance, and hospital cost.
- **Mixed cost:** Mixed cost can change overall but not with the proportion of production. More changeable cost is count under a Mixed cost. The example of a mixed cost is electricity expenses.

<u>3A.17.3 Cost classification according to relevance:</u>

Relevance base cost is mainly divided into five categories which are given below;

- **Relevant cost:** Which cost can be by making a new decision is called relevant cost. Occasionally there may have many relevant costs. This cost is not fixed from before.
- **Opportunity cost:** Opportunity cost is the system of getting some extra advantages from the existing things of a factory like land, money

and time etc. Someone can rent his office for another purpose of advantages. Moreover, they can rent their other things also. It is actually an extra benefit for a company.

- **Standard cost:** Standard cost is fixed from the previous experience. It was fixed according to the specific budget, the volume of an industry. The actual cost is also included with this cost.
- **Controllable cost:** Which cost can be controlled by management is called controllable cost. The manager can control some cost.
- **Sunk cost:** It is known as a historical cost. Sunk cost effect is most important for a company. It is such a cost which is already lost and can't be undone anymore. If a company is paid their monthly rent than we can say this rent cost is sunk cost.

Classification of cost according to management:

These costs are mainly divided into two categories; Manufacturing cost and Non-manufacturing cost given are given below;

- **Manufacturing cost:** Manufacturing cost refers to the total cost of a product from the raw materials to finish the product. It is mainly the combination of direct material cost, labour cost, and manufacturing overheads.
- **Non-manufacturing cost:** In order, the rules of GAAP Non-manufacturing cost are not actual product cost. It is a part of the company's income statement.

A proper knowledge of classifications of costs mandatory for increasing development of a company perfectly. Moreover, the accounting students must have to clear idea about it.

Check your progress:

1. State various concepts of costs.
2. Distinguish between Fixed cost and variable cost.
3. Explain the concept of Economic cost.
4. Distinguish between Direct cost and Indirect cost.

3A.18 LONG-RUN COSTS: THE PLANNING HORIZON

We may recall from our discussion of production theory that the long run does not refer to ‘some date in the future. Instead, the long run simply refers to a period of time during which all inputs can be varied.

Therefore, a decision has to be made by the owner and/or manager of the firm about the scale of operation, that is, the size of the firm. In order to be able to make this decision the manager must have knowledge about the cost of producing each relevant level of output. We shall now discover how to determine these long-run costs.’

3A.18.1 Derivation of Cost Schedules from a Production Function:

For the sake of analysis, we may assume that the firm’s level of usage of the inputs does not affect the input (factor) prices. We also assume that the firm’s manager has already evaluated the production function for each level of output in the feasible range and has derived an expansion path.

For the sake of analytical simplicity, we may assume that the firm uses only two variable factors, labour and capital, that cost Rs. 5 and Rs. 10 per unit, respectively.

The characteristics of a derived expansion path are shown in Columns 1, 2 and 3 of Table 14.4. In column (1) we see seven output levels and in Columns (2) and (3) we see the optimal combinations of labour and capital respectively for each level of output, at the existing factor prices.

These combinations enable us to locate seven points on the expansion path.

Column (4) shows the total cost of producing each level of output at the lowest possible cost. For example, for producing 300 units of output, the least cost combination of inputs is 20 units of labour and 10 of capital. At existing factor prices, the total cost is Rs. 200. Here, Column (4) is a least-cost schedule for various levels of production.

In Column (5), we show average cost which is obtained by dividing total cost figures of Column (4) by the corresponding output figures of Column (1). Thus, when output is 100, average cost is Rs.

120/100 = Rs. 1.20. All other figures of Column (5) are derived in a similar way.

From column (5) we derive an important characteristic of long-run average cost: average cost first declines, reaches a minimum, then rises, as in the short-run. In Column (6) we show long-run marginal cost figures.

Each such figure is arrived at by dividing change in total cost by change in output. For example, when output increases from Rs. 100 to Rs. 200, the total cost increases from Rs. 120 to Rs. 140. Therefore, marginal cost (per unit) is Rs. 20/100 = Re. 0.20. Similarly, when output increases from 600 to 700 units, MC per unit is 720-560/100 =160/100 =1.60

Column (6) depicts the behaviour of per unit MC: marginal cost first decreases then increases, as in the short run.

We may now show the relationship between the expansion path and long-run cost graphically. In Fig. 3A.8 two inputs, K and L, are measured along the two axes. The fixed factor price ratio is represented by the slope of the iso-cost lines $I_1I'_1$, $l_2l'_2$ and so on. Finally, the known production function gives us the iso-quant map, represented by Q_1, Q_2 and so forth.

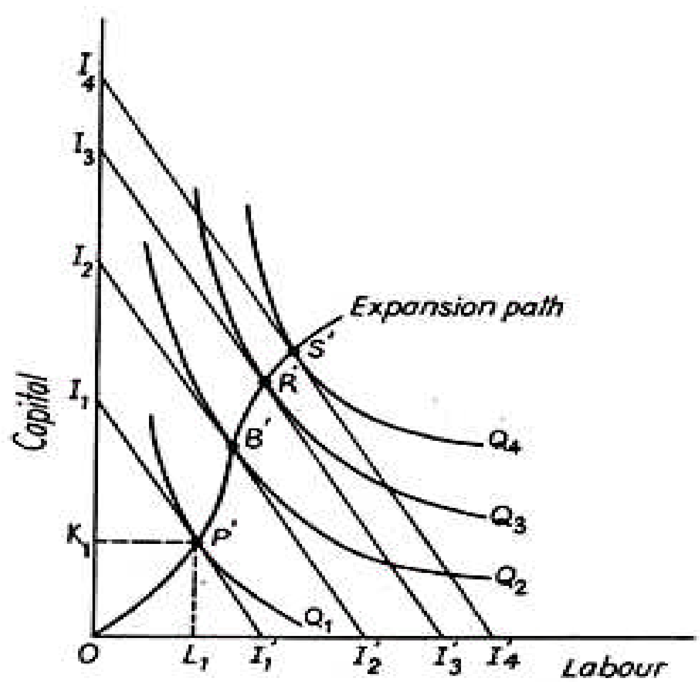


Fig. 3A.8 The expansion path and long-run cost

From our earlier discussion of long-run production function we know that, when all inputs are variable (that is, in long-run), the manager will choose the least cost combinations of producing each level of output. In Fig. 3A.8, we see that the locus of all such combinations is expansion path OP' B'R'S'.Given the factor-price ratio and the production function (which is determined by the state of technology), the expansion path shows the combinations of inputs that enables the firm to produce each level of output at the lowest cost.

Table 3A.4
Derivation long-run cost schedules

(1) Output (Units)	(2) Labour (Units)	(3) Least-cost usage of Capital of labour,	(4) Total cost at Rs. 5 per unit Rs. 10 per unit of capital	(5) Average cost	(6) Marginal cost (per Unit)
100	11	7	Rs. 120	Rs. 1.20	Rs. 1.20
200	12	8	140	Re. 0.70	Re. 0.20
300	20	10	200	0.67	0.60
400	30	15	300	0.75	1.00
500	40	22	420	0.84	Rs. 1.20
600	52	30	560	0.93	1.40
700	60	42	720	Rs. 1.03	1.60

We may now relate this expansion path to a long-run total cost (LRTC) curve. Fig. 3A.9 shows the 'least cost curve' associated with expansion path in Fig. 3A.8. This least cost curve is the long-run total cost curve. Points P,B,R and S are associated with points P', B', R' and S' on the expansion path. For example, in Fig. 3A.8 the least cost combination of inputs that can produce Q_1 is K_1 units of capital and L_1 units of labour.
Thus, in Fig. 3A.9, minimum possible cost of producing Q_1 units of output is TC_1, which is $K_1 + wL_1$, i.e., the price of capital (or the rate of interest) times K_1, plus the price of labour (or the wage rate) times L_1. Every other point on LRTC is derived in a similar way.

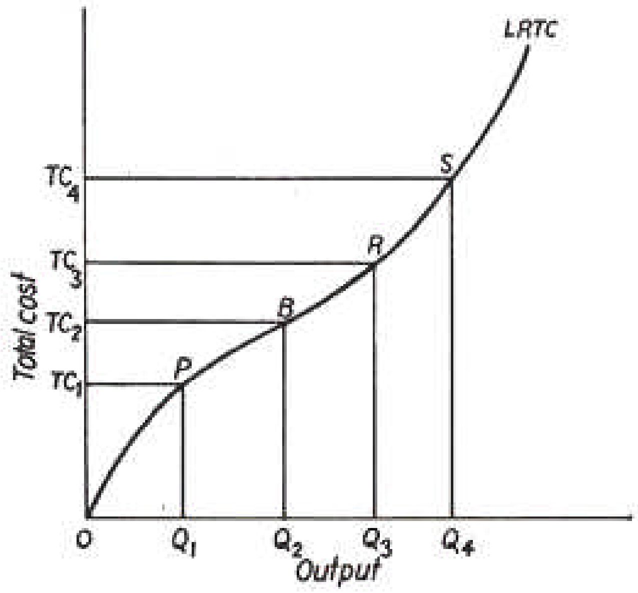


Fig. 3A.9 long-run total cost curve

Since the long run permits capital-labour substitution, the firm may choose different combinations of these two inputs to produce different levels of output. Thus, totally different production processes may be used to produce (say) Q_1 and Q_2 units of output at the lowest attainable cost.

On the basis of this diagram we may suggest a definition of the long run total cost. The time period during which even/thing (except factor prices and the state of technology or art of production) is variable is called the long run and the associated curve that shows the minimum cost of producing each level of output is called the long- run total cost curve.

The shape of the long-run total cost (LRTC) curve depends on two factors: the production function and the existing factor prices. Table 14.4 and Fig. 3A.9 reflect two of the commonly assumed characteristics of long-run total costs. First, costs and output are directly related; that is, the LRTC curve has a positive slope. But, since there is no fixed cost in the long run, the long run total cost curve starts from the origin.

Another characteristic of LRTC is that costs first increase at a decreasing rate (until point B in Fig. 3A.9), and an increasing rate thereafter. Since the slope of the total cost curve measures marginal cost, the implication is that long-run marginal cost first decreases and then increases. It may be added that all implicit costs of production are included in the LRTC curve.

3A.18.2 Long-Run Average and Marginal Costs:

We turn now to distinguish between long run average and marginal costs.

Long-run average cost is arrived at by dividing the total cost of producing a particular output by the number of units produced:

LRTC= LRTC/Q

Long-run marginal cost is the extra total cost of producing an additional unit of output when all inputs are optimally adjusted:

LRTC= Δ LRTC /ΔQ

It, therefore, measures the change in total cost per unit of output as the firm moves along the long run total cost curve (or the expansion path). Fig. 14.8 illustrates typical long-run average and marginal cost curves. They have essentially the same shape and relation to each other as in the short run. Long-run average cost first declines, reaches a minimum (at Q_2 in Fig. 3A.9), then increases. Long-run marginal cost first declines, reaches minimum at a lower output than that associated with minimum average cost (Q_1 in Fig. 3A.9), and increases thereafter.

The marginal cost intersects the average cost curve at its lowest point (L in Fig. 3A.9) as in the short-run. The reason is also the same. The reason has been aptly summarized by Maurice and Smithson thus: "When marginal cost is less than average cost, each additional unit produced adds less than average cost to total cost; so average cost must decrease.

When marginal cost is greater than average cost, each additional unit of the good produced adds more than average cost to total cost; so average cost must be increasing over this range of output. Thus marginal cost must be equal to average cost when average cost is at its minimum".

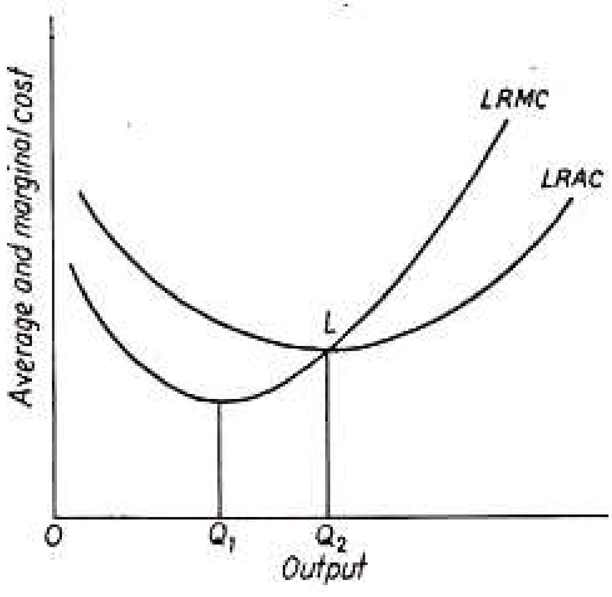


Fig 3A.10 long-run average and marginal cost curves

3A.19 THE SHAPE OF THE LAC: ECONOMIES AND DISECONOMIES OF SCALE

The shape of the long-run average cost depends on certain advantages and disadvantages associated with large scale production. These are known as economies and diseconomies of scale.

Average Cost in the Long Run: Smooth Envelope Case:

We know that in the short-run the firm has a fixed plant and it has a short run U-shaped cost curve SAC. If a new and larger plant is built, the new SAC will be drawn further to the right.

We assume that the firm is still in the planning stage and yet to undertake any fixed commitment. It can now draw all possible different U-shaped SAC curves, from which to choose one SAC for each specified level of output that promises the lowest cost. As output increases, the firm moves to a new SAC curve.

In the long run, the firm can change the size of the plant. Starting from zero output level, successively larger plants typically have lower and lower ATC up to some output level and then successively higher ATC curves beyond. The three representative ATC curves associated with the three successively larger plants are shown in Fig. 3A.11(a).

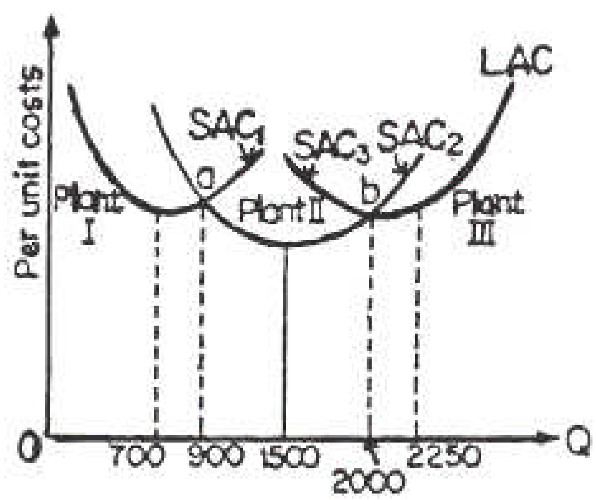


Fig 3A. 11(a) Long run AC

Plant I is the best plant for output levels less than 900 units because its AC curve is the lowest to the left of point a. Plant II is the best plant size for output levels between 900 to 2,000 units, because its AC curve is the lowest between point a and b. Plant III is the best plant size for output levels greater than 2,000 units, since its AC curve is the lowest beyond point b.

If these are only three possible plant sizes, the long run ATC curve will consist of the segments of Plant I's AC curve up to point a, the segment of plant II's AC curve between points a and b, and the segment of Plant Ill's AC curve from point of b and so on. The thick LAC is composed of the three lowest branches of SACs. This is why the LAC is called the envelope curve.

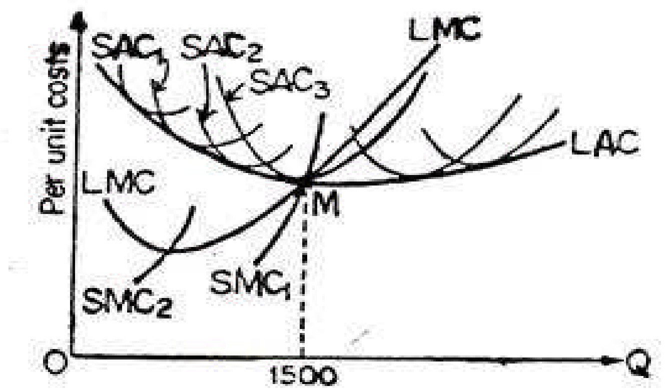


Fig. 3A.11(b) smooth envelope Curve

Fig. 3A.11(b) is the smooth envelope case. Writes Samuelson: "In the long run, a firm can choose its best plant sizes and its lower envelope curve." Since there is an infinite number of choices, we get LAC as a smooth envelope. And, as in the short-run, we can derive LMC from LAC, and LMC emerges from the minimum point of LAC with a smoother slope than the SMC curve.

3A.20 SUMMARY

1. Keeping other factors fixed, the Law of Variable Proportions explains the production function with one factor variable. In the short run when output of a commodity is sought to be increased, the law of variable proportions comes into operation.

2. There are many causes, which are responsible for the application of the law of variable proportions.
i)Under Utilization of Fixed Factor
ii) Fixed Factors of Production
iii)Optimum Production
iv)Imperfect Substitutes

3. In the long run, output can be increased by increasing all factors in the same proportion. Generally, laws of returns to scale refer to an increase in output due to increase in all factors in the same proportion. Such an increase is called returns to scale.

4. Economies of scale occur when a company's production increases, leading to lower fixed costs.

5. Internal economies of scale can be because of technical improvements, managerial efficiency, financial ability, monopsony power, or access to large networks.

6. External economies are ones where companies can influence economic priorities, often leading to preferential treatment by governments.

7. Diseconomies of scale can occur when a company becomes too big, lowering its production.

8. Economies of scope occur when a company branches out into multiple product lines. They benefit by combining complementary business functions, product lines, or manufacturing processes.

9. In economics, an expansion path (also called a scale line) is a curve in a graph with quantities of two inputs, typically physical capital and labour, plotted on the axes. The path connects optimal input combinations as the scale of production expands.

10. The learning curve is a visual representation of how long it takes to acquire new skills or knowledge.

11. In business, the slope of the learning curve represents the rate in which learning new skills translates into cost savings for a company.

12. The steeper the slope of the learning curve, the higher the cost savings per unit of output.

13. Short-run and long-run cost concepts are related to variable and fixed costs respectively. Short-run costs are the costs which vary with the variation in output, the size of the firm remaining the same. In other words, short-run costs are the same as variable costs. Long-run costs, on the other hand, are the costs which are incurred on the fixed assets like plant, building, machinery, etc.

14. Economic cost takes into account costs attributed to the alternative chosen and costs specific to the forgone opportunity. Before making

economic decisions, there are a series of components of economic costs that a firm will take into consideration.

15. The shape of the long-run average cost depends on certain advantages and disadvantages associated with large scale production. These are known as economies and diseconomies of scale.

3A.21 QUESTIONS

1. State and explain the Law of Variable proportions.
2. What are the conditions / causes responsible for the applicability of Law of Variable proportions?
3. State and explain the Law of Returns to scale.
4. Differentiate between Internal Economies and Internal Diseconomies of scale.
5. Discuss various External economies of scale.
6. Write notes on the following:
   a) Economies of scope
   b) Expansion path
   c) Learning curve
7. Differentiate between the following:
   a) Accounting cost and Economic cost
   b) Fixed cost and Variable costs
   c) Short run and Long run costs
   d) Direct and Indirect costs
   e) Implicit and Explicit costs
   f) Incremental and Sunk costs
   g) Private and Social costs
   h) Average and Marginal costs
8. State and explain all short run cost curves.
9. Derive Long run cost curve.
10. Write a note on Envelop curve.

❖❖❖❖

UNIT - IV

UNIT- 4

MARKET STRUCTURE ANALYSIS - I

Unit Structure:

4.0 OBJECTIVES

- To familiar students with Concept of perfectly and imperfectly competitive markets
- To acquaint the students with difference between Perfect competition and Monopoly
- To study the Sources of market power
- To study Profit maximization of simple and discriminating monopolist
- To understand the Methods of measuring monopoly power
- To Study Public policy towards monopoly

4.1 INTRODUCTION

In the competition between economic models, the theory of perfect competition holds a dominant market share: economists so widely and successfully use no set of ideas as is the logic of perfectly competitive markets. Correspondingly, all other market models (collectively labelled ‘imperfectly competitive’ and including monopoly, monopolistic competition, dominant-firm price leadership, bilateral monopoly and other situations of bargaining, and all the varieties of oligopoly theory) are little more than fringe competitors.

4.2 DIFFERENCE BETWEEN PERFECT COMPETITION AND IMPERFECT COMPETITION

Based on competition, the market structure has been classified into two broad categories like Perfectly competitive and Imperfectly competitive. **Perfect Competition** is not found in the real world market because it is based on many assumptions. But an **Imperfect Competition** is associated with a practical approach.

The type of market structure decides the market share of a firm in the market. If there exists a single firm, it will serve the entire market, and the demand of the customers are satisfied with that firm only. But if we increase the number of firms to two, the market will also be shared by the two. Similarly, if there are about 100 small firms in the market, the market is shared by all of them in proportion.

Therefore, it is the market structure, which affects the market. So here we are going to describe the differences between perfect competition and imperfect competition, in economics.

Content: Perfect Competition Vs Imperfect Competition

BASIS FOR COMPARISON	PERFECT COMPETITION	IMPERFECT COMPETITION
Meaning	Perfect Competition is a type of competitive market where there are numerous sellers selling homogeneous products or services to numerous buyers.	Imperfect Competition is an economic structure, which does not fulfill the conditions of the perfect competition.
Nature of concept	Theoretical	Practical
Product Differentiation	None	Slight to Substantial
Players	Many	Few to many
Restricted entry	No	Yes
Firms are	Price Takers	Price Makers

4.2.1 Definition of Perfect Competition

Perfect Competition is an economic structure where the degree of competition between the firm is at its peak. Given are the salient features of the perfect competition:

- Many buyers and sellers.
- Product offered is identical in all respects.
- Any firm can come and go, as per its own discretion.
- Both the parties to the transaction are having complete knowledge about the product, quantity, price, market and market conditions as well.
- Transportation and Advertising cost is nil.
- Free from government interference.
- The price for a product is uniform across the market. It decided by the demand and supply forces; no firm can affect the prices, that's why the firms are price takers.
- Each firm earns a normal profit.

Example: Suppose you go to a vegetable market to buy tomatoes. There are many tomato vendors and buyers. You go to a vendor and inquire about the cost of 1 kg tomatoes, the vendor replies, it will cost Rs. 10. Then you go ahead and inquire some more vendors. The prices of all the vendors are same for the demanded quantity. This is an example of perfect competition.

Key Differences Between Perfect Competition and Imperfect Competition

The main points of difference between perfect competition and imperfect competition in economics are depicted below:

1. The competitive market, in which there are a large number of buyers and sellers, and the sellers supply identical products to the buyers; it is known as perfect competition. Imperfect competition occurs when one or more conditions of the perfect competition are not met.
2. Perfect competition is a hypothetical situation, which does not apply in the real world. Conversely, Imperfect Competition is a situation that is found in the present day world.
3. When it comes to perfect competition, there are many players in the market, but in imperfect competition, there can be few to many players, depending upon the type of market structure.
4. In perfect competition, the sellers produce or supply identical products. As against, in imperfect competition the products offered by the sellers can either be homogeneous or differentiated.
5. If we talk about perfect competition, there are no barriers to the entry and exit of the firms which is just opposite in the case of imperfect competition.
6. In perfect competition, it is assumed that the firms do not influence the price of a product. Hence they are price takers but in imperfect competition, the firms are price makers.

4.2.2 Conclusion

Perfect competition is an imaginary situation which does not exist in reality, but imperfect competition is factual i.e. which genuinely exist.

Whichever market, you consider for this like for example if you consider the detergent market. There are many players like Tide, Rin, Surf Excel, Ariel, Ghadi, etc. producing similar product i.e. detergent.

At first instance, you may think that this is an example of perfect competition, but this is not so. If you dig a little deeper, you may find that all the products are different as well as they vary in their prices. Some are low budget detergents for capturing the market of price sensitive people while others are high budget detergents for quality sensitive people.

A monopoly, on the other hand, exists when there is only one producer and many consumers. Monopolies are characterized by a lack of economic competition to produce the good or service and a lack of viable substitute goods. As a result, the single producer has control over the price of a good – in other words, the producer is a price maker that can determine the price level by deciding what quantity of a good to produce. Public utility companies tend to be monopolies. In the case of electricity distribution, for example, the cost to put up power lines is so high it is inefficient to have more than one provider. There are no good substitutes for electricity delivery so consumers have few options. If the electricity distributor decided to raise their prices it is likely that most consumers would continue to purchase electricity, so the seller is a price maker.

Table 4.1 Characteristics of Perfect Competition and Monopoly

Characteristic	**Perfect Competition**	**Monopoly**
Market	Large number of sellers and buyers producing a homogeneous good or service, easy entry.	Large number of buyers, one seller. Entry is blocked.
Demand and marginal revenue curves	The firm's demand and marginal revenue curve is a horizontal line at the market price.	The firm faces the market demand curve; marginal revenue is below market demand.
Price	Determined by demand and supply; Each firm is a price taker. Price equals marginal cost.	The monopoly firm determines price; it is a price setter. Price is greater than marginal cost.

Table 4.1 Characteristics of Perfect Competition and Monopoly		
Characteristic	**Perfect Competition**	**Monopoly**
Profit maximization	Firms produce where marginal cost equals marginal revenue	Firms produce where marginal cost equals marginal revenue and charge the corresponding price on the demand curve.
Profit	Entry forces economic profit to zero in the long run.	Because entry is blocked, a monopoly firm can sustain an economic profit in the long run.
Efficiency	The equilibrium solution is efficient because price equals marginal cost.	The equilibrium solution is inefficient because price is greater than marginal cost.

4.3 SOURCES OF MONOPOLY POWER

Why are some markets dominated by single firms? What are the sources of monopoly power? Economists have identified a number of conditions that, individually or in combination, can lead to domination of a market by a single firm and create barriers that prevent the entry of new firms.

Barriers to entry are characteristics of a particular market that block new firms from entering it. They include economies of scale, special advantages of location, high sunk costs, a dominant position in the ownership of some of the inputs required to produce the good, and government restrictions. These barriers may be interrelated, making entry that much more formidable. Although these barriers might allow one firm to gain and hold monopoly control over a market, there are often forces at work that can erode this control.

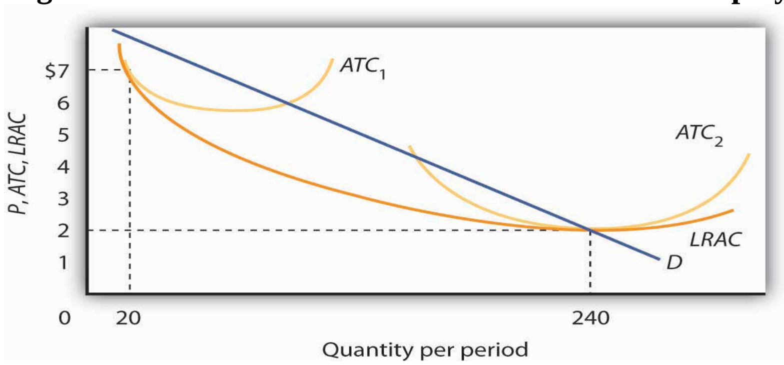
4.3.1 Economies of Scale

Scale economies and diseconomies define the shape of a firm's long-run average cost (*LRAC*) curve as it increases its output. If long-run average cost declines as the level of production increases, a firm is said to experience *economies of scale*.

A firm that confronts economies of scale over the entire range of outputs demanded in its industry is a natural monopoly. Utilities that distribute electricity, water, and natural gas to some markets are examples. In a natural monopoly, the *LRAC* of any one firm intersects the market demand curve where long-run average costs are falling or are at a minimum. If this is the case, one firm in the industry will expand to exploit the economies of scale available to it. Because this firm will have lower unit costs than its rivals, it can drive them out of the market and gain monopoly control over the industry.

Suppose there are 12 firms, each operating at the scale shown by ATC_1 (average total cost) in Figure 10.1 "Economies of Scale Lead to Natural Monopoly". A firm that expanded its scale of operation to achieve an average total cost curve such as ATC_2 could produce 240 units of output at a lower cost than could the smaller firms producing 20 units each. By cutting its price below the minimum average total cost of the smaller plants, the larger firm could drive the smaller ones out of business. In this situation, the industry demand is not large enough to support more than one firm. If another firm attempted to enter the industry, the natural monopolist would always be able to undersell it.

Figure 4.1 Economies of Scale Lead to Natural Monopoly



A firm with falling *LRAC* throughout the range of outputs relevant to existing demand (*D*) will monopolize the industry. Here, one firm operating with a large plant (ATC_2) produces 240 units of output at a lower cost than the $7 cost per unit of the 12 firms operating at a smaller scale (ATC_1), and producing 20 units of output each.

4.3.2 Location

Sometimes monopoly power is the result of location. For example, sellers in markets isolated by distance from their nearest rivals have a degree of monopoly power. The local movie theater in a small town has a monopoly in showing first-run movies. Doctors, dentists, and mechanics in isolated towns may also be monopolists.

4.3.3 Sunk Costs

The greater the cost of establishing a new business in an industry, the more difficult it is to enter that industry. That cost will, in turn, be greater if the outlays required to start a business are unlikely to be recovered if the business should fail.Suppose, for example, that entry into a particular industry requires extensive advertising to make consumers aware of the new brand. Should the effort fail, there is no way to recover the expenditures for such advertising. An expenditure that has already been made and that cannot be recovered is called a sunk cost.

If a substantial fraction of a firm's initial outlays will be lost upon exit from the industry, exit will be costly. Difficulty of exit can make for difficulty of entry. The more firms have to lose from an unsuccessful effort to penetrate a particular market, the less likely they are to try. The potential for high sunk costs could thus contribute to the monopoly power of an established firm by making entry by other firms more difficult.

4.3.4 Restricted Ownership of Raw Materials and Inputs

In very few cases the source of monopoly power is the ownership of strategic inputs. If a particular firm owns all of an input required for the production of a particular good or service, then it could emerge as the only producer of that good or service.

The Aluminum Company of America (ALCOA) gained monopoly power through its ownership of virtually all the bauxite mines in the world (bauxite is the source of aluminum). The International Nickel Company of Canada at one time owned virtually all the world's nickel. De Beers acquired rights to nearly all the world's diamond production, giving it enormous power in the market for diamonds. With new diamond supplies in Canada, Australia, and Russia being developed and sold independently of DeBeers, however, this power has declined, and today DeBeers controls a substantially smaller percentage of the world's supply.

4.3.5 Government Restrictions

Another important basis for monopoly power consists of special privileges granted to some business firms by government agencies. State and local governments have commonly assigned exclusive franchises—rights to conduct business in a specific market—to taxi and bus companies, to cable television companies, and to providers of telephone services, electricity, natural gas, and water, although the trend in recent years has been to encourage competition for many of these services. Governments might also regulate entry into an industry or a profession through licensing and certification requirements. Governments also provide patent protection to inventors of new products or production methods in order to encourage innovation; these patents may afford their holders a degree of monopoly power during the 17-year life of the patent.
Patents can take on extra importance when network effects are present. Network effects arise in situations where products become more useful the larger the number of users of the product. For example, one advantage of using the Windows computer operating system is that so many other people use it. That has advantages in terms of sharing files and other information.

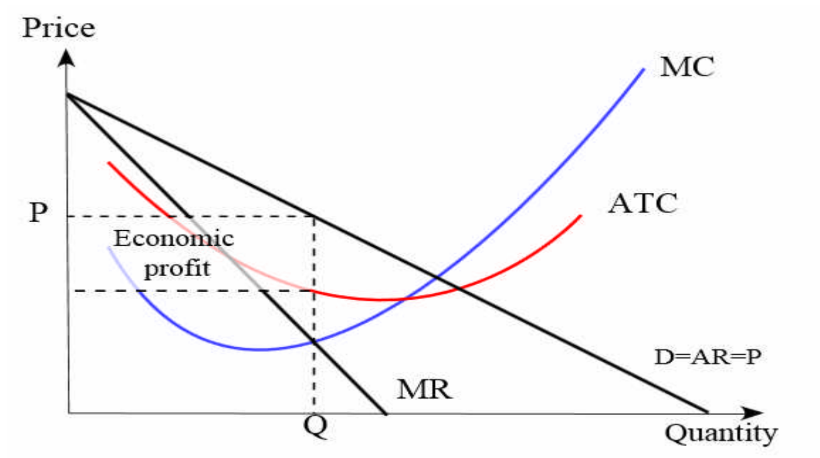


Figure 4.2

Monopoly: In a monopoly market, the marginal revenue curve and the demand curve are distinct and downward-sloping. Production occurs where marginal cost and marginal revenue intersect.

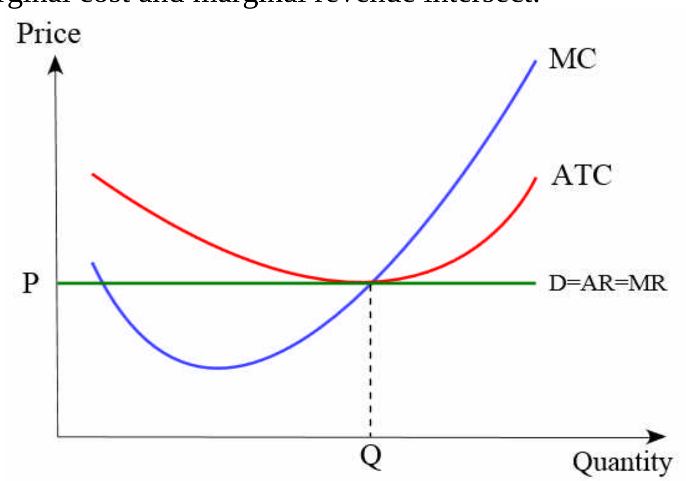


Figure 4.3

Perfect Competition : In a perfectly competitive market, the marginal revenue curve is horizontal and equal to demand, or price. Production occurs where marginal cost and marginal revenue intersect.

4.4 MONOPOLY - PRICE DISCRIMINATION

What is price discrimination?

Price discrimination happens when a firm charges a different price to different groups of consumers for an identical good or service, for reasons not associated with costs of supply.

4.4.1 The main aims of price discrimination

0. Extra Revenue
0. Higher Profit
0. Improved Cash Flow
0. Use up spare capacity

4.4.2 The difference between price discrimination and product differentiation

- Charging different prices for similar goods is not pure price discrimination
- Product differentiation gives a supplier greater control over price and the potential to charge consumers a premium price arising from differences in the quality or performance of a product

4.4.4 The main conditions necessary for price discrimination to work?

Here are the **main conditions** required for discriminatory pricing:

Differences in price elasticity of demand: There must be a different price elasticity of demand for each group of consumers. The firm is then able to charge a higher price to the group with a more price inelastic demand and a lower price to the group with a more elastic demand. By adopting such a strategy, the firm can increase **total revenue** and **profits** (i.e. achieve a higher level of producer surplus). To profit maximize, the firm will seek to set marginal revenue = to marginal cost in each separate (segmented) market.

Barriers to prevent consumers switching from one supplier to another: The firm must be able to **prevent "consumer switching"** – i.e. consumers who have purchased a product at a lower price are able to re-sell it to those consumers who would have otherwise paid the expensive price.

This can be done in a number of ways, – and is probably easier to achieve with the provision of a **unique service** such as a haircut, dental treatment or a consultation with a doctor rather than with the exchange of tangible goods such as a meal in a restaurant.

- Switching might be prevented by selling a product to consumers at unique **moments in time** – for example with the use of airline tickets for a specific flight that cannot be resold under any circumstances or cheaper rail tickets that are valid for a specific rail service.
- Software businesses often offer heavy price discounts for educational users providing they give an academic email address
- Students may be required to show proof of identification using secure ID cards

Price discrimination is easier when there are **separate and distinct markets** for a firm's products and when **price elasticity of demand varies** from one group of consumers to another.

Summary of the main conditions

Two main conditions required for price discrimination to work

1. Differences in Price Elasticity of Demand

a) Charge a higher price to group with low Price elasticity of demand

b) Charge lower price to consumers with a more Price elasticity of demand
0. Prevent Resale / Consumer Switching
b) Easier with services than goods
b) Time Limits- product brought at certain time
b) Photo cards / identification systems
b) Electronic / Digital ways of protecting usage.

4.5 WHAT IS 1ST DEGREE (PERFECT) PRICE DISCRIMINATION?

Perfect Price Discrimination is charging whatever the market will bear

- Sometimes known as **optimal pricing**, with perfect price discrimination, the firm separates the market into **each individual consumer** and charges them the price they are willing and able to pay
- If successful, the firm can **extract the entire consumer surplus** that lies underneath the demand curve and turn it into **extra revenue or producer surplus**.
- This is hard to achieve unless a business has full information on every **consumer's individual preferences and willingness to pay.** The **transactions costs** involved in finding out through market research what each buyer is prepared to pay is the main barrier to a business's engaging in this form of price discrimination.
- If the monopolist can **perfectly segment the market**, then the average revenue curve becomes the marginal revenue curve.
- A monopolist will continue to sell extra units as long as the extra revenue exceeds the marginal cost of production.

In reality, most suppliers and consumers prefer to work with **price lists** and **menus** from which trade can take place rather than having to negotiate a price for each unit bought and old. Pure price discrimination

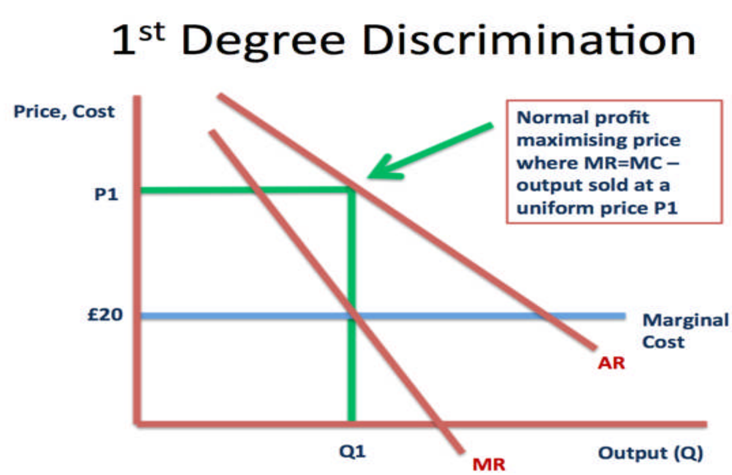


Figure 4.4

4.5.1 What is Second Degree Price Discrimination?

- This involves businesses selling off **packages or blocks of a product** deemed to be **surplus capacity** at lower prices than the previously published or advertised price.
- Price tends to fall as the quantity bought increases.
- Examples of this can be found in the **hotel industry** where spare rooms are sold on a last minute **standby basis**. In these types of industry, the **fixed costs** of production are high. At the same time the **marginal or variable costs** are low and predictable.
- If there are unsold rooms, it is in the hotel's best interest to **offload spare capacity** at a **discount prices**, providing that the extra revenue at least covers the marginal cost of each unit.
- There is nearly always some **supplementary profit** to be made. Firms may be quite happy to accept a smaller profit margin if it means that they manage to steal an advantage on their rival firms.

Second Degree Price Discrimination

0. Selling blocks of tickets/ products in larger quantities.
0. Getting rid of excess inventories / stocks when demand is low,
0. Standby tickets for hotels, theatres, flights etc.
0. Peak & Off-peak pricing schemes e.g. travel, Telecommunications

4.5.2 Early-bird discounts – generating extra cash flow for a business

Customers booking early with airline carriers such as EasyJet or RyanAir will normally find lower prices if they are prepared to book early. This gives the airline the advantage of knowing how full their flights are likely to be and is a **source of cash flow** prior to the flight taking off.

Closer to the time of the scheduled service the price rises, on the justification that consumer's demand for a flight becomes inelastic. People who book late often regard travel to their intended destination as a necessity and they are likely to be willing and able to pay a much higher price.

4.5.3 Peak and Off-Peak Pricing

- Peak and off-peak pricing and is common in the telecommunications industry, leisure retailing and in the travel sector.
- For example, telephone and electricity companies separate markets by time:
- There are three rates for telephone calls: a daytime peak rate, and an off peak evening rate and a cheaper weekend rate.
- Electricity suppliers also offer cheaper off-peak electricity during the night.

- At **off-peak times**, there is **plenty of spare capacity** and marginal costs of production are low (the supply curve is elastic)
- At **peak times** when demand is high, short run supply becomes relatively inelastic as the supplier reaches **capacity constraints**. A combination of higher demand and rising costs forces up the profit maximizing price.

4.6 EQUILIBRIUM CONDITIONS OF A DISCRIMINATING MONOPOLY

A discriminating monopolist, like an ordinary monopolist, tries to get maximum profits. He would supply the product in different amounts to achieve his ultimate goal. In fact, his action of price discrimination is profitable if the elasticity of demand in one market is different from the elasticity of demand in the other.

If the elasticity of demand for the product of the monopolist is greater in market A than what it is in market B, the monopolist would gain by reducing the supply in market B and thereby increasing the supply in market A. If a discriminating monopolist is to be in equilibrium, two separate conditions have to be fulfilled.

(1) Marginal revenue in both (or all) markets must be the same:

When the elasticity of demand for a monopolist's product is different in different markets, he would supply a smaller amount and charge a high price for the product where the demand is inelastic; but he would supply a larger amount and charge a low price for the same where the demand is elastic. By doing so, he will have to equalize the marginal revenue in both or all markets.

(2) The marginal revenue derived from each of these markets must also equal the marginal cost of the monopolist's total output:

It means that the monopolist would supply the different amounts in A and B markets in such a way and up to that amount at which the marginal revenue from the sale in each of these markets must be equal to the monopolist's marginal cost of producing the total output (aggregate of output in A and B).

In other words, the equilibrium condition of a discriminating monopolist becomes:

MR_1 (marginal revenue in market A) = MR_2 (marginal revenue in market B) = MC.

These two conditions are nothing more than an application of the general principle of equilibrium, i.e., MR = MC.

The equilibrium under discriminating monopoly can be shown in the following figure.In Fig. 4.5(a) and (b) show the average and marginal revenue curves of the firm for two separate markets (sub-market A and sub-market B). These markets have different elasticities of demand at each price. In Fig.4.5 (c) the profit maximizing output (OM) is shown at the intersection of the marginal cost curve (MC) for the monopolist's whole output, with the curve showing combined marginal revenue (CMR) obtained from the two markets. The curve CMR is obtained by adding the curves MR_1 and MR_2 together sideways.

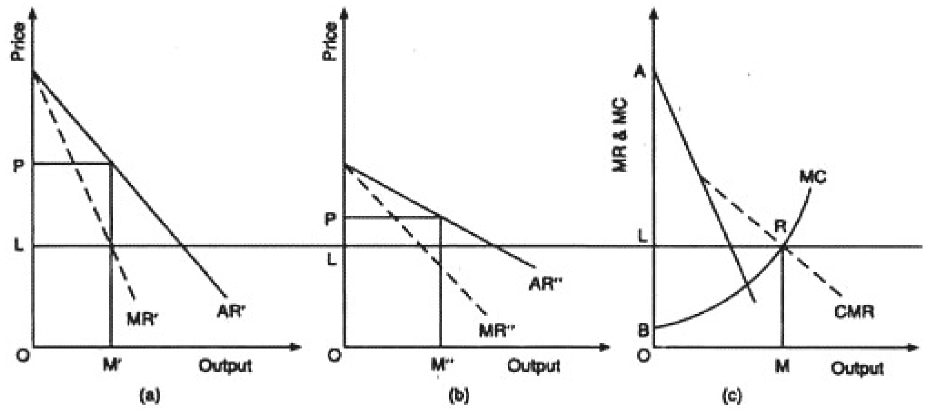


Figure 4.5 : Equilibrium of a Discriminating Monopolist

In this equilibrium situation, the output is OM, and marginal revenue is OL or MR. The output OM has, therefore, to be distributed between the two separate markets in such a way that marginal revenue in each is OL. It means that OM' is to be sold in sub-market A at price OP (marginal revenue is here OL).

Similarly, OM" must be sold in sub-market B at a price of OP" (marginal revenue here is also OL). The monopolist's profit is shown by the area ARB in Fig. 10(c) and here it is at a maximum.

4.7 OUTPUT UNDER PRICE DISCRIMINATION

The total output of a monopolist with two or more prices can be either larger or smaller than his total output if he would sell at one price. Conceivably, too, a monopolist could have an output equal to the output corresponding to conditions of pure competition.

In practice, demand and cost relations can be such that without discrimination a particular commodity or service will not be produced at all. Take the case of India's sugar industry. If free sale of sugar is prohibited production of sugar will be unprofitable.

Some commodities and services might not be produced at all if sellers were not be able or were not allowed to practice price discrimination. The standard and simple example is the physician in a small village. Similarly, railroad service on a particular route might depend on the ability of the railroad to charge higher rates to some groups of commuters than to others.

4.7.1 Preconditions of Price Discrimination:

It is obvious that discrimination between buyers is not possible under perfect competition because of the existence of a large number of sellers selling an identical product. It can only occur when there is a monopoly. But even under monopoly it is not always possible. A.C. Pigou has mentioned two important conditions for the successful operations of price discrimination by a monopolist.

1. No Possibility of Resale of Product:

A monopolist succeeds in price- discrimination where the products, mainly the services, cannot be resold or when the resale of the product or leakage of the product from low-priced to high-priced market can be prevented. A doctor having a monopoly position in a particular locality can charge rich patients high fee but poor patients low fee, for his services rendered.

Here, he becomes successful because his services cannot be resold. Similarly, lawyers and business consultants sometimes charge rates for their services that vary according to the incomes of their clients. Direct personal services like teaching, legal advice, haircut, modelling, etc., which cannot be resold by the buyers, foster price discrimination.

A commodity cannot be resold when it fulfills two important conditions:

(a) Units of its demand cannot be transferred from high-priced to low-priced markets, and(b) Units of its supply cannot be transferred from low-priced to high-priced markets.

In other words, arbitrage (transfer of the commodity from low-priced to high-priced market) can be stopped somehow.

2. Separation of Markets:

Price discrimination is also possible when markets are separated from one another. Geographically or politically markets cannot meet one another for the re-buying or the re-selling of the products. Dumping is an outstanding example of this type of discriminating monopoly.

4.8 BESIDES THESE TWO CONDITIONS, PRICE DISCRIMINATION IS ALSO POSSIBLE UNDER THE FOLLOWING CONDITIONS

(a) A monopolist becomes successful in price discrimination on account of consumers' peculiarities; such as consumers' ignorance about the prices, consumers' irrational feeling about the quality of the product, consumers' indifference towards small price differences, etc.

(b) Again, a monopolist becomes successful in price discrimination when the demand for his product has different elasticities in two sub-markets or different markets. He can sell his product at high prices in one market where its demand is inelastic (e.g., woolen dresses at cold places) but at low prices in the other sub-markets where its demand is elastic (e.g., woolen dresses at warm places).

It will pay the monopolist to transfer units of output from one market to other markets when the elasticity in two markets is different. In fact, the price discrimination will be profitable only when elasticity of demand in one market (or sub-market) is different from that in the other.

(c) When there is no state intervention or legal bar, a monopolist can successfully practise price discrimination.

(d) Finally, price discrimination is also possible when buyers and sellers are separated from one another by a great distance.

These conditions can also be extended to cover the case where a firm is a monopolist in one market but is operating under conditions of perfect competition in another. In this case, the marginal cost of producing the whole output must equal the price prevailing in the perfect market.

The part of the output, which is sold in the monopolised market, must be so restricted as to equalise the marginal revenue in that market to the marginal cost of the whole output. The price in the latter market will be higher than the price prevailing in the perfect market. This consequence follows from the fact that in the perfect market the average revenue curve of the firm is a horizontal straight line while in the other market it is downward sloping.

The relationship between marginal revenue and price is given by the formula :

$MR = p\ (1 – 1/e)$.

Using the symbols indicated earlier we get the following equations:
Marginal Revenue in market A = $p_1\ \{1 – 1/e_1\}$
Marginal Revenue in market B = $p_2\ \{1 – 1/e_2\}$

It has been shown that when the monopolist is earning maximum net revenue, the marginal revenues in the two markets must be equal.

Therefore, at equilibrium:
$P_1\ \{1 – 1/e_1\} = p_2\ \{1 – 1/e_2\}$

In this equation if $e_1=e_2$ then $p_1=p_2$. Therefore, it follows that when the demand-elastics (in the different markets, at the relevant output levels) are equal, the monopolist will charge the same price in the different markets. If the demand-elastics are different markets. If the demand elasticities are different, price-discrimination is profitable, and therefore possible.

The relationship between the price in the two markets (p1: p2) can be calculated from the equation given above. In general, the price will be higher in the market where the elasticity of demand is lower.

The analysis of price discrimination, given above, can be easily extended to the case of more than two markets. **Example 1:**
Suppose that elasticity in market A is equal to 2 and elasticity in market B is equal to 3. Then,

$$p_1\left\{1-\frac{1}{2}\right\} = p_2\left\{1-\frac{1}{3}\right\}$$

$$\frac{p_1}{p_2} = \frac{1-\frac{1}{3}}{1-\frac{1}{2}} = \frac{4}{3}$$

If in market A, Price is p_1 = Rs. 4, then in market B, price is p_2 = Rs. 3.

Example:

A monopolist has two markets and the demand schedules in them are as follows:

Market A		Market B	
Price (Rs.)	**Quantity**	**Price (Rs.)**	**Quantity**
50	400	60	600
40	600	50	800
30	900	40	1,100
20	1,000	30	1,400

He wants to sell 1,400 units. What price will he set in the two markets and why?

Solution:

A discriminating monopolist reaches equilibrium and hence maximizes profit when he equates the marginal revenue(s) in-both the markets, i.e., $MR_1 = MR_2$. If this condition holds total revenue will be maximum and revenue maximization subject to cost constraint implies profit maximization. So, we may calculate total revenue from each market for different price-quantity combinations and then the corresponding MR.

So, when the firm sells 600 units in market I, at a price of Rs. 40 per unit and 800 units in market 2 at a price of Rs. 50, $MR_1 = MR_2$ and total revenue is Rs. 24,000 + Rs. 40,000 = Rs. 64,000 which is maximum.

No other combination of Q_1 and Q_2 will yield the same total revenue and hence raise profit further.

Market A				**Market B**			
P	**Q**	**TR**	**MR**	**P**	**Q**	**TR**	**MR**
	Rs.	**Rs.**	**Rs.**		**Rs.**	**Rs.**	**Rs.**
50	400	20,000		60	600	36,000	
			20				20
40	600	24,000		50	800	40,000	
			10				13.3
30	900	27,000		40	1,100	44,000	
			-70				-0.66
20	1,000	20,000		30	1,400	4,200	

Check your progress:

1. Distinguish between Perfect competition and Imperfect competition.
2. State the sources of monopoly power.
3. State the conditions under which price discrimination is possible.
4. Explain the meaning of discriminating monopoly.
5. Differentiate between First degree and Second degree price discrimination.

4.8 MEANING OF MONOPOLY POWER

The monopolist is the only seller in the market of his product. As the only seller, he possesses a monopolistic dominance or monopoly power in the market. But the degree of monopoly power is not the same in the case of all monopolies. Generally speaking, the less elastic is the demand for a monopolist's product, the more would be his degree of monopoly power, and vice versa.

That is, the degree of monopoly power depends upon the numerical coefficient (e) of the price-elasticity of demand for the monopolist's product—a higher degree of monopoly power would be obtained at a smaller value of e and a lower degree of monopoly power at a larger value of e. This idea is supported by the formula given by Prof. A. P. Lerner (1903-82) for measuring the degree of monopoly power

According to Prof. Lerner, degree of monopoly power in perfect competition is zero. At the equilibrium point of a competitive firm, we have p = AR = MR = MC, or p = MC, or
p – MC = 0.

On the other hand, at the equilibrium point of a monopolistic firm, we have
p = AR > MR = MC, or, p > MC, or, p – MC = positive. Prof. Lerner thinks that the larger the positive value of p – MC as a proportion of p, the larger would be the degree of monopoly power. Therefore, his formula for the degree of monopoly power is

4.8.1 Lerner's Index of monopoly power = p – MC/p (11.48)

It is obvious from (11.48) that under perfect competition, the value of this index is zero (p – MC = 0), and in the case of monopoly, this index would be positive (p > MC).

We may now easily obtain the relation between the Lerner's Index and the price-elasticity of demand for the product:
https://www.economicsdiscussion.net/wp-content/uploads/2016/09/image-27.png

$$\text{Lemer's Index} = \frac{p - MC}{p} = \frac{p - MR}{p} \quad [\because MR = MC, \text{in equilibrium}]$$

$$= \frac{p - p\left(1 - \frac{1}{e}\right)}{p} \quad \left[\because MR = p\left(1 - \frac{1}{e}\right)\right]$$

$$= \frac{p\left[1 - 1 + \frac{1}{e}\right]}{p} = \frac{1}{e}$$

That is, the Lerner's Index of monopoly power is nothing but the reciprocal of the numerical coefficient of price-elasticity of demand for the product, which supports our idea that the less elastic is the demand for the product, the more would be the degree of monopoly power, and vice versa.

We may easily understand the economic meaning of this idea. The smaller the price-elasticity of demand, i.e., the value of e, the smaller would be the response of demand for the product in response to a change in its price and the larger would be the power of the monopolist to charge a price in excess of MC, i.e., the larger would be value of p – MC and, therefore, of the Lerner's Index.

4.8.2 Measures of Monopoly Power under Price Discrimination:

Under price discrimination, the firm is able to discriminate between different markets in respect of the price of its product. This is proof enough that the firm possesses some monopoly power.

We have seen that if the monopolist practices price-discrimination in two markets, then the prices charged in the two markets, p_1 and p_2, are known to us. Now, if we know the elasticity of demand in only one of the markets, we may obtain a measure of monopoly power of the firm. In the previous case, e_2 was known to be equal to ∞. But, if e_2 is not known to us exactly, then also, we may have an estimate of monopoly power on the basis of some assumptions about e_2. Let us suppose, $\frac{p_1}{p_2} = 3$, so that we have

$$\frac{p_2}{p_1} = \frac{1}{3} = \frac{1-\frac{1}{e_1}}{1-\frac{1}{e_2}}$$

Now, if, $e_2 = 2$, we get

$$1-\frac{1}{e_1} = \frac{1}{6}$$

$$\text{or, } \frac{1}{e_1} = \frac{5}{6}$$

i.e., here, the Lerner Index of monopoly power of the firm is equal to $\frac{5}{6}$.

Similarly, if $e_2 = 4$, we would have $\frac{1}{e_1} = \frac{3}{4}$ and if $e_2 = \infty$, we would have $\frac{1}{e_1} = \frac{2}{3}$.

Thus, we may have the estimates of monopoly power that the firm might possess on the basis of some reasonable guesses about e_2.

4.8.3 Concentration Ratios as Measures of Monopoly Power:

In an industry, usually there exist some smaller firms and some larger firms in the sense that smaller firms have relatively smaller shares in total industry sales (or profits or assets), and the larger firms have relatively larger shares. That is, sales (or profits or assets) may be more concentrated in a few firms of the industry, or such concentration may be less. Now, the size of the largest firms' share in total industry sales, etc. is known as the concentration ratio.

For example, if we consider sales as the criterion, then the n largest firms' share in total industry sales is called an n-firm concentration ratio which is denoted by CR_n. Usually, the four firm and eight firm concentration ratios denoted by CR_4 and CR_8, are used as a measure of monopoly power.

The concentration ratio may act as a measure of monopoly power because in a competitive industry, sales are more evenly distributed among firms—concentration of sales is more or less absent. On the other hand, in a monopolistic industry, sales tend to concentrate in a few large firms—in the limiting case, sales are concentrated in only one firm when we have the case of a pure monopoly.

Let us suppose that there are five firms in an industry, and the shares of the firms arranged in a descending order are as follows:

Firm	Market Share
1	0.50
2	0.30
3	0.10
4	0.06
5	0.04

We can compute the cumulative shares for the n largest firms for n = 1, 2, 3, 4, 5.

These cumulative shares are:

Cumulative Number of Firms	Cumulative Market Share
1	0.50
2	0.80
3	0.90
4	0.96
5	1.00

We have obtained above that the cumulative share of the first two largest firms (CR_2) is 0.80. Similarly, $CR_3 = 0.90$, $CR_4 = 0.96$ and $CR_5 = 1.00$. If we plot the cumulative percentage of sales against the cumulative number of firms from largest to smallest, we would obtain a curve called the concentration curve. The concentration curves of three typical industries have been shown in Fig.4.6.

The figure shows us that concentration is larger in industry A than in the industries B and C. But whether concentration is larger in B or C depends on whether we are comparing the concentrations in the largest four firms (CR_4) or in the largest eight firms (CR_8).

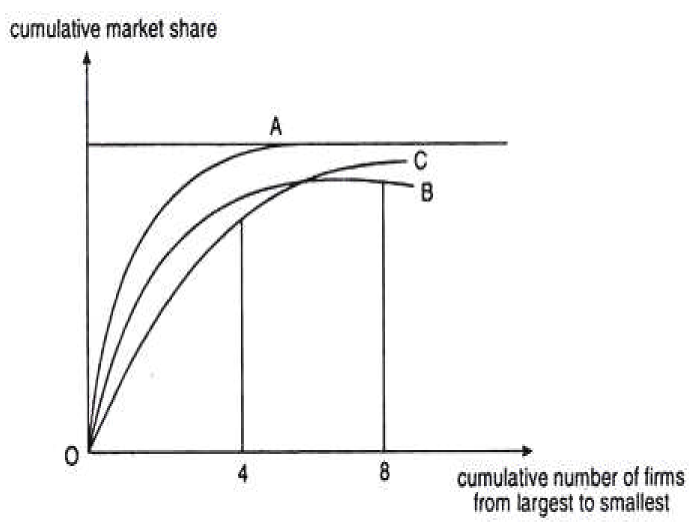


Figure 4.6 Concentration curves for three typical industries

If we look at CR_4, concentration is larger in industry B, but if we look at CR_8, concentration is larger in industry C. This is the basic defect of concentration ratios as measures of monopoly power.There may be another problem also with the concentration ratios. From the point of view of sales, one industry may be more concentrated than another and, from the point of view of profits or assets the latter may be more concentrated than the former.

A third problem with the concentration ratio is that it does not take into account the number of firms. For example, in the example of five firms we have obtained $CR_4 = 0.96$. In another industry with 100 firms the CR_4 may also be obtained to be 0.96. We cannot really compare the monopoly power or the competitiveness in these two industries, since the numbers of firms in the two cases are different.

A fourth problem with the concentration ratios is that they are usually based on the distribution of firms in the domestic industry and they completely ignore the picture in the foreign sector. Yet the existence of foreign competition might considerably affect the behaviour of the domestic firms.

4.8.4 The Herfindahl Index for Measuring Monopoly Power:

The Herfindahl Index (named after Orris C. Herfindahl) avoids some of the major problems involving the use of concentration ratios (CRs).

This index is denoted by HI and defined as:

$$HI = \sum_{i=1}^{n} S_i^2 \qquad (4.1)$$

where n is the number of firms in the industry and S; is the market share of the ith firm (i = 1,2, …, n). As is evident, this index reflects both the number of firms and their relative sizes. For, the example we have already considered, HI to be obtained would be

$HI = (0.50)^2 + (0.30)^2 + (0.10)^2 + (0.06)^2 + (0.04)^2 = 0.3552.$

In case all the firms had equal market shares of 0.2, the **Herfindahl Index** would be

$HI = 5\,(0.2)^2 = 1/5$

That is, if there are n firms in an industry all having equal shares, the share of each firm would be 1/n and we would have

$HI = n\left(\frac{1}{n}\right)^2 = \frac{1}{n}$, which is the reciprocal of the number of firms.

Now, elementary statistics gives us that the variance (σ^2) of market shares is

$$\sigma^2 = \frac{1}{n}\,\Sigma\, S_i^2 - \left(\frac{1}{n}\,\Sigma\, S_i\right)^2$$

$$= \frac{1}{n}.\,HI - \frac{1}{n^2} \quad [\because \Sigma\, S_i^2 = HI \text{ and } \Sigma_i\, S_i = 1]$$

$$\text{or,}\quad HI = n\,\sigma^2 + \frac{1}{n} \qquad (4.2)$$

Thus, HI depends solely on two things, viz., the variance of the market shares and the number of firms. If the market share is equally distributed among the firms, i.e., if $\sigma^2 = 0$, the measure of monopoly power which is given by the HI, would assume the value 1/n, and this is also the minimum value of the HI ($\because \sigma^2 \geq 0$) for a given n.

Therefore, if there are many firms in the industry that are more or less of equal size, the value of HI would be small, since n is large and σ^2 is close to zero. On the other hand, if n = 1, then we would have $\sigma^2 = 0$, and in that case the HI would be equal to 1.

In other words, in the case of pure monopoly, the HI would be equal to 1, and it is the maximum value of HI. That is, we have obtained that the HI would lie between and 1, both ends inclusive ($1/n \leq HI \leq 1$), and a larger HI indicates a greater monopoly power.

Public policy toward monopoly generally recognizes two important dimensions of the monopoly problem. On the one hand, the combining of competing firms into a monopoly creates an inefficient and, to many, inequitable solution. On the other hand, some industries are characterized as natural monopolies; production by a single firm allows economies of scale that result in lower costs.

The combining of competing firms into a monopoly firm or unfairly driving competitors out of business is generally forbidden in the United States. Regulatory efforts to prevent monopoly fall under the purview of the nation's antitrust laws, discussed in more detail in a later chapter.

At the same time, we must be careful to avoid the mistake of simply assuming that competition is the alternative to monopoly, that every monopoly can and should be replaced by a competitive market. One key source of monopoly power, after all, is economies of scale. In the case of natural monopoly, the alternative to a single firm is many small, high-cost producers. We may not like having only one local provider of water, but we might like even less having dozens of providers whose costs—and prices— are higher. Where monopolies exist because economies of scale prevail over the entire range of market demand, they may serve a useful economic role. We might want to regulate their production and pricing choices, but we may not want to give up their cost advantages.

Where a natural monopoly exists, the price charged by the firm and other aspects of its behavior may be subject to regulation. Water or natural gas, for example, are often distributed by a public utility— a monopoly firm—at prices regulated by a state or local government agency. Typically, such agencies seek to force the firm to charge lower prices, and to make less profit, than it would otherwise seek.

Although economists are hesitant to levy blanket condemnations of monopoly, they are generally sharply critical of monopoly power where no rationale for it exists. When firms have substantial monopoly power only as the result of government policies that block entry, there may be little defense for their monopoly positions.

Public policy toward monopoly aims generally to strike the balance implied by economic analysis. Where rationales exist, as in the case of natural monopoly, monopolies are permitted—and their prices are regulated. In other cases, monopoly is prohibited outright. Societies are likely to at least consider taking action of some kind against monopolies unless they appear to offer cost or other technological advantages.

4.9 SUMMARY

1. Based on competition, the market structure has been classified into two broad categories like Perfectly competitive and Imperfectly competitive. Perfect Competition is not found in the real world market because it is based on many assumptions. But an Imperfect Competition is associated with a practical approach.
2. Economists have identified a number of conditions that, individually or in combination, can lead to domination of a market by a single firm and create barriers that prevent the entry of new firms. Barriers to entry are characteristics of a particular market that block new firms from entering it. They include economies of scale, special advantages of location, high sunk costs, a dominant position in the ownership of some of the inputs required to produce the good, and government restrictions. These barriers may be interrelated, making entry that much more formidable.
3. Price discrimination happens when a firm charges a different price to different groups of consumers for an identical good or service, for reasons not associated with costs of supply.
4. Price discrimination is easier when there are **separate and distinct markets** for a firm's products and when **price elasticity of demand varies** from one group of consumers to another.
5. First degree price discrimination, sometimes known as **optimal pricing**, with perfect price discrimination, the firm separates the market into **each individual consumer** and charges them the price they are willing and able to pay.

6. Second degree price discrimination involves businesses selling off **packages or blocks of a product** deemed to be **surplus capacity** at lower prices than the previously published or advertised price.

7. A discriminating monopolist, like an ordinary monopolist, tries to get maximum profits. He would supply the product in different amounts to achieve his ultimate goal. In fact, his action of price discrimination is profitable if the elasticity of demand in one market is different from the elasticity of demand in the other.

8. The monopolist is the only seller in the market of his product. As the only seller, he possesses a monopolistic dominance or monopoly power in the market. But the degree of monopoly power is not the same in the case of all monopolies. Generally speaking, the less elastic is the demand for a monopolist's product, the more would be his degree of monopoly power, and vice versa.

8. In an industry, usually there exist some smaller firms and some larger firms in the sense that smaller firms have relatively smaller shares in total industry sales (or profits or assets), and the larger firms have relatively larger shares. That is, sales (or profits or assets) may be more concentrated in a few firms of the industry, or such concentration may be less. Now, the size of the largest firms' share in total industry sales, etc. is known as the concentration ratio.

4.10 QUESTIONS

1. Explain the various sources of monopoly power.
2. When price discrimination is possible?
3. Discuss First degree price discrimination.
4. Explain the Second degree price discrimination.
5. Write a note on discriminating monopoly.
6. Explain the degree of monopoly power.
7. Write a notes on the following

   a) Concentration ratio

   b) Marshall Lerner index of measuring of monopoly power

   c) Herfindhal index of measuring monopoly power

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UNIT - 4A

MARKET STRUCTURE ANALYSIS - II

Unit Structure:

4A.0 OBJECTIVES

- To familiar students with Concept of Different forms of imperfect competition
- To acquaint the students with Monopolistic competition and Oligopoly
- To study the Strategic decision making in oligopoly markets
- To understand colliding oligopoly : rivalry among few, price war and kinked demand curve
- To study basic concepts of game theory
- To understand Using Game theory to analyse strategic decisions
- To familiar with the application of model of prisoner's dilemma in market decisions

4A.1 INTRODUCTION: DIFFERENT FORMS OF IMPERFECT COMPETITION

An imperfect market refers to any economic market that does not meet the rigorous standards of the hypothetical perfectly—or purely—competitive market. Pure or perfect competition is an abstract, theoretical market structure in which a series of criteria are met. Since all real markets exist outside of the spectrum of the perfect competition model, all real markets can be classified as imperfect markets.

In an imperfect market, individual buyers and sellers can influence prices and production, there is no full disclosure of information about products and prices, and there are high barriers to entry or exit in the market.

Perfect competition, market equilibrium, and an unlimited number of buyers and sellers characterize a perfect market.

4A.2 DEFINITION OF IMPERFECT COMPETITION

The competition, which does not satisfy one or the other condition, attached to the perfect competition is imperfect competition. Under this type of competition, the firms can easily influence the price of a product in the market and reap surplus profits.

In the real world, it is hard to find perfect competition in any industry, but there are so many industries like **telecommunications, automobiles, soaps, cosmetics, detergents, cold drinks and technology,**

where you can find imperfect competition. By the virtue of this, imperfect competition is also considered as real world competition.

There are various forms of imperfect competition, described below:

- **Monopoly**: Single seller dominates the entire market.
- **Duopoly**: Two sellers share the whole market.
- **Oligopoly**: Few sellers are there who either act in collusion or competition.
- **Monopsony**: Many sellers and a single buyer.
- **Oligopsony**: Many sellers and few buyers.
- **Monopolistic Competition**: Numerous sellers offering unique products.
- Imperfect markets do not meet the rigorous standards of a hypothetical perfectly or purely competitive market.
- Imperfect markets are characterized by having competition for market share, high barriers to entry and exit, different products and services, and a small number of buyers and sellers.
- Perfect markets are theoretical and cannot exist in the real world; all real-world markets are imperfect markets.
- Market structures that are categorized as imperfect include monopolies, oligopolies, monopolistic competition, monopsonies, and oligopsonies.

4A.2.1 Types of Imperfect Markets

When at least one condition of a perfect market is not met, it can lead to an imperfect market. Every industry has some form of imperfection. Imperfect competition can be found in the following structures:

4A.2.2 Monopoly

This is a structure in which there is only one (dominant) seller. Products offered by this entity have no substitutes. These markets have high barriers to entry and a single seller who sets the prices on goods and services. Prices can change without notice to consumers.

4A.2.3 Oligopoly

This structure has many buyers but few sellers. These few players in the market may bar others from entering. They may set prices together or, in the case of a cartel, only one takes the lead to determine the price for goods and services while the others follow.

4A.2.4 Monopolistic Competition

In monopolistic competition, there are many sellers who offer similar products that can't be substituted. Businesses compete with one another and are price makers, but their individual decisions do not affect the other.

4A.2.5 Monopsony and Oligopsony

These structures have many sellers, but few buyers. In both cases, the buyer is the one who manipulates market prices by playing firms against one another.

4A.3 MONOPOLISTIC COMPETITION

Monopolistic competition is a market structure defined by free entry and exit, like competition, and differentiated products, like monopoly. Differentiated products provide each firm with some market power. Advertising and marketing of each individual product provide uniqueness that causes the demand curve of each good to be downward sloping. Free entry indicates that each firm competes with other firms and profits are equal to zero on long run equilibrium. If a monopolistically competitive firm is earning positive economic profits, entry will occur until economic profits are equal to zero.

After examining the two extreme market structures, let us now focus our attention to the market structure, which shares features of both perfect competition and monopoly, i.e. “Monopolistic Competition”.

Monopolistic Competition refers to a market situation in which there are large numbers of firms which sell closely related but differentiated products. Markets of products like soap, toothpaste AC, etc. are examples of monopolistic competition.

Monopoly + Competition = Monopolistic Competition

Under monopolistic competition, each firm is the sole producer of a particular brand or “product”.

i. It enjoys ‘monopoly position’ as far as a particular brand is concerned.
ii. However, since the various brands are close substitutes, its monopoly position is influenced due to stiff ‘competition’ from other firms.

So, monopolistic competition is a market structure, where there is competition among a large number of monopolists.

4A.4 FEATURES OF MONOPOLISTIC COMPETITION

1. Large Number of Sellers:

There are large numbers of firms selling closely related, but not homogeneous products. Each firm acts independently and has a limited share of the market. So, an individual firm has limited control over the market price. Large number of firms leads to competition in the market.

2. Product Differentiation:

Each firm is in a position to exercise some degree of monopoly (in spite of large number of sellers) through product differentiation. Product differentiation refers to differentiating the products on the basis of brand, size, colour, shape, etc. The product of a firm is close, but not perfect substitute of other firm.

Implication of 'Product differentiation' is that buyers of a product differentiate between the same products produced by different firms. Therefore, they are also willing to pay different prices for the same product produced by different firms. This gives some monopoly power to an individual firm to influence market price of its product.

Explore More about Product Differentiation:

1. The product of each individual firm is identified and distinguished from the products of other firms due to product differentiation.
2. To differentiate the products, firms sell their products with different brand names, like Lux, Dove, Lifebuoy, etc.
3. The differentiation among different competing products may be based on either 'real' or 'imaginary' differences.

(i) Real Differences may be due to differences in shape, flavour, colour, packing, after sale service, warranty period, etc.

(ii) Imaginary Differences mean differences which are not really obvious but buyers are made to believe that such differences exist through selling costs (advertising).

4. Product differentiation creates a monopoly position for a firm.
5. Higher degree of product differentiation (i.e. better brand image) makes demand for the product less elastic and enables the firm to charge a price higher than its competitor's products. For example, Pepsodent is costlier than Babool.

6. Some more examples of Product Differentiation:

(i) Toothpaste: Pepsodent, Colgate, Neem, Babool, etc.
(ii) Cycles: Atlas, Hero, Avon, etc.
(iii) Tea: Brooke Bond, Tata tea, Today tea, etc.
(iv) Soaps: Lux, Hamam, Lifebuoy, Pears, etc.

3. Selling costs:

Under monopolistic competition, products are differentiated and these differences are made known to the buyers through selling costs. Selling costs refer to the expenses incurred on marketing, sales promotion and advertisement of the product. Such costs are incurred to persuade the buyers to buy a particular brand of the product in preference to competitor's brand. Due to this reason, selling costs constitute a substantial part of the total cost under monopolistic competition.

It must be noted that there are no selling costs in perfect competition as there is perfect knowledge among buyers and sellers.

Similarly, under monopoly, selling costs are of small amount (only for informative purpose) as the firm does not face competition from any other firm.

4. Freedom of Entry and Exit:

Under monopolistic competition, firms are free to enter into or exit from the industry at any time they wish. It ensures that there are neither abnormal profits nor any abnormal losses to a firm in the long run. However, it must be noted that entry under monopolistic competition is not as easy and free as under perfect competition.

5. Lack of Perfect Knowledge:

Buyers and sellers do not have perfect knowledge about the market conditions. Selling costs create artificial superiority in the minds of the consumers and it becomes very difficult for a consumer to evaluate different products available in the market. As a result, a particular product (although highly priced) is preferred by the consumers even if other less priced products are of same quality.

6. Pricing Decision:

A firm under monopolistic competition is neither a price- taker nor a price-maker. However, by producing a unique product or establishing a particular reputation, each firm has partial control over the price. The extent of power to control price depends upon how strongly the buyers are attached to his brand.

7. Non-Price Competition:

In addition to price competition, non-price competition also exists under monopolistic competition. Non-Price Competition refers to competing with other firms by offering free gifts, making favourable credit terms, etc., without changing prices of their own products.

Firms under monopolistic competition compete in a number of ways to attract customers. They use both Price Competition (competing with other firms by reducing price of the product) and Non-Price Competition to promote their sales.

4A.5 DEMAND CURVE UNDER MONOPOLISTIC COMPETITION

Under monopolistic competition, large number of firms selling closely related but differentiated products makes the demand curve downward sloping. It implies that a firm can sell more output only by reducing the price of its product.

As seen in Fig. 4A.1, output is measured along the X-axis and price and revenue along the Y-axis. At OP price, a seller can sell OQ quantity. Demand rises to OQ_1, when price is reduced to OP_1. So, demand curve under monopolistic competition is negatively sloped as more quantity can be sold only at a lower price.

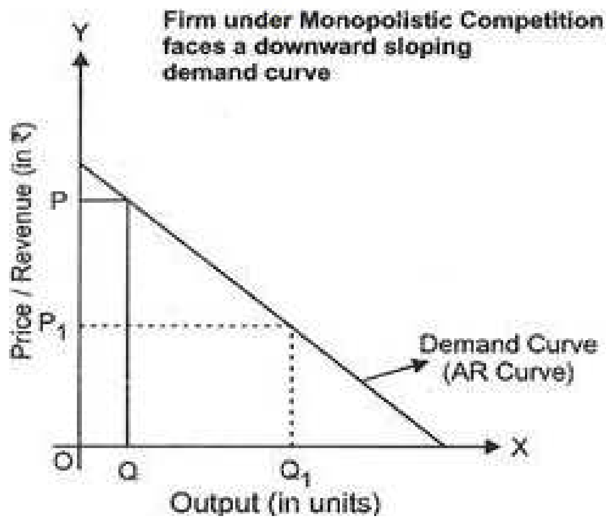


Figure 4A.1

MR < AR under Monopolistic Competition:

Like monopoly, MR is also less than AR under monopolistic competition due to negatively sloped demand curve.

4A.6 DEMAND CURVE: MONOPOLISTIC COMPETITION VS. MONOPOLY

At first glance, the demand curve of monopolistic competition (Fig. 4A.2) looks exactly like the demand curve under monopoly (Fig. 4A.3) as both faces downward sloping demand curves. However, demand curve under monopolistic competition is more elastic as compared to demand curve under monopoly. This happens because differentiated products under monopolistic competition have close substitutes, whereas there are no close substitutes in case of monopoly.Let us prove this with the help of Fig. 4A.5 (Proof is given just for reference).

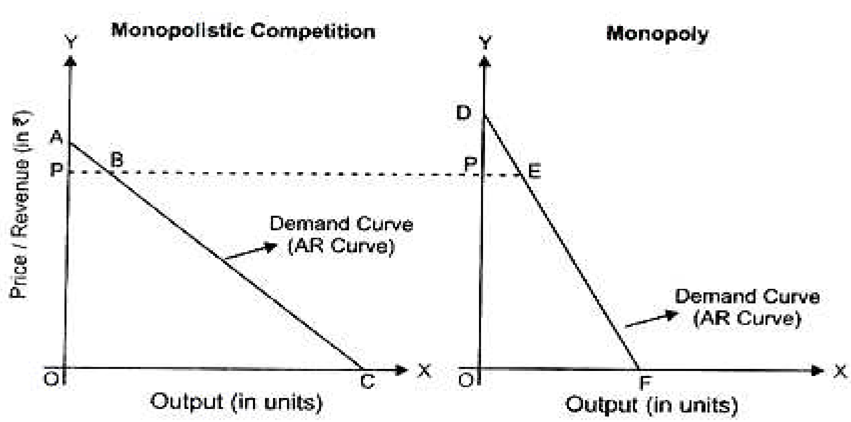


Figure 4A.2

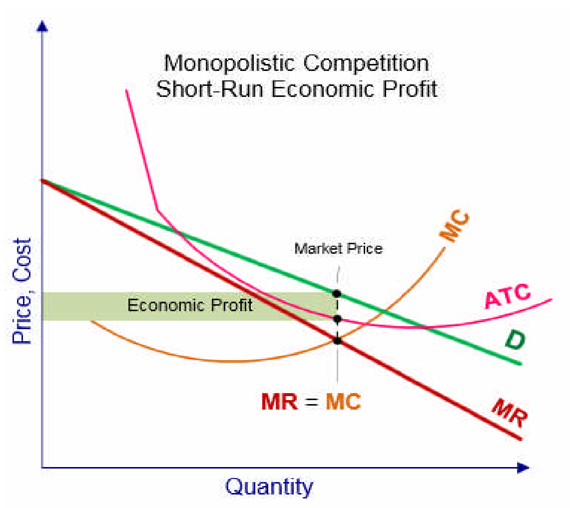
We know, price elasticity of demand (by geometric method) at a point on the demand curve is given by: E_d = Lower segment of demand curve / Upper segment of demand curve.

At price 'OP', price elasticity of demand under monopolistic competition is BC/AB and under monopoly is EF/DE. Fig. 10.5 reveals that BC > EF and DE > AB. So, BC/AB > EF/DE.It means, demand curve in case of monopolistic competition is more elastic as compared to demand curve under monopoly.

4A.7 MONOPOLISTIC COMPETITION IN THE LONG-RUN

The difference between the short-run and the long-run in a monopolistically competitive market is that in the long-run new firms can enter the market, which is especially likely if firms are earning positive economic profits in the short-run. New firms will be attracted to these profit opportunities and will choose to enter the market in the long-run. In contrast to a monopolistic market, no barriers to entry exist in a monopolistically competitive market; hence, it is quite easy for new firms to enter the market in the long-run.

In the short run, a monopolistically competitive firm maximizes profit or minimizes losses by producing that quantity where **marginal revenue = marginal cost**. If average total cost is below the market price, then the firm will earn an economic profit.



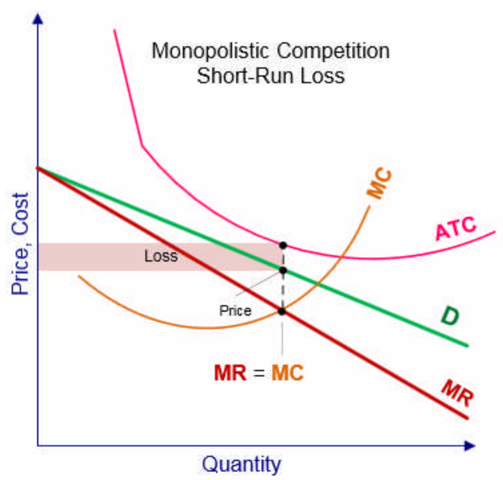


Figure 4A.3

- **D = Market Demand**
- **ATC = Average Total Cost**
- **MR = Marginal Revenue**
- **MC = Marginal Cost**

As can be seen in this graph, the **market price** charged by the monopolistic competitive firm = the point on the **demand curve** where **MR** = **MC**.

4A.7.1 Short-Run Profit = (**Price** - **ATC**) × **Quantity**

However, if the average total cost exceeds the market price, then the firm will suffer losses, equal to the average total cost minus the market price multiplied by the quantity produced. Losses will still be minimized by producing that quantity where marginal revenue = marginal cost, but eventually the firm either must reverse the losses or be forced to exit the industry.

Short-Run Loss = (**ATC** - **Price**) × **Quantity**

4A.7.2 Long-Run Equilibrium: Normal Profits

If the competitive firms in an industry earn an economic profit, then other firms will enter the same industry, which will reduce the profits of the other firms. More firms will continue to enter the industry until the firms are earning only a normal profit.

However, if there are too many firms, then firms will incur losses, especially the inefficient ones, which will cause them to leave the industry. Consequently, the remaining firms will return to normal profitability. Hence, the long-run equilibrium for monopolistic competition will equate the market price to the average total cost, where marginal revenue = marginal cost, as shown in the diagram below. Remember, in economics, average total cost includes a normal profit.

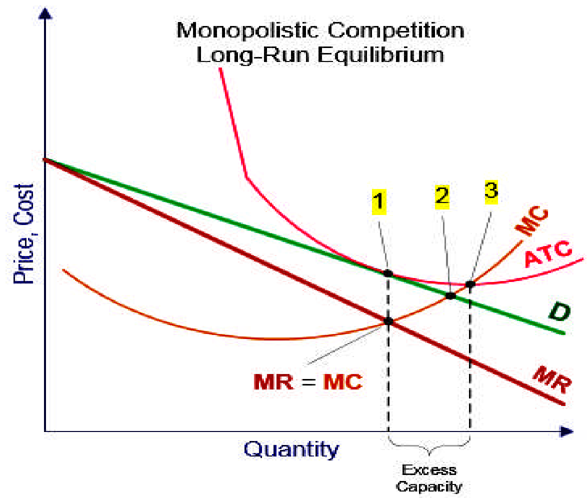


Figure 4A.4

Note that where **MC** rises above **MR**, the costs exceed additional revenue, which is why the firm maximizes its profit by producing only that quantity where **MR** = **MC**, and charging the price at position **1** in the graph.

2 Market Price = Marginal Cost = Allocative Efficiency

3 Productive Efficiency = Minimum ATC

Excess Capacity = Quantity Produced at Minimum **ATC –** Quantity yielding the greatest profit (**MR** = **MC**).

Because monopolistically competitive firms do not operate at their minimum average total cost, they, therefore, operate with **excess capacity**. Note in the above diagram that firms would lose money if they produced more to achieve either allocative or productive efficiency. That most firms operate with excess capacity is evident when looking at most monopolistically competitive firms, such as restaurants and other retailers, where salespeople are often idle.

Some firms may have enough of an advantage to continue earning economic profits, even in the long run. For instance, a business can have an excellent location relative to other locations in the area, which will always give it an advantage over other firms in that local market. Or a firm may have a patent or trademark on its product that prevents competition. In such cases, firms have some degree of market power that would allow them to price their products above competitors' prices without losing too much business.

4A.7.3 Productive and Allocative Efficiency of Monopolistic Competition

Productive efficiency requires that:

Price = Minimum Average Total Cost

Pure competition can achieve productive efficiency, but most monopolistic competitive firms do not, since they sell at a price higher than the minimum average total cost, and would actually lose money selling at their minimum ATC. To use their excess capacity, they would have to produce a quantity equal to their minimum ATC, but they would not be able to sell that amount without lowering their prices, thus either reducing their profits or incurring losses.

The monopolistic firm also does not achieve allocative efficiency. **Allocative efficiency** requires that:
Price = Marginal Cost

The monopolistic firm exhibits a downward sloping demand curve. That means that, to sell more units, it must lower its price, but if it lowers its price, then it must lower its price on all units. Thus, like a monopoly, marginal revenue continually declines as quantity is increased. The firm maximizes profits when marginal revenue = marginal cost, but this only occurs at a quantity less than what a purely competitive firm would produce, where marginal cost = market price. The marginal cost curve will always intersect the marginal revenue curve before it intersects the demand curve, because as previously stated, at any given quantity, marginal revenue is always less than the market price. Because of this allocative inefficiency, some consumers will forgo the product because of its higher price.

Monopolistic competitive firms achieve neither productive nor allocative efficiency: the greater the differentiation of the products, the greater the inefficiency. However, monopolistic competition creates a greater variety of products and services, and this greater diversity is more likely to satisfy consumer tastes, which leads to a more desirable market.

The monopolistically competitive firm's long run equilibrium situation is illustrated in Figure .

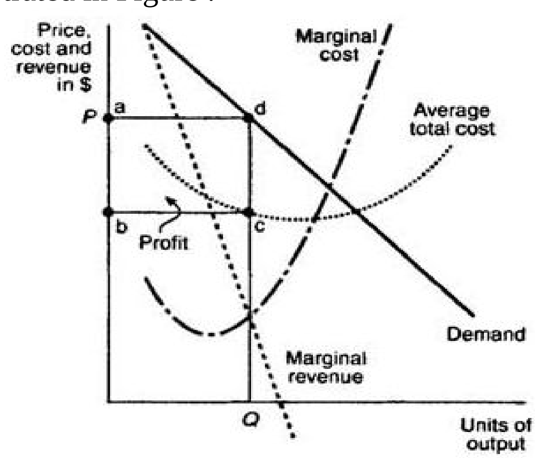


Figure 4A.5
Long-run profit maximization by a monopolistically competitive firm

The entry of new firms leads to an *increase* in the supply of differentiated products, which causes the firm's market demand curve to shift to the *left*. As entry into the market increases, the firm's demand curve will continue shifting to the left until it is just tangent to the average total cost curve at the profit maximizing level of output, as shown in Figure . At this point, the firm's economic profits are zero, and there is no longer any incentive for new firms to enter the market. Thus, in the long run, the competition brought about by the entry of new firms will cause each firm in a monopolistically competitive market to earn normal profits, just like a perfectly competitive firm.

Excess capacity. Unlike a perfectly competitive firm, a monopolistically competitive firm ends up choosing a level of output that is *below* its minimum efficient scale, labeled as point b in Figure . When the firm produces below its minimum efficient scale, it is under utilizing its available resources. In this situation, the firm is said to have excess **capacity** because it can easily accommodate an increase in production. This excess capacity is the major social cost of a monopolistically competitive market structure.

4A.8 WASTES OF MONOPOLISTIC COMPETITION ARE IN BRIEF AS FOLLOWS

(i) Huge expenditure on advertisement: The entrepreneurs in order to overcome the irrational preferences of the consumers like prejudices, liking of commodities, or shop or person have to spend large sums of money on advertisements. This is purely a waste from community point of view.

(ii) Expenditure on cross transportation: Another waste of monopolistic competition is the expenditure incurred on the cross transportation of the commodity. For instance, if a commodity produced in New York is very similar to the commodity produced in Washington, the buyers in Washington due to their irrational preferences may demand the commodity produced in New York and vice versa. Had the buyers given preference to the commodity produced in their own locality, this would have saved the expenditure on cross transportation of the goods.

(iii) Production of variety of products: Under monopolistic competition, an industry may not specialize in the production of those commodities for which it is best fitted. This is because of fact that it has to spend large sum of money on advertisement and secondly it has to cut down the prices in order to attract the customers. So it may find advantageous "to produce varied assortment of types and qualities to sell to its own particular customers rather than face the cost of attracting a large number of customers for one type of product alone".

(iv) Existence of inefficient firms: Under monopolistic competition, the inefficient firms also continue producing the commodities along with the efficient firms due to irrational preferences of the customers. The customers, therefore, have to pay higher prices for the goods produced by the inefficient firm. The consumers, thus, suffer monetary loss and the nation wastage of resources.

(v) Prevents standardization of products: Another wastage of imperfect competition is that it prevents !he standardization of the commodities. When goods are standardized, they can be produced on a large scale. In case of monopolistic competition or imperfect competition, no producer would like to produce any design of the commodity on a large scale because it involves risk. The liking of the design may change and his goods remain-unsold.

(vi) A firm need not be of the optimum size: Under perfect competition, all the firms in the long run are of optimum size and they are producing at the lowest average cost. If a firm is not of most efficient size, it will have to expand its output so that it should produce at minimum average cost. Under monopolistic competition, a firm need not be of the optimum size. There is no doubt that if it expands its output, the average cost will fall but then it will have to lower the price as well. The reduction in price may result in decrease of total revenue. So the firm may not expand its scale of business. From this, we conclude, that the total number of firms in an industry, under monopolistic competition, will be greater than under perfect competition. This is due to the fact that in perfect competition all the firms are, of the most efficient size and inefficient firms are eliminated. While in monopolistic competition, inefficient firms along with efficient firms continue to exist. The society, thus, pays higher prices for the products.

Conclusion:

From the above, it should not be inferred that monopolistic competition is sheer wasteful and reduces economic welfare. It has also its merits. For example, informative advertisement is useful for consumers and product differentiation provides the consumer a wider choice of products.

Check your progress:

1. Explain the meaning of monopolistic competition.
2. Discuss the features of monopolistic competition.
3. Derive the demand curve under monopolistic competition.
4. Explain short run equilibrium of a firm under monopolistic competition.
5. Discuss the concept of wastes under monopolistic competition.

4A.9 OLIGOPOLY MODELS

An oligopoly is defined as a market structure with few firms and barriers to entry.

Oligopoly = A market structure with few firms and barriers to entry.
There is often a high level of competition between firms, as each firm makes decisions on prices, quantities, and advertising to maximize profits. Since there are a small number of firms in an oligopoly, each firm's profit level depends not only on the firm's own decisions, but also on the decisions of the other firms in the oligopolistic industry. Oligopoly is defined as a market structure with a small number of firms, none of which can keep the others from having significant influence. An Oligopoly market situation is also called 'competition among the few'. In this article, we will look at Oligopoly definition and some important characteristics of this market structure.

An oligopoly is an industry which is dominated by a few firms. In this market, there are a few firms which sell homogeneous or differentiated products. Also, as there are few sellers in the market, every seller influences the behavior of the other firms and other firms influence it.Oligopoly is either perfect or imperfect/differentiated. In India, some examples of an oligopolistic market are automobiles, cement, steel, aluminum, etc.

4A.9.1 Characteristics of Oligopoly

Few firms

Under Oligopoly, there are a few large firms although the exact number of firms is undefined. Also, there is severe competition since each firm produces a significant portion of the total output.

Barriers to Entry

Under Oligopoly, a firm can earn super-normal profits in the long run as there are barriers to entry like patents, licenses, control over crucial raw materials, etc. These barriers prevent the entry of new firms into the industry.

Non-Price Competition

Firms try to avoid price competition due to the fear of price wars in Oligopoly and hence depend on non-price methods like advertising, after sales services, warranties, etc. This ensures that firms can influence demand and build brand recognition.

Interdependence

Under Oligopoly, since a few firms hold a significant share in the total output of the industry, each firm is affected by the price and output decisions of rival firms. Therefore, there is a lot of interdependence among firms in an oligopoly. Hence, a firm takes into account the action and reaction of its competing firms while determining its price and output levels.

Nature of the Product

Under oligopoly, the products of the firms are either homogeneous or differentiated.

Selling Costs

Since firms try to avoid price competition and there is a huge interdependence among firms, selling costs are highly important for competing against rival firms for a larger market share.

No unique pattern of pricing behavior

Under Oligopoly, firms want to act independently and earn maximum profits on one hand and cooperate with rivals to remove uncertainty on the other hand. Depending on their motives, situations in real-life can vary making predicting the pattern of pricing behavior among firms impossible. The firms can compete or collude with other firms which can lead to different pricing situations.

Indeterminateness of the Demand Curve

Unlike other market structures, under Oligopoly, it is not possible to determine the demand curve of a firm. This is because on one hand, there is a huge interdependence among rivals. And on the other hand there is uncertainty regarding the reaction of the rivals. The rivals can react in different ways when a firm changes its price and that makes the demand curve indeterminate.

4A.10 FIRMS BEHAVIOUR UNDER OLIGOPOLY

Based on the objectives of the firms, the magnitude of barriers to entry and the nature of government regulation, there are different possible outcomes in relation to a firm's behavior under Oligopoly. These are:

0. Stable prices
0. Price wars
0. Collusion for higher prices

Further, Oligopoly can either be collusive or non-collusive. Collusive oligopoly is a market situation wherein the firms cooperate with each other in determining price or output or both. A non-collusive oligopoly refers to a market situation where the firms compete with each other rather than cooperating.

4A.11 STRATEGIC INTERACTIONS

Each firm must consider both: (1) other firms' reactions to a firm's own decisions, and (2) the own firm's reactions to the other firms' decisions. Thus, there is a continuous interplay between decisions and reactions to those decisions by all firms in the industry. Each oligopolist must take into account these strategic interactions when making decisions. Since all firms in an oligopoly have outcomes that depend on the other firms, these strategic interactions are the foundation of the study and understanding of oligopoly. For example, each automobile firm's market share depends on the prices and quantities of all of the other firms in the industry. If Ford lowers prices relative to other car manufacturers, it will increase its market share at the expense of the other automobile companies.

When making decisions that consider the possible reactions of other firms, firm managers usually assume that the managers of competing firms are rational and intelligent. These strategic interactions form the study of game theory, the topic of Chapter 6 below. John Nash (1928-2015), an American mathematician, was a pioneer in game theory. Economists and mathematicians use the concept of a Nash Equilibrium (NE) to describe a common outcome in game theory that is frequently used in the study of oligopoly.

4A.11.1 Nash Equilibrium = An outcome where there is no tendency to change based on each individual choosing a strategy given the strategy of rivals.

In the study of oligopoly, the Nash Equilibrium assumes that each firm makes rational profit-maximizing decisions while holding the behavior of rival firms constant. This assumption is made to simplify oligopoly models, given the potential for enormous complexity of strategic interactions between firms. As an aside, this assumption is one of the interesting themes of the motion picture, "A Beautiful Mind," starring Russell Crowe as John Nash. The concept of Nash Equilibrium is also the foundation of the models of oligopoly presented in the next three sections: the Cournot, Bertrand, and Stackelberg models of oligopoly.

4A.12 COURNOT MODEL

Augustin Cournot (1801-1877), a French mathematician, developed the first model of oligopoly explored here. The Cournot model is a model of oligopoly in which firms produce a homogeneous good, assuming that the competitor's output is fixed when deciding how much to produce.

A numerical example of the Cournot model follows, where it is assumed that there are two identical firms (a duopoly), with output given by Q_i (i=1,2). Therefore, total industry output is equal to: $Q = Q_1 + Q_2$. Market demand is a function of price and given by $Q^d = Q^d(P)$, thus the inverse demand function is $P = P(Q^d)$. Note that the price depends on the market output Q, which is the sum of both individual firm's outputs. In this way, each firm's output has an influence on the price and profits of both firms. This is the basis for strategic interaction in the Cournot model: if one firm increases output, it lowers the price facing both firms. The inverse demand function and cost function are given in Equation 4A1.

(4A.1) $P = 40 – QC(Q_i) = 7Q_i$ $i = 1,2$

Each firm chooses the optimal, profit-maximizing output level given the other firm's output. This will result in a Nash Equilibrium, since each firm is holding the behavior of the rival constant. Firm One maximizes profits as follows.

$\max \pi_1 = TR_1 - TC_1$

$\max \pi_1 = P(Q)Q_1 - C(Q_1)$[price depends on total output $Q = Q_1 + Q_2$]

$\max \pi_1 = [40 - Q]Q_1 - 7Q_1$

$\max \pi_1 = [40 - Q_1 - Q_2]Q_1 - 7Q_1$

$\max \pi_1 = 40Q_1 - Q_1^2 - Q_2Q_1 - 7Q_1$

$\partial\pi_1/\partial Q_1 = 40 - 2Q_1 - Q_2 - 7 = 0$

$2Q_1 = 33 - Q_2$

$Q_1^* = 16.5 - 0.5Q_2$

This equation is called the "Reaction Function" of Firm One. This is as far as the mathematical solution can be simplified, and represents the Cournot solution for Firm One. It is a reaction function since it describes Firm One's reaction given the output level of Firm Two. This equation represents the strategic interactions between the two firms, as changes in Firm Two's output level will result in changes in Firm One's response. Firm One's optimal output level depends on Firm Two's behavior and decision making. Oligopolists are interconnected in both behavior and outcomes.

The two firms are assumed to be identical in this duopoly. Therefore, Firm Two's reaction function will be symmetrical to the Firm One's reaction function (check this by setting up and solving the profit-maximization equation for Firm Two):

$Q_2^* = 16.5 - 0.5Q_1$

The two reaction functions can be used to solve for the Cournot-Nash Equilibrium. There are two equations and two unknowns (Q_1 and Q_2), so a numerical solution is found through substitution of one equation into the other.

$Q_1^* = 16.5 - 0.5(16.5 - 0.5Q_1)$

$Q_1^* = 16.5 - 8.25 + 0.25Q_1$

$Q_1^* = 8.25 + 0.25Q_1$

$0.75Q_1^* = 8.25$

$Q_1^* = 11$

Due to symmetry from the assumption of identical firms:

$Q_i = 11$ $i = 1,2$$Q = 22$units $P = 18$ USD/unit

Profits for each firm are:

$\pi_i = P(Q)Q_i - C(Q_i) = 18(11) - 7(11) = (18 - 7)11 = 11(11) = 121$ USD

This is the Cournot-Nash solution for oligopoly, found by each firm assuming that the other firm holds its output level constant. The Cournot model can be easily extended to more than two firms, but the math does get increasingly complex as more firms are added. Economists utilize the Cournot model because is based on intuitive and realistic assumptions, and the Cournot solution is intermediary between the outcomes of the two extreme market structures of perfect competition and monopoly.

This can be seen by solving the numerical example for competition, Cournot, and monopoly models, and comparing the solutions for each market structure.

In a competitive industry, free entry results in price equal to marginal cost (P = MC). In the case of the numerical example, $P_C = 7$. When this competitive price is substituted into the inverse demand equation, $7 = 40 – Q$, or $Q_c = 33$. Profits are found by solving $(P – MC)Q$, or $\pi_c = (7 – 7)Q = 0$. The competitive solution is given in Equation (4A.2).
(4A.2) $P_c = 7$ USD/unit$Q_c = 33$ units$\pi_c = 0$ USD

The monopoly solution is found by maximizing profits as a single firm.
max $\pi_m = TR_m – TC_m$
max $\pi_m = P(Q_m)Q_m – C(Q_m)$[price depends on total output Q_m]
max $\pi_m = [40 – Q_m]Q_m – 7Q_m$
max $\pi_m = 40Q_m – Q_m^2 – 7Q_m$
$\partial\pi_m/\partial Q_m= 40 – 2Q_m – 7 = 0$
$2Q_m = 33$
$Q_m^* = 16.5$
$P_m = 40 – 16.5 = 23.5$
$\pi_m = (P_m – MC_m)Q_m = (23.5 – 7)16.5 = 16.5(16.5) = 272.25$ USD
The monopoly solution is given in Equation (4A.3).
(4A.3) $P_m = 23.5$ USD/unit $Q_m = 16.5$ units$\pi_m = 272.5$ USD
The competitive, Cournot, and monopoly solutions can be compared on the same graph for the numerical example (Figure 4A.6).

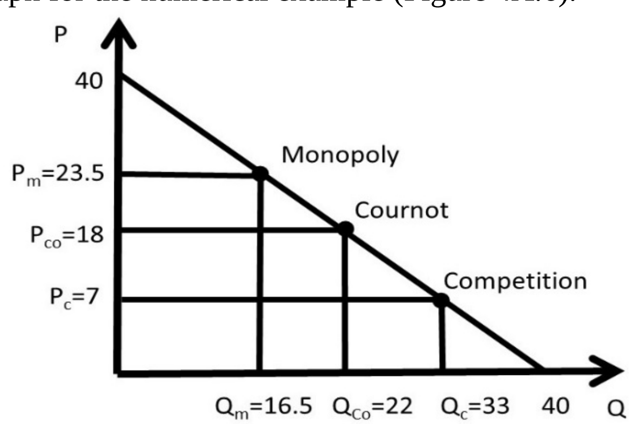


Figure 4A.6:Comparisons of Perfect Competition, Cournot, and Monopoly Solutions

The Cournot price and quantity are between perfect competition and monopoly, which is an expected result, since the number of firms in an oligopoly lies between the two market structure extremes.

4A.13 DOMINANT FIRM MODEL: PRICE LEADERSHIP

A dominant firm is defined as a firm with a large share of total sales that sets a price to maximize profits, taking into account the supply response of smaller firms. The dominant firm model is also known as the price leadership model. The smaller firms are referred to as the "fringe." Let F = fringe, or many relatively small competing firms in the same industry as the dominant firm. Let Dom = the dominant firm. The market demand for the good (D_{mkt}) is equal to the sum of the demand facing the dominant firm (D_{dom}) and the demand facing the fringe firms (D_F).

$D_{dom} = D_{mkt} – D_F$

Total quantity (Q_T) is also the sum of output produced by the dominant and fringe firms.

$Q_T = Q_{dom} + Q_F$

The dominant firm model is shown in Figure SF gives the supply curve for the fringe firms, and the marginal cost of the dominant firm is MC_{dom}. Recall that the marginal cost curve is the firm's supply curve. The dominant firm has the advantage of lower costs due to economies of scale. In what follows, the dominant firm will set a price, allow the fringe firms to produce as much as they desire, and then find the profit-maximizing quantity and price with the remainder of the market.

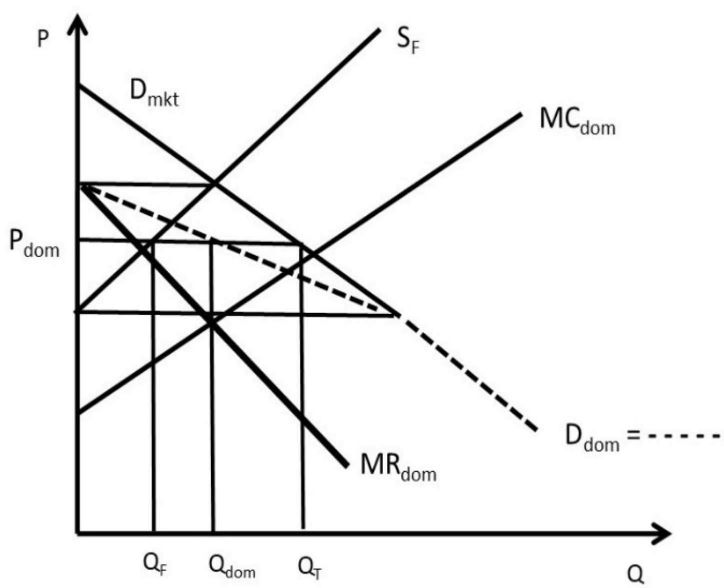


Figure 4A.7: The Dominant Firm Model

To find the profit-maximizing level of output, the dominant firm first finds the demand curve facing the dominant firm (the dashed line in Figure 4A.7), then sets marginal revenue equal to marginal cost. The dominant firm's demand curve is found by subtracting the supply of the fringe firms (S_F) from the total market demand (D_{mkt}).

$D_{dom} = D_{mkt} – S_F$

The dominant firm demand curve is found by the following procedure. The y-intercept of the dominant firm's demand curve occurs where SF is equal to the D_{mkt}. At this point, the fringe firms supply the entire market, so the residual facing the dominant firm is equal to zero. Therefore, the demand curve of the dominant firm starts at the price where fringe supply equals market demand. The second point on the dominant firm demand curve is found at the y-intercept of the fringe supply curve (S_F). At any price equal to or below this point, the supply of the fringe firms is equal to zero, since the supply curve represents the cost of production. At this point, and all prices below this point, the market demand (D_{mkt}) is equal to the dominant firm demand (D_{dom}). Thus, the dashed line below the y-intercept of the fringe supply is equal to the market demand curve. The dominant firm demand curve for prices above this point is found by drawing a line from the y-intercept at price ($S_F = D_{mkt}$) to the point on the market demand curve at the price of the S_F y-intercept. This is the dashed line above the S_F y-intercept.

Once the dominant firm demand curve is identified, the dominant firm maximizes profits by setting marginal revenue equal to marginal cost at quantity Q_{dom}. This level of output is then substituted into the dominant firm demand curve to find the price P_{dom}. The fringe firms take this price as given, and produce Q_F. The sum of Q_{dom} and Q_F is the total output Q_T. In this way, the dominant firm takes into account the reaction of the fringe firms while making the output decision. This is a Nash equilibrium for the dominant firm, since it is taking the other firms' behavior into account while making its strategic decision. The model effectively captures an industry with one dominant firm and many smaller firms.

4A.14 CARTELS

A **cartel** is a group of firms that have an explicit agreement to reduce output in order to increase the price.

Cartel = An explicit agreement among members to reduce output to increase the price.

Cartels are illegal in the United States, as the cartel is a form of collusion. The success of the cartel depends upon two things: (1) how well the firms cooperate, and (2) the potential for monopoly power (inelastic demand).

Cooperation among cartel members is limited by the temptation to cheat on the agreement. The Organization of Petroleum Exporting Countries (OPEC) is an international cartel that restricts oil production to maintain high oil prices. This cartel is legal, since it is an international agreement, outside of the American legal system. The oil cartel's success depends on how well each member nation adheres to the agreement. Frequently, one or more member nations increases oil production above the agreement, putting downward pressure on oil prices. The cartel's success is limited by the temptation to cheat. This cartel characteristic is that of a prisoner's dilemma, and collusion can be best understood in this way.

A collusive agreement, or cartel, results in a circular flow of incentives and behavior. When firms in the same industry act independently, they each have an incentive to collude, or cooperate, to achieve higher levels of profits. If the firms can jointly set the monopoly output, they can share monopoly profit levels. When firms act together, there is a strong incentive to cheat on the agreement, to make higher individual firm profits at the expense of the other members. The business world is competitive, and as a result oligopolistic firms will strive to hold collusive agreements together, when possible. This type of strategic decisions can be usefully understood with game theory

4A.15 NON-COLLUSIVE OLIGOPOLY-SWEEZY'S KINKED DEMAND CURVE MODEL (PRICE-RIGIDITY)

Usually, in Oligopolistic markets, there are many price rigidities. In 1939, Paul Sweezy used an unconventional demand curve – the kinked demand curve to explain these rigidities.

4A.15.1 Reason for the kink in the demand curve

It is assumed that firms behave in a two-fold manner in reaction to a price change by a rival firm. In simple words, firms follow price cuts by a rival company but not price increases. So, if a seller increases the price of his product, his rivals do not follow the price increase. Therefore, the market share of the firm reduces significantly as a result of the price rise. On the other hand, if a seller reduces the price of his product, then the rivals also reduce their price to bring it at par with the price reduction of the firm. This ensures that they prevent their market share from falling. Once the rivals react, the firm lowering the price first cannot gain from the price cut.

4A.15.2 Why the price rigidity?

As can be seen above, a firm cannot gain or lose by changing its price from the prevailing price in the market. In both cases, there is no increase in demand for the firm which changes its price. Hence, firms stick to the same price over time leading to price rigidity under oligopoly.

Explanation of the Kinked-Demand Curve Model

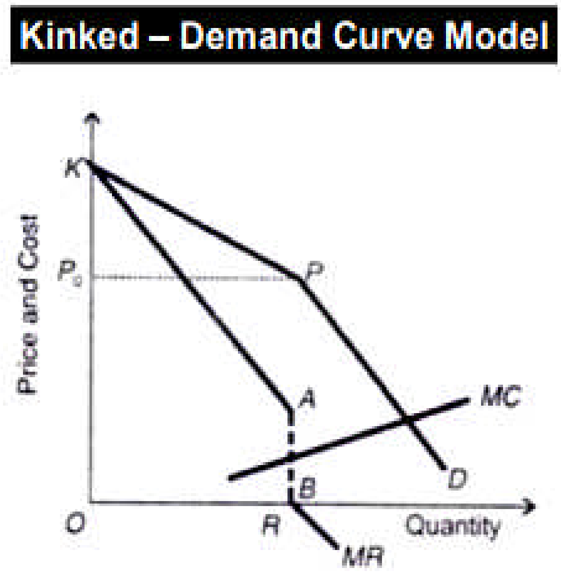


Figure 4A.8

In the figure above, KPD is the is the kinked-demand curve and OP_0 is the prevailing price in the oligopoly market for the OR product of one seller. Starting from point P, corresponding to the point OP_1, any increase in price above it will considerably reduce his sales as his rivals will not follow his price increase.

This is because the KP portion of the curve is elastic and the corresponding portion of the MR curve (KA) is positive. Therefore, any price increase will not just reduce the total sales but also his total revenue and profit. On the other hand, if the seller reduces the price of the product below OPQ (or P), his rivals will also reduce their prices.

However, even if his sales increase, his profits would be less than before. This is because the PD portion of the curve below P is less elastic and the corresponding part of the marginal revenue curve below R is negative. Therefore, in both price-raising and price-reducing situations, the seller is the loser. He will stick to the prevailing market price OP_0 which remains rigid.

4A.15.3 Working of the kinked-demand curve

Let's analyze the effect of changes in cost and demand conditions on price stability in the oligopolistic market. Let's suppose that the prevailing price in the market is OP_0.Therefore, if one seller increases the price above OP_0 and the rival sellers don't and keep the prices of their products at OP, then it will lead to the product becoming costlier than the others. Subsequently, the demand for the costlier product will fall significantly. This is seen in the demand curve of a firm for any price above OP_0 or the KP section of the curve, is relatively elastic. The high elasticity reduces the demand significantly as a result of the price increase.

On the other hand, if the seller reduces the price below OP_0, the rivals also follow the price cut to prevent their demand from falling. This is seen in the demand curve of a firm for any price below OP_0 or the PD segment of the curve is relatively inelastic. The low elasticity does not increase the demand significantly as a result of the price cut. This asymmetrical behavioral pattern results in a kink in the demand curve and hence there is price rigidity in oligopoly markets. The prices remain rigid at the kink (point P). In other words, the price will remain sticky at OP_0 and the output = OR at this price.

Due to the difference in the elasticities, the MR curve becomes discontinuous corresponding to the point of change in elasticity of the demand curve. The kink represents this. At the output < OR, the demand curve is KP and the corresponding MR curve is KA. For output > OR, the demand curve is PD and the corresponding MR curve is BMR.

4A.16 COLLUSIVE OLIGOPOLY

Sometimes, firms may try to remove uncertainty related to acting independently and enter into price agreements with each other. This is collusion. Collusion is either formal or informal. It can take the form of cartel or price leadership. A cartel is an association of independent firms within the same industry which follow the common policies relating to price, output, sale, profit maximization, and the distribution of products. Price leadership is based on informed collusion. Under price leadership, one firm is a large or dominant firm and acts as the price leader who fixes the price for the products while the other firms allow it.

4A.16.1 Collusive Oligopoly Model: Price Leadership Model:

Non-collusive oligopoly model (Sweezy's model) presented in the earlier section is based on the assumption that oligopoly firms act independently even though firms are interdependent in the market. A vigorous price competition may result in uncertainty. The question that arises now is: how do oligopoly firms remove uncertainty? In fact, firms enter into pricing agreements with each other instead of adopting competition or price war with each other. Such agreement—both explicitly (or formal) and implicit (or informal)—may be called collusion.

Always, every firm has the inclination to achieve more strength and power over the rival firms. As a result, in the oligopolist industry, one finds the emergence of a few powerful competitors who cannot be eliminated easily by other powerful firms. Under the circumstance, some of these firms act together or collude with each other to reap maximum advantage. In fact, in oligopolist industry, there is a natural tendency for collusion. The most important forms of collusion are: price leadership cartel and merger and acquisition.

When a formal collusive agreement becomes difficult to launch, oligopolist sometimes operate on informal tacit collusive agreements. One of the most common form of informal collusion is price leadership. Price leadership arises when one firm—may be a large as well as dominant firm—initiates price changes while other firms follow. An example of dominant firm price leadership is shown in Fig. 4A.9 where D_T is the industry demand curve. Since small firms follow the leader—the dominant firm—they behave as “price-takers”. MCs is the horizontal summation of the MC curves of all small firms.

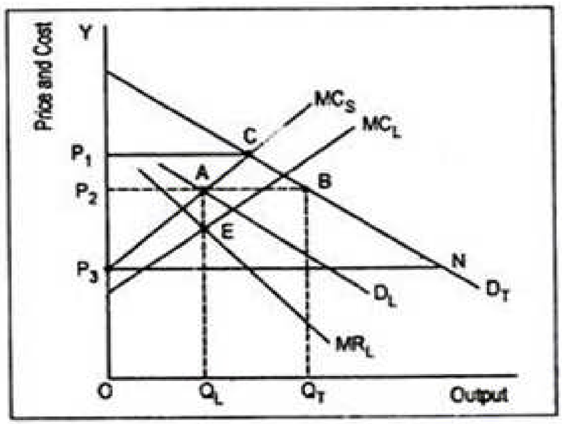


Figure 4A.9

Suppose, the dominant firm sets the price at OP_1 (where D_T and MCs intersect each other at point C). The small firms meet the entire demand P_1C at the price OP_1. Thus, the dominant firm has nothing to sell in the market. At a price of OP_3, the small firm will supply nothing. It is obvious that price will be set in between OP_1 and OP_3 by the leader.

The demand curve faced by the leader firm of the oligopoly industry is determined for any price—it is the horizontal distance between industry demand curve, D_T, and the marginal cost curves of all small firms, MC_S. In Fig. 4A.9, D_L is the leader’s demand curve and the corresponding MR curve is MR_L.

Being a leader in the industry, the dominant firm’s supply curve is represented by the MC_L curve. Since it enjoys a cost advantage, its MC curve lies below the MC_S curve. A dominant firm maximizes profit at point E where its MC_L and MR_L intersect each other. The corresponding output of the price leader is OQ_L. Price thus determined is OP_2. Small firms accept this price OP_2 and sell Q_LQ_T (=AB) amount – industry demand the OQ_T output. In actual practice, the analysis of price leadership is complicated, particularly when new firms enter the industry and try to become the leader or dominant.

4A.16.2 Collusive Oligopoly—Merger and Acquisition:

Another method to remove price war among oligopoly firms is merger. Merger may be defined as the consolidation of two or more independent firms under single ownership. When a firm purchases assets of another firm, acquisition takes place. Merger and acquisition take place because the management comes to a conclusion that a consolidated firm is powerful than the sum of individual firms. Since basically the difference between cartel and merger is a legal one, we won't consider mergers and acquisitions. The marginalistic principle applied in the case of profit maximizing cartel is also applicable in the case of merger.

Conclusion:

Can we make some definite conclusions from the oligopolistic market structure? Though one can make unambiguous predictions about perfect competition as well as monopoly, no such predictive element of an oligopolistic competition exists. It is, thus, a perplexing market structure. One important characteristic of an oligopoly market is interdependence among sellers.

Check your progress:

1. State the features of oligopoly.
2. Explain the concept of Collusive and Non Collusive oligopoly.
3. Discuss dominant firm leadership model.
4. Explain the term Cartel.

4A.17 COLLUSION – MEANING AND EXAMPLES

Collusion occurs when rival firms agree to work together – e.g. setting higher prices in order to make greater profits. Collusion is a way for firms to make higher profits at the expense of consumers and reduces the competitiveness of the market.

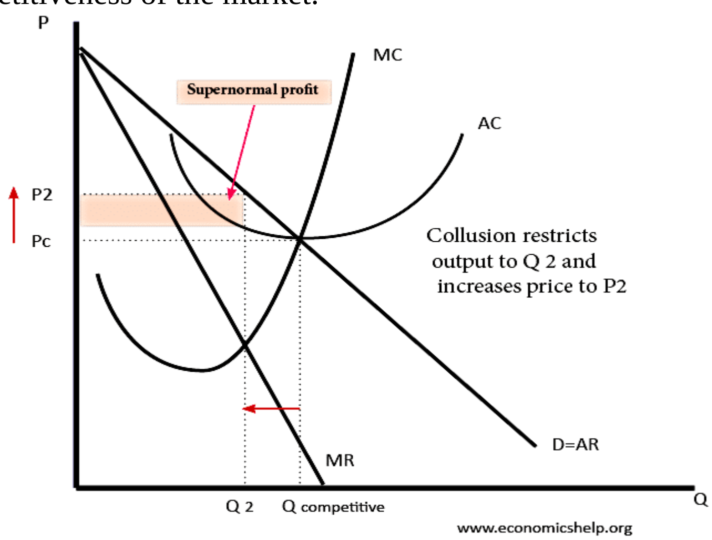


Figure 4A.10

In the above example, a competitive industry will have price P1 and Q competitive. If firms collude, they can restrict output to Q2 and increase the price to P2.

Collusion usually involves some form of agreement to seek higher prices. This may involve:Agreeing to increase prices faced by consumers.

- Deals between suppliers and retailers. For example, vertical price-fixing e.g. retail price maintenance. (For example, Fixed Book Price (FBP) set the price a book is sold to the public.
- Monopsony pricing – where retailers collude to reduce the amount paid to suppliers. For example, a retailer with great buying power (Walmart, Amazon) can offer very small profit margins to suppliers as they have little alternative.
- Collusion between existing firms in an industry to exclude new firms from deals to prevent the market from becoming more competitive.
- Sticking to output quotas and higher prices.
- Collusive tendering. For example, 'cover prices' for competitive tendering in bidding for public construction contracts. This is when a rival firm agrees to set artificially high price to allow the firm of choice to win with a relatively high contract offer.

4A.17.1 Types of collusion

- **Formal collusion** – when firms make formal agreement to stick to high prices. This can involve the creation of a cartel. The most famous cartel is OPEC – an organisation concerned with setting prices for oil.
- **Tacit collusion** – where firms make informal agreements or collude without actually speaking to their rivals. This may be to avoid detection by government regulators.
- **Price leadership**. It is possible firms may try to unofficially collude by following the prices set by a market leader. This enables them to keep prices high, without ever meeting with rival firms. This kind of collusion is hard to prove whether it is unfair competition or just the natural operation of markets.

4A.17.2 Problems of collusion

Collusion is seen as bad for consumers and economic welfare, and therefore collusion is mostly regulated by governments. Collusion can lead to:

- High prices for consumers. This leads to a decline in consumer surplus and allocative inefficiency (Price pushed up above marginal cost)
- New firms can be discouraged from entering the market by types of collusion which act as a barrier to entry.
- Easy profits from collusion can make firms lazy and avoid innovation and efforts to increase productivity.
- Industry gets the disadvantages of monopoly (higher price) but none of the advantages (e.g. economies of scale)

4A.17.3 Justification for collusion

In times of unprofitable business conditions, collusion may be a way to try and save the industry and prevent firms from going out of business, which wouldn't be in the long-term consumer interest. Dairy suppliers tried to use this justification in 2002/03 after problems from foot and mouth disease led to a decline in farm incomes.

Research and development: Profits from collusion could, in theory, be used to invest in research and development.

4A.17.4 Examples of collusion

Milk price by supermarkets 2002-03

After a period of low milk, butter and cheese prices, supermarkets such as Asda and Sainsbury's colluded with Dairy suppliers, Dairy Crest and Wiseman Dairies to increase the price of milk, cheese and other dairy products in supermarkets. After an OFT investigation, supermarkets and suppliers were fined a total of £116m.The OFT found prices set by supermarkets went up by three pence per pint of milk, but the income received by farmers did not go up. Milk collusion at BBC

Bank loans collusion – RBS and Barclays 2008-2010

In 2010 the OFT found RBS and Barclays guilty of collusion in sharing price arrangements for loans to professionals, such as lawyers and accountants. Sharing price information is a way to avoid price competition and keep prices high. RBS was fined £28.59m.

Recruitment agencies forum cartel 2004-06

Between 2004 and 2006 six recruitment companies formed a cartel called the "Construction Recruitment Forum" which met to fix prices for supplying labour to intermediaries and construction companies. They also excluded a new firm Parc from any dealings. Hays was fined £30.4 million for a 'Serious breach of competition law.

Collusion in the construction industry – collusion on tender price

In bidding for public sector construction work, construction firms would collude in setting artificially high prices. Firms would decide which contracts they wanted, and rivals would bid purposefully high price. This is a practice known as "Cover pricing". Successful companies would often reward rivals with a secret payment for avoiding competition. During the investigation, the OFT found 199 offences where the 103 companies artificially inflated £200m worth of work. Companies were fined a total of £129.5m by the OFT.

Price fixing in air travel – British Airways and Virgin 2004-06

In 2007, British Airways was fined £270m for illegal price-fixing arrangements with Virgin on long haul flights. The two companies met to agree and collude on the extra price of fuel surcharges in response to rising oil prices. Between 2004 and 2006, surcharges on air tickets rose from £5 to £60 per ticket. The £270m fine compares to an annual profit of £611m for BA.

Collusion over hiring practices.

In 2015, Apple and Google were investigated for an agreement between the two companies where they agreed not to hire staff from the other company. This was an attempt to prevent wage spirals due to workers moving between the companies. The companies agreed to make a settlement rather than take it to court.

Regulation for collusion

In the UK, the Competition Act of 1998, states the OFT has the power to impose penalties on companies of up to 10 per cent of their worldwide turnover for breaches of competition law.Firms which act as whistleblowers can gain immunity from penalties. Therefore, if two firms are colluding there is an incentive to be the first to blow the whistle and give information to the OFT**.**

4A.18 GAME THEORY AND COLLUSION

	Firm A **High price**	**Low Price**
High Price **Firm B**	*(collusion)* £8m – A £8m – B	£2m for B £10m for A
Low price	£10m for B £2m for A	*(non-collusion)* £4m – A £4m - B

- If firms are competitive and they set low price -they will both make £4m.
- If they collude and set high price, then they will both double their profits and make £8m.
- However, if during collusion, firm A undercuts the collusive price and sets a low price – it is able to sell more. In this case, firm A benefits from the best of both worlds. Prices are high because firm B is setting high price, but firm A is also selling large quantity because it is undercutting its rival. In this case, firm A makes £10m and firm B only makes £2m.
- Therefore, firm B is unlikely to keep prices high and the market reverts to both setting low prices.

The optimal outcome for the firms is to collude (high price, high price) However, whether this occurs depends on whether there are incentives to keep colluding

- For example, legal restrictions on collusion can make it unstable. If a firm reports the collusion to the regulator, then the firm is immune from being fined; it is the other firm which will suffer. Therefore, in collusion, there is a strong incentive to be first to confess. It is a very risky strategy to continue with the collusion, hoping the other firm won't run to the regulator.
- This is why the law is designed as it is – with a strong incentive to be the one to confess. The downside is that firms who collude for a long-time can be immune from prosecution and being fined.

4A.19 THE BASICS OF GAME THEORY

Game theory is the process of modeling the strategic interaction between two or more players in a situation containing set rules and outcomes. While used in a number of disciplines, game theory is most notably used as a tool within the study of economics. The economic application of game theory can be a valuable tool to aide in the fundamental analysis of industries, sectors and any strategic interaction between two or more firms.

Here, we'll take an introductory look at game theory and the terms involved, and introduce you to a simple method of solving games, called backwards induction.

4A.19.1 Game Theory Definitions

Any time we have a situation with two or more players that involves known payouts or quantifiable consequences, we can use game theory to help determine the most likely outcomes.

Let's start out by defining a few terms commonly used in the study of game theory:

- **Game**: Any set of circumstances that has a result dependent on the actions of two of more decision-makers (players).
- **Players**: A strategic decision-maker within the context of the game.
- **Strategy**: A complete plan of action a player will take given the set of circumstances that might arise within the game.
- **Payoff**: The payout a player receives from arriving at a particular outcome. The payout can be in any quantifiable form, from dollars to utility.
- **Information set**: The information available at a given point in the game. The term information set is most usually applied when the game has a sequential component.
- **Equilibrium**: The point in a game where both players have made their decisions and an outcome is reached.

4A.19.2 Assumptions in Game Theory

As with any concept in economics, there is the assumption of rationality. There is also an assumption of maximization. It is assumed that players within the game are rational and will strive to maximize their payoffs in the game. When examining games that are already set up, it is assumed on your behalf that the payouts listed include the sum of all payoffs associated with that outcome. This will exclude any "what if" questions that may arise.

Game theory, the study of strategic decision-making, brings together disparate disciplines such as mathematics, psychology, and philosophy. Game theory was invented by John von Neumann and Oskar Morgenstern in 1944 and has come a long way since then. The importance of game theory to modern analysis and decision-making can be gauged by the fact that since 1970, as many as 12 leading economists and scientists have been awarded the Nobel Prize in Economic Sciences for their contributions to game theory.

Game theory is applied in a number of fields, including business, finance, economics, political science, and psychology. Understanding game theory strategies—both the popular ones and some of the relatively lesser-known stratagems—is important to enhance one’s reasoning and decision-making skills in a complex world.

4A.20 PRISONER’S DILEMMA

One of the most popular and basic game theory strategies is the prisoner's dilemma. This concept explores the decision-making strategy taken by two individuals who, by acting in their own individual best interest, end up with worse outcomes than if they had cooperated with each other in the first place. In the prisoner’s dilemma, two suspects apprehended for a crime are held in separate rooms and cannot communicate with each other. The prosecutor informs both Suspect 1 and Suspect 2 individually that if he confesses and testifies against the other, he can go free, but if he does not cooperate and the other suspect does, he will be sentenced to three years in prison. If both confess, they will get a two-year sentence, and if neither confesses, they will be sentenced to one year in prison. While cooperation is the best strategy for the two suspects, when confronted with such a dilemma, research shows most rational people prefer to confess and testify against the other person than stay silent and take the chance the other party confesses.

4A.20.1 Game Theory Strategies

The prisoner's dilemma lays the foundation for advanced game theory strategies, of which the popular ones include:

4A.20.2 Matching Pennies

This is a zero-sum game that involves two players (call them Player A and Player B) simultaneously placing a penny on the table, with the payoff depending on whether the pennies match. If both pennies are heads or tails, Player A wins and keeps Player B's penny. If they do not match, Player B wins and keeps Player A's penny.

4A.20.3 Deadlock

This is a social dilemma scenario like the prisoner's dilemma in that two players can either cooperate or defect (i.e. not cooperate). In a deadlock, if Player A and Player B both cooperate, they each get a payoff of 1, and if they both defect, they each get a payoff of 2. But if Player A cooperates and Player B defects, then A gets a payoff of 0 and B gets a payoff of 3. In the payoff diagram below, the first numeral in the cells (a) through (d) represents Player A's payoff, and the second numeral is that of Player B:

Deadlock Payoff Matrix		**Player B Cooperate**	**Player B Defect**
Player A	**Cooperate**	(a) 1, 1	(b) 0, 3
	Defect	(c) 3, 0	(d) 2, 2

Deadlock differs from prisoner's dilemma in that the action of greatest mutual benefit (i.e. both defect) is also the dominant strategy. A dominant strategy for a player is defined as one that produces the highest payoff of any available strategy, regardless of the strategies employed by the other players.

A commonly cited example of deadlock is that of two nuclear powers trying to reach an agreement to eliminate their arsenals of nuclear bombs. In this case, cooperation implies adhering to the agreement, while defection means secretly reneging on the agreement and retaining the nuclear arsenal. The best outcome for either nation, unfortunately, is to renege on the agreement and retain the nuclear option while the other nation eliminates its arsenal since this will give the former a tremendous hidden advantage over the latter if war ever breaks out between the two. The second-best option is for both to defect or not cooperate since this retains their status as nuclear powers.

4A.21 COURNOT COMPETITION

This model is also conceptually similar to prisoner's dilemma and is named after French mathematician Augustin Cournot, who introduced it in 1838. The most common application of the Cournot model is in describing a duopoly or two main producers in a market.

For example, assume companies A and B produce an identical product and can produce high or low quantities. If they both cooperate and agree to produce at low levels, then limited supply will translate into a high price for the product on the market and substantial profits for both companies. On the other hand, if they defect and produce at high levels, the market will be swamped and result in a low price for the product and consequently lower profits for both. But if one cooperates (i.e. produces at low levels) and the other defects (i.e. surreptitiously produces at high levels), then the former just break even while the latter earns a higher profit than if they both cooperate.

The payoff matrix for companies A and B is shown (figures represent profit in millions of dollars). Thus, if A cooperates and produces at low levels while B defects and produces at high levels, the payoff is as shown in the cell (b)—break-even for company A and $7 million in profits for company B.

Cournot Payoff Matrix		**Company B**	**Company B**
		Cooperate	**Defect**
Company A	**Cooperate**	(a) 4, 4	(b) 0, 7
	Defect	(c) 7, 0	(d) 2, 2

4A.21.1 Coordination

In coordination, players earn higher payoffs when they select the same course of action. As an example, consider two technology giants who are deciding between introducing a radical new technology in memory chips that could earn them hundreds of millions in profits, or a revised version of an older technology that would earn them much less. If only one company decides to go ahead with the new technology, rate of adoption by consumers would be significantly lower, and as a result, it would earn less than if both companies decide on the same course of action. The payoff matrix is shown below (figures represent profit in millions of dollars).

Thus, if both companies decide to introduce the new technology, they would earn $600 million apiece, while introducing a revised version of the older technology would earn them $300 million each, as shown in the cell (d). But if Company A decides alone to introduce the new technology, it would only earn $150 million, even though Company B would earn $0 (presumably because consumers may not be willing to pay for its now-obsolete technology). In this case, it makes sense for both companies to work together rather than on their own.

Coordination Playoff Matrix		**Company B**	**Company B**
		New Technology	**Old Technology**
Company A	**New Technology**	(a) 600, 600	(b) 0, 150
	Old Technology	(c) 150, 0	(d) 300, 300

4A.22 CENTIPEDE GAME

This is an extensive-form game in which two players alternately get a chance to take the larger share of a slowly increasing money stash. The centipede game is sequential since the players make their moves one after another rather than simultaneously; each player also knows the strategies chosen by the players who played before them. The game concludes as soon as a player takes the stash, with that player getting the larger portion and the other player getting the smaller portion.

As an example, assume Player A goes first and has to decide if he should "take" or "pass" the stash, which currently amounts to $2. If he takes, then A and B get $1 each, but if A passes, the decision to take or pass now has to be made by Player B. If B takes, she gets $3 (i.e. the previous stash of $2 + $1) and A gets $0. But if B passes, A now gets to decide whether to take or pass, and so on. If both players always choose to pass, they each receive a payoff of $100 at the end of the game.

The point of the game is if A and B both cooperate and continue to pass until the end of the game, they get the maximum payout of $100 each. But if they distrust the other player and expect them to "take" at the first opportunity, Nash equilibrium predicts the players will take the lowest possible claim ($1 in this case). Experimental studies have shown, however, this "rational" behavior (as predicted by game theory) is seldom exhibited in real life. This is not intuitively surprising given the tiny size of the initial payout in relation to the final one. Similar behavior by experimental subjects has also been exhibited in the traveler's dilemma.

4A.23 TRAVELER'S DILEMMA

This non-zero sum game, in which both players attempt to maximize their own payout without regard to the other, was devised by economist Kaushik Basu in 1994. For example, in the traveler's dilemma, an airline agrees to pay two travelers compensation for damages to identical items. However, the two travelers are separately required to estimate the value of the item, with a minimum of $2 and a maximum of $100. If both write down the same value, the airline will reimburse each of them that amount. But if the values differ, the airline will pay them the lower value, with a bonus of $2 for the traveler who wrote down this lower value and a penalty of $2 for the traveler who wrote down the higher value.

The Nash equilibrium level, based on backward induction, is $2 in this scenario. But as in the centipede game, laboratory experiments consistently demonstrate most participants, naively or otherwise, pick a number much higher than $2.Traveler's dilemma can be applied to analyze a variety of real-life situations. The process of backward induction, for example, can help explain how two companies engaged in a cutthroat competition can steadily ratchet product prices lower in a bid to gain market share, which may result in them incurring increasingly greater losses in the process.

4A.24 BATTLE OF THE SEXES

This is another form of the coordination game described earlier, but with some payoff asymmetries. It essentially involves a couple trying to coordinate their evening out. While they had agreed to meet at either the ball game (the man's preference) or at a play (the woman's preference), they have forgotten what they decided, and to compound, the problem, cannot communicate with one another. Where should they go? The payoff matrix is shown below with the numerals in the cells representing the relative degree of enjoyment of the event for the woman and man, respectively. For example, cell (a) represents the payoff (in terms of enjoyment levels) for the woman and man at the play (she enjoys it much more than he does). Cell (d) is the payoff if both make it to the ball game (he enjoys it more than she does). Cell (c) represents the dissatisfaction if both go not only to the wrong location but also to the event they enjoy least—the woman to the ball game and the man to the play.

Battle of the Sexes Payoff Matrix		**Man**	**Man**
		Play	**Ball Game**
Woman	**Play**	(a) 6, 3	(b) 2, 2
	Ball Game	(c) 0, 0	(d) 3, 6

4A.25 DICTATOR GAME

This is a simple game in which Player A must decide how to split a cash prize with Player B, who has no input into Player A's decision. While this is not a game theory strategy *per se*, it does provide some interesting insights into people's behavior. Experiments reveal about 50% keep all the money to themselves, 5% split it equally and the other 45% give the other participant a smaller share. The dictator game is closely related to the ultimatum game, in which Player A is given a set amount of money, part of which has to be given to Player B, who can accept or reject the amount given. The catch is if the second player rejects the amount offered, both A and B get nothing. The dictator and ultimatum games hold important lessons for issues such as charitable giving and philanthropy.

4A.26 PEACE-WAR

This is a variation of the prisoner's dilemma in which the "cooperate or defect" decisions are replaced by "peace or war." An analogy could be two companies engaged in a price war. If both refrain from price cutting, they enjoy relative prosperity (cell a), but a price war would reduce payoffs dramatically (cell d). However, if A engages in price cutting (war) but B does not, A would have a higher payoff of 4 since it may be able to capture substantial market share, and this higher volume would offset lower product prices.

Peace-War Payoff Matrix		**Company B**	**Company B**
		Peace	**War**
Company A	**Peace**	(a) 3, 3	(b) 0, 4
	War	(c) 4, 0	(d) 1, 1

4A.27 VOLUNTEER'S DILEMMA

In a volunteer's dilemma, someone has to undertake a chore or job for the common good. The worst possible outcome is realized if nobody volunteers. For example, consider a company where accounting fraud is rampant but top management is unaware of it. Some junior employees in the accounting department are aware of the fraud but hesitate to tell top management because it would result in the employees involved in the fraud being fired and most likely prosecuted. Being labeled as a whistleblower may also have some repercussions down the line. But if nobody volunteers, the large-scale fraud may result in the company's eventual bankruptcy and the loss of everyone's jobs. Game theory can be used very effectively as a tool for decision-making whether in an economical, business or personal setting.

4A.28 THE PRISONER'S DILEMMA IN BUSINESS AND THE ECONOMY

The prisoner's dilemma, one of the most famous game theories, was conceptualized by Merrill Flood and Melvin Dresher at the Rand Corporation in 1950. It was later formalized and named by Princeton mathematician, Albert William Tucker.

The prisoner's dilemma basically provides a framework for understanding how to strike a balance between cooperation and competition and is a useful tool for strategic decision-making. As a result, it finds application in diverse areas ranging from business, finance, economics, and political science to philosophy, psychology, biology, and sociology.

- A prisoner's dilemma describes a situation where, according to game theory, two players acting strategically will ultimately result in a suboptimal choice for both.
- In business, understanding the structure of certain decisions as prisoner's dilemmas can result in more favorable outcomes.
- This set-up allows one to balance both competition and cooperation for mutual benefit.

4A.28.1 Prisoner's Dilemma Basics

The prisoner's dilemma scenario works as follows: Two suspects have been apprehended for a crime and are now in separate rooms in a police station, with no means of communicating with each other. The prosecutor has separately told them the following:

- If you confess and agree to testify against the other suspect, who does not confess, the charges against you will be dropped and you will go scot-free.
- If you do not confess but the other suspect does, you will be convicted and the prosecution will seek the maximum sentence of three years.
- If both of you confess, you will both be sentenced to two years in prison.
- If neither of you confesses, you will both be charged with misdemeanors and will be sentenced to one year in prison.[1]

What should the suspects do? This is the essence of the prisoner's dilemma.

4A.29 EVALUATING BEST COURSE OF ACTION

Let's begin by constructing a payoff matrix as shown in the table below. The "payoff" here is shown in terms of the length of a prison sentence (as symbolized by the negative sign; the higher the number the better). The terms "cooperate" and "defect" refer to the suspects cooperating with each other (as for example, if neither of them confesses) or defecting (i.e., not cooperating with the other player, which is the case where one suspect confesses, but the other does not). The first numeral in cells (a) through (d) shows the payoff for Suspect A, while the second numeral shows it for Suspect B.

Prisoner's Dilemma – Payoff Matrix	**Suspect B**		
		Cooperate	**Defect**
Suspect A	**Cooperate**	(a) -1, -1	(c) -3, 0
	Defect	(b) 0, -3	(d) -2, -2

The dominant strategy for a player is one that produces the best payoff for that player regardless of the strategies employed by other players. The dominant strategy here is for each player to defect (i.e., confess) since confessing would minimize the average length of time spent in prison. Here are the possible outcomes:

- If A and B cooperate and stay mum, both get one year in prison—as shown in the cell (a).
- If A confesses but B does not, A goes free and B gets three years—represented in the cell (b).
- If A does not confess but B confesses, A gets three years and B goes free—see cell (c).
- If A and B both confess, both get two years in prison—as the cell (d) shows.

So if A confesses, they either go free or get two years in prison. But if they do not confess, they either get one year or three years in prison. B faces exactly the same dilemma. Clearly, the best strategy is to confess, regardless of what the other suspect does.

4A.30 IMPLICATIONS OF PRISONER'S DILEMMA

The prisoner's dilemma elegantly shows when each individual pursues their own self-interest, the outcome is worse than if they had both cooperated. In the above example, cooperation—wherein A and B both stay silent and do not confess—would get the two suspects a total prison sentence of two years. All other outcomes would result in a combined sentence for the two of either three years or four years.

In reality, a rational person who is only interested in getting the maximum benefit for themselves would generally prefer to defect, rather than cooperate. If both choose to defect assuming the other won't, instead of ending up in the cell (b) or (c) option—like each of them hoped for—they would end up in the cell (d) position and each earn two years in prison.

In the prisoner's example, cooperating with the other suspect fetches an unavoidable sentence of one year, whereas confessing would in the best case result in being set free, or at worst fetch a sentence of two years. However, not confessing carries the risk of incurring the maximum sentence of three years, if say A's confidence that B will also stay mum proves to be misplaced and B actually confesses (and vice versa).This dilemma, where the incentive to defect (not cooperate) is so strong even though cooperation may yield the best results, plays out in numerous ways in business and the economy, as discussed below.

4A.31 APPLICATIONS TO BUSINESS

A classic example of the prisoner's dilemma in the real world is encountered when two competitors are battling it out in the marketplace. Often, many sectors of the economy have two main rivals. In the U.S., for example, there is a fierce rivalry between Coca-Cola (KO) and PepsiCo (PEP) in soft drinks and Home Depot (HD) versus Lowe's (LOW) in building supplies. This competition has given rise to numerous case studies in business schools. Other fierce rivalries include Starbucks (SBUX) versus Tim Horton's (THI) in Canada and Apple (AAPL) versus Samsung in the global mobile phone sector.

Consider the case of Coca-Cola versus PepsiCo, and assume the former is thinking of cutting the price of its iconic soda. If it does so, Pepsi may have no choice but to follow suit for its cola to retain its market share. This may result in a significant drop in profits for both companies.

A price drop by either company may thus be construed as defecting since it breaks an implicit agreement to keep prices high and maximize profits. Thus, if Coca-Cola drops its price but Pepsi continues to keep prices high, the former is defecting, while the latter is cooperating (by sticking to the spirit of the implicit agreement). In this scenario, Coca-Cola may win market share and earn incremental profits by selling more colas.

4A.31.1 Payoff Matrix

Let's assume that the incremental profits that accrue to Coca-Cola and Pepsi are as follows:

- If both keep prices high, profits for each company increase by $500 million (because of normal growth in demand).
- If one drops prices (i.e., defects) but the other does not (cooperates), profits increase by $750 million for the former because of greater market share and are unchanged for the latter.
- If both companies reduce prices, the increase in soft drink consumption offsets the lower price, and profits for each company increase by $250 million.

The payoff matrix looks like this (the numbers represent incremental dollar profits in hundreds of millions):

Coca-Cola vs. PepsiCo – Payoff Matrix	**PepsiCo**		
		Cooperate	**Defect**
Coca-Cola	**Cooperate**	500, 500	0, 750
	Defect	750, 0	250, 250

Other oft-cited prisoner's dilemma examples are in areas such as new product or technology development or advertising and marketing expenditures by companies.

For example, if two firms have an implicit agreement to leave advertising budgets unchanged in a given year, their net income may stay at relatively high levels. But if one defects and raises its advertising budget, it may earn greater profits at the expense of the other company, as higher sales offset the increased advertising expenses. However, if both companies boost their advertising budgets, the increased advertising efforts may offset each other and prove ineffective, resulting in lower profits—due to the higher advertising expenses—than would have been the case if the ad budgets were left unchanged.

4A.32 APPLICATIONS TO THE ECONOMY

The U.S. debt deadlock between the Democrats and Republicans that springs up from time to time is a classic example of a prisoner's dilemma.

Let's say the utility or benefit of resolving the U.S. debt issue would be electoral gains for the parties in the next election. Cooperation in this instance refers to the willingness of both parties to work to maintain the status quo with regard to the spiraling U.S. budget deficit. Defecting implies backing away from this implicit agreement and taking the steps required to bring the deficit under control. If both parties cooperate and keep the economy running smoothly, some electoral gains are assured. But if Party A tries to resolve the debt issue in a proactive manner, while Party B does not cooperate, this recalcitrance may cost B votes in the next election, which may go to A.

However, if both parties back away from cooperation and play hardball in an attempt to resolve the debt issue, the consequent economic turmoil (sliding markets, a possible credit downgrade, and government shutdown) may result in lower electoral gains for both parties.

4A.32.1 How Can You Use It?

The prisoner's dilemma can be used to aid decision-making in a number of areas in one's personal life, such as buying a car, salary negotiations and so on.

For example, assume you are in the market for a new car and you walk into a car dealership. The utility or payoff, in this case, is a non-numerical attribute (i.e., satisfaction with the deal). You want to get the best possible deal in terms of price, car features, etc., while the car salesman wants to get the highest possible price to maximize his commission. Cooperation in this context means no haggling; you walk in, pay the sticker price (much to the salesman's delight), and leave with a new car. On the other hand, defecting means bargaining. You want a lower price, while the salesman wants a higher price. Assigning numerical values to the levels of satisfaction, where 10 means fully satisfied with the deal and 0 implies no satisfaction, the payoff matrix is as shown below:

Car Buyer Vs Salesman			
	Salesman		
Pay Off Matrix			
		Cooperate	**Defect**
Buyer	**Cooperate**	**( ) 7 , 7**	**(c) 0, 10**
	Defect	**(b) 10, 0**	**(d) 3, 3**

What does this matrix tell us? If you drive a hard bargain and get a substantial reduction in the car price, you are likely to be fully satisfied with the deal, but the salesman is likely to be unsatisfied because of the loss of commission (as can be seen in cell b).

Conversely, if the salesman sticks to his guns and does not budge on price, you are likely to be unsatisfied with the deal while the salesman would be fully satisfied (cell c).

Your satisfaction level may be less if you simply walked in and paid full sticker price (cell a). The salesman in this situation is also likely to be less than fully satisfied, since your willingness to pay full price may leave him wondering if he could have “steered” you to a more expensive model, or added some more bells and whistles to gain more commission. Cell (d) shows a much lower degree of satisfaction for both buyer and seller, since prolonged haggling may have eventually led to a reluctant compromise on the price paid for the car. Likewise, with salary negotiations, you may be ill advised to take the first offer that a potential employer makes to you (assuming you know that you are worth more).

Cooperating by taking the first offer may seem like an easy solution in a difficult job market, but it may result in you leaving some money on the table. Defecting (i.e., negotiating) for a higher salary may indeed fetch you a fatter pay package. Conversely, if the employer is not willing to pay more, you may be dissatisfied with the final offer.

Hopefully, the salary negotiations do not turn acrimonious, since that may result in a lower level of satisfaction for you and the employer. The buyer-salesman payoff matrix shown earlier can be easily extended to show the satisfaction level for the job seeker versus the employer.

Conclusion

The prisoner’s dilemma shows us that mere cooperation is not always in one’s best interests. In fact, when shopping for a big-ticket item such as a car, bargaining is the preferred course of action from the consumers' point of view. Otherwise, the car dealership may adopt a policy of inflexibility in price negotiations, maximizing its profits but resulting in consumers overpaying for their vehicles. Understanding the relative payoffs of cooperating versus defecting may stimulate you to engage in significant price negotiations before you make a big purchase.

4A.33 SUMMARY

1. An imperfect market refers to any economic market that does not meet the rigorous standards of the hypothetical perfectly—or purely—competitive market. Since all real markets exist outside of the spectrum of the perfect competition model, all real markets can be classified as imperfect markets. In an imperfect market, individual buyers and sellers can influence prices and production, there is no full disclosure of information about products and prices, and there are high barriers to entry or exit in the market.
2. Monopolistic competition is a market structure, where there is competition among a large number of monopolists.
3. Under monopolistic competition, large number of firms selling closely related but differentiated products makes the demand curve downward sloping. It implies that a firm can sell more output only by reducing the price of its product.
4. The difference between the short run and the long run in a monopolistically competitive market is that in the long run new firms can enter the market, which is especially likely if firms are earning positive economic profits in the short run. New firms will be attracted to these profit opportunities and will choose to enter the market in the long run.
5. Monopolistic competition is sheer wasteful and reduces economic welfare. It has also its merits. For example, informative advertisement is useful for consumers and product differentiation provides the consumer a wider choice of products.
6. Oligopoly is defined as a market structure with a small number of firms, none of which can keep the others from having significant influence. An Oligopoly market situation is also called ‘competition among the few’.
7. Oligopoly can either be collusive or non-collusive. Collusive oligopoly is a market situation wherein the firms cooperate with each other in determining price or output or both. A non-collusive oligopoly refers to a market situation where the firms compete with each other rather than cooperating.
8. Nash Equilibrium is an outcome where there is no tendency to change based on each individual choosing a strategy given the strategy of rivals.
9. The Cournot model is a model of oligopoly in which firms produce a homogeneous good, assuming that the competitor’s output is fixed when deciding how much to produce.

10. A dominant firm is defined as a firm with a large share of total sales that sets a price to maximize profits, taking into account the supply response of smaller firms. The dominant firm model is also known as the price leadership model. The smaller firms are referred to as the "fringe."

11. **A** cartel is a group of firms that have an explicit agreement to reduce output in order to increase the price. Cartel **is** an explicit agreement among members to reduce output to increase the price.

12. Sometimes, firms may try to remove uncertainty related to acting independently and enter into price agreements with each other. This is collusion. Collusion is either formal or informal. It can take the form of cartel or price leadership. A cartel is an association of independent firms within the same industry which follow the common policies relating to price, output, sale, profit maximization, and the distribution of products. Price leadership is based on informed collusion. Under price leadership, one firm is a large or dominant firm and acts as the price leader who fixes the price for the products while the other firms allow it.

13. Another method to remove price war among oligopoly firms is merger. Merger may be defined as the consolidation of two or more independent firms under single ownership. When a firm purchases assets of another firm, acquisition takes place. Merger and acquisition take place because the management comes to a conclusion that a consolidated firm is powerful than the sum of individual firms.

14. Collusion occurs when rival firms agree to work together – e.g. setting higher prices in order to make greater profits. Collusion is a way for firms to make higher profits at the expense of consumers and reduces the competitiveness of the market.

15. Game theory is the process of modeling the strategic interaction between two or more players in a situation containing set rules and outcomes. While used in a number of disciplines, game theory is most notably used as a tool within the study of economics.

16. One of the most popular and basic game theory strategies is the prisoner's dilemma. This concept explores the decision-making strategy taken by two individuals who, by acting in their own individual best interest, end up with worse outcomes than if they had cooperated with each other in the first place.

17. Augustin Cournot introduced Cournot Competition in 1838. The most common application of the Cournot model is in describing a duopoly or two main producers in a market.

18. This is an extensive-form game in which two players alternately get a chance to take the larger share of a slowly increasing money stash. The centipede game is sequential since the players make their moves one after another rather than simultaneously; each player also knows the strategies chosen by the players who played before them. The

game concludes as soon as a player takes the stash, with that player getting the larger portion and the other player getting the smaller portion.

19. This non-zero sum game, in which both players attempt to maximize their own payout without regard to the other, was devised by economist Kaushik Basu in 1994.

20. This is another form of the coordination game where it essentially involves a couple trying to coordinate their evening out. While they had agreed to meet at either the ball game (the man's preference) or at a play (the woman's preference), they have forgotten what they decided, and to compound, the problem, cannot communicate with one another.

21. This is a simple game in which Player A must decide how to split a cash prize with Player B, who has no input into Player A's decision. While this is not a game theory strategy *per se*, it does provide some interesting insights into people's behavior.

22. This is a variation of the prisoner's dilemma in which the "cooperate or defect" decisions are replaced by "peace or war." An analogy could be two companies engaged in a price war.

23. In a volunteer's dilemma, someone has to undertake a chore or job for the common good. The worst possible outcome is realized if nobody volunteers.

24. The prisoner's dilemma basically provides a framework for understanding how to strike a balance between cooperation and competition and is a useful tool for strategic decision-making. As a result, it finds application in diverse areas ranging from business, finance, economics, and political science to philosophy, psychology, biology, and sociology.

4A.34 QUESTIONS

1. Explain in detail monopolistic competition.
2. Explain the short run and long run equilibrium of a monopolistically competitive firm.
3. Explain wastages under monopolistic competition.
4. Discuss in detail oligopoly market.
5. Write a note on Nash equilibrium.
6. Explain Cournot's model of oligopoly.
7. Explain dominant firm price leadership model under oligopoly.
8. Write notes on the following:
   a) Game Theory
   b) Prisoner's dilemma

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