UNIT 1: CONSUMER BEHAVIOUR

NOTES

CHAPTER 1 DETERMINATION OF DEMAND

✣ STRUCTURE ✣

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1. INTRODUCTION

Under capitalism, price mechanism solves the central problems of the economy. Further, price of any commodity or economic service is determined by the interaction of demand and supply. It is important to understand precisely what demand and supply are, as they play an important role in the determination of price of a commodity.

The modern theory of demand rests on the structure built by Alfred Marshall (1842-1924). He taught at Cambridge University and through his book 'Principles of Economics', influenced the thinking of the British and American economists.

2. DEMAND

Goods are demanded, because they have utility. These goods are demanded by everyone, who thinks that it is useful in satisfying his want. Alcohol, though actually harms a person, is demanded by one whose want it satisfies. But, every want of a consumer cannot be expressed as a demand in the economic sense of the term. Demand does not mean mere desire for a commodity. A beggar may desire to have a car, but his desire is not going to affect its market price as he is not having the necessary purchasing power to buy a car. Such a desire, which is not backed by the necessary purchasing power to fulfil it, will remain a desire and will never become the demand. To become a demand, a desire, (i) must be backed by the ability or the capacity to pay for the good, and (ii)

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the willingness on the part of the consumer to spend for the good. A demand is, thus, an effective desire.

Demand is always defined with reference to price and a time period. It is meaningless to specify demand without reference to price and time period. The statement that demand for apples is 2000 kg is meaningless. The price at which these apples are demanded is to be mentioned, as with the change in price, the quantity demanded may also change. Demand is also expressed with reference to time. Even at the same price, demand may change, depending upon the time period under consideration. Thus, at ₹ 10 per kg demand for apples may be different at different times during a particular period. Demand for goods may be defined as the, "quantity of a commodity that will be bought at a particular price and during a given period or point of time."

3. PRICE DEMAND RELATIONSHIP

Demand for a commodity during a given period of time depends on many factors including the price of the commodity. Demand schedules and demand curves are the techniques to describe the pricedemand relationship. Both the demand schedules and demand curves can be for an individual or for a market as a whole.

The demand of an individual consumer for a commodity is called individual demand. An individual demand schedule is a tabular statement of prices and quantities showing how much an individual consumer will buy of a commodity at each of the given prices. It does not say anything about what the price is. It is a list of the various quantities that the individual consumer will buy at different prices. While preparing an individual demand schedule, it is assumed that other factors like prices of the related goods, income of the consumer, etc., do not change. A hypothetical demand schedule of a consumer, showing the quantities of apples demanded at different prices is shown in Table 1.

Table 8.1. Demand schedule for apples.

Price of Apples (per kg)	*Quantities of Apples Demanded by the Consumer (in kg)*
12	1
11	2
10	3
9	4
8	5

We can see from the table that when the price of apples is ₹ 12 per kg, only one kg of apples is demanded. When the price comes down to ₹ 8 per kg, the consumer buys 5 kg of it. Hence, we see an inverse relationship between the price and the quantity demanded. This inverse relationship between the price and quantity demanded of a commodity is known as the 'law of demand', which is explained later in the chapter.

Individual Demand Curve

The combinations of the prices and the quantities for an individual consumer is shown in the demand schedule. When plotted on a graph, it becomes the individual demand curve. This is a graphical representation of the combinations of the prices and the quantities

of the commodity under consideration. While economists do use arithmetical demand schedule, the demand schedule for a commodity is more usually shown graphically by drawing the demand curve for the commodity in question.

Various market prices are measured along the vertical axis. Quantities demanded of the commodity are measured along the horizontal axis. Now, the demand schedule of the table is plotted as a series of points. The information presented in this figure is exactly the same as in the table. But, the form of presentation is different. Now, we have it in the form of a curve.

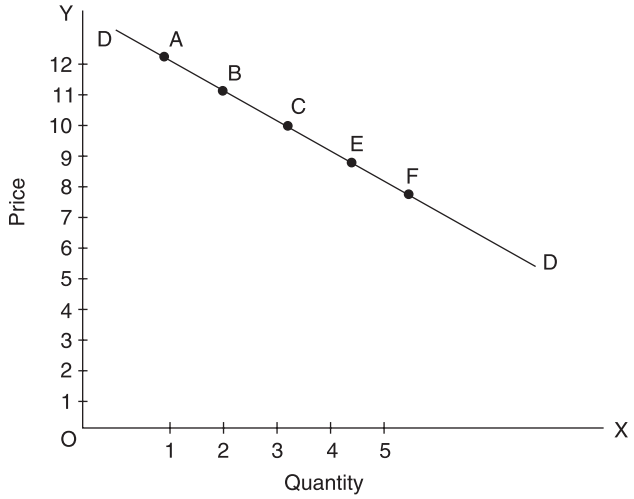

Fig. 8.1. Individual demand curve.

At point 'A' the consumer is buying 1 kg of apples, when the price of apples is ₹ 12 per kg. Point 'B' represents the purchase of 2 kg of apples at the reduced price of ₹ 11 per kg. Similarly, 'C', 'E' and 'F' represent other combinations of prices and quantities. By joining these points, we have a smooth curve DD, called the demand curve for apples. It shows the quantities of apples that the consumer would buy at each of the prices. The demand curve shows the relation between the price of the commodity and the quantity demanded. That is why, it is also called price quantity curve. Given price, corresponding quantity demanded can be read out from the curve and vice versa. The demand curve is downward sloping indicating that with the fall in price, quantity demanded increases. It is drawn on the assumption that other factors influencing demand, viz., prices of related goods, incomes and tastes of consumers, etc. remain unchanged.

Market Demand Schedule and Market Demand Curve

So far we have considered the case of a single consumer buying goods. But, in the market, there are a large number of consumers. Market demand means the demand of all the consumers in the market for goods at a particular price. Market demand schedule shows the total demand of all the consumers in the market at various prices. It can be constructed by the summation of the individual demand schedules of all the individuals in the market. Let us take the case of two individuals in the market. The analysis can be extended to any number of buyers. The individual demand schedules of both the individual buyers, 'A' and 'B' and the market demand schedule is shown in the figure. Market demand has been found out by adding the individual demands of 'A' and 'B' at corresponding prices.

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Table 2. The market demand at each price.

P	Q_A	Q_B	Q_{A+B}
12	1	2	3
11	2	3	5
10	3	4	7
9	4	5	9
8	5	6	11

In the table Q_A is the demand of 'A', Q_B is the demand of 'B' and Q_{A+B} represents the combined demand of 'A' and 'B' (or the market demand) at each price.

At the price of ₹ 12 per kg 'A' demands 1 kg of apples and 'B' demands 2 kg of apples. The total demand at ₹ 12 per kg is 3 kg. At price of ₹ 11 per kg 'A' demands 2 kg of apples and 'B' demands 3 kg of apples. The total demand at this price is 5 kg of apples, which is also the market demand for apples at that price on the assumption that there are only two buyers in the market. Similarly, the total demand of apples at every other price can be found out.

The same relation between price and quantity that has been shown with numbers displayed geometrically in Fig. 2. The market demand schedule has now been transformed into a market demand curve. The market demand curve has been found by the horizontal summation of individual demand curves of A and B. Note again that the market demand curve is downward sloping, showing the inverse relationship between price and quantity demanded. Some people who bought some of the commodity before its price fell may buy more now, because it is cheaper. Further, when price of a commodity falls, new buyers will enter the market and will further raise the demand of the commodity. This is another reason for downward slope of the market demand curve.

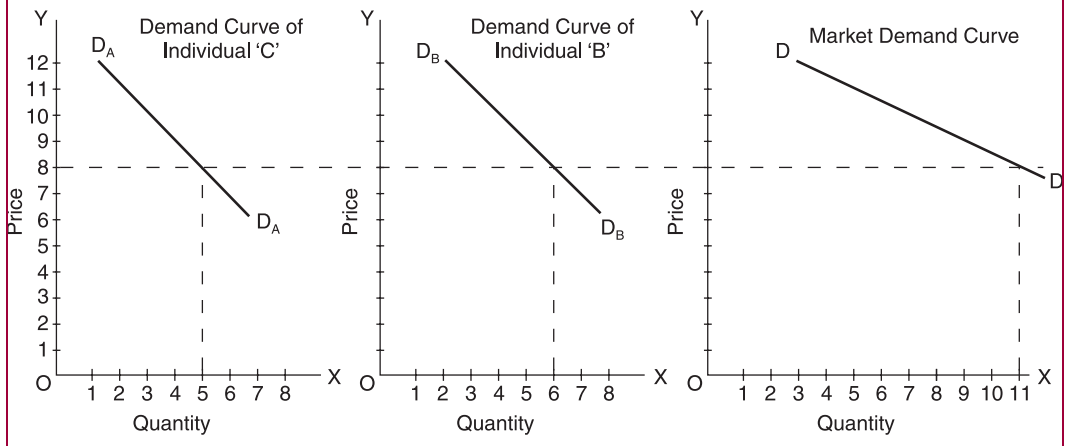

Fig. 2. Derivation of the market demand curve.

Demand Function

A function explains the relationship between two or more variables. If two or more variables are related in such a way that for each set of values of some variables (called the independent variable) there corresponds a value of some other variables (the dependent

variable), then the dependent variable is called the function of the independent variable. In economics, a number of functions such as demand function, production function, cost function, etc., are discussed. Thus, the word 'function' refers to the factors on which demand, production or cost depends.

The demand function for a good is the relation between the various amounts of the commodity that might be bought and the determinants of those amounts in a given market and in a given period of time. As stated earlier, to constitute demand, desire must be backed by the necessary purchasing power to purchase the commodity. While the desire to purchase is revealed by tastes and preferences, income reveals the capability to purchase. Further, since a household spends this income to purchase a number of commodities, demand for a particular commodity depends upon its price and the prices of other commodities. Thus, the factors on which demand for a commodity depends (determinants of demand) are: (1) the price of the commodity, (2) the prices of related goods (substitutes or compliments), (3) the income of the consumers, (4) the tastes and preferences of the consumers, and (5) the expectations about the future prices of the commodity.

The demand function may be expressed symbolically as Q = f (P, Pr, Y, T, E)

where 'Q' stands for the quantity demanded of the commodity, 'P' for the price of the commodity, 'Pr' for prices of the related goods, 'Y' for income of the consumer, 'T' for tastes and preferences of the consumer and 'E' for the expectations about the future prices. Now, we explain, how demand for the commodity is affected by each of these determinants.

1. **Price of the Commodity:** Price of the commodity is the most important determinant of demand. Generally, it is expected that with the fall in the price, the quantity demanded of the commodity increases and with the increase in the price, the quantity demanded of the commodity decreases. Thus, there is an inverse relationship between the price of a commodity and its quantity demanded. The inverse relationship between price and quantity demanded of a commodity is commonly known as the 'law of demand'. The relation between price and quantity demanded of a commodity is also called the price demand or simply demand.
2. **Prices of the Related Goods:** The demand for a commodity also depends upon the prices of the goods related to it. In economics, two types of relations between goods are discussed. These are complimentarily and substitutability of goods. How the prices of the related goods affect the price of the commodity under consideration depends upon whether the related goods are complimentary or substitutes. If the two goods are used together to satisfy a given want, they are said to be complimentary goods, such as tea and sugar, ball pen and refill, car and petrol, etc. when two or more goods are simultaneously required to satisfy a want, their demand is called as joint demand. A fall in the price of a commodity raises the demand for its complimentary goods. For example, with the fall in the price of petrol, demand for car will go up. This happens because, with the fall in the price of petrol, its demand increases. Increased quantity of petrol can be used with more cars. Similar is the relation between the price of tea and demand for sugar. A fall in the price of tea causes increase in the demand for sugar. On the other hand, those goods which can be used in place of one another are called substitutes. For example, tea and coffee, scooter and motor cycle, etc. Existence of alterative goods (substitutes) to satisfy a given demand divides the total demand among different goods. The larger the number of substitutes, the smaller will be demand for anyone of them. Further,

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the level of prices of different goods influences the demand for their substitutes. A fall in the price of goods results in the decrease in the demand for its substitutes and an increase in the price of goods results in the increase in the demand for its substitutes. With the increase in the price of coffee, demand for tea increases because people start using more of tea and less of coffee. In other words, tea is substituted for coffee. On the contrary, with the decrease in the price of coffee, demand for tea will come down. Thus, we can see a direct relation between the price of goods and demand for its substitute.

The relation between the price of one commodity and demand for another commodity is called the cross demand. Fig. 3(a) shows the cross demand curve that shows the relation between the price of petrol and the demand for car (complimentary goods). It has a negative slope. With the decrease in the price of petrol from OP_1 to OP_2, demand for car has gone up from OQ_1, to OQ_2 Fig. 3(b) shows the cross demand curve for tea and coffee (substitute goods). It is upward sloping, showing the direct relation between the price of coffee and demand for tea. With the increase in the price of coffee from OP_1 to OP_2, the demand for tea has gone up from OQ_1 to OQ_2 this is so because with the increase in the price of coffee people start substituting tea for coffee.

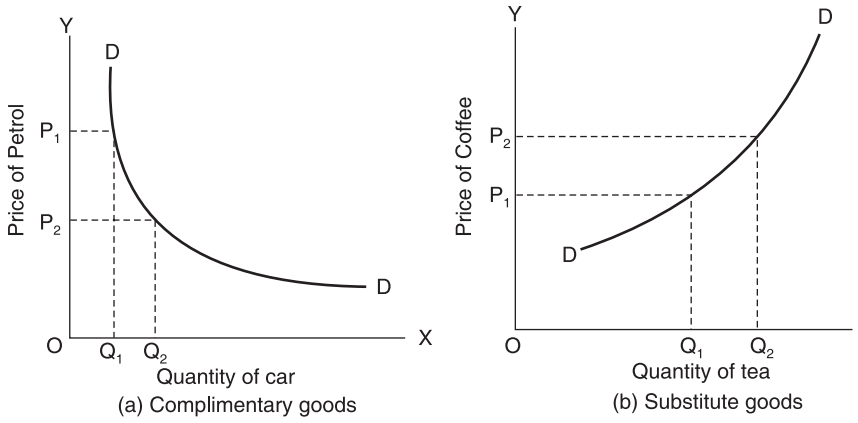

Fig. 8.3. Complimentary and substitute goods.

3. **Income of the Consumer:** The demand for goods also depends upon income of the consumer. With the increase in the income, his purchasing power increases and he is in a position to afford more goods. Consequently, their demand for goods increases. Thus, increase in income has a positive effect on the demand for goods. The relation between income and demand is called income demand. Generally income of the people is directly related to their demand. So, the income demand curve is upward sloping [Fig. 4(a)]. Such goods are called normal goods for which income effect is positive, i.e., when income goes up, demand for such goods also goes up and when income falls, demand also falls. However, for certain goods called necessities; demand is not related to income either way. Here, an example of salt may be given. The demand for salt does not increase with the increase in income and it does not decrease with the decrease in income. Thus, the curve showing the relation between the income of the consumer and the demand for salt is vertical. Such a curve is shown in Fig. 4(b). It is also possible that a rise in income of the consumer may lead to a fall in the quantity demanded of goods. This is the case with *inferior goods*. These goods

are said to be inferior goods, if its demand falls with the increase in the income of the consumer. Thus, there is an inverse relationship between income and demand of inferior goods, i.e., income effect is negative. Examples of inferior goods are vegetable ghee, gur, coarse grain such as bajra, etc. Fig. 4(c) illustrates the income demand curve for inferior goods.

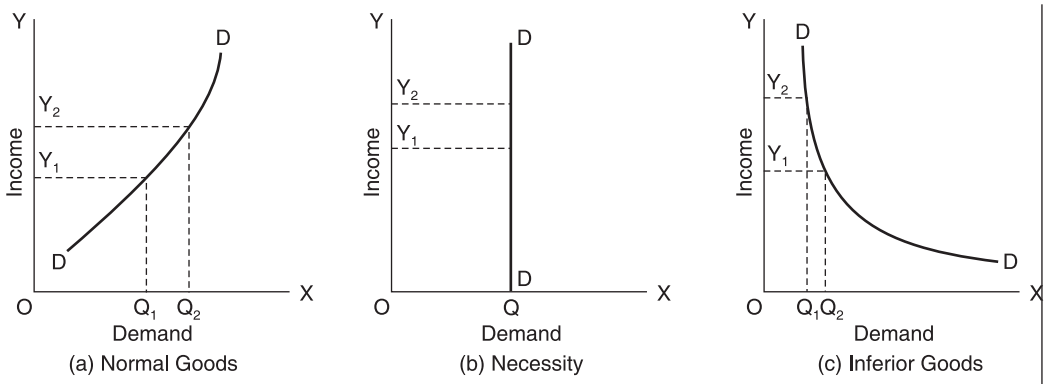

Fig. 4. Income vs. demand for goods.

Sometimes it may even happen that quantity demanded of a commodity increases initially. But after a certain level of income, quantity demanded remains the same or even falls.

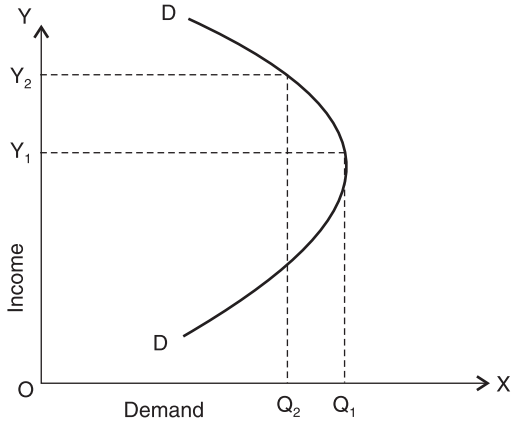

Fig. 5. The income demand curve.

Demand is influenced not only by changes in current income, but also by accumulated income of the preceding periods (wealth). If marginal propensity to consume by the consumer is high (i.e. low marginal propensity to save), a large portion of additional income earned will be used to buy goods and little will be saved and vice versa. Thus, change in propensity to consume (or save) brings about a change in the demand for goods.

4. **Tastes and Preferences of the Consumer:** Another important factor which affects the level of demand of a commodity in the market is the tastes and preferences of the consumer: Tastes and preferences often change, which affect the level of demand for various goods. The demand for goods are more, which is liked by consumers and for which they have a preference. Consumer's tastes and preferences may change because of a change in the fashion or as a result of the advertisement for various

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products. It is advertisement that to a large extent has affected the demand for Babul tooth paste. Many a times, films are responsible for the creation of fashion, which affect the demand of the various existing products. Sometimes, consumers become habitual or accustomed to the use of certain goods and they may not change the use of such goods, unless sufficient impetus is applied. Consumer preferences are also molded by changes in customs, conventions and habits. On the contrary, when some goods have gone out of fashion or people's tastes and preferences no longer remain favourable to them, the demand for them falls.

5. **Expectations about Future Prices:** Consumers expectations about the future prices of the goods also affect their demand. If for some reason, consumers expect prices of certain goods to rise in the near future, they tend to demand more of it in the present. Consequently, demand for these goods whose prices are expected to rise goes up. On the other hand, if they expect the prices to fall in the near future, they will demand less of it in the present. Further, if consumers hope that in the future they will have good income, then they will increase their purchases in the present. The present demand for goods will rise as a result.

6. **Other Factors:** Educational background, social status, marital status, age, place of residence (urban or rural) are some of the sociological factors, which affect consumer demand. Changes in climate and weather conditions also influence a consumer's demand. Advertisement, sales promotion measures, availability of credit also affects a consumer's demand. The market demand for goods are obtained by adding up the individual demands at various prices. It is influenced by three additional factors. These are:

   (a) **Size of the Population:** The greater is the number of consumers of goods, the greater the market demand for it, thus, the demand for a commodity is directly related with the population which is determined by birth and death rates. Population is also affected by migration and immigration.

   (b) **Composition of Population:** If there are more children, demand for baby food, toys, biscuits, sweets, etc. will be large. Similarly, if there are more old people, spectacles, artificial teeth, tonics, and fruits etc. will be more in demand. Predominance of young people in the population will raise the demand for cosmetics, sport goods, jeans etc. Similarly, sex composition also affects the demand for a number of commodities.

   (c) **Distribution of Income:** If income is equally distributed among the different sections of the society, all of them will be in a position to demand. But, there will be more demand for goods purchased by relatively poorer people, like wheat, rice, fans, etc. But, if the income is unevenly distributed, then majority of the people will get small portion of the national income, the demand for commodity will be limited. Most of the demand in this case will come from rich people. Further, in this case, relatively greater portion of the income will be saved (by rich people).

4. LAW OF DEMAND

Law of demand is one of the best known and the most important laws of economic theory. It explains the general tendency of the consumers to buy more goods at a lower

price and less of it at a higher price. Lower price attracts consumers to buy more. Besides, some consumers who were not buying the goods at a higher price can also afford to buy it at a lower price. Consequently, with the fall in the price of the goods, demand for it generally increases. Thus, the law of demand expresses the inverse relationship between the price and the quantity demanded of a commodity, other things being equal. In other words, when the price of goods rises, demand falls and when the price falls, demand rises, provided factors other than the price remain unchanged. The law is based on the assumption that the other determinants of demand, viz. income of the consumer, tastes and preferences of the consumer, prices of the related goods, future expectations, size and composition of population, distribution of income, etc. do not change during the operation of the law. If they do change, the law may fail to operate. For example, if with the fall in the price of the goods, a consumer develops disliking for it or his income declines, he may not buy more of it.

The law of demand indicates only the direction of the change of demand corresponding to a change in price. It does not say anything about the magnitude of change in the quantity demanded. For example, if price of apples comes down from ₹ 12 per kg to ₹ 10 per kg, the law tells us that demand for apples will increase. But, it does not tell the amount by which the demand for apples will increase as a result of a fall in price. There is no mathematical relationship between price and demand of a commodity.

The law of demand has been defined by various economists differently. Some of the definitions are as under:

"The greater the amount to be sold, the smaller must be the price at which it is offered in order that it may find purchasers or in other words, if other things remain the same, the amount demanded increases with a fall in price and diminishes with a rise in price." **Marshall**

"A fall in the price of a commodity causes the household to buy more of that commodity and less of the other commodities which compete with it, while rise in prices causes the household to buy less of this commodity and more of competing commodities". **Lipsey**

"When the price of the goods are raised (at the same time that all other things are held constant) less of it is demanded. Or, what is the same thing: if a greater quantity of goods are put on the market, then, other things being equal, it can be sold at a lower price." **Samuelson**

All the definitions exhibit one thing—that there exists a negative association between prices and quantities demanded. The qualifying clause 'other things remaining the same' implies the assumptions underlying this law.

The law of demand can be illustrated through a demand curve. In Fig. 6 price is measured along the Y-axis and quantity is measured along the X-axis. DD is the demand curve of the goods under consideration. At the price OP_1 the quantity demanded is OQ_1. If the price of the goods falls to OP_2 the quantity demanded increases to OQ_2. The demand curve is downward sloping, which is in accordance with the law of demand. It should be remembered that while drawing the demand curve, all the determinants of demand (except price of the goods in question) are assumed to remain constant. Only the relationship between price and quantity demanded of the commodity is described. The effect of a change in other determinants of demand is discussed later in this chapter.

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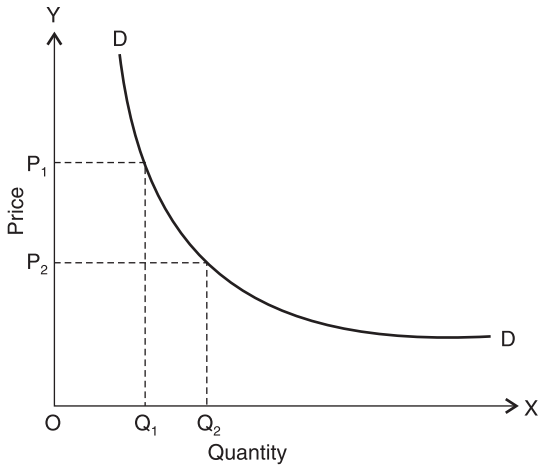

Fig. 6. The demand curve.

The functional relationship between demand and prices can be expressed as Qx = f (Px) where Qx is demand and Px is the own price of goods 'X'.

The above expression shows that price is the cause variable and demand is effect variable.

Alternatively, price is the independent variable while demand is dependent variable. In technical terms, independent variable (here, price) is also called *exogenous variable*, while dependent variable (here, demand) is called *endogenous variable*.

When the demand curve for the goods are a straight line, the corresponding demand function will have a linear equation of the form:

$$Qx = a - b\ Px$$

Here, 'a' is the quantity intercept and 'b' is the slope. DQx/DPx express the rate at which quantity demanded changes, with change in the price. Negative sign in the equation shows inverse price-demand relationship. For plotting the demand curve, we normally use the inverse demand curve Px = $\alpha - \beta$ Qx. here, $\alpha = a/b$ is the price intercept and $\beta = 1/b$ is the slope of inverse demand curve and equals DPx/DQx. This inverse form of the demand curve indicates that for each given quantity demanded, the maximum price a consumer (or consumers) would be willing to pay rather than doing without that quantity. The normal form of the demand curve can also be similarly defined.

5. WHY DEMAND CURVE SLOPES DOWNWARD?

Law of demand states the inverse relationship between price of a commodity and its quantity demanded, other things remaining the same. The demand of a commodity is more at a lower price and less at a higher price. That is why, the demand curve slopes downward. But, a question arises as to why more quantity is demanded at a lower price and less quantity is demanded at a higher price. The factors responsible for the downward slope of the demand curve are.

1. The Law of Diminishing Marginal Utility

The law of diminishing marginal utility states that as the consumption of a commodity by a consumer increases, the satisfaction obtained by the consumer from each additional

unit (i.e., marginal utility) of the commodity goes on diminishing. Thus, a thirsty man gets too much satisfaction by drinking a glass of water. But, the second glass of water will not be as much satisfying to him, as the first glass of water. The satisfaction derived from the third glass will even be lesser. The price that a consumer is willing to pay for a commodity is directly related to the satisfaction that he derives from that commodity. As we have seen, the consumer gets more satisfaction from the initial units of a commodity. He is ready to pay a high price for it. Further, the satisfaction that he gets from the successive units diminishes; he will purchase additional units of the commodity only at a lower price. Thus, more quantity is bought at a lower price and less quantity is bought at a higher price.

2. Income Effect

A fall in the price of a commodity increases the purchasing power (or the real income) of the consumer. In other words, the consumer has to spend less to buy the same quantity of the commodity as before. The money so saved because of a fall in the price of the commodity can be spent by the consumer in any way he likes. He will spend a part of this money on buying some more units of the same commodity, whose price has fallen. Thus, a fall in the price of this commodity increases its demand. This is called *income effect*. Same explanation can be given for a rise in price. In this case, demand for the commodity under consideration will increase due to fall in purchasing power of the consumer.

3. Substitution Effect

This is another important reason for increase in demand as a result of a fall in the price of the commodity and *vice versa*. When the price of a commodity falls, it becomes relatively cheaper than other commodities, whose prices have not fallen. So, the consumer substitutes this commodity for other commodities, which are now relatively dearer. This is known as *substitution effect*. 'Because of this substitution effect, demand for the commodity in question rises. In most of the cases, substitution effect is stronger than the income effect. *Marshall* explained the downward slope of the demand curve with the help of substitution effect, ignoring the income effect. Later on, income effect was also considered by *Hicks* and *Allen* (under the indifference curve analysis) to explain the downward slope of the demand curve. The sum of income effect and substitution effect is called *price effect*. The demand curve slopes downward, as a fall in price of a commodity causes more of it to be demanded and *vice versa*.

4. Changes in the Number of Consumer

Many people cannot afford to buy a commodity at a high price. When the price of the commodity falls, a number of persons who could not afford it at a higher price can purchase it at the reduced price. This increases the number of consumers of the commodity. Thus, at a lower price, the quantity demanded of the commodity increases because of the increase in the number of consumers of the commodity and vice versa.

5. Diverse Uses of a Commodity

Many commodities can be put to several uses. A commodity having several uses in said to have a *composite demand*. For example, electricity can be used for lighting,

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cooking, heating, cooling and so on. At a higher price, electricity may not be used for all of these purposes, i.e., the use of electricity may be restricted to lighting only. But, if price of electricity falls, people may afford to use it for other purposes also. Thus, the demand of electricity at a lower price will increase. All the factors discussed above are responsible for the downward slope of the demand curve. In other words, these factors explain the operation of the law of demand. The importance of these factors, depends upon the circumstances of the case.

Exceptions to the Law of Demand

Law of demand expressing the inverse relationship between price and quantity demanded of a commodity is generally valid in most of the situations. But, there are some situations under which there may be direct relationship between price and quantity demanded of a commodity. These are known as exceptions to the law of demand. One of the exceptions is associated with name of Torstein Veblen (1857–1929). He was a social critic and propounded the doctrine of *conspicuous consumption*. According to him, if consumers measure the desirability of the utility of a commodity solely by its price and nothing else, then they tend to buy more of the commodity at a higher price and less of it at a lower price. Thus, the relationship between price and quantity demanded of the commodity becomes direct, leading to an exception to the law of demand. Diamonds are often cited as an example. Commodities like diamond, precious stones, rare paintings, etc. have a status or prestige value (rather than intrinsic value) for the rich section of the society. In this type of situation, prestige is directly associated with the price of the good. Higher the price of the good, greater will be the status or prestige of the buyer in the society and vice versa. That is why, rich people buy more of it at a higher price and less of it at a lower price. Therefore, the law of demand does not apply in case of commodities which are used as status symbols. Another exception to the law of demand is associated with the name of Robert Giffen (1837–1910). Early in the nineteenth century, he observed rise in the demand for bread by low paid British workers with the increase in its price. Bread was the staple food for the British workers. When the price of bread rose, they were compelled to spend more on the same quantity of bread. With little income left with them, they could not afford to buy as much meat as before. To maintain their total intake of food, they substituted bread (still being a cheaper food) for meat even at a higher price of it. Thus, a direct relationship is established between price and quantity. After the name of Robert Giffen, these goods for which there is a direct price-demand relationship are called Giffen goods. Such basic food items (like potato, bajra, barley, gram, etc.) consumed by poor families are some other examples of Giffen goods. In the case of Giffen goods, demand curve slopes upward and the law of demand does not operate.

The law of demand does not hold in times of emergency like flood, drought, famine or war, as households do not behave in normal way in such periods. Fear of shortage of goods in future in such periods increases their present demand, although the prices are rising. Further, an ignorant buyer may buy more of a commodity when its price in fact goes up. He may also be haunted by the phobia that higher priced commodity is better in quality and vice versa.

There are some other exceptions to the law of demand, which are only apparent and not real. One of these is related to the people's expectations about future prices. If

people expect the price of a goods to rise in the future, they demand more of it even at a higher price. And if they expect the price to fall in the future, they demand less of it even at a lower price. Thus, more quantity of the goods are demanded at rising prices and less quantity of goods are demanded at falling prices. This seems contrary to the law of demand. But in this case the law of demand still holds. The change in demand for the goods are not due to the change in the prices, but, because of a shift in the demand curve, to the right or left as the case may be. Moreover, the law of demand assumes future expectations.

Similarly, over the course of a business cycle, it is found that during a period of prosperity larger amounts of goods are purchased at higher prices and during depression periods of a business cycle, smaller quantities are purchased at lower prices. If properly interpreted, this is also not an exception to the law of demand. This only shows that demand for many goods increases during prosperity because of increase in the income of people and not because of increase in prices of goods. Similarly, during the depression period, demand for goods decreases because of the decline in the income of the people and not because of the decrease in the prices of goods. Thus, it does not contradict law of demand.

Another apparent exception to the law of demand is found when a commodity is sold under different brand names at different prices. Almost identical 'Lux' and 'Supreme Lux' are sold at different prices. Higher priced 'Supreme Lux' is sold more than the lower priced 'Lux', even though both are almost identical. But, this is also not a real exception to the law of demand. This is so because those who buy higher priced brand think that the two brands are different. Hence, two brands should be analyzed as different commodities.

Notwithstanding these exceptions, the universal applicability of the law of demand is undoubted. Even the demand for Giffen goods have to be considered from the existence point of view. Bread is bare necessity for existence. The wage earners purchase the same or more amount of bread despite the price rise as it is cheap and people are habituated to consume it. Further, the demand for luxurious goods are considered from the social point of view and not from economic consideration.

6. MOVEMENT ALONG THE DEMAND CURVE

We have studied under the law of demand that other things remaining the same, if price of a commodity rises, its demand decreases and if price of the commodity falls, its demand increases. When quantity demanded of a commodity increases as a result of the fall in the price, it is called extension (or expansion) in demand (a movement down the demand curve) and when the quantity demanded decreases as a result of an increase in the price of the commodity, it is called contraction in demand (a movement up the demand curve). Thus, extension and contraction in demand imply change in quantity demanded due to change in the price of the commodity, other things remaining the same.

Extension in demand is shown in Fig. 7. At price OP_1 OQ_1, quantity of the commodity is demanded. If the price falls to OP_2, quantity demanded of the commodity increases to OQ_2. Q_1Q_2 is the extension in demand, which results from a fall in the price of the commodity from OP_1 to OP_2.

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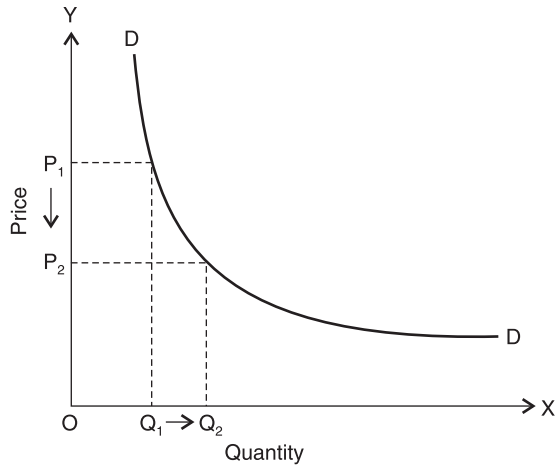

Fig. 8.7. Extension in demand.

Contraction in demand is shown in Fig. 8 at price OP_2. The quantity demanded of the commodity is QQ_1. When the price of the commodity rises to OP_1. The demand of the commodity falls to QQ_2, Q_1Q_2 is the contraction in demand resulting from an increase in the price from OP_1 to OP_1.

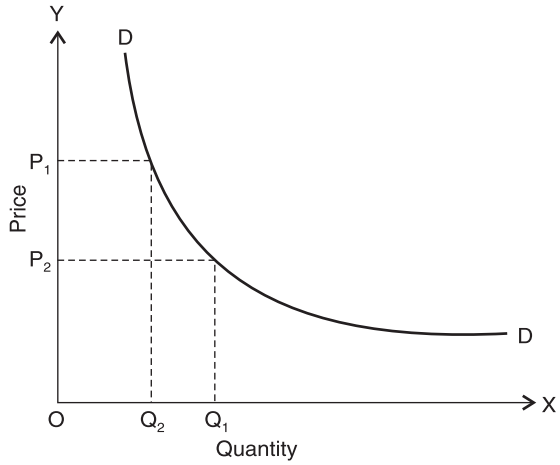

Fig. 8.8. Contraction in demand.

Both extension and contraction in demand are represented by a movement (moving down and up respectively) along the same demand curve. In these cases, there is no shift in the demand curve.

7. SHIFT IN THE DEMAND CURVE

The factors or determinants of demand other than price of goods are assumed to be constant for the period for which the demand curve is prepared. As long as these factors remain unchanged, the demand curve constructed on the basis of these assumptions hold good, i.e., at lower prices, larger quantities will be demanded. Whenever these factors change, a new demand curve will come into existence, either at a lower level or a higher level, depending upon whether these factors have changed for the better or worse.

When demand of goods changes due to the change in the determinants of demand other than price of goods in question, it is called change (increase or decrease) in demand, as the case may be. The direction of change in quantity demanded depends on the nature of change. Increase in demand means that even at the same price more quantity is demanded (or same quantity is demanded at a higher price). This may be due to the increase in the income of the people, increase in the population, and increase in the prices of the substitutes of the good in question, a fall in the prices of complimentary goods, expectations of rise in price in future, redistribution of income toward groups who favour the commodity, favourable change in taste and preferences of the consumers for the commodity in the question. The increase in demand is shown in Fig. 9. DD is the initial demand curve. At price OP, OQ quantity is demanded. Due to the changes in the determinants of demand other than price, the demand curve shifts to the right. D′D′ is the new demand curve, now, at the same price OP, the quantity demanded is OQ_1'. Thus, the demand has increased from OQ to OQ_1, QQ_1 is the increase in demand.

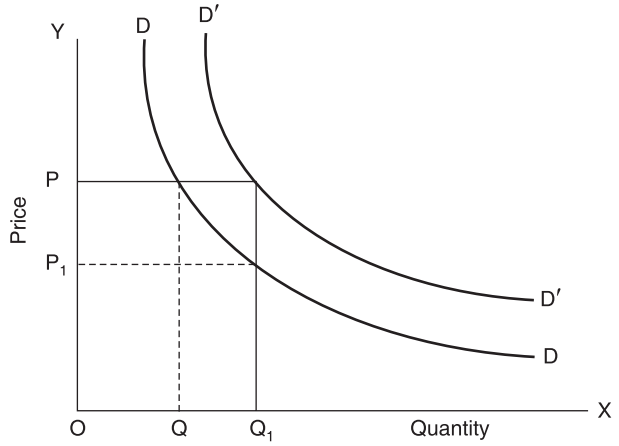

Fig. 9. Increase in demand.

Similarly, there is decrease in demand, when the demand curve shifts to the left. Decrease in demand means that even at the same price, small quantity is demanded or the same old amount is demanded due to the decrease in the income of the people, decrease in the population, decrease in the prices of substitute goods, increase in the prices of complementary goods, expectations of fall in price in future, redistribution of income away from groups who favour the commodity or a decline in the tastes and preferences of the consumers for the commodity. The decrease in the demand is shown in Fig. 10. DD is the initial demand curve. At price OP, OQ quantity is demanded. Due to the changes in the determinants of demand other than price, the demand curve shifts to the left. D′D′ is the new demand curve. Now, at the same price OP, the quantity demanded is OQ. The quantity demanded has decreased from QQ to QQ_1. QQ_1 is the decrease in demand. It can also be shown that in case of decrease in demand, same quantity may be demanded, but at a lower price. Thus, in Fig. 10 after a shift to the left in the demand curve, the same old quantity OQ may be demanded at a lower price OP_1.

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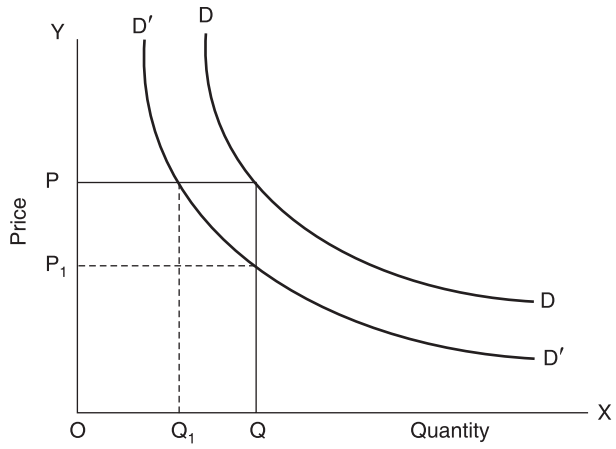

Fig. 10. Decrease in demand.

The causes of change in demand (upward or downward) shift in demand can be summarized as follows:

Table 8.3. Increase vs. decrease in demand.

Increase in demand (Upward or shift towards right in demand)	***Decrease in demand (Downward or shift towards left in demand)***
(i) Increase in income and wealth of the people.	(i) Decrease in income or wealth of the people.
(ii) Increase in the population.	(ii) Decrease in the population.
(iii) Increase in the prices of substitute goods.	(iii) Decrease in the prices of substitute goods.
(iv) Decrease in the prices of complementary goods.	(iv) Increase in the prices of complementary goods.
(v) Expectations of rise in prices in future.	(v) Expectations of fall in prices in future.
(vi) Changes in tastes, preferences, fashions, customs, habits, etc., in favour of a commodity.	(vi) Changes in tastes, preferences, fashions, customs, habits, etc., against a commodity.

To sum up, a change in quantity demanded (extension or contraction) implies a movement along the demand curve, while a change in demand (increase or decrease) means a shift in the demand curve. Movement along a demand curve is different from the movement of the curve. A movement along a demand curve indicates that a different quantity will be demanded because the price has changed. If we move along a demand curve to the right (when the price of the commodity falls), it is a case of extension in demand. If the movement is to the left of the given point on the demand curve (when the price of the commodity rises), we get contraction of demand. On the other hand, when the demand curve moves to the right, it is called increase in demand, since at each possible price, more is demanded. Similarly, a movement of the demand curve to the left implies that there is decrease in demand. Increase or decrease (change) in demand takes place due to change in factors other than the price of the commodity in question.

8. PRICE ELASTICITY OF DEMAND (PED)

Ped measures the responsiveness of demand for a product following a change in its own price. The formula for calculating the co-efficient of elasticity of demand is:

Percentage change in quantity demanded divided by the percentage change in price.

Since changes in price and quantity nearly always move in opposite directions, economists usually do not bother to put in the minus sign. We are concerned with the co-efficient of elasticity of demand. Price elasticity of demand describes the effect of a given percentage change in price (P) on the percentage change in quantities(Q) that would be purchased. The simplest formula for price elasticity (E) is

$$E = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{P_2 - P_1}{P_2 + P_1}}$$

where Q_1 and Q_2 are quantities that would be taken before and after a price change, and P_1 and P_2 are the corresponding prices. If E is less than 1.0, total revenue (P × Q) decreases if price is decreased, and the demand is said to be inelastic; if total revenue increases price decreases (E is greater than 1.0), the demand is said to be elastic. In other words, price elasticity indicates the responsiveness of a change in quantity to change in price.

Elasticity of demand is an important concept in the determination of price policies. However, the measurement of elasticity is difficult in actual practice. The difficulty arises from the fact that elasticity is a concept relating to a given point of time, and price elasticity describes the effect of price on quantity, assuming all other determinants to be constant. Two statistical approaches attempt to estimate the nature of the demand curve: (i) study of time series of prices and quantities; and (ii) controlled experiments. However, even if a manager does not want to go to the trouble of using these methods, the concept is valuable as an aid to his judgement. The nature of demand curve, faced by a manager, obviously is important in pricing decisions. Some authorities argue that it might be best to concentrate on demand as the most important factor in pricing.

$$E_D = \frac{\text{Relative change in Quantity Demanded}}{\text{Relative Change in Price}} = \frac{\frac{\Delta \text{ Quantity}}{\text{Average Quantity}}}{\frac{\Delta \text{ Price}}{\text{Average Price}}} = \frac{\frac{Q_2 - Q_1}{(Q_2 + Q_1)/2}}{\frac{P_2 - P_1}{(P_2 + P_1)/2}}$$

Table 4. Demand schedule.

Price	2	3	4	5	6	7	8	9
Quantity	9	8	7	6	5	4	3	2
Total Revenue	18	24	28	30	30	28	24	1

P goes from 4 to 5 and Q from 7 to 6	***P goes from 5 to 6 and Q from 6 to 5***	***P goes from 6 to 7 and Q from 5 to 4***
$\frac{\frac{6-7}{(7-6)/2}}{\frac{5-4}{(4+5)/2}} = \frac{\frac{1}{6.5}}{\frac{1}{4.5}}$ $= \frac{4.5}{6.5} = .69$	$\frac{\frac{5-6}{(6+5)/2}}{\frac{6-5}{(5+6)/2}} = \frac{\frac{1}{5.5}}{\frac{1}{5.5}}$ $= \frac{5.5}{5.5} = 1$	$\frac{\frac{4-5}{(5+4)/2}}{\frac{7-6}{(6+7)/2}} = \frac{\frac{1}{4.5}}{\frac{1}{6.5}}$ $= \frac{6.5}{4.5} = 1.44$

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A downward sloping demand curve yields a negative E_D. Its sign is often ignored.

Table 5. Interpreting elasticity of demand.

Relative change in Quantity	*Terminology*	*E_D Parameters*
None, will pay anything, numerator is zero	Perfectly Inelastic	ED = 0
Small	Inelastic	0 < ED < 1
Q demanded and P change same percentage	Unitary Elasticity	ED = 1
Large	Elastic	1 < ED < ∞
Infinitely, large, price doesn't change, denominator is zero	Perfectly Elastic	ED is undefined, can't divide by zero.

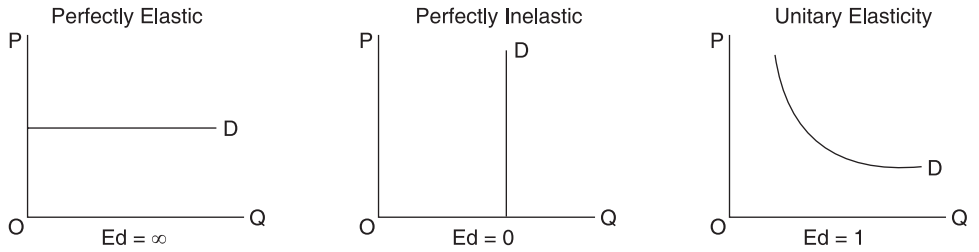
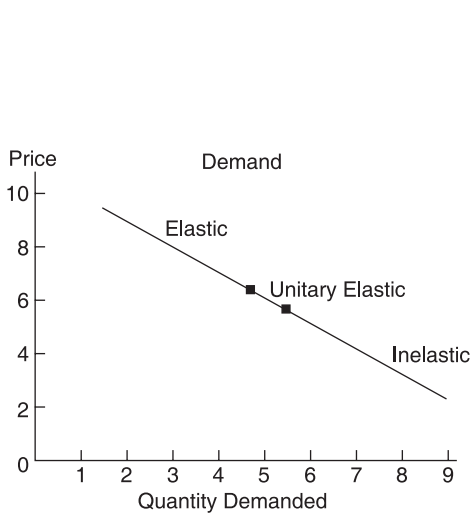


Fig. 11. Elasticity of demand at the extremes.

Total Revenue along a Linear Demand Curve

(a) Moving from left to right on the bottom graph indicates what happens to revenue as price is lowered and the quantity sold increases.



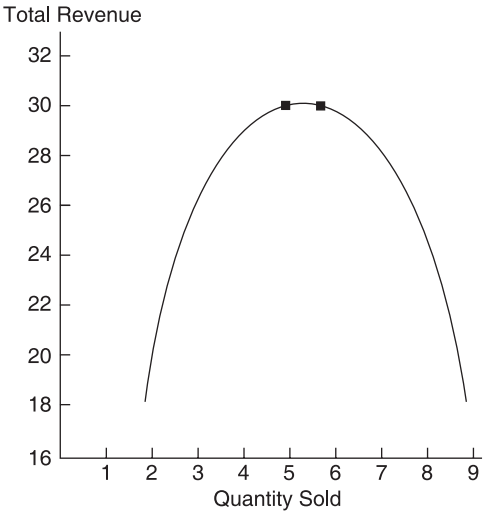


Fig. 12. Price vs. quantity demanded. Fig. 13. Quantity sold vs. total revenue.

(b) At lower quantities (higher prices) demand is elastic. Quantity increases are relatively greater than price decreases and total revenue increases as more units are sold.

(c) This means a company facing an elastic demand can increase revenue by decreasing price. An important question to be answered concerns what happens to costs when a lower price causes more units to be sold.

(d) When demand becomes inelastic, quantity increases are relatively less than price decreases and total revenue falls.

(e) This means a company could increase total revenue by increasing price and selling fewer units. This could mean a very high profit. Important questions to be answered concern how competitors react to these higher prices, can the company produce lower quantities at reasonably low costs, exactly how much profit will the company make, and how will the government reach to these higher profits.

(f) The total revenue test

1. When demand is elastic, price and total revenue move in the opposite direction.
2. When demand is inelastic, price and total revenue move in the same direction.

Table 6. Elasticity of demand and total revenue.

		When Price Increases	*Total Revenue*
ED > 1	Somewhat Elastic	Quantity changing a lot so you could lose lots of money.	decreases
ED = 1	Unitary Elasticity	Quantity/Price changing by same %	no change
ED < 1	Somewhat Elasticity	Quantity doesn't change much, so you could make lots of money	increases

We need to understand cost production to understand making a profit.

Table 7. Elastic vs. inelastic demand.

Product Characteristics	*Elastic Demand*	*Inelastic Demand*
Number of substitutes	Many	Few or none
% of purchaser's budget	High	Low
Type of good	Luxury	Necessity, Emergency
Time until purchase	No hurry	Required quickly
Examples	Steak, Vacations	Salt, Brea

Understanding Values for Price Elasticity of Demand

- If Ped = 0 then demand is said to be perfectly inelastic. This means that demand does not change at all when the price changes—the demand curve will be vertical.
- If Ped is between 0 and 1 (i.e., the percentage change in demand from A to B is smaller than the percentage change in price), then demand is inelastic. Producers know that the change in demand will be proportionately smaller than the percentage change in price.
- If Ped = 1 (i.e., the percentage change in demand is exactly the same as the percentage change in price), then demand is said to be elastic. A 15% rise in price would lead

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to a 15% contraction in demand leaving total spending by the same at each price level.

- If Ped > 1, then demand responds more than proportionately to a change in price i.e., demand is elastic. For example, a 20% increase in the price of goods might lead to a 30% drop in demand. The price elasticity of demand for this price change is 1.5.

What Determines Price Elasticity of Demand

- The number of close substitutes for a goods/uniqueness of the product—the more close substitutes in the market, the more elastic is the demand for a product because consumers can more easily switch their demand if the price of one product changes relative to others in the market. The huge range of package holiday tours and destinations make this a highly competitive market in terms of pricing—many holiday makers are price sensitive.
- The cost of switching between different products—there may be significant transaction costs involved in switching between different goods and services. In this case, demand tends to be relatively inelastic. For example, mobile phone service providers may include penalty clauses in contracts or insists on 12-month contracts being taken out.
- The degree of necessity or whether the goods are luxury—goods and services deemed by consumers to be necessities tend to have an inelastic demand whereas luxuries will tend to have a more elastic demand because consumers can make do without luxuries when their budgets are stretched, i.e., in an economic recession we can cut back on discretionary items of spending.
- The % of a consumer's income allocated to spending on the goods—goods and services that take up a high proportion of a household's income will tend to have a more elastic demand than products where large price changes makes little or no difference to someone's ability to purchase the product.
- The time period allowed following a price change—demand tends to be more price elastic, the longer that we allow consumers to respond to a price change by varying their purchasing decisions. In the short-run, the demand may be inelastic, because it takes time for consumers both to notice and then to respond to price fluctuations.
- Whether the goods are subject to habitual consumption—when this occurs, the consumer becomes much less sensitive to the price of the goods in question. Examples such as cigarettes and alcohol and other drugs come into this category.
- Peak and off-peak demand—demand tends to be price inelastic at peak times—a feature that suppliers can take advantage of when setting higher prices. Demand is more elastic at off-peak times, leading to lower prices for consumers. Consider for example the charges made by car rental firms during the course of a week, or the cheaper deals available at hotels at weekends and away from the high-season. Train fares are also higher on Fridays (a peak day for travelling between cities) and also at peak times during the day.
- The breadth of definition of goods or services—if goods are broadly defined, i.e., the demand for petrol or meat, demand is often fairly, inelastic. But specific brands of petrol or beef are likely to be more elastic following a price change.

Wi-Fi Prices and Price Elasticity of Demand

From airports to hotels to conference centres to inter-city rail services to sports stadiums and libraries, more and more people are demanding wireless internet connections for personal and business use. But demand is being constrained by the limited availability of services and, in places, high user charges. However, the price of connecting to the internet through wi-fi services is set to fall as competition in the sector heats up. Nearly 90% of laptops now come with wi-fi connections as standard and many public areas are being equipped with hotspots, but users often complain about the high price of accessing the internet. At present airports and hotels can charge high prices because in many cases a wi-fi service provider has exclusively on the area. However, the supply of wi-fi services is more competitive on the high street and prices are falling rapidly as restaurants and coffee shops are using low-priced wi-fi access as a means of attracting customers. The more wi-fi providers there are in the market-place, the higher is the price elasticity of demand for wi-fi connections.

Wireless usage is growing across the UK with sales of 3G cards growing by 475%; these are mostly through business channels. In the consumer market, sales of wi-fi routers for the home have grown by 77%. Many broadband providers are now providing free wireless routers with each new broadband subscription.

Demand Curve with Different Price Elasticity of Demand

Elasticity of demand measures the responsiveness of demand to changes in price.

Where the % change in demand is greater than % change in price–demand is elastic.

Where the % change in demand is less than % change in price–demand is inelastic.

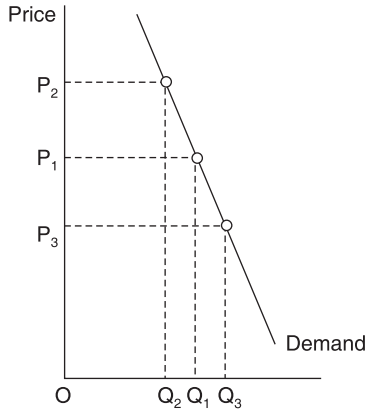


Fig. 14. Relatively inelastic demand.

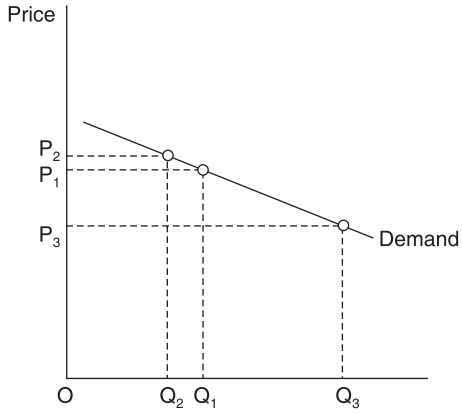


Fig. 15. Relatively elastic demand.

Elasticity of Demand and total Revenue for a Producer

The relationship between price elasticity of demand and a firm's total revenue is a very important one. The following figures show demand curves with different price elasticity and the effect of a change in the market price.

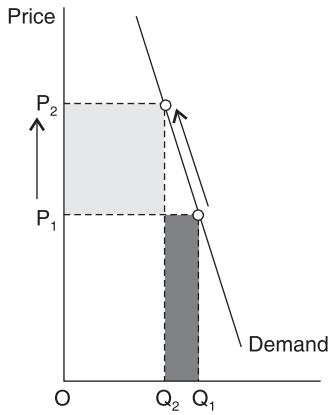


Fig. 16. Inelastic demand.

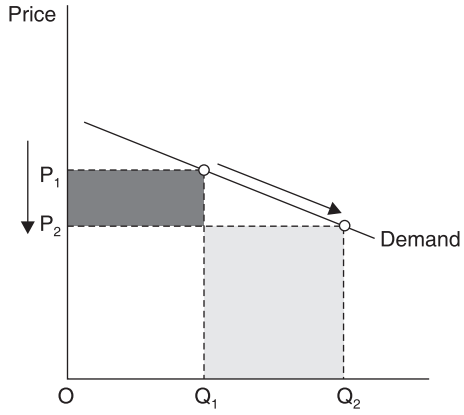


Fig. 17. Elastic demand.

When demand is inelastic—a rise in price leads to a rise in total revenue—for example, a 20% rise in price might cause demand to contract by only 5% (Ped = – 0.25)

When demand is elastic—a fall in price leads to a rise in total revenue—for example, a 10% fall in price might cause demand to expand by only 25% (Ped = + 2.5)

The following table gives a simple example of the relationships between market prices; quantity demanded and total revenue for a supplier. As price falls, the total revenue initially increases, in our example the maximum revenue occurs at a price of ₹ 12 per unit when 520 units are sold giving total revenue of ₹ 6240.

Table 8. Relationships between market-prices, quantity demanded and total revenue.

Price ₹ *per unit*	*Quantity Units*	*Total Revenue* ₹	*Marginal Revenue* ₹
20	200	4000	
18	280	5040	13
16	360	5760	9
14	440	6160	5
12	520	6240	1
10	600	6000	– 3
8	680	5440	– 7
6	760	4560	– 11

Consider the price elasticity of demand of a price change from ₹ 20 per unit to ₹ 18 per unit. The % change in demand is 40% following a 10% change in price—giving an elasticity of demand of – 4 (i.e., highly elastic). In this situation when demand is price elastic, a fall in price leads to higher total consumer spending/producer revenue.

Consider a price change further down the estimated demand curve—from ₹ 10 per unit to ₹ 8 per unit. The % change in demand = 13.3% following a 20% fall in price—giving a co-efficient of elasticity of – 0.665 (i.e., inelastic). A fall in price when demand is price inelastic leads to a reduction in total revenue.

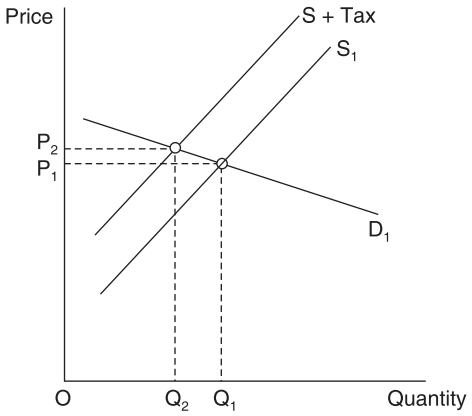
Table 9. Change in the market vs. total revenue.

Change in the Market	*What Happens to Total Revenue?*
Ped is inelastic and a firm raises its price	Total revenue increases
Ped is elastic and a firm lowers its price	Total revenue increases
Ped is elastic and a firm raises its price	Total revenue decreases
Ped is – 1.5 and the firm raises price by 4%	Total revenue decreases
Ped is – 0.4 and the firm raises price by 30%	Total revenue increases
Ped is – 0.2 and the firm lowers price by 20%	Total revenue decreases
Ped is – 4.0 and the firm lowers price by 15%	Total revenue increases

Elasticity of Demand and Indirect Taxation

Many products are subject to indirect taxation imposed by the government. Good examples include the excise duty on cigarettes (cigarette taxes in the UK are among the highest in Europe), alcohol and fuels. Here we consider the effects of indirect taxes on a producer's costs and the importance of price elasticity of demand in determining the effects of a tax on market price and quantity.

Most of the taxes are paid by producer Most of the taxes are paid by the consumer



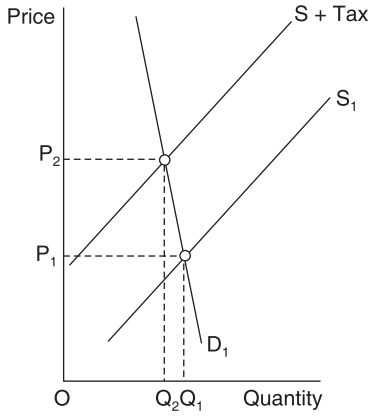


Fig. 18. A tax when demand is price elastic. *Fig. 19. A tax when demand is price inelastic.*

A tax increases the costs of a business causing an inward shift in the supply curve. The vertical distance between the pre-tax and the post-tax supply curve shows the tax per unit. With an indirect tax, the supplier may be able to pass on some or all of this tax onto the consumer through a higher price. This is known as shifting the burden of the tax and the ability of businesses to do this depends on the price elasticity of demand and supply.

Consider Figs. 18 and 19 in Fig. 18, the demand curve is drawn as price elastic. The producer must absorb the majority of the tax itself (i.e., accept a lower profit margin on each unit sold). When demand is elastic, the effect of a tax is still to raise the price—but we see a bigger fall in equilibrium quantity.

Output has fallen from Q_1 to Q_2 due to a contraction in demand. In Fig. 19, demand is drawn as price inelastic (i.e., Ped < 1 over most of the range of this demand curve) and therefore the producer is able to pass on most of the tax to the consumer through

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a higher price without losing too much in the way of sales. The price rises from P_1 to P_2—but a large rise in price leads only to a small contraction in demand from Q_1 to Q_2.

The Usefulness of Price Elasticity for Producers

Firms can use price elasticity of demand (Ped) estimates to predict:

- The effect of a change in price on the total revenue and expenditure on a product.
- The likely price volatility in a market following unexpected changes in supply—this is important for commodity producers who may suffer big price movements from time to time.
- The effect of a change in a government indirect tax on price and quantity demanded and also whether the business is able to pass on some or all of the tax onto the consumer.
- Information on the price elasticity of demand can be used by a business as part of a policy of price discrimination (also known as yield management). This is where a monopoly supplier decides to charge different prices for the same product to different segments of the market e.g., peak and off peak rail travel or yield management by many of our domestic and international airlines.

Income Elasticity of Demand

Income elasticity of demand is the % change in quantity demanded divided by the % change in income.

$$\varepsilon d = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in real income}}$$

- Income elasticity is positive for **normal (superior) goods** such as steak and vacations—more is purchased as income increases.
- Income elasticity is negative for **inferior goods** such as bread and hamburger—less is purchased as income increases.
- In times of recession, income elasticity determines loss in revenue by producing firms.

How sensitive is the demand for a product to a change in the real income of consumers? We use income elasticity of demand to measure this. The results are important since the values of income elasticity tell us something about the **nature of a product** and how it is perceived by consumers. It also affects the extent to which changes in economic growth affect the level and pattern of demand for goods and services.

Normal Goods: Normal goods have a positive income elasticity of demand so as consumers' income rises, more is demanded at each price level i.e., there is an outward shift of the demand curve.

- **Normal necessities** have an income elasticity of demand of between 0 and + 1, for example, if income increases by 10% and the demand for fresh fruit increases by 4% then the income elasticity is + 0.4. Demand is rising less than proportionately to income.
- **Luxuries** have an income elasticity of demand > + 1 i.e., the demand rises more than proportionately to a change in income—for example a 8% increase in income might lead to a 16% rise in the demand for restaurant meals. The income elasticity

of demand in this example is + 2.0. Demand is highly sensitive to (increases or decreases in) income.

Inferior Goods: Inferior goods have a negative income elasticity of demand. Demand falls as income rises. Typically inferior goods or services tend to be products where there are **superior goods available** if the consumer has the money to be able to buy it. Examples include the demand for cigarettes, low-priced label foods in supermarkets and the demand for council-owned properties.

The income elasticity of demand is usually strongly positive for fine wines and spirits, high quality chocolates (e.g., Lindt) and luxury holidays overseas, consumer durables, audio visual equipment, 3G mobile phones and designer kitchen, sports and leisure facilities (including gym membership and sports clubs).

In contrast, income elasticity of demand is lower for staple food products such as bread, vegetables and frozen foods, mass transport (bus and rail), beer and takeaway pizza. Income elasticity of demand is negative (inferior) for cigarettes and urban bus services.

Product Ranges: However, the income elasticity of demand varies within a product range. For example, the Ped for own-label foods in supermarkets is probably less for the high-value "finest" food ranges that most major supermarkets now offer. You would also expect income elasticity of demand to vary across the vast range of vehicles for sale in the car industry and also in the holiday industry.

Long-term Changes: There is a general downward trend in the income elasticity of demand for many products, particularly foodstuffs. One reason for this is that as a society becomes richer, there are changes in consumer perceptions about different goods and services together with changes in consumer tastes and preferences. What might have been considered a luxury goods several years ago might now be regarded as a necessity (with a lower income elasticity of demand).

Consider the market for foreign travel. A few decades ago, long-distance foreign travel was regarded as a luxury. Now as real price levels have come down and incomes have grown, so millions of consumers are able to fly overseas on short and longer breaks. For many an annual holiday overseas has become a necessity and not a discretionary item of spending!

How do Business Make use of Estimates of Income Elasticity of Demand?

Knowledge of income elasticity of demand for different products helps firms predict the effect of a business cycle on sales. All countries experience a business cycle where actually GDP moves up and down in a regular pattern causing booms and slowdowns or perhaps a recession. The business cycle means income rise and fall.

Luxury products with high income elasticity see greater sales volatility over the business cycle than necessities where demand from consumers is less sensitive to changes in the economic cycle.

Income Elasticity and the Pattern on Consumer Demand

Over time we expect to see our real incomes rise. And as we become better off, we can afford to increase our spending on different goods and services. Clearly what is happens to the relative prices of these products will play a key role in shaping our consumption decisions. But the income elasticity of demand will also affect the pattern of

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demand over time. For normal luxury goods, whose income elasticity of demand exceeds + 1, as incomes rise, the proportion of a consumer's income spend on that product will go up. For normal necessities (income elasticity of demand is positive but less than 1) and for inferior goods (where the income elasticity of demand is negative)—as income rises, the share or proportion of their budget on these products will fall.

Cross Price Elasticity of Demand

Very often, a change in the price of one product leads to a change in the demand for another, economists call this the cross-price effect and this is the focus of this chapter. Cross price elasticity (CPed) measures the responsiveness of demand for good X following a change in the price of good Y (a related goods). We are mainly concerned here with the effect that changes in relative prices within a market have on the pattern of demand. With cross price elasticity we make an important distinction between substitute products and complimentary goods and services.

Substitutes: With substitute goods such as brands of cereal or washing powder, an increase in the price of one goods will lead to an increase in demand for the rival product. Cross price elasticity for two substitutes will be positive.

Compliments: With goods that are in complimentary demand, such as the demand for DVD players and DVD videos, when there is a fall in the price of DVD players we expect to see more DVD players bought, leading to an expansion in market demand for DVD videos. The cross price elasticity of demand for two compliments is negative. The stronger the relationship between two products, the higher is the co-efficient of cross-price elasticity of demand. For example, with two close substitutes, the cross-price elasticity will be strongly positive. Likewise when there is a strong complimentary relationship between two products, the cross-price elasticity will be highly negative. Unrelated products have a zero cross elasticity.

How can Business Make use of the Concept of Cross Price Elasticity of Demand?

Pricing strategies for substitutes: If a competitor reduces the price of a rival product, firms use estimates of cross-price elasticity to predict the effect on the quantity demanded and total revenue of their own product. For example, two or more airlines competing with each other on a given route will have to consider how one airline might react to its competitor's price change. Will many consumers switch? Will they have the capacity to meet an expected rise in demand? Will the other firm match a price rise? Will it follow a price fall?

Consider for example the cross-price effect that has occurred with the rapid expansion of low-cost airlines in the European airline industry. This has been a major challenge to the existing and well-established national air carriers, many of whom have made adjustments to their business model and pricing strategies to cope with the increased competition.

Pricing strategies for complimentary goods: Popcorn, soft drinks and cinema tickets have a high negative value for cross elasticity—they are strong compliments. Popcorn has a high mark up i.e., popcorn costs pennies to make but sells for more than a pound. If firms have a reliable estimate for Cped they can estimate the effect, say, of a two-for-one cinema ticket offer on the demand for popcorn. The additional profit from extra popcorn sales may more than compensate for the lower cost of entry into the cinema.

Advertising and marketing: In highly competitive markets where brand names carry substantial value, many businesses spend huge amounts of money every year on persuasive advertising and marketing. There are many aims behind this, including attempting to shift out the demand curve for a product (or product range) and also build consumer loyalty to a brand. When consumers become habitual purchasers of a product, the cross-price elasticity of demand against rival products will decrease. This reduces the size of the substitution effect following a price change and makes demand less sensitive to price. The result is that firms may be able to charge a higher price, increase their total revenue and turn consumer surplus into higher profit.

For goods which are compliments, Cped will have negative sign and for goods which are substitutes, cross elasticity will have a positive sign.

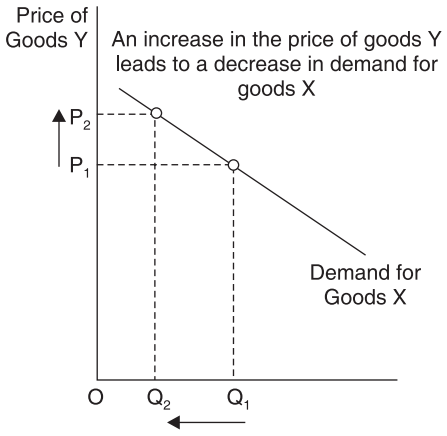

Fig. 20. Relationship between two close compliments.

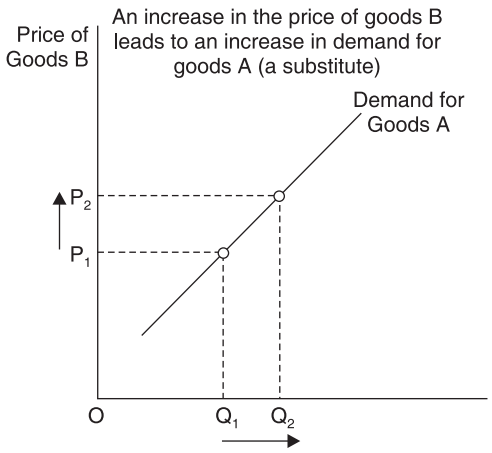

Fig. 21. Relationship between two substitutes

SELF ASSESSMENT QUESTIONS

1. What do you understand by the term 'demand' in economics? Will a beggar desiring to purchase a Maruti car constitute demand? Explain.
2. Briefly point out the main determinants of demand for a commodity.

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3. Individual demand schedules of Anil Batla, Sanjeev Dhingra and Vinod Nanglee are given in the following table. Prepare market demand curve geometrically.

Price	*Anil Batla*	*Sanjeev Dhingra*	*Vinod Nanglee*
1	30	60	110
2	22	40	10
3	16	30	45
4	12	24	36
5	10	20	32
6	9	18	30

4. State and explain the law of demand. State its assumptions and exceptions.
5. Give reasons for the following:
   (a) Why does demand for coffee rise, when price of tea increases?
   (b) Why does demand for car increase, when petrol becomes cheaper?
   (c) Why does demand for gur increase, when the price of sugar increases?
   (d) Give two reasons which may make a consumer buy more of a commodity even at a higher price.
6. Why does demand curve slope downward from left to right?
7. (a) When does a consumer buy a smaller quantity of the commodity at the same price?
   (b) When does a consumer buy more commodities at a particular price?
8. Distinguish between the following:
   (i) Demand schedule and demand curve
   (ii) Market demand schedule and household demand schedule
   (iii) Market demand curve and household demand curve
   (iv) Complimentary goods and substitute goods
   (v) Normal goods and inferior goods
   (vi) Income demand cross demand
   (vii) Income demand and substitution effect
   (viii) A shift of demand curve and a movement along a demand curve
   (ix) Extension in demand and increase in demand
   (x) Contraction in demand and decrease in demand.
9. Write short notes on the following:
   (i) Demand schedule for sugar
   (ii) Demand curve
   (iii) Giffen goods
   (iv) Prestige goods
   (v) Price effect.

Objective Type Questions

I. State whether the following statements are true or false:

(i) The desire and the demand of a commodity are the same.

(ii) The demand for cloth is 10,000 units in Rajouri Garden over one month.

(iii) The demand for pullovers is 5,000 units in Pitam Pura over one week, when the average price of a pullover is 300.

(iv) As size of population rises, the demand for commodities falls.

(v) The composition of population does not determine the demand for goods.

(vi) As income distribution becomes more equal, the demand for goods rises.

(vii) The demand curve always slopes downward from left to right.

(viii) Price effect = Income effect + Substitution effect.

(ix) Navpreet Kaur gave birth to a baby on March 9. The family expenditure on milk increased as a result. This is an example of extension in demand.

(x) Change in taste shifts the demand curve.

II. Fill in the blanks with appropriate words:

(i) Demand for a good is always expressed in relation to a particular ..... .

(ii) The requirement of two or more goods (like bricks and cement) at a time is an example of ..... demand.

(iii) The demand for food is ..... demand.

(iv) If the price of Limca goes up, the demand for Campa ..... .

(v) Demand schedule and demand curve supply the ..... information.

(vi) Demand curve slopes ..... because of the income and substitution effects.

(vii) If demand falls due to the rise in price of a commodity, it is called .... in demand.

(viii) If demand increases at the same price, it is the case of ..... in demand.

(ix) For a given income, when price falls, there is ..... .

(x) A shift in income is known as ..... .

(xi) The amount of a commodity that consumers wish to purchase at various prices is called ..... for the commodity.

(xii) The demand curve is a representation of the functional relation between .... and ..... . It differs from the demand function, because values of the other determinants of demand are assumed to be .... This assumption is frequently described by the latin term ... .

(xiii) When an increase in the price of other good causes an increase in the demand for a commodity, the other goods are called a..... , if it causes a decrease, the other goods are called information.

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(xiv) A movement along a demand curve implies a change in ..... and therefore in the quantity ..... .

(xv) A shift in the demand curve may be caused by changes in any determinant ... . function except that of the commodity.

(xvi) A change in the willingness of the consumer to purchase a particular product because of a change in something other than price is called a change in ....

Choose the Correct Answer

(i) When we draw a market demand curve, we

(a) Ignore tastes and incomes and all other prices.

(b) Assume that tastes, incomes and all other prices do not matter.

(c) Assume that tastes, incomes and all other prices change in the same way prices change.

(d) Assume that tastes, incomes and all other prices stay constant.

(ii) Consumer tastes and preference are

(a) Always treated as exogenous to the economic system.

(b) Always treated as endogenous to the economic system.

(c) So unpredictable that demand analysis is virtually impossible.

(d) Altered by such economic activities as advertising and demonstration effects.

(iii) A decrease in income can be predicted to

(a) Invariably cause shifts towards left in demand curves.

(b) Increase the quantity demanded of an inferior goods .

(c) Invariably cause shifts towards right in demand curves.

(d) Decrease the quantity demanded of an inferior goods.

(iv) A shift towards right in the demand curve for Corn Flakes would be predicted from

(a) A decrease in the number of breakfast eaters.

(b) A change in tastes in favour of hot cereals.

(c) A fall in the price of Corn Flakes.

(d) A rise in the price of wheat.

CHAPTER 2 APPLICATIONS OF INDIFFERENCE CURVE ANALSYSY

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✣ STRUCTURE ✣

- ☆ Introduction
- ☆ Derivation of Demand Curve
- ☆ Derivation of Engel Curve
- ☆ Splitting of Price Effect
- ☆ Why Demand Curve Slopes Downward?
- ☆ Derivation of Compensated Demand Curve
- ☆ Further Applications of Indifference Curve Analysis

2.1 INTRODUCTION

The indifference curve analysis was originally developed to study the consumer behaviour. Now, it has wide applications in explaining different economic phenomena. The indifference curve technique has also been fruitfully applied in analyzing various economic problems. The applications of the indifference curve analysis in explaining economic phenomena are discussed in this chapter. More important applications are explained in the next chapter.

2.2 DERIVATION OF DEMAND CURVE

Demand curve depicting the relationship between price and demand can be derived from the price consumption curve through indifference curve technique. The price effect and the price consumption curve are discussed below.

Price Effect and Price Consumption Curve

In consumer equilibrium, the consumer purchases such a combination of commodities on the budget line from which there is no tendency for change or rearrangement. However, if the price of only one commodity (say, 'X') changes, with everything else including consumer's income remaining unchanged, the consumer equilibrium will shift to a new budget line. The point of equilibrium corresponding to each price change will be given by the point at which the corresponding budget line touches the highest possible indifference curve. With every change in the price of commodity 'X', the budget line changes its slope, but its starting point on the Y-axis remains the same, as the price of commodity 'V' is assumed to be constant. In other words, the purchasing power of the consumer in terms of commodity 'V' remains unchanged, equal to OA. For fall in the price of commodity

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'X', the budget line swings to the right and becomes flatter and flatter. On the other hand, when the price of commodity on the horizontal axis rises, the budget line will rotate about a pivot point on the Y axis clockwise (to the left). In limiting case, when the price of commodity 'X' rises to infinity, the budget line coincides with the Y-axis. In this case the consumer is forced out of buying commodity 'V' altogether and decides not to buy commodity 'X' at such a high price. Therefore, it can be said that the price consumption curve starts from that point on the axis ('X' or 'V'), whose price remains unaffected and moves to those points, where price of commodity changes.

In the figure below initial consumer equilibrium is shown at point E″ where the original budget line AB_1 touches the highest possible indifference curve IC_1. Suppose the price of commodity 'X' falls, the budget line shifts to the right from AB_1 to AB_2. The new budget line is tangent to a higher indifference curve IC_2 at point E_2. The new equilibrium of the consumer at point E_2 is to the right of point E_1 (This shows that the consumer buys more of a commodity 'X' as the price of commodity 'X' falls. He has become better off, i.e., his level of satisfaction has increased as a result of the fall in the price of commodity X. When the price of commodity X further falls, the new consumer equilibrium point is point of contact (E) between the new budget line and the still higher indifference curve IC_2. When all these equilibrium points are joined together, what we get is price consumption curve. Thus, price consumption curve is the curve formed by connecting the various points of consumer equilibrium, depicting the most preferred combinations of the two commodities, when the price of one commodity is varied and all other things are kept constant. Price consumption curve traces out the price effect, which measures the effect of the changes in the price of one commodity (commodity 'X' in this case) on the consumer's demand of this commodity, when the price of other commodity, consumer's income and tastes as well as preferences remains unchanged. In Fig. 2.1 the movements from E_1 to E_2, and to E_3 indicate the price effect.

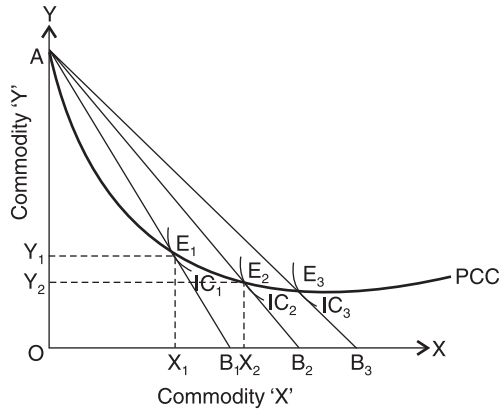

Fig. 2.1. The price effect.

The shape of the price consumption curve (PCC) depends on the amount spent on commodity 'X', when its price falls. With amount spent on commodity 'X' rising, PCC will be downward sloping. When amount spent on 'X' is constant, PCC will be horizontal. Lastly, with amount spent falling, PCC will be upward sloping. These different cases are discussed below in details.

The price consumption curve (PCC) depicted in Fig. 2 is downward sloping. In this case, the consumer demands a larger quantity of commodity 'X' and a smaller quantity of commodity 'Y', if the price of commodity 'X' falls. When the equilibrium of the consumer shifts from point E_3 to point E_3 due to fall in the price of commodity 'X', the quantity demanded of commodity 'X' rises from OX_1 to OX_2 and the amount spent on this commodity rises from AY_1 to AY_2. Since, with fall in the price of commodity 'X' the expenditure on this commodity rises, the price elasticity of demand for commodity 'X' (by total outlay method) is greater than one. This implies that when PCC is downward sloping, the demand for commodity 'X' is elastic.

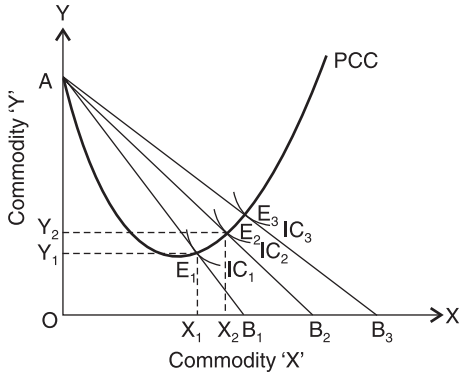

Fig. 2.2 The price consumption curve.

Upward sloping price consumption curve (PCC) is another possibility. In this case, as the price of commodity 'X' falls, the quantity demanded of commodities 'X' as well as 'Y' rises. Though the quantity demanded of commodity 'X' increases, when its price falls, the expenditure on this commodity falls from AY_1 to AY_2. Hence, the demand for commodity 'X' is inelastic.

Price consumption curve for a commodity can take horizontal shape also. It means that as the price of commodity 'X' falls, its quantity demanded rises proportionately, but, quantity demanded of commodity 'Y' remains the same. Fig. 2.3 illustrates horizontal price consumption curve. In this case, the expenditure on commodity 'X' remains unchanged at AY_1. Therefore, by total outlay method, the commodity has unitary elastic demand.

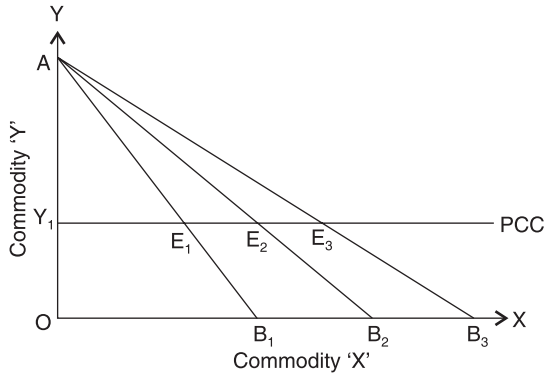

Fig. 2.3. Horizontal price consumption curve.

Generally, price consumption curve has different slopes at different price ranges. At higher price levels, it usually slopes downward. It may, thereafter, have a horizontal

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shape for some price ranges. However, it ultimately slopes upward. To some price ranges, it may be backward sloping, as in the case of Giffen goods. A price consumption curve (PCC) with different shapes and slopes is illustrated in Fig. 2.4. In this figure, the PCC is downward sloping up to point E_3. The curve is almost horizontal between points E_3 and E_4 and rises thereafter. It becomes almost vertical between points E_7 and E_8 indicating very low elasticity. At the end, price consumption curve bends backward, depicting direct price-demand relationship.

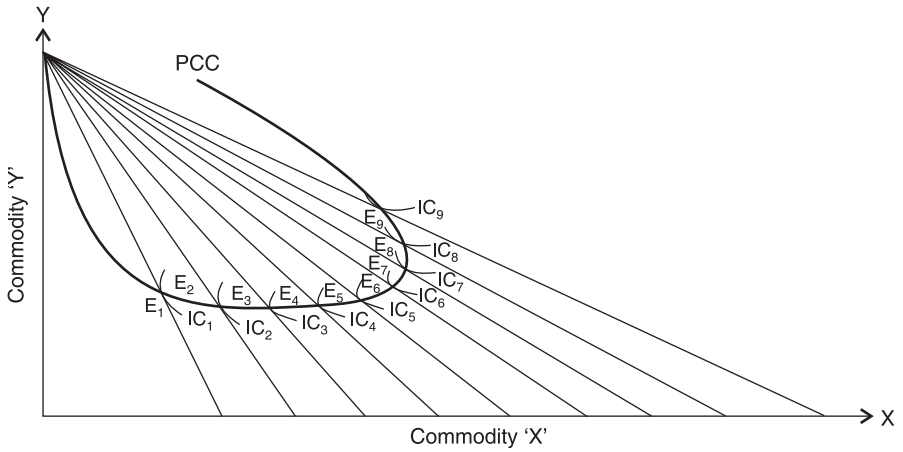

Fig. 2.4. A price consumption curve with different shapes and slopes.

Price Demand Relationship (Demand Curve)

Though price consumption curve (PCC) traces the effect of a change in the price of a commodity on its demand, yet it fails to relate the price with the quantity demanded. The diagram of PCC does not explicitly show price on either axis, whereas the demand curve clearly represents the price—demand relationship. The demand curve depicting this relationship can be derived from the price consumption curve of the indifference curve analysis.

In Fig. 2.5, the quantity of commodity 'X' is taken along the X-axis, while income of the consumer (₹ 60 in this case) is taken on the Y-axis. As the price of a commodity falls, the budget line shifts to the right in case of normal commodities. Consequently, the new equilibrium point occurs to the right of the previous equilibrium point. If the price of the commodity 'X' is allowed to fall from ₹ 3, to ₹ 2 to ₹ 1.50 and so on, we get a series of equilibrium points like E_1, E_2, E_3 on budget lines AB_1, AB_2 and AB_3, respectively in Fig. 5 (The consumer can purchase at the most 20, 30 and 40 units of commodity 'X' on these budget lines respectively). By joining the successive equilibrium points E_1, E_2 and E_3, we get a price consumption curve (PCC).

The demand curve in the lower panel diagram can be derived from the upper panel diagram. Since demand curve shows a relationship between price and quantity demanded of a commodity, the lower panel, like the upper panel of Fig. 5, still measures the quantity demanded of commodity 'X' on the horizontal axis. However, the vertical axis in the lower panel measures the price of commodity 'X'. Each point on the PCC corresponds

to a particular quantity of commodity 'X'. Every point on this curve also corresponds to a particular price of this commodity, though there are no prices on the Y-axis. The price of commodity 'X' can be known from the slope of the budget line. It is, thus, clear that the PCC can provide information required to draw the demand curve, showing the quantity demanded of the commodity 'X' at various prices.

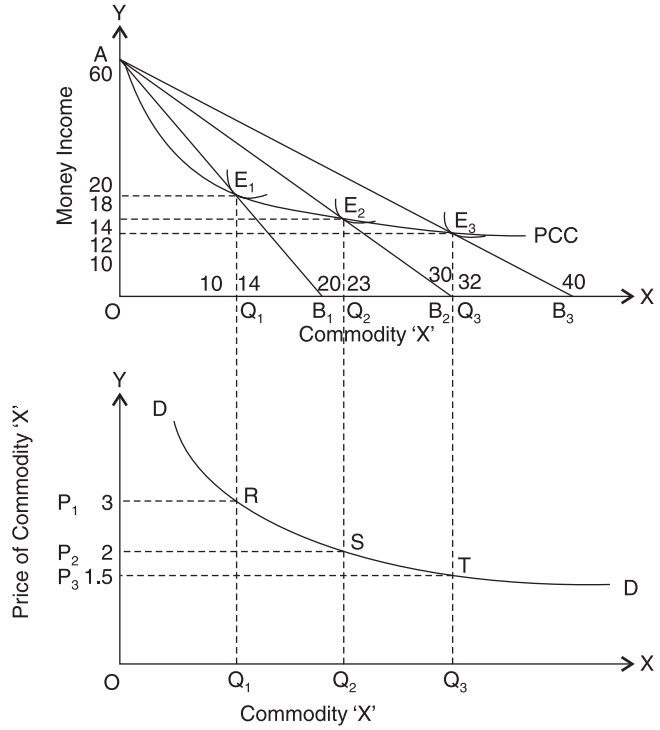

Fig. 2.5. Series of equilibrium points on budget lines.

To derive demand curve from PCC, consider point of consumer equilibrium E, on budget line AB_1. The quantity demanded at this point is OQ_1. The price of commodity 'X' for this budget line is equal to money income (OA) divided by the number of units of commodity 'X' that can be bought with this money income (OB_1), OA, OB_1 or price of commodity 'X' in this case is equal to 60/20 or ₹ 3. At point E the consumer purchases 14 units of commodity 'X' by spending ₹ 42 (14 × ₹ 3) and has left with a money income of 18 (₹ 60 – ₹ 42).

Now, 14 units of commodity 'X' at its price of ₹ 3 becomes a point 'R' on the demand curve of the consumer, shown in the lower panel of Fig. 2.5. Similarly, from equilibrium point E_1' the quantity of commodity 'X' demanded is OQ1′ equal to 23 units and the corresponding price is OA/OB_2 equal to 60/30 or ₹ 2. Further, at equilibrium point E_3, 32 units of commodity 'X' are demanded at a price of ₹ 60/40 or ₹ 1.50. These combinations of quantity and price of commodity 'X' are point 'S' and point 'T' respectively on the consumer's demand curve depicted the lower panel of Fig. 5. The demand curve for commodity 'X' is obtained by joining points 'R', 'S' and 'T'. The demand schedule showing prices and quantities corresponding to these points is depicted in Table 2.1.

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Table 2.1. Demand schedule corresponding to demand curve derived from PCC.

Price line	*Price of Commodity 'X'*		*Quantity Demanded to 'X'*	
AB_1	₹ 3	(OA/OB_1)	₹ 14	(OQ_1)
AB_2	₹ 2	(OA/OB_2)	₹ 23	(OQ_2)
AB_3	₹ 1.50	(OA/OB_3)	₹ 32	(OQ_3)

Thus, we observed that both the price consumption curve and the demand curve provide the same information, i.e., how much of a commodity would be demanded by a consumer at different prices. However, the techniques of drawing the two curves are different and they assume different forms. Some of the differences between the two curves are as follows:

(i) The price consumption curve (PCC) is drawn with two commodities 'X' and 'Y' represented on the two axes. On one of the two axes, instead of a commodity, money income can also be taken. On the other hand, the demand curve is drawn with quantity demanded of the commodity on the X-axis and its price on the Y-axis. In the PCC, the price of the commodity is mentioned.

(ii) PCC tells us the size of the consumer's income and also the amount of money income left after the consumer has made the purchase of a commodity. The demand curve provides no such information, except that it is assumed to be constant.

(iii) PCC shows the total expenditure, when any number of units of a commodity are purchased. Price of the commodity can be calculated by dividing the total expenditure by the number of units of the commodity bought, when the entire money income is spent on it.

(iv) The price consumption curve clearly brings out separately the income and substitution effects of a change in the price of a commodity. The conventional demand curve does not attempt for splitting the price effect into income and substitution effects.

Deriving Demand Curve for a Giffen Good

Giffen goods are those commodities, the demand of which falls as the price of such goods falls. The demand for these goods has a positive slope, which means more is demanded when the price is higher and less is demanded when the price is lower. Derivation of demand curve for a Giffen commodity is explained below.

In Fig. 2.6, commodity 'X' is assumed to be Giffen commodity. In this figure, the consumer is at equilibrium at point E1, where the initial budget line AB_1 is tangent to the indifference curve IC_1. At this equilibrium, the consumer purchases OX_1 quantity of the commodity 'X' at price OA/OB_1. When the price of commodity 'X' falls, the new budget line AB_2 is to the right of the original budget line AB. The new equilibrium point is E_2. Since commodity 'X' is a Giffen commodity, the demand for this commodity falls to OX_2 and the new equilibrium point E_2 is to the left of the original equilibrium E. The price of commodity 'X' in this situation is OA/OB2 . When the price of commodity 'X' falls further, the new budget line AB3 becomes tangent to the indifference curve IC_3 at point E_3. At this equilibrium point, the demand of the consumer for commodity 'X' falls to OX3. The price consumption curve (PCC) for the Giffen commodity 'X' is obtained by joining the successive equilibrium points E_1, E_2 and E_3. This PCC is found to be backward bending.

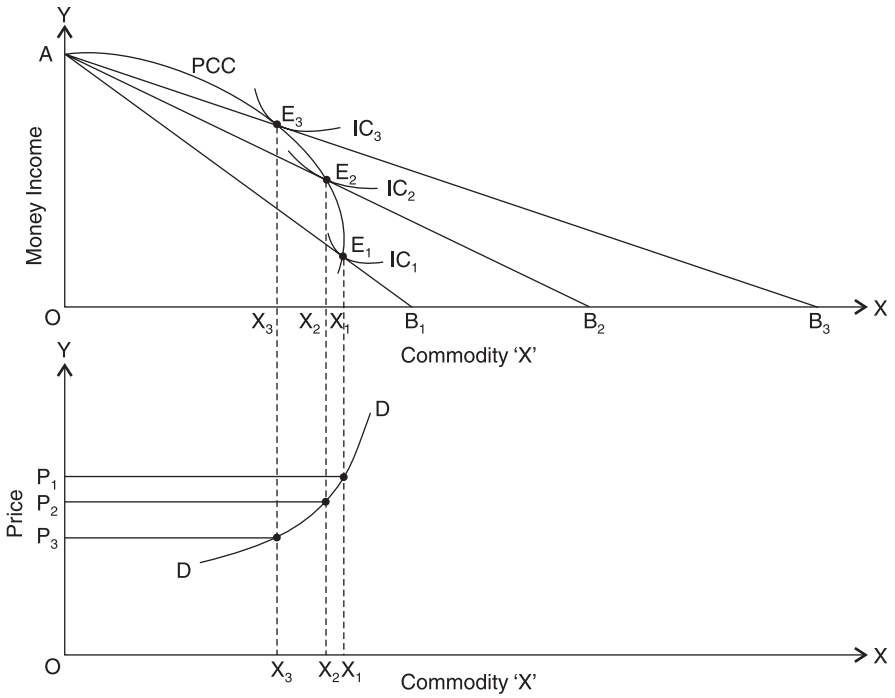

Fig. 2.6. Derivation of demand curve for a Giffen commodity.

With the above information from PCC, demand curve for the Giffen commodity can be drawn in the lower panel of Fig. 2.6. It may be seen that the demand curve of a Giffen commodity has a positive slope, which indicates that the quantity demanded falls (from OX to OX_2 to OX), as the price decreases (from OA/OB_1 to OA/OB_2 to OA/OB_3). In other words, the quantity demanded varies directly with the changes in price. This case is an exception to the general law of demand.

2.3 DERIVATION OF ENGEL CURVE

The concept of an Engel curve is similar to that of the demand curve derived from the price consumption curve in the previous section. The Engel curve relates quantity demanded with different levels of income, other things remaining constant. Since Engel curve can be derived from the income consumption curve, we first explain the concept of income consumption curve and income effect.

Income Effect and Income Consumption Curve

With given money income and the prices of the two commodities, the consumer is in equilibrium at the point of contact of budget line and the highest possible indifference curve. Now, we shall analyze the consumer behaviour, when only his money changes. A consumer will be able to enjoy more or less satisfaction, when he has more or less money income in the two cases respectively. The effect of change in consumer's income on his total satisfaction or purchase of the two commodities, (as given by consumer equilibrium position), prices of the two commodities, his tastes and preferences remaining constant is referred to as the income effect. This is illustrated in Fig. 2.7.

In Fig. 2.7 the consumer is initially in equilibrium at point E_1 where the original budget line A_1B_1 is tangent to indifference curve IC_1. At this point, the consumer

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purchases OX1 of commodity 'X' and OY_1 of commodity 'Y'. When the money income of the consumer increases, the budget line will shift upward and will be parallel to the original budget line A_1B_1. "The budget line moves out by the proportion of change in the purchasing power. With the increased income, the consumer would be able to choose a combination of the two commodities on a higher indifference curve IC_2. In Fig. 2.7, the new budget line A_2B_2 touches this indifference curve at point E2 where the consumer consumes OX_2 of commodity 'X' and OY_2 of commodity 'Y'. It is clear from the figure that with increased money income, the consumer is able to purchase larger quantities of both the commodities. Since he is on the higher indifference curve IC_2, he will be better off than before, i.e., his level of satisfaction will rise. If the money income of the consumer increases further, the budget line will have a further upward parallel shift to A_3B_3. The consumer is now in equilibrium at point E_3 where the budget line A_3B_3 is tangent to indifference curve IC_3. Here, the consumer consumes greater quantities of both the commodities.

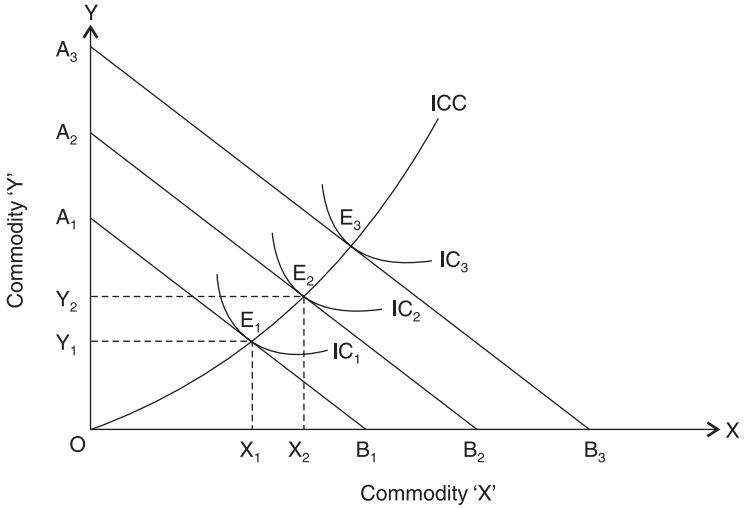


Fig. 2.7. The income effect.

The curve obtained by connecting successive consumer's equilibrium points (E_1, E_2 and E_3 in this case) at various levels of money income of the consumer, other things remaining unchanged, is known as income consumption curve. It is, thus, locus of combinations of the two commodities, when the money income is varied and prices of the commodities, tastes, preferences, etc. are held constant. The income consumption curve (ICC) traces out the income effect of the change in money income of the consumer. ICC invariably starts from the origin, because, if the consumer had no income, the quantities of commodities 'X' and 'Y' he could purchase must be zero. However ICC need not be a straight line curve. At every point on such a curve Px/Py = MRSx, y and since (PxPy) is constant for all parallel budget lines (with same slope) A_1 B_1, A_2 B_2, A_3 B_3, so MRSx,y is constant throughout ICC.

In Fig. 2.7, income effect is indicated by the movements from consumer equilibrium points E_1 to E_2 to E_3. In this figure, X_1X_2 shows positive income effect for commodity 'X', while Y_1Y_2 measures positive income effect for commodity 'Y', as with rise in money income, a consumer purchases more of these commodities. Only an upward sloping income consumption curve can show rising consumption of the two commodities, as income increases.

When the two commodities are perfect complements to each other, they have to be used in fixed proportions. In such a situation, as discussed in the previous chapter indifference curves will be L-shaped and the points of consumer equilibrium will occur, where the common points of the indifference curves meet the budget line. Hence, income consumption curve will be linear (upward sloping) as shown in Fig. 2.8 (a). On the other hand, for perfect substitutes, the ICC will coincide with the X or Y axis, as shown in Fig. 2.8(b) and Fig. 2.8(c) respectively.

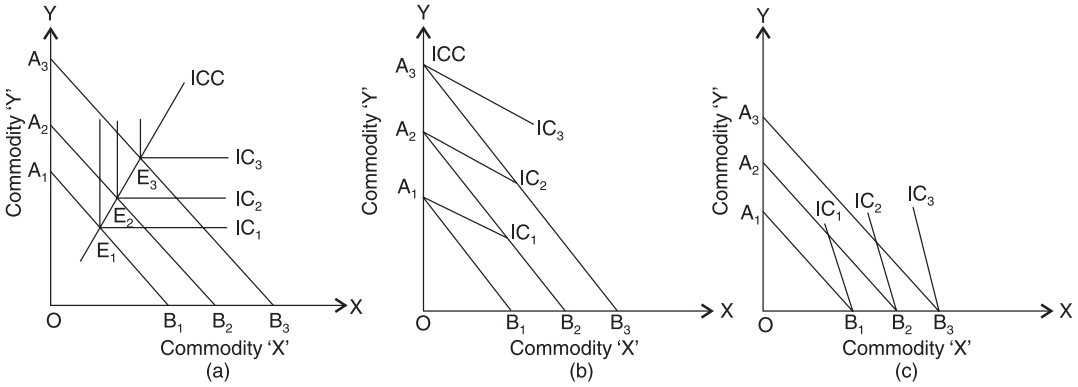
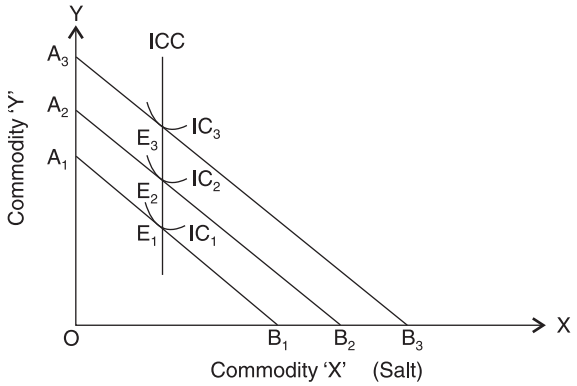


Fig. 2.8. The income consumption curve.

Positive, Zero and Negative Income Effects

So far we have discussed income effect and income consumption curve (ICC) for normal or superior commodities (luxuries or comforts). For such commodities, the income effect is positive, i.e., consumers demand more of these commodities with rise in the money income and ICC is upward sloping. However, the income effect for a commodity can also be zero or negative. The income effect is zero for those commodities, which the consumer purchases in fixed quantities (e.g., drugs, salt, etc.) irrespective of the level of income of the consumer. Here, an increase in income will not be followed by any increase in the quantity demanded. Zero income effect for commodity 'X' is illustrated in Fig. 2.9(a). In this figure, the X-axis represents the quantity of salt, whereas the Y-axis represents other commodity. The money income of the consumer rises from OA_1 to OB_1 but, the consumer continues to demand OX_1 quantity of salt. Therefore, the income effect



(a)

(a)

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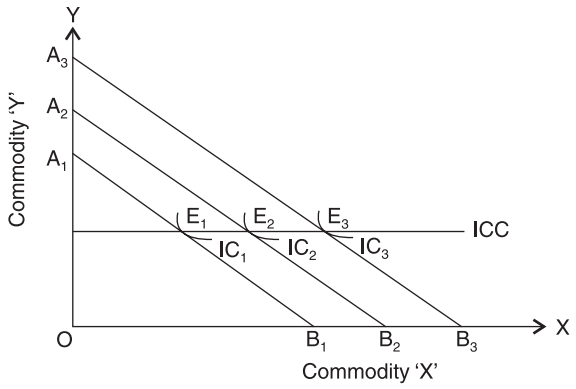


(b)

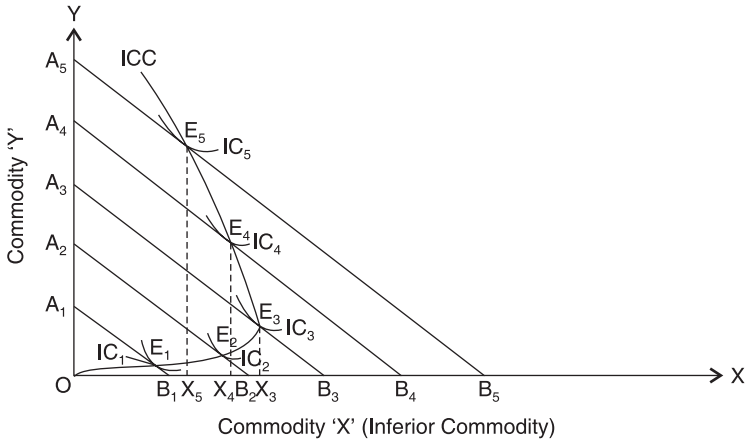
(b)

Fig. 9.9. Zero income effect.

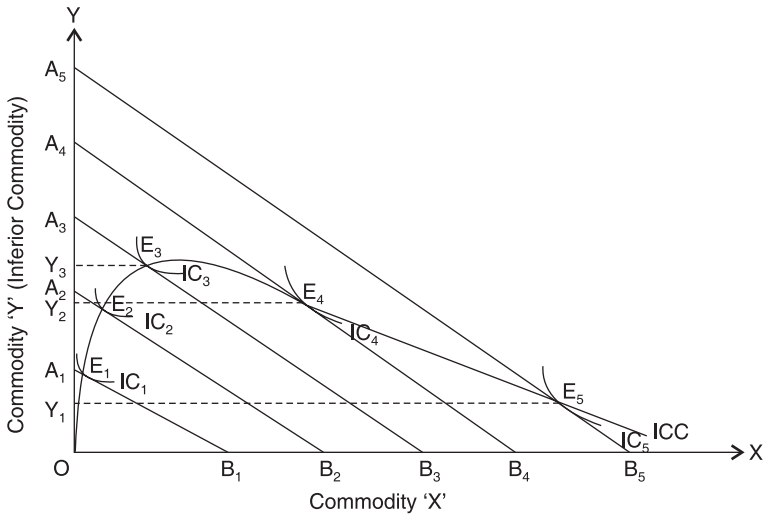
of salt in this case is equal to zero. This means that the consumer spends the same amount of his money income on salt and the additional money income is used to purchase other commodity. ICC in case of commodities with zero income effect is vertical. Its income elasticity of demand is equal to zero, since with change in income of the consumer, the demand for commodity 'X' remains unchanged.

Income consumption curve with zero income effect for commodity 'Y' will be horizontal indicating no change in the demand for this commodity in equilibrium, irrespective of any change in the income of the consumer. Income elasticity of demand for commodity 'Y' is zero.

The income effect is negative for those commodities, which are considered inferior (e.g., wheat, maize, jowar, bajra, cereals, vegetable oils, cotton clothes, etc.) by the consumer. For such commodities, with the increase in income of the consumers, the consumption of the commodity falls, as the consumer starts substituting superior commodities for them. In other words, poor people cannot afford to purchase expensive superior commodities. But, when they become richer, they are in a position to shift their purchase towards more expensive superior commodities. A negative income effect is illustrated in Fig. 2.10(a).



(a)



(b)

Fig. 9.10. A negative income effect.

In Fig. 2.10(b) with higher budget line A_3 B_3, A_4 B_4, A_5 B_5 the demand for inferior commodity (taken on the X-axis) declines from OX_3 to OX_4 and then to OX_5, with rise in the level of money income. This is shown by the relative positions of equilibrium points E_3, E_4 and E_2. Point E_5 lies to the left of point E_4 which lies to the left of point E_3, indicating a lower quantity of commodity 'X', despite the fact that it (E_5) is on a higher budget line and thus involves a higher income for the consumer. The consumer instead, purchases more of superior commodity (shown on the Y-axis), the income consumption curve obtained by joining the successive equilibrium points in the figure bends towards Y-axis, as increased money income of the consumer beyond point E3 would reduce the demand for commodity 'X'. Thus, ICC slopes backward (i.e.. upward to the left), when commodity 'X' is an inferior commodity.

If, on the other hand, commodity shown on the Y-axis happens to be an inferior commodity, the income consumption curve slopes downward to the right and bends towards X-axis. Fig. 2.10(b) illustrates this situation. In this figure, A_1B_1 is the initial budget line. This line touches the indifference curve IC_1 at point E_1. Thus, this is the point of consumer equilibrium. When income of the consumer increases, prices remaining constant, the budget line has a parallel shift and the new budget line is A_2 B_2. This budget line touches a higher indifference curve IC_2 at point E_2, which is the new point of consumer equilibrium. With further rise in the consumer's income, a consumer is able to purchase OY_3 quantity of inferior commodity 'Y' at equilibrium point E_3. Till this point, the consumption of both the commodities rise with the increase in income of the consumer. However, any subsequent increase in the income of the consumer reduces the consumption of inferior commodity (commodity X_1 in this case). This is indicated by the consumer equilibrium points E_4 and E_5, where the consumption of commodity 'Y' has declined from OY_3 to OY_4 and OY_5, depicting negative income effect for inferior commodity Y.

It can be noticed from Fig. 2.10(a) and (b) that income effect for inferior commodity becomes negative only after a point. This shows that only at higher levels of income, some commodities become inferior and before that, changes in their demand behave like

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those of normal commodities up to a certain point (E_3 in Fig. 2.10). Income effect is positive for both the commodities up to point E_3. Beyond this point, income effect is negative for commodity X [Fig. 2.10(a)] and commodity Y [Fig. 2.10(b)]. It is important to note that indifference curves do not explain why a commodity happens to be an inferior commodity or why income effect for a commodity is negative. Indifference curves merely explain the inferior commodity phenomenon. It is the consumer's scale of preferences which tell us whether a commodity is an inferior commodity or not and when as well as why. Accordingly, a set of indifference curves can be drawn. In the words of Ryan, "Indifference analysis can never tell us why a commodity is inferior. Knowing that it is inferior, indifference analysis describes this, it never explains. And it is our knowledge of economic behaviour of actual households that tell us what to describe."

Income-Demand Relationship (Engel Curve)

Engel curve is named after a 19th century German statistician Christian Lorenz, Ernst Engel who developed it for the first time. Income consumption can be used to derive this curve. Derivation of Engel curve for commodity 'X' is illustrated in Fig. 2.11.

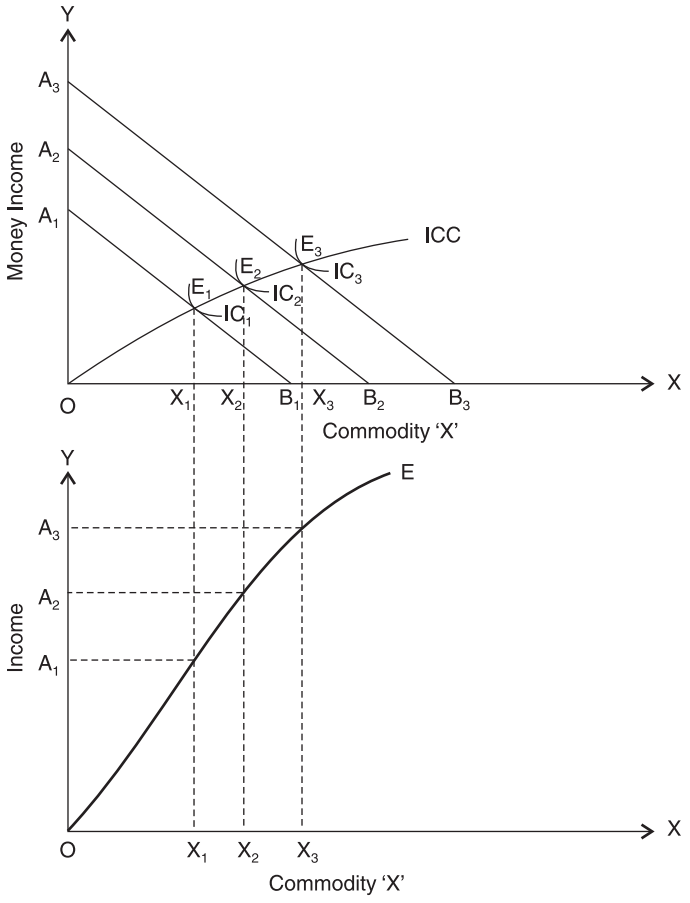

Fig. 2.11. Derivation of Engel curve for commodity X.

In the upper panel of Fig. 2.11, three parallel budget lines $A_1 B_1$, $A_2 B_2$ and $A_3 B_3$ corresponds to OA_1, OA_2 and OA_3 levels of money income respectively, prices of the commodities remaining constant. The income consumption curve (ICC) is obtained by joining the points of tangency of these budget lines with the indifference curves IC_1,

IC_2 and IC_3 respectively. Each point on the ICC corresponds to a particular quantity of commodity 'X'. Each point on the ICC also corresponds to particular money incomes.

The various pairs of the income and the quantity purchased of commodity 'X' (OA_1, OX_1), (OA_2, OX_2) and (OA_3, OX_3) corresponding to three equilibrium points E_1, E_2 and E_3 are plotted in the lower panel of the Fig. 2.11 to obtain the Engel curve. This Engel curve indicates the relationship between the income level and the quantity of the commodity purchased by the consumer.

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Engle Curve and Inferior Goods

The shape of Engel curve depends upon the shape of income consumption curve (ICC). As discussed earlier, when ICC has a positive slope the corresponding Engel curve will also have a positive slope. However, when ICC slopes backward, the Engel curve will have a negative slope. Since commodities generally become inferior after a certain level of income, the income consumption curve has a positive slope upto some point. Thereafter it bends backward.

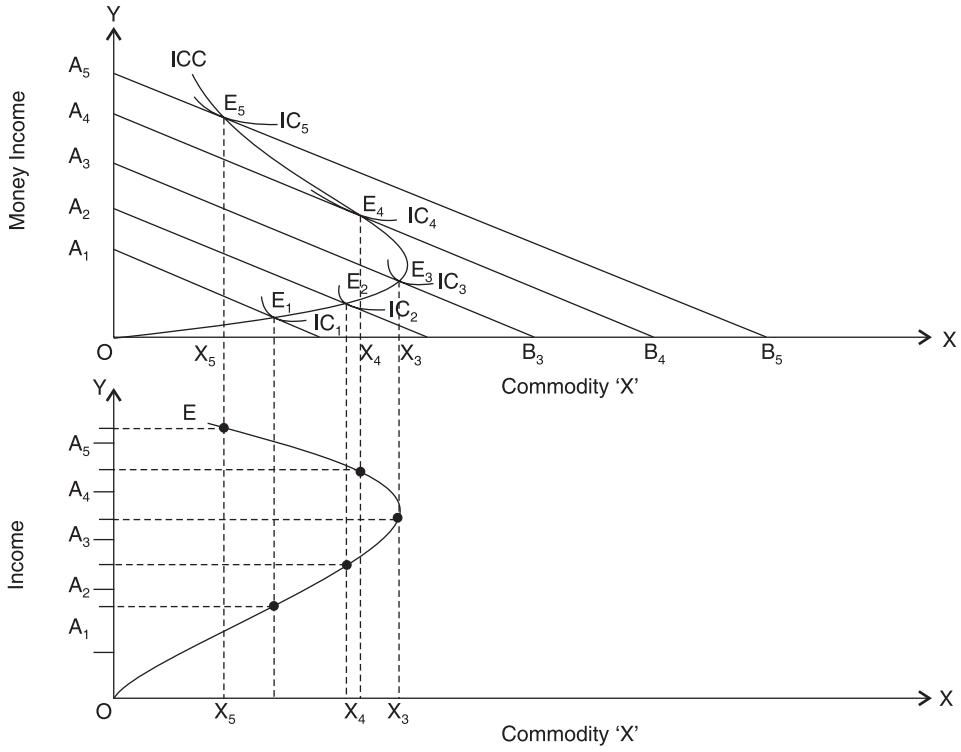

Fig. 2.12. Shape of Engel curve depends upon the shape of income consumption curve.

In Fig. 2.12 the income consumption curve is obtained by joining the points of contact of the budget lines A_1 B_1, A_2 B_2, A_3 B_3 with indifference curves IC_1, IC_2 and IC_3 respectively. As the level of income rises, the corresponding equilibrium points E_1, E_2 and E_3 represent greater and greater consumption of commodity 'X'. But, when the level of income rises further, the demand for commodity 'X' (being an inferior commodity) falls from OX_3 to OX_4 and then to OX_5. Therefore, ICC rises up to point E3 and bends backward beyond this point. When various income levels OA_1, OA_2, OA_3, OA_4 and OA_1

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are plotted against the quantities demanded corresponding to equilibrium points (E_1, E_2, E_3, E_4 and E_5 respectively) on these budget lines in the lower panel diagram of an Engel curve is formed for the inferior commodity 'X'.

This Engel curve rises upward (positive slope) initially, but bends backward beyond a point. Its shape is again similar to that of the income consumption curve.

Engel Curve and Demand Cruve

A demand curve for a commodity shows how its demand changes due to changes in its price, assuming other things remain constant. On the other hand, Engle curve indicates how the demand for a commodity changes, when the income of a consumer changes, other things remaining unchanged. The relation between demand curve for commodity X and its Engel curve is illustrated in Fig. 2.13.

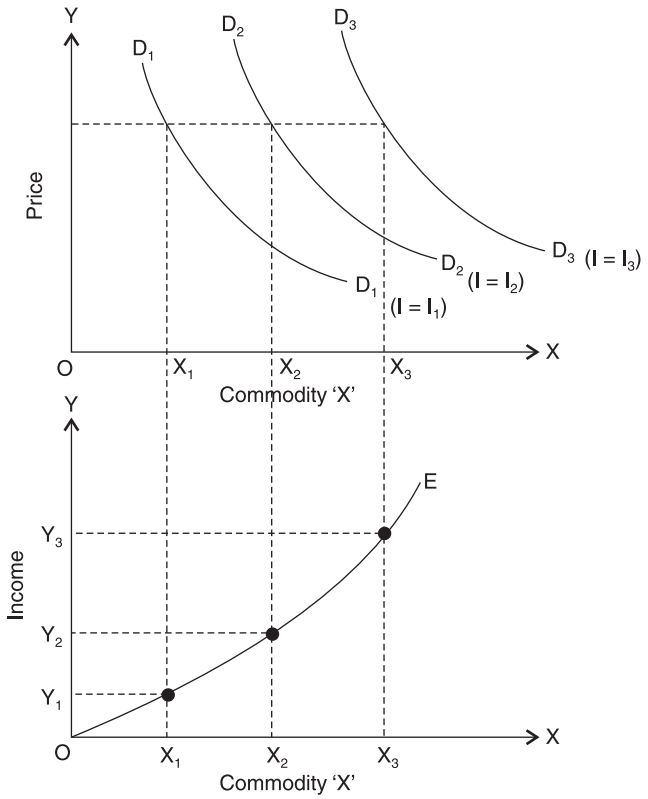

Fig. 2.13. The relation between demand curve for commodity X and its Engel curve.

The upper panel of Fig. 2.13 depicts demand curve for commodity 'X'. Price of this commodity is shown along the Y-axis and its quantity demanded is taken along the X-axis. The initial demand curve corresponds to a level of income l = l. When the income of the consumer rises to $l = l_2$ and then to $l = l_3$, the demand curve shifts to the right to D_2 and then to D_3. Consequent upon the rise in income of the consumer, the quantity demanded increases from OX_1 to OX_2. Engel curve showing the relationship between income and demand is constructed by plotting income demand points ($OY_1 = I_1$, OX_1), ($OY_2 = I_2$, OX_2) and ($OY_3 = I_3$, OX_3) in the lower panel diagram. In this figure of Engel curve, income is shown along the Y-axis, while quantity demanded of commodity 'X' is still shown on the X-axis.

Engel Expenditure Curve

Engel curve explains the relation between the income level and the quantity of a commodity purchased, while the Engel expenditure curve relates income to expenditure on the commodity purchased. Economists are often interested in conducting family expenditure surveys to determine the expenditure behaviour of the households. Engel expenditure curve serves as a useful device in all such studies.

An Engel expenditure curve is illustrated in Fig. 2.14, where the income level is shown along the Y-axis and the corresponding expenditure is represented on the X-axis. In case this curve happens to coincide with the 45° line from the origin, the consumer spends his entire income on the commodity 'X' or a group of commodities taken on the X-axis. The Engel expenditure curve cannot lie below this line, since normally it is not possible for a consumer to incur expenditure more than the income. As the consumer has to save a part of his income for various contingencies or speculations, thus, the actual Engel expenditure curve lies above the 45° line.

At extremely low levels of income, people spend a very large proportion of their income on necessities of life, particularly food. With rise in the income of a consumer, expenditure on food increases, but the proportion of expenditure on food declines. Since this sort of behaviour of the consumer was first observed by Ernst Engel, it has come to be known as Engel's law. Fig. 2.14(a) illustrates the Engel curve for food. At a low level of income OY_1 or BE_1, a consumer spends only OE_1 equal to F_1 E_1 on food and there is a saving of BF_1.

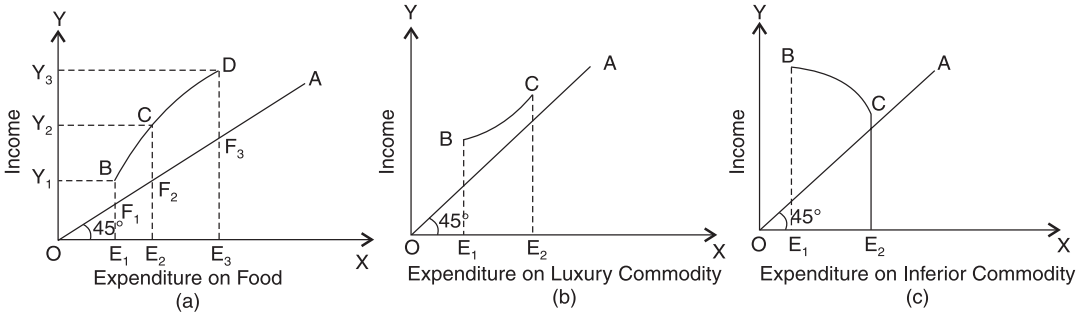

Fig. 9.14. Engel expenditure curve.

When the income level rises to OY_2 or CE_2, the expenditure of the consumer increases to OE_2 equal to F_2 E_2, the saving increases to CF_2. Further, when the income goes up to OY_3 or OE_3, the expenditure of the consumer on food becomes OE equal to F_3 E which is and hence there is saving of DF_3, which is still higher than CF_2. We observe that with increase in the income of the consumer, though the expenditure on food rises in absolute terms, it declines in percentage terms. As a result, the Engel expenditure curve diverges more and more from the 45° line, as income increases.

If an *Engel* expenditure curve is drawn for luxury commodities, we observe that the expenditure rises more than proportionately to rise in income at higher income levels (Expenditure curve for inferior commodities declines as income rises.)

2.4 SPLITTING OF PRICE EFFECT

Whenever price of a commodity falls (price of other commodity and money income remaining unchanged) or when relative price of a commodity falls, the consumer (given a

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constant money income) substitutes this commodity for the other one so as to maintain the original standard of living. This is referred to as *substitution effect*. Thus, the substitution effect may be defined as the change in the consumption of the two commodities (or the substitution of one commodity by the other) as a result of a change in their relative prices (given constant money income), so that the consumer is able to maintain the original standard of living by remaining on the same indifference curve.

Substitution effect implies a change in the quantity bought, when the price of the commodity changes, after 'adjusting' the income, so that the real income of the consumer remains the same as before. This adjustment of income was explained differently by Hicks and by Slutsky. Hicks assumes constancy of real purchasing power of the consumer by keeping the consumer on the same satisfaction level. Slutsky keeps real purchasing power constant in the sense that the consumer could purchase the original combination of the commodities. It will be noticed that Slutsky's substitution effect pushes the consumer to a higher indifference curve. It implies that Slutsky's substitution effect exceeds Hicksian's substitution effect.

Hicksian and *Slutsky* approaches have their own merits and demerits. Hicksian approach is useful for the analysis of consumer surplus and welfare economics. But, it is not so easy to know the compensating variation under this approach, as it requires the knowledge of indifference curve, revealing tastes and preferences of the consumer between various combinations of commodities. On the other hand, Slutsky approach can be easily used to establish the law of demand. Under this approach, it is easier to find out the amount of income by which income of the consumer is to be adjusted to isolate the substitution effect. It has the merit of being dependent on observable market data. However, the substitution effect isolated by this approach involves some gain in the real income, graphically shown as a movement to a higher indifference curve.

Whenever the price of a commodity changes (with the price of other commodity and money income of the consumer remaining constant), the real income of the consumer changes. As a result the consumer is able to rearrange his purchases. This implies that income effect exists as an element of price effect. Further, the consumer also intends to substitute relatively expensive commodity (whose price has remained constant) with the cheaper one (whose price has fallen). This shows that the substitution effect is also present in the price. Hicksian and Slutsky approaches for separating the price effect into substitution effect and income effect are discussed now.

Break-up of Price Effect under Hichsian Approach (Through Compensating Variation)

J.R. Hicks has defined 'original standard of living' in terms of level of satisfaction. According to him, when the relative prices of the commodities change, the money income of the consumer is altered in such a manner that his real purchasing power remains constant and he is neither better off nor worse off than before i.e., he continues to remain on the same indifference curve. Let us now discuss Hicksian substitution effect in the case of price fall and price rise.

Normal Commodity Case (Price Fall): Consider two commodities, tea and coffee. Tea is shown on the X-axis and coffee on the Y-axis. The initial budget line AB is tangent to the indifference curve IC at point 'E'. At this equilibrium point, the consumer purchases OX of commodity 'X' and OY of commodity 'Y'. Suppose the price of tea declines,

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which will increase the purchasing power or real income of the consumer. With decline in the price of tea, the equilibrium of the consumer will shift to point 'F', where the outer new budget line AB touches a higher indifference curve IC. The movement from point 'E' to point 'F' is called the price effect. In quantity terms, the price effect is given by the expansion in the quantity demanded of tea from OX_1 to OX_2, i.e., X_1 X_2, as shown in Fig. 2.15. Now, this price effect can be broken up into two parts—substitution effect and income effect. The procedure of separation is discussed as follows.

Let us assume that an income worth DB' quantity in terms of tea or CA in terms of coffee is taken away from the consumer (at the new price ratio), so that the real income of the consumer is held constant and he comes back to his original indifference curve IC. This required reduction in his money income, which is just sufficient to neutralize the income effect of the fall in price (rise in real income) is referred to as compensating variation in income. It is shown graphically by a parallel shift of the new budget line AB' until it becomes tangent to the original indifference curve. The purpose of the compensating variation is to allow the consumer to remain on the same level of satisfaction as before the price change and to isolate the substitution effect from the price effect. In Fig. 2.15, the compensated budget line CD is tangent to initial indifference curve IC at point 'G'. This point is to the right of the point of original tangency 'E', since budget line CD is parallel to the new budget line AB' which is less steep than the original budget line AB (the slope of indifference gets smaller towards the right). The movement from point 'E' to point 'G' reflects the *Hicksian* substitution effect of a price change. It is the response of a consumer to a change in relative price ratio, holding real income constant. As tea has become relatively cheaper, the consumer demands more of tea and less of coffee now. In quantity terms, the Hicksian substitution effect is given by the expansion in the quantity demanded of tea from OX_1 to OX_3, i.e., X_1 X_3 as shown in Fig. 2.15. (The quantity purchased of commodity 'Y' gets reduced from OY_2 to OY_1). It is clear from Fig. 2.15 that the substitution effect can always be represented by a movement along an indifference curve.

In substitution effect, the consumer is on the same indifference curve. He can purchase the same quantities of commodities as before. That is why, mathematically, the sign of substitution effect is always negative (relative to the price of one commodity, if the price of the other commodity decreases, the quantity demanded of the latter increases and vice versa). It always induces the consumer to buy more of the commodity, the price of which has fallen in comparison to an other, the price of which has either increased or remained constant.

The reason is not difficult to understand. For two commodities 'X' and 'Y' if the price of commodity 'X' falls and that of commodity 'Y' remains constant, the marginal significance of commodity X in terms of commodity 'Y' increases. Thus, every rupee spent on commodity 'X' will bring more satisfaction to the consumer than commodity 'Y'. He would not mind in diverting expenditure from commodity 'Y' to commodity 'X', since the latter has become cheaper in relation to the former. Thus, quantity demanded and price move in opposite directions, even after money income is adjusted to hold real income constant. The substitution effect may however be strong or weak, depending upon the portion of income that is spent on the relevant commodity. The bigger the portion of expenditure, the stronger the effect. This is equally true for income effect (explained in the previous section) also.

To isolate the income effect from the price effect, the money taken away from the

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consumer is restored to him, so that he is back from equilibrium point 'G' on indifference curve IC to the equilibrium point 'F' on the higher indifference curve IC′ and budget line AB′ (parallel shift with the same relative prices). The consumer has in fact a higher purchasing power. If the commodity 'X' is a normal commodity, he will spend some of his increased 'real income' on this commodity. Change in real income will change the consumption in general and in particular of the commodity whose price has changed. The movement from point 'G' to point 'F' is only due to the increase in income and therefore measures the income effect. In quantity terms, income effect is given by the expansion of the quantity demanded of tea from OX_3 to OX_2, i.e., X_3 X_2.

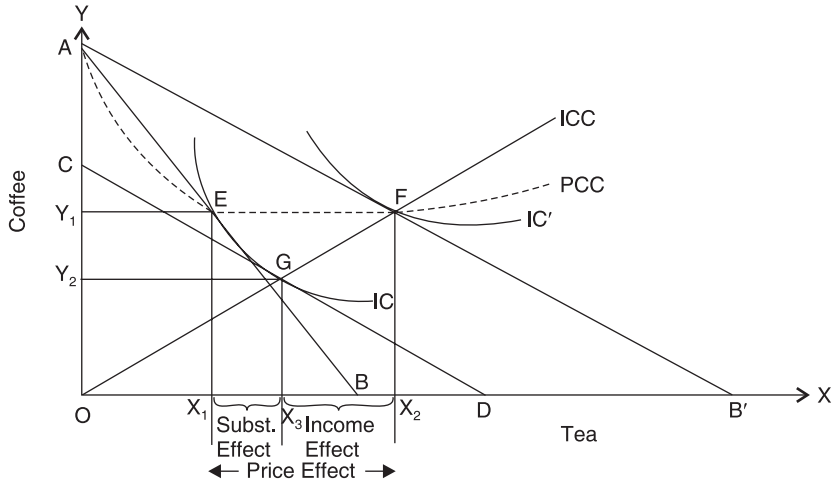

Fig. 2.15. The price effect.

Mathematically, the sign of income effect of a price change is also negative for normal commodities and it reinforces the negative substitution effect (both work in the same direction). Therefore, the total price effect (for normal goods) remains negative. Even if income effect is zero the price effect will remain negative and will be equal to substitution effect. The law of demand showing inverse price-demand relationship will hold.

We have just noticed that when the price of commodity 'X' falls, two effects—substitution effect and income effect are generated. The former makes commodity 'X' cheaper compared with another commodity and the latter increases the real income of the consumer. The total increase in quantity demanded (total price effect) is the result of the combined action of these effects. The movement of equilibrium point from 'E' to 'F' in Fig. 2.15 has occurred into two steps; first from point 'E' to point 'G' as a result of substitution effect (when compensation for the change in real income is made) and then from point 'G' to point 'F' as a result of income effect (the effect of removing the compensation). The price effect is, thus, the sum of substitution effect and income effect. The various effects on the purchase of commodity 'X' (Fig. 9.15) is as follows:

Price Effect (P.E.) = X_1 X_2 (movement from point 'E' to point 'F')

Substitution Effect (S.E.) = X_1 X_3 (movement from point 'E' to point 'G')

Income Effect (L.E.) = X_2X_3 (movement from point 'G' to point 'F')

Clearly,

$$X_1 X_2 = X_1 X_3 + X_3 X_2$$

Price Effect = Substitution Effect + Income Effect

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Normal Commodity Case (Price Rise): The procedure for splitting up of price effect is now explained, when the price of commodity 'X' (tea in our case) rises. The original budget line AB is tangent to the indifference curve IC at point 'E'. At this point, Px/Py = MRS xy if the price of tea rises (price of commodity 'Y', i.e., coffee and money income of the consumer remaining constant), this equilibrium is disturbed and Px/Py becomes more than MRSx.v'. The consumer undertakes consumption adjustment. A new equilibrium is established at point 'F' on a new steeper budget line AB′, where it is touched by a lower indifference curve IC′. At this price, the price ratio changes, but, again becomes equal to the marginal rate of substitution (MRS). As a result, the demand of tea falls from OX_1 to OX_2. The movement from point 'E' to point 'F' or expansion in quantity demanded X_1 X_2 is called the price effect. It is composed of substitution effect and income effect.

The consumer suffers a decline in real income on account of increase in the price of commodity 'X'. The income effect can be eliminated from the price effect, if the consumer is given additional money income just sufficient to maintain his initial level of satisfaction. The compensation to the consumer is equal to B′D in terms of tea or AC in terms of coffee. This compensation is shown by constructing a compensated budget line CD (lying above the budget line AB) parallel to the new budget line AB′ and tangent to the original indifference curve at point 'G'. The income which compensates the consumer for the rise in price of tea is known as compensating variation in income.

Although the consumer is back on the original indifference curve, he purchases less of tea and more of coffee since tea has become relatively dearer. The movement from point 'E' to point 'G' measures the Hicksian substitution effect. In quantity terms, it is equal to X_1 X_3 (a reduction in quantity demanded of tea from OX_1 to OX_3 on account of its relative expensiveness). The income effect can be known, once money given to the consumer is taken back, in which case the consumer will move back from point 'G' to equilibrium point 'F'. This movement is called income effect. In quantity terms, it is equal to $OX_3 - OX_1$.

The result can be presented as under (Fig. 2.16).

Price Effect = X_1 X_2

Substitution Effect = X_2 X_3

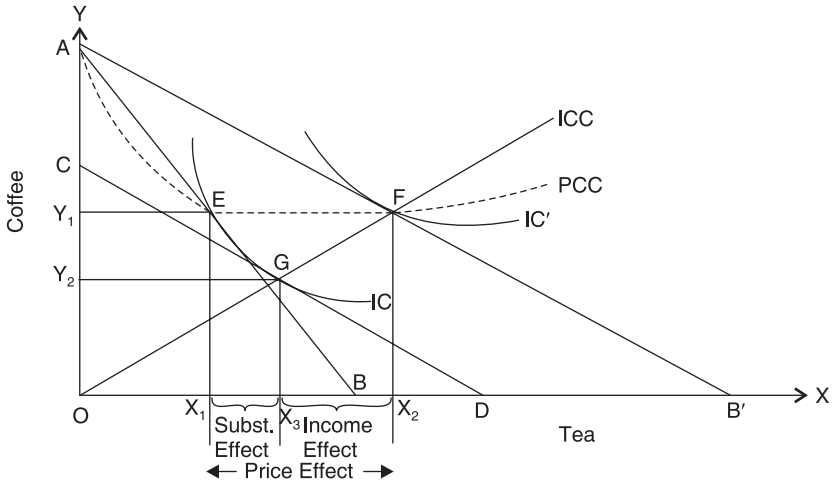

Fig. 2.16. Separation of price effect into substitution effect and income effect for a rise in the price of commodity on X-axis (Hicksian approach)

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Income Effect = $X_3\ X_2$

Since, $X_1\ X_2 = X_2\ X_3 + X_3\ X_2$

$\therefore$ Price Effect = Substitution Effect + Income Effect

Thus, the demand curve has negative slope due to two effects, namely, substitution effect and income effect. Both of these effects extend the demand of the (normal) commodity, whose price falls and makes the demand curve slope downward.

Mathematically,

P.E. = $\dfrac{\partial X}{\partial P_X}$ (Price of other commodity PY and money income 'M' are constant)

S.E. = $\dfrac{\partial X}{\partial P_X}$ (Real income and hence satisfaction level held constant)

I.E. = $\dfrac{\partial X}{\partial P_X}$ (Price ratio X $\dfrac{P_X}{P_Y}$ held constant)

Now, since P.E. = S.E. + I.E.

$$\therefore \quad \frac{\partial X}{\partial P_X}\bigg|_{M=M_0,\ P_Y=P_{Y0}} = \frac{\partial X}{\partial P_X}\bigg|_{U=U_0} + \frac{\partial X}{\partial P_X}\bigg|_{\frac{P_X}{P_Y}=\frac{P_X}{P_Y}}$$

Giffen Commodity Case: So far we have discussed the Hicksian approach to the decomposition of price effect in case of normal commodity. If commodity happens to be a Giffen commodity, the substitution effect of the price change will continue to be negative. However, the mathematical sign of the income effect will be positive. For Giffen commodities. the positive income effect is stronger in magnitude than the negative substitution effect. Therefore, their sum total price effect is positive. As a result, the normal inverse price-demand relationship does not hold in case of Giffen commodities. The case of a Giffen commodity is illustrated in Fig. 2.17.

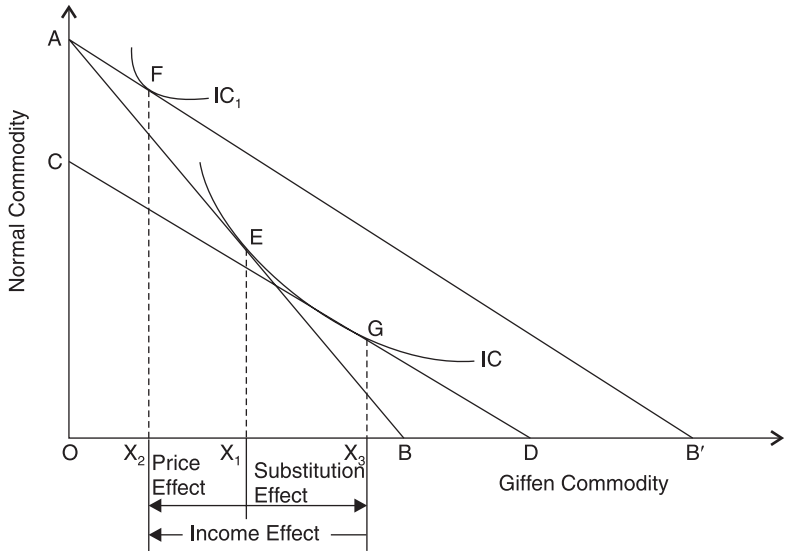

Fig. 2.17. Break-up of price effect into substitution effect and income effect in the case of Giffen commodity.

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In Fig. 2.17, a Giffen commodity is shown along X-axis, while a normal commodity is taken on the Y-axis. The original equilibrium of the consumer with the given income price situation occurs at point 'E', where the original budget line touches the indifference curve IC. With a fall in the price of the Giffen commodity, the consumer shifts to point of contact 'F' between the new budget line AB' and indifference curve IC'. Consequently, the consumption of the Giffen commodity decreases from OX_1 to OX_2. Since with the fall in price of Giffen commodity, its consumption has decreased, the price effect equal to X_1 X_2 in quantity terms is positive. This price effect (the movement from point E to point F) comprises two effects. The movement from point 'E' to point 'G' in the figure is the substitution effect, which induces the consumer to buy more of the (Giffen) commodity. This effect (equal to X_1 X) is isolated from the price effect by drawing an income compensating budget line CD parallel to the new budget line AB and touching the original indifference curve IC at point 'G'. Further, the movement from point 'G' to point 'F' is the income effect, which is equal to X_3 X_2 in quantity terms. Clearly, the positive income effect X_3 X_2 in this case is large enough to outweigh the negative substitution effect X_1 X_3. Therefore, the net effect of the fall in price of Giffen Commodity is the fall in the demand of this commodity. In general, it can be stated that quantity demanded of a Giffen commodity varies directly with the price and the demand curve is upward sloping. The law of demand is violated in the case of Giffen commodity. Following conditions are necessary for this situation termed as Giffen case or Giffen paradox:

- The commodity must be an inferior commodity having a substantial income effect with a positive mathematical sign. The consumption of the commodity should fall on account of rise in consumer's real income, when the price of the commodity falls.
- The income effect can be substantial, when the consumer spends a very large proportion of his income on the commodity in question. As a result, a large amount of income is released, when the price of the commodity falls.
- The substitution effect must be small so that the bigger positive income effect may outstrip the negative substitution effect making the price effect positive.

From the above discussion, it is concluded that *Giffen* commodities are those inferior commodities on which a consumer spends a major part of his total expenditure so that the positive income effect of a price change is bigger enough to overwhelm the negative substitution effect. As a result, the consumer reduces the demand of a commodity with fall in its price and vice versa. The negative substitution increases the quantity demanded, while the positive income effect reduces the quantity demanded by still greater amount, whenever the price of a *Giffen* commodity falls and vice versa.

The *Giffen* case may be theoretically conceivable, but its chance of occurrence in the real world is almost negligible. This is on account of the fact that the consumption of the households is so diversified that they spend a small proportion of their income on a single commodity. Consequently, even price induced negative income effect is too weak to swamp the substitution effect.

Inferior Commodity Case: *All Giffen commodities are inferior commodities, but all inferior commodities* are not Giffen commodities. Those inferior commodities which are not Giffen commodities too have positive mathematical sign of income effect which works in opposite direction to that of negative substitution effect. However, for such commodities, the negative substitution effect will more than offset the positive income

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effect, so that the total price effect will be negative. As a result the normal law of demand holds. Thus, the negative substitution effect is adequate for establishing the inverse price demand relationship in most cases.

When the price of an inferior commodity falls, the substitution effect acts to increase the quantity demanded while the income effect tends to reduce the quantity demanded. The price effect, which is the sum of the substitution effect, and income effect, depends upon the relative strength of the two effects. For inferior commodities (which are not Giffen), the positive income effect is weaker than the negative substitution effect, since a consumer spends a very small proportion of his income on a single commodity. This is illustrated in Fig. 2.18.

In Fig. 2.18, the consumer is in equilibrium at point 'E' on the original budget line AB and indifference curve IC. The fall in the price of inferior commodity (shown along the X-axis) makes the consumer to shift to point 'F', where the new budget line AB′ touches a higher indifference curve IC′. Consequently, the quantity demanded rises from OX_1 to OX_2. X_1 X_2 measures the price effect. The increase in real income as a result of the fall in the price of inferior commodity needs to be compensated such that the real income is held constant at the new price ratio. The required decrease in money income is called the compensating variation. Graphically, the compensating variation is depicted by constructing compensated budget line CD parallel to the new budget line AB′ and tangent to the original indifference curve IC at point 'G'. The movement from point 'E' to point 'G' is the Hicksian substitution effect. In quantity terms, it is equal to the increase in the quantity demanded of commodity X from OX, to OX_3' i.e., X_1 X_3. The substitution effect is negative because the consumer demands more of this commodity on account of its relative cheapness to other commodity 'Y'. If the consumer is restored back the compensating variation that was taken away from him, the real income of the consumer rises. Since commodity 'X' is an inferior commodity, less of it (from OX_3 to OX_2) will be demanded with an increase in real income.

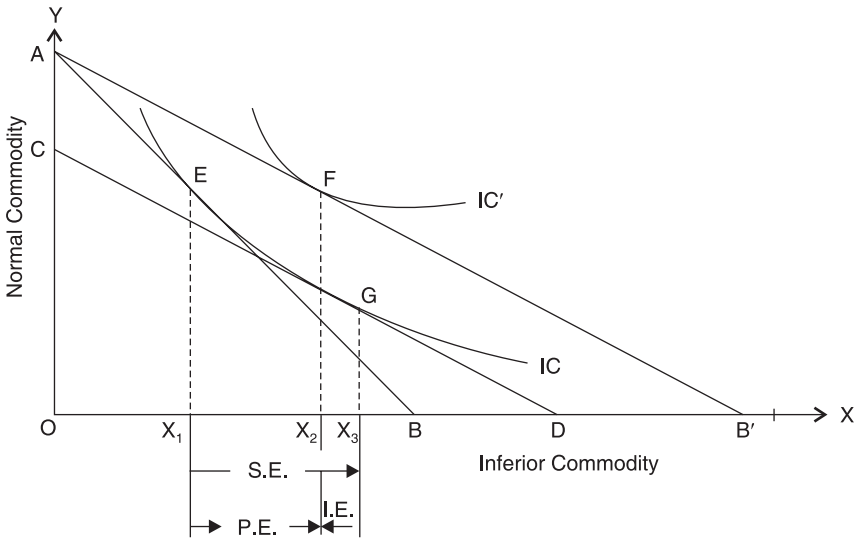

Fig. 2.18. Break-up of price effect into substitution effect and income effect in the case of inferior commodity.

The movement from point 'G' to point 'F' reflects negative income effect. In quantity terms it is equal to X_3 X_2. Here, substitution effect (X_1 X_3) dominates over income effect

(X_3 X_2). Hence, there is a net increase in the quantity demanded equal to X_1 X_2 (price effect). Thus, we conclude, the quantity demanded varies inversely with price in the case of inferior commodities.

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Perfect Complements Case: As discussed in the previous chapter, for perfect complements, the indifference curves are L-shaped. The breaking up of price effect for such goods is shown in Fig. 2.19. The original equilibrium of the consumer is at point 'E', where the initial budget line AB meets the common point to L shaped indifference curve IC. At this point, OX quantity of commodity 'X' is demanded. When the price of commodity 'X' falls, the budget line shifts rightward to AB′. On this budget line, the highest possible indifference curve IC′ meets at equilibrium point 'F'. The increase in quantity demanded from OX_1 to OX_2, i.e., X_1 X_2 depicts the price effect. As the two commodities are perfect complements to each other, the Hicksian substitution effect is equal to zero. This is also clear from the fact that the compensated budget line CD drawn parallel to the new budget line AB′ passes through the same point 'E' on the original budget line AB and point of original indifference curve IC. This implies that the entire increase in quantity demanded is due to the income effect. Thus, price effect of X1 X2 is equal to income effect.

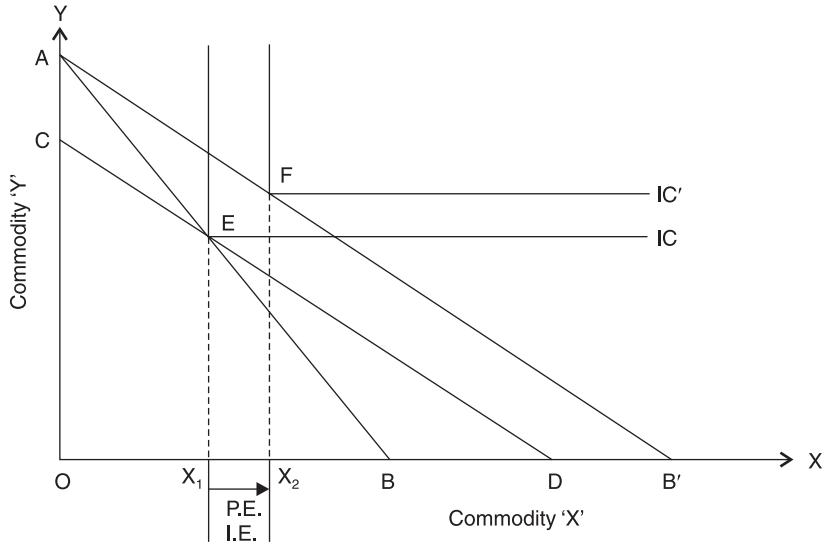

Fig. 2.19. Break-up of price effect in the case of perfect complements.

Perfect Substitutes Case: When two commodities are perfect substitutes, the indifference curves are straight lines and have constant marginal rate of substitution, which is greater than or equal to one. The decomposition of price effect in the case of such commodities for a fall in the price of commodity 'X' is represented in Fig. 2.20(a). In this figure, the initial equilibrium of the consumer occurs at point AB, where the initial budget line 'A' has a comer solution with the initial indifference curve IC. When the price of commodity 'X' falls, the budget line shifts to the right to AB′ and the new consumer equilibrium shifts to point B′ on the new budget line (again a common solution). The quantity demanded rises from O to DB′ as a result of a fall in the price of commodity 'X'. Thus, the price effect is equal to DB′. To isolate the substitution effect, compensated budget line CD is drawn parallel 'to the new budget line AB′ and touching the original indifference curve IC. Now, the Hicksian substitution effect would be a movement from point 'A' to point 'D' and the income effect would be a movement from point 'D' to

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point B′. Therefore, OD is the quantity of substitution effect and DB′ is the quantity of income effect. The total price effect is equal to DB′. Thus, the demand curve for the commodity 'X' is downward sloping.

Now, consider another situation (where the consumer is in equilibrium at another common point 'B' of initial budget line AB on the X-axis. At this point, he demands DB quantity of commodity 'X'. When the price of commodity 'X' falls, the equilibrium point shifts to point B′ on the new budget line AB′. The total price effect in this case is equal to BB′. When money income is decreased to hold real purchasing power constant, the compensating budget line CD so obtained is parallel to new budget line AB′ and touching original indifference curve IC. The implication is that Hicksian substitution effect is zero. The quantity demanded corresponding to original equilibrium and compensated budget is same at DB. Thus, the entire increase in the quantity demanded is on account of income effect. In other words, the price effect DB is equal to income effect. Further, the demand curve for commodity 'Y' is downward sloping.

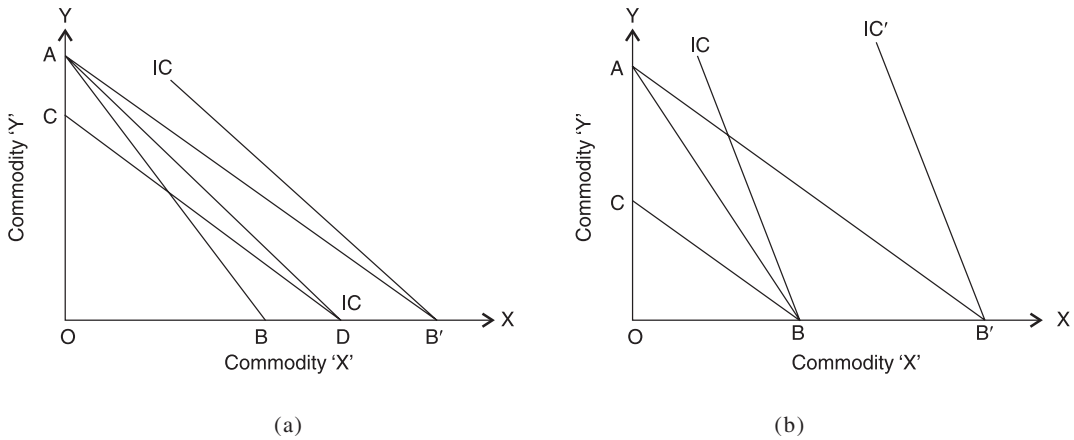

Fig. 9.20. Break-up of price effect in the case of perfect substitutes.

Equivalent Variation is Income Method

Equivalent variation is another way in which the composition of price effect can be analyzed. There is a slight difference in this method and that of compensating variation in income method. Under equivalent variation method, the consumer's income is changed (at the original equilibrium point) and he reaches a new indifference curve, relative prices remaining constant. The required change in money income is equivalent to the change in price of the commodity 'X' in terms of satisfaction. The substitution effect is shown along the subsequent indifference curve. The splitting of the price effect in this method is shown in Fig. 2.20

Commodities 'X' and 'Y' are shown along X and Y axis respectively. The initial equilibrium of the consumer is at point 'E', where the original budget line AB touches the original indifference curve IC. When the price of commodity 'X' falls the consumer is in a position to buy more of both the commodities with increased real income. Suppose, he actually buys a combination of the two commodities indicated by point 'F', where the new budget line AB′ is tangent to a higher indifference curve IC′ the movement from equilibrium point 'E' to equilibrium point 'F' shows the price effect. A fall in the price of commodity 'X' releases some amount of money, if the consumer wants to maintain the same level of satisfaction as before. Money, thus, released can be used to spend

on both the commodities. In Fig. 2.21, increase in purchasing power (real income) on account of a fall in the price of commodity 'X' is CA in terms of commodity Y and DB′ in terms of commodity 'X'. In the figure, CD line is drawn parallel to AB such that it touches the indifference curve IC′ at point 'G'. The movement from point 'E' to point 'G' along income consumption curve ICC indicates the income effect of the price fall. The movement from point 'G' to 'F' on account of relative cheapness of commodity 'X' is referred to as substitution effect. In quantity terms, price effect (X_1 X_2) is equal to the sum of income effect (X_1 X_3) and substitution effect (X_3 X_2). The analysis of price effect for rise in the price can be similarly explained.

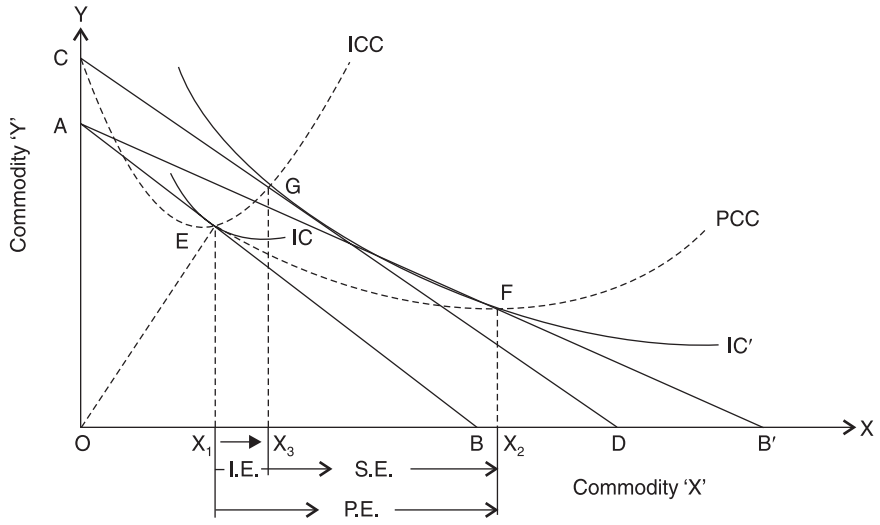

Fig. 2.21. Decomposition of price effect through equivalent variation in income.

Break-up of fPrice Effect under Slutsky's Approach (Through Cost Difference)

Eugen Slutsky, a Russian economist gave the indifference curve technique prior to *R.G.D. Allen* and *J.R. Hicks* in 1915. His analysis was highly mathematical and has important empirical and practical uses. It was relatively complex and was in Russian script. That is why, it did not come in the lime-light. Even *Allen* and *Hicks* admitted the fact in their analysis.

Under *Slutsky's* approach, when the price of a commodity changes, a consumer's purchasing power changes equal to the price change multiplied by the number of units of the commodity which the consumer used to buy at the original price. As a result, the income of the consumer changes by the amount equal to the change in the purchasing power. He is now able to purchase the old combination of the commodities.

The splitting of the price effect under Slutsky's approach is illustrated in Fig. 2.22. The initial equilibrium of the consumer is at point 'E' at the point of contact of the indifference curve IC and the initial budget line AB. Now, suppose the price of commodity 'X' falls, the new equilibrium of the consumer occurs at point 'F' on the new budget line AB′. The price effect given by the movement from point 'E' to point 'F' is equal to X_1 X_2 in quantity terms.

To isolate the substitution effect from the price effect, the money income of the consumer is reduced by such an amount that he is in a position to purchase the original

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combination of the commodities. For this purpose, an imaginary line CD is drawn parallel to new budget line AB′ and passing through original equilibrium point 'E'. In this manner, an income equal to CA in terms of commodity 'Y' or DB′ in terms of commodity 'X' has been taken away from the consumer. Now, the consumer will not choose to buy the combination of the two commodities represented by point 'E', but will opt for and settle at point 'G', where the imaginary budget line CD touches an indifference curve Ie. This is on account of the fact that commodity 'X' becomes relatively cheaper and the consumer substitutes this commodity for commodity 'Y'.

The consumer cannot move along the same indifference curve in this Slutsky substitution case, since the imaginary price line CD, on which the consumer has to remain is not tangent to the indifference curve IC. Under Slutsky approach, *what remains constant is only the apparent real income and not the real income of the consumer, as the consumer is able to move on to a higher indifference curve*. In Fig. 2.22, the movement from point 'E' to point 'G' is called Slutsky substitution effect, which is equal to X_1 X_3 in quantity terms like *Hicksian* substitution effect. *Slutsky* substitution effect of a price change is also always negative, since change in quantity demanded due to a substitution effect is opposite to the change in price of the commodity. The Slutsky substitution effect is due to the change in relative prices alone, as the effect due to rise in real income has been eliminated by reducing money income equal to cost difference.

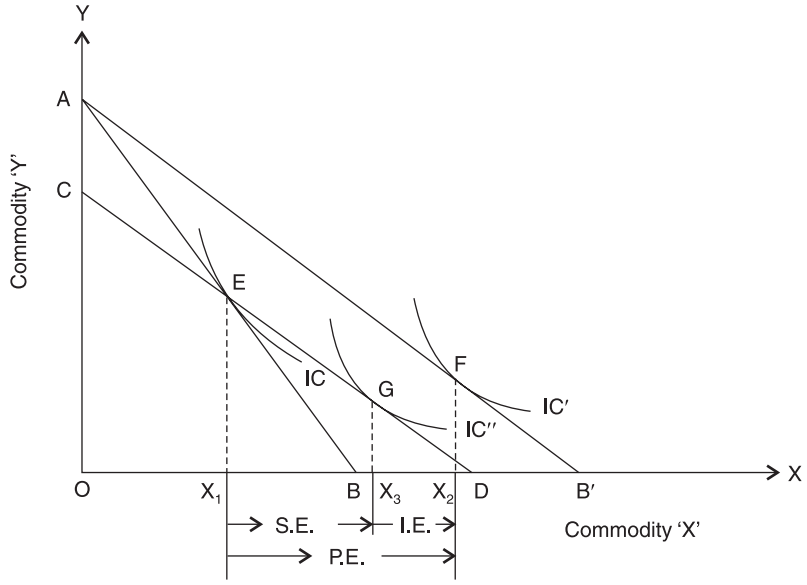

Fig. 9.22. Break-up of price effect into substitution effect and income effect (Slutsky Approach).

If now, the money income taken from the consumer is given back to him, he will move from point 'G' to point 'F' on the indifference curve IC′. The journey from point 'G' to point 'F' is income effect, which is equal to X_3 X_2 in quantity terms.

Now, we can say that,

Price Effect (X_1 X_2) = Substitution Effect (X_1 X_3) + Income Effect (X_3X_2)

The decomposition of price effect into substitution effect and income effect for the rise in the price of commodity 'X' under this approach can be similarly explained.

It is important to note that the direction and magnitude of the change in quantity as a result of the fall in price depends upon the direction and magnitude of income effect

and substitution effect. The following points summarise the relationship between price and quantity demanded under various situations.

1. The quantity demanded of a commodity varies inversely with price, when the income effect is zero or negative, but, is weaker than the substitution effect.
2. The quantity demanded of a commodity varies directly with price, when the income effect for the commodity is negative and is more powerful than the substitution effect.

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2.5 DERIVATION OF COMPENSATED DEMAND CURVE

The substitution effect of a price change under Hicksian approach and Slutsky approach has already been explained in the previous section. The compensated demand curve can be derived using these substitution effects in the same way in which demand curve and Engel demand curve were derived from price consumption curve (PCC) and income consumption curve (ICC) respectively. The derivation of compensated demand curve under the two approaches is illustrated in Fig. 2.23.

First, we consider the derivation of Hicksian compensated demand curve. In the upper panel of Fig. 2.23 the vertical axis shows the money income and the horizontal axis shows the quantity of commodity. The consumer is in equilibrium at point 'E', where the initial budget line is tangent to indifference curve IC. Now, suppose the price of commodity 'X' falls. The consumer's equilibrium shifts to point 'F' on the new budget line and higher indifference curve IC′. Hicks-Allen substitution effect is shown as a movement along the same indifference curve IC. Under Hicksian approach, since the consumer is just compensated for the change in his real income on account of a price change, his level of satisfaction is restored to the original level through compensating variation. We know that the consumer substitutes relatively cheaper commodity. In the figure, the consumer increases the quantity demanded of commodity 'X' from OX to OX_2, while the quantity demanded of commodity 'Y' falls from OY to OY′. The Hicksian substitution effect in the figure measures the effect of change in relative prices, with real income constant, since two budget lines AB and CD (with different slopes) touch the same indifference curve IC at point 'E' and 'G'. The movement from equilibrium point 'E' to equilibrium point 'G' reflects the substitution effect. It is equal to X_1 X_1 in quantity terms.

In the lower panel diagram, the vertical axis shows the price of commodity 'X' and the horizontal axis shows the quantity of commodity 'Y'. We record that the quantities demanded corresponding to equilibrium points 'E' and 'G' are OX and OX_3 respectively. When these quantities are plotted against their respective prices OA/OB and OA/OB′ in the lower panel of the figure, we get Hicksian compensated demand curve CD.

Now, we consider the derivation of Slutsky compensated demand curve. In upper panel of Fig. 2.23 the consumer equilibrium shifts from point E on the budget line AB to point F on the budget line AB′, when price of the commodity X falls. Again, money income of the consumer is shown along the vertical axis and the quantity demanded of commodity 'X' is shown along the horizontal axis. Indifference curves IC and IC′ touch the two budget lines at these points respectively. Now, the money income of the consumer

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is adjusted by taking away money, such that the consumer is able to purchase the original combination of the two commodities. For this purpose, an imaginary budget line CD is drawn parallel to new budget line AB′ and passing through original equilibrium point 'E'. We observe that the Slutsky approach over compensates the consumer and puts him at a point, say, 'G' on a higher indifference IC″ on the budget line CD. The journey from point 'E' to point 'G' is the substitution effect, which is equal to X_1 X_3 in quantity terms.

In the lower panel diagram, the vertical axis shows the price of commodity 'X' and the horizontal axis shows the quantity demanded of commodity 'X'. We observe that the quantities demanded corresponding to equilibrium points E and G are OX_1 and OX_3 respectively. When these quantities are plotted against their respective prices OA/OB and OA/OB′ in the lower panel of Fig. 2.23, we get Slutsky compensated demand curve (CD′).

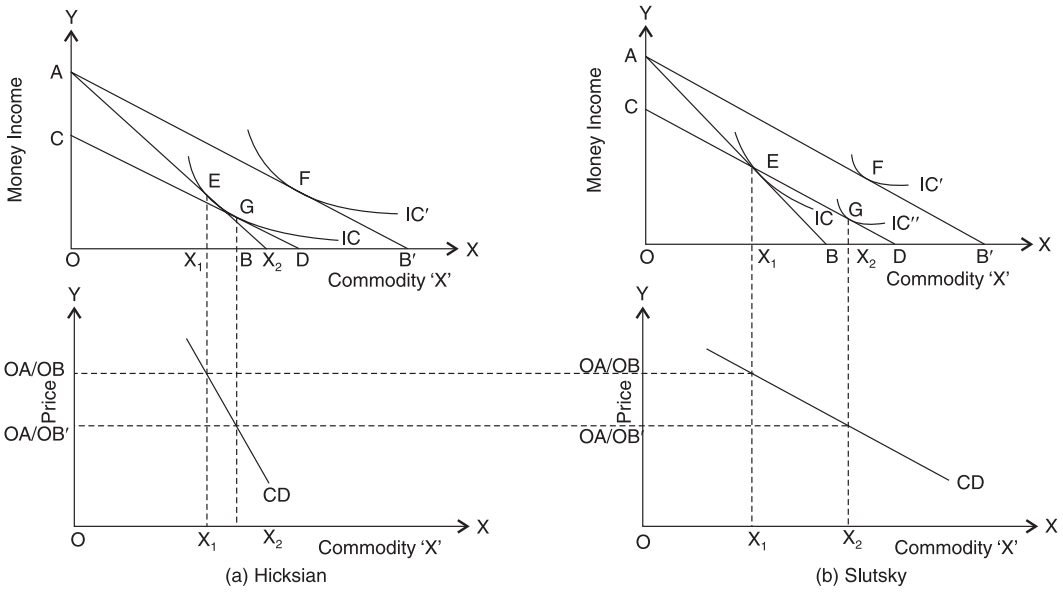

Fig. 2.23. Derivation of compensated demand curve.

It is important to note that the compensated demand curve (or constant real income demand curve) under both the approaches is downward sloping. However, the *Slutsky compensated demand curve is more elastic than the Hicksian compensated demand curve*. Further, since the sign of substitution effect is always negative, the compensated demand curve is always downward sloping, whether the commodity under consideration is a normal commodity, inferior commodity or a Giffen commodity. Thus, its shape is independent of the nature of the commodity. The conventional demand curve for a normal commodity is even more elastic than Hicksian as well as Slutsky compensated demand curve, as it includes income effect besides substitution effect of a change in the price of a commodity. For an inferior commodity, the elasticity of demand of the conventional demand curve will be less than that of the corresponding compensated demand curve. When income effect is equal to zero, the elasticity of demand of the conventional demand curve will be same as that of corresponding compensated demand curve. For a Giffen commodity, unlike compensated demand curve the conventional demand curve is upward sloping. The elasticity of demand for such demand curve depends upon the relative strength of the substitution effect on one hand and the income effect on the other hand.

2.6 FURTHER APPLICATIONS OF INDIFFERENCE CURVE ANALYSIS

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In the previous chapter, the applications of indifference curve analysis to study and explain consumer's demand and behaviour were discussed. This technique can also be fruitfully applied to analyze several other economic phenomena and in some situations to solve many economic problems. Some of the such popular applications are discussed in this chapter. The applications of the indifference curve technique in the fields of welfare economics and international trade can be discussed at length in their respective chapters.

Taxation (Direct Taxes Versus Indirect Taxes)

Taxation is the most important source of revenue for the government. The taxes are broadly divided into two categories—direct taxes and indirect taxes. Direct taxes like income tax, wealth tax and gift tax are those taxes whose initial impact and ultimate incidence fall on the same person, i.e., the person on whom the tax is imposed cannot shift the burden of the tax partly or fully. These taxes have to be paid by the individuals or firms on whom these are levied. On the other hand, indirect taxes such as sales tax, excise duty and customs duty are those taxes, whose impact and incidence fall on different persons, i.e., the person on whom the tax is levied can shift its buden wholly or partly to some other person. The extent of shifting depends on the elasticity of demand and elasticity of supply. Indirect taxes are levied on commodities and services which are paid by the individuals, when they buy these commodities and services. The sellers/ manufacturers of the commodities and services are, thus, able to shift the burden of tax on the consumers by raising the prices.

While raising additional revenue, the government often faces the problem of choice of levying a direct tax or an indirect tax. This requires an understanding of the welfare effects of a given amount of revenue raised through a direct tax on one hand and an indirect tax on the other hand. For this purpose, we can make use of Hicks-Allen indifference curve technique, as explained below.

The quantity of a commodity 'X' is measured on the X-axis, while money income is taken along the Y-axis with a given income of the consumer and the given price of commodity 'X', the initial budget line is AB. The consumer is in equilibrium at point 'E' where this budget line is tangent to indifference curve IC. This indifference curve shows the level of welfare attained in the pre-tax situation. Now, suppose that the government levies an indirect tax, say, excise duty on commodity 'X' (either at a specific rate or at an advalorem rate). This will raise the price of commodity 'X' depending on the elasticity of demand and supply. As a result, the budget line will rotate to a new position AB', which is tangent to a lower indifference curve IC′ at point 'F'. Thus, the level of a consumer's welfare falls consequent upon the imposition of a commodity tax (indirect tax). At the new consumer equilibrium point, the consumer demand OH quantity of commodity 'X' by spending IA amount of his income on it. The money income left with the consumer is equal to OI. In the absence of excise duty, the consumer could have purchased OH quantity of commodity 'X' for JA amount of money at the old price. Therefore, the excise duty paid by the consumer is equal to FK.

If instead of excise duty, the government levies an equal yield (revenue) direct tax on income then the new budget line CD passes through point 'F' and is parallel to the

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initial budget line AB (since prices are assumed to be unaffected). A downward shift in the budget line is on account of reduction in the individual's disposable income, when a tax is imposed on his income. The gap between the budget lines AB and CD is equal to IJ or FK. This shows that the same amount of revenue is to be raised through income tax as with the excise duty. However, with CD as the budget line, the consumer is in equilibrium at point 'G' on indifference curve IC″ which lies at a higher level than at point 'F'. This implies that when the government raises resources through direct taxes, the consumer is relatively better off as compared to the situation, when the same amounts of resources are raised through indirect taxes.

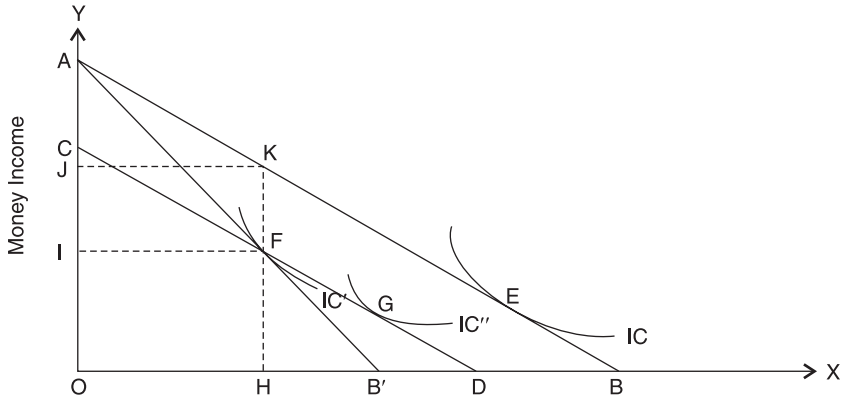

Fig. 2.24. Impact of direct and indirect taxes on consumer's welfare.

It is important to note that a tax is a compulsory payment (levy) against which the tax payer can expect no direct benefit in return (no quid pro quo). Therefore, a tax will always lower an individual's welfare. But reduction in welfare would be lesser under a direct tax system than under an indirect tax system. In Fig. 2.24, the welfare of the consumer has reduced from IC to IC″ under income tax (a direct tax), while it has reduced from IC to IC′ in the case of excise duty (an indirect tax). The reduction of welfare in the former case causes an inevitable burden on the consumer. On the other hand, the reduction in welfare in the latter case leads to excess burden. We observe that an indirect tax imposes a burden in excess of the inevitable burden.

This conclusion regarding excess burden of indirect tax as compared to with the direct tax may be true for a single individual, whose whole income is taxed at a uniform rate. Whether indirect tax reduces welfare more than direct tax depends upon other conditions also for the economy as a whole. A direct tax may not always be superior to an indirect tax or a general tax may not always be better than a specific tax. The outcome under a general equilibrium framework might become different.

This excess burden arises, as the tax on commodity 'X' distorts a consumer's choice, through a change in the relative price structure. On the contrary, a general income tax does not distort relative prices or consumer's choice. It only reduces disposable income of the consumer and hence, the attainable consumption set. It lowers welfare and imposes an inevitable burden, but no excess burden. Thus, from an individual tax payer's point of view, income tax is preferable to excise duty. The Finance Minister acting on the principle of least aggregate sacrifice should collect the given amount of revenue by introducing direct tax rather than a commodity tax.

The extent of excess burden under indirect tax depends on the elasticity of substitution or the curvature of the indifference curve. Greater is the elasticity of substitution, greater

is the distortionary effect of a specific tax imposed on commodity 'X' due to substitution of the non-taxed commodity for the taxed one. Lower the elasticity; the smaller will be the excess burden of an indirect tax on account of low substitution effect. In an extreme situation, when the two commodities are perfect substitutes, the excess burden of the indirect tax will be maximum. In another extreme situation, when the two commodities are perfect complements, there will be zero tax burden.

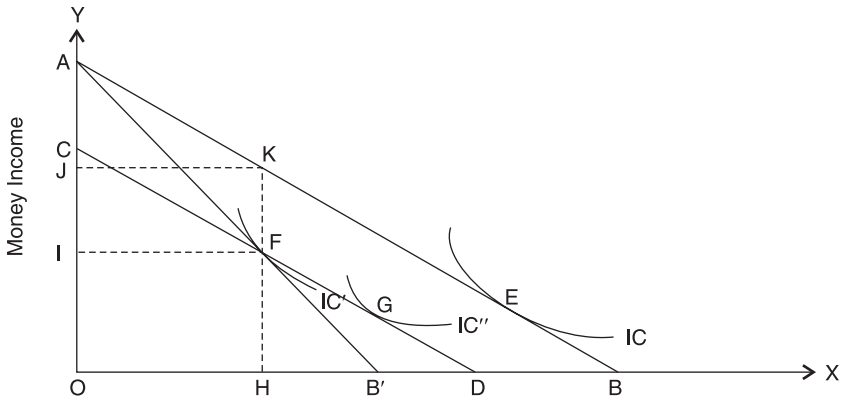

Fig. 2.25. Loss of welfare is same under direct and indirect taxes.

In Fig. 2.25, the initial equilibrium of the consumer is at point 'E' on the original budget line AB. The new equilibrium with the imposition of direct tax (which shifts the budget line downwards parallel to original budget line AB) or indirect tax (which shifts the budget line downwards to AB′) is the same, i.e., point F with L-shaped indifference curves for perfect complements, it is not possible to think of equilibrium other than point F on budget line CD. The loss of welfare is, thus, the same under both the tax systems.

Alternative Government Policies

Indifference curve can also be used to evaluate the effects of alternative government policies. Modem welfare state provides different types of subsidies, particularly to the poor families and special class of people like pensioners. Subsidies may be given in kind in the form of food, medical benefits, free education, etc. or in terms of money (for example, in the form of supplementary income to weaker sections of the society). The government can know the relative cost of these policies, their effects on consumption pattern and welfare level of the weaker sections of the society, etc., with the aid of indifference curve analysis.

Food Subsidy versus Supplementary Income Policy: The government often provides subsidies to help low income group people to meet their requirements of food and reach a certain minimum level of nutrition. In India, the government has been giving such a relief or subsidy to the poor in the case of wheat. The resultant loss to the government is ultimately passed on to the consumers.

The effect of food subsidy and supplementary income policy of the government is illustrated in Fig. 2.26. Consider the case of food subsidy. Suppose that under food-subsidy programme, the needed families are enabled to purchase food at half the market price, the other half being paid by the government as subsidy. The effect of this subsidy on consumer's welfare is shown in Fig. 2.26, where the quantity of food is measured along the X-axis and money on the Y-axis.

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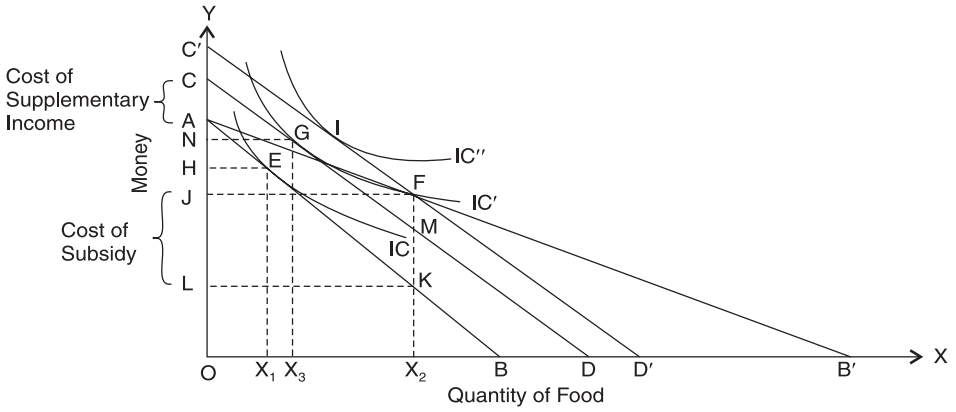

Fig. 2.26. Food subsidy versus supplementary income.

The total money income of the consumer is assumed to be OA. If the whole income is spent on the purchase of food, the consumer can buy OB quantity of food, given the market price of food. The budget line is, therefore, AB. The consumer is in equilibrium at point 'E', where the indifference curve IC touches this budget line. The consumer consumes OX_1 quantity of food at this point paying HC of his income and having OH income left over to spend on other commodities.

Since, it is assumed that the subsidy paid by the government is equal to half the market price of food, the consumer is enabled to purchase double the quantity of food. Thus, with subsidy, the consumer will face a new budget line AB' such that OB′ = 2 OB. With this budget line, the consumer is in equilibrium at point 'F' on it. At this point, a higher indifference curve IC′ touches new budget line AB′. By purchasing OX_2 quantity of food, the consumer is spending JC amount of money.

In the absence of food subsidy the relevant budget line is AB. If no food subsidy was given, the consumer would have spent LA amount of money (which is also the market price of food) for OX_2 quantity of the commodity. After food subsidy, the consumer pays only JA money. Therefore, LA – JA = LJ or KF (the vertical distance between the budget lines AB and AB′ at OX_2 quantity of food) amount is paid by the government as food subsidy to the food producers. In other words, the government subsidizes the consumer by an amount equal to KF or LJ, which is also the cost of subsidization to the government.

Following are the implications of the food subsidy policy adopted by the government:

1. The welfare of the consumer rises from IC to IC' in the Fig. 2.26.
2. The market price of food (LA) remains unaffected by this policy, though the effective price to the consumer is reduced (a subsidy per unit of consumption equal to OB′/OB)
3. The government contributes LJ portion of the market price. Hence, the cost of the subsidization policy to the government is equal to LJ or KF.
4. The food subsidization programme of the government benefits not only the consumers, but also the producers of food stuff, since more food is consumed (an increase from OX_1 to OX). More consumption by the consumers is particularly useful in providing

minimum nutritional requirements of the population especially, when there is surplus food.

5. The assistance to the consumers via the food subsidy imposes a certain pattern of consumption, a definite choice of spending their income.

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Now, we are in a position to find out the money value of this food subsidy (KF), i.e., to know as to how much money will make the consumer as well off as the food subsidy does. For this purpose, the government has to grant a supplementary income to the consumer so that he reaches the same higher indifference curve IC′. The required amount of money or cash subsidy (given original price conditions) can be found out by drawing a budget line CD parallel to the initial budget line and touching the indifference curve IC′ at point 'G'. In this situation, the consumer consumes OX_3 quantity of food by paying NC amount of money like food subsidy, the cash subsidy also benefits consumers as well as producers, since more food is consumed as a result of subsidy. Cash subsidy or grant required to bring the consumer to the indifference curve is AC. This is the cost of the supplementary income policy to the government. However, the cost of food subsidy is KF, which is greater than the cost of supplementary income by MF_3. Thus, the consumer reaches the same level of welfare with less cash relief (AC) as he does with more food subsidy (KF). But, the quantity of consumption of subsidized food is relatively smaller in the former situation (supplementary income policy). The market price of the subsidized food again remains unaffected.

We observe that from the point of view of economic efficiency, cash subsidy is preferable to a food subsidy, since money equivalent of the subsidy is less than the cost of subsidy to the government. So long as the indifference curves remain convex and smooth, the cost of food subsidy always exceeds that of cash subsidy irrespective of the magnitude of the subsidy and preferences of the consumers. In the words of Watson and Getz "The cost of giving subsidies to consumers is always greater than the money equivalent of the subjective gain to the consumers". Further, as a special case of general principle, one can make a man happier by giving him cash instead of a commodity, which he really wants. Relief payments in cash are preferable to a subsidy, since these are economically more efficient, providing either a greater gain at the same cost to the government or the same gain at a lower cost.

Though food subsidy may not be justified on the ground of economic efficiency, but it induces the consumers to consume more food. In times of surpluses in the economy, the government in its value judgement has priority for the amount of commodity demanded. Therefore, the policy of food subsidy is pursued which also helps in attaining production—balance in the economy. Use of food subsidy to dispose of the food surpluses to the needy people would be an ideal measure to improve their health and efficiency by increasing the consumption of food grains in such a situation.

Comparing the two alternative policies, it is concluded that both the policies achieve the government's role of enabling the consumer to reach a higher welfare level implied by a higher indifference curve IC′ in Fig. 2.26. Though the cost of food subsidy programme is higher for the government, it ensures more consumption of food. The choice of policy

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depends upon the goals of the government and the indirect effect of the policy. A more costly food subsidization policy may be adopted for eliminating the food surplus in the country. On the contrary, supplementary income policy though less costly, may result in inflationary tendencies in the economy on account of increased income of some needy groups. This will ultimately decrease the welfare of the consumers. However, the food subsidy policy leaves prices unaffected. At times, when the government is severely constrained by the shortages of resources, it may prefer to adopt supplementary income policy (lump-sum income transfer) to help the weaker sections of the society. In this manner, we see that indifference curve technique helps in efficient policy formulation by giving insight into the implications of alternative government policies.

Equal Sized Cash Grant—If instead of compensating lump-sum subsidy to the consumer the government provides a cash grant of equal size the price ratio will remain constant at the initial level as given by the slope initial budget line AB. The new budget line C′D′ passes through point F and is parallel to initial budget line AB. The cash grant KF equals AC or BD′. Now, the consumer attains equilibrium at point F on the indifference curve IC″. Since this indifference curve lies above the indifference curve IC′, equal sized cash grant ensures more welfare to the consumer than the compensating cash subsidy. The consumption in any case is greater than that in the pre-subsidy/grant situation. Therefore, cash grant lump-sum subsidy should be preferred to excise subsidy from the welfare point of view.

Education Subsidy: In the case of food subsidy, the government pays a part of the price which reduces the effective price of the food to the consumer. However, governments often provide subsidy by making available a certain quantity of the good or service free of cost or at a considerably lower price. The aim of the government is not to provide free or very cheap education to all sections of the society, but only to the poorer sections. Free or highly subsidized education in government institutions is an important example. People requiring larger or different types of educational facilities have to pay higher price for these services in the private institutions. The effect of such fixed quantity subsidy on the consumer welfare is illustrated.

The budget line before the subsidy is AB. Let us suppose, the consumer is in equilibrium at point 'E' on this line by demanding OX_1 quantity of educational services. The consumer retains OY_1 amount of money to be spent on other commodities. Assume that the government introduces free education service in government schools equal to OX_2 in quantity. Now, the relevant budget line of the consumer is ACDB. AC part of the budget line parallel to the X-axis indicates, consumer can avail OX_2 quantity of the schooling absolutely free, thereby saving the entire money income for other commodities. If the consumer desires to consume more than the subsidized quantity OX_2, he will have to bear the entire cost of education himself in some private school along the DB portion of the budget line. With the ACDB budget line, the consumer can choose to consume at point 'C' on thisline. This brings him to a higher indifference curve IC. Therefore, the point 'C' in the post-subsidy situation should be preferred to point 'E' in the pre-subsidy situation. At this point, the consumer consumes OX_2 educational service, which is less than the earlier service consumed by $X_1 X_2$. The money income of $A Y_2$ which was earlier used to avail educational service is now available for other uses.

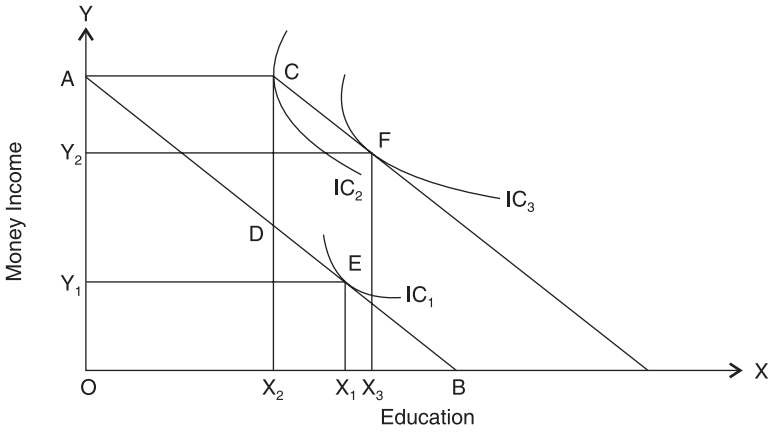

Fig. 9.27. Subsidizing education.

In under-developed countries marked by poor families, the demand for educational services may rise, when education is subsidized. The demand for educational services in such case in the presubsidy situation will be less than OX_2 and the poor family chooses a point along the AD portion of the budget line in Fig. 2.27. Further, when educational services are not made absolutely free, the AC portion of the budget line in Fig. 2.27 will have a negative slope. This generally happens in the case of higher education, professional and technical services, where education is partly subsidized.

There is another way to subsidize education, wherein the families are enabled to educate their children in whatever school they like and also reach a higher level of satisfaction (point 'F' on indifference curve IC in Fig. 2.27). The family is in a position to provide OX units of educational services in some private school by making an effective payment of A Y_2. If the family continues to send its child to the government school, it will remain at point 'C'. On account of resource consideration, this scheme is followed only in the developed countries. The private sector in the developing countries may also pursue this scheme, which coexists along with the normal education subsidization programme of the government.

Economics of Gift

A gift may be given in cash or in kind. The cost of providing gift to a donor will remain the same in both the situations. However, for a recipient of the gift, the gift in cash on one hand and in kind on the other hand will make a lot of difference.

Suppose, you plan to give OQ quantity as gift to your friend on his birthday. The initial budget line AB is tangent to indifference curve IC_1. At point 'E' a gift equal to OQ or AF extends this budget line to AFC. The gift receiver maximizes his satisfaction at point 'F' of the budget set AFC. A gift-in-kind raises the welfare of the recipient from IC_1 to IC_2. When instead of this gift in kind, its money equivalent is given, the gift receiver may become better off by remaining on indifference curve IC_2 and the new budget line DC. This new budget line is parallel to the initial budget line AB and passes through point 'F'. The gift receiver becomes better off with gift-in-cash, because he can spend the cash in any way he likes according to his preferences. But, when the gift receiver has a strong preference for the commodity in which the gift is embodied, there may be no (or not much) differences in welfare consequences of gift in kind and gift-in-cash.

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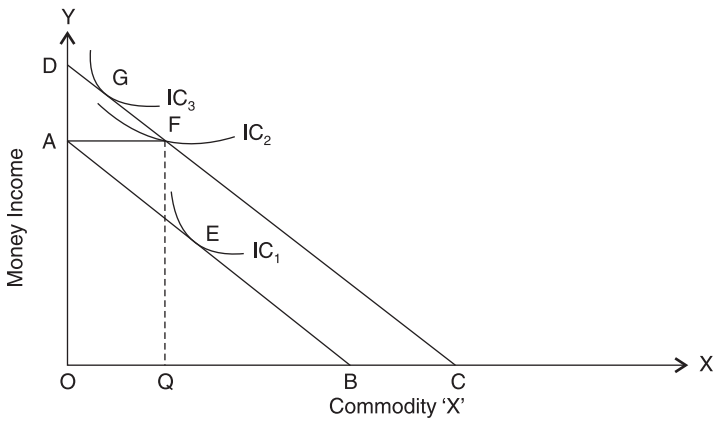

Fig. 2.28. Welfare consequences of gift in kind and gift-in-cash.

During the periods of war or famine, when there is acute shortage of goods, price control is implemented to check prices from rising and rationing is introduced. The mechanism of rationing involves the distribution of goods in short supply among the consumers in an equitable manner. Every consumer is issued a ration card indicating the quantity of different goods, say, wheat and rice, which he can buy every month or fortnightly. The rationing mechanism operates through the budget constraint on one hand and a ration constraint (similar to a budget line) on the other hand.

The budget constraint is on account of the limited income of the consumer, given the prices of goods and services. The ration constraint limits the quantity of a commodity (or more than one commodity) that can be bought. The ration constraint is super imposed with the budget constraint so as to obtain the effective budget set.

Indifference curve analysis can be used to explain under what conditions rationing of goods by the government may act as a potentially binding constraint or an actually binding constraint for a consumer and further how it affects his welfare.

Suppose a consumer consumes two commodities 'X' and 'Y'. Given the income of the consumer and the prices of these commodities, the budget constraint of the consumer can be shown by the budget line AB in Fig. 2.29. The consumer can purchase the maximum quantity OA of commodity 'Y' and the maximum quantity OB of commodity 'X'. The budget set or the market opportunity set of the consumer is given by the area of triangle OAB, from which the consumer can make a choice of the two commodities. In the absence of rationing, the most preferred combination of the two commodities is represented by point 'E', where the budget line is tangent to indifference curve IC.

When the government imposes a ration limit or ration quota of OX_1 for commodity 'X', the ration constraint (shown by a vertical line parallel to Y-axis in Fig. 2.29) proves to be ineffective in restricting the consumption of commodity 'X'. In this case, the ration limit is so large that it is neither an actually binding constraint nor a potentially binding constraint, since point X_1 lies to the right of point 'B'. As the utility maximizing choice of the consumer remains unaffected, the rationing has no effect on the consumer's welfare.

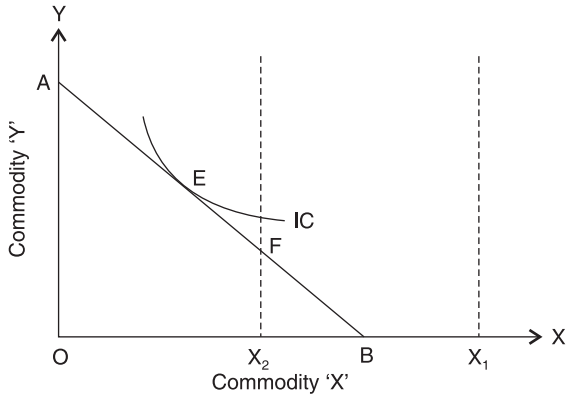

Fig. 2.29. The budget constraint of the consumer.

Now, assume that the ration limit decreases to OX_2 such that point X_2 is to the left of point B in Fig. 2.29. This ration limit reduces the feasible consumption set (set of attainable combinations of two commodities) of the consumer from OAB to $OAFX_2$. However, this ration quota is only a potentially binding constraint, since the ration quota makes any set of two commodities lying in the region X_1 FB outside the reach of the consumer. This quota is not effective in restraining the consumption of the consumer. The consumer can continue to consume the same combination of the two commodities indicated by point 'E'. Though the consumer can purchase the ration amount, but, he is not willing to consume commodity 'X' as much as the ration limit permits him. At equilibrium point 'E', the consumer consumes quantity of commodity 'X', which is smaller than the ration amount OX_2. Here, the consumer's welfare remains undisturbed, when such rationing is introduced by the government. This can be interpreted to be the case of a poor consumer whose optimum consumption basket of the two commodities is small on account of his low income and remains unaffected when ration limits are fixed at a higher level.

Now, consider a more relevant case of rationing, where the ration limit is not only a potentially binding constraint (the market opportunity set gets reduced to OA FX_1 in Fig. 2.30), but, it is also an actually binding constraint. In this case, the ration limit fixed is OX_1, which lies to the left of the equilibrium point 'E'. The consumer is forced to consume only OX_1 of commodity 'X' and not OX_0 as he was consuming before the ration limit was imposed. When ration limit is an actually binding constraint; the

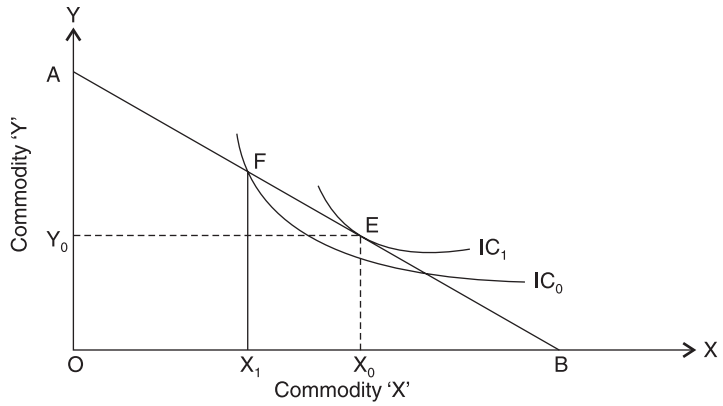

Fig. 2.30. The market opportunity set gets reduced.

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truncated budget line of the consumer becomes AFX_1 with link at point 'F'. On AFX_1, both budget constraint and ration constraint are satisfied. This new equilibrium point lies at lower indifference curve IC_0. Thus, the ration quota makes the consumer to buy less of rationed commodity 'X' and more of non-rationed commodity 'Y' (than what he otherwise preferred). In this manner, the welfare of the consumer is reduced from IC_0 to IC_1, when ration quota becomes an actually binding constraint.

Rationing of Both the Commodities: Consider the case when both the commodities are subject to rationing. Various situations can be thought of:

1. Ration limits on both the commodities are neither potentially nor actually binding. Such rationing has no affect on the market opportunity set or the welfare level of the consumer, since the ration limit is very large and beyond the two extremes of the budget line AB [Fig. 2.31(a)].
2. Ration limits on both the commodities are not actually binding, but potentially binding. In Fig. 2.31(b), the consumer is in equilibrium at point 'E' buying OX_0 of commodity 'X' and OY_0 of commodity 'Y'. Now, suppose ration limits for the two commodities are fixed at OX_1 and OY_1 respectively, indicating the maximum quantities of the two commodities that can be bought. It is clear from the figure that the ration quantities OX_1 and OY_1 are greater than OX_0 and OY_0 of the two commodities that the consumer was purchasing with his given price in come situation. The ration limits don't restrict the consumption of the two commodities.

   Hence, these are not actually binding. These limits merely narrow down the market opportunity set at both ends on X and Y-axis. This can be interpreted to be the case of a poor consumer, whose optimum consumption basket of the two commodities is small on account of his low income and remains unaffected when ration limits are fixed at higher levels. If the income of the consumer rises to such an extent that the budget line lies outside the ration limits, the ration quota will become both potentially binding as well as actually binding. This case is discussed in the next point.

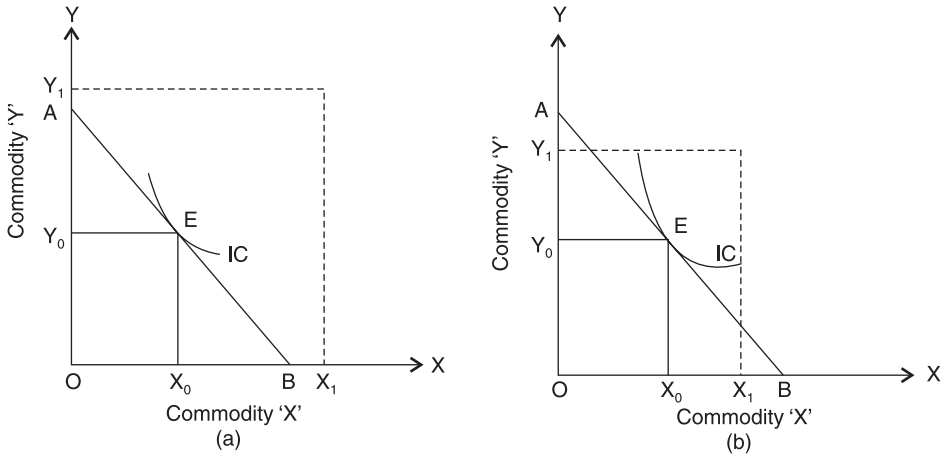

Fig. 2.31. Ration limits do not restrict the consumption of commodities.

Ration limits on both the commodities are potentially as well as actually binding. In Fig 2.32, the consumer is in equilibrium at point 'E' in the absence of rationing of the two commodities. He decides to consume OX_0 quantity of commodity 'X' and OY_0

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of commodity 'Y' at this point. Introduction of ration limits, on the two commodities respectively forces the consumer to consume less quantities of both the commodities (OX_1 and OY_1 respectively at point 'F' in Fig. 2.32) than he would do without the restrain of rationing. Therefore, the rationing in this case is potentially as well as actually binding on him and reduces his welfare from IC_0 to IC_1 at the prevailing market prices. Therefore, it is an ineffective method of distribution of the commodities.

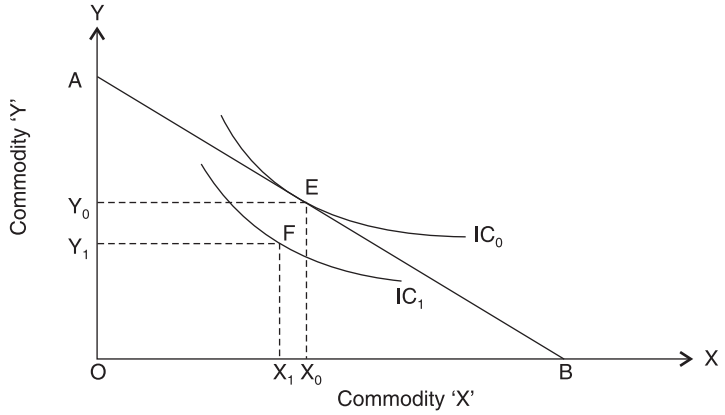

Fig. 2.32. Ration is binding for both the commodities.

Ration limit is binding on one of the two commodities. In Fig. 2.33, the consumer is in equilibrium position at point 'E' on the budget line AB and indifference curve IC_0. It is clear from this figure that the ration limit OX for commodity 'X' is greater than his equilibrium consumption of this commodity, while it is not so for commodity 'Y'. The ration limit of OY, for commodity 'Y' is fixed at a lower level and is potentially as well as actually binding on the consumer. It forces the consumer to shift to point 'F' on a lower indifference curve IC1. Therefore, binding by rationing lowers the level of welfare of the consumer and he consumes less of commodity 'Y' than what he prefers for commodity 'X', the ration limit only reduces the market opportunity set and so is just potentially binding.

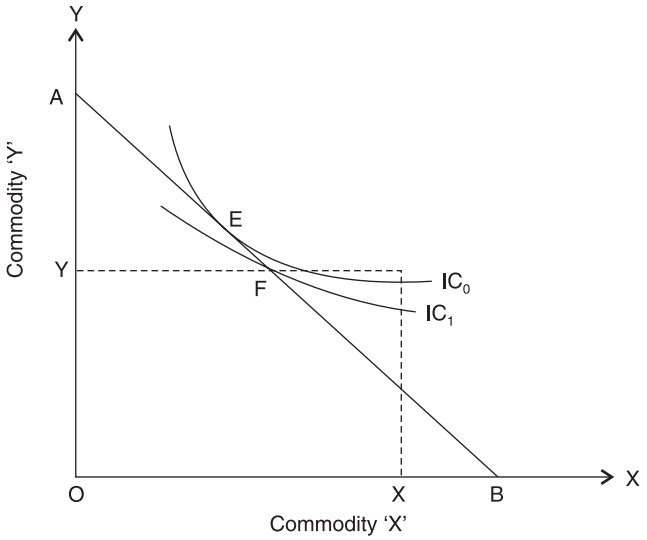

Fig. 2.33. Ration is binding for only commodity 'Y'.

If ration limit on commodity 'X' is potentially as well as actually binding, while it is only potentially binding for commodity 'Y', similar explanation and diagram can be given.

Leisure Income Trade-off

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Indifference curve analysis can also be used to explain worker's choice between income and leisure. The income leisure trade-off and the indifference curve between leisure and income can be used for deriving worker's supply curve and in explaining why firms must pay higher wages for overtime work. For this purpose, the derivation of the income leisure curve is explained below.

The income is earned by doing some work or by sacrificing some leisure. The greater is the amount of this sacrifice, the greater is the amount of work done and hence greater is the income of the worker and vice-versa. It is important to note that the income is used to purchase goods for consumption, while leisure can be used for sleeping, playing, resting, entertaining, etc. Both income as well as leisure provides satisfaction to the consumer. The enjoyment of the leisure yields satisfaction to the consumer directly. On the other hand, income only represents the purchasing power which can be used for the satisfaction of various wants through the purchase of goods and services. Now, it is possible to draw indifference curves between income and leisure.

Fig. 2.34 shows income leisure trade-off through indifference curves representing different combinations of income (earned by working) and leisure time providing equal satisfaction to the worker. The further away indifference curve is from the origin, the higher the level of satisfaction it means for a worker. These indifference curves have usual properties (downward sloping, convex to the origin and never cut each other).

These indifference curves between income and leisure are also called trade-off curves, since they show the trade-off between income and leisure. The trade-off is given by the slope of the indifference curve measuring marginal rate of substitution between income and leisure. This trade-off means how much income the worker is willing to accept for, say one hour sacrifice of leisure time. The trade-off between income and leisure varies at different income-leisure levels.

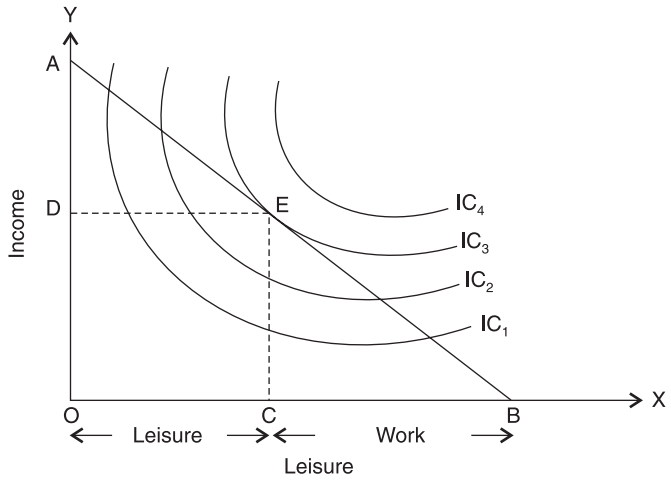

Fig. 9.34. Income leisure equilibrium.

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Income-leisure constraint (line) is superimposed to know the market rate of exchange between income and leisure. In Fig. 2.34, income is measured along the vertical axis and leisure time along the horizontal axis. It is further assumed that the maximum time available for either leisure or work is OB hours a day. The worker can either use all the OB hours for leisure, in which case he earns zero income. He can also choose to work all the OB hours (leisure equal to zero) and earn a maximum income OA. Alternatively, he may use part of the OB hours for leisure and the remaining hours for work, in which case he would earn some income. The line AB is called income leisure constraint.

Income-leisure constraint shows the various combinations of income and leisure among which the worker has to make a choice. It tells how much time of leisure a worker must give up so as to earn a certain level of income. The slope of the income-leisure line AB in Fig. 2.34 is equal to OA + OB. But, OA is the total income earned for working OB hours and OB indicates the total hours worked to obtain OA income. Therefore, OA + OB is equal to wage rate per hour of work. In brief, slope of the income-leisure line is equal to the market wage rate. In other words, to increase leisure by one hour, a worker has to forego the opportunity of earning income (equal to wage per hour) which he can earn by doing work for an hour. The steeper is the income-leisure constraint, the higher is the wage rate per hour.

Income-Leisure Equilibrium: Income-leisure constraint along with the indifference map between income and leisure would determine the actual choice of income and for leisure to the worker in his equilibrium position. This will also automatically show the amount of work (in terms of hours worked) done by him in this optimal situation. This equilibrium analysis assumes that the worker is free to work as many hours per day as he likes and the wage rate is assumed to remain same irrespective of the number of hours he chooses to work.

Fig. 2.34 depicts the worker's equilibrium at point (E) of tangency of his income-leisure constraint with the highest possible trade-off curve IC_3. Given the wage rate (w), the worker maximizes his satisfaction by working for BC (or OB – OC) hours, earning income OD and using the remaining time OC for leisure. Wage rate per hour (w) is equal OD/OC, which is same as the slope of income-leisure line AB.

Overtime Wage Rates: In order to make the individual work for more hours (or sacrifice his leisure), he would have to be paid an overtime wage rate (w′), where w′ is greater than the normal wage rate (w). This higher wage rate gives him the incentive to forego more leisure time. Consider Fig. 2.35 with the given wage rate, the worker is in equilibrium at point E, where the income-leisure line touches the indifference curve IC. At this point, the worker chooses to work for BC hours, enjoy OC leisure and earns OD income. To make him work for more than BC hours, it is required to pay him a higher wage rate than the normal wage rate (w). An increase in the wage rate is depicted by a new leisure-income line drawn from original equilibrium point E to its left, which is steeper than the original leisure-income line. With higher overtime payment, the worker will be induced to give up some of his leisure time. In this manner, he will reach a new equilibrium point F on a higher indifference curve IC′. Therefore, he is better off than before. At this new point of equilibrium, the worker works for BC′ (which is greater

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than BC by CC′) hours and earns higher income OD′. To increase income by DD′, the worker has to reduce leisure by CC′ (from OC to OC′).

The new income-leisure line BEF is linked at point 'E'. Since no rational employer will pay higher wage rate than w for working less than (or equal to) BC hours, the new equilibrium point 'F' of the worker occurs to the left of point 'E'. The new wage rate (w′) is given by the slope of EF line. Clearly w′ (new wage rate) is higher than the 'w' (original wage rate).

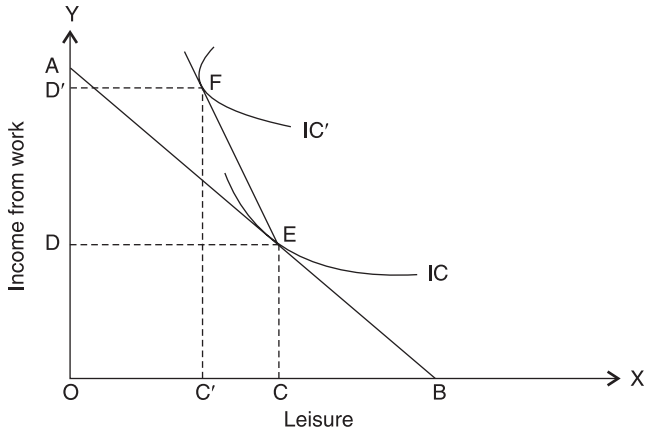

Fig. 2.35. Normal wage rate vs. overtime wage rate.

Wage Offer Curve and Labour Supply Curve: Indifference curve technique gives an insight into the individual's choice of the amount of labour time he is willing to offer and supply at various wage rates. This is depicted in Fig. 2.36, where X-axis shows leisure and Y-axis shows the income from work.

It is assumed that the worker has OB hours at his disposal to be divided between leisure and work. The original income-leisure line is AB, given the wage rate (w1) the worker is in equilibrium at point E″ where the income-leisure line touches the indifference curve IC. In equilibrium, the worker works for BC hours and obtains OD income. Suppose the wage rate rises to W_2 (= OA_2/OB). The new income-leisure line J\B touches a higher indifference curve IC_2 at point E_2. The higher wage rate induces the worker to reduce his leisure time from OC_1 hours to OC_2 hours. As a result, the working hours increase to BC_2 and income increases to OD with further increase in the wage rate to W (= OA/OB), the worker chooses point E on still higher indifference curve IC and income-leisure line BA. He has even less leisure time OC hours and supplies BC work hours. Now, he earns a further high income OD. A still higher wage rate W_4 (= OA/OB) will make the worker so much better-off that he is induced to cut down the working time to BC_4, but, he still earns a higher income OD_1′. Worker's equilibrium point E_4 corresponding to this situation lies to the right of previous equilibrium point implying that his leisure time has increased. However, he is on yet higher indifference curve IC_4 and income-leisure line BA_4′. The curve obtained by joining points E_1, E_2, E_3 and E_4 is called wage offer curve (See Fig. 2.36).

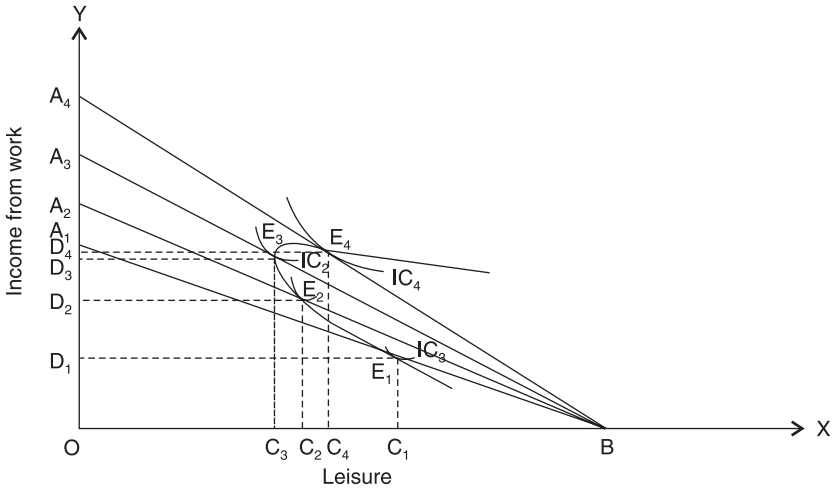

Fig. 2.36. Wage offer curve.

Wage offer curve shown in Fig. 2.36 can be used to derive the labour supply curve. Labour supply curve is depicted in Fig. 2.37, where work hours (labour supply) are shown along the X-axis, while wage rate is shown on the Y-axis. At wage rate of W_1, the work hours supplied are BC. This is plotted as point 'E' where labour supply OL, is equal to work hours BC. in terms of Fig. 2.37. When wage rate rises to W_1' the labour supply increases from OL_1 to OL_2 (equal to BC_2 in terms of Fig. 2.36) plotted as point 'F' in the figure. A further rise in the wage rate to W_1 raises the labour supply to OL_3 (equal to BC_3 in terms of Fig. 2.36). A still higher wage rate of W_4 reduces the labour supply to OL_4 (equal to BC_4 in terms of Fig. 2.37 plotted as point H in the figure). Labour supply curve is obtained by joining points E, F, G and H.

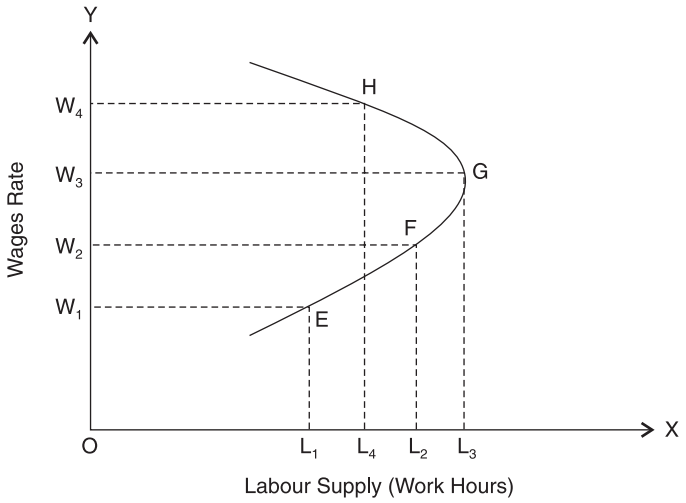

Fig. 2.37. Labour supply curve.

The labour supply curve shown in Fig. 2.37 traces out the supply of labour (work hours) at different wage rates. This curve is upward sloping up to point 'G'. Beyond this point, it bends backward. The reason for this is that the total effect of a change in wage rate on labour supply is the result of income effect and substitution effect. The income effect of a wage rate rise induces the worker to increase leisure and decrease the work hours. On the other hand, the higher cost of leisure per hour induces the worker to

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substitute income for leisure by working for more hours. When wage rate increases from W_1 to W_2 and W_3, the substitution effect outweighs the income effect. Consequently, the work hours (labour supply) increase. However, further increase in the wage rate leads to a curtailment in labour supply. This happens, because, at higher wage levels, the requirements of the worker are almost met and the worker decides to opt for more leisure.

Income Tax and Willingness to Work: Now, consider where the government levies a tax on the income of the workers. Such tax may force the workers to work more to maintain their standard of living. In this way, imposition of an income tax leads to an increase in the volume of output and national income through more work on the part of the workers. However, many economists are of the opinion that the imposition of a tax on income may work as disincentive to work leading to a fall in the volume of output and national income. Which of the two effects will actually work in the economy, depends on the income elasticity of demand of the workers. The effect of income tax on the willingness to work and thus on the side of national income under the two cases is considered in Fig. 2.38 (a) and (b). In this figure, the total time available with the worker has been taken as OB, which is shown along X-axis. The income is depicted on the Y-axis and the income leisure line is AB. Given the preference for leisure and work (represented by indifference curves), the worker is initially in equilibrium at point 'E' where the income-leisure line touches the indifference curve IC. Here, he works for BC hours to earn OD income and enjoys OC leisure time.

Case I (Inelastic Income Demand): Consider that the government imposes a tax on the income of the workers with low level of income. A certain minimum level of income, say OG amount is assumed to be exempted from tax. In order to earn OG income, the worker has to work for BH hours. If he works for more than BH hours, he has to pay tax to the government. As a result his earnings from work will be reduced by the amount of tax paid. So, the income-leisure line will take the shape of BJA (the portion JA′ is below JA). The worker will now, obviously be on a lower indifference curve IC′ and his new equilibrium position will be at point 'F'. He now works for more hours (BC′ instead of be) to partly compensate for the reduction in his income due to tax. Despite this, his income falls from OD to OD′. Thus, inelastic income demand stimulates workers to work for longer hours and to sacrifice a part of their leisure. We can expect that the output will rise leading in turn, to a higher level of national income.

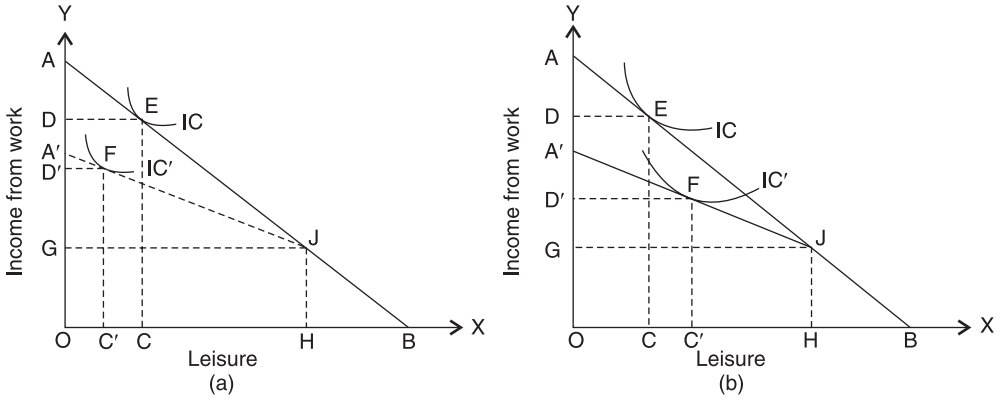

Fig. 9.38. Income vs. leisure.

Case II (Elastic Income Demand): Now, consider the case, where workers enjoy a good standard of living and they have a preference for leisure also. Under this condition, a

tax on income will adversely affect the incentive to work. As a result of taxation, the new income-leisure line is BJA. The new equilibrium position 'F' is on a lower indifference curve IC′ and is to the right of original equilibrium point 'E'. At this new equilibrium, the worker reduces his working time by CC′ and increases leisure time from OC to OC′. In this situation, the worker works for BC′ hours and earns OD′ income which is much less than his pre-tax income. Therefore, in case of a worker with income elastic demand, a tax acts more as a disincentive than as an incentive. A tax on income reduces the hours of work, thereby reducing the output and national income.

Theory of Exchange

Indifference curve technique can be used to explain as to why individuals (groups of individuals or countries, regions and so on) exchange commodities with each other. We can show that under certain conditions, exchange of commodities may lead to an increase in the welfare of at least one individual without any reduction in the welfare of the other, such that the overall welfare which can be enjoyed from a given bundle of commodities can be increased. For this purpose, we make use of an Edgeworth box, named after the British economist F. Y. Edgeworth, who first used this construction.

Suppose, there are two individuals 'A' and 'B', and two commodities 'X' and 'Y', whose total quantities are given, measured along the sides of the Edgeworth box as shown in Fig. 2.39. The tastes of the two individuals are assumed to remain unchanged. The indifference map depicting reference pattern of consumer 'A' is represented by indifference curves A_1 '—' A_3, etc. from origin OA (bottom left comer of the Edgeworth box) and of consumer B by indifference curves B_1, B_2, B_3, etc., from origin OA (top right comer of the Edgeworth box). The indifference curves are convex to their respective points of origin and have other usual properties of the indifference curves. The further up an indifference curve of 'A' or the further down an indifference curve of 'B' lies, the greater is the satisfaction level of the two consumers respectively. Any point of the Edgeworth box represents a certain distribution of the available quantities of commodities 'X' and 'Y' between individuals 'A' and 'B'. The two sets of indifference curves, being of opposite curvature have points of tangency, which form the so called Edgeworth's contract curve OA OB in Fig. 2.39. It is the locus of points of tangency of the indifference curves 'A' and 'B'. Since at all such points, the marginal rate of substitution of the two commodities is the same for both the consumers (that is, the slope of the two indifference curves are equal) it can also be considered as the locus of points at which MRSA y, x = MRSBy,x′.

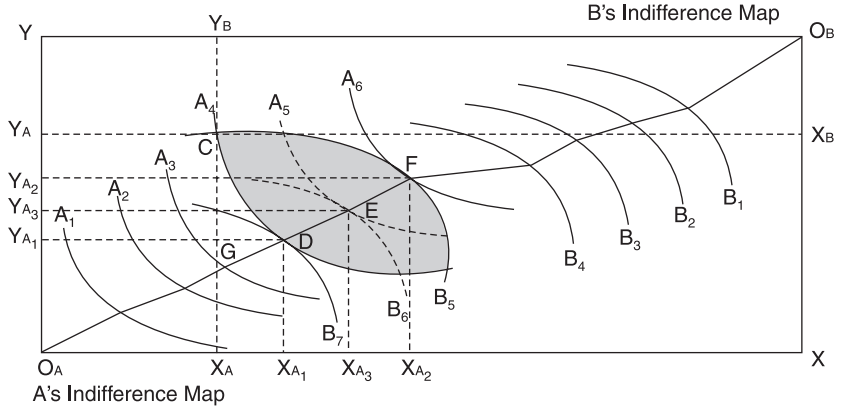

Fig. 2.39. The edgeworth box.

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Only the points lying on the contract curve represent optimal distribution of the available quantities of commodity 'X' and commodity 'Y' between the two consumers. Any point other than on the contract curve would mean a lower level of satisfaction for at least one individual. Consider point 'C' of the contract curve. At this point, consumer 'A' has OXA of commodity 'X' and OYA of commodity 'Y', while consumer 'B' has OXB (equal to remaining quantity XAX) of commodity 'X' and OYB (equal to remaining quantity YAY) of commodity 'Y'. With this distribution of the two commodities, consumer 'A' is on indifference curve A_4, while consumer 'B' is on indifference Curve B_5. If 'A' and 'B' exchange some of the quantities of the two commodities, at least one of them will be better off (without the other being worse off) by moving to any point on the section DF of the contract curve.

Suppose, the consumers exchange the two commodities such that they arrive at point 'D'. Here, the consumer 'A' gives away $YAYA_1$ of commodity 'Y' in exchange for XA XA_1 of commodity 'X'. Consumer 'A' will retain his initial level of satisfaction, since points 'C' and 'D' lie on the same indifference curve A_4 (he is no worse off than before). On the other hand, consumer B will reach a higher welfare situation (moving from indifference curve B_5 to the higher one B_7). The opposite situation will be obtained, when the consumers arrive at the distribution denoted by point 'F' (another boundary point) through exchange of the two commodities. In this case, consumer 'A' will attain a higher indifference curve A_6, while consumer 'B' will retain his initial level of satisfaction since points 'C' and 'E' lie on the same indifference curve B_5'. Finally, if the consumers reach at any other distribution of the two commodities between points 'D' and 'F' (say, point 'E'), both the consumers 'A' and 'B' will be better off, reaching higher indifference curves (A_5 and B_6 respectively) as compared to their initial positions. Thus, it is to the mutual advantage of the individuals to move from a point off the contract curve to the point on the contract curve.

All points on the contract curve are known as *Pareto optimal*. They indicate the situation of maximum social welfare, where no individual can be made better off without making the other worse off. The distribution cannot be improved from the point of view of economic efficiency. The movement off the contract curve can make one individual better off only at the expense of the other. The points off the contract curve are called as Pareto sub optimal, where there is possibility of making all individuals better off or some better off without making an other worse-off. The equilibrium exchange of commodities (trading) between the two individuals takes place only on the contract curve.

All points on the contract curve are not equally advantageous to both the individuals. As one moves from point 'D' to 'F' in Fig. 2.39, individual 'A' will be moving to this higher indifference curve, but, individual 'B' will be going towards his lower indifference curves. While trading, individual 'A' would like to move near point 'F', while individual B would like to go towards point 'D'. The final distribution or the rate of exchange of the two commodities and gains from their exchange will depend on the relative bargaining strengths of the two individuals. If individual 'A' is more powerful, the exchange (trading point) will be settled near point 'F'. On the other hand, if individual 'B' is more powerful, the exchange will be settled near point 'D'. Thus, the actual exchange will settle within the limits of points 'D' and 'F' on the contract curve. Since, movement along the contract

curve implies increase in the satisfaction (or welfare) of one individual and reduction in the satisfaction of the other, contract curve is sometimes called as conflict curve.

Sometimes, the actual choice among the different efficiency points is made on the basis of some other considerations like equity or fairness. At times, considerations of equity may require choosing an inefficient point in place of the efficient one. This happens, when the government decides to benefit the poor at the expense of the rich. However, it's always better to select an efficient point on the contract curve rather than the point of inefficient allocation (say, point 'G' rather than point 'C' in Fig. 2.36), so that the objectives of equity as well as efficiency are met simultaneously.

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Self-Assessment Questions

1. Direct taxes are better than indirect taxes. Explain with the help of indifference curve analysis.
2. The extent of excess burden under indirect tax depends on the curvature of the indifference curve. Discuss particularly in the light of perfect substitutes and perfect complementary commodities.
3. If you compare a specific tax with a lump-sum tax of an equal yield, which one should be preferred by an individual tax payer?
4. Compare a lump-sum tax and an equal yield general tax on all commodities imposed at the same rate. Will the result change, if an equal yield general tax is imposed on income. Also compare a general tax on income and equal yield general tax on all commodities.
5. Explain the implications of the food subsidy policy adopted by the government with the help of indifference curve technique.
6. "The cost of giving subsidies to the consumers is always greater than the money equivalent of the subjective gain to the consumers". Explain with the help of indifference curves.
7. "Cash subsidy programmers are not necessarily more beneficial than food subsidy programmes", Do you agree? Explain with the help of indifference curve technique.
8. Explain the implications of subsidizing education using indifference curve analysis.
9. Explain the economics of gift with the help of indifference curve technique.
10. Is rationing a better method of distributing a commodity in short supply than the market from the point of view of welfare of the consumers?
11. Explain the income-leisure trade-off. Why must firms pay higher wages for overtime work? Explain the derivation of worker's labour supply curve from the wage offer curve.
12. Examine whether taxation is disincentive to work when there is (a) inelastic income demand, (b) elastic income demand.
13. How does exchange increase economic welfare? Use Edgeworth's box diagram.
14. Define Pareto optimum. Illustrate it with the help of Edgeworth's contract curve.
15. Define the concept of price consumption curve (PCC). Where does it start from and why? What will be its elasticity of demand for its various possible shapes? Use diagrams.

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16. What is price effect? How does a change in the price of a commodity affect the equilibrium of the consumer?
17. What is the difference between a price consumption curve and a conventional demand curve? Derive demand curve with the help of price consumption curve.
18. What is a Giffen good? Derive the demand curve from the price consumption curve in case of a Giffen good.
19. Show how the equilibrium of the consumer is affected when there is a rise or a fall in the income of the consumer.
20. What is an income consumption curve? Draw an Engel curve with the help of an income consumption curve for a luxury commodity. How is it related to the demand curve?
21. What is the difference between a normal commodity and an inferior commodity? Derive an Engel curve for an inferior commodity.
22. Distinguish between an Engel curve and an Engel expenditure curve.
23. Explain the possible shapes of price consumption curve and income consumption curve. How will it look like, when the two commodities are (i) perfect substitutes, (ii) perfect complements of each other?
24. Show that price effect is the sum of substitution effect and income effect, using Hicksian and Slutsky approaches. Under what conditions will the law of demand not apply. Draw diagrams.
25. How do the income and substitution effects of a rise in the price of a commodity explain shifts in a consumer's equilibrium?
26. Distinguish between compensating variation and equivalent variation to explain the decomposition of price effect.
27. (a) Distinguish between an inferior commodity and a Giffen commodity. Which is an exception to the law of demand?

    (b) What will be the shape of the demand curve, when the mathematical sign of income effect is positive and is larger than the substitution effect?

    (c) While all Giffen goods are inferior, all inferior goods are not Giffen goods. Explain.
28. If the mathematical sign of the income effect is negative, will the consumer buy less of it when the price of the commodity falls?
29. Is positive income elasticity of demand the only condition for an inverse relationship between the price of a commodity and quantity demanded?
30. Suppose, the price of a commodity rises. Does it follow that the income and substitution effects of the price change always work in the same direction if the income elasticity of demand is negative? Will the demand curve be downward sloping?
31. Explain Giffen paradox. Does it result from income effect or substitution effect or both?
32. Discuss graphically the procedure of breaking up of price effect into substitution effect and income effect in the case of (i) perfect substitutes, and (ii) perfect complements.
33. Why is substitution effect always negative? Why does Slutsky's substitution effect exceed the Hicksian substitution effect?

34. What is substitution effect? How is Slutsky substitution effect different from Hicksian substitution effect? Which one is better?

35. Why is substitution effect always negative? Draw compensatory demand curve for a normal and a Giffen commodity and comment upon its shape.

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Practical Questions

1. A family income is ₹ 300 per month. It buys 50 units of commodity A at a price of ₹ 2. It per unit and units of commodity 'B' at a price of ₹ 4 per unit. The price of commodity 'A' rises to ₹ 5 per unit and the price of commodity B falls to ₹ 2 per unit.
   (a) Why don't the families buy the same quantities of the two commodities as before?
   (b) Why will the satisfaction level of the family be lowered? Give reasons for your answer in each case.
2. A consumer purchases 100 units of good 'X' and 75 units of good 'Y' at given money prices and given money income. Suppose the price of 'X' rose by ₹ 3 and that of 'Y' fell by ₹ 4. Analyze the typical consumer's response to the change in prices if his money income is held constant.

Objective Type Questions

1. Fill in the blanks with the appropriate words:
   (i) A fall in the price of a commodity, ceteris paribus, will lead to more of it being sold as a result of two effects: ..... and ..... .
   (ii) The substitution effect of a price fall always leaves the amount demanded either the same or ..... than before.
   (iii) The income effect of a price, if positive, will result in a ..... quantity demanded.
   (iv) For a good to have an upward-sloping demand curve, the income effect must be both ..... and ..... than the substitution effect.

II. Choose the Correct Answer:

(i) The price consumption curve shows
   (a) The changes in price of both the commodities, money income remaining the same
   (b) Changes in the price of one of the commodities, holding the consumer's income and price of the other commodity constant
   (c) The change in the tastes of a consumer, money income and prices of both the commodities remaining the same
   (d) Change in the income of a consumer, holding constant the relative prices of the both commodities.

(ii) The demand curve for a good may be derived with the help of
   (a) Constitution curve
   (b) Income consumption curve

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(c) Price consumption curve

(d) Budget line.

(iii) Income consumption curve shows

(a) How the consumption of two goods is affected by change in income?

(b) How the consumption of one commodity is affected by change in income?

(c) None of the above

(d) All the above.

(iv) If income consumption curve of a consumer first rises and then falls as one moves towards right along the X-axis and is convex from above, it implies

(a) Commodity 'Y' is inferior

(b) Commodity 'X' is inferior

(c) Both 'X' and 'Y' are inferior

(d) Both are normal commodities.

(v) Negative income effect refers to the situation

(a) When income and demand for a commodity move in opposite directions

(b) When income and demand for a commodity move in same directions

(c) When income moves in positive direction and demand moves in negative direction

(d) All the above directions.

(vi) Normal goods have

(a) Postive income effect

(b) Negative income effect

(c) Sometime positive and sometime negative income effect

(d) None of the above.

(vii) Other things remaining the same, the proportion of income spent on food diminishes as income increases. This statement is known as

(a) Hicks-Allen Effect

(b) Gossen's Law

(c) Greshem's Law

(d) Engel's Law.

UNIT 2: PRODUCTION AND COST

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CHAPTER 3 THEORY OF PRODUCTION: CONTENT AND IMPORTANCE

✣ STRUCTURE ✣

- ☆ Introduction
- ☆ Factors of Production
- ☆ Land
- ☆ Labour
- ☆ Division of Labour
- ☆ Territorial Division of Labour
- ☆ Capital
- ☆ Capital Formation
- ☆ Enterprise

1. INTRODUCTION

Having discussed the demand side of the price theory, we now proceed to discuss the supply side. Supply side relates to the production of goods and services. Production of goods depends on the cost of production, which in turn depends on the prices of inputs or the factors of production. Cost of production is determined by the physical relationship between inputs and outputs. In the theory of production, we largely discuss the relation between inputs and output.

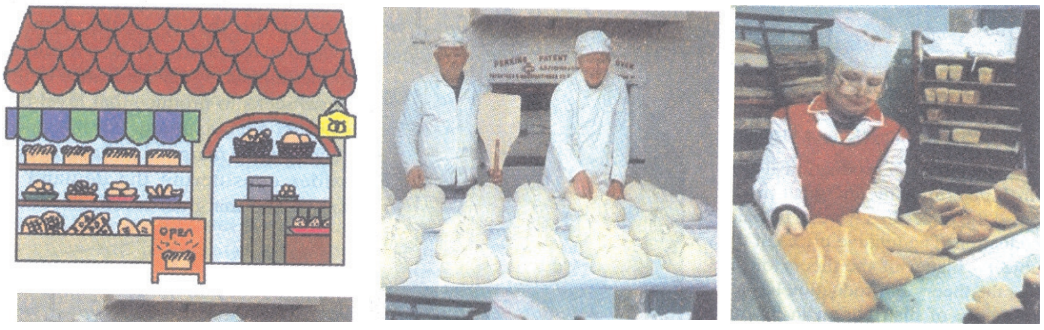

Fig. 3.1. Production means transformation of inputs into output.

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Production in economics is generally understood as the transformation of inputs into outputs. The inputs are what a firm buys (i.e., productive resources) and outputs (i.e., goods and services produced) what it sells. Apart from physical changes of the matter, production also includes services like buying and selling, transporting and financing. But in economic analysis we restrict the use of the term 'production' to the production of goods only, because in the production of goods we can precisely specify the inputs and also identify the quantity and quality of outputs.

In the theory of production, we study the factors of production and their organization. We also study the laws of production, i.e., the generalizations governing the relations between the outputs and inputs. We shall also study the theories of population, which govern the supply of an important factor of production, viz., labour. We shall also study the 'production function, i.e., the relation between the output and inputs of a firm. The analysis of production function leads us to the quantity in which the various factors of production are combined, i.e., whether they are combined in fixed proportion or in variable proportions. When all the factors are varied, we have the laws of return to scale. We also see how a firm hits at the most economical or optimum combination of factors so that the unit costs are the lowest.

The theory of production occupies a very important place in economic analysis and it has a great relevance to the study of various economic problems. The theory of production plays an important role in the theory of relative prices. Specifically, (a) it helps in the analysis of relations between costs and volume of output; it tells us how a manufacturer combines various inputs in order to produce a given output in an economically efficient manner, i.e., at the minimum cost. (b) The theory of production also provides a base for the theory of the demand of firms for reproductive resources. Thus, we find that the theory of production has a great relevance to the theory of firm. Firm seeks to produce that level of output at which its profits are maximum. For this purpose, it will have to consider the marginal and average cost of production besides considering the demand conditions, i.e., average and marginal revenues.

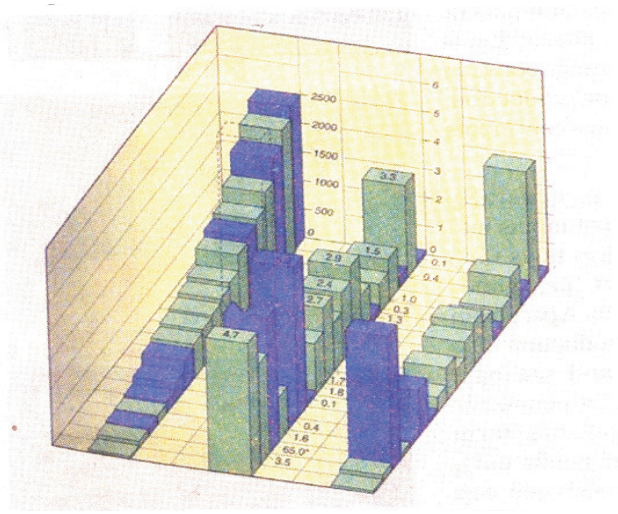

Fig. 3.2. Production refers to creation of utility.

The theory of production also explains the forces which determine the marginal productivity of factors and so the prices that have to be paid for the factors of production.

The relative prices of the factors form the subject-matter of the theory of distribution. In this way, the theory of production has a great relevance to the theory of distribution in its microform, i.e., the relative shares of the various factors of production. It has also a great relevance to the macro theory of distribution, i.e., the aggregate distributive shares of the various factors of production, e.g., aggregative share of wages and profits in the national income. The aggregative shares are influenced by the elasticity of substitution between factors of production which is also an important concept in the theory of production.

We shall first study the various factors of production in this chapter and then in the next chapter the forms of entrepreneurial organization. Then in the subsequent chapters, we shall study the population theories, the scale of production, the production possibility curve and production function, the laws of returns, the isoquants or equal product curves, cost and cost curves and supply. This will complete the study of the theory of production.

Meaning of Production

Production is sometimes defined as the creation of utility or the creation of wants – satisfying goods' and services. It is said that just as man cannot destroy matter, he also cannot create matter. "If consuming means extracting utilities from," says Fraser, "producing means putting utility into." But this is not a scientifically correct definition to produce a thing, which has utility, but not value is not production in the economic sense. One may spread the cult of Yoga and promote the physical and spiritual well being of one's friends—a thing of great utility but unless one makes it one's profession, his activities will not come under production.

Production, therefore, should be defined, not as creation of utility, but creation (or addition) of value. Utilities are created in three forms: (i) form utility, (ii) time utility, and (iii) place utility.

Production essentially means transformation of one set of goods into another. A good may be transformed by being physically changed (from utility); or being transported to the place of use (place utility) or being kept in store till required time (time utility). Pure exchange is also an act of transformation.

3.2 FACTORS OF PRODUCTION

Productive resources required to produce a given product are called factors of production. These productive resources may be raw materials or services of the various categories of workers or of capitalism supplying capital or of entrepreneurs assembling the factors and organizing the work of production. They are now generally called 'inputs'. Fraser defined "factor of production as a group or class of original productive resources." The term "factor" is used for a class of productive elements, the individual members of which are known as "units" of the factor. Modern economists prefer to talk in terms of anonymous productive services rather than the classical factors of production.

The factors of production have been traditionally classified as land, labour, capital and organization (or enterprise). Now, we shall briefly deal with them one by one. These factors are complementary in the sense that their co-operation or combination is essential in the production process.

The typical situation in production is that a group of complementary factors is required between which there is some degree of substitutability. Between labour and capital, the

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relation is both of substitution and complementarily.

Specificity

A factor is said to be specific when it can be used for one purpose only and for none other, e.g., spare part of a particular machine.

Versatility

A factor is said to be versatile when it can be put to every and any use.

These are, however, two extremes. No factor is completely specific or versatile. That is, a factor can be put to several uses but not all uses. A factor of low versatility is called a specialized factor. The specific or specialized nature of the factors of production play an important role in the disposition of productive resources.

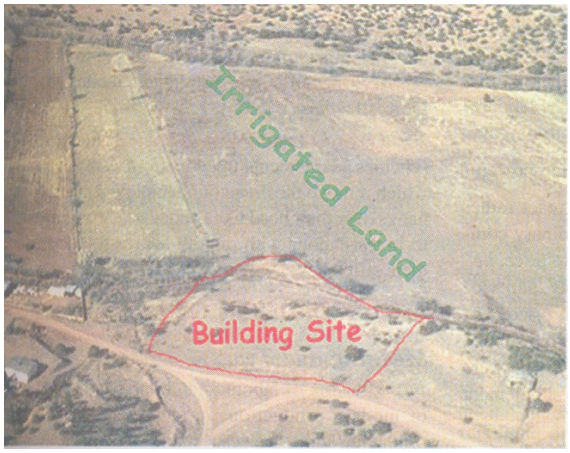

Fig. 5.3. Irrigated land and building.

3.3 LAND

Meaning and Importance of Land

The term 'land' has been given a special meaning in economics. It does not mean soil as in the ordinary speech, but it is used in a much wider sense. In the words of Marshall, land means "the materials and the forces which nature gives freely for man's aid, in land and water, in air and light and heat." Land stands for all natural resources which yield an income or which have exchange value. It represents those natural resources, which are useful and scarce, actually or potentially.

Peculiarities of Land

In contrast to the other factors of production, land presents certain well-marked peculiarities:

(i) Land is nature's gift to man.

(ii) Land is fixed in quantity. It is said that land has no supply price. That is, price of land prevailing in the market cannot affect its supply; the price may be high or low, its supply remains the same.

(iii) Land is permanent. There are inherent properties of the land which Ricardo called 'original and indestructible.'

(iv) Land lacks mobility in the geographical sense.

(v) Finally, land provides infinite variation of degrees of fertility and situation so that no two pieces of land are exactly alike. This peculiarity explains the concept of margin of cultivation.

These are a few peculiarities of land and they have a bearing on economic rent.

3.4 LABOUR

Meaning of Labour

In the ordinary speech, the term 'labour' means a mass of unskilled labour. But in Economics it is used in a wider sense. Any work, whether manual, or mental, which is undertaken for a monetary consideration, is called: 'labour' in Economics. Any work done for the sake of pleasure or love does not fall under labour in the economic sense. In Marshall's words, "Any exertion of mind or body undergone partly or wholly with a view to some good other than the pleasure derived directly from the work is called labour."

Fig. 2.4. The division of labour.

Labour is manifestly different from the other factors of production. It is a living thing, and that makes all the difference. Labour is not only a means of production but also an end of production. There are certain characteristics, which distinguish labour from the rest of the factors of production:

(i) Labour is inseparable from the labourer himself.

(ii) Labourer has to sell his labour in person.

(iii) Labour does not last. It is perishable: As Erich Roll remarks, "He has no reserve price." The labourer has, therefore, to accept the wage offered to him.

(iv) Labour has a very weak bargaining power.

(v) Changes in the price of labour react rather curiously on its supply. In the case of ordinary commodities, supply is directly proportionate to price, i.e., the higher the price the greater the supply, and vice versa. But, in the case of labour, a fall in price i.e., wage below a certain point may increase the supply. For instance, some members of the family, who were not working before, may start working to supplement the family income.

(vi) There can be no rapid adjustment of the supply of labour to demand for it, because supply cannot be increased quickly, nor can it be reduced.

These peculiarities of labour have an intimate bearing on the determination of wages.

That labour should be treated differently from a commodity is a social rather than an economic question.

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Factors Determining Efficiency of Labour

The following are some of the main factors, which affect labour efficiency:

(i) **Racial Qualities:** Labour efficiency largely depends on heredity and the racial stock to which a worker belongs.

(ii) **Climatic Factors:** A cool bracing climate is conducive to hard work, whereas the tropical climate is not suitable.

(iii) **Education:** Efficiency also depends on education, both general and technical.

(iv) **Personal Qualities:** A worker's efficiency also depends upon his personal qualities, e.g., physique, mental alertness, intelligence, resourcefulness and initiative etc.

(v) **Industrial Organization and Equipment:** The level of organization and the nature of equipment supplied to the workers, too, determine their efficiency.

(vi) **Factory Environments:** Cramped and ill-ventilated factories, situated in crowded and non-sanitary surroundings, are not conductive to efficiency.

(vii) **Working Hours:** Long hours impair labour efficiency.

(viii) **Fair and Prompt Payment:** A well-paid worker is generally contented and puts his heart into the job.

(ix) **Organization:** An organized effort is always more effective.

(x) **Social and Political Factors:** Social security schemes guaranteeing freedom from want and fear, and which remove the dread of unemployment that always hangs over their head like Damocles' sword, are bound to invest labour with dignity and respect and add to their efficiency.

3.5 DIVISION OF LABOUR

Division of labour is an important characteristic of modern production. In fact, there is hardly any producing unit of a respectable size, which does not organize production on the basis of division of labour. Division of labour is associated with efficiency of production. "The division of labour is not a quaint practice of eighteenth century pin factories; it is a fundamental principle of economic organization." (Benjamin Franklin).

When making of an article is split up into several processes and each process is entrusted to a separate set of workers, it is called division of labour.

The division of labour is of the following main types:

Simple Division of Labour: This means division of society into major occupations, e.g., carpenters, blacksmiths, weavers, etc. It may also be called functional division of labour.

Complex Division of Labour: In this case, no group of workers makes a complete article. Instead, the making of an article is split up into a number of processes and sub-

processes and each process or sub process is carried out by a separate group of people. This is proper division of labour.

Fig. 5.5. Increasing productivity skills.

Territorial Division of Labour: This form of division of labour refers to certain localities, cities or towns specializing in the production of some commodity. This is also called localization of industries.

Advantages

Several advantages are claimed for the system of division of labour. Adam Smith's contribution to this part of the economic theory is still regarded as classic. Division of labour has proved beneficial in the following ways:

Increase in Productivity: Adam Smith takes the example of a pin-making industry to illustrate the immense increase in productivity. He describes pin-making as divided into 18 distinct operations. Ten men can make 48,000 pins in a day; one worker may, therefore, be considered to have made 4,800 pins in a day. In the absence of division of labour and machinery, one man could scarcely have made one pin in a day, and certainly not twenty.

Increase in Dexterity and Skill: Practice makes a man perfect. After repetitive performance of the same task, a worker becomes an expert.

Inventions are Facilitated: In division of labour, the movement becomes mechanical and the worker can freely think while at the job. New ideas often occur leading to inventions.

Introduction of Machinery Facilitated: When a man is doing the same job over and over again, he will be able to think of some mechanical procedure to relieve himself. A machine is, therefore, bound to take over this simple movement sooner or later.

Saving in Time: Under the system of division of labour, a worker has only to do one process or a part of a process. Less time is, therefore, needed to learn a specialized trade.

Saving in Tools and Implements: When a worker has to perform a part job only, e.g., making the legs of a chair, he need not be supplied with a complete set of tools. One set of tools can serve many workers at the same time.

Diversity of Employment: Division of labour increases the number and variety of jobs. Employment is thus diversified.

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Large-scale Production: Division of labour involves production on a large-scale. The community reaps all the economies of large-scale production. Production improves not only in quantity but also in quality since goods are made by specialists.

Right Man in the Right Place: Under division of labour, workers are so distributed among the various jobs that each worker occupies the right place. There are no round pegs in square holes.

Disadvantages

We have seen that division of labour enhances the productive capacity of the community. But as Chapman puts it, "Productiveness of a method of production is not the sole test of its value—to get many commodities is not the only end in life." We have rather to see how man, for whom production is meant, has been affected by the division of labour. Considered in this light, division of labour has not proved to be an unmixed blessing.

The following may be mentioned as some of the disadvantages of division of labour:

Monotony: Under division of labour, a worker has to do the same job over and over again. The work becomes monotonous. It is drudgery, pure and simple. The work ceases to be interesting.

Retards Human Development: A person's development, physical and mental, is greatly affected by the job he is engaged in. Under division of labour, a worker has to repeat the same movement over and over again. His muscles and mind move in the same direction. Repetitive movement cramps a person's mind and narrows his outlook. Monotony is soul-killing.

Industry De-humanized: Under division of labour, many people combine to produce an article. "Everybody's business is nobody's business." The worker loses all sense of responsibility and pride in his work. The industry is thus de-humanized.

Loss of Skill: The master craftsman loses his skill. He knows, for instance, only either spinning or weaving, making the legs of the chair or its seat. He does not know how to make the whole chair.

Risk of Unemployment: Knowing only a part of the job, the worker is in danger of becoming unemployable. If he happens to lose his present job, he may not be able to get similar job elsewhere. He thus becomes unemployable.

Disrupts Family Life: Division of labour facilitates employment of women and children. The influx of women into the factory disrupts domestic life and the employment of children involves the deterioration of valuable human resources of the nation. It is a great national loss.

Division of Labour and Evils of the Factory System: Division of labour is associated with the factory system which has given rise to evils like water pollution and air pollution, the countryside is contaminated with foul smell; over-crowding endangers morals; and non-sanitary surroundings spread disease. Man becomes a slave of machine and of the factory owner.

Conclusion

Division of labour has, however, come to stay. Shortening of the working day thus increasing leisure, diffusion of education and rising of remuneration are some of the

measures that can be adopted to counteract the bad effects of division of labour on a worker's life and personality.

Division of Labour is Limited by the Extent of the Market

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This is so obvious. If, for instance, a shoemaker is able to dispose one pair of shoes in six months, it will look foolish for him to employ half a dozen persons on the making of soles, half a dozen on the making of uppers, and another six persons in joining them. There must be adequate demand for his product before he can adopt such methods. Division of labour implies large-scale production, and it is meaningless to produce more in the absence of a sufficient market for goods. The limiting factor for the introduction and extension of labour is, therefore, the existence of a wide market.

But no individual entrepreneur looks at the matter like this. He no doubt considers the market while fixing the size of his plant. But when he has done that, the extent of the division of labour will depend on the nature of the machinery installed and the number and the variety of the people employed. It will depend also on an entrepreneur's own organizing ability. But the extent of the market is not so much in his mind.

Market also Depends on Division of Labour: Under division of labour, production is done on a large-scale, which means cheaper production. When goods are cheap, more people will buy them. Thus, the boundaries of the market are extended by division of labour.

Hence, division of labour and the market are interdependent. But it is more true to say that division of labour is limited by the extent of the market than that the extent of the market depends on division of labour.

3.6 TERRITORIAL DIVISION OF LABOUR

Localization of Industries

Territorial division of labour is also called localization of industries. By localization we mean the establishment of an industry in a certain place or a region. A certain town or a territory specializes in a certain place or a region in a certain industry. Indian jute industry is centered in Bengal, iron and steel industry in Bihar, sugar industry in U.P. and Bihar, cotton mill industry in Mumbai, and so on. For instances of localization in State towns, we may mention hosiery industry of Ludhiana (Punjab), bangles in Firozabad (U.P.), silk manufactures in Hazaribagh (Bihar), etc.

Causes of Localization

The chief factors that govern localization are as follows:

Nearness to Raw Materials: To have raw materials near at hand is a great advantage. Transport costs will be considerably reduced. Production will be more economical. It is not surprising that most of the industries have been started in the region where abundant supplies of the necessary raw materials are available, e.g. "jute mills in Bengal, sugar mills in U.P. and iron and steel industry in Bihar and Orissa.

Nearness to Sources of Power: Another attraction for the industries is the availability of power resources. If coalmines are near, several industries will soon crop up, e.g., iron and steel works and several other industries in the coal regions.

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Indian cotton mill industry in North India and in Bengal has been located by a desire to be near the markets.

Availability and ability of Labour: If trained labour is available, it is regarded as a great facility. That is why new industrialists flock to old established industrial centres. If somebody wants to start a hosiery industry, he will find it to his advantage to start it at Ludhiana (Punjab) because there is ample trained labour available there besides several other external economies.

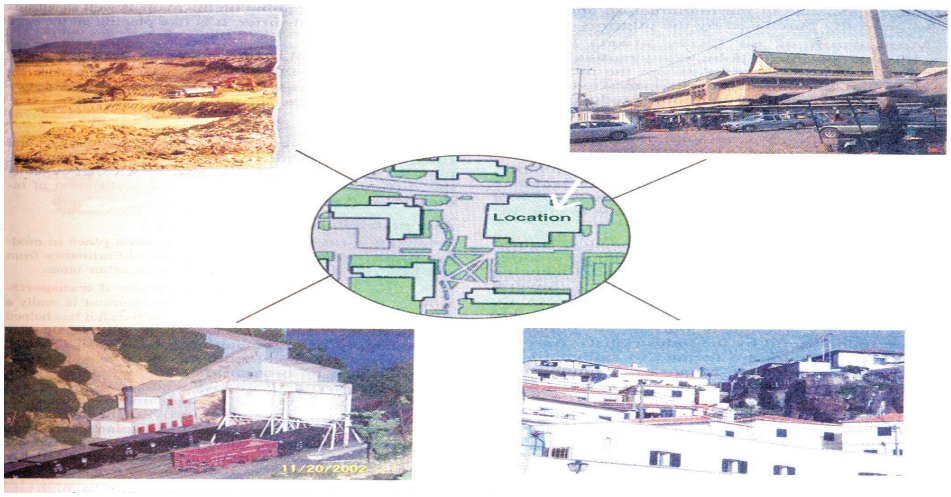

Fig. 2.6. A good location mean's proximity to the market.

Availability of Capital: Finance is the very breath of industry. Where there are banks and other financiers ready to assist industry, it is a great attraction. Cities like Mumbai and Kolkata are the centres of industry, because they enjoy better credit facilities.

Political Factor: Sometimes, the political factor is responsible for the establishment of an industry. Some of the old princely States in India, like Hyderabad, offered special concessions, incentives and facilities to industrialists to attract them and to induce them to set up industries in their states.

Religious Factor: In some cases, religious causes, making for larger number of people, give rise to some industries. It is generally seen that places of pilgrimage specialize in the manufacture and sale of articles generally purchased by pilgrims.

Momentum of an Early Start: In some cases, it is not possible to point to any particular cause of the localization of industry except the momentum of an early start: the industry just happened to be started there first. The example of the pioneer industrialists is followed by others in the place. In this way, the industry becomes established in that place.

Causes of Further Concentration

After an industry has got going in a certain place, it then has a tendency to stick to and further gravitate to that place. If any new entrepreneur wants to enter this industry, he, too, will go to that place to start his business rather than start it elsewhere. Several reasons account for this tendency. Trained labour is readily available there. Plant and accessories and raw materials can be conveniently had. Financing agencies are also established in that place. Several supplementary and subsidiary industries are established in course of time, and they are a valuable aid to the main industry. Technical journals

are published which are found useful by the industrialists. Associations of entrepreneurs are formed to safeguard and promote common interests. Means of communication and transportation become specialized and adapted to the needs of the industry. All these factors considerably assist the entrepreneurs. In a new place, they will find even easy and ordinary problems difficult.

Above all, there is what is called industrial inertia. Once established in a place, the industry does not like to move out. It is human nature that one is prepared to put up with known difficulties rather than face unknown ones.

Consequences of Localization

Localization, however, is not an unmixed blessing. All the factors mentioned above as the causes of persistence of an industry, are the several advantages afforded by the place in which it has become localized, viz., availability of labour, capital, raw materials, etc., and the benefit of specialized transport, subsidiary industries, technical journals, associations, etc. Besides, there are ample opportunities for exchange of ideas: quality can be improved, costs lowered and common problems thoroughly thrashed out and successfully solved. Labour of that category is sure to find employment in that place. Localization, however, is not an unmixed blessing. Dependence of a place on one industry is dangerous. If the industry happens to be in a depressed state, all the people depending on the main as well as subsidiary industries will suffer. It is like placing all the eggs in one basket. Further, there is little scope for the employment of any other type of labour. The specialized labour loses mobility and may not find alternative openings.

Remedy

The obvious remedy is to start supplementary and subsidiary and other allied industries. The establishment of such industries goes a long way in mitigating the difficulties arising out of the localization of industries and removing the evils.

Decentralization of Industry

Several developments have taken place in modern times, which have displaced old industries from their native soil and planted them in other lands. The development in the means of transportation is one such factor. This development is really a double-edged weapon. On the one hand, it has helped the localized industries to keep to their original home. If the supply of raw materials, on the basis of which they originally developed, has been exhausted, the materials can be brought there. If the market, originally wide enough, is no longer adequate, distant markets can be tapped through improved transport. But, on the other hand, improvement in transport has also helped the transfer of heavy plants to distance countries, which are better markets, e.g., Swedish match factories were started in India. Labour and technicians can also move out.

Further, the rise of rents, congestion, high land prices and higher municipal taxation in the industrial centres have driven out the old established industries, e.g., cotton mills were shifted from Mumbai to Ahmedabad, Sholapur and other places.

Finally, the advent of electricity, which can be carried to a long distance, has enabled the industries to start at more convenient places. They need no longer cling to the source of power, say coal mines, and suffer from other handicaps.

Conclusion

Owing to the causes stated above, several of the factors, which were responsible for localization, have ceased to operate and industries have been decentralized.

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3.7 CAPITAL

Meaning

Capital refers to that part of a man's wealth which is used in producing further wealth or which yields an income. But capital is not a primary or original factor of production. It is a 'produced means of production'. The term 'capital' is generally used for capital goods, e.g., plant and machinery, tools and accessories, stocks of raw materials, goods in process, and fuel. The raw materials are used up in a single act of consumption. Moreover, money spent on them is fully recovered when goods made with them are sold in the market. But plant and machinery is a permanent investment.

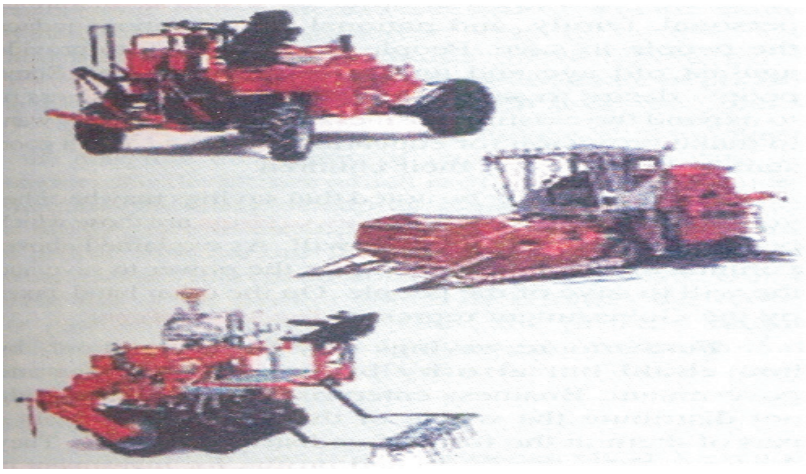

Fig. 2.7. Machines are capital goods used for production.

Is land capital? Land is not regarded as capital because (a) land is a free gift of nature but capital is man-made or is a 'produced' agent of production; (b) capital is perishable, whereas land is indestructible and permanent; (c) capital is mobile but land has no mobility; (d) the amount of capital can be increased but the quantity of land is fixed and limited; and (e) income from capital is uniform whereas rent of land varies.

Importance of Capital

Capital plays a vital role in the modern productive system. Production without capital is hard for us even to imagine. Nature cannot furnish goods and materials to man unless he has the tools and machines for mining, farming, fishing, etc.

Because of its strategic role in raising productivity, capital occupies a central position in the process of economic development. In fact, capital formation is the very core of economic development.

Another important economic role of capital formation is the creation of employment opportunities in the country. Capital formation creates employment at two stages. First, when the capital is produced, some workers have to be employed to make capital goods

like machinery, factories, dams, irrigation works, etc. Secondly, more men have to be employed when capital has to be used for producing further goods.

3.8 CAPITAL FORMATION

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Importance of Capital Formation

Capital accumulation is the very core of economic development. It may be a predominantly private enterprise system like the American, or a communist economy like the Soviet Union economic development cannot take place without capital accumulation. No economic development is possible without the construction of irrigation works, the production of agricultural tools and implements, land reclamation, building of dams, bridges and factories with machines installed in them, roads, railways, and airports, ships and harbors—all the "produced means of further production" associated with high levels of productivity. It seems unquestionable that the insufficiency of capital accumulation is the most serious limiting factor in underdeveloped countries. In the view of many economists, capital formation occupies the central and strategic position in the process of economic development.

Meaning of Capital Formation

Capital formation means the increase in the stock of real capital in a country. In other words, capital formation involves making of more capital goods such as machines, tools, factories, transport equipment, materials, electricity, etc., which are all used for further production of goods. For making additions to the stock of capital, saving and investments are essential. Professor Nurkse has, therefore, defined capital formation as follows:

"The meaning of 'capital formation' is that society does not apply the whole of its current productive activity to the needs and desires of immediate consumption, but directs part of it to the making of capital goods: tools and instruments, machines, and transport facilities, plant and equipment—all the various forms of real capital that can so greatly increase the efficiency of productive effort. The essence of the process, then, is the diversion of a part of society's currently available resources for the purpose of increasing the stock of capital goods so as to make possible an expansion of consumable output in the future."

It is thus evident that in order to accumulate capital goods some current consumption has to be sacrificed. The greater the extent that people are willing to abstain from present consumption, the greater the extent that society will devote resources to new capital formation.

From the above, it is clear that saving is essential for capital formation. But in a monetary economy, savings may not directly and automatically result in the production of capital goods. Savings must be invested in order to have capital goods. In a modern economy, where savings and investment are done mainly by two different classes of people, there must be certain means or mechanism whereby savings of the people are obtained and mobilized in order to give them to the businessmen or entrepreneurs to invest in capital goods. Therefore, in a modern free-enterprise economy the process of capital formation consists of the following three stages:

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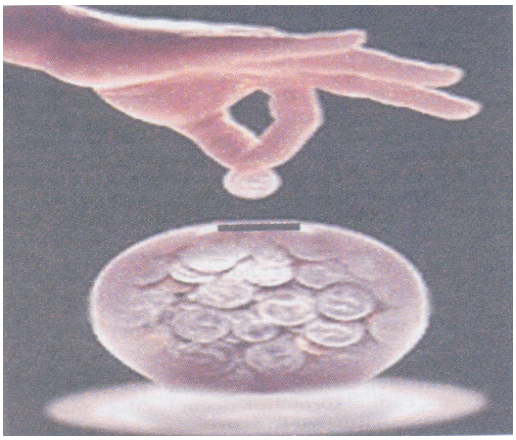

Fig. 3.8. Savings depends on power and willingness to save.

(i) **Creation of Savings:** Savings are done by individuals or households. They save by not spending all their income on consumer goods. When individuals or households save, they release resources from the production of consumer goods. Workers, natural resources, materials, etc., thus released are made available for the production of capital goods.

The level of savings in a country depends upon the power to save and the will to save. The power to save or saving capacity of an economy mainly depends upon the average level of income and the distribution of national income. The higher the level of income, the greater will be the amount of savings. The countries having higher levels of income are able to save more. That is why the rate of savings in the U.S.A. and Western European countries is much higher than that in under-developed and poor countries like India, Further, the greater the inequalities of income, the greater will be the amount of savings in the economy.

Apart from the power to save, the total amount of savings also depends upon the will to save. Various personal, family, and national considerations induce the people to save. People save in order to provide for themselves in old age and unforeseen emergencies. Some people desire to save a large sum to start a business or to expand the existing business. Moreover, people want to make provision for education, marriage, and a good start in business for their children.

Further, it may be noted that savings may be either voluntary or forced. Voluntary savings are those, which people do of their own free will. As explained above, voluntary savings depend upon the power to save and the will of the people to save. On the other hand, taxes by the Government represent forced savings.

Furthermore, savings may be done not only by households but also by business enterprises and government. Business enterprises save when they do not distribute the whole of their profits but retain a part of them in the form of undistributed profits. They then use these undistributed profits for investment in real capital.

The third source of savings is government. The government savings constitute the money collected as taxes and the profits of public undertakings. The greater the amount of taxes collected and profits made, the greater will be the government savings. The savings so made can be used by the government for building up new capital goods like factories, machines, roads, etc., or it can lend them to private enterprise to invest in capital goods.

(ii) **Mobilization of Savings:** The next step in the process of capital formation is that the savings of the households must be mobilized and transferred to businessmen or entrepreneurs who require them for investment. In the capital market, funds are supplied by the individual investors (who may buy securities or shares issued by companies), banks, investment trusts, insurance companies, finance corporations, government, etc. If the rate of capital formation is to be stepped up, the development of capital market is very necessary. A well-developed capital market will ensure that the savings of the society will be mobilized and transferred to the entrepreneurs or businessmen who require them.

(iii) **Investment of Savings in Real Capital:** For savings to result in capital formation, they must be invested. In order that the investment of savings should take place, there must be a good number of honest and dynamic entrepreneurs in the country who are able to take risks and bear uncertainty of production.

Given that a country has got a good number of entrepreneurs, investment will be made by them only if there is sufficient inducement to invest. Inducement to invest depends on the marginal efficiency of capital i.e., the prospective rate of profit on the one hand and the rate of interest on the other.

But of the two determinants of inducement to invest—the marginal efficiency of capital and the rate of interest, it is the former, which is of greater importance. Marginal efficiency of capital depends upon the cost or supply price of capital as well as the expectations of profits. Fluctuations in investment are mainly due to the changes in expectations regarding profits. But it is the size of the market, which determines the scope for profitable investment. Thus, the primary factor which determines the level of investment or capital formation in an economy is the size of the market for goods.

Foreign Capital

Capital formation in a country can also take place with the help of foreign capital, i.e., foreign savings.

Foreign capital can take the form of (a) direct private investment by foreigners, (b) loans or grants by foreign governments, (c) Loans by international agencies like the World Bank.

There are very few countries, which have successfully marched on the road to economic development without making use of foreign capital in one form or the other. India is receiving a good amount of foreign capital from abroad for investment and capital formation under the Five-Year Plans.

In recent days foreign capital is playing a vital role in the economic development of less developed countries. After the GATT agreement as well as the establishment of WTO (World Trade Organization) on 1st January 1995, there is an enormous increase of foreign capital from developed countries to developing countries.

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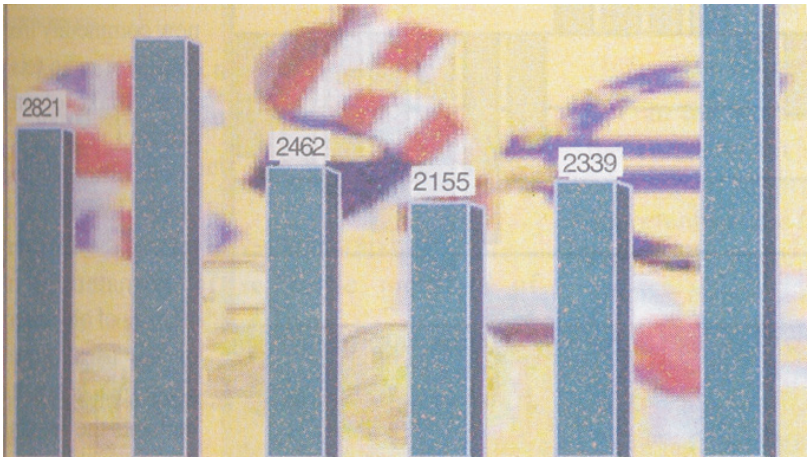

Fig. 3.9. Net inflow of foreign capital.

Foreign capital is divided into two categories; viz.

(a) Foreign Direct Investments, (FDI) and,

(b) Foreign Institutional Investments (FIIs).

(a) **Foreign Direct Investment:** (FDI) This is a very important aspect of foreign capital. The FDI means the foreigners are allowed investment either in collaboration with public and government (including both state and central) or directly starting of factories, mills, departmental stores, chain stores, and infrastructure and so on. The FDI plays a vital role in the economic development of a country. Due to FDI the employment and economic growth of an economy increases. This further with multiplier effects accelerates the economic growth and also cumulative economic process take place. For developing countries this is a very good opportunity. There is a direct relation between FDI and economic development.

(b) **Foreign Institutional Investments (FIIs):** In this category of foreign capital the foreigners either directly or through their institutions invest in the portfolio investment of an economy. This may help the economy or may harm the economy. Generally the investment in stock exchange is of speculative nature. Due to the liberalization and globalization policy the world-over the FIIs are increasing their investment in developing countries. It has accelerated the tempo of speculation in almost all the markets of the world.

Along with the FIIs there is another kind of investment in India, that is the NRI (Non Resident Indian) deposits or investments. If it is in government bonds, than it may not be a non-speculative, otherwise it may be of FIIs type of investment.

Deficit Financing: Deficit financing, i.e., newly created money, is another source of capital formation in a developing economy. Owing to very low standard of living of the people, the extent to which voluntary savings can be mobilized is very much limited. Also, taxation beyond limit is quite unpleasant and therefore politically inexpedient. Deficit financing is, therefore, the method on which the government can fall back to obtain funds.

However, the danger inherent in this source of development finance is that it may lead to inflationary pressure in the economy, although a certain measure of deficit financing can be had without creating much pressure.

There is specially a good case for using deficit financing to utilize the existing

and underemployed labour in schemes which yield quick returns so that the inflationary potential of deficit financing may be neutralized by an increase in the supply of output in the short-run.

Disguised Unemployment: Another source of capital formation is to mobilize the saving potential that exists in the form of disguised unemployment. Surplus agricultural workers can be transferred from the agricultural sector to the non - agricultural sector without diminishing agricultural output. The objective is to mobilize these unproductive workers and employ them on various capital creating projects, such as roads, canals, building of schools, health centres and funds for flood control in which they do not require much more capital to work with.

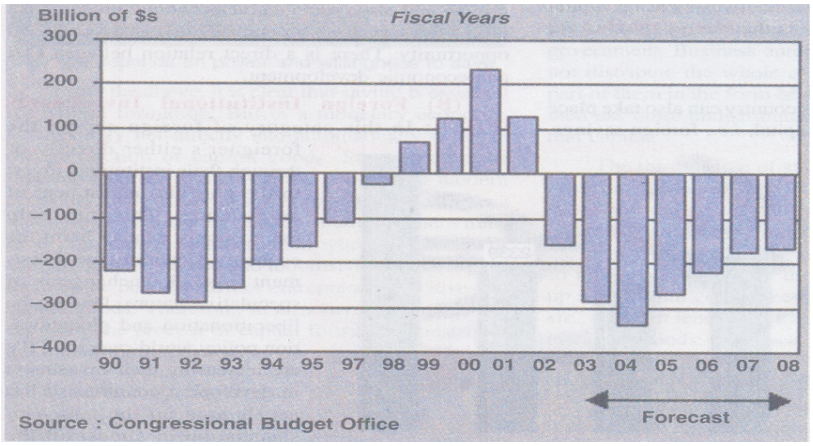

Fig. 5.10. Big budget deficits.

3.9 ENTERPRISE

The fourth factor of production is enterprise, which is supplied by the entrepreneur.

Entrepreneur's Role

The role that the entrepreneur plays consists in co-ordinating and correlating the other factors of production. He starts the work, organizes and supervises it. He undertakes to remunerate all the factors of production: to pay rent to the landlord, interest on the borrowed capital, and wages to labour, and pays them in advance of the sale of goods. The residue, if any, is his. Nothing may be left after he has made the necessary payments. In that case, his venture will have been miscarried. But it is also possible that he may be lucky enough to make a handsome profit. Whatever may be the outcome, he must be prepared to accept it. He thus takes the final responsibility of the business.

If he has anticipated the consumers' wishes right and interpreted them correctly, he is amplyrewarded. Organizing and risk-taking, or 'uncertainty is bearing', as it is sometimes called, are the two chief functions of the modern entrepreneur.

The entrepreneur is the innovator. Innovation by the entrepreneur implies a variety of things. It may mean the introduction of a new method of production or an improvement in the old method. It may consist of the introduction of a new commodity like the transistor radio sets or a new make of an old product, e.g., yet another brand of toothpaste. Innovation may refer to the discovery of new materials; fresh sources of old materials, or new uses

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for materials or final goods. It also includes the opening up of new markets. Innovation may also take the form of new techniques in the way of administration, finance, marketing, or human relations inside the business and public relations outside, i.e., with suppliers of material and customers of products. It is involved, finally, when new forms of business organizations are instituted, such as chain stores, the merger of several establishments, or a monopolistic combination among producers.

It will be easily understood that uncertainty is inherent in the making of the decisions like those enumerated earlier and also in any innovations that may be adopted. The all–embracing function that the entrepreneur performs is, therefore, that of bearing uncertainty.

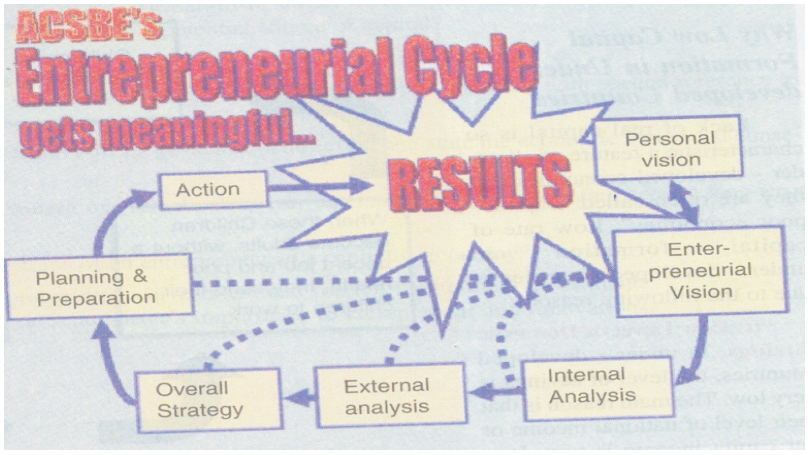

Fig. 3.11. Entrepreneurship.

Schumpeter's Concept of Entrepreneur

J.A. Schumpeter, a German economist, has put more emphasis on the role of an entrepreneur. According to him, and entrepreneur can "change the direction of an economy", in the Japanese economy during the Meiji Era after 1868 the 'Zaibtsu' (Five main Entrepreneurs) played a vital role in its economic development.

According to Schumpeter the entrepreneur is one who combines the factor of production and carries out the production process. He is not just an investor but also one who can be a manager. An entrepreneur is dynamic and possesses initiative and foresight. He is a risk-taker and an innovator. He introduces the five types of innovations:

1. Introduction of a new product
2. Introduction of a new machine
3. Discovery of a new source of supply of raw-materials.
4. Opening up of a new market, and
5. Introduction of scientific methods of organization

As a leader an entrepreneur possesses the following motives, whose main aim is not only to earn profit, but also a:

1. Desire to establish private commercial kingdom.
2. Will to conquer and prove superiority over others.
3. Joy of creation and getting things done.

Schumpeter said, an entrepreneur does not belong to a particular class, "Because being an entrepreneur is not a profession and as a rule not a lasting condition, entrepreneurs do not form a social class in the technical sense like the class of landowners or capitalists or workers."

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Summing Up

An entrepreneur's functions may be summarized thus:

(i) Initiating a business enterprise by mobilizing and harnessing the necessary productive resources.

(ii) Taking the final responsibility of the business enterprise—risk-taking and uncertainty bearing.

(iii) An entrepreneur's role as an innovator.

In the words of Professor Harvey Eisenstein, an entrepreneur's role is to "search and discover economic opportunities, evaluate economic opportunities, the financial resources necessary for the enterprise, make time-binding arrangements, take ultimate responsibility for management, be the ultimate uncertainty and/or risk-bearer, provide and be responsible for the motivational system within the firm, search and discover new economic information, translate new information into new markets, techniques and goods and provide leadership for the work groups."

Who is an Entrepreneur in a Joint Stock Company?

The main parties involved in a joint stock company are the shareholders, directors and the management. The shareholders have risked their money but they do not exercise any control over the business except in a very small corporation. There is thus a divorce between the two functions of an entrepreneur, viz., ownership (risk-taking) and control. The shareholders elect the directors who exercise control over the business on behalf of the shareholders. The directors are also usually the biggest shareholders. Thus, they can be considered the entrepreneurs, for they generally initiate the enterprise, mobilize resources and risk their capital, although they do not bear the entire risk. The management runs no risk nor do they exercise the ultimate control. Thus, in a corporation the entrepreneurial functions are shared between the shareholders, the directors and top executives.

Why is There Low Capital Formation in Undeveloped Countries?

Lack of real capital is so characteristic a feature of all under-developed economies that they are often called "capital poor economies." Low rate of capital formation in under-developed countries is due to the following reasons:

(i) **Low Level of Domestic Savings:** In under-developed countries, the level of savings is very low. The main reason is that their level of national income or per capita income is very low. Under-developed countries are, in fact, caught up invicious circle of poverty: Low income–small savings–low investment–less productivity, ending in low income. Apart from the low level of absolute income, their low relative level of real income also reduces their capacity to save. This tendency of the people of under-developed countries to copy the higher levels of consumption prevailing in the advanced countries has been called "international demonstration effect" by Nurkse. The people, who get large incomes, general use much of their income for

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conspicuous consumption, investment in land and real estate, speculative transaction, inventory accumulation and hoarding of gold and jewellery rather than using it for productive investment.

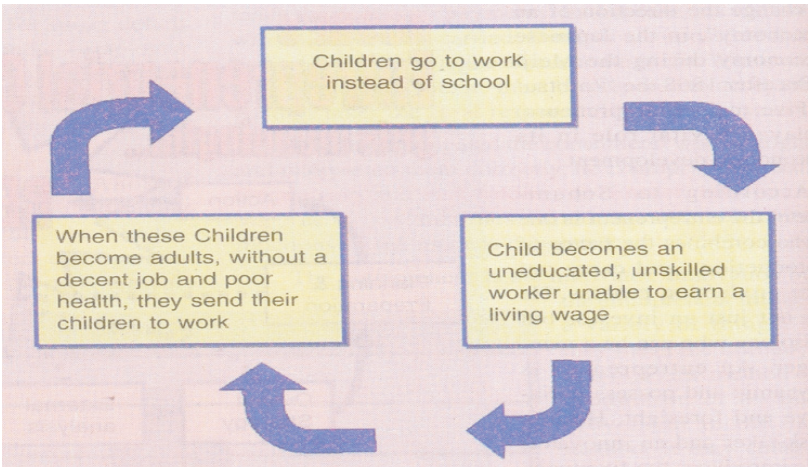

Fig. 3.12. Cycle of poverty and illiteracy.

(ii) **Lack of Entrepreneurship:** Another reason is the lack of good entrepreneurs who can invest the savings and carry out innovations. They are not daring enough to bear large risks involved in making capital goods.

(iii) **Weak Inducement to Invest:** A vicious circle also operates on the demand side of capital formation. "The inducement to invest may be low because of the small buying power of the people, which is due to their small real income, which again is due to low productivity. The low level of productivity, however, is a result of the small amount of capital used in production, which in its turn may be caused at least partly by the small inducement to invest". According to Nurkse.

Conclusion

Thus, under-developed economies are caught up in the vicious circle of poverty on both the supply and the demand sides of capital formation. Once the vicious circle is broken and the country starts developing, the growth becomes cumulative and then these "vicious circles" become beneficent.

Self-Assessment Questions

1. Indicate the criticism to which the traditional classification of the factors is subjected.
2. What are the peculiarities of traditional factors of production?
3. Distinguish between productive and unproductive labour. What are the factors which determine the efficiency of labour?
4. What is meant by division of labour? Briefly discuss its advantages and disadvantages.
5. "Division of labour is limited by the extent of the market." Discuss.
6. Discuss the causes of localization of industries and its advantages and disadvantages.
7. What are the advantages of decentralization of industries?

8. Discuss the role of the following in capital formation: (a) savings; (b) investments; (c) capital market and finance mechanism; and (d) foreign capital.
9. Account for the low rate of capital formation in under-developed countries. How far can disguised unemployment be regarded as a potential source of capital?

Or

Suggest measures to step up capital formation in under-developed countries with special reference to India.

10. Explain the role of machinery in large-scale production and state the economic and social consequences of mechanization.
11. "The introduction of machinery may create short-run unemployment while creating general long-term employment". Discuss.
12. Examine the role and functions of an entrepreneur in a capitalist economy.
13. Explain the concept of foreign direct investment and foreign institutional investment.
14. Discuss the main features of Schumpeter's importance to entrepreneurs and innovations.

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CHAPTER 4 PRODUCTION POSSIBILITY CURVE AND PRODUCTION FUNCTION

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✣ STRUCTURE ✣

- ☆ Introduction
- ☆ Production Possibility Curve
- ☆ Efficient Allocation of Resources
- ☆ Production Function: Input-Output Relationship

1. INTRODUCTION

In this chapter, we propose to deal with two fundamentals of the theory of production, viz., production possibility curve and production function.

Fig. 4.1. Material resources.

Fig. 4.2. Resources are used for production of goods in the economy.

4.2 PRODUCTION POSSIBILITY CURVE

We know that the resources, both human and material, at the disposal of the community are strictly limited and they are capable of alternative uses, whereas we want to produce innumerable commodities, i.e., the ends are unlimited. We have, therefore, to choose the most desirable assortment of goods that we can produce with the resources that we command and with a given state of technical knowledge. Had the resources at our disposal been unlimited, there would have been no problem, and we would have produced more of everything to satisfy our wants. If some resources were lying idle, then also it would have been possible to increase the production of all goods. But, in an economy

characterized by full employment, some good can be produced only by foregoing the production of some other good. This is in keeping with the opportunity cost principle.

An economy has a certain population and some millions of workers of various grades; it has mastered certain techniques of production; it has certain resources in the form of land, water and other natural resources. That is, it has a certain number of factors or inputs. The society has really to decide how these resources can be utilized to produce the various possible commodities. In other words, it has to discover its production possibility curves.

The production possibility curve shows the maximum output of any one commodity that the economy can produce together with the prescribed quantities of other commodities produced and the resources utilized. In short, the production possibility curve tells us what assortment of goods and services the economy can produce with the resources and techniques at its disposal. The assortment on the curve is regarded as technologically efficient and below it as inefficient, for the simple reason that the economy is capable of producing a bigger assortment at least in respect of one commodity without decreasing any other. Any assortment which is beyond the frontier is really beyond the economy's power and is unattainable. The production possibility curve depicts the society's menu of choices.

We shall illustrate the concept of the production possibility curve by means of a table and a diagram. We take only two commodities, although in the real world, the commodities that can be produced are numberless. We take only two, because a larger number cannot be represented on a two dimensional diagram. But the principle will be clear and can be applied to any number of commodities.

Let us take two commodities X and Y that a firm can produce. If it decides to devote more of its resources to the production of X, it must sacrifice to that extent production of some limits of Y as shown in Table 4.1.

Table 4.1. Alternative production possibilities.

Production Possibilities	*X (Thousands)*	*Y (Thousands)*
A	0	15
B	1	14
C	2	12
D	3	9
E	4	5
F	5	0

As in the case of indifference curves, we first suppose that all the resources at the disposal of the economy are devoted to the production of good X. In that case 5,000 X-products is the maximum that it can produce. Now let all the productive resources available be devoted to the production of Y with the result that 15,000 Y will be produced but no X. These are the two extreme limits, viz., 5,000 X but no Y and 15,000, Y but no X. In between these two extreme limits, there are numerous combinations of X and Y that can be produced.

The production possibility curve can be depicted by means of diagram given below.

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In this diagram (Fig. 4.1), A represents the extreme limit at which all Y's are produced. Now, if we want to produce some X, some Y will have to be sacrificed. For instance, in order to produce 1,000 X we shall have to be content with 14,000 Y instead of 15,000. That is, we have transformed, as it were, one thousand Y into 1,000 X, and so on in the Table 4.1. Thus, production possibility schedule is the same thing as production transformation schedule and the curve in the diagram (Fig. 4.3) is called the Production Transformation Curve.

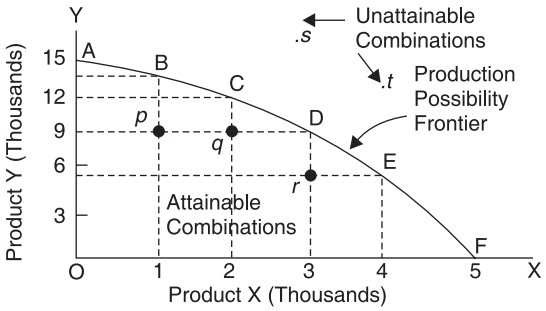

Fig. 4.3. Production possibility curve.

In the diagram, the curve marks the production possibility frontier and all points on the curve represent production possibility, the points inside the curve are attainable combinations and those outside such as *s, t* are unattainable combinations. Any point inside the curve represents an under utilization of resources or underemployment. A fuller utilization will shift the curve outwards.

Increase in the resources at the disposal of the firm will take it to a higher production possibility curve.

Marginal Rate of Transformation

We have seen above that, in order to produce more X, we must sacrifice some Y, i.e., Y's can be transformed into X's. The rate at which one product is transformed into another is called marginal rate of transformation. For instance, marginal rate of transformation between good X and good Y is the amount of Y which has to be sacrificed for the production of X. We can also see from the Table 4.1 that for the production of additional units of X, increasing quantities of Y have to be sacrificed. Hence, the marginal rate of transformation increases as more of X and and less of Y is produced. This makes the production possibility curve concave to the origin. The marginal rate of transformation (MRT) at any point on the production possibility curve is given by the slope of the curve at that point.

Iso-Revenue Lines

We have seen that the production possibility curve shows the various combinations of the two goods which can be produced with given resources. The question remains as to which of these various combinations the firm will decide to produce. Which is considered the most desirable? Surely, the firm will have to decide which combination out of the so many available will be most profitable. In order to hit on the most desirable combination, we shall introduce the price factor or the revenue factor (price paid by the purchaser is revenue for the seller). The producer must maximize his revenue. We shall, therefore,

draw the iso-revenue line yielding the same revenue output expansion path. In Fig. 4.4 RL, R′L′, R″L″ and R″ 'L'" are the iso-revenue lines, each showing that every point on the line represents the same revenue from the sale of the products X and Y. AB is our production possibility curve at which RL is the tangent touching it at P. Similarly, R′ L′ touches CD at higher production possibility curve at Q and R′ 'L' touches EF at a still higher curve at R and R" 'L', iso-revenue line touches GH, the higher curve, at S. Joining P, Q, R and S, we get output expansion path. The iso-revenue lines are parallel to one another since the prices of the products are taken as fixed. The slope of the iso-revenue line represents the ratio of the price of X to the price of Y.

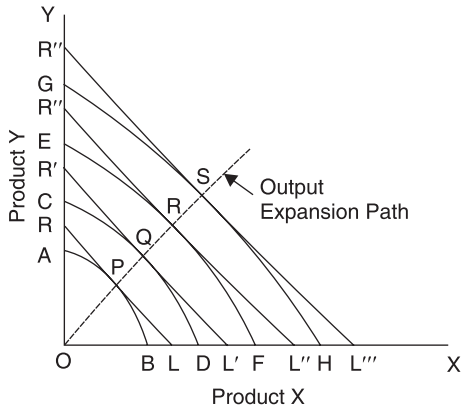

Fig. 4.4. Iso-revenue lines.

Output expansion path shows the revenue maximizing locus of different combinations of two products as resources of the firm change keeping prices of products constant. If the resources at the disposal of the firm are represented by the production possibility curve AB, then it will choose for production the combination of X and Y represented by the point P. At this point, its revenue will be maximum. Here the marginal rate of transformation MRTxy on the given production possibility curve will be equal to the price ratio of the two products, i.e., Py/Py similarly, as rega rds the points Q, R and S, P, Q, R, S expansion path is the locus of all the revenue maximizing product combinations with the varying amount of resources that the firm commands.

Uses of Production Possibility Curve

The production possibility curve can be put to a number of practical uses. Besides helping in the solution of the basic problems of production, viz., what and how, i.e., what is to be produced and how and with what combinations of resources it is to be produced, the concept of the production possibility curve can be put to the following uses:

(i) The planning authority of a developing country may decide after a certain stage to divert its resources from the production of necessities to luxuries and from producer goods to consumer goods.

(ii) A democratic country may decide to devote its resources less to the production of privately manufactured goods purchased by price and more by public sector enterprises supplied free but financed by taxes such as public utilities, free education, free medical services, etc.

(iii) The production possibility curve can also help in guiding the diversion of resources

from current consumption goods to capital goods like machines and increases productive resources to attain higher levels of production. Many more alternatives can be imagined.

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4.3 EFFICIENT ALLOCATION OF RESOURCES

We have been examining the problem of resource allocation from the point of view of an individual firm. Let us widen the horizon and try to see how the resources of the entire economy can be most efficiently utilized. What, in other words, is the criterion for the optimum utilization of the country's resources? The resources will be most efficiently allocated from the consumers' point of view if the highest possible level of satisfaction has been attained. From the point of view of national income, resource allocations will be regarded as efficiently employed if they make the maximum possible contribution to the national income. There will be misallocation, if the net national output is less than what it can be.

In a free enterprise economy, this important function is performed by the resource prices. For attaining maximum efficiency of resource allocation, there is constant shifting and reallocation of resources between different uses in response to changes in the tastes and preferences of people, changes in the category and the quantities of available resources and changes in techniques of production. Resource prices furnish the mechanism for rectifying misallocations of the resources in the economic system.

Criterion of Maximum Efficiency

Thus, the criterion for a correct or efficient utilization of resources is that the net national product has been maximized, i.e., at the existing technology it has attained a peak level. Conversely, the resources will not be correctly allocated if the net national product is below its maximum potential. However, in case of misallocation, automatically such forces will be set in motion as it will bring about a reallocation of the resources so as to maximize the national product.

The Principle

The question now is as to how the optimum allocation of resources can be achieved. Or, if there is a misallocation of resources among the various uses, how it is to be rectified. The law of substitution or equimarginal returns solves the problem. A community can allocate its resources in the most efficient manner by acting on this principle. This means that the resources should be so allocated among their various uses that the value of the marginal product in each use is the same. If it is not the same, then it has to be equalized by the application of the Law of Substitution, i.e., by transferring resources from one use to another.

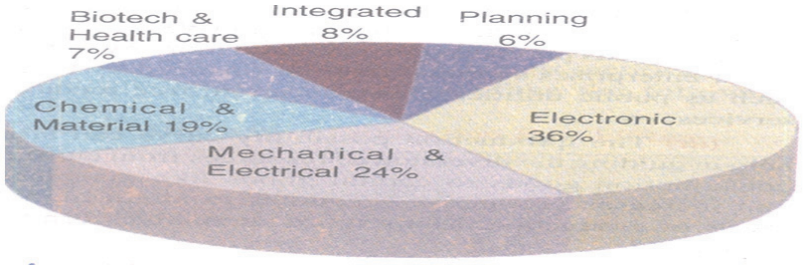

Fig. 4.5. An example of allocation of resources into various areas.

For instance, if the value of the marginal product of resources in one use is greater than it is in other uses, it is obvious that they will be more valuable to the society if they are used where the value of the marginal product is higher. Some units of the resource, therefore, must be transferred from the lower value to the uses with higher value of marginal product. That would increase the total value of the economy's output.

Since some price has to be paid for a factor, no factor will be used to such an extent as to reduce its marginal productivity to zero. Each scarce factor will be allocated among the various industries or uses in such a manner as to equalize the value of its marginal product in every industry where it is employed. If the value of the marginal product of labour, say, in the iron and steel industry, is greater than that in the sugar industry, labour will be shifted from the latter to the former, till the marginal productivities of labour in the two industries are equalized. In the same manner, if land is devoted to sugarcane cultivation it yields more than that if it is devoted to growing cotton, it will obviously pay to withdraw some land which cultivates cotton and divert it to sugarcane. This diversion will continue till the value of the marginal product in the two alternative uses of land has been equalized.

Thus, the factors of production will be optimally allocated among the various alternative uses when there is no inducement for diverting them from any one use to another. This will be the case only if the marginal return in each use is equal. So long as it is not equal, reshuffling will go on.

Thus, "the best allocation of the factors of production is when the value of the marginal production of a factor is the same in every line in which it is employed, or the equilibrium situation with regard to allocation of factors is that in which the community places the same value upon marginal product of the factor in every industry" (Benham).

The reshuffling of the resources between different uses takes places through the mechanism of resource prices. When the value of the marginal product of a given resource is lower in some industries, it is clear that the firms will not be willing to pay for it more than the value of its marginal product. On the other hand, where the value of its marginal product is higher, the firms will be keen to use more of it and they will offer to pay a higher price which is above the value of its marginal product in the former case. The owner of the resources who is keen to maximize his income will transfer the resources from the less remunerative, to the more remunerative uses. This transfer will continue till the value of the marginal product is equalized in all uses. When equality between the values of the marginal product has been attained, the resources will be making the maximum contribution to the net national product.

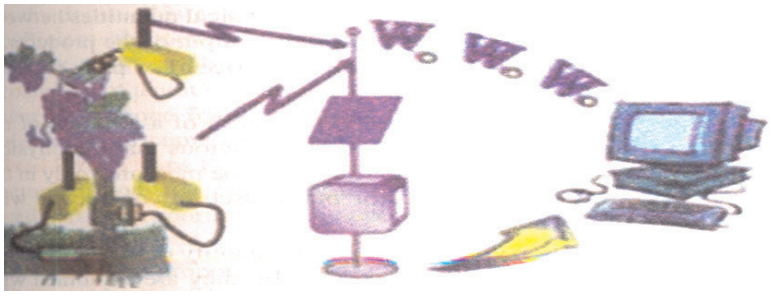

Fig. 4.6. Input and output.

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An illustration will make it clear. Let us take firms in two industries using resource A and producing two products X and Y. In accordance with the principle enunciated above, the resources will be correctly allocated among firms of the two industries when the value of marginal product of A in firms of the industry producing X (V of MPax) is equal to the value of marginal product of A in firms of the industry producing y = Y (v of MPay). Thus,

V of MPax = V of MPay = Pa

or MPPax × Px = MPPay × Py = Pa

V of MP means value of marginal product. Pa is the price per unit of resource A.

Px is the price of product X.

Py is the price of product Y.

Now if demand for the commodity X in the market increases, the price of X will rise, with the result that V of M Pax increases. This means that it has become more valuable for the community to utilize resource A more in the production of X than in the production of Y. The firms producing X will feel that at price Pa, the resource A is in short supply. Hence, they will raise its price to induce the owners of A resource to transfer its units to an industry producing X from that producing Y. As a consequence of larger quantities of A resource being used in X-producing industry, MP Pax will decrease. As the output of X expands, its price declines. Thus V of M Pax goes down. On the other hand, reduced use of A resource in Y-producing industry will result in the increase of MP Pay. Since output of Y decreases, its price Py will rise. As a result of increase in MP Pay and in Py, V of M Pay increases. Such transfer of resources from Y-producing industry to X-producing industry will continue till V of MPax becomes equal to V MPay. Since the value of the marginal product of A resource is now higher in both industries, the new price per unit of A will be higher. This resource will again be making its maximum contribution to the net national product.

Conclusion

The following statement clinches the issues underlying an efficient utilization of the resources: "Efficient transformations are those in which ceteris paribus: (1) it is not possible to increase the amount of any output without increasing the amount of some input or decreasing the amount of some other output; (2) it is not possible to decrease the amount of any output without reducing the amount of some input or increasing the amount of some other output. All others are inefficient.

4.4 PRODUCTION FUNCTION: INPUT-OUTPUT RELATIONSHIP

Production function may be defined as the functional relationship between physical inputs (i.e., factors of production) and physical outputs, i.e., the quantity of goods produced. As Stigler puts it, "the production function is the name given to the relationship between the rates of input of productive services and the rate of output of product. It is the economist's summary of technological knowledge."

Thus, the production function expresses the relationship between quantity of output and the quantities of various inputs used in production. The physical relationship between a firm's physical input and output depends on a given state of technological knowledge.

Like demand, production function refers to a period of time. Accordingly, it refers to a flow of inputs resulting in a flow of outputs over a period of time, leaving prices aside. It shows the maximum amount of output that can be produced from a given set of inputs in the existing state of technology. The output will change when the quantity of any input is changed or the minimum quantities of various inputs required to produce a given quantity are changed.

In real life, a manufacturer wants to know how much of the various factors or inputs, viz., land (i.e., natural resources), labour and capital will be required to produce a unit or given quantity of a commodity during a given period of time. It is necessary for him to know this so that he may be able not only to assess his requirements of productive services but also roughly to estimate the probable cost. It will thus indicate the varieties of the productive resources and their possible combinations used for the purposes of production.

Production function of course depends, inter alia, on (a) quantities of resources used, (b) state of technical knowledge, (c) possible processes, (d) size of the firms, (e) nature of organization, (f) relative prices of the factors of production and the manner in which the factors of production are combined. As these things change, production function will change too. For instance, output can be increased by increasing the quantity of factors of production or of some of them. It can also be increased by varying the proportion in which the factors are combined. Adoption of more efficient techniques of production, too, will add to the output. The less efficient the techniques the smaller will be the output.

Production changes with period of time. In the very long period, it changes altogether because the same inputs produce different outputs. In the long-run, the production function depicts the whole set of choices available to the producer, i.e., what inputs will produce what output. In the short-run, the choices available to the producer are restricted because some of the factors are fixed and cannot be changed in the short period and only some can be varied. In this situation, the producer tries to find out the relation between the variable inputs and the outputs.

Since production function is concerned with physical aspects of production, it is more a concern of an engineer or a technician than of an economist. Only a technician can say what specific quantity of a good can be produced by the use of the various productive resources and their combinations. Production function can be expressed as under: $x = f(a, b, c, d, \ldots\ldots)$

Here X is the output of a commodity per unit of time and *a, b, c, d*, ... are the various productive resources which go into the making of the quantity of the commodity; *f* is function, i.e., which varies.

Every management has to make a choice of the production function depending not only on industrial knowledge and the prices of the various factors of production but also on its own capacity to manage. It has also to select the various factors and knit them together in economical combinations. These two choices are interlinked. The over-riding consideration is to seek a combination, which gives the minimum average cost and maximum aggregate profit.

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For understanding the nature of production function the following points may be emphasized:

(i) The production function represents a purely technical relationship in physical quantities between the inputs of factors and the output of the products, it has no reference to money price. The price factor is left out altogether.

(ii) The output is the result of a joint use of the factors of production. It is obvious that the physical productivity of one factor can be measured only in the context of this factor being used in conjunction with other factors.

(iii) The nature or the quantity of the various factors and the manner in which they are combined will depend on the state of technical knowledge. For instance, labour productivity will depend on the quality of labour as determined by their education and training. Similarly, the productivity of machines will be determined by the technical advances embodied in them. Again, it is on the basis of technical knowledge at the time that labour, machines and other factors will be combined in the processes of production.

Thus, the state of technical knowledge is treated as given (i.e., as a parameter) for specifying a production function A change in technology will mean a shift to another production function. It will alter the cost condition, improvement in technology will result in a larger output from a given combination of the factors of production.

(iv) In specifying the production function of a firm, we have to take into account the variability of the factors of production and also whether they are divisible or indivisible: These features of the factors of production will determine their productivities and hence, the nature of the production function.

Types

Production function may take several forms: Broadly speaking (a) it can be a fixed proportions production function, or (b) it can be a variable proportions production function. In the case of fixed-proportions production function, the factors of production are used in a fixed proportion. For instance, a fixed number of workers may be required to produce a unit/units of the product and this proportion cannot be varied by substituting one factor for the other factors. In the case of variable proportions production function, the technical coefficient of production is variable. In other words, the quantity of a factor of production required to produce a given unit of product can be varied by substituting some other factor/factors in its place. This means that in this case a given quantity of a product can be turned out by several alternative combinations of factors of production as is shown in an iso-quant map.

Suppose we require 40 workers to produce 200 units of a product. The technical coefficient of production in this case is 1/5. In case the technical coefficient of production is fixed then in a case like this one-fifth of labour must be employed for the production of a unit of the commodity in question and there is no scope for varying its proportion through substitution of some other factor. This is the case of fixed proportions production function in which the factors of production e.g., labour and capital must be used in fixed proportions in the production of a certain level of output.

The fixed proportion production function can be illustrated by the following diagram:

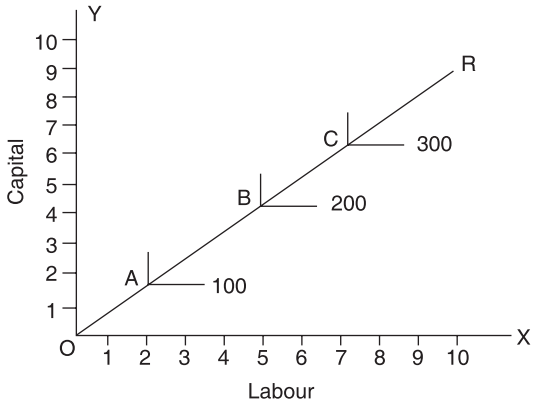

Fig. 4.7. The fixed proportion production

In this diagram, OR represents the fixed labour capital ratio. This ratio must be maintained whatever the level of output. Since this ratio is fixed, the isoquants relating to such a production function are shown as right-angles. Suppose the ratio is 2 : 3 i.e., 2 units of capital and 3 units of labour, when 100 units of the product are to be produced; then for producing 200 units 4 units of capital and 6 units of labour will be required, and so on. It may be noticed that along each iso-quant, the marginal product of a factor is zero. For instance, at B an iso-quant of 200, if the amount of capital used is fixed the use of extra labour makes no addition to the total product, i.e., the marginal product of labour is zero. However, doubling both factors will result in doubling the output, and so on.

In this case, as already mentioned, the ratio in which the factors of production are used is not fixed but it is variable. That is, a given quantity of the product can be produced by several alternative combinations of factors. In the iso-quant map various equal product curves are drawn to show how different combinations of factors of production can be used to produce a given level of output.

Linear Homogeneous Production Function

The linear homogeneous production function implies that if all the factors of production are increased in same proportion, the output also increases in the same proportion. That is, the doubling of all inputs will double the output and trebling them will result in the trebling of the output, and so on. This represents a case of constant returns to scale. This type of production function is called by the economists as a well behaved production function because it can be easily handled and used in empirical studies. It can be used by computers in calculations. That is why it is widely used in linear programming and input-output analysis. It is also extensively used in model analysis of production, distribution and economic growth.

This is a production function, which is homogeneous of the first degree. That is, it shows that the increase in output in the same proportion follows a given change in the factors of production. This has been put mathematically as:

$$mP = f(mX, mY)$$

Here m is any number and K means constant. This function is homogeneous of the Kth degree. If K is equal to one then this homogeneous function is homogeneous of the

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first degree and if K is equal to two it is homogeneous of the second degree, and so on. If K is greater than one the production function gives increasing returns to scale and if it is less than one it gives decreasing returns to scale. In the case of homogeneous production function, the expansion path is always a straight line through the origin. This means that in the case of homogeneous production function of the first degree, given constant relative factor prices, the proportions between the factors used will always be the same whatever the level of output. This makes the task of the entrepreneur easy. Having hit on optimum factor proportions, he need not change the decision so long as the relative prices of the factors remain unchanged.

Cobb-Douglas Production Function

A well known empirical production function is the Cobb-Douglas production function. It takes two inputs, labour and capital, and is expressed by the following equation:

$$Q = Kl^{a}\ C(I - a)$$

Here Q is the quantity of output, L is the labour employed, K and a are positive constants ($a < 1$) and C is the quantity of capital used.

Self-Assessment Questions

1. Explain a linear homogeneous production function.
2. What is 'production function'? How does it help in understanding a producer's equilibrium?
3. Explain with the help of production possibility curve how economics is concerned with the problem of employment and allocation and growth of a community's resources.
4. Explain the following problems in economics with the help of production possibility curve: (i) Choice between the production of consumer goods and producer goods in an economy; (ii) The problem of unemployed resources; (iii) The problem of economic growth.

CHAPTER 5 LAWS OF RETURN

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✣ STRUCTURE ✣

- ☆ Introduction
- ☆ Law of Diminishing Returns
- ☆ The Law of Variable Proportions
- ☆ Average-Marginal Relations
- ☆ Law of Increasing Returns
- ☆ Law of Constant Returns
- ☆ Returns to Scale

5.1 INTRODUCTION

We shall first study the laws of return, which are different aspects of one law, viz., the law of variable proportions, and then returns to scale and in the next chapter equal product curves.

There are three laws of returns known to economists, the laws of diminishing, increasing and constant return. "There is said to be increasing, decreasing or constant returns accordingly as the marginal returns rise, fall or remain unchanged" as the quantity of a factor of production is increased. In terms of cost, an industry is subject to increasing, decreasing or constant returns accordingly as the marginal cost of production falls, rises or remains the same, respectively, with the expansion of an industry.

5.2 LAW OF DIMINISHING RETURN

Statement of the Law

In the absence of the law of diminishing returns, "the science of political economy", says Cairnes, "would be as completely revolutionized as if human nature itself were altered". Such is the importance of the law of diminishing returns in economic theory.

The law of diminishing returns was supposed to have a special application to agriculture. It is the practical experience of every farmer that "successive applications of labour and capital to a given area of land must ultimately, other things remaining the same, yield a less than proportionate increase in produce." If by doubling labour and capital he could double the yield of his land and so on, it can be easily seen that one acre of land could be made to produce as much wheat as could suffice for the entire population of the world. This cannot be done but simply due to the operation of the law of diminishing returns. If investment is increased, the total yield will no doubt increase, but at a diminishing rate.

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Marshall stated the law thus: "An increase in capital and labour applied in the cultivation of land causes in general less than proportionate increase in the amount of produce raised, unless it happens to coincide with an improvement in the art of agriculture." The phrase 'in general' in this statement is important. It means that there may be cases where the law does not hold good. It refers to limitations of the law.

Table 5.1. Three aspects of the law of diminishing returns.

No. of workers	*Total return*	*Marginal return*	*Average return*
(1)	(2)	(3)	(4)
1	80	80	80
2	170	90	85
3	270	100	90
		—	
4	368	98	92
			—
5	430	62	86
6	480	50	80
7	504	24	72
8	504	0	63
9	495	– 9	55
10	440	– 55	44

From the Table 5.1, it appears that there are three different aspects of the law of diminishing returns:

(1) Law of Total Diminishing Returns (Column 2): In this sense, the returns begin to diminish from the 9th worker. Every successive worker employed does make some addition to the total output. But the 8th adds nothing and the 9th and 10th are a positive nuisance. As workers cannot be productive, no prudent farmer will employ more than seven workers in the conditions represented by Table 14.1.

(2) Law of Diminishing Marginal Returns (Column 3): Marginal returns go on increasing up to the 3rd worker. This is so because the proportion of workers to land was at first insufficient and the land was not being properly tilled. This phase of cultivation is unstable and will not be found in practice. When the farmer knows that he can get more than proportionate return by employing an extra hand, he will certainly do so. The marginal, i.e., the additional, return goes on falling from the 3rd man onwards till it drops down to zero at the 8th, the 9th and 10th men are merely a cause of obstruction to the others and are responsible in making the marginal return negative. The point at which the addition made to the total output by each successive unit of the variable factor starts diminishing is known as the point of diminishing marginal returns.

It can be seen that the total output is at its maximum when marginal output is zero. It should be remembered that the marginal return is not what can be attributed to the last unit whose employment is considered just worthwhile, as all men are supposed to be alike. The marginal return is simply the addition that the marginal unit makes to the total return.

(3) Law of Diminishing Average Returns (Column 4): The average return reaches the maximum at the 4th worker, i.e., one step later than the marginal return reaches the maximum. Then the marginal return falls more sharply. The two equalize somewhere between the 4th and 5th, i.e., when the 5th worker works part-time. But we do not employ men in fractions in real life. Therefore, it is not always possible to equalize the marginal and the average returns. It is also clear that it is possible for the average output to increase while the marginal output falls.

Diagrammatic Representation. The law can be diagrammatically represented as in Fig. 5.1.

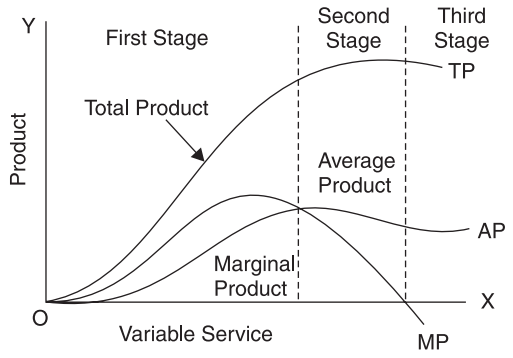

Fig. 5.1. Stages of the law of diminishing returns.

The total production (i.e., return) goes on increasing till it reaches the maximum where the third stage starts. The marginal return reaches the maximum at the earliest and starts diminishing at the first stage. The average return starts diminishing next, i.e., where the second stage begins.

This is in keeping with the above table. Obviously, no sensible entrepreneur will operate in the third stage where the marginal product is zero, unless, ofcourse, the variable factor is free. Economically, the second stage is the significant region where the average product is greater than the marginal product, which is still positive. It can be seen that the total output curve is the steepest where the marginal output is the largest. The law of diminishing returns is also called the law of diminishing physical productivity.

Limitations of the Law of Diminishing Return

The law of diminishing returns does not apply to all situations. There are several exceptions to the law as it applies in agriculture:

(i) **Improved methods of cultivation:** Man's ingenuity is ever striving to counteract the operation of this law by improving the technique of cultivation. Scientific rotation of crops, improved seeds, modern implements, artificial manures and better irrigation facilities, etc. is bound to give increasing return. But science cannot keep pace with the increasing demand for food. The niggardliness of nature must ultimately assert itself and the law must operate sooner or later.

(ii) **New soil:** When a virgin soil is brought under cultivation, the additional return for each successive dose of labour and capital may increase for a time. But after a point, the tendency of diminishing returns will set in. Hence, in the case of a new soil, the law of diminishing returns does not apply in the beginning.

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(iii) **Insufficient capital:** If capital applied hitherto has not been insufficient, increased application will, at first, yield more than proportionate return. Later, however, the marginal return will decrease. The early stage is an exception to the law of diminishing return.

How to Counteract the Law

Anything, which improves the quality of the land and makes it yield more, or anything, which adds to the value of the yield, will check the operation of the law. Use of modern implements, judicious mixing of soil and manures, careful selection of the seed and proper sowing, deeper and deeper tillage, and the provision of ample irrigation facilities, etc. can enable a farmer to counteract the working of the law. Scientific cultivation, in short, can check the operation of the law of diminishing returns.

Application of the Law

Besides agriculture, the law also applies to extractive industries like mining, fisheries and also to building industry. The law operates when mining operations are extended to inferior, distant or deeper mines, when fishing operations are concentrated in one place and when more and more storeys are raised on a building.

Why the Law Specially Applies to Agriculture

We have seen that the law of diminishing returns has a wide application. But it specially applies to agriculture and other extractive industries. One thing that is common to all these industries is the supremacy of nature. It is, therefore, often remarked that the part that nature plays in production corresponds to diminishing returns and the part which man plays conforms to the law of increasing returns. The inference is that agriculture, where nature is supreme, is subject to diminishing returns, while industry, where man is supreme, is subject to increasing returns.

There are several reasons why agriculture is subject to the law of diminishing returns:

(i) The agricultural operations are spread out over a wide area, and consequently supervision cannot be very effective.

(ii) Scope for the use of specialized machinery is also very limited. Therefore, economies of large-scale production cannot be reaped.

(iii) There are further limitations arising from the seasonal nature of the industry. Agricultural operations are likely to be interrupted by rain and other climatic changes. Man is not a complete master of nature, and it is no wonder that the law of diminishing returns operates in agriculture.

Similarly, it is understandable that manufacturing industries should be subject to the law of increasing return. Here man's ingenuity has the fullest scope to show itself. By the introduction of division of labour and the use of the most modern appliances, production can be greatly increased. Concentration of workers under one roof renders supervision easy and effective. Nature's malignant influences are thus held constantly at bay. Man is free to plan, undertake and execute. He can realize all the possible economies, internal and external.

But it is wrong to say that agriculture is always subject to diminishing returns and manufacturing always to increasing returns. The law of diminishing returns applies

everywhere. To borrow Wicksteed's words. "This law is as universal as the law of life itself." Its application is not confined to agriculture only; it applies to manufacturing industries too. If the industry is expanded too much and becomes unwieldy, supervision will become lax. The law of diminishing returns will, therefore, set in both in agriculture and industry earlier. The only difference is that in agriculture it sets and in industry much later.

Thus, both laws apply in all types of industrial extractive as well as manufacturing. As a matter of fact, they are two aspects of the same law, which also known as the Law of Variable Proportions.

Law of Diminishing Returns in a Firm

The discussion of the law of diminishing returns in relation to land, since the times of the English classical economists, has obscured its real significance. There is nothing peculiar about agriculture for the law to be exclusively associated with it. As a matter of fact, in agriculture, the law has been held in check by scientific cultivation in progressive countries. This is evident from the fact that whereas consumption of food has increased on account of higher standards of living, the number of people engaged in the production of food has actually gone down.

The fact is that the law of diminishing returns does not apply to agriculture alone. It has got a general application and can, therefore, be put in a general form. The law of diminishing returns simply refers to a principle of combination of the factors. In a general way, it can be stated that if a variable factor is combined with some constant factors, the average and the marginal return for that variable factor will diminish. Benham states the law thus: "As the proportion of one factor in a combination of factors is increased after a point the average and marginal product of that factor will diminish."

Why the Law of Diminishing Returns Operates

The operation of the law of diminishing returns can be attributed to several causes:

(i) **Wrong Combination:** In the initial stages, the fixed factor is not fully used since the units of variable factor are too few. Hence, increase in the variable factor in the initial stages proves productive on account of fuller utilization of the fixed factor and of better co-operation and greater specialization in the variable factor units. We are moving towards the optimum combination. But after a stage, increase in the variable factor brings down the marginal return. Thus, the law of diminishing returns operates because the combination of the factors of production ceases to represent a correct proportion. It ceases to be an optimum combination. There is too much of one factor in relation to the others. The fixed factor has reached its maximum capacity and there is no further possibility of specialization of the variable factor. This explains the operation of the law of diminishing returns. When proper balance is restored the law of diminishing returns will no longer operate.

But the law of diminishing returns is a misnomer. We saw that in the beginning the marginal return increases. It is only ultimately that the law operates. This is why Bounding calls it "the law of eventually diminishing marginal physical productivity."

(ii) **Scarcity of Factors:** The law of diminishing returns operates due to the scarcity of the factors of production. In the words of Chapman, "The expansion of an industry, provided that additional supplies of some agent in production, which is essential cannot

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be obtained, is invariably accompanied at once or eventually by decreasing returns, other things being equal."

(iii) **Imperfect Substitutes:** A little reflection will show that the law of diminishing returns operates because the factors of production are imperfect substitutes for one another. As Robinson says, "What the law of diminishing returns really states is that there is a limit to the extent to which one factor of production can be substituted for another, or, in other words, that the elasticity of substitution between factors is not infinite. If this were not true it would be possible when one factor of production is fixed in amount and the rest are in perfectly elastic supply, to produce part of the output with the aid of the fixed factor, and then, when optimum proportion between this factor and other factors was attained, to substitute some other factor for it and to increase output at constant cost. Thus, the law of diminishing returns entails that the various elements required for the production of any commodity should be divided into groups, each group being a factor of production, in such a way that the elasticity of substitution between one factor and another is less than infinite.

Importance of the Law of Diminishing Returns

We have quoted Cairns when he says that in the absence of the law of diminishing returns, "The science of political economy would be as completely revolutionized as if human nature itself were altered." Such is the great importance of the law of diminishing returns. The law of diminishing returns has a very wide, almost universal application. Uptill Marshall, it was thought that the law of diminishing returns applied to agriculture whereas the laws of increasing or constant returns applied to manufacture. But it is now held that the law of diminishing returns applies in all fields of production, whether agriculture, mining or manufacture. Whenever we find that some factors of production are fixed and cannot be varied and other factors are varied, then techniques of production remaining the same, diminishing returns are bound to follow, sooner or later. There is no escape.

The validity of the law of diminishing returns is not merely based on theoretical reasoning but it has been supported by extensive empirical evidence. It has been remarked that if the diminishing return did not occur we could grow sufficient food grains in a flower pot merely by increasing the dozes of labour and capital. It is obvious that if the successive applications of dozes of labour and capital resulted in obtaining constant returns, the whole population of the world could be fed by growing crops on a tiny piece of land. As population increased, we could use more labour and capital on a piece of land to get proportionate increase in agricultural output and there would be no fear of famine and starvation. As Professor Lipsey remarks, "Indeed, where hypothesis of diminishing returns is incorrect, there would be no fear that the present population explosion will bring with it a food crisis. If the marginal product of additional worker applied to a fixed quantity of land were constant, then the world's food production would be expanded in proportion to the increase in population merely by keeping the same proportion of the population on farms. As it is, diminishing returns means an inexorable decline in the marginal product of each additional labourer as an expanding population is applied, with static techniques, to a fixed world supply of agriculture. But let there be no misunderstanding. We need not arrive at the dismal conclusion that since the law of diminishing returns is universally true, the average and marginal returns must eventually decline and humanity is doomed. There is no such fear. Experience of both developed technology may be able to keep the law of diminishing returns in abeyance. We see from the Indian experience

that improved technology has ushered in what is known as the 'green revolution' and, in a short span of time, we have not only been able to ban hunger and starvation from the land, but we have also now a comfortable surplus. The ghost of law of diminishing returns seems to have been laid.

At the same time, we must point out that this happy experience is no contradiction of the law of diminishing returns. The law clearly states that if there is no charge in technical knowledge, capital equipment, and other aids to production, the law of diminishing returns is kept in check for the time being. But who can say that the improvement in technology and addition to capital equipment will keep pace with a galloping population. We have only suspended the operation of the law of diminishing returns by improving techniques of production through the application of science and technology, but if we fail to keep up the technical progress in a sufficient measure, the law of diminishing returns may assert it self. As Lipsey observes, "Unless there is a continual and rapidly accelerating improvement in techniques of production, the population explosion must bring with it decline in living standards over much of the world and eventual widespread famine."

The law of diminishing returns has formed the basis of a number of economic doctrines propounded by the English classical economists, especially Malthus and Ricardo. It was represented as an inexorable law of nature. It accounted for a lot of pessimistic thinking in economics and earned for it the title of a 'dismal science' The Malthusian theory of population, which says that population increases faster than the food supply, is obviously based on the fact that the production of food is subject to the law of diminishing returns.

Ricardian Theory of Rent: The Ricardian theory of rent explains the determination of rent on the assumption that inferior lands have to be cultivated on account of the operation of the law of diminishing returns. The margin of cultivation descends, and rent rises. The optimum size of business is explained again by the working of this law.

Theory of Distribution: The marginal productivity theory, which determines the share of a factor of production in the national dividend, is also based on the operation of this important law.

Conclusion

The law of diminishing returns, therefore, occupies a very important place in the realm of economic thought.

5.3 THE LAW OF VARIABLE PROPORTIONS

The law of variable proportions (of which the law of diminishing returns is one aspect) shows the efficiency of factor combination. Incidentally, the three stages of the law of diminishing returns showed above throw light on how efficiently have the factors (land and labour) been combined in the process of production. The average return shows the amount of the product obtained per unit of labour for the various land-labour ratios and the total product column (Column 2) shows the total output obtained from that unit of land for the various land-labour ratios.

In stage I, as more and more labour is used, the average product of labour increases, which reflects the increasing efficiency of labour. In this stage, the total product increases also for this unit of land, which shows that the efficiency of land too is increasing. Hence, this stage shows that both land and labour are being efficiently utilized.

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The second stage shows decreasing average product and marginal product of labour. But since the total output goes on increasing the marginal product is positive. This stage shows the decreasing efficiency of labour. But the efficiency of land continues to increase because the total return continues to increase. In the third stage, the average product (of labour) decreases still further. Also, the marginal product becomes negative and the total product is decreasing. Hence, in this stage, both labour and land have been used inefficiently.

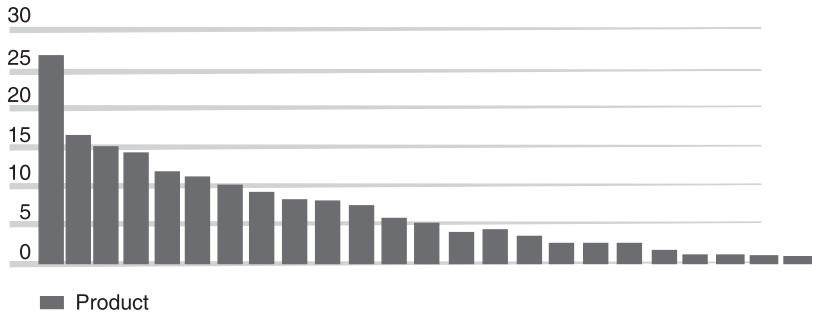

Fig. 5.2. Diminishing returns.

Thus, the combination of land and labour attained maximum efficiency of labour at the boundary line between stage I and II and maximum efficiency of land at the boundary line between stage II and stage III. Stage II represents higher efficiency of land-labour ratio than that of the other two stages.

The productive resources of land and labour both command a price in the market and have to be paid for. Since, in stage I, product per unit of both land and labour increases, the firm will keep expanding and move to the boundary between stage I and stage II. But when it enters the second stage, it finds that the return per unit expenditure on labour decreases while that of land increases. The proportions in which land and labour will be used will depend on their relative prices or costs per unit. If the price of land is low relative to the price of labour, the firm will operate more in the beginning of stage II, and, conversely, less the price of labour relative to the price of land, it will operate towards the end of the stage II. Stages III and I are ruled out. Stage I is ruled out because throughout this stage average product of both land and labour are still increasing and stage III is ruled out because the average product of both factors is decreasing.

It will be seen that the name of the law "law of diminishing returns" is a misnomer. This law is also called the law of proportionality. This law tells us how the total output or marginal output is affected by a change in the proportion of the factors used. Since the return to the variable factor does not change at the same rate in all stages, it is also called the law of non-proportional returns.

When, after a stage, the marginal return begins to diminish, it is not due to the fact that either the prices of the factors of production have gone up or the price of the output has gone down. It is rather due to the technological facts underlying the production of the product in question. Every industry has its own peculiar set of technical facts; for example, agriculture is dominated by the nature of land and manufacturing industry by capital. In agriculture, the marginal return starts diminishing early, whereas in a manufacturing industry, it starts diminishing very late, which a wise entrepreneur can altogether avoid. In some industries, the return may remain constant. This is all due to the technological peculiarities of each industry.

In agriculture, marginal return increases in the beginning but then decreases later, whereas in industry it continues increasing but may decrease if the industry is expanded too much. It is thus wrong to say that one law applies in one industry and another in another industry. The fact is that there is only one law, which applies everywhere, and which is properly called the Law of Variable Proportions. This law operates in all industries, although its different stages are to be found in different industries or its different stages are larger or shorter in different industries. In some industries, the stage of increasing marginal return finishes earlier and diminishing marginal return starts as in agriculture and, in some other industries, the stage of increasing marginal return is so long that the marginal return starts diminishing only when the scale of production is unduly enlarged as in the case of almost all manufacturing industries.

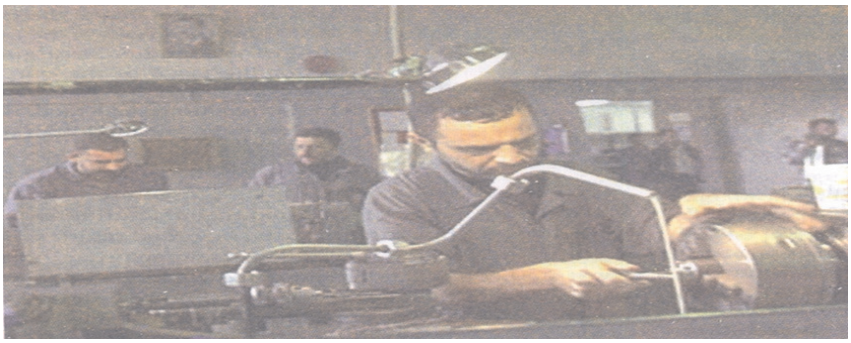

Fig. 5.3. Labour and capital.

The law of variable proportion occupies a very important place in economic theory. It describes the production function with one variable factor while the quantities of other factors of production are fixed. That is, it describes the input-output relation in a situation when the output is increased by increasing the quantity of one input, keeping the other inputs constant. When the quantity of one factor is increased and the quantities of the other factors of production are kept constant, naturally the proportion between the variable factors and the fixed factor is altered. That is, the ratio of the variable factor to that of the fixed factor goes on increasing as a quantity of the variable factor is increased. It is because in this law we study the effect on output of variations in factor proportion, this law is called the law of variable proportions. In fact, the law of variable proportions is the new name for the well-known law of diminishing returns.

Marshall, thought that there were three separate laws of production, viz., the laws of diminishing, increasing and constant returns. The modern economists are of the view that these three laws are not three separate laws but are only three phases of one general law of variable proportions.

The law of variable proportions has been variously stated by the economists. In the words of Stigler, "As equal increments of one input are added, the inputs of other productive services being held constant, beyond a certain point the result in increment of product will decrease, i.e., the marginal product will diminish." Professor Samuelson states the law thus, "An increase in some inputs relative to other fixed inputs will, in a given state of technology, cause output, to increase; but after a point the extra output resulting from the same additions of extra inputs will become less and less." Professor Benham also states the law almost in similar words, "As the proportion of one factor in a combination of factors is increased, after a point, first the marginal and then the

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average product of that factor will diminish."

It will be seen that these statements are really statements of the law of diminishing returns, which should be considered as an old name for the new law of variable proportions. Prof. Bounding considers that the expression 'diminishing returns' is a loose one, He, therefore, called it the law of Eventually Diminishing Marginal Physical Productivity. He defines the law thus, "As we increase the quantity of any one input which is combined with a fixed quantity of other inputs the marginal physical productivity of the variable input must actually decline."

Thus, we find from the statements of the law of variable proportions given above that this law relates to the behaviour of output as on the quantity of one factor is varied by keeping the quantities of the other factors constant. It states further that the marginal product and the average product of the factor kept constant will eventually diminish.

Assumptions of the Law of Variable Proportions

The law of variable proportions, as stated above holds true under certain conditions. The following are its main assumptions:

(a) It is assumed that the state of technology remains unaltered. It is obvious that improvements in technology are bound to raise the marginal and average product and they will not diminish as the law says.

(b) It is also assumed that of the various inputs employed in production at least some must be kept constant. This is so because only in this way we can change the factor proportions and find out its effects on the output. Hence, this law does not apply where all factors of production are proportionately varied. Behaviour of output when all inputs are varied comes under, 'returns to scale' which we shall discuss later.

(c) The law of variable proportions is clearly based upon the possibility of varying proportions in which the various factors are combined in production. It does not apply to cases where the factors have to be used in fixed proportions to yield fixed products. In cases where the various factors are to be used in rigidly fixed proportions, the increase in one factor would not lead to any increase in input, that is, the marginal product of the factor will be zero and not diminishing. But such cases are very uncommon and hence the law of variable proportions has almost a universal application.

5.4 AVERAGE-MARGINAL RELATIONS

When we study trends in marginal and average returns (or outputs) we can discover certain unique relationship between them:

(1) So long as the marginal return exceeds the average return (see columns 3 and 4 of Table 5.1), each new average return will be larger than the previous one, i.e., the average output continues to increase. Conversely, if average output is rising, it can be safely concluded that the marginal output is larger than the output.

(2) When the marginal return goes below the average return, average output begins to decline. This is so, because the new marginal return, which is lower, brings down the average. That is, when the average product is decreasing, the marginal product is less than the average product.

(3) The average output remains constant when the marginal and average returns are equal. Conversely, if the average output remains constant, it can be inferred that the marginal output is also constant and the two are equal. Also, when the average product is maximum, marginal product equals average product. In such cases, the average and marginal curves coincide and they are horizontal, parallel to the X-axis.

5.5 LAW OF INCREASING RETURNS

Another aspect of the universal law of variable proportions is the law of increasing returns. An industry is subject to the law of increasing returns if extra investment in the industry is followed by more than proportionate returns, i.e, if the marginal product increases. In terms of cost, the law of increasing returns means the lowering of the marginal costs as industry is expanded. As marginal cost indicates price, we can say that the law of increasing returns operates in an industry if, with every expansion of its output, the price of the product falls.

These two laws of increasing and diminishing returns can also be explained in terms of the optimum business unit. We shall have increasing returns when we are moving towards the optimum and diminishing returns when we move beyond the optimum.

Why the Law of Increasing Returns Operates

We have already seen what economies can be reaped if the scale of production is increased. Advantages of specialization of labour and machinery and other commercial and miscellaneous economies make' it possible to lower the cost of production, and we have increasing returns.

Economies among the economies of mass production which contribute to greater productivity at less cost may be mentioned.

(i) Use of non-human and non-animal power resources (water and wind power, steam, electricity, atomic energy);

(ii) Automatic self-adjusting mechanism;

(iii) Use of standardized, interchangeable parts;

(iv) Breakdown of complex processes into simple repetitive operations;

(v) Specialization of functions and division of labour; and

(vi) Many other technological factors.

No Scarcity of Factors: The law of diminishing returns operates when there is dearth of an essential factor. But if there is no dearth, the law of increasing returns will operate. The expansion of an industry, provided that there is no dearth of suitable agents of production, tends to be accompanied, other things being equal, by increasing returns.

Right Combination: The law of diminishing returns operates when the factors have been combined in wrong proportions. Now when we try to correct the combination, increasing returns will follow till the balance is completely restored.

Full Use of Indivisible Factors: The concept of indivisibility, too, has a close bearing on the law of increasing returns. A manufacturer sets up a plant to cope with a peak demand, but in actual practice it may be producing below capacity. In that case, if an addition is made to some other factor or factors, the indivisible factor will be more fully employed, and increasing returns will follow.

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5.6 LAW OF CONSTANT RETURNS

There can be a situation when neither the law of diminishing returns nor the law of increasing returns operates, but there is instead constant return. An industry is subject to the law of constant returns when, whatever the output or scale of production, the cost per unit remains unaltered, or increased investment of labour and capital results in a proportionate increase in the output.

Marshall pointed out that the part played by nature corresponded to diminishing returns and the part played by man to increasing returns. That is why in agriculture, where nature is said to be supreme, there is diminishing return. In manufacturing industries, where man's ingenuity has the fullest play in effecting all sorts of economies unhampered by external forces, there operates the law of increasing returns. It is conceivable that some industry may lie midway between the two, where neither there is diminishing return nor increasing return, but there is constant return.

Think of an industry where the raw materials, representing nature's part, account for the same proportion of the total cost as the manufacturing cost which is man's part. In such a case, the law of constant return will operate.

In every industry, the two opposite tendencies are at work. When it is expanded some costs rise and the others fall. It is possible that there may be an industry where these two tendencies just neutralize each other, and we have constant return. The example of an industry making blankets out of pure natural wool is sometimes given in this connection. It is said that the raw material (wool) is subject to diminishing returns, but this tendency is just counter-balanced by the economies in the manufacturing costs, and there is a constant return.

The concept of the optimum can help us to understand the operation of the laws of returns. We have said that movement towards the optimum means increasing returns, and the movement beyond it the diminishing returns. But, if we keep to the optimum, for however short a period it may be, we shall have constant returns.

5.7 RETURNS TO SCALE

Distinction between Laws of Returns and Returns to Scale

The laws of returns are often confused with 'returns to scale'. The two may be clearly distinguished. By "returns to scale" is meant the behaviour of production or returns when all the productive factors are increased or decreased simultaneously in the same ratio. In other words, in returns to scale, we analyze the effect of doubling, trebling, and quadrupling and so on of all the inputs of productive resources on the output of the product.

The returns to scale may clearly be distinguished from the Law of Variable Proportions. In the law of variable proportions, while some co-operating factors of production may be increased (or decreased), at least one factor (e.g., land in agriculture or entrepreneur in industry) remains constant or cannot be increased, so that the proportion among the factors of production changes and we see how returns or output is affected by such changes in the supply of the productive resources. In returns to scale, on the other hand, all the necessary factors of production are increased/decreased to the same extent so that whatever the scale of production, the proportion among the factors remains the same.

Three Phases of Returns to Scale

A layman, uninitiated into the techniques of economic analysis, would perhaps expect that, with the doubling of all productive factors, the output would also double and with trebling of all factors of production, production would also be trebled, and so on. But actually this is not so. In other words, actually the output or returns do not increase/ decrease strictly according to the change in the scale.

We know that in the case of the law of variable proportions, as we increase some of the cooperating factors, the marginal product or return increases at first, then stays constant and ultimately it starts diminishing. Similarly, when we increase the scale, i.e., increase all the factors of production together to the same extent, the marginal product or return increases at first, i.e., up to a point, then constant for some further increases in the scale of production is increased still further.

Table 5.2. Returns of scale.

S. No.	*Scale product*	*Total or returns (in quintals)*	*Marginal product (in quintals)*	
1	1 W + 3 A	2	2	
2	2 W + 6 A	5	3	Stage I: Increasing Returns
3	3 W + 9	9	4	
4	4 W + 12 A	14	5	
5	5 W + 15 A	19	5	Stage II: Constant Returns
6	6 W + 18 A	24	5	
7	7 W + 21 A	28	4	
8	8 W + 24 A	31	3	Stage III: Decreasing Returns
9	9 W + 27 A	33	2	

Note. 'W' stands for workers and 'A' stands for acres of land.

In other words, there are three distinct phases of, or stages in, the behaviour of the marginal product. Let us take a numerical example to explain the behaviour of the returns to scale.

In the Table 5.2 we see that, at the outset, when we employ one worker on 3 acres of land, the total product is 2 quintals. Now to increase output, we double the scale, but the total product increases to more than double (to 5 instead of 4 quintals) and when the scale is trebled, the total product increases from 5 quintals to 9 quintals—the increase this time being 4 quintals as against 3 in the previous case. In other words, the returns to scale have been increasing. If the scale of production is further increased, the marginal product remains constant up to a certain point and, beyond it, it (the marginal product) starts diminishing. In the table at Serial No.9, the marginal product or return falls to only 2 quintals.

Explanation

Now, we may try to explain why we get the above-mentioned three phases or stages, i.e., what makes the returns to scale behave in the manner they do. The chief reason of this kind of behaviour is that when in the beginning, the scale of production is increased,

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increased division of labour becomes possible and is adopted and, as a result thereof, output increases rather rapidly. In the Table 5.2, when there is only one worker working on three acres of land, there is no scope for division of labour. When there are two workers instead and six acres of land, i.e., the factors of production are doubled, there will be increased scope for division of labour and output not only doubles but increases still more and the returns to scale increase.

In this way, up to a certain point, the returns to scale will go on increasing until there is no further scope for division of labour. Beyond this point, the marginal product or the returns to scale will cease to increase and will remain constant for certain further increases in scale (e.g., in the Table 5.2 when 5 workers and 15 acres of land are used instead of 4 workers and 12 acres of land, the marginal product remains 5 quintals as before; similarly for Serial No. 5 to Serial No .6).

But when scale is increased beyond Serial No. 6, the scope for division of labour is reduced with the result that the marginal return or product begins to decline. In short, the main underlying cause of the changing returns to scale is the possibility or otherwise of the division of labour or specialization.

However, it is very important to state here, that, in actual life, the scale of production cannot be increased beyond a certain limit. To increase the scale of production means that all factors being used in production can be increased at will and indefinitely. But it is not so in practice. While land, labour and capital can be increased at will, organization or enterprise does not increase, since the entrepreneur or organizer remains the same. In other words, there is at least one factor of production which cannot be varied at will, and, hence when more output is desired, the proportion among the factors of production used must change.

Hence, the returns to scale are more of theoretical interest than being relevant to actual life. In practice, it is the law of variable proportions, which is of universal application.

Returns to scale can also be explained with the help of iso product or equal product curves. This is explained in the next chapter.

Causes of Diminishing Returns to Scale

Diseconomies, both internal and external, account for the diminishing returns to scale.

(We have discussed these diseconomies in the previous chapter).

Self-Assessment Questions

1. State and explain the law of diminishing returns and indicate its significance in economic theory and policy.
2. 'The part played by nature conforms to diminishing returns while the part which man plays conforms to increasing returns". Critically examine this statement.
3. State the law of diminishing marginal returns and in this context explain the significance of indivisibility of factors.
4. Discuss the view that diminishing returns arise out of defective factor proportions.
5. What do you understand by optimum factor combination? Explain fully with the aid of indifference curves.

6. State clearly the law of variable proportions. Illustrate diagrammatically. How does it affect the supply curve?

Or

The laws of diminishing returns and increasing returns are two phases of the law of variable proportions. Discuss.

7. Explain the law of increasing returns. Do increasing returns necessarily lead to monopoly?

Or

How far are increasing returns compatible with competition?

8. Enunciate the law of constant returns and indicate the cases where it operates.
9. Explain the reasons for the operation of (a) the law of diminishing returns, and (b) diminishing returns to scale.
10. What is the difference between law of returns and returns to scale? Enumerate the factors that cause decreasing returns to scale.

CHAPTER 6 ISOQUANTS OR EQUAL PRODUCT CURVE

NOTES

✣ STRUCTURE ✣

6.1 INTRODUCTION

In recent years, a new technique has been developed to study the theory of production and to show the equilibrium of a producer regarding a combination of factors. This technique is of iso-product curves which are parallel concepts to the indifference curves in the theory of consumption.

Just as an indifference curve represents various combinations of two goods which give a consumer equal amount of satisfaction, similarly an iso-product curve also shows all possible combinations of the two inputs physically capable of producing a given level of output.

6.2 MEANING OF EQUAL PRODUCT CURVES

Since an iso-product curve represents those combinations which will allow the production of an equal quantity of output, the producer would be indifferent between them. Iso-product curves are, therefore, called product-indifference curves. They are also

known as iso-quants or equal-product curves. Any point on the iso-quant is a recipe for the same output as any other point on the same curve.

The concept of equal-product curves can be easily understood from the Table 15.1. In this Table 6.1 assumed that two factors X and Y are being used to produce a given product.

Table 6.1. Equal product combinations.

Combinations	*Factor X*	*Factor Y*
A	1	12
B	2	8
C	3	5
D	4	3
E	5	2

To begin with, combination A, representing 1 unit of factor X and 12 units of factor Y, produces a given quantity (say, 40 units) of a product. All other combinations in the table are assumed to yield the same amount, i.e., 40 units of the product. Thus, combination C representing 3X + 5Y, combination D representing 4X + 3Y and combination E having 5X + 2Y will all produce 40 units of the product. If we now plot all these combinations on a graph paper and join them, we shall get a continuous and smooth curve called iso-product curve on which are represented the various combinations A, B, C, D and E of Table 6.1. IP represents all those combinations with which 40 units of the product can be produced. The shape of the isoquants shows the degree of substitution between the two factors used in production. Indifference curves and iso-product curves can be distinguished. Though iso-product curves are similar to the indifference curves of the theory of demand, one important difference between them is worth noting. While an indifference curve shows all those combinations of two goods which provide equal satisfaction to a consumer, it does not tell us exactly how much satisfaction is derived by the consumer from those combinations. This is because utility or satisfaction being a mental phenomenon cannot be measured in absolute terms. Thus, there are no physical units in which satisfaction can be measured. That is why we label indifference curves as I, II, III, etc. showing that higher indifference curves provide greater level of satisfaction, but we cannot say how much greater the level of satisfaction is. On the other hand we can label iso-product curves in the physical units of the output produced without any difficulty. Production of a good being a physical phenomenon lends itself to absolute measurement in physical units.

Moreover, if we draw an iso-product map showing various iso-product curves, it is possible to say by how much production is greater or less on one iso-product curve than on another.

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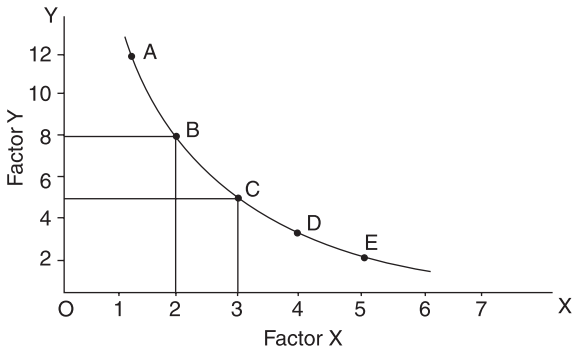

Fig. 6.1. An isoquant.

We have drawn an iso-product map in Fig. 6.2 showing equal product curves IP, IP′, IP″ and IP‴, which represent 40 units, 60 units, 80 units, 100 units, of output respectively. Thus, isoproduct curve IP′ represents an output 20 units greater than on iso product curve IP and iso-product curve IP‴ yields output 60 units greater than on IP. It is, therefore, possible not only to lable isoproduct curves by physical units but also to judge how much greater or less is the size of the output on one iso-product curve than on another. This is an advantage.

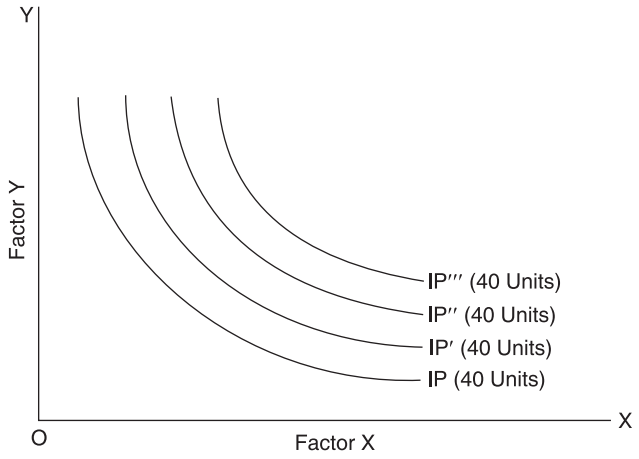

Fig. 6.2. An isoquant map is a set of isoquants. The output level increases as isoquant goes higher to the right.

6.3 MARGINAL RATE OF TECHNICAL SUBSTITUTION

Marginal rate of technical substitution is a concept similar to the marginal rate of substitution in the theory of demand. Marginal rate of technical substitution of X for Y is the number of units of factor Y which can be replaced by one unit of factor X, quantity of the output remaining unchanged. The concept of marginal rate of technical substitution can be easily understood from the Table 6.1. We reproduce below the same table to find out the marginal rate of technical substitution.

As mentioned earlier, in this table various combinations of factors X and Y yield output equal to 40 units of the product. From the comparison of combinations A and B, it will become clear that here 4 units of factor Y can be replaced by 1 unit of factor X

without any change in output. Therefore, 4 : 1 is the marginal rate of technical substitution (MRTS) at this stage.

Table 6.2. Marginal rate of technical substitution.

Combination	*Factor X*	*Factor Y*	*MRTS of X for Y*
A	1	12	
B	2	8	4 : 1
C	3	5	3 : 1
D	4	3	2 : 1
E	5	2	1 : 1

Now by comparing combinations B and C, it will be found that 3 units of factor Y can be replaced by 1 unit of factor X without any loss of output. Therefore, here the marginal rate of technical substitution is 3 : 1. Similarly, the marginal rate of technical substitution between C and D is 2 : 1 and between D and E is 1 : 1. Algebraically, it can be stated that:

$$\text{MRTS} = \frac{X}{Y}$$

But $\frac{X}{Y}$ shows the slope of a curve. Therefore, MRTS is the slope of the iso-product curve at a given point and can, therefore, be found out by tangent of the angle. The marginal rate of technical substitution at point R will be equal to the slope of the tangent DE. Slope of the tangent DE is equal to OD/DE. Hence, the marginal rate of technical substitution at point R will be equal to OD/DE. Likewise, marginal rate of technical substitution at point S of the iso-product curve will be OG/OH.

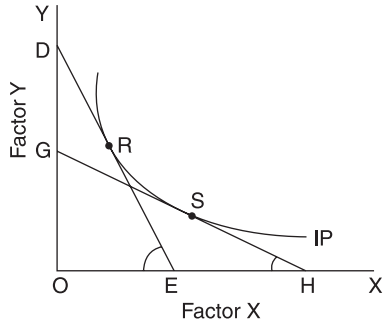

Fig. 15.3. Marginal rate of technical substitution.

Law of Diminishing Marginal Rate of Technical Substitution

An important feature of the marginal rate of technical substitution is worth noting. Marginal rate of substitution of X for Y will generally diminish as the quantity of X is increased relative to the quantity of Y. In other words, as the quantity of factor X is increased relative to the quantity of Y, the number of units of Y that will be required to be placed by one unit of factor X will diminish, quantity of the output remaining unchanged. This is known as the law of diminishing marginal rate of technical substitution which is only an extension of the law of diminishing returns to the relationship between the productivity of two factors.

As the quantity of factor X is increased, and the quantity of factor Y is decreased, the marginal productivity of X will diminish and marginal productivity of Y will increase and, therefore, less of Y will be required to be replaced by one unit of X to maintain the same level of output as more of X and less of Y is used.

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Elasticity of Substitution between Facators

In the theory of demand, we explained the concept of elasticity of substitution between goods in the scheme of consumption of a consumer. That is, we explained to what extent one good could be substituted by a consumer for another good. In the theory of production, on the other hand, we are concerned with the factors of production instead of the commodities for consumption. Here we discuss to what extent a factor of production, say labour, can be substituted for another factor, say capital. That is, we are concerned with what may be called elasticity of technical substitution. Just as the marginal rate of substitution of commodity X for commodity Y falls as X is substituted for Y along an indifference curve, similarly the marginal rate of technical substitution (MRTS) of factor X for factor Y declines as factor X is substituted for factor Y along an iso-quant or equal product curve. "The relative change in the factor-proportions (or input ratios) as a consequence of relative change in the marginal rate of technical substitution is known as elasticity of substitution between factors".

The rate at which the marginal rate of technical substitution falls is a measure of the extent to which the two factors can be substituted for each other. If they are perfect substitutes, that is, if either factor can be used equally well to produce the product, the marginal rate of substitution will not fall.

The substitutability of one factor for another depends on the elasticity of substitution, i.e., the degree to which it is possible to substitute one factor for another. The elasticity of substitution can be defined as the percentage change in the rates of the factors used, say X and Y, in response to a given percentage change in the marginal rate of technical substitution. This elasticity is unity if a given percentage change in the marginal rate of technical substitution induces an equal change in the factors ratio in the opposite direction; it will be greater than unity if it induces greater percentage change and less than unity if the percentage change induced in the factors ratio is less than the percentage change in the MRTS. Thus,

$$\text{Elasticity of Substitution} = \frac{\text{I(X/Y)} \times \text{MRTS}}{\text{(I/IRTS) (X/Y)}}$$

A high elasticity of substitution means that the factors can be substituted freely for one another, while in the case of low elasticity they can be used only in definite proportions. We can refer to the shape of isoquants or equal product curves to determine the magnitude of elasticity of substitution between factors. The measure of elasticity depends on the curvature of the isoquants. The greater the convexity of isoquant the less will be the substitution elasticity, and vice versa. In case the two factors are perfect substitutes of each other and the isoquants between them are straight lines, substitution elasticity between them is infinite. On the other hand, when the two factors are perfect

complements and their isoquants are right angled, the substitution elasticity between them is zero. Besides, since there is an inverse relationship between the marginal rate of substitution and factor-ratio (i.e., as the factor-ratio increases, the marginal rate of technical substitution falls), elasticity of substitution between factors is always negative.

The concept of elasticity of substitution also occupies an important place in the theory of distribution. It affects the distributive shares of the factors of production. For example, the relative shares of labour and capital will largely depend on the elasticity of substitution between them. If capital can be freely substituted for labour, the share of labour relative to the share of capital is bound to decline.

6.4 APPLICATION OF EQUAL PRODUCT CURVES

The iso-quant technique is applicable to agriculture and to all lines of manufacture. The marginal rate of technical substitution guides in the substitution of some units of one input for some units of another input, in some cases, increased use of labour can help in making a reduction in the use of raw materials, because spoilage and wastage of material may be cut to the minimum. Similarly, by adding to the supervisory staff, labour may be economized or the introduction of machinery may cut down the use of labour. In this way, the businessman tries various permutations and combinations and the iso-quant technique helps him in reaching the most economical combination.

Properties of Equal Product Curves

Properties of iso-product curves are the same as those of indifference curves. Their properties can also be proved in the same manner as in the case of indifference curves. The following are the important properties of iso product curves:

(i) **Sloping Downwards:** Iso-product curves slope downwards from left to right. This is so because if the quantity of a factor X is increased, the quantity of factor Y must be decreased so as to maintain the same level of output.

In Fig. 6.4 on y-axis K (capital) and x-axis 'L' (Labour) iso-quant are negative sloping that means as the increase in one more unit-of' L′ than we have to decrease certain amount of capital (K). Due to this the iso-quant curve slopes downward from left to right. In other words, it has a negative slope.

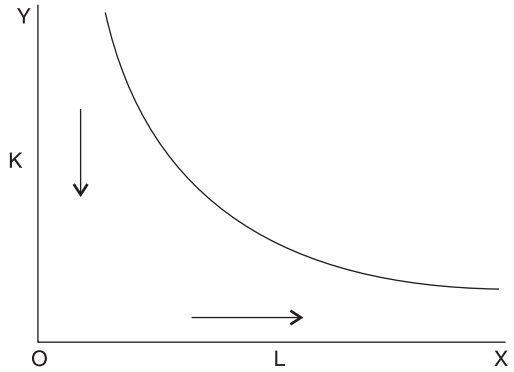

Fig. 6.4. Downward sloping isoquant.

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Table 6.3. Marginal rate of technical substitution for labour and capital.

	Labour	—	*Capital*	*Marginal rate of technical substitution*
A	1	—	12	
B	2	—	8	1 : 4
C	3	—	5	1 : 3
D	4	—	3	1 : 2
E	5	—	2	1 : 1

(ii) **Convexity:** Iso-product curves are convex to the origin. This is due to the fact that marginal rate of technical substitution falls as more and more of X is substituted for Y. Iso-product curves being concave would mean that the marginal rate of technical substitution of X for Y increases as more and more of X is substituted for Y. But increasing marginal rate of technical substitution is not realistic. As explained above owing to the operation of the law of diminishing returns, the marginal rate of technical substitution falls as more and more substitution takes place.

MRTS = Marginal Rate of Technical Substitution

$$\text{MRTS} = \frac{\Delta K}{\Delta L}$$

ΔK = Change in Capital

ΔL = Change in Labour.

In the diagram it is clear that with the increase in unit of labour we have to reduce the unit of capital. Initially more and more capital and than less and less capital is substituted for each unit of labour. This gives us a 'convex' iso-quant curve.

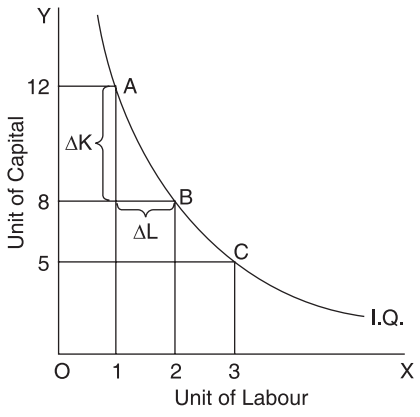

Fig. 15.5. Marginal rate of technical substitution (MRTS).

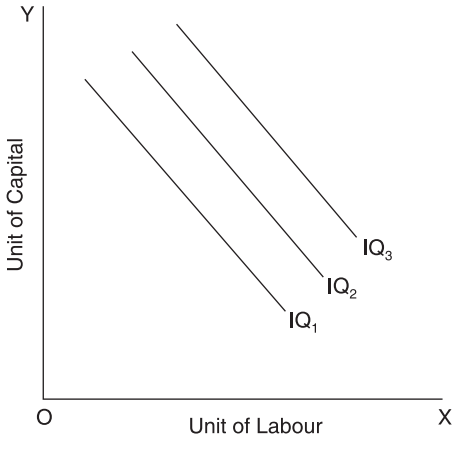

Fig. 15.6. Factors-perfectly substitute.

However, there are two exceptions to the rule that equal product curves are convex to the origin: In the curves there would be a common combination of factors which will lie on both these curves such as combination C in Fig. 6.7. It would then mean that the same combination C which yields 40 units of output according to one iso-

product curve, can produce 60 units according to another iso-product curve. This is absurd. How can the same combination produce two different levels of output.

(iii) The Iso-quant is an Oval-sloped Curve: As we take the combination of an abundant factor say capital (K) with relatively less factor labour 'L', this indicates that the marginal productivity of the abundant factor say K is zero and the vice versa.

K_1, K_2, K_3 are tangent to Iso-quant IQ_1' IQ_2 and IQ_3' which shows that above this point the productivity of capital is zero. In the same way L_1' L_2' and L_3 are tangent to IQ_1' IQ_2 and IQ_3 which indicate beyond this point productivity of labour is zero. When we join K_1' K_2' K_3 and L_1' L_2' L_3 we get the ridge lines.

The 'Ridge Lines' are the loans of locus of points of iso-quant where marginal productivity of the concerned factor is zero. The ridge line indicates that the region outside the ridge lines are useless or uneconomic to the producer.

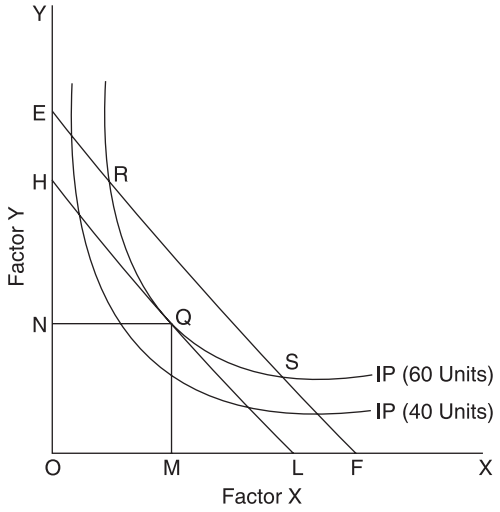

Fig. 6.7. Tangency between isoquant and lowest possible isocost line such as the point Q gives optimum combination of factors to minimum cost of production given the level of output.

6.5 ISO-COST LINE

The combination of factors with which a firm produces the product also depends on the prices of the factor and the amount of money which a firm wants to spend. Iso-cost line represents these two things—the prices of productive factors and the total amount of money which a firm wants to spend. Each iso-cost line will show various combinations of two factors which can be purchased with a given amount of total money.

Suppose a producer wants to spend ₹ 300 on factors X and Y. If the price of the factor Y is ₹ 3 per unit and if he spends the whole sum of ₹ 300 on it, then he can purchase 100 units of Y. Let OH in Fig. 6.8 represent 100 units of Y.

Now, if the price of X is ₹ 5 per unit and the whole sum of ₹ 300 is spent on it, 60 units of X can be purchased. Let OL in Fig. 6.8 represent 60 units of X.

If we now join together the points H and L, we shall get the iso-cost line HL on which will lie all those combinations of factors X and Y which can be purchased with ₹ 300. This line is called iso-cost line since the total cost or total money spent remains the same. Whatever the combination, which lies on it, is purchased. The iso-cost line is also known as price line or outlay line.

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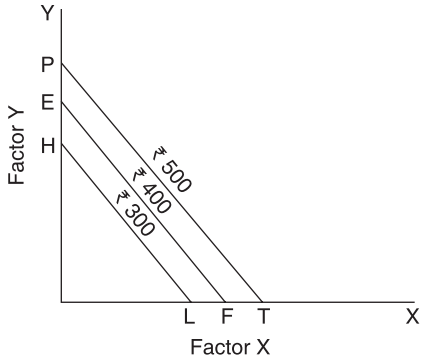

Fig. 6.8. Iso-cost lines.

Now, if the producer decides to increase the total money to be spent on the productive factors to ₹ 400, more of both the factors can be purchased. As a result of the increase in the total outlay to ₹ 400, iso-cost line will shift to EF. Similarly, with total outlay of ₹ 500 the iso-cost line will be PT. Higher iso-cost will show greater total outlay.

The slope of the iso-cost line represents the ratio of the price of a unit input X to the price of a unit of input Y. In case the price of anyone of them changes, there would be a corresponding change in the slope of the iso-cost curve and the equilibrium would shift too producer's equilibrium optimum.

6.6 FACTOR COMBINATION

The producer will try to attain an equilibrium position by choosing at the most economical or the least cost combination of the factors of production. Just as a consumer is faced with the problem of making a choice between different combinations of two or more goods, similarly a producer is confronted with the problem of choosing between different combinations of two or more factors of production.

A rational entrepreneur would try to maximize his money profits from the production and sale of commodities, just as a consumer tries to obtain maximum satisfaction from the consumption of commodities. To produce a given output various combinations of factors of production are possible. But a rational producer or a firm would seek to produce that output with the 'optimum' or 'least-cost' combination of factors of production. (In Economics factors of production are also called 'inputs'.) The producing firm will use its productive resources in such proportions or such ratios that whatever the output produced, the cost outlay should be as small as possible for that output. Or, we can say that the firm should use that combination of resources which produces the maximum output for given cost outlay.

In arriving at an optimum or least cost combination, the producer is guided by the principle of substitution or that of equal marginal returns. If a rupee spent on factor A results in a greater output than a rupee spent on factor B, it would pay the producer to divert expenditure from factor B to factor A; that is, he will substitute factor A for factor B. He will be in equilibrium when the additional output resulting from the marginal rupee spent on factor A equals the additional output resulting from the marginal rupee spent on factor B. So long as the additional output due to the marginal rupee spent on factor A is not equal to the additional output resulting from the marginal rupee spent on factor B, it

will be advantageous for the producer to go on substituting one factor for the other. In this way the output will be maximized.

But most often, units of factors cost much more than 1 each. In such cases, the additional output due to the marginal rupee spent in factor A would be equal to the marginal product of factor A divided by its price. As has been explained earlier, the marginal product of a factor is the additional product resulting from the employment of an additional unit of the factor. It, therefore, follows that the marginal product of a factor divided by the price of the factor is the additional product resulting from a rupee spent on the factor. Suppose the marginal product of a factor is 120 units of output and the price of the factor is 10 then, 120 ÷ 10 = 12 i.e.,12 is the additional output resulting from the marginal rupee spent on that factor.

The condition for the least – cost combination may, then, be put in the following form:

$$MPa / Pa = MPb / Pb = MPa / Pa$$

where MPa is the marginal product of factor A and Pa is the price of A, and so on. If

MPa / Pa is greater than MPb / Pb it will be to the advantage of the entrepreneur to employ more of factor A and less of factor B. He will employ more of one factor and less of the other till the above 'proportionality rule' is satisfied.

It is in this manner, that the firm is able to discover the least cost combination which means producing the maximum output with a given cost.

It will have been clearly understood that it is not the marginal products of the various factors that are sought to be equalized by the producer for maximizing output. What he seeks to equalize are the marginal products of the various factors divided by their respective prices. Of course, when the prices of all factors are equal, in that case alone will he seek to equalize the marginal products of the various factors? In that case, the denominators Pa' Pb Pn will all be equal to each other, so that all that the producer does is to attempt to equalize the numerators, i.e., the marginal products of the various factors (MPa′ MPb . . . . . MPm)′. But seldom are the prices of the various factors equal to each other. We can use the iso-product curve technique also for this purpose.

6.7 PRODUCER'S EQUILIBRIUM WITH EQUAL PRODUCT CURVE

Iso-product curves show the various possible combinations with which a given level of output can be produced. Thus, iso-product curve shows the technical conditions of production. On the other hand, iso-cost lines represent total amount of outlay to be spent and the ratio of the prices of the two factors. Now the question arises: which combination of factors a producer will choose to produce a given level of output? In other words, at what point on the iso-product map the producer will be in equilibrium regarding the factors combination, given the level of output to be produced. This can be illustrated as shown in Fig. 6.9.

We assume that the producer wants to produce a given level of output as cheaply as possible, because in doing so his profits will be maximized. In other words, the producer will try to strike least cost combination of factors to produce a given level of output

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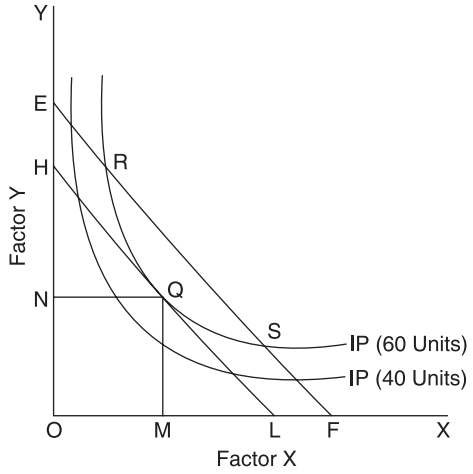

Fig. 6.9. Tangency between isoquant and lowest possible iso-cost line such as the point Q, gives optimum combination of factors to minimum cost of production given the land of output.

Suppose a producer has decided to produce 60 units of a product. 60 units of the product can be produced by any of the combinations such as R, S, Q, which lie on the iso-product curve IP in Fig. 6.9. He will choose that combination on the iso-product curve IP which gives him the lowest cost of production for the production of 60 units of the product.

It will be clear that the producer will choose combination Q at which iso-cost line HL is tangent to the iso-product curve IP. Combination Q will cost the producer least for producing 60 units of output. The producer will not choose any other combination on iso-product curve IP' such as R, S, because all these lie on the higher iso-cost line (EF) than Iso-cost line HL and will, therefore, mean greater total outlay for producing 60 units of output. The producer will not go the left of Q, for he will not be able to produce 60 units of output by any combination which lies to the left of Q on IP′.

Hence, we conclude that the producer will be in equilibrium by choosing the factor combination Q to produce 60 units of the output. Factor combination Q is an optimum factor combination for him to produce 60 units of output. This is so because factor combination Q will give him the lowest cost of production.

6.8 COINCIDENCE OF MRTS AND PRICE RATIO

It will be evident from Fig. 6.9 that at point Q marginal rate of technical substitution will be equal to the ratio of prices of the factors. Marginal rate of technical substitution is given by the slope of the iso-product curve and the price ratio of the factors is given by the slope of the iso-cost line. The slope of the iso-product curve IP′ and the iso-cost line HL are equal at the point of tangency Q, and the marginal rate of technical substitution (MRTS) will be equal to the price-ratio of factors X and Y at point Q.

Thus, at the point of equilibrium:

$$\text{MRTS of X for Y} = \frac{\text{Price of X}}{\text{Price of Y}}$$

This means that the producer will substitute one factor for another in search of the cheapest method of production until the prices ratio and the marginal rate of technical substitution are approximately equal.

6.9 SCALE LINE OR EXPANSION PATH

If now the producer wishes to produce 80 units of output instead of 60 units, which combination of factors will he select? Obviously, he will choose that combination which will cost him the least for producing 80 units of output. Such a combination is Q′ at which iso-cost line is tangent to the isoproduct curve IP″ which represents 80 units of output. This is shown in Fig. 6.10.

Similarly, for the production of 100 units of output, the producer will choose factor combination Q″ and for 120 units of output his equilibrium will lie at Q‴. If points like Q, Q′, Q″, Q‴ are joined together, we get what is called scale line or expansion path.

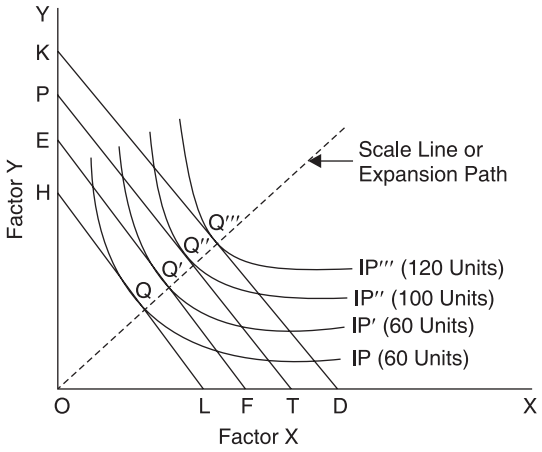

Fig. 6.10. Expansion path is the locus of various optimum combinations of factors given the factor prices.

This line is known as a scale line because it shows the way in which the producer will adjust the scale of his operations as he changes the scale of his output. This is also called expansion path as along this line he will expand his output, if relative factor prices remain the same. Given the prices of factors X and Y, a producer, who is able to vary the amounts of both these factors, will always fix his scale of output at some point along the scale line such as Q, Q′, Q″, Q‴. Producing on the scale line shows the cheapest way of producing each level of output, given relative factor prices.

An iso-quant or the equal product curve represents different input combinations, or input ratios which can produce a specified level of output, whereas the scale line shows different levels of output with input ratio remaining the same.

It must be noted that slope of the scale line will depend on the relative prices of the factors and the shape of the iso-product curves. One cannot know at which point on a scale line the producer will be in equilibrium until one knows that output he wishes to produce. How a producer will decide about the level of output to be produced by him will depend upon the conditions in the product market.

Application of Equal Product Curves to Returns to Scale

The equal product curves can be used to show how returns to factors of production will vary as the scale of production is varied. In Fig. 6.11, IP_0' IP_1' and IP_2 are the three equal product curves.

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They constitute the firm's equal product map like an indifference map. Along the X-axis, we indicate factor A and along the Y-axis the factor B. We take here the returns with two variable factors. LM, L′ M′ and L″M″ are the price lines or outlay lines tangential to the respective equal product curves. In this situation, according to the proportionality rule

$$\frac{\text{Price of factor } a = \text{OL} = \text{OL}' = \text{OL}''}{\text{Price of factor } b = \text{OM} = \text{OM}' = \text{OM}''}$$

As in the case of indifference curves indicating the consumer′s equilibrium, in this case also the producer will be in equilibrium position at the points P, P′ and P″ respectively on the equal product curves IP_0' IP_1' and IP_2' because at these points the price lines are tangential to their respective curves. This means that only at these points will the firm be producing in the cheapest manner. At any other point (say other than P on the equal product curve $IP_0)'$ the producer will have to use either more than OM of factor A or more than OL of factor B. At the points P, P′ and P″, the marginal productivity of factor A in terms of factor B is equal to the relative money prices of factors A and B.

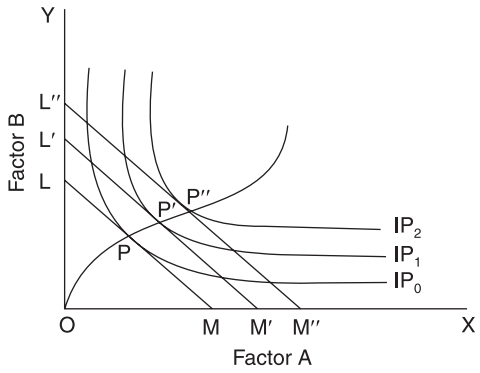

Fig. 15.11. Iso product curves and return to scale.

By joining P, P′ and P″ we get what is known as the scale line corresponding to the income consumption curve in the case of indifference curves map. It is on some point along the scale line that the firm will fix its scale of output given the relative prices of the two factors. The scale line shows how a producer varies his scale of operations. It indicates the most economical combination of the factors of production or the cheapest way of producing each output. The shape of the equal product curves and the relative prices of the factors used will determine the shape of the scale line. Thus, the scale line shows the varying combinations of the factors of production as the scale of output is varied. A change in the relative prices of the factors will change the course of the scale line.

The equal product map like the one given above shows (a) whether the returns to scale will increase, decrease or remain constant as the scale of production is varied, and (b) whether the proportion between the factors of production employed will vary or remain constant as we move along the scale line.

Shape of the Scale Line

The following diagram (Fig. 6.12) shows how variations in the amounts of the factors used and in the output obtained determine the shape of the scale line. Suppose the return is constant so that doubling the amount of each factor results in doubling of the output, that is, a certain proportionate change in the amount of each factor used leads to the change in the output exactly in the same proportion.

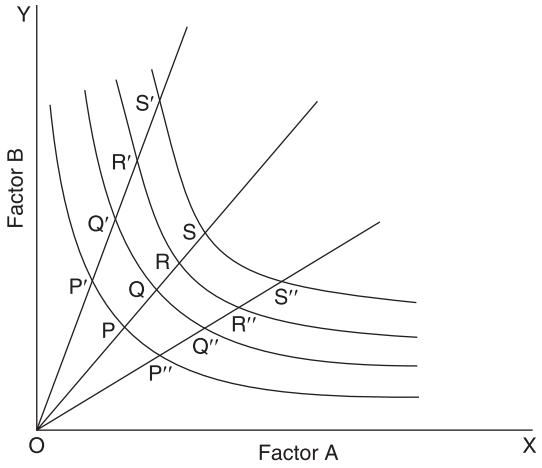

Fig. 6.12. Shape of the scale line.

In a situation like this, the scale lines will be straight through the origin. P′ Q′ R′ S′, PQRS and P″ Q″R″ S″ are the three straight scales lines. The returns to scale along each scale line on the equal product map are constant. This is shown by the fact that the distance between the three equal product curves along each scale line is the same, i.e., OP = PQ = QR = RS and OP′ = P′ Q′ = R′ S′ and so on.

In a diagram like this, given relative factor prices, i.e., with a constant price slope, not only are the returns to scale constant but the returns to outlay are also constant. Similarly, the returns to scale and returns to outlay are interchangeable and the same.

But, if there is an equal product map where the relative prices are not constant and where the returns are not constant, the returns to scale and returns to outlay will not be the same. When as the output changes, the proportion between factors also changes, it will be necessary to speak of returns to outlay instead of returns to scale. However, here for the sake of convenience, we assume that proportion between the factors remains constant, whatever the scale of production.

6.10 EFFECT OF CHANGE IN INPUT PRICE ON INPUT USE

This effect is similar to what we discussed in the case of indifference curves and it can be illustrated diagrammatically in the same manner as price effect on consumer's equilibrium by indifference curves. The total effect on the use of the input of a change in its price is made up of two components: the substitution effect and the output effect. The substitution effect is the effect on the use of the input due exclusively to the change in the relative price of the inputs, the output remaining the same. This effect is invariably negative, because a rise in the price of an input must lead to a reduction in its use and a fall in price to its greater use. The output effect indicates the effect on input use due to change in the level of output, the input price remaining unchanged. This effect, too, is always negative, because increase in cost reduces both the output, and vice versa.

6.11 SUBSTITUTE AND COMPLEMENTARY FACTORS

Just as some goods are substitutes and complementary goods for others, similarly substitute and complementary relationship can be found to exist among factors of production. We have said above that if a factor X becomes cheaper relatively to factor

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Y, there will be a tendency to buy more of X and less of Y. This in effect means that factor X has been substituted for factor Y. In this case factors X and Y are substitutes of each other. Two factors X and Yare said to be substitutes when the substitution effect on Y of a change in the price of X is greater than the output effect on it. This is so because the negative substitution effect is greater than the positive output (or expansion) effect.

But when the marginal rate of technical substitution declines very rapidly (i.e., when the equal product curves are highly convex to the origin, the substitution effect will be very small. In this case, the output effect of the fall in price on the purchase of Y is greater than the substitution effect. Hence, the net effect of the fall in price of X will be to increase the quantity purchased of Y also. In this case, both factors X and Y will be purchased in greater quantities. This means they are complements of one another. The two factors are said to be complementary to each other when the output effect of a fall in the price of one factor is greater than the substitution effect.

6.12 APPLICATION TO UNDER-DEVELOPED COUNTRIES

The theory of production is not a dry and abstract theory having little relevance to practical problems. It has a special significance for the under-developed countries which are faced, like others, with factor proportions problem. These countries have excessive rural population dependant on agriculture where their marginal productivity is practically nill. That is, if a sizeable proportion of them is withdrawn, it would not significantly affect output. Such countries are characterized by 'structural disequilibrium at the factor level' as Kind learner puts it. There is obviously a need for the adoption of more labourintensive methods than capital-intensive methods. The factor combinations should embody high labour capital ratios. As economic development proceeds, the composition of demanded goods will change, calling for a change in factor proportions in the processes of production.

Self-Assessment Questions

1. What are iso-product curves? Explain their characteristics.
2. What is the significance of tangency between an Isoquant and an iso-cost line?
3. Show with the help of curves that different combinations of two factors of production give the same output (iso-product). Explain the characteristics of the curves drawn.
4. Given the iso-product curve of a firm and the prices of the two inputs it uses, find the condition that the firm must fulfil to produce (i) a given output at the least possible cost, and (ii) the largest output at a given total cost.

CHAPTER 7 COST AND COST CURVES

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✣ STRUCTURE ✣

- ☆ Introduction
- ☆ Nominal and Real Cost
- ☆ Alternative, Opportunity or Transfer Costs
- ☆ Social Cost
- ☆ Entrepreneur's Cost
- ☆ Short-Run and Long-Run Cost Curves
- ☆ Producer's Equilibrium with Equal Product Curve

7.1 INTRODUCTION

The cost of production of an individual firm operating in a market has an important influence on the market supply of a commodity. It is very necessary to have a clear idea about the concept of cost of production and then proceed to study the cost curves.

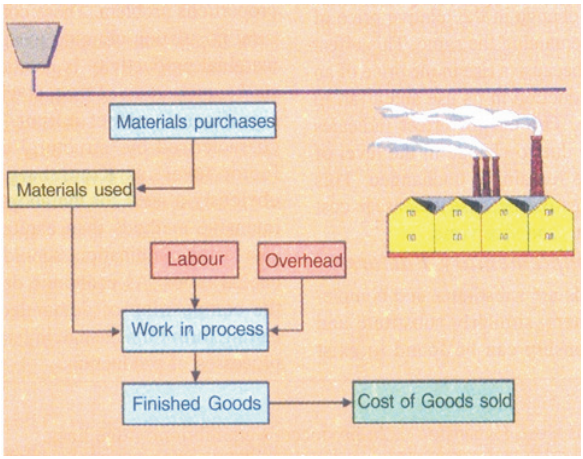

Fig. 7.1. Costs arise in the production process.

7.2 NOMINAL AND REAL COST

The cost may be nominal cost or real cost. Nominal cost is the money cost of production. It is also called expenses of production. These expenses are important from the point of view of the producer. He must make sure that the price of the product, in the long-run, covers these expenses including normal profit; otherwise he cannot afford to carry on the business.

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Real Cost

Attempts have been made to "pierce the monetary veil" and to establish cost on a real basis. The real cost of production has been variously interpreted. Adam Smith regarded pains and sacrifices of labour as real cost. Marshall includes under it "real cost of efforts of various qualities" and "real cost of waiting." This is called the social cost by Marshall.

From the point of view of the community, as a whole, the money costs do not tell the whole story. It is the real cost which is more important.

Money Cost and the Real Cost do not Coincide

It is very seldom that the real cost of a commodity may be equal to the money cost. As Marshall puts it, "If the purchasing power of money in terms of effort remained about constant, and if the rate of remuneration for waiting has remained about constant, then the money measure of costs corresponds to real costs; but such a correspondence is never to be assumed lightly."

Thus, there is very little connection between money costs and real costs. The two can never be equal in a world of change, as our world is, whether we consider the long period or the short period. The value of land depends on scarcity. The question of cost in terms of effort and sacrifice in this case does not arise. The earnings of cinema stars, professors, sweepers, peasants, businessmen; etc. seldom correspond to the respective efforts and sacrifices undergone by each class.

Opportunity Cost

The Austrian school of economists and their followers gave a new concept of real costs. According to them, the real cost of production of a given commodity is the next best alternative sacrificed in order to obtain that commodity. It is also called opportunity cost or displacement cost.

Economic Cost

By economic costs is meant those payments which must be received by resource owners in order to ensure that they will continue to supply them in the process of production. This definition is based on the fact that resources are scarce and they have alternative uses. To use them in one process is to deny their use in other processes. Economic cost includes normal profit.

Implicit and Explicit Costs

Costs of production have also been classified as explicit and implicit costs. Implicit costs are costs of self-owned and self-employed resources such as salary of the proprietor or return on the entrepreneur's own investment. These costs are frequently ignored in calculating the expenses of production.

Explicit costs are the paid-out costs, i.e., payments made for productive resources purchased or hired by the firm. They consist of the salaries and wages paid to the employees, prices of raw and semi-finished materials, overhead costs and payments into depreciation and sinking fund accounts. These are a firm's accounting expenses.

If we add to the money expenses two items, viz. alternative or opportunity costs and normal profits, we get the full costs of a firm as distinguished from business costs which are synonymous with a firm's total money expenses as computed by ordinary accounting methods. The entrepreneur must be sure of normal profit if he is to continue in business. In this sense normal profit too is a cost.

7.3 ALTERNATIVE, OPPORTUNITY OR TRANSFER COSTS

In modern economic analysis, the term real cost is interpreted in the sense of opportunity cost or transfer cost. The American economist Davenport explains this concept as follows: "Suppose, for example, that a child has been given both a pear and a peach, that some predatory boy tries to seize them and that the only method of saving either is to drop one, say the pear, in the wayside weeds, and to run for shelter with the peach while the aggressor is picking up the pear. What has the peach cost? True, the peach was a gift. In a certain sense, therefore, it costs nothing. Nevertheless it is retained only on terms of foregoing the pear. The term cost seems not quite satisfactory to cover the case. Perhaps displacement would be preferable. Or, if one offers you choice between a ride and an evening at the theatre, it is awkward to say that the acceptance of one is at the cost of the other. Yet the resistance of taking one is the letting go of the other. Or, if with a dollar which you have earned you have a choice between buying a book, or a pocket knife, and finally buy the book, the resistance overcome is best expressed, not by the labour devoted to the earning of the dollar, and not by the dollar itself, but by the alternative application of the dollar. The highest cost of the book—the best test or measure of its worth to you was in the significance of its strongest competitor, the knife."

Since productive resources are limited, the production of one commodity can only be at the expense of another. The commodity that is sacrificed is the real cost of the commodity that is produced. In the words of Henderson, "Real cost of anything is the curtailment of the supply of other useful things, which the production of that particular thing entails. Economists define costs of production of a particular product as the value of the foregone alternative products that resources used in its production could have produced. The costs of resources to a firm are their values in their best alternative uses."

Suppose with a sum of ₹ 1000 a manufacturer can produce two radio sets or a small refrigerator. Suppose further that he decides to produce the refrigerator rather than the radio sets. In this case, the real cost of the refrigerator is equal to the cost of two radio sets, i.e., the alternative foregone. Conceived on these lines, cost of production means not the effort and sacrifices undergone, but the most attractive alternative foregone or the next best choice sacrificed. Real costs are thus not entities, ultimate and independent of utility, but they are sacrifices of competing demands.

In a money economy, it is "the amount of money necessary to induce the factors of production to be devoted to this particular task rather than to seek employment elsewhere."

Significance of Opportunity Cost

There are competing demands (depending upon the marginal utility of the consumers) for the same resources. Since the resources are scarce, certain demands are satisfied only by the sacrifice of other demands. The resources tend to move from those uses in which

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their demand price (marginal utility to the consumers in the aggregate) is lower to those in which it is higher until they tend to be distributed in various uses (for the production of various commodities and services) in such a way as to equalize their marginal utilities in the various uses.

It is thus the demand price or marginal utility which determines how much of a particular factor of production will be utilized for the production of a particular commodity. The supply of a commodity, therefore, ultimately depends upon the attraction offered by the demand price (or marginal utility) to the relevant factors of production. If this demand price is not high enough, these factors will be used for the production of commodities the demand price for which is high enough to attract them.

Thus, the cost of production of a commodity is fundamentally the sum-total of retention prices that have to be paid to the productive services for retaining them in a particular industry, and this must at least be equal to what they can command elsewhere.

Application of Opportunity Cost Doctrine

The opportunity cost doctrine has a wide application in the field of economic theory. It applies to the determination of values both internally and internationally. It also applies to income distribution.

Limitations: There are, however, some limitations in its application:

(i) *Specific:* It does not apply to productive services which are specific. A specific factor has no alternative use. Its transfer cost or opportunity cost is, therefore, zero. Hence, the payment made to this factor is of the nature of rent (preferably called non-cost outlays).

(ii) *Inertia:* Further, the doctrine of opportunity cost does not take into consideration the element 01 inertia. The factors may be reluctant to leave an occupation. In a case like this, where a factor's preference may have to be overcome, a payment exceeding the purely transfer cost will have to be made to induce it to an alternative occupation.

(iii) *Non-pecuniary considerations:* In view of these non-pecuniary considerations, the notion of objective costs must be given up. The theory of opportunity costs can be restated thus: "The cost of productive service X in making A is equal to the amount B that X could produce plus (or minus) the non-pecuniary returns (or cost) attached to producing B. It has been suggested that non-pecuniary returns should be converted into pecuniary returns to restore objectivity to the theory. But it is not always possible to find a common monetary denominator for the purpose.

(iv) *Factors not homogeneous:* Besides, it should be remembered that units of productive service are rarely homogeneous. This obstructs their transfer.

(v) *Wrong assumption*: Moreover, the theory is based on perfect competition which seldom exists.

(vi) *Individual and social costs*: Another discrepancy may arise on account of their difference in individual and social costs. A product may cost the factory owner 10 but to the society it will cost something in the form of ill-health due to the smoke that his factory emits.

Conclusion

Inspite of all these limitations and complications, the theory of cost, viz., theory of opportunity or alternative costs, is the most acceptable one at present. Certain features of this theory are worth noting:

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(i) Cost of production of a commodity depends on demand prices of other commodities to the production of which the same productive service can contribute.

(ii) This cost analysis is not vitiated by the fact that a commodity is produced by the combination of several factors because marginal product of each factor can be ascertained.

7.4 SOCIAL COST

It is the amount of cost the society bears due to industrialization. Industrialization has certain economic and social merits, but along with the merits, they bring about certain demerits also. They are like, development of slums, air-pollution, noise pollution, land pollution, social inequalities, and so on. The amount of cost the society bears due to industrialization is referred as social cost. Bhopal gas tragedy is one of the major examples of social cost. People suffer from certain diseases for which the government has to incur heavy expenditure on health care and research.

7.5 ENTREPRENEUR'S COST

In what follows, we shall use the term 'cost of production' in the sense of money cost or expenses of production. This is entrepreneur's cost.

The entrepreneur's cost of production includes the following elements: (i) wages of labour; (ii) interest on capital; (iii) rent or royalties paid to the owners of land or other property used; (iv) cost of raw materials; (v) replacement and repairing charges of machinery; (vi) depreciation of capital goods; and (vii) profits of the manufacturer sufficient to induce him to carry on the production of the commodity.

Entrepreneur's costs may be classified as—(i) production costs, including material costs, wage costs, interest costs, etc., both direct and indirect costs; (ii) selling costs, including costs of advertising and salesmanship; (iii) managerial costs; and (iv) other costs, including insurance charges, rates, taxes, etc.

7.6 SHORT-RUN AND LONG-RUN COST CURVES

After discussing the concept of cost as used in economics, we are now in a position to study the nature of cost curves, both in the Short-Run and the Long-Run. The shape of the cost curve shows how a change in output affects the costs. There will be a shift in the cost curve, if factors, other than a change in output, have affected the costs.

Meaning of Short-Run and Long-Run

Short-Run is a period of time within which the firm shows its output by varying only the amount of variable factors, such as labour and raw materials. In the Short-Run,

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fixed factors, such as capital equipment, top management personnel, etc., cannot be varied. In other words, in the Short-Run, the firm cannot build a new plant or abandon an old one. If the firm wants to increase production in the Short-Run, it can do so only by overworking the existing plant, by hiring more workers and buying more raw materials. It cannot increase its output in the Short-Run by enlarging the size of its existing plant or building a new plant of a larger size. The Short-Run is a period of time in which only variable factors can be varied, while fixed factors remain the same.

On the other hand, Long-Run is a period of time during which the quantities of all factors, variable as well as fixed, can be adjusted. Thus, in the Long-Run output can be increased by increasing capital equipment or by increasing the size of the existing plant or by building a new plant of a greater productive capacity.

Fig. 7.2. Social cost due to air pollution.

Short-Run Fixed and Variable Costs

The cost of production for the entrepreneur may be analyzed from another point of view. Some costs vary more or less proportionately with the output, while others are fixed and do not vary with the output in the same way. The former are known as prime costs and the latter as supplementary costs of production or overhead costs.

The supplementary or fixed costs must be paid even though production has been stopped temporarily. They include rent of the factory building, interest on capital invested in machinery, and salaries of the permanently employed staff.

The prime costs, on the other hand, are variable costs. They vary with output. These costs include the cost of raw materials used in the making of the commodity as well as the costs of casual or daily labour employed. They are incurred only when the factory is operating.

The distinction between variable and fixed costs applies only to a short period. Nothing can remain fixed for a long time. In the long-run, the staff would change, amount of capital invested would be different, the dimensions of the factory, too, may change, and so on.

Hence, in the very long run, all costs are variable.

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Total Fixed Cost: Total cost is the sum of:

Table 7.1. Cost of production of a firm.

Units of output	*Total fixed cost*	*Total variable cost*	*Total cost (2) + (3)*	*Average fixed cost (2) ÷ (3)*	*Average variable cost (3) ÷ (1)*	*Average cost (5) + (6)*	*Morginal cost*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	30	0	30	—	—	—	—
1	30	10	40	30	10	40	10
2	30	18	48	15	9	24	8
3	30	24	54	10	8	18	6
4	30	32	62	7.5	8	15.5	8
5	30	50	80	6	10	16	18
6	30	72	102	5	12	17	22

Fixed cost (factory land, building and machinery…..)

Plus the total variable cost (raw material charges, electricity…)

$$TC = TFC + TVC$$

$$\text{Total fixed cost} = \text{Total fixed cost} + \text{Total variable cost}$$

$$AFC = \frac{TFC}{Q}$$

$$\text{Average fixed cost} = \frac{\text{Total fixed cost}}{\text{Quantity}}$$

$$AVC = \frac{TFC}{Q}$$

$$\text{Average variable cost} = \frac{\text{Total variable cost}}{\text{Quantity}}$$

$$\text{Average cost} = \frac{\text{Total cost}}{\text{Quantity}} = \frac{TC}{Q}$$

$$\text{Average cost} = \text{Average fixed cost} + \text{Average variable cost}$$

$$AC = AFC + AVC$$

$$\text{Marginal cost} = \frac{\text{Change in total cost}}{\text{Change in quantity}}$$

$$MC = \frac{C}{Q}$$

The total cost function is:

$$C = 15x - 6x^{-2} + x^3$$

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whereas 'x' is output and 'c' is total cost

1. Find out the following:

(a) Average cost function

$$\text{Average cost} = \frac{\text{Total cost}}{\text{Quantity}}$$

$$\text{AC} = \frac{\text{TC}}{x}$$

$$\text{AC} = \frac{15x - 6x^2 + x^3}{x} = 15 - 6x + x^2$$

(b) Minimum 'AC' or when is AC (Average cost) is minimum.

2. (i) For the 'AC' to be minimum, first derivation should be equal to zero, that means:

$$\frac{d}{dx}(\text{AC}) = 0$$

$$\frac{d}{dx}(15 - 6x - x^2) = 0$$

$$-6 + 2x = 0$$

$$2x = 6$$

$$x = 3$$

(ii) The second derivation of 'AC' should be greater than zero

$$\frac{d}{dx}(f) = -6 + 2x > 0 + 2 > 0$$

Hence, the condition is satisfied, where $x = 3$ 'AC' is minimum

(c) What is minimum 'AC'

substitute in 'AC' = $15 - 6x + x^2$, the value of $x = 3$

$$15 - 6 \times 3 + (3)2$$

$$15 - 18 + 9$$

$$24 - 18 = 6$$

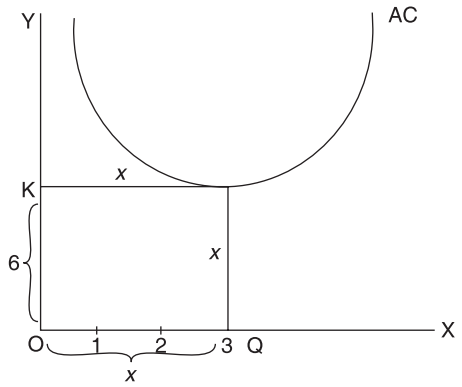

Fig. 7.3. Average cost is the cost per unit of output the AC is a 'U' shaped curve.

(d) Marginal cost function

Marginal cost function is obtained by taking the derivation of the total cost function.

$$TC = 15x - 6x^2 + x^3$$

$$\frac{d}{dx}(TC) = 15x - 6x^2 + x^3$$

$$MC = 15 - 12x + 3x^2$$

(e) When is the marginal cost the minimum? for 'MC' to be minimum the first derivation of 'MC' should be equal to zero.

(i) $$\frac{d}{dx}(MC) = 15 - 12x + 3x^2$$

$$-12 + 6x = 0$$

$$6x = 12$$

$$x = 2$$

(ii) The second derivation of 'MC' should be greater than zero.

$$= -12 + 6x$$

$$\frac{d}{dx}(MC)\ f'' = -12 + 6x + 6 > 0$$

Thus the condition is satisfied.

(iii) How much is marginal cost?

$$15 - 12x + 3x^2$$

When $x = 2$, marginal cost is minimum

$$15 - 12x + 3x^2$$

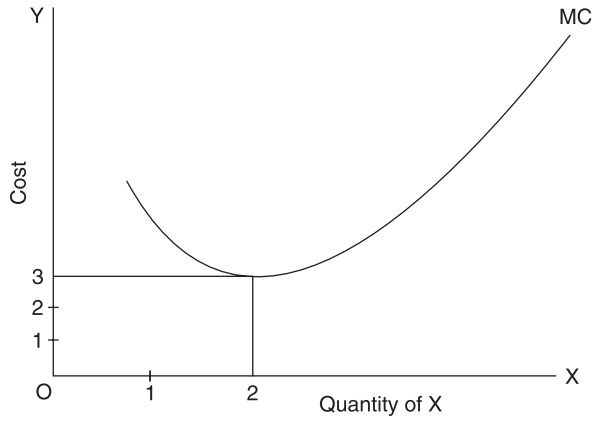

Fig. 7.4. Marginal cost curve is also U shaped.

It depicts the slope (1st derivative) of total cost curve.

Substitute x = 2

$$15 - 12 \times 2 + 3 \times (2)^2$$

$$15 - 24 + 12$$

$$\therefore \quad 27 - 24 = 3$$

where $x = 2$, Marginal cost = 3, that is, the 'MC' is minimum.

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(f) When are average cost and marginal cost equal? At the point of minimum 'AC' 'MC' cuts 'AC' and that is the point when AC = MC.

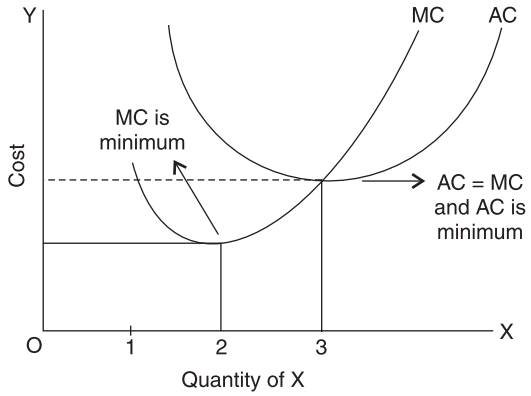

Fig. 7.5. Average and marginal cost.

When $x = 3$, AC is minimum, at the same point 'MC' is cutting 'AC', thus AC = MC when $x = 3$.

Short-run: Total, Average and Marginal Costs

Total cost of a given output is the sum of total fixed cost and total variable cost. As far as the total fixed cost is concerned, it remains constant for all units of output, but we have to incur more variable costs when output increases. Total variable cost is zero, when output is zero and it increases with an increase in output, though the rate of increase is not constant. At first it increases rapidly but, then, due to economies of larger production, it does not increase as fast as before, thought it jumps up rapidly at a later stage (when output increases from 4 units to 5 units) due to diseconomies that set in.

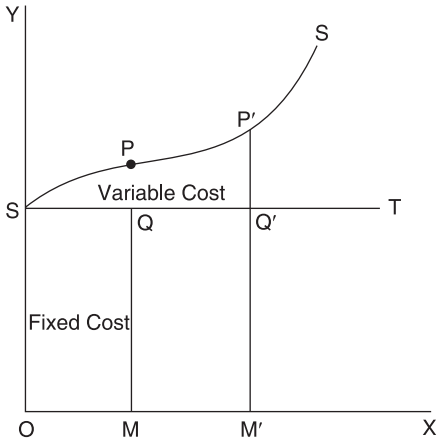

Fig. 7.6. Total cost: fixed and variable in the short seen.

In Fig. 7.6 SS is the total cost curve. It includes the total fixed cost (the distance between the curve ST and X-axis) and the total variable cost (represented by the distances between the curves SS and ST).

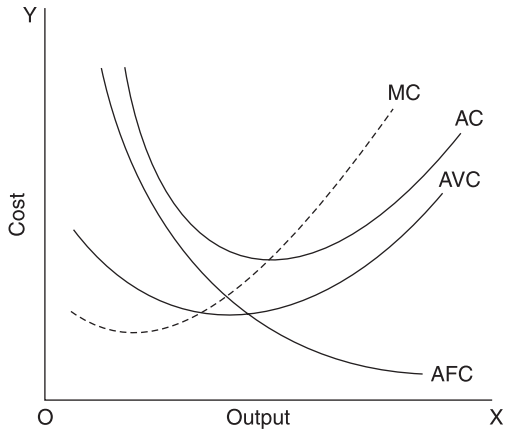

Fig. 7.7. Average and marginal cost in the short seen.

Average cost per unit is the total cost divided by the number of units produced. It is the sum of average fixed cost and the average variable cost. In Fig. 7.7, we have drawn both the average fixed cost curve and the average variable cost curve. The total fixed cost being fixed for all units of output, average fixed cost is a falling curve in the shape of a rectangular hyperbola. Average variable cost curve (AVC) at first falls and then rises, as there emerge the diseconomies of large production.

By adding the two costs, average fixed and average variable, we get the average cost (AC) per unit of output. At first, the average cost is high due to large\fixed cost and small output. As output increases, the fixed cost is thinly spread over the larger number of units produced, and the average cost accordingly falls. This is due to the various internal economies and the fuller use of indivisible factors. But when diminishing returns set in due to difficulties of management and limitations of plants and space, the variable costs, and therefore, the average costs, start increasing. The lower end of the curve turns up and gives it a V-shape. That is why average cost curves are *y*-shaped.

Marginal cost is the addition to total cost caused by a small increment in output. Marginal cost may be defined as the change in total cost resulting from the unit change in the quantity produced. Thus, it can be expressed by the formula:

$$MC = \frac{\text{Change in Q}}{\text{Change in TC}}$$

Marginal cost curve (MC) in Fig. 7.7 also falls at first due to more efficient use of variable factors as output increases and then it slopes upward as further additions to the output interfere with the most efficient use of the variable factors.

Relation between Marginal and Average Costs: It can be seen that average variable cost continues to decline so long as the marginal cost is below it but it starts rising at the point where MC crosses AVC. The marginal cost will always rise more sharply than the average variable cost. Similar relation holds between marginal cost and average cost.

Total Marginal Cost Relationship: When total cost is increasing at an increasing rate, its corresponding marginal cost is rising; when total cost is increasing at a decreasing rate, its corresponding marginal cost is falling; and when total cost has reached the maximum, i.e., it is increasing at a zero rate, its corresponding marginal cost is zero.

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It will be seen that when marginal cost is less than average cost, average cost is falling, and when marginal cost is greater than average cost, average cost is rising. This marginal-average relationship is a matter of mathematical truism and can be illustrated by a simple example.

Suppose that a cricket player's batting average is 50. If in the next innings, he scores less than 50, say 44. His average will fall because his marginal (additional) score is less than his average score; if in the next innings he scores more than 50, say 58, his average will rise because marginal score is greater than his average score. If with the present average as 50, in the next innings, he scores just 50, then his average and marginal scores will be equal and his average score will neither rise nor fall.

In the same way, let us suppose that the average cost of a producer is ₹ 15. If by producing another unit. his average cost falls, the additional (marginal) unit must have cost him less than ₹ 15. If the production of the additional unit raises his average cost, the marginal unit must have cost him more than 15. And, finally, if his average cost remains unchanged, the marginal unit must have cost him exactly 15. In other words, in the third case, his marginal and average costs are equal.

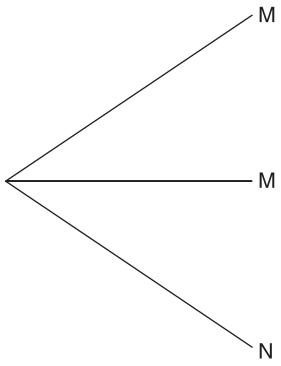

Fig. 7.8. Average and marginal relationship.

In Fig. 7.8, a represents average cost and M represents marginal cost. It is clear from this figure that when marginal cost is above (greater than) average cost, average cost rises. It is as if marginal cost were pulling average cost up towards itself. Similarly, when marginal cost is below the average cost, average cost falls as if the marginal cost were pulling the average cost downwards. When marginal cost is the same as the average cost, average cost remains constant as if marginal cost were pulling average cost along horizontally.

We can see in Fig. 7.8 that so long as marginal cost curve lies below the average cost curve, the latter is falling, and where marginal cost curve lies above the average cost curve, the average cost curve is rising. Therefore, at the point of intersection, where marginal cost equals average cost, average cost curve has just ceased to fall but has not yet begun to rise. This, by definition, is the minimum point on the average cost curve.

It must be carefully understood that we cannot deduce about the direction in which marginal cost is moving from the way average cost is changing, that is, we cannot make any generalization about whether marginal cost will be rising or falling when average cost is rising or falling. If average cost curve is falling, marginal cost must be below it but it (MC curve) may itself be rising or falling. If average cost curve is rising, marginal

cost curve must be above it, but it (MC curve) may itself be rising or falling. This can also be easily understood with the example of batting average.

Suppose that a player's batting average is 60. In his next innings he scores 54, his average score will fall to 57. But his present marginal score of 54 may well be greater than his previous marginal score. He might, for instance, have had a 'duck' in his previous innings so that his marginal score has risen considerably. But as long as average score is falling, marginal score whether rising or falling will be less than average score.

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Deriving Marginal and Average Cost

Curves from total Cost Curve: In Fig. 7.9, SS is the total cost curve. To get the average and marginal cost for a given point P on the total cost curve, we proceed as follows:

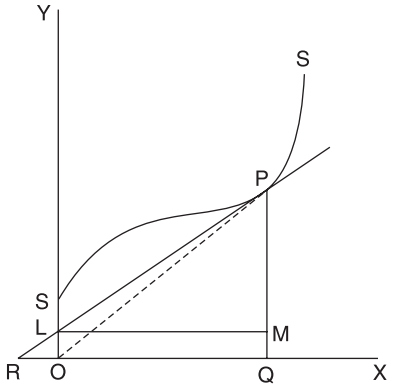

Fig. 7.9. Derivation of AC and MC curves from the total cost curves.

Draw a straight line from P to the origin O. Then average cost at the point P equals the value of tangent of the angle (POX) that the straight line makes with the X-axis. In this figure, it is equal to PQ/OQ. Similarly, we can know the corresponding average costs at different points of the total cost curve. By joining all these points we get a V-shaped average cost curve (AC in Fig. 7.10).

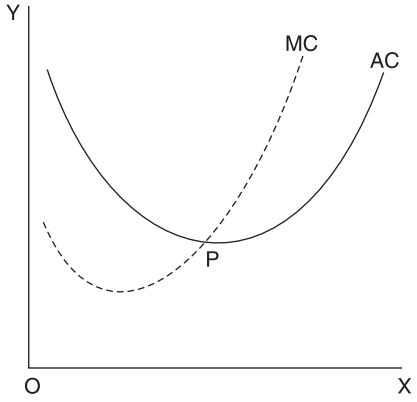

Fig. 7.10. MC and AC curves.

To know the marginal cost at the point P, we draw a tangent to the curve SS at the point P:

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Then the marginal cost corresponding to the total cost at P is given by the value of the tangent of the angle that RP makes with the X-axis. In this case, it is equal to the value of the tangent of angle PRQ and this equals PQIRQ or which is the same thing as PM/LM.

Similarly, we can know the marginal cost at different points of the total cost curve and by joining them, we get the marginal cost curve (MC in Fig. 7.10).

Long-Run Average Cost Curves

The Long-Run average cost curves will normally be V-shaped just as Short-Run cost curves are, but they will always be flatter than the Short-Run ones. The longer the period to which the curve relates, the less pronounced will be the V-shape of the cost curves. By the long period, we mean the period during which the size and organization of the firm can be altered to meet changed conditions.

Why LAC Curves are Flatter: The simple explanation of why the Long-Run average cost curve is flatter than the Short-Run cost curve may be given in terms of fixed and variable costs. It should be obvious that longer the period at the disposal of the producer, the fewer costs will be fixed and more costs will be variable. Over a long period of time, there are very few costs which are just as great if output is small as they are if it is large. Over a long period, the size of the plant can be changed, unwanted buildings can be sold or let, and administrative and marketing staff can be decreased or increased in order to deal efficiently with smaller or larger outputs and sales.

Thus, total fixed cost can be varied to a considerable extent over long periods, whereas in the short-run its amount is fixed absolutely. In other words, the longer the period under consideration, the fewer costs are 'fixed' and more costs become 'variable'.

In the short-run, a reduction in output will raise average costs because fixed costs will work out at a higher amount per unit of output. In the long period, however, the fixed costs can be reduced somewhat if output continues at a low level. Average fixed cost will, therefore, be lower in the long than in the short-run.

Variable costs will not rise as sharply in the long-run as they do in the short-run. In the longrun, the size of the firm can be increased to deal with an increased output more satisfactorily and the management can better tackle the various problems of larger output.

Thus, in the long-run, average costs will be lower and the variable costs will not rise as sharply as in the short period. Hence, LAC cost curves are flatter than the short-run ones.

A more adequate explanation of the flatter long-run average cost curves may be given in terms of greater divisibility of the factors of production in the long-run. In the long-run, the indivisible factors of production (like the plant, building, elaborate marketing organization) can be used more economically because in the long-run, they are, in fact, to some extend divisible. In the short-run, the shape of the cost curve of the firm depends on the action of the law of variable proportions, with capital and management as fixed (indivisible) factors. In the long-run, the cost curve of the firm depends on what are called the "returns to scale". In the long-run, the amount of capital can be altered and the management can be arranged differently, if necessary. They are no longer completely indivisible.

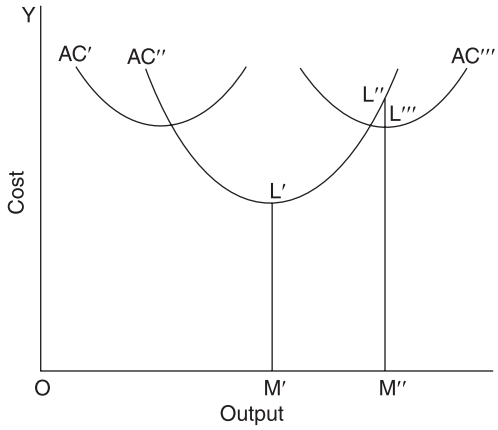

Fig. 7.11. Change the scale of operation.

If all the factors of production can be used in varying proportions, it means that the scale of operations of the firm can be changed. Each time the scale of operations is changed, a new short-run cost curve will have to be drawn for the firm. The accompanying figure will bring this out. To begin with, let us suppose that the firm has the short-run cost curve AC″. In that case, the optimum output will be OM′ at the lowest average cost M′ L′. Now if output is desired to be increased to OM″, in the short-run, it can be obtained at the average cost M″ L″ along the short turn cost curve AC″, because in the short-run the 'scale' of operations is fixed. But, in the long-run, a new and bigger plant can be built on which OM″ is the optimum output. That is, the firm now has the short-run average cost curve AC‴, and that by increasing the scale of its operations, the firm can produce the output OM″ at a cost of M″ L‴ instead of M″ L″.

Thus, it will have been seen that, at any given scale of operations, the firm will encounter regions of rising and falling costs, while in the long-run the firm can produce on a completely different cost curve to the left or the right of the original one. For each different scale, there will be an output where average cost is at a minimum.

At this output, the firm is said to be producing at its technical 'optimum', given its scale of operations. Output is 'optimum' in the sense that average cost is at a minimum. Therefore, in the long-run, the firm will be able to adjust its scale of operations so that it produces any given output at the lowest cost.

Look at the diagram. If the firm in question wishes to produce output OM′ it will find it best to produce at that scale which has the average cost curve SAC′. If OM″ quantity is desired, it will be best to produce on the curve SAC″, and for output OM‴ on the curve SAC‴. In each case, it will be producing the desired output at the lowest possible cost. It should, of course, be clearly understood that only in the long run can the scale of operations be altered; in the short-run it will be fixed, and the average cost of output above or below the optimum level will necessarily rise along the short-run curve in question, whether it be SAC′ or SAC″ or SAC‴. A long-run average cost curve can, therefore, be drawn and it will show what the long-run cost of producing each output would be.

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The shape of the long-run average cost curve will depend on the assumptions made. One assumption relates to the prices of factors. In the above examples, we have assumed constant factor prices. Various assumptions are, however, possible about the divisibility of factors of production. The simplest case is to assume that all factors are infinitely divisible and that there are no economies to be reaped from, for example, the division of labour. In other words, in the long run, all factors can be adjusted so that the proportions between them are the optimum ones and production can take place at the lowest point on the relevant short-run average cost curve. As will be seen from the (Fig. 7.12), on this assumption the long-run cost curve of the firm LAC, is a horizontal straight line.

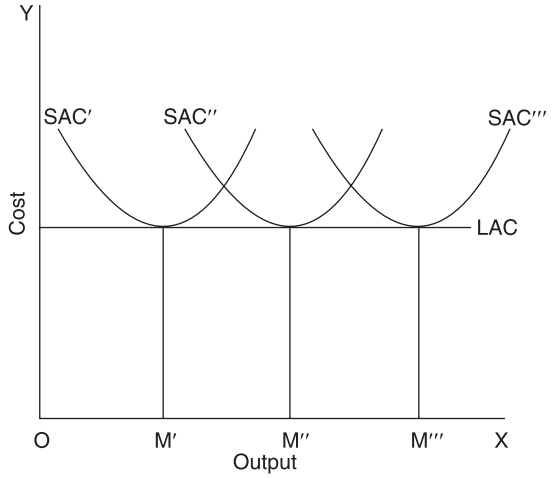

Fig. 7.12. Horizontal LAC curve with constant factor prices and divisible factors.

But this is not a realistic assumption. It is very unlikely that all factors are infinitely divisible even in the long-run. And as output is increased, the firm may reasonably expect to reap some economies from the division of labour that will become more and more practicable as the scale of operations becomes larger.

It is a common observation that some factors of production are indivisible. In particular, management is likely to be incompletely divisible. It is mere commonsense that an entrepreneur will be unlikely to produce twice a given output as efficiently as he produces a given output. It is, therefore, reasonable to expect that, even in the long-run, firms will produce more cheaply at some scales of output than at others, if for no other reason, at least because, beyond a certain point, management becomes more difficult and less efficient. Certain combinations of factors will thus produce at lower costs per unit than others. This means that, in the more probable conditions, the short-run average cost curves of the firm will have different minimum points.

In the figure given below, it will be seen that the short-run average cost curve SAC_2 has a lower minimum point than either the curves SAC. The optimum output of the firm is obtained at point M. The long-run average cost curve, which is a tangent to all the short-run curves, will be the curve LAC. It will, therefore, be U-shaped itself. But, as will be obvious from Fig. 7.13, it will be flatter than the short-run cost curves, the U-shape will be less pronounced.

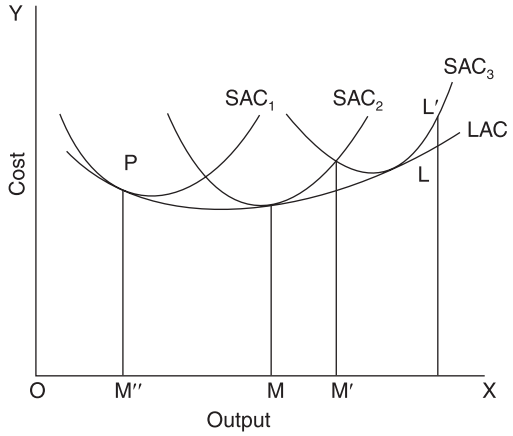

Fig. 7.13. LAC curve: An envelop of SAC's.

Economists generally call this curve as 'envelope', since it envelops all the short-run curves. It is also called the "planning curve" of a firm. From the LAC curve it should be clear that for any given output, average cost cannot be higher in the long-run than in the short-run. After all, any adjustment in production which may be expected to cut costs, and which may be possible to make in the short-run, must also be feasible in the long-run. On the other hand, in the short-run, it is not always possible to produce a" given output in the cheapest possible way. If a different output is to be produced, it is impossible to change the amounts used of all factors of production in the short-run. While in the long-run all possible adjustments can be made.

The conclusion, therefore, follows that at no point can the long-run average cost curve lie above a short-run average cost curve or the long-run average cost curve can never cut a short-run average cost curve, though they may be tangential to each other.

Long-Run Marginal Cost Curve

In the diagram, we have drawn long-run marginal cost curve LMC from short-run average cost and marginal cost curves and long-run average cost curve. Just as every point of the continuous long-run average cost curve corresponds to some point of a short-run average cost curve, similarly every point of the continuous long-run marginal cost curve corresponds to some point on a short-run marginal cost curve.

If the output to be produced is OA, then in the long-run it must be produced on point P on the short run average cost curve SAC, and the long-run average cost curve LAC, because only point P minimizes the cost for output SAC,. OA. Corresponding to point P on SAC, and LAC, there is a point R on the short-run marginal cost curve SMC. Then AR is the relevant short-run marginal cost for output OA in the long-run. Therefore, the point R must lie on the long-run marginal cost curve corresponding to output OA.

If the output OB is to be produced, then in the long-run it will be. produced on point L on the short run average cost curve SAC_1 and long-run average cost curve LAC, L is also the point on the short-run marginal cost curve SMC_2 corresponding to output OB. Therefore, point L must also lie on the long-run marginal cost curve corresponding to output OB.

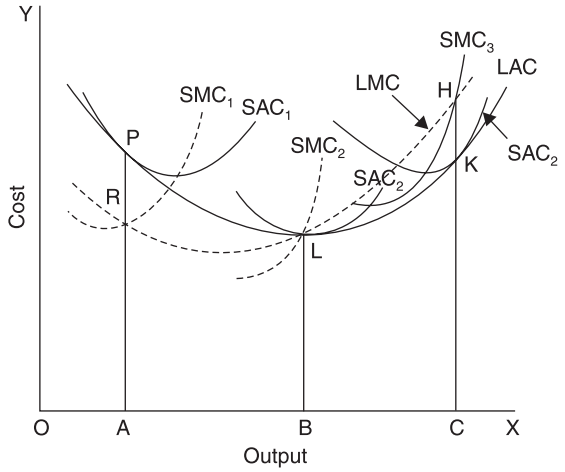

Fig. 7.14. Derivation of long-run marginal cost curve.

Similarly, if output OC is to be produced, then in the long-run it must be produced on point K of the short-run average cost curve SAC_3. Corresponding to K on SAC_3, the relevant point on the SMC_3 is H. Therefore, H must also lie on the long-run marginal cost curve corresponding to output OC.

By joining points such as R, L and H, we get long-run marginal cost curve LMC. The long-run marginal cost curve, like the long-run average cost curve, is U-shaped.

It is clear from Fig. 7.14 that the long-run marginal cost curve is flatter than the short-run marginal cost curves. This is what one would expect, because the U-shape of the long-run average cost curve is less pronounced than that of the short-run average cost curves. The relationship between the long-run marginal cost curve and long-run average cost curve is the same as that between shortrun marginal cost curve and short-run average cost curve. That is, when the long-run marginal cost curve lies below long-run average cost curve, the latter is falling and when the LMC curve lies above LAC curve, the latter is rising. The long-run marginal cost curve cuts the long-run average cost at the latter's lowest point. This is so because long-run marginal cost is equal to the long-run average cost when the latter is neither rising nor falling.

Why LAC Curve First Falls and then Rises? That the LAC curve slopes downwards as the scale of production is enlarged is due to the various economies of scale, e.g., (i) larger scope of specialization of labour, (ii) increasing use of specialized machinery, (iii) other technological improvements. The LAC curve rises after a point because of the various diseconomies of scale, e,g., rising cost of the inputs and the difficulty of management, etc.

Optimum Plant: The plant is said to be of the optimum size which is operated at the point of its minimum average cost of production. It is the minimum point of whose short-run average cost curve coincides with the minimum point of the long-run average cost curve. In Fig. 7.4, plant SAC_2 is operated at its minimum cost of production for producing OB output. It is being used to its full capacity to turn over an optimum output. Any size of the plant which is either bigger or smaller than SAC_2 will be producing at higher average cost.

Optimum Output: In Fig. 7.14, OB is the optimum output. It is optimum because it is the least cost output. If the output is smaller (e.g., OA) or larger (e.g., OC), it will be obtained at a higher cost of production as compared with OB output.

Optimum Firm: The firm which produces optimum output (i.e., the least cost output) with the optimum plant is called the Optimum Firm. The firm producing OB output by operating SAC_2 plant is said to have achieved the optimum size. Since the minimum cost point of SAC_2 coincides with the minimum point of the long-run average cost curve, the optimum firm can also be defined as the firm which produces at the minimum point of the long-run average cost curve (LAC). The size of the optimum firm is different in different industries. For instance, it is smaller in agriculture and other industries like mining, whereas it is bigger in manufacturing industries like automobile industry.

L-Shaped Long-Run Average Cost Curve

We have said that the long-run average cost curves are V-shaped. But empirical studies have shown that the LAC curves are L-shaped, rather than V-shaped. It is found that there is a rather rapid downward slope in the early part of the curve, i.e., in the initial stages of production.

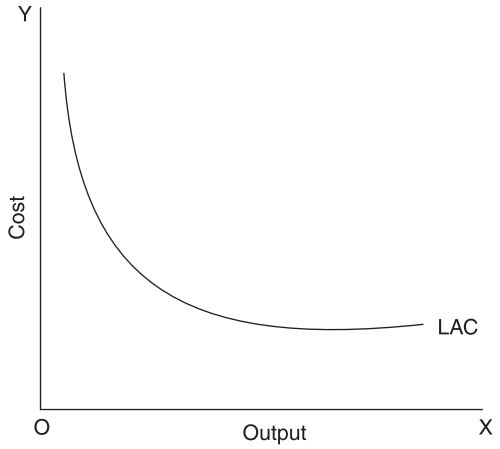

Fig. 7.15. 'L' shaped LAC.

The following reasons are given in support of this view:

(a) Rapid technical progress brings about a sharp decline in unit cost. At first, the unit cost is high and remains quite high for an initial scale of production. But then the unit cost takes a downward course and remains constant so that the LAC curve is flat at the right, making the curve L-shaped. This is due to technical progress.

The figure explains that, in the absence of technical progress, the long-run average cost curve is V-shaped, technical progress would convert it into an L-shaped curve. Initially, in the figure given in Fig. 7.15, the output is OMI and the unit cost is OC and the relevant long-run average cost curve is LAC_1 but when the output is expanded in response to increased demand to M_2, the cost of production per unit is OC_1 on the curve LAC_1, which is quite high. But if technical progress is going apace, it may be possible to produce the same output at a unit cost of OC_2 on the curve LAC_2; this cost is much lower since a more modern plant has been installed due to technical progress. With further expansion of the output to OM_3 and technical progress gathering momentum, the unit cost drops further to OC_3 on the long run average cost curve LAC_3. It is thus that the long-run average cost curve LAC takes L-shape.

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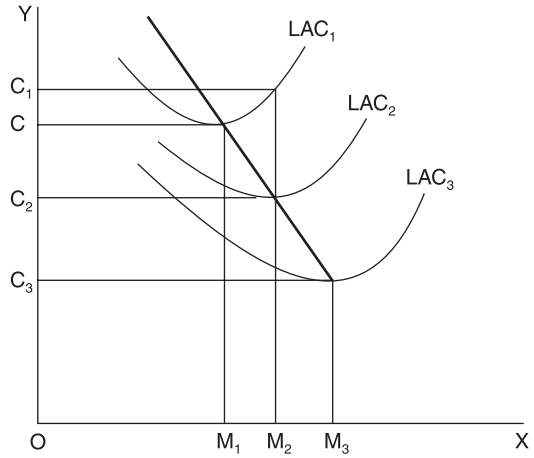

Fig. 7.16. LAC falls with technical progress.

(b) The second reason why the long-run average cost curves slope downwards is 'learning' to produce at lower cost. The cost does not merely depend on how much is produced in a given period but also on the aggregate output since the time the firm commenced operations. As the aggregate output increases and longer the period that has elapsed, efficiency of the firm improves and costs are lowered. Hence, although the short-run average cost curve must be U-shaped, the long-run cost curves may be U-shaped or L-shaped.

Empirical Cost Curves

Most of the cost curves that are discussed in the text books of economics are theoretical or conventional and they are U-shaped. But there are some cost curves of different shapes which are found in the real world. They are called empirical cost curves.

Dish-Shaped Curve

An attempt has been made to reconcile the theoretical and empirical approaches. The U-shaped cost curves apply to cases where the plant is indivisible but can be used with changing quantities of variable factors. In such cases, change in output results through a change in variable factors when the returns are non-proportionate giving rise to U-shaped cost curves. But in the case of a fairly divisible and flexible plant, the cost curves may be horizontal over a range of output. When a plant is divisible it is possible to maintain the factor proportion so that all the factors have to be increased in the same proportion as the increase in the output. The result is that the costs are constant. Under these circumstances the cost curves will be dish-shaped. You will notice that at first both AC and MC fall, and then they remain constant for a wide range of output and then rise forming a sort of dish.

The U-shaped curve of the traditional theory was questioned by economists both on theoretical and empirical grounds. For instance, George Stigler suggested that the short-run average variable cost curve has a flat stretch over a range of output so that the long-run cost curve is L-shaped rather than U-shaped. It has been argued that managerial diseconomies can be avoided by improved methods of modern management.

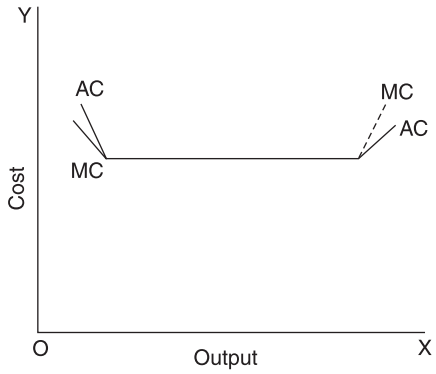

Fig. 7.17. Dish shaped AC and MC.

Inverse J Cost Curves

More recently, the economists have questioned even the L-shaped cost curve. It has been said that there are economies of scale at all levels of output, although their magnitude becomes small beyond a certain scale of output. Hence, we get cost curves of the shape of an inverse J as shown in Fig. 7.18.

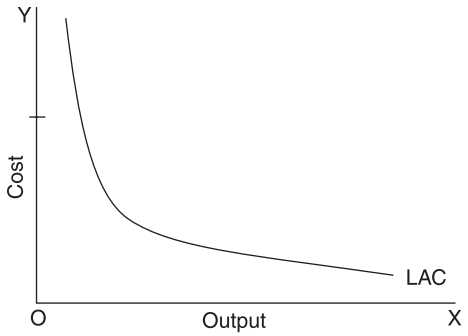

Fig. 7.18. Inverse 'J' cost curve.

Self-Assessment Questions

1. What is meant by the equilibrium of a firm and of the industry? Indicate the conditions of equilibrium of both under perfect competition.
2. Distinguish between AC and MC and discuss the significance of this distinction in the analysis of firm's equilibrium.

CHAPTER 8 THE FIRM: STAKEHOLDERS

NOTES

✣ STRUCTURE ✣

- ☆ Introduction
- ☆ Objectives of the Firm
- ☆ Profit as Business Objective
- ☆ The Profit Maximization Principle
- ☆ Satisfactory Level of Profits
- ☆ Value Maximization
- ☆ Alternative Objectives of Firms
- ☆ Economic Objectives
- ☆ Non-Economic Objectives
- ☆ Social Responsibilities of a Business Firm
- ☆ Goals of Real World Firms
- ☆ Firm's Constraints
- ☆ Basic Factors of Decision-Making
- ☆ The Equi-Marginal Principle
- ☆ The Discounting Principle
- ☆ The Opportunity Cost Principle
- ☆ The Invisible Hand

8 .1 INTRODUCTION

The firm is an organization that produces a good or service for sale and it plays a central role in theory and practice of Managerial Economics. In contrast to non-profit institutions like the 'Ford Foundation', most firms attempt to make a profit. There are thousands of firms in India producing large amount of goods and services; the rest are produced by the government and non-profit institutions. It is obvious that a lot of activities of the Indian economy revolve around firms. One of the crucial determinants of a firm's behaviour is the state of technology. Technology imposes a limit on how much a firm can produce. It is the sum total of society's pool of knowledge concerning the industrial and agricultural arts. Production is any activity that transforms inputs into output and is applicable not only to the production of goods like steel and automobiles, but also to production of services like banking and insurance. The firm changes hired inputs into saleable output. An input is defined as anything that the firm uses in its production

process. Most firms require a wide array of inputs. For example, some of the inputs used by major steel firms like SAIL or TISCO are iron ore, coal, oxygen, skilled labour of various types, the services of blast furnaces, electric furnaces, and rolling mills as well as the services of the people managing the companies. To give another example, the inputs in production and sale of "chaat" by a street vendor are all the ingredients that go into making of the "chaat", i.e., the stove, the "carrier", and the services of the vendor.

The inputs or the factors of production are divisible into two broad categories—human resources and capital resources. Labour resource and entrepreneurial resource are the two human resource inputs while land, man-made capital, forests, rivers, etc., are the capital resources. Thus the four major factors of production (FOP) are land, man-made capital, labour, and entrepreneur (organization) while the remuneration they get is rent, interest (capital rental), wage, and profit, respectively. The function of the firm, thus, is to purchase resources or inputs of labour services, capital and raw materials in order to convert them into goods and services for sale. There is a circular flow of economic activity between individuals and firms as they are highly interdependent. Labour has no value in the market unless there is a firm willing to pay for it. In the same way, firms cannot rationalize production unless some consumer is willing to buy their products. However, there is some incentive for each. Firms earn profits in turn satisfying the consumption demand of individuals and resource owners get wage, rent and interest payment.

In the process of supplying the goods and services that consumers demand, firms provide employment to workers and also pay taxes that government uses to provide service (education, defense) that firms could not provide at all or efficiently. Essentially a firm exists because the total cost of production of output is lower than if the firm did not exist. There are several reasons for lower costs. Firstly, long term contract with labour saves the transaction costs because no new contract has to be negotiated every time a labour is to be hired or given new assignment. Secondly, there are government regulations like price-control and sales taxes also saved by having the transaction within the firm. Recall that sales tax is levied for transaction between firms and not within firms. When transactions take place within a firm they may be cheaper and hence such savings decrease the total cost of production of an output. In other words, the existence of firms could be explained by the fact that it saves transaction costs. However, the size of the firm has to be limited because as the firms grow larger, a point is reached where the cost of internal transaction becomes equal to or greater than the cost of transaction between firms. When such a stage is reached, it puts a limit to the size of the firm. Further, the cost of supplying additional services like legal, medical etc. within the firm exceeds the cost of purchasing these services from other firms; as such services may be required occasionally.

Let us consider the size of different kinds of firms around us and try to understand the reasons for such differences. Why are service firms generally smaller than capital-intensive firms like SAIL, Maruti Udyog, and ONGC etc? What is the reason that a number of firms are choosing the BPO route? A part of the explanation must lie in the fact that it is cheaper to outsource than to absorb that activity within the firm. Consider a firm that needs to occasionally use legal service.

Under what conditions will it choose to hire a full-time lawyer and take her on its rolls and under what conditions will the firm outsource the legal activity or hire legal services on a case-bycase basis. Naturally, the answer depends upon the frequency of use for legal services. The transaction cost framework demonstrates that the firm will

contract out if the cost of such an arrangement is lower and will prefer in-house legal staff when the opposite is true.

Firms are classified into different categories as follows:

(a) Private sector firms.

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(b) Public sector firms.

(c) Joint sector firms.

(d) Non-profit firms.

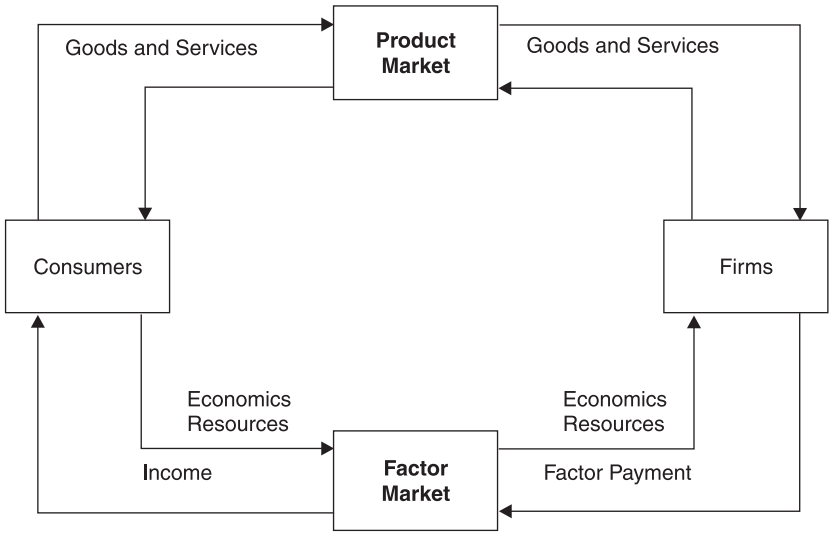

Fig. 8.1. Interrelation between consumers and firms.

Firms can also be classified on the basis of number of owners as:

(a) Proprietorship.

(b) Partnership.

(c) Corporations.

Some firms mentioned below are different from above. They may provide service to a group of clients for example, patients or to a group of its members only:

(i) Universities.

(ii) Public Libraries.

(iii) Hospitals.

(iv) Museums.

(v) Churches.

(vi) Voluntary Organizations.

(vii) Cooperatives.

(viii) Unions.

(ix) Professional Societies, etc.

The concept of a firm plays a central role in the theory and practice of managerial economics. It is, therefore, valuable to discuss the objectives of a firm.

8.2 OBJECTIVES OF THE FIRM

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Profit maximization goal of the firm has been the approach to the study of a firm in equilibrium analysis. Profit maximization means the largest absolute amount of profit over a time period, both short-term and long-term. The short-run is a period where adjustments cannot be made quickly in matters of supply and demand. Long-run however enables adjustment to changed conditions. In the short-run for instance, there are production and financial constraints in expanding the firm even though it would yield higher profits. But given some time most of the constraints can be overcome.

Profit maximization can be viewed from the point of view of the control wielded by a firm over price and output determination. Where the firm operates under conditions of perfect competition from several firms, the price is determined in the market by supply and demand conditions. The individual firms have to maximize their profits at this given price. They are price-taker firms. On the other hand, when there is imperfect competition, the number of sellers is small enough so that each seller has some control over its selling price. The firms in these markets are called price searchers because they must constantly search out the price that will maximize profits. The price-searcher firm is a broad term encompassing the market structures of monopoly, oligopoly and to some extent monopolistic competition.

Though profit maximization can be viewed from many different perspectives, the marginal approach helps to formulate a rule which is applicable for both price takers and price searchers. Profit can be defined as the difference between total revenue (TR) and total cost (TC).

$$\text{Profit} = TR - TC$$

The output which yields the maximum profits is the ideal to be achieved. Fig. 8.2 below illustrates this simple profit maximization rule.

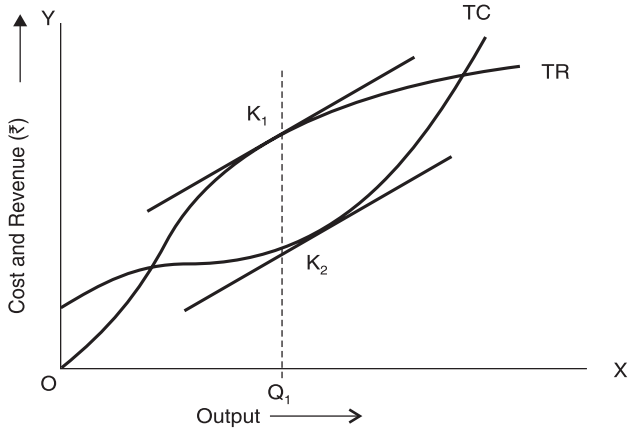

Fig. 8.2. Profit maximization of a firm (total cost and total revenue).

TC and TR represent total cost and total revenue curves respectively.

The gap between the two curves is maximum ($K_1 - K_2$) at OQ_1 output. Here the slopes of the two curves show by "tangents" are also equal i.e., marginal revenue is equal to marginal cost. Therefore, OQ_1 is the profit maximizing output.

As the firm increases its production it results in additional cost. The generalized decision making rule for propitiation can be stated as follows:

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"As long as marginal revenue exceeds marginal cost, the firm should expand its output. The firm should produce that level of output which equates marginal revenue with marginal cost".

Marginal revenue is the change in revenue which comes, from selling an additional unit. Marginal cost is the change in cost which results from producing an additional unit. The profit maximization rule in simple terms means the firm should continue production as long as the incremental cost of production is less than the increase in revenue. Profit maximization by equating marginal cost with marginal revenue is illustrated in Fig. 8.3.

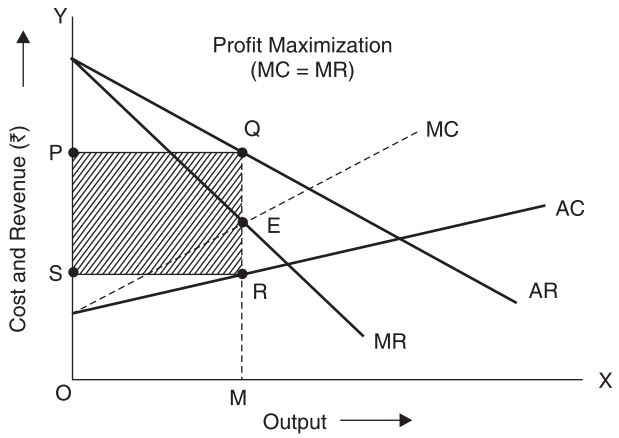

Fig. 8.3. Profit maximization in a firm: (MC = MR Rule).

Fig. 8.3 above shows the profit maximization rule applied to a firm. AC and AR are the average cost and average revenue curves respectively. MC is the marginal cost and MR is the marginal revenue. As the firm expands its output from O, there is a fall in marginal revenue and a rise in marginal cost. So long as marginal revenue is higher than marginal cost, the additional output gives profit. When the output reaches OM, marginal revenue equals marginal cost at E and gets a profit of PQRS (the shaded area). Beyond OM output, the MC curve is higher than MR curve indicating losses. The maximum profit is shown by the shaded rectangular area. Thus profits are maximum when MR = MC. (A detailed discussion of profit maximization in the short-run and long-run for the price taker firm under perfect competition and price searcher firm under imperfect competition is given in the chapter on price determination under different market structures).

There are some reasons why a firm should adopt the profit maximization goal. Firstly, in the case of owner managed firms it is only natural that they should get the adequate and maximum returns. Maximizing profits is, therefore, a rational behaviour of the firm. Secondly, profit maximization is an aspect of the survival of the firm. When there are many firms as under perfect competition, he can survive only if the firm makes profits. Under monopoly there are no rivals but he would naturally wish to pursue maximization for his efforts.

The traditional objective of the firm has been profit maximization. It is still regarded as the most common and theoretically the most plausible objective of business firms. We define profits as revenues less costs. But the definition of cost is quite different for the economist than for an accountant. Consider an independent businessperson who has an MBA degree and is considering investing ₹ 1 lakh in a retail store that she would manage. There are no other employees. The projected income statement for the year as

prepared by an accountant is as shown below:

Sales:			₹ 90,000
Less: Cost of Goods sold		₹ 40,000	
Gross Profit:			₹ 50,000
Less:	Advertising	₹ 10,000	
	Depreciation	₹ 10,000	
	Utilities	₹ 3,000	
	Property Tax	₹ 2,000	
	Misc.	₹ 5,000	= ₹ 30,000
Net Accounting Profit			= ₹ 20,000

Fig. 8.4. Projected income statement.

This accounting or business profit is what is reported in publications and in the quarterly and annual financial reports of businesses. The economist recognizes other costs, defined as implicit costs. These costs are not reflected in cash outlays by the firm, but are the costs associated with foregone opportunities. Such implicit costs are not included in the accounting statements but must be included in any rational decision-making framework. There are two major implicit costs in this example. First, the owner has invested ₹ 1 lakh in the business. Suppose the best alternative use for the money is a bank account paying a 10 per cent interest rate. This risk less investment would return ₹ 10,000 annually. Thus, ₹ 10,000 should be considered as the implicit or opportunity cost of having ₹ 1 lakh invested in the retail store.

Let us consider the second implicit cost, which includes the manager's time and talent. The annual wage return on an MBA degree may be taken as ₹ 35,000 per year. This is the implicit cost of managing this business rather than working for someone else. Thus, the income statement should be amended in the following way in order to determine the economic profit:

Sales:			₹ 90,000
Less: Cost of Goods sold		₹ 40,000	
Gross Profit:			₹ 50,000
Less Explicit Cost:			
	Advertising	₹ 10,000	
	Depreciation	₹ 10,000	
	Utilities	₹ 3,000	
	Property Tax	₹ 2,000	
	Misc.	₹ 5,000	= ₹ 30,000
Accounting Profit		₹ 20,000	
Less:Implicit Costs:			
	Return on ₹ 1 lakh of capital	₹ 10,000	
	Foeign wages	₹ 35,000	= ₹ 45,000
Net "Economic Profit"			= ₹ 25,000

Fig. 8.5. Income statement for determining economic profit.

Looking at this broader perspective, the business is projected to lose ₹ 25,000 in the first year. ₹ 20,000 accounting profit disappears when all relevant costs are included. Another way of looking at the problem is to assume that ₹ 1 lakh had to be borrowed at, say, 10 per cent interest and an MBA graduate hired at ₹ 35,000 per year to run the

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store. In this case, the implicit costs become explicit and the accounting made explicit. Obviously, with the financial information reported in this way, an entirely different decision might be made on whether to start this business or not.

Thus, we can say that economic profit equals the revenue of the firm minus its explicit costs and implicit costs. To arrive at the cost incurred by a firm, a value must be put to all the inputs used by the firm. Money outlays are only a part of the costs. As stated above, economists also define opportunity cost. Since the resources are limited, and have alternative uses, you must sacrifice the production of a good or service in order to commit the resource to its present use. For example, if by being the owner manager of your firm, you sacrifice a job that offers you ₹ 2,00,000 per annum, then two lakhs is your opportunity cost of managing the firm. Similarly, if he was not playing cricket, Sachin Tendulkar, could have earned a living (perhaps, not such a good one!) by being a cricket commentator. Sachin's opportunity cost of playing cricket is the amount he could have earned being a television commentator. The assignment of monetary values to physical inputs is easy in some cases and difficult in others. All economic costing is governed by the principle of opportunity cost. If the firm maximizes profits, it must evaluate its costs according to the opportunity cost principle. Assigning costs is straightforward when the firm buys an input on a competitive market. Suppose the firm spends 20,000 on buying electricity. For its factory, it has sacrificed claims to whatever else ₹ 20,000 can buy and thus the purchase price is a reasonable measure of the opportunity cost of using that electricity. The situation is the same for hired factors of production.

However, a cost must be assigned to factors of production that the firm neither purchases, nor hires because it already owns them. The cost of using these inputs is implicit costs and has to be imputed. Implicit costs arise because the alternative (opportunity) cost doctrine must be applied to be firm. The profit calculated after including implicit as well as explicit costs in total cost is called economic profit. Profit plays two primary roles in the free-market system. First, it acts as a signal to producers to increase or decrease the rate of output, or to enter or leave an industry. Second, profit is a reward for entrepreneurial activity, including risk taking and innovation. In a competitive industry, economic profits tend to be transitory. The achievement of high profits by a firm usually results in other firms increasing their output of that product, thus reducing price and profit. Firms that have monopoly power may be able to earn above normal profits over a longer period; such profit does not play a socially useful role in the economy. Although, profit maximization is a dominant objective of the firm, other important objectives of the firm, other than profit maximization that we will discuss in this unit are:

1. Maximization of sales revenue.
2. Maximization of firm's growth rate.
3. Maximization of manager's own utility or satisfaction.
4. Making a satisfactory rate of profit.
5. Long-run survival of the firm.
6. Entry-prevention and risk avoidance.

8.3 PROFIT AS BUSINESS OBJECTIVE

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Meaning of Profit

Profit means different things to different people. The word "Profit" has different meaning for businessmen, accountants, tax collectors, workers and economists and it is often used in a loose polemical sense that buries its real significance. In a general sense, "profit" is regarded as income accruing to the equity holders, in the same sense as wages accrue to the labour rent accrues to the owners of rentable assets; and interest accrues to the money lenders. To, a layman, profit means all income that flows to the investors. To an accountant, 'profit' means the excess of revenue over all paid out costs including both manufacturing and overhead expenses. It is more or less the same net profit. For all practical purposes, profit or business income means profit in accountancy sense plus non-allowable expenses. Economic concept of profit is of pure profit and is called economic profit or just profit. Pure profit is a return over and above opportunity cost i.e., the income which a businessman might expect from the second best alternative use of his resources.

Economic Versus Accounting Profits

When most people hear the word profit, they think of accounting profits. Accounting profits are the difference between the total amount of money taken in from sales (total revenue, or price times quantity sold) minus the dollar cost of producing goods or services. Accounting profits are what show up on the firm's income statement, and are typically reported to the manager by the firm's accounting department.

A more general way to define profits is in terms of what the economist refers to as economic profits. Economic profits are the difference between total revenue and total opportunity cost of producing the firms goods or services. The opportunity cost of using a resource includes both the explicit cost of the resource and the implicit cost of giving up the next best alternative use of the resource. The opportunity cost of producing a good or service generally is higher than accounting cost because it includes both the dollar value of the cost and any implicit costs.

Implicit costs are very hard to measure and therefore are often overlooked by managers. Effective managers, however continually seek data from other sources to identify and quantify implicit costs. Managers of large firms can use sources within the company, including the firm's finance, marketing, and/or legal departments to obtain data about the implicit costs of decisions. In other instances managers must collect data on their own. For example, what does it cost to you to read this book? The price you paid to the bookstore for this book is explicit (or accounting) cost, while the implicit cost is the value of what you are giving up by reading the book. You could be studying some other subjects or watching TV and each of these alternatives have some value to you. The "best" of these alternatives is the implicit cost of reading this book: you are giving up this alternative to read the book. Similarly, the opportunity cost of going to school is much higher than the cost of tuitions and books; it also includes the amount of money you would earn had you decided to work rather than go to school.

In the business world, the opportunity cost of opening a restaurant is the next best alternative use of the resources used to establish the restaurant—say, opening a hair styling saloon. Again these resources include not only the explicit financial resources needed to

open the business but any implicit cost as well.

Accounting profit = TR – (W+R+I+M)

where W = Wages and salaries

R = Rent

I = Interest

M = Cost of materials

If an entrepreneur uses his capital in his business, he forgoes interest which he might earn by purchasing debentures of other companies or depositing his money with joint stock companies for a period. Furthermore if an entrepreneur uses his labour in his own company he foregoes his income which he might earn by working as a manager in another firm. Similarly, by using productive assets in his own business, he sacrifices his market rent. The foregone incomes—interest, salary, and rent are called opportunity cost or transfer costs. Accounting profit does not take into account the opportunity cost.

It may be noted that the economic or pure profit makes provisions also for (a) insurable risk, (b) depreciation, and (c) necessary payment to shareholders to prevent them from withdrawing their capital. Pure profit may thus be defined as 'a residual left after all contractual costs have been met, including the transfer costs of management, insurable risks, depreciation and payments to shareholders sufficient to maintain investment at its current level. Thus, Pure profit = Total revenue – (explicit costs + implicit costs).

Pure profit so defined may not be necessarily positive for a single firm in a single year—it may be even negative, since it may not be possible to decide beforehand the best way of using the resources. Besides, in economics, pure profit is considered to be a short-term phenomenon—it does not exist in the long-run especially under perfectly competitive conditions.

8.4 THE PROFIT MAXIMIZATION PRINCIPLE

The profit maximization principle has been criticized on several grounds.

1. Divorce of Ownership from Control

The rise of corporate firm of organization has resulted in a separation of ownership and control. Ownership is vested with the shareholders and control is wielded by the managers. It has not been empirically proved that shareholders are more concerned with profitability than anything else. Profitability is not the only criterion by which shareholders appraise the performance of a company.

2. Difficulties in Pursuing Profit Maximization

The business environment is considerably more complex than what the neoclassical theorists thought of, when they propounded the profit maximization theory of the firm. 'The modern firm faces lot of uncertainties. As a result, short run profit maximizing behaviour is subordinated to the more important objective of long-run equilibrium of the firm. For example, the firm's objective to pursue 'good-will' in the long-run may clash with short-run profit objective. The structure of competition may be such that the firm may be concerned about market share and diversification of the enterprise rather than profit-maximization in the short-run.

3. Problems in the Measurement of Profit

There are some problems about the measurement of a profit as a measure of firm's efficiency. Profit may be the result of imperfections in the market and profits may be the reward of monopolistic exploitation. Worse still, profit measurement process itself is dubious. For instance, many business firms often present the business accounts in such a way as to show good profits on a particular day by the clever manipulation of the value of its assets.

4. Social Responsibility of the Firm

The firm is now-a-days not just an economic entity concerned with production or sales alone. The firm owes a responsibility to offer good, well-paid jobs for employees, to provide efficient services to customers. In short the firm has a social responsibility beyond profit maximization.

5. Deliberate Limitation of Profits

Firms may deliberately show lesser profits in the short-run in order to discourage labourers from asking for higher wages or to" discourage entry of new firms. Limited profits may be shown to prevent the government from taking over the business.

6. A Version for Business Expansion

Profit maximization requires business expansion and it means additional risk and responsibility. Businessmen may be satisfied with the present level of profits and may not expand.

Conclusion

There is no doubt that in a competitive world, the main measure of business efficiency is the profit made by a firm. In a very dynamic society, profitability is essential for the survival of the business. Several firms have disappeared due to inability to make profits. However, society's attitude towards profits is less indulgent. Many feel that profit is socially unacceptable and excess profits are even immoral. But this disenchantment of Western societies regarding the profit objective of the firm is in sharp contrast to the changing attitude of the communist countries which have come to accept that incentives provided by the profit motive have some role to play in the allocation of resources.

8.5 SATISFACTORY LEVEL OF PROFITS

Herbert A. Simon has presented the concept of satisfactory level of profits to be the major goal of firms as opposed to maximization of profits. In his view an entrepreneur "must expect the firm's goals to be not maximizing profits, but attaining a certain level or rate of profit, holding a certain share of the market or a certain level of sales. Firms would try to "satisfy" rather than maximize with reference to profits. However, this goal has been criticized for two reasons:

1. It is often difficult if not impossible to distinguish between satisfactory level of profits and maximum profits. Firms may be satisfied only when they earn the maximum profits. In that case, the implications of both the theories become the same;

2. Firms which have a satisfactory level of profits may be left behind by the profit maximizing firm in their struggle for survival. This results in all firms getting involved in a mad race for maximum profits.

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8.6 VALUE MAXIMIZATION

Most firms have sidelined short-term profit as their objective. Firms are often found to sacrifice their short-term profit for increasing the future long-term profit. Thus, the theory states that the objective of a firm is to maximize wealth or value of the firm. For example, firms undertake research and development expenditure, expenditure on new capital equipment or major marketing programmers which require expenditure initially but are meant to generate future profits. The objective of the firm is thus to maximize the present or discounted value of all future profits and can be stated as:

$$PV(\pi) = \frac{\pi_1}{(1+r)^1} + \frac{\pi_2}{(1+r)^2} + ... \frac{\pi_u}{(1+r)^2}$$

$$= \sum_{t=1}^{n} \frac{\pi_t}{(1+r)^2}$$

where, PV = Present value of all expected future profits of the firm.

$p, ..., p_n$ = Expected profit in 1, 2, ..., n years

r = Appropriate discount rate

t = Time period 1, ..., n.

Assumed profit is equal to total revenue (TR) minus total cost (TC), then the value of the firm can also be stated as:

$$\text{Value of the firm} = \sum_{t=1}^{n} \frac{TR_t - TC_t}{(1+r)^2}$$

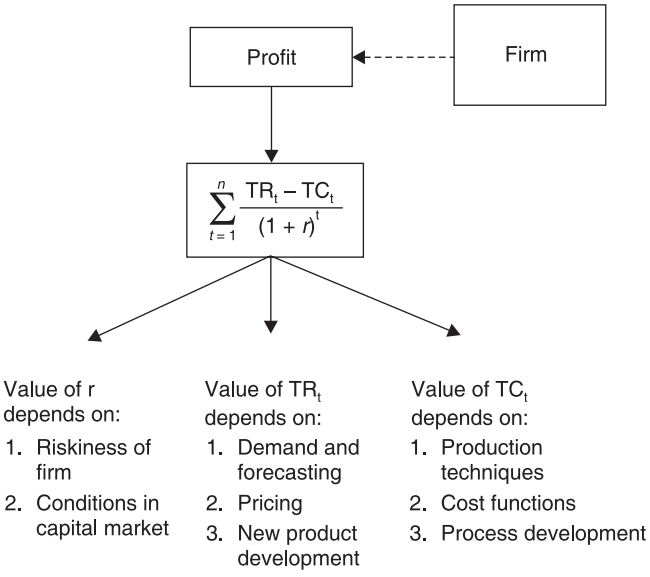

Fig. 8.6. Present value of all expected future profits.

Thus maximizing the discounted value of all future profits is equivalent to maximizing the value of the firm.

A careful inspection of the equation suggests how a firm's managers and workers can influence its value. For example, in a company, the marketing managers and sales representatives work hard to increase its total revenues, while its production managers and manufacturing engineers strive to reduce its total costs. At the same time, its financial managers play a major role in obtaining capital, and hence influence the equation, while its research and development personnel invent and reduce its total costs. All of these diverse groups affect the company's value, defined here as the present value of all expected future profits of the firm.

8.7 ALTERNATIVE OBJECTIVES OF FIRMS

Economists who do not accept profit maximization as the sole objective of the firm has suggested alternative goals. These may be classified into two types:

1. Explanations where something other than profit is maximized.

   These are known as optimizing models;

2. Explanation where non-maximizing behaviour is described.

   (Non-optimizing models). Sales Revenue maximization

   Approach given by Prof. J. Baumol belongs to the first category.

Sales Maximization

Economists have also examined other objectives of firms. We shall discuss some of them here. According to Baumol, most managers will try to maximize sales revenue. There are many reasons for this. For example, the salary and other earnings of managers are more closely related to sales revenue than to profits. Banks and financers look at sales revenue while financing the corporation. The sales revenue trend is a readily available indicator of performance of the firm.

Growth in sales increases the competitive strength of the firm. However, in the long-run, sales maximization and profit maximization may converge into one objective. Another economist Robin Marris assumes that owners and managers have different utility functions to maximize. The manager's utility function (Um) and Owner' utility functions (Uo) are:

$$U_m = f \text{ (Salary, job, power, prestige, status)}$$

$$U_o = f \text{ (Output, capital, profit, share)}$$

By maximizing the variables, managers maximize both their own utility function and that of the owners. Most of the variables of both managers and owners are correlated with a single variable, namely, the size of the firm. Maximization of these variables depends on the growth rate of the firm. Thus, Marris argues that managers will attempt to maximize growth rate of firms. However, this objective does not completely discard the profit maximization objective. According to Oliver Williamson, managers seek to maximize their own utility function subject to a minimum level of profit. The utility

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function which managers seek to maximize include both quantifiable variables like salary and slack earnings and non-quantifiable variables like power, status, security of job, etc. The model developed by Cyert-March focuses on satisfying behavior of managers. The firm has to deal with an uncertain business world and managers have to satisfy a variety of groups—staff, shareholders, customers, suppliers, authorities, etc. All these groups often have conflicting interests in the firm. In order to reconcile between the conflicting interests and goals, managers form an aspiration level of the firm combining the following objectives—production, sales and market share, inventory and profit. The aspiration levels are modified and revised on the basis of achievements and changing business environment. As is true with most economic models, the application will depend upon the situation and one cannot say that a particular model is better than the other. In general, one can assert that the profit maximizing assumption seems to be a reasonable approximation of the real world, although in certain cases there might be a deviation from this objective.

Firms prefer maximization of sales revenue for various reasons:

1. Financial institutions evaluate the success and strength of the firm in terms of rate of growth of its sales revenue.
2. Empirical evidence shows that the stock earnings and salaries of top management are correlated more closely with sales than with profits.
3. Increasing sales revenue over a period of time gives prestige to the top management, but profits are enjoyed only by the shareholders.
4. Growing sales means higher salaries and better terms. Hence sales revenue maximization results in a healthy personal policy.
5. It is seen that managers prefer a 'steady performance with satisfactory profits' than spectacular profit maximization. Because it is difficult for managers to present spectacular profits year after year. They will be criticized if spectacular profits decline. Hence, they may prefer a safe and steady performance with satisfactory profits but good sales.
6. Large and increasing sales help the firm to obtain a bigger market share which gives it a greater competitive power.

Baumol's sales maximization model is based on the following assumptions:

(i) Sales maximization goal is subject to a minimum profit. Prof. Baumol does not give a clear definition of minimum profit. It may be defined as "the funds to pay some satisfactory rate of dividends, to reinvest for growth and ensure financial safety.

(ii) Advertisement is a major instrument of 'sales maximization i.e., advertisement will shift the demand curve to the right.

(iii) Advertisement costs are independent of production costs.

(iv) Price of the product is assumed to be constant.

Sales maximization objective is explained in the following figure:

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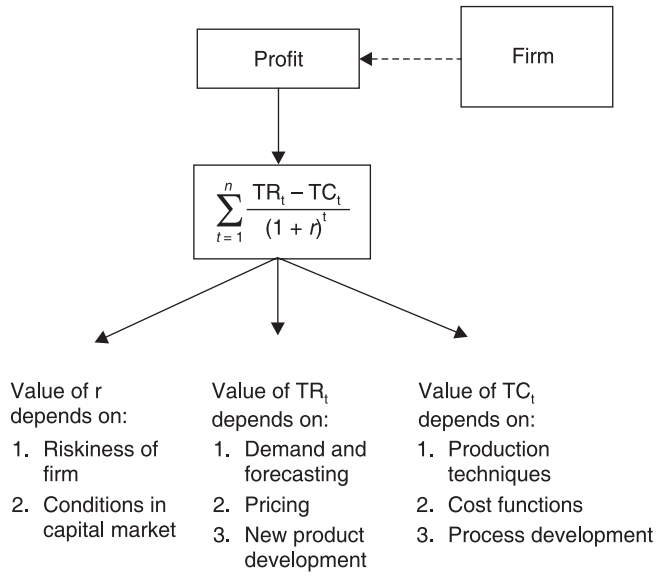

Fig. 8.7. Sales maximization.

Total Revenue, cost and profits are measured on Y axis and output on X axis. TR is the total revenue curve and TC is the total cost curve. TP shows the total profit curve which rises up to E and then starts declining. MP denotes Minimum Profit Line. If the firm's objective is to maximize profits it will produce OA output because at this level it gets the maximum profit EA. But the firm wants to achieve sales maximization. This can be done up to the point where its marginal revenue becomes zero. This is R2 on the total revenue curve. Hence OC is the sales maximization output which is larger than the profit maximization output of OA. But the total profits are only GC which is less than EA, the maximum profits possible. But the firm operates with a constraint that it must make a minimum profit of OM. The total profits earned by the firm are equal to minimum profit goal at D. Hence sales maximization firm will produce OB output.

Baumls explanation has more implications than the traditional profit maximization principle. His theory is more consistent with observed behaviour. In the traditional theory changes in fixed costs do not influence output or prices except for fixing the break-even point. But according to Baumol a firm which experiences any increase in fixed costs will try to reduce them or pass them on to the consumer in the form of higher prices, through large sales. This theory also establishes that businessmen may consider non-price competition through sales maximization to be the more advantageous alternative.

However, Baumol's theory does not explain how the firms maximize their sales volume within a profit constraint. Further it explains business behaviour, without elaborating the mechanisms by which they try to find new alternative.

8.8 ECONOMIC OBJECTIVES

Besides maximization of profits and sales, a firm may have certain other economic goals.

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1. Maximum Growth Rate

This is a dynamic objective for a firm which is consistent with profit constraint i.e., a firm can attain maximum rate of growth with optimal net profits. While tracing the growth process of a firm, Kenneth E. Bounding has traced the various stages in the life cycle of a firm. In the early stage, the main aim of a firm is to establish itself in new markets for which it may introduce new products. In the second stage, when it is well established it may focus its attention on the goal of improving internal efficiency to achieve high growth rates. Bounding points out that at a later stage "as the industry approaches maturity, the near-term potential becomes dimmed partly through saturation of demand and partly because of the very high costs of further market penetration at the expense of competition. At this point, major emphasis at the expense of competition is placed on long-term growth and flexibility". Finally in the long-run, the firm may face adverse conditions such as a falling demand for its products or rising prices for its inputs. As a result, if it incurs losses, it may continue for a short while but will eventually go out of business because the resources can find more profitable employment elsewhere.

2. Desire for Liquidity

Prof. Joel Dean considers the liquidity criterion to be more important than that of profit maximization. This refers to the desire of a firm to keep adequate amount of cash so that it can avoid a liquidity crisis. This is referred to as 'Banker Mentality' i.e., the fear of financial crisis and the fear of bankruptcy are very powerful factors in influencing the firm to keep adequate cash.

8.9 NON-ECONOMIC OBJECTIVES

1. Survival

Peter F. Ducker says that survival is the main goal of any firm. This is a long-term goal. Of course profitability is required for survival. But it need not be maximum profits but reasonable profits. It can survive only if it wins the goodwill of the people by producing goods and services of good quality. A good name earned would help the firm to enjoy a bigger share of the market and this will enable it in its aspirations of survival, over a long period. This may be considered as a conservative objective by some economists. Prof. K. Rothschild and Pellner supported this objective.

2. Building up Public Confidence for the Product

This is a secondary objective to the goal of survival. The primary aim of some firms may be to build up the customer confidence for its product and services. It may also adopt vigorous advertising techniques.

3. Welfare

The business firm has to keep welfare of different groups of people as its objective. First and foremost, the welfare of the workers has to be considered. They should be provided good working conditions, fair wages and other benefits to increase their involvement in the firm. Labour welfare goal is very important as it can improve labour efficiency and productivity.

Such labour welfare schemes may include subsidized canteen, medical care, schools and housing for the workers. The business firm depends upon the patronage of the society for its survival. Hence it owes some moral responsibility towards social welfare for which it may undertake charitable works like construction of hospitals, schools, etc.

4. Sound Business Practice

A firm may give more importance to business ethics. This will make it adopt only sound business practices like providing price lists, replacement or refund for defective products, which again will go a long way in building up the goodwill for the company.

5. Progressive Management

Progressive management is very essential for dynamic growth of the firm. Hence, as a part of this goal, the firm may implement suitable policies like worker's participation in management, workers training programmes etc.

An analysis of the different goals of the firm shows that the firms keep several goals before them, of which profit maximization may be the more important one. The short-run goals may be different from long-term objectives. Different firms prefer different objectives at different points of time. They may continue different economic and non-economic objectives within a framework of social responsibilities.

8.10 SOCIAL RESPONSIBILITIES OF A BUSINESS FIRM

The concept of social responsibility of a business firm is of recent origin. Traditional economic theory considered the business firm as an economic entity operating with the sole criterion of profit maximization. But profits have to be earned through sales which requires good public image. To the extent the business profits emerge from the society in which it operates, the firm owes a responsibility to the society. Kenneth Andrews defines social responsibility as "the intelligent and objective concern for the welfare of society that restrains individual and corporate behaviour from ultimately destructive activities no matter how immediately profitable." In short it must result in positive contribution to human betterment. This is also known as the philanthropic theory of the firm whereby it is expected to make efforts to share its profits with the society.

Business firms are expected to have social responsibility for three reasons. Firstly, business firms are able to operate only because of the support it enjoys from the society. Therefore, they are expected to be worthy of confidence reposed by the society. Secondly, a business corporation cannot operate in a vacuum. It cannot stand alone by disrupting the stability of the society. The firms must help in the attainment of certain social goals like sponsoring hospitals and technical institutes in the interest of its long-term survival and lasting growth. Thirdly, if the business firms show a greater social responsibility, the need for governmental controls and regulations will be minimal. Thus greater the social responsibility shown by a firm, greater will be the autonomy and economic freedom it would be permitted to enjoy. Prof. Milton Friedman does not give much credit to the concept of social responsibility but Prof. Paul Samuelson advocates a spirit of social responsibility as an inherent feature of a modern business firm. Operating in an anti-social way can be subjected to social regulation.

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Social responsibility of the firms may be viewed from the point of its impact on constituent elements of the social environment in which it operates viz., the employees, the consumers, the owners and the society.

As far as the employees are concerned they should be provided with a congenial work atmosphere and fair wages. It should keep a part of its profits for workers' training programmes and education. The firm should allocate funds generously for workers' welfare programmes like maintenance of crèches for working mothers, operation of canteens, provision of recreational facilities, etc. The culmination of social responsibility towards employees takes the shape of allowing them an opportunity to participate in management. Workers' participation in management can be called an internal aspect of social responsibility. Any attempt on the part of the firm to extend social responsibility to its employees will result in an increase in workers' efficiency and productivity and it is therefore in the interest of the firm to discharge this duty.

The firm owes a social responsibility to the consumers on whose patronage its very existence depends. Thus the firms should provide goods and services of the proper and standard quality. Any lapse on its part in this respect must be corrected by replacement of the article or refunding of money as far as possible. This alone will win over the confidence of the consumers. Similarly price policy should be fair enough to give normal profits. Any prosperity the firm enjoys should be" shared with the consumers either through lowering of prices or provision of incentives and discounts. Discharge of this social responsibility is an external function which will increase its goodwill and help in sales promotion and further profits.

The firm owes a social responsibility to the owners who have been enterprising enough to invest their savings to carry on the business activity. Hence the firm should be managed well to give a fair return on capital to the owners. Only then they would have the incentive for future investment and expansion policies of the firm. While this will naturally occur in sole proprietorship or partnership, it may be overlooked in a joint stock firm where shareholders interests may not be taken into account. Firms should share their prosperity with shareholders by giving them good dividends. Similarly as reserves increase, they should be automatically given bonus shares and rights equity. This will also help to generate more capital for the firm. Thus discharge of social responsibility to the shareholders ultimately turns out to be to the advantage of the firm itself.

Finally the firm is responsible to the society at large. The firm is expected to take anti-pollution measures. It can undertake financial sponsorship for the maintenance of parks, entertainment centre, hospitals, schools, etc. Firms are even found to sponsor by providing funds for research activities in science, industry and medicine which may not be possible by individuals on account of financial constraints. Though such external activities do not directly benefit the firm, it results in better public relations and hence is good for its long-term survival policy.

In the discharge of such social responsibility function, the firm will have to deal with three types of problems. The first set of problems is those social problems which are not created by the firm. They may be like poverty, drug abuse, urban disintegration, etc., yet the firm can try to solve them in any small way it can, for instance, new firms can decide to set up their new units in undeveloped regions instead of setting up in already congested

areas like Mumbai. Free medical camps to poor sections may be financially sponsored. The second set of problems are those which are caused by the routine business operations like control of pollution, safety measures in the industrial unit, production of safe goods, etc. The Bhopal gas tragedy is the result of gross negligence of a firm to undertake proper safety measures in maintenance. Similarly cigarette companies are required to give a statutory warning about the hazards of smoking on the covering on the packet. These are all aspects of social responsibility for problems for which the firm is responsible. The third set of problems is connected with regular economic activities within the firm; they may vary from providing equal employment opportunity to promotion, consideration for occupational health or improving the quality of life and work for its employees.

In India the Sachar Committee Report recognized that social responsibility of business must be given a serious consideration. It pointed out a few instances where private companies have shown a sense of social responsibility in problems of rural development and environmental protection or provision of basic amenities, etc. Several firms have now taken up the practice of adopting small villages in their area to provide basic amenities in health, education and housing for the poor in a phased manner. The Committee insisted that private business should give proper information to the shareholders, consumers and workers. Secrecy in corporate operations should be avoided. The Committee recommended that private enterprise in India must have public accountability as in the case of public enterprises.

The concept of social responsibility of firms is very important for poor, developing countries like India, where social problems are rampant. Yet social responsibility alone cannot be the overriding concern above economic criteria.

Milton Friedman feels that advocacy of social responsibility by firms is the green signal to pure socialism. Businessmen should discharge their duty of managing their business responsibilities and they cannot be expected to be trained for shouldering social responsibilities. Nevertheless the concept of social responsibility has emerged to be the pre-dominant non-economic objective to be pursued by firms along with other economic objectives of profit maximization.

8.11 GOALS OF REAL WORLD FIRMS

By now we know that firms that maximize profits are not just concerned about short-run profits, but are more concerned with long-term profits. They may not take full advantage of a potential monopolistic situation, for example, many stores have liberal return policies; many firms spend millions on improving their reputation and want to be known as 'good' citizens. The decision maker's income is often a cost of the firm. Most real-world production takes place in large corporations with 8–9 levels of management, thousands of stockholders and boards of directors. Self-interested decision makers have little incentive to hold down their pay. If their pay is not held down, a firm's profit will be lower. Most firms manage to put some pressure on managers to make at least a pre-designated level of profit. In the modern corporation, the owners or stakeholders (i.e., the principals) hire managers (i.e., agents) to conduct the day-to-day operations of the firm. These managers are paid a salary to represent the interest of the owners, ostensibly, to maximize the value of the firm. A board of directors is elected by the owners to

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meet regularly with the managers to oversee their activity and to try to ensure that the managers are, in fact, acting in the best interest of the owners. Because of the difficulty of monitoring the managers on a continual basis, it is possible that goals other than profit maximization may be pursued.

In addition to those mentioned earlier, the managers may seek to enhance their positions by spending corporate funds on fancy offices, excessive and expensive travel, club memberships, and so forth. In recent years, many corporations have taken action to align the interests of owners with the interests of the managers by tying a large share of managerial compensation to the financial performance of the firm. For example, the manager may be given a basic salary plus potentially large bonuses for meeting such goals as attaining a specified return on capital, growth in earnings, and/or increase in the price of the firm's stock. With regard to the latter, the use of stock options awarded to top managers is a most effective way to ensure that managers act in the interest of the shareholders. Typically, the arrangement provides that the manager is to receive an option to buy a specified number of shares of common stock at the current market price for a specified number of years. The only way the executives can benefit from such an arrangement is if the price of stock rises during the specified term. The option is exercised by buying the shares at the specified price, and the gain equals the increase in share price multiplied by the number of shares purchased. Sometimes the agreement specifies that the stock must be held for several years following purchase. Essentially, this option arrangement makes the manager a de facto owner, even if the option has not been exercised. In almost every case of a report of unusually high executive compensation, the largest part of that compensation is associated with gains from stock option. Emergence of oligopoly, a market structure characterized by the existence of a few large firms, mergers and amalgamations have made the structure of industries concentrated so that few large (dominant) firms account for a major portion of an industry's output. This shifts the pressure on each firm to maximise profit independently and leads to joint profit maximizations through cartels and collusions. Profit maximization may not be the only inevitable objective.

India's Global Companies and their Objectives: One of the most significant business and economic trends of the late twentieth century is the rise of 'global' or 'stateless' corporation. The trends toward global companies are unmistakable and are accelerating. The sharpest weapon that a corporation can develop to survive and thrive, in the globalized market place is competitiveness. Its cornerstone as articulated by strategy guru Michael Porter is its ability to create more value on a sustainable basis for the customer than its rivals can.

For the first time, many Indian corporations such as Reliance Industries, Ranbaxy, Sundaram Fasteners, Arvind Mills and Bajaj Auto among others are competing on the world stage. Whatever product or service a company offers, it must meet the customers wants in the most satisfactory manner. This should be the aim of the company. The competitiveness of Reliance in the global marketplace comes from both quality and scale. The challenge is to remain at the top. That challenge is linked with productivity. Ranbaxy's greatest strength lies in the fact that it is strongly backward integrated. It helps them manage cost across the entire value chain making them extremely cost competitive. Cost leadership is

a function of scale and technology. By upgrading technology, Ranbaxy could continue to be a cost leader. A company has to continuously upgrade itself on several parameters: production efficiency, product development, quality management and marketing skills. Sundaram has programmes to address all these parameters. This competitiveness—defined by Michael Porter as the sustained ability to generate more value for customers than the cost of creating that value—is what will keep India's companies alive in the bitter battle for survival that they are waging even on their home turf with rivals pouring in from all corners of the globe.

8.12 FIRM'S CONSTRAINTS

Decision-making by firms takes place under several restrictions or constraints, such as:

Resource Constraints: Many inputs may be available in a limited or fixed quantity e.g., skilled workers, imported raw material, etc.

Legal Constraints: Both individuals and firms have to obey the laws of the State as well as local laws. Environmental laws, employment laws, disposal of wastes are some examples.

Moral Constraints: These imply to actions that are not illegal but are sufficiently consistent with generally accepted standards of behaviour.

Contractual Constraints: These bind the firm because of some prior agreement such as a long-term lease on a building or a contract with a labour union that represents the firm's employees. Decision-making under these constraints with optimal results is a fundamental part of managerial economics.

8.13 BASIC FACTORS OF DECISION-MAKING

Managerial economics is a discipline, oriented towards business decision-making with full realization that knowledge of future is uncertain. Management must nevertheless make decisions daily; and they must formulate plans for the future. Experience has shown that the following five fundamental concepts viz. the incremental concept, the concept of time perspective, the discounting concept, and the opportunity cost concept and the equimarginal principle help to take correct decisions.

The Incremental Concept

Incremental reasoning involves estimating the impact of decision alternatives. The two basic concepts in the incremental analysis are: Incremental Cost (IC), and Incremental Revenue (IR). Incremental costs are the added costs of a change in the level or nature of activity.

Incremental cost is defined as the change in total cost as a result of change in the level of output, investment etc. They can refer to any kind of change: adding a new product, changing distribution channels, adding new machinery. Incremental costs are not the same as marginal costs. It simply measures the difference between the old and the new total costs. Marginal cost refers to the cost of an added unit of output. It is the per unit cost of the added units. Incremental costs are more flexible than the marginal costs because incremental costs refer to any kind of change while marginal costs are calculated for unit changes in output. Incremental cost appears to be more relevant in

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decision-making at the firm level. The incremental costs can be computed by employing the formula:

$$IC = C_2 - C_1 = \Delta C$$

where IC stands for incremental costs

C_2 indicates new total costs

C_1 indicates old total costs.

Similarly marginal costs may be computed by using the following formula:

$$MC = C_2 - C_1/Q_2 - Q_1 = \Delta C/\Delta Q = dC/dQ$$

where MC shows marginal cost

C_2 implies new total costs

C_1 denotes old total costs

Q_2 indicates new total output

And Q_1 represents old total output

Most business decisions require cost estimates that are essentially incremental in nature. Incremental cost though familiarly short-run are not necessarily variable. In many short-run problems, the most important incremental cost is the foregone opportunity of using strictly limited facilities in their present work rather than shifting them to a new activity.

Incremental revenue is defined as the change in total revenue resulting from a change in the level of output, prices etc. The formula for incremental revenue is

$$IR = R_2 - R_1 = \Delta R$$

where IR stands for incremental revenue

R_2 indicates new total revenue and

R_1 denotes old total revenue

"Δ"- delta means change in

Incremental revenue concept is akin to the marginal revenue concept of the economic theory. But there exists some difference between the incremental revenue and the marginal revenue. Marginal revenue means the addition made to the total revenue per unit of output change. It is derived by employing the following formula :

$$MR = R_2 - R_1/Q_2 - Q_1 = \Delta R/\Delta Q = dR/dQ$$

where MR shows marginal revenue

R_2 represents new total revenue

R_1 measures old total revenue

Q_2 stands for new quality of output sold

Q_1 indicates old quantity of output sold.

d or Δ indicate change in

R-Revenue

Q-Output

A manager always determines the worth of a decision on the basis of the criterion that IR > IC.

A decision is profitable if:

It increases revenue more than it increases cost

It reduces some costs more than it increases others

It increases some resources more than it decreases others

It decreases costs more than it decreases revenues.

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To illustrate the above points, let us take a case where a firm gets an order that can get it additional revenue of ₹ 2,000. The normal cost of production of this order is:

Labour	:	₹ 600
Materials	:	₹ 800
Overheads	:	₹ 720
Selling and administration expenses	:	₹ 280
Full cost	:	₹ 2,400

Comparing the additional revenue with the above cost suggests that the order is unprofitable. But, if some existing facilities and underutilized capacity of the firm were utilized, it would add much less to cost than 2,400. For example, let us assume that the addition to cost due to this new order is, say, the following:

Labour	:	₹ 400
Materials	:	₹ 800
Overheads	:	₹ 200
Total incremental cost	:	₹ 1,400

In the above case the firm would earn a net profit of ₹ 2000 – ₹ 1400 = 600, while at first it appeared that the firm would make a loss of ₹ 400 by accepting the order.

The worth of such a decision can be judged on the basis of the following theorem:

Theorem: A course of action should be pursued up to the point where its incremental benefits equal its increment costs. According to the theorem, the firm represented in Table 2.1 will produce only seven units of output as its Marginal Revenue (MR) = Marginal Cost (MC) at that level of output. As can be calculated from the table, the MC of the 8th unit is more than its MR. Hence the firm gets negative profit from the 8th unit and thus is advised not to produce it.

The acceptance or rejection of an order by a firm for its product depends on whether the resultant costs are greater or less than the resultant revenue. If these principles are not followed, the equilibrium position would be disturbed. But the problem with the concept of marginalize is that the independent variable may be subject to "bulk changes" instead of "unit changes". For example, a builder may not change one labourer at a time, but many of them together. Similarly, the output may change because of a change in process, pattern or a combination of factors, which may not always be measured in

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unit terms. In such cases, the concept of marginalize is changed to instrumentalism. Or, in other words, instrumentalism is more general, whereas marginalize is more specific. All marginal concepts are incremental concepts, but all incremental concepts need not be marginal concepts.

Table 8.1. Profits derived from units of output.

Units of Output	*Total Revenue*	*Total Cost*	*Total Profit*	*Average Profit*	*Marginal Profit*
1	***2***	***3***	***4***	***5***	***6***
1	20	15	5	5.0	—
2	40	29	11	5.5	6
3	60	42	18	6.0	7
4	80	52	28	7.0	10
5	100	65	35	7.0	7
6	120	81	39	6.5	4
7	140	101	39	5.6	0
8	160	125	35	4.4	– 4

Though incremental reasoning of managerial economics is closely related to the marginal reasoning of economic theory, yet there are differences between these two, both of which demand attention. Firstly, managerial costs and revenues are always defined in terms of unit changes in output whereas incremental costs and revenues are not necessarily restricted to unit changes. The marginal analysis enables one to have a microscopic examination of such unit by unit changes. But the decision-maker may not be interested in such a microscopic analysis of the situation.

Secondly, incremental concepts are more flexible than marginal concepts. Marginal costs and marginal revenues are restricted to the effects of unit changes in output.

8.14 THE EQUI-MARGINAL PRINCIPLE

According to this principle, different courses of action should be pursued up to the point where all the courses provide equal marginal benefit per unit of cost. It states that a rational decision-maker would allocate or hire his resources in such a way that the ratio of marginal returns and marginal costs of various uses of a given resource or of various resources in a given use is the same. For example, a consumer seeking maximum utility (satisfaction) from his consumption basket, will allocate his consumption budget on goods and services such that

$$MU_1/MC = MU_1/MC_1 = \ldots\ldots = MU_n / MC_n,$$

where MU_1 = Marginal utility from good one,

MC_1 = Marginal cost of good one and so on.

Similarly, a producer seeking maximum profit would use the technique of production (Input-mix.) Which would ensure?

$$MRP_1/MC_1 = MRP_1/MC_1 = \ldots\ldots\ldots\ldots = MRP_n/MC_n$$

where MRP_1 = Marginal revenue product of input one (e.g., Labour),

MC_1 = Marginal cost of input one and so on.

It is easy to see that if the above equation was not satisfied, the decision makers could add to his utility/profit by reshuffling his resources/input e.g., if $MU_1/MC_1 > MU_2/MC_1$ the consumer would add to his utility by buying more of good one and less of good two. Table 8.2 summarizes this principle for different sellers.

Example: A multi-commodity consumer wishes to purchase successive units of A, B and C. Each unit costs the same and the consumer is determined to have a combination including all the three items. His budget constraint is such that he cannot buy more than six units in all. Again, he is subject to diminishing marginal utility i.e., as he has more of an item, he wants to consume less of it. Table 8.3 shows the optimization example:

Table 8.2. The equi-marginal principle.

Unit	Equi-marginal Principle
Multi-market seller	$MR_1 = MR_2 = MR_3 = ... MR_n$
Multi-plant monopolist	$MC_1 = MC_2 = MC_3 = ... MC_n$
Multi-factor employer	$MP_1 = MP_2 = MP_3 = ... MP_n$
Multi-product firm	$Mp_1 = Mp_2 = Mp_3 = ... Mp_n$
Multi-commodity consumer	$MU_1 = MU_2 = MU_3 = ... MU$

MR = Marginal revenue, MC = Marginal cost, MP = Marginal product,

Mp = Marginal profit ; MU = Marginal utilities

Table 8.3. Marginal utilities.

Units	*Item A*	*Item B*	*Item C*
1	10	9	8
2	9	8	7
3	8	7	6
4	7	6	5
5	6	5	4
6	5	4	3

The utility maximizing consumer will end up with a purchase of 3A + 2B + 1C because that combination satisfies equi-marginalism:

$MUa = MUb = MUc = 8$

In the real world, often the equi-marginalism concept has to be replaced by equi-incrementalism.

This is because, changes in the real world are discrete or lumpy and therefore the concept of marginal change may not always apply. Instead, changes will be incremental in nature, but the decision rule or optimizing principle will remain the same.

8.15 THE DISCOUNTING PRINCIPLE

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This principle has its genesis in valuing the money received at different points of time.

Many transactions involve making or receiving cash payments at various future dates. A person who takes a house loan trades a promise to make monthly payments for say, fifteen or twenty years for a large amount of cash now to pay for a home. This case and other similar cases relate to the time value of money. The time value of money refers to the fact that a rupee to be received in the future is not worth a rupee today. Therefore, it is necessary to have techniques for measuring the value today (i.e., the present value) of rupees to be received or paid at different points in the future. This section outlines the approach to analyzing problems that involve payment and/or receipt of money at one or more points in time.

One may ask how much money today would be equivalent to ₹ 100 a year from now if the rate of interest is 5%. This involves determining the present value of ₹ 100 to be received after one year. Applying the formula:

$$PV_1 = \frac{100}{1.05}$$

We obtain ₹ 95.24,

₹ 95.24 will accumulate to an amount exactly equal to ₹ 100 in one year at the interest rate of 5 per cent. Looked at another way, you will be willing to pay maximum of ₹ 95.24 for the benefit of receiving ₹ 100 one year from now if the prevailing interest rate is 5 per cent. The same analysis can be extended to any number of periods. A sum of ₹ 100 two years from now is worth:

$$PV_2 = \frac{100}{1.05^2}$$

In general, the present value of a sum to be received at any future date can be found by the following formula:

$$PV = \frac{R_n}{(1+i)^n}$$

PV = present value, R_n = amount to be received in future, i = rate of interest, n = number of years lapsing between the receipt of R.

If the receipts are made available over a number of years, the formula becomes

$$PV = \frac{R_1}{1+i} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + ... + \frac{R_n}{(1+i)^n}$$

$$PV = \sum_{K=1}^{n} \frac{R_k}{(1+i)^k}$$

In the above formula if $R_1 = R_2 = R_3$ etc., it becomes an 'annuity'. An annuity has been defined as a series of periodic equal payments. Although the term is often thought of in terms of a retirement pension, there are many other examples of annuities. The repayment schedule for a home loan is an annuity. A father's agreement to send his son 1000 each month while he is in college is another example. Usually, the number of periods

is specified, but not always. Sometimes retirement benefits are paid monthly as long as a person is alive. In other case, the annuity is paid forever and is called 'perpetuity.'

It must be emphasized that the strict definition of an annuity implies equal payments. A contract to make 20 annual payments, which increase each year by, say, 10 per cent, would not be an annuity. As some financial arrangements provide for payments with periodic increase, care must be taken not to apply an annuity formula if the flow of payments is not a true annuity.

The present value of an annuity can be thought of as the sum of the present values of each of several amounts. Consider an annuity of three ₹ 100 payments at the end of each of the next three years at 10 per cent interest. The present value of each payment is:

$$PV_1 = 100\frac{1}{1.10}$$

$$PV_2 = 100\frac{1}{(1.10)^2}$$

$$PV_3 = 100\frac{1}{(1.10)^3}$$

and the sum of these would be

$$PV = 100\frac{1}{1.10} + 100\frac{1}{(1.10)^2} + 100\frac{1}{(1.10)^3}$$

$$PV = 100\left[\frac{1}{1.10} + \frac{1}{(1.10)^2} + \frac{1}{(1.10)^3}\right]$$

The present value of this annuity is:

$$PV = 100\ (0.9091 + 0.8264 + 0.7513) = 100\ (2.4868) = 248.68$$

Although this approach works, it clearly would be cumbersome for annuities of more than a few periods. For example, consider using this method to find the present value of a monthly payment for 40 years if the monthly interest rate is 1 per cent. That would require evaluating the present value of each of 480 amounts! In general, the formula for the present value of an annuity of A rupees per period for n periods and a discount rate of i is:

$$PV = A\frac{1}{(1+i)} + A\frac{1}{(1+i)^2} + ... + A\frac{1}{(1+i)^n}$$

The process of reducing future values to their present values is often referred to as discounting. In this context, the interest rate used in present value problem is sometimes referred to as a discount rate. This concept is highly useful in managerial economics in making investment decisions.

8.16 THE OPPORTUNITY COST PRINCIPLE

Fundamental to the managerial economics is the concept of opportunity cost. It is the cost of displaced alternatives. By the opportunity cost of a decision is meant the sacrifice

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of alternatives required by the decision. The opportunity cost of anything is the return that can be had from the next best alternative use. A farmer who is producing wheat can also produce sugar cane with the same factors. Therefore, the opportunity cost of a quintal of wheat is the amount of the output of sugar cane given up. The opportunity costs are the 'costs of sacrificed alternatives.'

Whenever the manager takes a decision he chooses one course of action, sacrificing the other alternative courses. We can therefore evaluate the one, which is chosen in terms of the other (next best) alternative that is sacrificed. A machine can produce either X or Y. The opportunity cost of producing a given quantity of X is the quantity of Y which it would have produced.

The opportunity cost of holding ₹ 1000 as cash in hand for one year is the 10% rate of interest, which would have been earned had it been invested in the form of fixed deposits in the bank.

All decisions which involve choice must involve opportunity cost calculation. The opportunity cost may be either real or monetary, either implicit or explicit, either non-quantifiable or quantifiable.

Opportunity costs' relevance is not limited to individual decisions. Opportunity costs are also relevant to government's decisions, which affect everyone in society. A common example is the guns-versus-butter debate. The resources that a society has are limited; therefore its decisions to use those resources to have more guns (more weapons) means that it must have less butter (fewer consumer goods). Thus when society decides to spend 100 crores on developing a defense system, the opportunity cost of that decision is 100 crores not spent on fighting drugs, helping the homeless, or paying off some of the national debt. For the country as a whole, the production possibility reflects opportunity costs. Fig. 8.8 shows the Production Possibility Curve (PPC) reflecting the different combinations of goods, which an economy can produce, given its state of technology and total resources. It illustrates the menu of choices open to the economy. Let us take the example that the economy can produce only two goods, butter and guns. The economy can produce only guns, only butter or a combination of the two, illustrating the trade-offs or choice inherent in such a decision. The opportunity cost of choosing guns over butter increases as the production of guns is increased. The reason is that some resources are relatively better suited to producing guns. The quantity of butter, which has to be sacrificed to produce an additional unit of guns, is called the opportunity cost of guns (in terms of butter). Due to the increasing opportunity cost of guns, the PPC curve will be concave to the origin. Increasing opportunity cost of guns means that to produce each additional unit of guns, more and more units of butter have to be sacrificed. The basis for increasing opportunity costs are the following assumptions:

(i) Some factors of production are more efficient in the production of butter and some more efficient in the production of guns. This property of factors is called specificity. Thus specificity of factors of production causes increasing opportunity costs.

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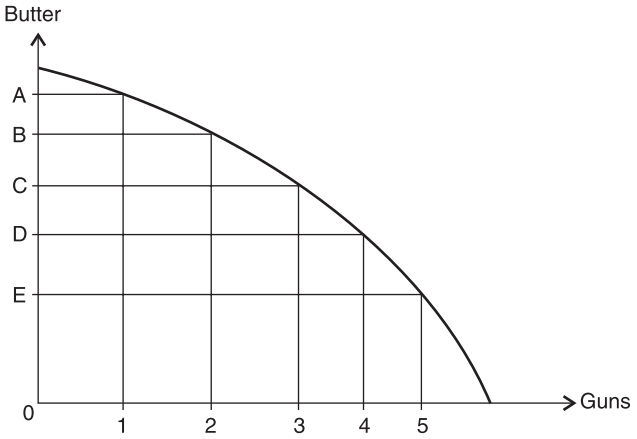

Fig. 8.8. The production possibility curve.

(ii) The production of the goods requires more of one factor than the other. For example, the production of guns may require more capital than that of butter. Hence, as more and more of capital is used in the manufacture of guns, the opportunity cost of guns is likely to increase.

Let us assume that an economy is at point A where it uses all its resources in the production of butter. Starting from A, the production of 1 unit of guns requires that AC units of butter be given up. The production of a second unit of guns requires that additional CD units of butter be given up. A third requires that DE be given up, and so on. Since DE > CD > AC, and so on, it means that for every additional unit of guns more and more units of butter will have to be sacrificed, or in other words, the opportunity cost keeps on increasing.

The opportunity cost of the first few units of guns would initially be low and those resources, which are more efficient in the production of guns move from, butter production to gun production. As more and more units of guns are produced, however, it becomes necessary to move into gun production, even for those factors, which are more efficient in the production of butter. As this happens, the opportunity cost of guns gets larger and larger. Thus, due to increasing opportunity costs the PPC is concave.

If the PPC curve were to be a straight line, the opportunity cost of guns would always be constant. This would mean equal and not increasing amounts of butter would have to be forgone to produce an additional unit of guns. The assumption of constant opportunity costs is very unrealistic. It implies that all the factors of production are equally efficient either in the production of butter or in the production of guns.

For many of the choices society makes opportunity costs tend to increase as we choose more and more of an item. Such a phenomenon about choice is so common that it has acquired a name: the principle of increasing marginal opportunity cost. This principle states that in order to get more of something, one must give up ever-increasing quantities of something else. In other words, initially the opportunity costs of an activity are low, but they increase the more we concentrate on that activity.

The concept of opportunity cost has a wide application in managerial economics. It is also applied in price determination, consumption and public expenditure.

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The concept of opportunity cost is subject to the following criticism:

- In many cases, a specific factor has no opportunity cost. For instance, a barren land has no attractive alternatives.
- Immobility of factors of production makes this concept a limited scope.
- The foregone alternatives cannot be quantatively measured. For example, a landlord does not know how much of rent he will be getting by cultivation of wheat instead of cotton. This concept is based on perfect competition which is not true in reality.

8.17 THE INVISIBLE HAND

Adam Smith, the father of modern economics believed that there existed an "invisible hand" which ruled over the economic system. According to him the economic system, left to itself, is self-regulating. The basic driving force in such a system is trying to enhance its own economic well-being. But the actions of each unit, acting according to its own self-interest, are also in the interests of the economy as a whole.

Producers are led by the profit motive to produce those goods and services which the consumers want. They try to do this at the minimum possible cost in order to maximize their profits. Moreover, if there is competition among a number of producers, they will each try to keep the price of their product low in order to attract the consumers. The goods produced are made available in the market by traders. They also act in their own self-interest. However, in a self-regulating economy, there is rarely any shortage of goods and services.

Decisions to save and invest are also taken by the individual economic units. For example, households save some of their income and deposit part of it in the banks, or invest it in shares and debentures and so on. The producers borrow from the banking system and also issue shares and debentures to finance their investments. In turn, they reinvest a part of their profits.

All the economic functions have been carried out by individuals acting in isolation. There is no government or centralized authority to determine who should produce what and in what quantity, and where it should be made available. Yet in a self-regulating economy there is seldom a shortage of goods and services. Practically everything you want to buy is available in the market. Thus according to Adam Smith, the economic system is guided by the "invisible hand". In a more technical way we can say that the basic economic problems in a society are solved by the operation of market forces.

Self-Assessment Questions

1. Write notes in about 200 words on the following:
   (a) The incremental concept.
   (b) Opportunity cost.
   (c) Scope of managerial economics.
   (d) The invisible hand.
2. 'Managerial economics serves as a link between traditional economics and decision sciences for business decision-making.' Elucidate.

3. Calculate, using the best estimates you can make:
   (a) Your opportunity cost of attending college.
   (b) Your opportunity cost of taking this course.
   (c) Your opportunity cost of attending yesterday's lecture of your course.
4. The following is the hypothetical production possibility table of India:

Resources Devoted to Clothing	*Output of Clothing*	*Output of Food*
100%	20	0
80%	16	5
60%	12	9
40%	8	12
20%	4	14
0%	0	15

   (a) Draw India's production possibility curve.
   (b) What is happening to marginal opportunity costs as output of food increases?
   (c) If the country gets better at the production of food, what will happen to the production possibility curve?
   (d) If the country gets equally better at producing food and producing clothing, what will happen to the production possibility curve?
5. Use the following interest rates for government bonds for the risk-free discount rate and answer the following:

Time of Maturity (years)	*Interest Rate (%)*
1	5.75
2	6.00
3	6.25
4	6.50
5	6.75

   (i) Calculate the PV of a ₹ 1 lakh payment to be received at the end of 1 year, 2 years, 3 years, 4 years and 5 years.
   (ii) What is the present value of a firm with a 5 years life span that earns the following stream of expected profit at the year-end?

Years	*Expected Profit (in Crores)*
1	10
2	20
3	50
4	25
5	50

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6. Value maximization has become the major objective of a modern firm. Comment.

7. (a) "Among the various objectives of a modern firm, profit animation is the most important" Comment.

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(b) Outline the circular flow of economic activity between individuals and firms.

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(c) (i) ..... profit is a cost of doing business and is the amount by which ..... exceeds ..... profit.

(ii) When a firm earns just a normal rate of return, ... equals total economic cost and ..... profit is zero.

(d) A firm collects ₹ 1.75 lakhs in revenue and spends ₹ 80 thousands on raw materials in a year. The owners of the firm have provided ₹ 5 lakhs of their own money to the firm instead of investing the money and earning a high rate of interest.

(i) The firm earns economic profit of ..... . The firms normal profit is ..... .

(ii) The firm's accounting profit is ..... .

(iii) If the firm's costs stay the same but its revenue falls to ..... only a normal profit is earned.

CHAPTER 9 PRICE AND OUTPUT RELATIONSHIP UNDER DIFFERENT MARKET STRUCTURES

NOTES

✣ STRUCTURE ✣

8 .1 INTRODUCTION

By structure of any complex body we mean the pattern of form or manner in which the constituent parts of that body are arranged together. Taking the market as a complex 'body', we have to examine how its different constituents, i.e., sellers and buyers are linked together. This we can specify in terms of the organizational characteristics which determine the relations: (a) of sellers in the market to each other; (b) of buyers in the market to each other; (c) of sellers to the buyers, and (d) of sellers established in the market to the new potential firms which might enter the market. In the words of Bain, this means those characteristics of the organization of a market that seems to exercise a strategic influence on the nature of competition and pricing within the market. The following four main features of the market structure have been suggested by Bain, which are important to understand the concept precisely and to measure it.

(i) *The Degree of Sellers Concentration*: This is the number and size distribution of firms producing a particular commodity or types of commodities in the market.

(ii) The Degree of Buyers Concentration: This is shows the number and size distribution of buyers for the commodities in the market.

(iii) *The Degree of Product Differentiation*: This shows the difference in the products of different from in the market.

(iv) *The Condition of Entry to the Market*: This shows the relative case with which new firms can join the category of sellers (i.e., firms) in the market.

Each of these four different dimensions of features of the market structure will be important in determining the behaviour of the firms which in turn will be affecting their performance as well as the performance of the industry as a whole. We already know how

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the number of sellers is a crucial variable determining the structure of the industry in the theory of the firm. If there is only one firm then we get the form of monopoly market; if there are two, then duopoly; if few then oligopoly and finally if there are 'many' then we encounter with the atomistic market. In each case, the process of output and price determination will be different. Similarly, how differential goods and the large number of sellers generate the conditions for monopolistic competition is another example showing the importance of the market-structure. Rooking at the absolute sizes of the sellers as another feature of the market structure, there will be interesting problems to find how the large one will be more efficient than the smaller one or vice versa; and when we take into account the size distribution of the sellers in the market, we will have to find whether the concentrated industries are more efficient than the others. Similarly, the buyers' concentration in the market will have considerable imports on the actions of the sellers and their performance. Product diversification and the entry conditions in the market play their own roles in the real life situation which we will be studying in details later on.

Apart from the aspect of the market structure mentioned above, there will be other characteristics coexisting side by side. They relate to the psychological, technological, geographical, or institutional factors present in the market and conditioning the behaviour and performance of the firms. All such characteristics and the one listed above together constitute a set of the economically significant features of a market which affect the behaviour of firms ... supplying that market."

Market structure is a multidimensional concept. So it is not possible to measure it through a single variable. In practice, a set of variable related to different aspects of it are used simultaneously to measure the market structure.

9.2 PRICE-OUTPUT DETERMINATION IN PERFECT COMPETITION

(i) Monopoly

(a) Features of Monopoly

(i) There is a single producer or seller of the product.

(ii) There are no close constitutes for the product. If there is a substitute, then the monopoly power is lost.

(iii) No freedom to enter as there exists strong barriers to entry.

(iv) The monopolist may use his monopolistic power in any manner to get maximum revenue. He may also adopt price discrimination.

(b) Causes of Monopoly

There can be several factors that lead to monopoly:

(a) *Government policies and legal provisions:* These can by an acting legislation, often create and maintain monopoly. The Indian Railways has absolute monopoly as the Government of India has restricted others from entering the rail transport business. Patents, intellectual property rights, trademarks and so on, will enhance the monopoly power for a specific period.

(b) *Mergers and acquisitions:* These enable the business organisations to emerge stronger with higher market share. The Standard Chartered Bank acquired the ANZ Grindiays Bank and emerged much stronger and bigger, leading to enlargement of economies of scale, cost advantages and elimination of competition from Grindlays.

(c) *Research and Development (R&D):* These and latest technology enable firm to replace its old products with superior ones. Helwlett & Packard emerged stronger after the development of laser printers, fast replaced dot matrix printers.

(d) *Control over key inputs*: Control of key inputs, such as raw materials, skilled labour, technology and financial resources also leads to monopoly.

(c) Price-output Determination under Monopoly

The aim of the monopolist is to maximise profits. Therefore, he will produce that level of output and charge a price which gives him the maximum profits. He will be in equilibrium at that price and output at which his profits arc maximum. In order words, he will be in equilibrium position at that level of output at which marginal revenue equals marginal cost. The monopolist, to be in equilibrium should satisfy two conditions:

(i) Marginal cost should be equal to marginal revenue and

(ii) The marginal cost curve should cut marginal revenue curve from below:

The short run equilibrium of the monopolist is shown in figure 9.1.

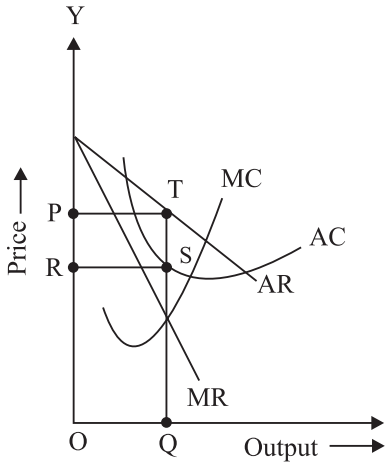

Fig. 9.1

AR is the average revenue curve, MR is the marginal revenue curve, AC is the average cost curve and MC is the marginal cost curve. Upto OQ level of output marginal revenue is greater than marginal cost but beyond OQ the marginal revenue is less than marginal cost. Therefore, the monopolist will be in equilibrium where MC = MR. Thus a monopolist is in equilibrium at OQ level of output and at OP price. He earns abnormal profit equal to PRST.

But it is not always possible for a monopolist to earn super-normal profits. If the demand and cost situations are not favourable, the monopolist may realist short run losses,

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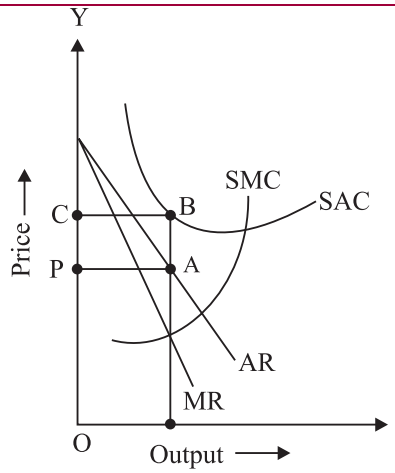

Fig. 9.2

Though the monopolist is a price maker, due to weak demand and high costs, he suffers a loss equal to PABC.

(d) Long Run Equilibrium

In the long run the firm has the time to adjust his plant size or to use the existing plant so as to maximise profit. The long run equilibrium of the monopolist is shown m Figure 9.3.

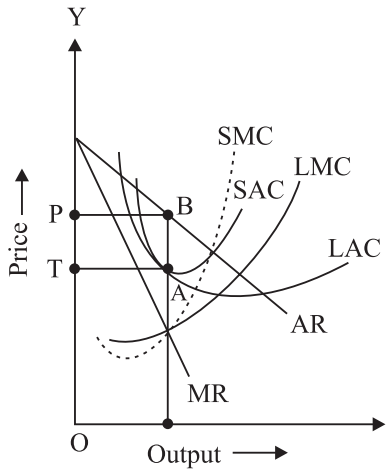

Fig. 9.3

The monopolist is in equilibrium at OL output where LMC on MK curve. He will charge OP price and earn an abnormal profit equal to TPQL.

In order to show the difference between the short run equilibrium and long run equilibrium under monopoly, both can be shown in a single figure 9.4.

The monopolist is in the short run equilibrium at E producing OS level of output. In the long run he can change the plant and will be in equilibrium at F where MR curve cuts LMC curve. The monopolist has increased his output from OS to OL and price has fallen from OP to OJ. Profits have also increased in the long run from TPQR to GHKJ.

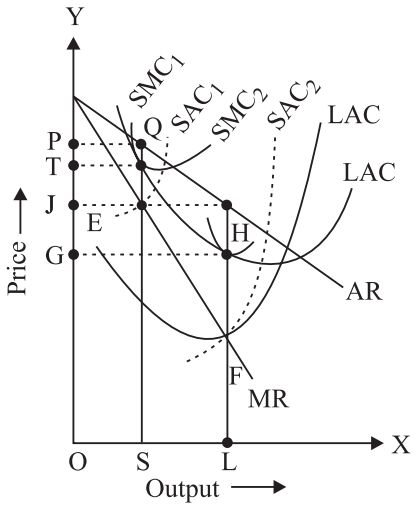

Fig. 9.4

(e) Discriminating Monopoly

Price discrimination refers to the practice of selling the same product at different prices to different buyers. Mrs. Robinson defines it as "charging different price for the same product or same price for differentiated product". Prof. Stigler defines price discrimination as "the scale of technically similar products at prices which are not proportional to marginal costs".

Price discrimination may be divided into three types-personal, local and according to use. Price discrimination is personal when a seller charges different prices for different persons. For example, hair out for children and adult. Price discrimination is local when the seller charges different prices for people of different localities. For instance, a seller may charge one price at domestic market and another price in international market. Discrimination is according to use when the same commodity is put to different uses. For example, electricity is usually sold at a cheaper rate for industrial uses than for domestic purposes.

Degrees of Price Discrimination

Prof. A.C. Pigou has distinguished between three degrees of price discrimination.

1. Price discrimination of the first degree.
2. Price discrimination of the second degree.
3. Price discrimination of the third degree.

Price discrimination of the first degree

It is also known as perfect price discrimination. Price discrimination of the first degree is said to occur when the monopolist is able to sell each separate unit of the output at a different price. In other words, it involves maximum possible exploitation of each buyer. Price discrimination of the first degree is depicted in Figure 9.5.

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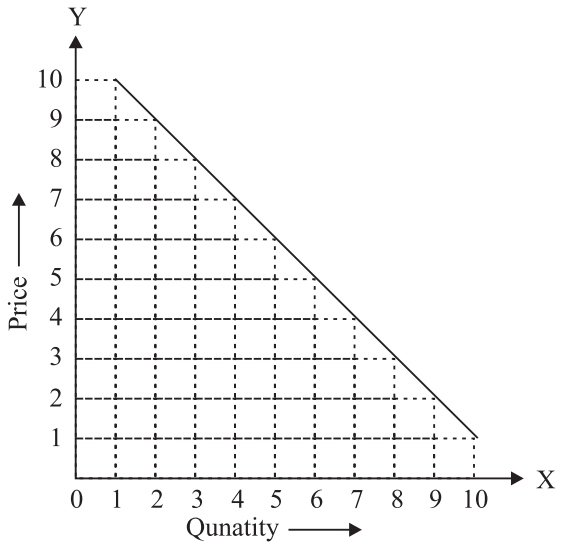

Fig. 9.5

At price Rs. 10 the buyer will purchase one unit of the good; at price Rs. 9 the buyer would purchase 2 units of the good; at price of Rs. 8 he would purchase 3 units of the good; at price of Rs. 7 he would take 4 units of the good and so on. Under simple monopoly, if the seller fixes the price at Rs. 7 the buyer buys 4 units then the would pay Rs. 28 as the price for 4 units. By doing so, he gets a consumer surplus of Rs. 6. This is to because, the buyer is willing in pay Rs. 10 for the first unit. Rs. 9 for the second, Rs. 8 for the third and Rs. 7 for the fourth. In all he is willing to pay Rs. 34. He actually pays only Rs. 28. But under rice discrimination of the first degree the monopolist charges Rs. 34. As a result the buyer has no consumers surplus

Price discrimination of the second degree

In price discrimination of the second decree buyers are divided into different groups and from each group a different price is charged which is the lowest demand price of that group. This is shown in Figure 9.6.

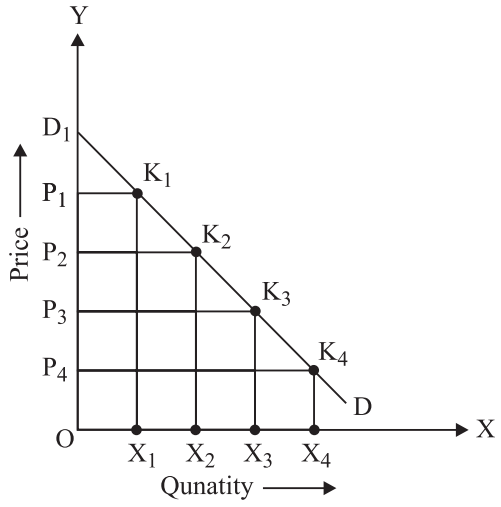

Fig. 9.6

Market is divided into four groups. DD is the market demand curve. In the first group X units of output will be sold at a price of OP_1. All the buyers in this group pay OP_1 price and the group gets DK_1 P_1 as consumers surplus. Similarly for other groups, consumers pay OP_2, OP_3, OP_4 and get the consumer's surplus equal to DK_2 P_2. DK_4 P_4 and DK_4 P_4 respectively.

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Prie Discrimination of the third degree

It occurs when the seller divides his buyers into two or more than two sub-markets or groups and charges a different price in each sub-marker. The price charged in the sub-market need not be the I fewest demand price of that sub-market.

Possibility of Price Discrimination

Price discrimination is possible in the following cases:

(i) The nature of the commodity, should he such as to enable the monopolist to charge different prices. This is possible only when there is no possibility of transference of the commodity from one market to the other. For example, doctors charge different fees for the rich and for the poor for same service.

(ii) When the markets are separated by long distance or tariff, then price discrimination is possible. If the transportation cost is higher than the price difference between the two markets, one monopolist can charge different prices. For example, a commodity may be sold at Rs. 10 in Delhi and Rs. 20 in Madras. If the transportation cost between Delhi and Madras is greater than Rs. 10 it is not profitable for the consumers to transport the commodity from Delhi to Madras on their own. Similarly when domestic market is protected by tariff, the monopolist can sell the product at a lower price in the foreign market and at a higher price in the domestic market.

(iii) In certain cases, the firms have a legal sanction of price discrimination. For example, electricity board charges a lower price for industrial purposes and a higher price for domestic purposes. Similarly, transportation companies charge different fares for different classes of passengers.

(iv) Price discrimination is possible due to preferences or prejudices of the consumers. Different prices are charged for different varieties although they differ only in label or name. Upper class people may prefer to buy in fashionable quarters to buy in a congested, ugly and cheaper locality.

(v) Price discrimination may become possible due to ignorance and laziness of buyers. If a seller is discriminating between two markets but the buyers are ignorant that the seller is filing the product at a lower price in another market, price discrimination is possible. Price discrimination is also possible if the buyers are aware that the seller is selling the , product at lower price in another market but due to laziness may nor go for shopping in the cheaper market.

(vi) When a monopolist is able to meet different needs for his customers it is possible for him to follow price discrimination. For example, railways charge different rates for carrying coal, cotton, silk and fruit even though the service rendered is the same for all.

(vii) A monopolist can easily charge discriminating prices when goods are being supplied to special orders. In such a case, there is no question of comparing prices by the buyers.

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It is obvious that price discrimination can be practised only under imperfect competition. It is not at all possible when there is perfect competition. Under perfect competition, the seller has to take the market price as given, Therefore, there is no scope for price discrimination. The possibility of price discrimination under perfect competition exists only if all sellers arc combined together. But as soon as they combine, perfect competition ceases to exist. Price discrimination can occur under conditions of imperfect or monopolistic competition. Larger the market imperfection, greater is the possibility of price discrimination. When there is monopoly, the market imperfection is maximum and the possibility of price discrimination is also maximum. Since, in case of a monopoly there arc no other sellers selling the same product or its substitutes, the monopolist is in a position to charge different prices from different parts of the market.

Conditions for profitable Price Discrimination

The monopolist may be able to charge discriminating prices hut it need not necessarily be profitable for him. It is only when the elasticity of demand in one market is different from the elasticity of demand in the other market that the monopolist will find the policy of price discrimination profitable. The monopolist will find it profitable to charge more in the market where elasticity is low and lower price where it is high. Mrs. Robinson says, 'The sub-markets will be arranged order in ascending order of their elasticities, the highest price being charged in the least elastic market, and the lower price in the most classic market.

Same elasticity of demand in two markets

If the elasticity of demand is same in two markets, the marginal revenues in two markets at every price of the product will also be the same and it will not be profitable for the monopolist to discrimination between the two markets. This is illustrate in Figure 9.7.

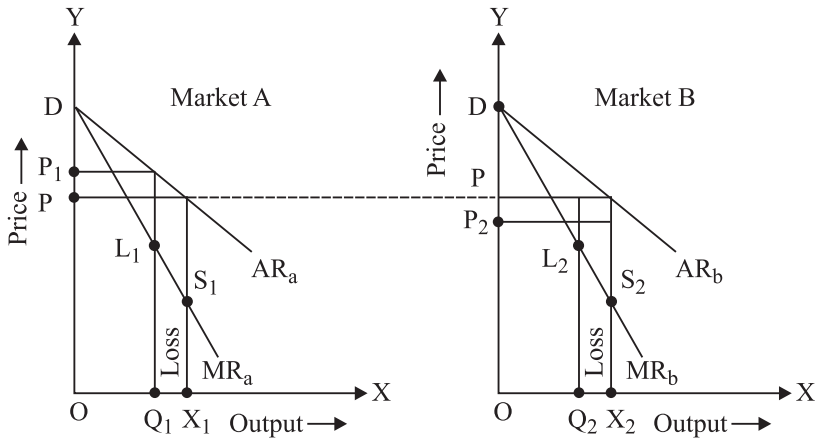

Fig. 9.7

AR_a and AH_a are the iso-elastic demand curves of the markets A and B. A thrice OP marginal revenue in the two markets is the same. If the monopolist transfers a given amount from one market to another and thereby charge different prices, it would not be profitable for the monopolist. Suppose, he reduces his sale sin market. A from OX to OQ_1 and transfer it to market B, where the scales go up from OQ_2 to OX_2. As a result of reduced sales in market A, the monopolist losses Q_1 X_1 S_1 L_1 while he gains Q_2 X_2

L_2 S_2 in market B by increasing his sales. Since the loss is greater than the gain, it is not profitable for the monopolist to discriminate prices between the two markets having the same elasticity of demand.

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Elasticity of demand differs in two markets

If the monopolist wants to maximum profits, he must discriminate prices if the elasticities of demand in the two markets at the given monopoly prices are different. This is shown in Figure 9.8.

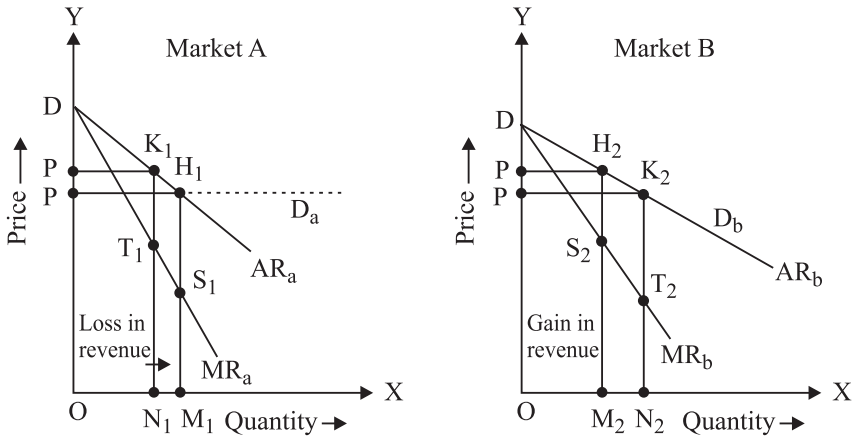

Fig. 9.8

The monopolist reduces the output in market B and transfers is to market A. When he increases his sales in market A from OX to OQ_1, he gains X_1 Q_1 L_1 S_1 and when he reduces it in market B his sales go down from OQ_2 to OX_2, he loses X_2 Q_2 L_2 S_2. Snce the gain is more than the loss it is profitable for the monopolist to follow price discrimination.

(f) Price-Output determination under discriminating monopoly

The graphical representation of price-output determination under conditions of discriminating monopoly can be shown with the help of a figure 9.9.

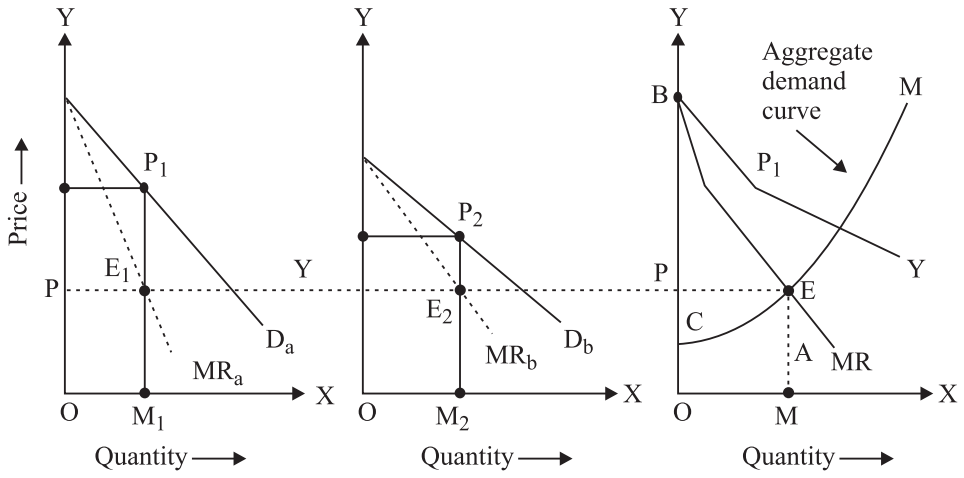

Fig. 9.9 Sub-market

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There are two markets A and B with different price elasticities. The price elasticity in market B is lower than that in market A. The total marginal revenue arising from the two markets is arrived at by horizontal summition of the marginal revenue curves for the two sub-markets. D_2 is the demand curve and MR_2 is the marginal revenue curve in market A. Similarly, MRb is the marginal revenue curve in market B corresponding to the demand curve D_2. AMK is the aggregate marginal revenue curve, which has been derived by adding MR_a and MR_b. MC is the marginal cost curve of the monopolist.

The discriminating monopolist will maximum its profits by producing that level of output at which MC intersects AMR. Thus he will be producing OM level of out put. This total output will be distributed in such a way that marginal revenues in two markets are equal and at the same time it would be equal to the marginal cost. Since marginal cost is ME, the total output OM has to be distributed in such a way that the marginal revenue in tw markets should be equal to the marginal cost. Hence OM_1 amount can be sold in market A at M_1P_1 price and OM_2 can be sold in market B at demand is more elastic. Thus, a profit maximising monopolist charges different prices and supplies different quantities in the sub-markets having different price elasticities.

9.3 PRICE-OUTPUT DETERMINATION IN IMPERFECT COMPETITION

Monopolistic Competition

Perfect competition and monopoly are rarely found in the real world. Therefore, professor Edward II, Chamberlain of Harvard University brought about a synthesis of the two theories and put forth. Theory of Monopolistic Competition" in 1933. Monopolistic competition is more realistic than either pure competition or monopoly. It is a blending of competition and monopoly. “There is competition which is keen though not perfect, between many firms making very similar products.” Thus monopolistic competition refers to competition among a large number of sellers producing close but not perfect substitutes.

(a) Features of Monopolistic competition

(i) **Large number of sellers:** In monopolistic competition the number of sellers is large. No one controls a major portion of the total output. Hence each firm has a very limited control over the price of the product. Each firm decides its own price-output policy without considering the reactions of rival firms. Thus there is no interdependence between firms and each seller pursues an independent course of action.

(ii) **Product differentiation:** One of the most important features of monopolistic competition is product differentiation. Product differentiation implies that products are different in some ways from each other. They are heterogeneous rather than homogeneous. There is slight difference between one product and others in the same category. Products arc close substitutes but not perfect substitutes. Product differentiation may be due to differences in the quality of the product. Product may be differentiated in order to suit the tastes and preferences of the consumers. The products are differentiated on the basis of materials used, workmanship, durability, size, shape, design, colour, fragrance, packing, etc. Products are differentiated in order to promote sales by influencing

the demand for the products. This can be achieved through propaganda and advertisement. Advertisement brings a psychological reaction in the minds of the buyers and thus influences the demand. In addition, location of the shop, its general appearance, counter service, credit and other facilities increase sales.

Patent rights and trade marks, also promote product differentiation, Kodak and Cocoa Cola are the examples of patent rights. Trade marks like Hamam, Rexona, Lux, etc. help the consumers to differentiate one product over others.

(iii) **Free entry and exit of firms:** Another feature of monopolistic competition is the freedom of entry and exit of firms. Firms under monopolistic competition are small in size and they are capable of producing close substitutes. Hence they are free to enter or leave the industry in the long run. Product differentiation increases entry of new firms in the group because each firm produces a different product from the others,

(iv) **Selling cost:** It is an important feature of monopolistic competition. As there is keen competition among the firms, they advertise-their products in order to attract the customers and sell more. Thus selling cost ha's a bearing on price determination under monopolistic competition.

(v) **Group equilibrium:** Chamberlin introduced the concept of group in the place of industry. Industry refers to a number of firms producing homogeneous products. But, firms under monopolistic competition produce similar but not identical products. Therefore, chamberlin uses, the concept of group to include firms producing goods which are close substitutes.

(vi) **Nature of demand curve:** Under monopolistic competition, a single firm can control! only a small portion of the total output. Though there is product differentiation, as products are close substitutes, a reduction in price leads to increase in sales and vice-versa. But it will have little effect on the price-output conditions of other firms. Hence each will loose only few customers, clue to an increase in price. Similarly a reduction in price will increase sales. Therefore the demand curve of a firm under monopolistic competition slopes downwards to the right. It is highly elastic but not perfectly elastic. In other words, under monopolistic competition, the demand curve faced by the firm is highly elastic. It means that it has some control over price due to product differentiation and their arc price differentials between the firms.

(b) Price-output Determination under Monopolistic Competition

Since, under monopolistic competition, different firms produce different varieties of products, prices will be determined on the basis of demand and cost conditions. The firms aim at profit maximisation by making adjustments in price and output, product adjustment and adjustment of selling costs.

Equilibrium of a firm under monopolist competition is based on the following assumptions:

(i) The number of sellers in large and they set independently of each other

(ii) The product is differentiated.

(iii) The firm has a demand curve which is elastic.

(iv) The supply of factor services is perfectly elastic.

(v) The short run cost curves of each firm differ from each other.

(vi) No new firms enter the industry.

(c) Individual Equilibrium and Price Variation

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Based on these assumptions, each firm fixes such price and output which maximises its profit. Product is held constant. The only variable is price. The equilibrium price and output is determined at a point where the short run minimal cost equals marginal revenue. The equilibrium of a firm under monopolistic competition is shown in figure.

DD is the demand curve of the firm. It is also the average revenue curve of the firm. MC is the marginal cost of the firm. The firm will maximise profits by equating marginal cost with marginal revenue. The firm maximises its profit by producing OM level of output and selling it at a price of OP. The profit earned by the firm is PQRS. Thus in the short run, a firm under monopolistic competition earns supernormal profits.

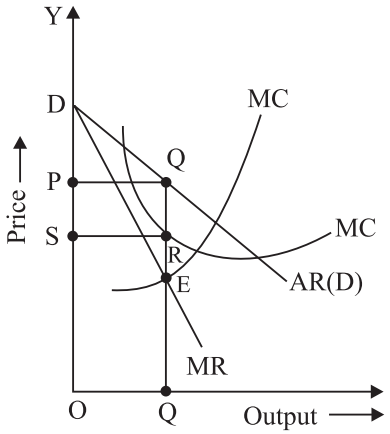

Fig. 9.10

In the short run, the firm may incur losses also. This is shown in Figure 9.11.

The firm is in equilibrium by producing an output of OQ. It fixes the price at OP. As price is less than cost, it incurs losses equal to pabc. Thus a firm in equilibrium under monopolistic competition may be making supernormal profits or losses depending upon the position of the demand curve and average cost curve.

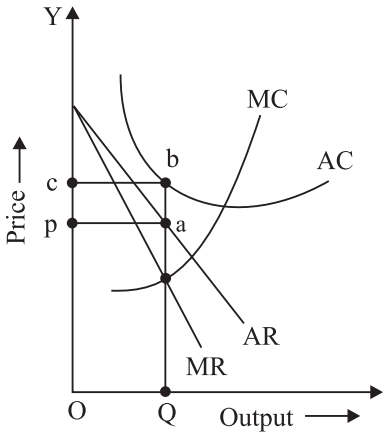

Fig. 9.11

(d) Group Equilibrium and Price Variation

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Group equilibrium refers to price-output determination in a number of firms whose products are close substitutes. The product of each firm has special characteristics. The difference in the quality of the products of the firms under monopolistic competition results in large variation in elasticity and position of the demand curves of the various firms. Similarly the shape and position of cost curves too differ. As A result there exists differences in prices, output and profits of the various firms in the group. For the sake of simplicity in the analysis of group equilibrium, Chamberlin ignores these differences by adopting 'uniformity assumption'. He assumes that the cost and demand curves of all the products in the group are uniform, Chamberlin introduces another assumption known as 'symmetry assumption'. It means that the number of firms under monopolistic competition is large and hence the action of an individual firm regarding price and output will have a negligible effect upon his rivals.

Based on these assumptions, short run equilibrium of a firm under monopolistic competition can be shown in Figure 9.12.

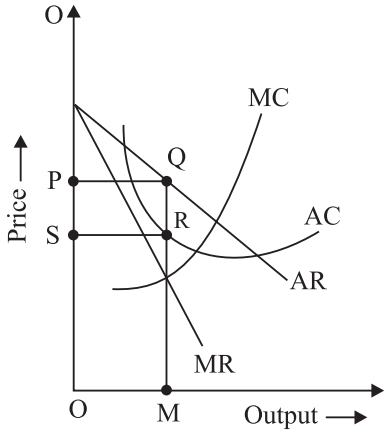

Fig. 9.12

Figure 9.12 represents short run equilibrium and figure 9.14 the long run equilibrium. In the short run, the price is Ol and average cost is only MR. Hence there is supernormal profit equal to PQRS. But in the long run, as shown in figure 9.14 the excess profit is competed away. MC = MR at OM_1 level of output. LAB is tangent to LAC. Price is equal to average cost and there is no extra profit. Only normal profit is earn.

9.4 OLIGOPOLY

Oligopoly is a situation in which few large firms concepts against each other and there is an element of interdependence in the decision making of these firms. A policy change on the part of one firm will have immediate effects on competitors, who react with with their counter policies.

(a) Features of Oligopoly

Following are the features of oligopoly which distinguish it from other market structures:

(i) **Small number of large sellers:** The number of sellers dealing in a homogeneous

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or differentiated product is small. The policy of one seller will have a noticeable impact on market, mainly on price and output.

(ii) **Interdependence:** Unlike perfect competition and monopoly, the oligopolist Is not independent to take decisions. The oligopolist has to take into account the actions and reactions of his rivals while deciding his price and output policies. As the products of the oligopolist arc close substitutes, the cross elasticity of demand is very high.

(iii) **Price rigidity:** Any change in price by one oligopolist invites retaliation and counteraction from others, the oligopolist normally sticks to one price. If an oligopolist reduces his price, his rivals will also do so and therefore, it is not advantageous for the oligopolist to reduce the price. On the other hand, if an oligopolist tries to raise the price, others will not do so. As a result they capture the customers of this firm. Hence the oligopolist would never try to either reduce or raise the price. This results in price rigidity.

(iv) **Monopoly element:** As products are differentiated the firms enjoy some monopoly power. Further, when firms conclude with each other, they can work together to raise the price and earn some monopoly income.

(v) **Advertising:** The only way open to the oligopolists to raise his sales is either by advertising or improving the quality of the product. Advertisement expenditure is used as an effective tool to shift the demand in favour of the product. Quality improvement will also shift the demand favourably. Usually, both advertisement as well as variations in designs and quality are used simultaneously to maintain and increase the market share of an oligopolist.

(vi) **Group behaviour:** The firms under oligopoly recognise their interdependence and realise the importance of mutual cooperation. Therefore, there is a tendency among them for collusion. Collusion as well as competition prevail in the oligopolistic market leading to uncertainty and indeterminateness.

(vij) **Indeterminate demand curve:** It is not possible for an oligopolist to forecast the nature and position of the demand curve with certainty. The firm cannot estimate the sales when it decides to reduce the price. Hence the demand curve under oligopoly is indeterminate.

(b) Typas of Oligopoly

Oligopoly may be classified in the following ways:

(i) **Perfect and imperfect oligopoly:** On the basis of the nature of product, oligopoly may be classified into perfect (pure) and imperfect (differentiated) oligopoly. If the products are homogeneous, then oligopoly is called as perfect or pure oligopoly. If the products are differentiated and are close substitutes, then it is called as imperfect or differentiated oligopoly.

(ii) **Open or closed oligopoly:** On the basis of possibility of entry of new firms, oligopoly may be classified into open or closed oligopoly. When new firms are free to enter, it is open oligopoly. When few firms dominate the market and new firms do not have a free entry into the industry, it is called closed oligopoly.

(iii) **Partial and full oligopoly:** Partial oligopoly refers to a situation where one firm acts as the leader and others follow it. On the other hand, full oligopoly exists where no firm is dominating as the price leader.

(iv) **Collusive and non-collusive oligopoly:** Instead of competiting with each other, if the firms follow a common price policy, it is called collusive oligopoly. If the collusion is in the form of an agreement, it is called open collusion. If it is an understanding between the firms, then it is a secret collusion. On the other hand, if there is no agreement or understanding between oligopoly firms, it is known as non-collusive oligopoly,

(v) **Syndicated and organised oligopoly:** Syndicated oligopoly is one in which the firms sell their products through a centralised syndicate. Organised oligopoly refers to the situation where the firms organise themselves into a central association for fixing prices, output, quota, etc.

(c) Kinked Demand Theory

Prices in many oligopolistic industries appear to have exhibited a remarkable degree of stability particularly in their resistance to change in the downward direction. An explanation of this is provided by the "kinked" demand curve. The demand curve faced by an oligopolistic industry is said to have a kink at the prevailing price because of the asymmetric behaviour of firms in response to variants in prices by the rival firms. Its proponents relieve that competitors follow price decreases but they do not follow price increase by their rival firms. This is because, if the price is reduced by a firm, its competitors will feel the drain on their customers quickly and so they will be forced to match this price cut. Consequently, the firm which first lowered the price may not be able to increase its sales appreciably. On the other hand, if a firm raised its price, other oligopolists may not raise their price because they will happier now than before as they tend to attract more customers. Thus, the firm which raises the price will experience significant cut in its sales. For these reasons, the demand curve of an oligopolist is actually a composite of two demand curves, one is valid for price increases and the other for price decreases. It should be obvious that the former will be more price elastic than the later. This is illustrated in figure 11.13.

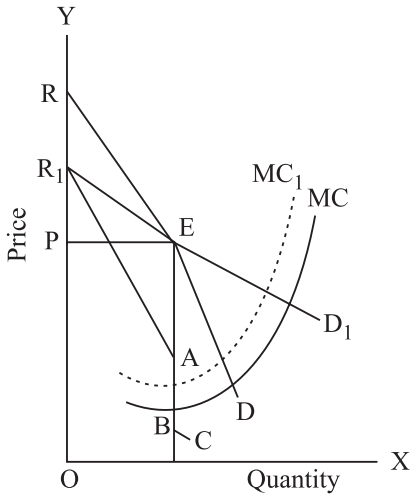

Fig. 11.13

In Figure 11.17, OP is the current, price, R_1D_1 is the demand curve for price increases and RD is that for price decreases. The true demand curve facing the oligopolist is R_1 ED, which has a kink at the current price OP.

(d) Pricing under Oligopoly

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A special and increasingly important case of imperfect competition is that of oligopoly. It is characterized by a few sellers of a commodity in which the factions of any individual sellers have a perceptible influence upon his rivals. The product of rival firms could be both homogeneous or heterogeneous. If the product is standardized, the market is called homogeneous oligopoly and, if differentiated, heterogeneous oligopoly. A special type of oligopoly is duopoly, which has only two sellers.

Interdependence in the decision making of the various sellers is the main feature of tan oligopoly market. Any change in price on the part of one firm may set off a chain of reactions among other firms. Thus, the decision maker must consider the potential reactions before changing his price. The reactions of rival firms arc difficult to guess,for a very "wide variety of behaviour patterns is possible. Rivals may decide to get together and cooperate in the pursuit of their objectives to the extent permitted by law, or at the other extreme, they may try to fight each other to elbow out their rivals. As a result, price is indeterminate under oligopoly unless some assumption is made about the behaviour of rivals. Several models have been developed on different assumptions to explain pricing in such a market. These include the Cournot model. Collusion model, Market-share model, and the Leader-follower model.

Augustin Cournot provided a solution to the oligopoly problem by assuming that each oligopolist maximizes his profit on the assumption that quantity produced by his rival is invariant with respect to his own quantity decision. The Collusion solution postulates that the oligopolists recognize their mutual interdependence and agree to act in unison in order to maximize the total profit of the industry. The decision making is centralized and every oligopolist surrenders his autonomy of making decisions affecting prices and output, and accepts the policies laid down by the centralized authority, The centralized authority. which is called a "cartel", sets the price and output so as to maximize the total profit of the industry. Where cartels are illegal, the price can be determined through a tacit agreement either or the basis of a given share of each oligopolist in the total market or through recognition of one firm as the "leader" and all other firms as its "followers" in pricing decisions. In either case, price is determined under oligopoly.

In the absence of any such understanding among rival firms, there will be "price wars" in oligopolistic markets. In price wars each competitor shades his price below that of the other and consequently some times the oligopoly price falls even below average variable cost. Oligopolists are aware of such undesirable events and so price wars are becoming less and less frequent over time. Managers have learned, some through bitter experience, that price wars do not pay and are very costly and so they either enter into an understanding among themselves of some sort to their common advantage or do not choose to compete in price. In the latter case, competition among rivals takes the form of product variation or advertising, In the automobile industry, for example, competition is in terms of style and new models producer each year. In the cigarette ami tooth paste industries, competition is mainly in the form of introducing new brands and advertising.

(iv) Duopoly and Oligopoly

When there are two monopolists who share the monopoly power then it is called duopoly. It may be of two types—duopoly without product differentiation and duopoly with product differentiation.

Under duopoly without product differentiation, there are two monopolists selling an identical commodity. There is no product differentiation. There is also a possibility for collusion. They may agree on price or divide the market for goods. Suppose, if there is no agreement between the two, a constant price war will emerge. In this case they will earn only normal profits. If their costs are different, the one with lower costs will squeeze out the other and a simple monopoly would result. The best course for these for the duopolists will be to fix the monopoly price and share the market and profits, in the short run, duopoly price may be lower than in the competitive price.

When there is product differentiation, each producer will have his own customers. There is no danger of price war. There is no agreement. Since products are differentiated the firm with better product will earn supernormal profits.

SUMMARY

- Oligopoly is a situation in which few large firms concepts against each other and there is an element of interdependence in the decision making of these firms.
- When there are two monopolists who share the monopoly power then it is called duopoly.

Review Questions

1. Explain features of market structure.
2. What is predatory pricing?
3. What are the features of monopoly?
4. Explain price discrimination.
5. What are the features of monopoly?
6. What are the features of monopolistic competition?
7. Define oligopoly. What are the features of oligopoly?

CHAPTER 10 PRICING

NOTES

✣ STRUCTURE ✣

- ☆ Pricing Concept
- ☆ Determination of Price
- ☆ Objectives of Pricing
- ☆ Pricing Methods-In Practice
- ☆ Pricing Under Different Market Structure

10.1 PRICING CONCEPT

Determination of prices is an important managerial function in all enterprises. Price affects profit through its effect both on total revenue and total cost. The total revenue or sale proceeds equals price per unit multiplied by the quantity sold. As seen in earlier chapters, the quantity sold varies with variations in the price, and the total cost as well as the average cost depend on the volume of output. Thus, pricing plays as an important role in profit planning. Every management attempts to find that combination of price, volume and cost which will be most advantageous to it. If the price is set too high, the seller may not find enough consumers to buy his product. If the price is too low, the seller may not be able to cover his costs. Thus, setting the appropriate price is important for every enterprise. Furthermore, since what is a good price today need not be a good price tomorrow, the pricing decision needs to be reviewed and reformulated from time to time.

10.2 DETERMINANTS OF PRICE

Since the time of Marshall, it is well known that the price of a product or service is determined by the demand for it and its supply. Both demand and supply are as important in price determination as the blades of a pair of scissors in cutting cloth. The greater the demand and/or smaller the supply, the greater will be the price and vice versa. As explained in the earlier chapters, behind the demand for a commodity lies its utility to the consumers, and supply is governed by the cost of production and the objective of the Firm. Competition from rival sellers would affect the demand facing an individual firm. Ifiliere is no competitor, all demand will flow to the monopoly firm, in the presence of competitors, the market demand will be divided among the competitors. Competition may also affect the cost of production through its effects on factor prices. The greater the competition in buying various factors of production, the higher would be the factor prices, and vice versa. The government exercises its influence on the rice through taxes and subsidies, and direct price controls. Direct price controls take the form of fixation of maximum or minimum price for all output and fixation of the price either for all output (price freeze) or for a part of the output (dual pricing). Thus, in theory, there are five

basic determinants of the price of a commodity:

(a) the demand for it,

(b) its cost of production,

(c) objective of its producers,

(d) nature of the competition in its market (market structure), and

(e) government policy pertaining to it.

To illustrate the role of each of these factors, examples are provided in which each of all these factors but one is constant and the remaining ones arc variable. In this section, price determination is explained with and without taxes or subsidies.

Let the demand facing a firm for its product be expressed by the following:

$$Q = 25 - 0.5\ P \qquad ...(10.1)$$

(Q = quantity demanded, P = price)

and the supply of this firm, which is obtained from its cost function and its objective as explained be given by the following:

$$Q = 10 + 1.0\ P \qquad ...(10.2)$$

(Q = quantity supplied, P = price) . . :

In the absence of any influence from the government, the price for this commodity will be obtained by equating demand and supply:

$$25 - 0.5\ P = 10 + 1.0\ P$$

i.e., $P = 10$

and $Q\_ = 20$

If the government imposes a specific sales tax at the rate of, say, Rs. 3 per unit, the new supply function would be

$$Q = 10 + 1.0\ (P - 3) \qquad ...(10.3)$$

This is because the seller would charge a price P from the buyers, but from that he would pay Rs. 3 per unit to the government as tax on his sales. The new equilibrium price and quantity would be determined by equating demand of equations with the new supply equation

$$25 - 0.5\ P = 10 + 1.0(P - 3)$$

i.e., $P = 12$

Substituting P = 12 in equations, we get Q = 19. The new price is higher than the old price and the new quantity is lower than the old quantity. Thus, specific taxes tend to raise the price and reduce quantity. Subsidy is a negative tax and its influence on the price could be analyzed in a similar way. The role of direct price controls in pricing will be discussed later in the chapter.

Average Pay Load

Average pay load refers to the average number of passengers carried per vehicle per trip.

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Earnings Per Bus Mile (EPBM)

Earnings per bus mile is the ratio of total traffice revenue obtained to total bus miles operated.

Load Factor (or Occupation Ratio)

Load factor is often used to compare the actual operational performance with the maximum potential performance and is usually expressed in percentage. It is presented generally on rate and passenger basis. Load factor on rate basis indicates the relationship between actual traffic income obtained and maximum traffic income that could be realised with the same operation or operations. Load factor on passenger basis refers to the percentage of total number of actual passengers carried to the maximum passenger carrying capacity.

10.3 OBJECTIVES OF PRICING

The first and foremost objective of pricing policy is of course profit maximisation. (Analysis given in chapter 11) However, empirical studies have established certain other objectives besides profit maximisation,

(a) Price Stabilisation

Big firms which have earned adequate return over time, prefer to keep their prices stable inspite of some changes in costs or demand. This may be partly because of the fear of upsetting the market and partly because of the fear of damaging the goodwill of the firm. Firms find it difficult to justify frequently changes in prices. Such price changes have harmful effect on forward planning of turnover, stock, investment and finance. It thus harms the future growth of organisation. Therefore, usually when the demand is good, output is increased and prices tend to remain the same. So also, if the demand slackens, sales efforts are stepped up or output is curtailed, price does not change. Thus firms tend to consider only long run trends of costs and productivity in their price policies. They ignore short term changes in costs and demand. Thus any fluctuations in wage rates, prices of raw material etc. are borne by profits and not prices. By keeping prices stable, the firm will be able to keep up its reputation and thus earn stable and sure rate of return.

(b) Maintenance of market share

Firms always try to maintain if not increase their market share. This requires a proper assessment of the prevailing competitive conditions in the market for pricing the product. Reputed firms would like to have the maximum share of the market. In order to have the prestige of larger share of market, the firm may sacrifice the present level of profits. They may retain a considerable proportion of profit for future development and distribute the balance among the shareholders.

(c) Target return on capital

Firms have to pursue their pricing policy in order to earn a particular rate of return on their capital. This is necessary to follow a prudent policy of profit-capital-investment planning as well as capital budgeting, during war time, several companies in the west adopted a cost plus fixed fee method and contractual agreements with the government.

NOTES

Target rate of return on capital is a good policy for new product as there are no rivals. In such cases the usual practice is to have skimming of the market, by exploiting the inelasticity of demand in different markets by maintaining a definite price as long as potential competition permits it. Sometimes firms follow a price penetration policy to capture the market with a low price and.

(d) Prevention of competition

Firms as are not able to cut prices in a competitive business environment. Hence pricing policy' has managerial discretion when there is some degree of imperfection. Pricing the depends upon market share psychology. Firms try to match their prices to equal the price of the products of their competitors to expand the volume of their business. Most of the firms do this not only to face competition but to prevent it. On the other hand if a firm enjoys some monopoly power, it may try to fix prices to prevent the entry of potential competitors. This may mean lower profits in the short can but helps to maintain monopoly power of the firm.

(e) Ethical pricing policy

Ethical consideration also are a major objective of the firm. Modern firms are not just interested in maximum profits only. They want to maintain good relations' with employees, suppliers, creditors, public and government. Firms are often expected to follow price regulations by the government in carrying out socio-economic programmes. The prices are not fixed with a view to only exploit the consumers.

(f) Good returns for product-line

Multi-product firms have to fix the price of each product independently as well as along with the rest of the products in the product-line. Multi-product firm has some common costs. Further demand elasticities and competitive conditions differ for each product. The firm will have to consider not only the specific conditions faced by each product but also the complementary role of the product in a product-line to finalise optimum set of prices. This firms are found to fix a price which gives maximum profits on the entire range of product instead of a high profit on one product and a very low profit on the rest of the product.

(g) Liquidity

Some firms face the problem of liquidity. They would prefer to keep prices at a level which would ensure rapid cash recovery. Thus they may be willing to charge lower prices for customers who make prompt payment for the product. The other customers who seek two or three months to make final payment will have to settle for higher prices.

From the point of view of the objectives for pricing, the managers of firms may be classified into risk averters and risk lovers. The risk averters are managers who recommend safe pricing policies rather than aim at maximum profits which involves a lot of risk. Risk loving managers are those who would follow any price policy, however unorthodox it may be, in order to maximise profits.

To conclude, no firm can have a single goal of pricing. There are other objectives of pricing like steady working of plants, promotion of new products, etc. Firms often combine two or more goals. Thus some firms try to prevent competition rather than

maintaining their position. Sonic firms may be interested in getting a fair return instead of stabilising prices. There are some firms which try to meet competition as well as maintain their share in the market. On the whole it can be concluded that pricing policy differs from firm to firm. Each firm has an order of priorities and the choose objectives from among several alternatives according to conditions that warrant them.

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10.4 PRICING METHODS-IN PRACTICE

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(d) Prevention of competition

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10.5 PRICING UNDER DIFFERENT MARKET STRUCTURE

The determination of price is affected by the competitive structure of the market. This is because the firm operates in a market and not in isolation. In making decisions concerning economic variables, it is affected, as are all institutions in society, by its environment.

The phrase "competitive structure", as briefly explained in Chapter 2, refers to the nature and extent of the monopolistic elements, if any, that arc present in any particular market structure. The economists' classification of markets on this basis is illustrated below:

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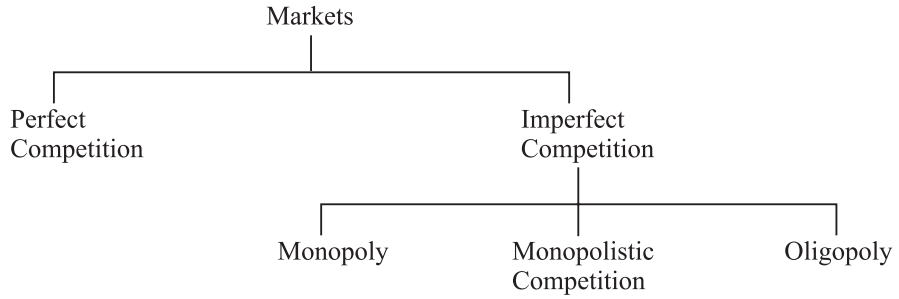

Fig. 10.1 Classification of Market

Examples of each such market has been given in Chapter 2. In what follows, the salient features and the pattern of price determination in each of these markets will be explained.

Pricing under Perfect Competition

A perfectly competitive market is characterized by the following features:

(i) *A large number of buyers and sellers.* The number of buyers and sellers is large and the share of each one of them in the market is so small that none has any influence on the market price.

(ii) *Homogeneous product.* The product of each seller is totally undifferentiated from those of the others,

(iii) *Free entry and exist.* Any buyer and seller is free to enter or leave the market of the commodity.

(iv) *Perfect knowledge.* All buyers and sellers have perfect knowledge about the market for the commodity.

(v) *Indifference.* No buyer has a preference to buy from a particular seller and no seller to sell to a particular buyer.

Under such a market, no single buyer or seller plays a significant role in price determination. However, all of them jointly determine the price. The price is determined in the industry, which is composed of all the buyers and sellers for the commodity. The demand curve facing the industry is the sum of all consumers' demands at various prices. The industry supply curve is the sum of all sellers' supplies at various prices. The equations of the industry's demand and supply curves are similar to the above equations (1) and (2) respectively, and the price is determined by equating demand and supply as before.

Both the individual firm and the individual consumer treat the price as given. The demand curve facing an individual firm is horizontal—perfectly elastic. This follows from the first feature of the perfectly competitive market-the relative insignificance of each firm and customer so that none of them can affect the price noticeably. A single wheat producer or consumer can do nothing about its price. If a producer raises the price of his wheat above the going price, he will be unable to sell anything. Similarly, he would gain nothing by cutting his price below the market price, for at the prevailing price be can sell any amount he produces. Thus, an individual firm has no price decision to make-the price figure is simply handed to it.

Different firms have different cost functions depending upon the factors of production utilized by them. Firms having more efficient input factors would have lower costs for each output level than the other firms having less efficient factors of production. Since the price is given and demand is no constraint to an individual seller, it cost function and objective would determine its equilibrium output. If the industry demand and supply functions were (1) and (2), the price would be 10. In order to explain the equilibrium of a firm under perfect competition, let the cost function of the firm be

$$C = 25 - 2O + 4Q_1^2 \quad ...(3)$$

If the firm aims at maximum profit, it would maximize the following function with respect to input:

$$\pi_1 = R_1 - C_1$$
$$= PQ_1 - (25 - 2Q_1 + 4Q_1^2)$$
$$= 10Q_1 - 25 + 2Q_1 + 4Q_1^2 \quad \text{(since P = 10)}$$

i.e. $$\pi_1 = -25 + 12Q_1 - 4Q_1^2 \quad ...(4)$$

For π_1 to be maximum with respect to Q_1, the first derivative of function (4 – 10) must be zero, and the second derivative must be negative:

$$\frac{d\pi_1}{dQ_1} = 12 - 8\ Q_1 = 0$$

or, $$Q_1 = 1.5$$

$$\frac{d\pi_1^2}{d_2Q_1} = -8, \text{ which is negative.}$$

Thus, the equilibrium output of firm 1 is 1.5. It can be verified that the necessary condition for profit maximization, i.e., the first derivative of the profit function be zero is the same as the condition that the marginal revenue (MR) be equal to the marginal cost (MC). Since under perfect competition, the price is a parameter to an individual firm and so P = MR, this condition is tantamount to P = MC. The sufficient condition that the second derivative of the profit function be negative, in terms of geometry, means that the MC curve must intersect the MR curve from below.

The price determination and equilibrium of the firm under perfect competition is illustrated in Figure 10.2.

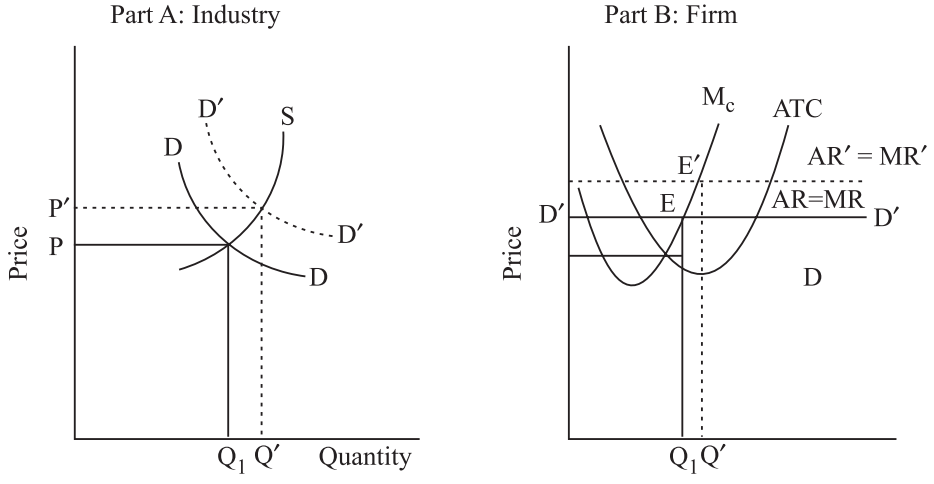

Fig. 10.2 Pricing under Perfect Competition

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The firm's demand curve is horizontal at the price determined in the industry by the intersection of the demand and supply curves. The demand curve is also the firm's average revenue curve. This is because if all units of a commodity are sold at the same price, the revenue brought in by an average unit must be its price. Also, we know that where the average revenue is neither rising nor falling, it will coincide with the corresponding marginal curve. Thus, D_1 D_1 is the AR curve and also the MR curve. Thus, ATC and MC are the firm's average total cost and marginal cost curves, respectively. The firm reaches its equilibrium at point E, when P = MC and the MC curve intersects the MR curve from below. The firm's equilibrium output is OQ_1^2 .

It may be noted that the firm under discussion makes profits equal to the area of rectangle D_1EFG. In the short-run, a firm can make profit, loss, or just break-even depending upon its cost function and market conditions. However, in the long-run no firm makes profit or loss under perfect competition. This follows from the feature of free entry and exit which characterize a perfectly competitive market.

A change in the market demand function or/and in the market supply function would cause a change in the market price, industry output, and the output levels of various firms in the industry. For example, if the market demand curve were D' D' instead of DD, the market price would be OP', industry output OQ' and the firm's output OQ'

Pricing under Imperfect Competition

(i) Monopoly

The monopoly market for a commodity is characterized by the following features:

(a) *Single seller*: There is only one seller of the commodity.

(b) *No close substitutes*: There are no close substitutes for the monopolist's product and the seller faces no imminent threat of competition.

Under such a market, the firm and the industry coincide by definition. The demand function facing a monopolist is the same as that facing the industry. Thus, a monopolist's demand curve would be falling, A monopolist, like a perfectly competitive firm, would be expected to have U-shaped average and marginal cost curves. The situation would be as shown in Figure 10.2.

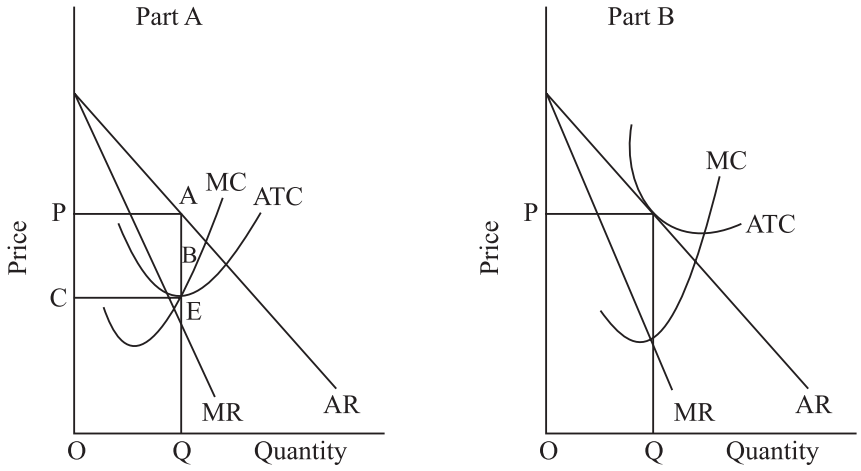

Fig. 10.3 Pricing under Monopoly

The equilibrium of a profit maximizing monopolist will be at the point where MR = MC and the MC curve cuts the MR curve from below. In Figure 10.3, Part A, E is the equilibrium point, OP is the equilibrium price and OQ is the equilibrium output. The firm makes profit represented by the area of rectangle PABC.

A monopolist could make profit both in the short and long-run. He could also end up with zero profit and could even incur loss in the short-run. However, he must cover all variable costs and so his loss cannot exceed his total fixed cost. The monopolist will break-even if the ATC curve is tangent to the R curve at the point of equilibrium. This is illustrated in Figure 10.3.

In general, the monopolist will produce less than the optimum output, i.e., output at which the ATC is minimum. The optimum output is the socially desirable level of output and hence we find government policies restricting monopoly practices. Furthermore, the monopolist's price is generally higher than his ATC and the difference between these two measures the extent of the monopoly power; the larger the difference, the greater is the monopoly power and vice versa.

It should be noted that a monopolist firm can determine either its price or its output but not both, for the remaining variable is determined by the demand function on which the firm has no control. This is different from the position of a competitive firm which has no control on its price and can determine its output only.

It is not necessary to take a numerical example to illustrate prices under monopoly. Suffice it to say that given the demand function facing a monopolist and his cost function, the equilibrium price and output will be determined in exactly the same way as explained earlier in this chapter.

(ii) Pricing under Monopolistic Competition

A market with "monopolistic competition" as defined by Edward Chamberlin or "important competition", a term made popular by Joan Robinson, possesses the following features.

(i) *A large number of buyers and sellers*: There are many sellers of a commodity each with an insignificant share of the market so that the activities of each have to effect on others. Similarly, there are large number of buyers in such a market.

(ii) *Differentiated product*: Each firm produces basically the same product but endeavors to distinguish it from its rivals by producer differentiations. The difference will often only be marginal or a matter of branding or packaging, but the manufacturer sets out to establish his product as unique even though it has in fact very close substitutes,

(iii) *Free entry and exit*: Individual buyers and sellers are free to enter or leave the market.

Since products are similar but not identical, there will be no unique price. Instead there will be a cluster of market prices reflecting consumer opinions of comparative qualities of differentiated products. The price of an individual firm's product is determined by its cost function, demand, its own objective and by government regulations, if any. The demand curve of the firm has a downward slope because of product differentiation and attachment of consumers to particular brand names. As larger and larger price reduction

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are instituted by a firm, more and more customers from its rivals will come to it. Even customers who are attached to a particular brand name and/or to a particular firm will switch to others when the price reduction by the latter are large. However, the demand curve is highly elastic (more elastic than that faced by a monopolist) within the relevant price-output range, for numerous good substitutes are available for his product. The cost function of a firm under such a market structure would be similar to that under other types of markets. The equilibrium of a firm under such a market structure is illustrated in Figure 10.3.

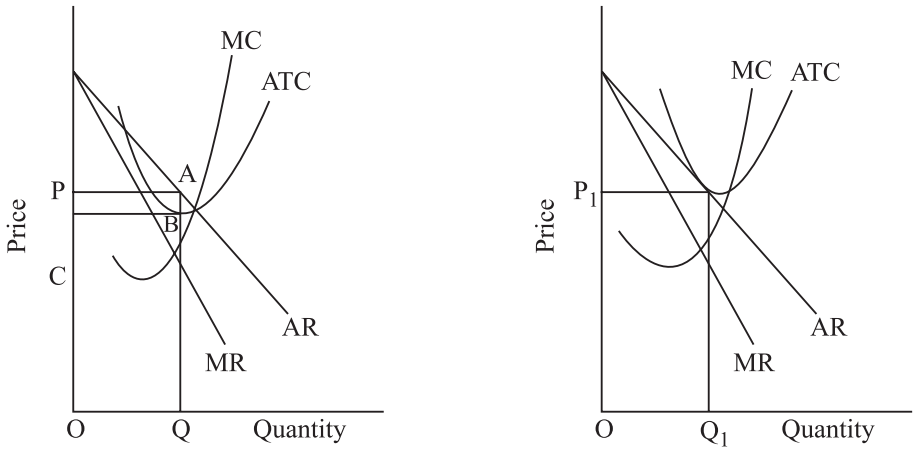

Fig. 10.4 Pricing under Monopolistic Competition

In the short-run, a firm may or may riot earn profit. The firm in Figure 4.3, Part A is in equilibrium at price OP and output OQ. lt makes profit equal to the area of rectangle PABC. In the long-run, no firm would make any profit or loss. Because of free entry, profits of the short-run will attract new firms, which will take some customers away from existing firms. This would reduce the demand for the existing firms' products and,thus the demand curve facing the existing firms would shift to the left This shift will continue as long as profits exist, or until the demand curve becomes tangent to the average cost curve as in Figure 10.3, Part B. At this point, the entry will stop because there are no profits to be made. The firm will charge OP_1 price and sell OQ_4 quantity. The opposite will happen if any firm is making losses in the short-run.

It should be noted that under monopolistic competition in the long-run, the equilibrium output is less than the optimum output. This is because the demand curve is falling, and in order that the AC curve is tangent to the demand curve the former must be falling too. Since the AC curve falls before it reaches its minimum level, the equilibrium output is less than the optimum output. The positive difference between the optimum output and the equilibrium output is termed as "excess capacity" and so there exists excess capacity in a market characterized by monopolistic competition. For similar reasons, price in such a market is higher than the minimum average total cost.

(iii) Pricing under Oligopoly

A special and increasingly important case of imperfect competition is that of oligopoly. It is characterized by a few sellers of a commodity in which the actions of any individual sellers have a perceptible influence upon his rivals. The product of rival firms could be both homogeneous or heterogeneous. If the product is standardized, the market is called

homogeneous oligopoly and, if differentiated, heterogeneous oligopoly. A special type of oligopoly is duopoly, which has only two sellers.

Interdependence in the decision making of the various sellers is the main feature of an oligopoly market. Any change in price on the part of one firm may set off a chain of reactions among other firms. Thus, the decision maker must consider the potential reactions before changing his price. The reactions of rival firms are difficult to guess, for a very wide variety of behaviour patterns is possible. Rivals may decide to get together and cooperate in the pursuit of their objectives to the extent permitted by law, or at the other extreme, they may try to fight each other to elbow out their rivals. As a result, price is indeterminate under oligopoly unless some assumption is made about the behaviour of rivals. Several models have been developed on different assumptions to explain, pricing in such a market. These include the Cournot model, Collusion model, Market-share model, and the Leader-follower model.

Augustin Cournot provided a solution to the oligopoly problem by assuming that each oligopolist maximizes his profit on the assumption that quantity produced by his rival is invariant with respect to his own quantity decision. The Collision solution postulates that the oligopolist recognize their mutual inter-dependence and agree to act in unison in order to maximize the total profit of the industry. The oligopolist surrenders his autonomy of making decisions: prices and output, and accepts the policies laid down by the centralized authority. The centralized authority, which is called a "cartel", sets the price and output so as to maximize the total profit of file industry. Where cartels are illegal, the price can be determined through a tacit agreement either on the basis of a given share of each oligopolist in the total market or through recognition of one firm as the "leader" and all other firms as its "followers" in pricing decisions. In either case, price is determined under oligopoly.

In the absence of any such understanding among rival firms, there will be "price wars" in oligopolistic markets. In price/wars each competitor shades his price below that of the other and consequently some times the oligopoly price falls even below average variable cost. Oligopolists are aware of such undesirable events and so price wars are becoming less and less frequent over time. Managers have learned, some through bitter experience, that price wars do not pay and are very costly and so they either enter into an understanding among themselves of some sort to their common advantage or do not choose to compete in price. In the latter case, competition among rivals takes the form of product variation or advertising. In the automobile industry, for example, competition is in terms of style and new models produced each year. In the cigarette and tooth paste industries, competition is mainly in the form of introducing new brands and advertising.

Price Rigidity and the Kinked Demand Curve

Prices in many oligopolistic industries appear to have exhibited a remarkable degree of stability particularly in their resistance to change in the downward direction. An explanation of this is provided by the "kinked" demand curve. The demand curve faced by an oligopolistic industry is said to have a kink at the prevailing price because of the asymmetric behaviour of firms in response to variations in prices by the rival firms. Its proponents believe that competitors follow price decreases but they do not follow price increases by their rival firms. This is because, if the price is reduced by a firm, its competitors will feel the drain on their customers quickly and so they will bE forced to match this price cut. Consequently, the firm which first lowered the price may not be

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able to increase it sales appreciably. On the other hand, if a firm raises its price, other oligopolists may not raise their price, because they will be happier now than before as they tend to attract more customers. Thus, the firm which raises the price will experience a significant cut in its sales. For these reasons, the demand curve of an oligopolist is actually a composite of two demand curves, one is valid for price increases and the other for price decreases. It should be obvious that the former will be more price elastic than the latter. This is illustrated in Figure 10.4.

In figure 10.4 OP is the current price, R_1D_1 is the demand curve for price increases and RD is that for price decreases. The true demand curve facing the oligopolist is R_1ED_2 which has a kink at the current price OP. Corresponding to a kink in the demand curve, there will be a discountinuity in the marginal revenue curve. The MR curve is RjABC. The length of this discountinuity (AB) depends on the elasticities of the two parts of the demand curve.

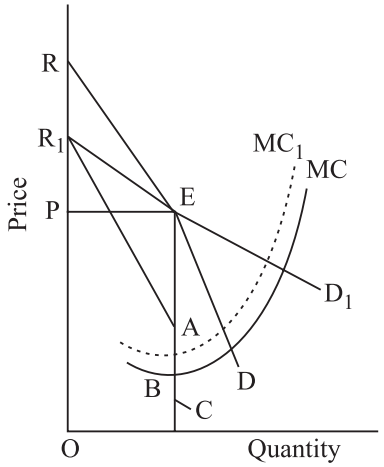

Fig. 10.5 The Kinked Demand Curve

In the presence of a landed demand curve of this type, a firm would have no motive to change its price. Furthermore, a profit-maximizing firm, which equates its MR and MC, would not change its price even if this cost changes to long as changes in the marginal cost fall within the discontiguous range of the MR curve. For example in Figure 10.4, if the new MC curve is MC_1, the equilibrium price remains invariant at OP

PROBLEM 1

The market price of a transformer is Rs. 50,000 and the discount allowed to the distributor is 20% of the market price. It is found that selling expenses cost is 1/4th the factory cost and if the material cost, labour cost and factory overhead charges are in the ratio of 1 : 4 : 2. What profit is made by the firm on each transformer, if the material cost is Rs. 4,000.

Solution: Marketing Price of transformer = Rs. 50,000

After 20% discount, the net rate

$$\left(50,00-50,000\times\frac{20}{100}\right) = \text{Rs. } 40,000$$

The ratio of material cost and labour cost and factory overhead charge = 1 : 4 : 2

Material cost = 4,000

Labour cost = 16,000

Overhead charges = 8,000

Factory cost = 28,000

The selling experience is 1/4 of factory cost = $\frac{28,000}{4}$ = 7,000

Actual price = 28,000 + 7000 = 35,000

The profit/transformer = 40,000 – 35,000 = Rs. 5,000

Problem 2

The variable overhead charges for a resistor are Rs. 2 and fixed overhead charges per month are Rs. 35,100. It is found that 65,000 pieces of this resistor arc manufactured per month under normal conditions.

(1) Find the normal overhead cost per resistor (2) If the-production drops to 90% determine the overhead charges that are unrecordred, (3) If the production is increased to 130% by what amount these charges will be over recovered?

Solution. Variable overhead charges/resistor = Rs. 2

Fixed overhead charges/month = Rs. 35,100

Total amount of transistor manufactured = 65,000 pieces

Normal OH/Transistor = $2+\left(\frac{35,100}{65,000}\right)$ = Rs. 2.54

If the Production dropping to 90%

Then the new production = 65,000 × $\frac{90}{100}$ = 58,500 pieces.

The fixed overhead charges = Rs. 58,500 × Rs. 0.54

(2.54 – 2 = 0.54) = Rs. 31,590

The uncovered overhead = 35,100 – 31,590 = Rs. 3150

If the production increased to 130%

Then the new production = 65,000 × $\frac{130}{100}$

= 84,500 pieces

Fixed overhead charges = 84,500 × Rs. 0.54 = Rs. 45,630

The overhead recovered = Rs. 45,630 – Rs. 35,100

over head charges= Rs. 10,530

SUMMARY

- Price affects profit through its effect both on total revenue and total cost.
- Five basic determinants of the price of a commodity:

  (a) the demand for it, (b) its cost of production, (c) objective of its producers,

(d) nature of the competition in its market (market structure), and

(e) government policy pertaining to it.

- Average pay load refers to the average number of passengers carried per vehicle per trip.

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- Earnings per bus mile is the ratio of total traffice revenue obtained to total bus miles operated,
- Load factor is often used to compare the actual operational-performance with the maximum potential performance and is usually expressed in percentage.
- The first and foremost objective of pricing policy is of course profit maximisation.
- The determination of price is affected by the competitive structure of the market.
- Price discrimination arises when a firm sells its (homogeneous) product at different prices at the same time.

Review Questions

1. What are the Determinants of Price.
2. Define Average Pay Load.
3. What is EPBM.
4. Define Load Factor.
5. What are the objectives of pricing.
6. What is meant by the term liquidity.
7. What are the characteristics of perfectly competitive market.
8. Write short notes on pricing under monopoly.
9. What are the features of market with monopolistic competition.
10. Explain kinked demand curve.

CHAPTER 11 DUMPING

NOTES

✣ STRUCTURE ✣

- ☆ Meaning and Nature of Dumping
- ☆ Forms of Dumping
- ☆ Price and Output Determination Under Dumping
- ☆ Meaning and Nature of Transfer Pricing
- ☆ Transfer Pricing with No External Market for the Intermediate Product
- ☆ Transfer Pricing with a Perfectly Competitive Market for the Intermediate Product
- ☆ Transfer Pricing with an Imperfectly Competitive Market for the Intermediate Product

11.1 MEANING AND NATURE OF DUMPING

When price discrimination is practiced between the domestic market and the foreign market, it is known as dumping. Thus dumping is international price discrimination and refers to the charging of a lower price abroad than at home for the same commodity because of the greater price elasticity of demand in the foreign market. By so doing, the monopolist earns higher profits than by selling the best level of output at the same price in both markets. The price elasticity of demand for the monopolist's product abroad is higher than at home because of the competition from producers from other nations in the foreign market. Foreign competition is usually restricted at home by import tariffs or other trade barriers. These import restrictions serve to segment the market (i.e., keep the domestic market separate from the foreign market) and prevent the re-export of the commodity back to the monopolist's home country (which would undermine the monopolist's ability to sell the commodity at a higher price at home than abroad).

Graphic Analysis of Dumping

International price discrimination can be viewed with Figure 15-1. Panel a in Figure 11.1 shows D_1 and MR_1 (the demand and marginal revenue curves for the product that the firm faces in the domestic market); panel *b* shows D_2 and MR_2 (the demand and marginal revenue curves that the firm faces in the foreign market); and panel *c* shows D and MR (the total demand and marginal revenue curves for the product that the firm faces in both markets together).

The total market demand curve (D) is obtained from the horizontal summation of the demand curves in the domestic market and in the foreign market (that is, $D = \Sigma D_1 +$ 2). Note that up to Q = 60, $D = D_1$.

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Similarly, the total marginal revenue curve (MR) is obtained from the horizontal summation of MR_1 and MR_2 (that is, MR = ΣMR_{1+2}). Note also that up to Q = 30, MR = MR_1.

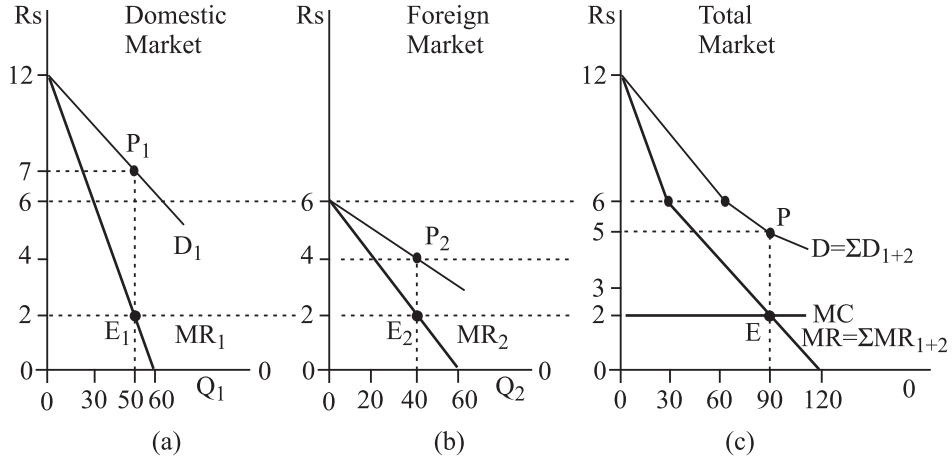

Figure 11.1 International Price Discrimination: Dumping

The best level of output of the firm is 90 units of the product and is given by point E in panel *c*, at which MR = ΣMR_{1+2} = MC = Rs_2. To maximize profits the firm should then sell 50 units of the product in the domestic market and the remaining 40 units of the product in the foreign market, so that MR_1 = MR_2 = MR = MC = Rs 2 (see, respectively, points E_1 E_2, and E in the three panels of Figure 11.1).

For Q_1 = 50, P_1 = Rs 7 on D_1 in the domestic market.

For Q_2 = 40, P_2 = Rs 4 on D_2 in the foreign market.

Note that the price is higher in the domestic market with the more inelastic demand.

Thus, the firm generates total revenues of Rs 350 in the domestic market and Rs 160 in the foreign market, for overall total revenue of Rs 510 in both the markets together.

If the average total cost (ATC) of the firm is Rs 3 at the best level of output of 90 units, then the firm earns a profit of P_1 – ATC = Rs 7 – Rs 3 = Rs 4 per unit and Rs 200 in total in the domestic market, and P_2 – ATC = Rs 4 – Rs 3 = Rs 1 per unit and Rs 40 in total in the foreign market, for a total profit of Rs 240 in both markets together.

In the absence of price discrimination, the firm would sell the best level of output of Q = 90 at P = Rs 5 (see panel *c*) and generate a total revenue of Rs 450 (as compared to a TR = Rs 510 with dumping). With ATC = Rs 3 for Q = 90, the firm would earn a profit of P – ATC = Rs 5 – Rs 3 = Rs 2 per unit and Rs 180 in total as compared to a profit of Rs 240 with dumping.

Thus, given the best level of output and costs, the firm can increase its total revenue and profits significantly by practicing international price discrimination (dumping).

Algebraic Analysis of Dumping

From Figure 11.1, we can determine that the demand and marginal revenue functions of the firm in each market are, respectively,

$$Q_1 = 120 - 10P_1 \text{ or } P_1 = 12 - 0.1Q_1 \text{ and } MR_1 = 12 - 0.2\ Q_1$$

$$Q_2 = 120 - 20P_2 \text{ or } P_2 = 6 - 0.05Q_2 \text{ and } MR_2 = 6 - 0.1\ Q_2$$

With price discrimination, the condition for profit maximization is

$$MR_1 = MR_2 = MR = MC$$

Setting $MR_1 = MC$ and $MR_2 = MC$, we get

$$MR_1 = 12 - 0.2\ Q_1 = 2 = MC \text{ and } MR_2 = 6 - 0.1\ Q_2 = 2 = MC$$

so that $Q_1 = 50$ and $Q_2 = 40$

The price that the firm should charge for the product in each market is then

$$P_1 = 12 - 0.1(50) = \text{Rs } 7 \text{ and } P_2 = 6 - 0.05(40) = \text{Rs } 4$$

so that $TR_1 = P_1\ Q_1 = (\text{Rs } 7)(50) = \text{Rs } 350$ and $TR_2 = P_2\ Q_2 = (\text{Rs } 4)(40) = \text{Rs } 160$

If the firm's total cost function is

$$TC = 90 + 2(Q_1 + Q_2)$$

the total cost for 90 units of output is

$$TC = 90 + 2(50 + 40) = \text{Rs } 270$$

and the total profits (Ω) of the firm are

$$\Omega = TR_2 + TR_2 - TC$$
$$= \text{Rs } 350 + \text{Rs } 160 - \text{Rs } 270$$
$$= \text{Rs } 240$$

11.2 FORMS OF DUMPING

There can be three forms of dumping:

1. **Persistent Dumping:** dumping resulting from international price discrimination (the form discussed above).
2. **Predatory Dumping:** the temporary sale of a commodity at below cost or at a lower price abroad in order to drive foreign producers out of business, after which prices are raised abroad to take advantage of the newly acquired monopoly power.
3. **Sporadic Dumping:** the occasional sale of the commodity at below cost or at a lower price abroad than domestically in order to unload an unforeseen and temporary surplus of a commodity without having to reduce domestic prices.

11.3 PRICE AND OUTPUT DETERMINATION UNDER DUMPING

Price and output determination under dumping can be explained with the help of Fig. 11.2. Figure 11.2 has been drawn with the assumption of having two markets-first local market and second foreign market. In local market firm enjoys monopoly, and in foreign market it stays in the stale of perfect competition. Monopolist will be at the state of equilibrium when profit will be maximum and profit will only be maximum when total marginal revenue will be equal to total marginal cost as shown in Fig. 11.2.

In the state of perfect competition, horizontal line PD represents average revenue curve (AR_W) in foreign market. In this condition of market average revenue (Price) is equal to marginal revenue ($AR_W - MR_W$).

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Due to state of monopoly in local market, slope of average revenue curve (AR_H) is downward, and slope of marginal revenue curve MR_H, is also downward, and which is below to AR.

MC is the marginal cost curve of total output of firm. How much monopolist should produce, is dependent on the fact at which point his marginal cost curve will cut the combined marginal revenue curve of local and foreign market with this point his output will be determined. Now he will divide total output into two markets in a way that the marginal revenue of every market will become equal. In Fig. 11.2 AMTD has been shown as combined marginal revenue (combined MR), in ANTD curve. AN is the marginal revenue curve of local market, with this portion of foreign market NTD has been added. Now this A NTD curve is being intersected by marginal cost curve (MC) at point T, at this point output of firm in these two markets is OM. Monopolist will now sell OL output in local market and LM output to foreign market, because by doing this the marginal revenue of both markets will become equal. Monopolist will sell OL output at price OP_1 and LM output at price OP. In comparison of foreign market, the price in local market will be more.

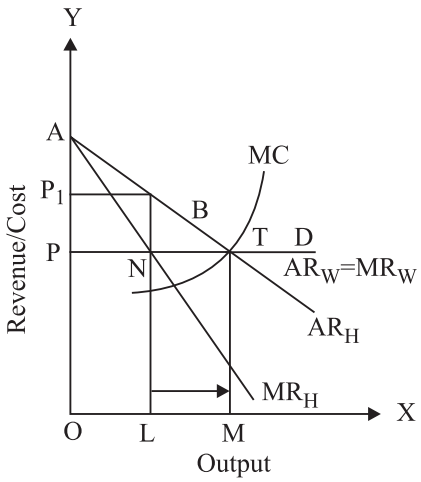

Fig. 11.2

Under the condition of dumping, monopolist need to keep one thing in mind that the price in foreign market must not be determined so less that business is not able to re-import the goods which are bought by them in less price, if this will happen then there will be no profit from dumping. That is why the difference between the prices in local market to that of foreign market should be less than the transportation cost of having goods back to the country.

Transfer Pricing

In this section we will discuss the meaning and importance of transfer pricing, and we will examine the rules for optimal transfer pricing when no external market for the transfer or intermediate product exists, when such a market exists and is perfectly competitive, and when it is imperfectly competitive.

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11.4 MEANING AND NATURE OF TRANSFER PRICING

The rapid rise of modern large-scale enterprises has been accompanied by decentralization and the establishment of semiautonomous profit centers. Decentralization and the establishment of semiautonomous profit centers gave rise to the need for transfer pricing, or the need to determine the price of intermediate products sold by one semiautonomous division of a large-scale enterprise and purchased by another semiautonomous division of the enterprise. For example, if a steel company owned its own coal mine, the questions would arise as to how much coal the coal mine should sell to the parent steel company and how much to outsiders, and at what prices. Similarly, the parent steel company must determine how much coal to purchase from its own coal mine and how much from outsiders, and at what prices. These are some of the most complex and troublesome questions that arise in the operation of large-scale enterprises today. The transfer pricing is of crucial importance to the efficient operation of the individual divisions of the enterprise as well as to the enterprise as a whole. There are two reasons for this. First, the price paid by a division of the enterprise for intermediate products produced by another division affects the output of each division and, therefore, the output of the entire enterprise. If wrong transfer prices are set, the various divisions of the firm involved in the transaction, and the firm as a whole, will not produce the optimum or profit-maximizing level of output. Second, transfer prices affect the profitability of the divisions involved in the transfer of the intermediate products, and, as such, they serve as incentives and rewards for the efficient operation of the various divisions of the enterprise. Too low transfer prices artificially reduce the profitability of the producing division and artificially increase the profitability of the purchasing division, and these can undermine the morale of the managers, officers, and workers of the former since salary increases and bonuses, and sometimes even their jobs, depend on the profitability of the division.

We will examine how the appropriate transfer prices are determined in cases where an external market for the transfer or intermediate product does not exist, when it exists and is perfectly competitive, and when it exists and is imperfectly competitive. To simplify our discussion, we assume that the firm has two divisions, a production division (indicated by the subscript p) and a marketing division (indicated by the subscript m). The production division sells the intermediate product to the marketing division, as well as to outsiders, if an outside market for the intermediate product exists. The marketing division purchases the intermediate product from the production division, completes the production process, and markets the final product for the firm. Also, to simplify the presentation, we will assume that 1 unit of the transfer or intermediate product is required to produce each unit of the final product sold by the marketing division.

11.5 TRANSFER PRICING WITH NO EXTERNAL MARKET FOR THE INTERMEDIATE PRODUCT

When there is no external demand for the intermediate product, the production division can sell the intermediate product only internally to the marketing division of the firm, and the marketing division can purchase the intermediate product only from the production division of the firm. Since 1 unit of the intermediate product is used to produce each unit of the final product, the outputs of the intermediate product and of the final product are equal. Figure 11.3 shows how the transfer price of the intermediate product is determined when there is no external market for the intermediate product.

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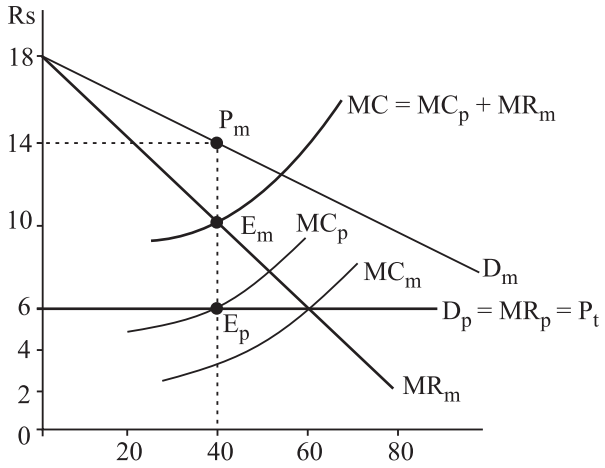

Figure 11.3 Transfer Pricing With No External Market for the Intermediate Product

In Figure 11.3, MC_p and MC_m are the marginal cost curves of the production and marketing divisions of the firm, respectively, while MC is the vertical summation of MC_p and MC_m, and it represents the total marginal cost curve for the firm as a whole. The Figure also shows the external demand curve for the final product sold by the marketing division, Dm, and its corresponding marginal revenue curve, MR_m.

The firm's best or profit-maximizing level of output for the final product is 40 units and is given by point Em at which MR_m = MC. Therefore, P_m = Rs 14.

Since 40 units of the intermediate product are required (i.e., are demanded by the marketing division of the firm in order to produce the best level of 40 units of the final product), the transfer price for the intermediate product, P_t is set equal to the marginal cost of the intermediate product (MC_p) at Q_p = 40. Thus, P_t = Rs 6 and is given by point E_p at which Q_p = 40. The demand and marginal revenue curves faced by the production division of the firm are then equal to the transfer price (that is, $D_p = MR_p = P_t$). Note that Q_p = 40 is the best level of output of the intermediate product by the production division of the firm because at Q_p = 40, $D_p = MR_p = P_t = MC_p$ = Rs 6. Thus, we can conclude that the correct transfer price for an intermediate product for which there is no external market is the marginal cost of production.

11.6 TRANSFER PRICING WITH A PERFECTLY COMPETITIVE MARKET FOR THE INTERMEDIATE PRODUCT

When the external market for the intermediate product does exist, the output of the production division need not be equal to the output of the final product. If the optimal output of the production division exceeds the quantity of the intermediate product demanded internally by the marketing division, the excess of the intermediate product produced can be sold on the external market for the intermediate product. On the other hand, if the marketing division of the firm demands more than the best level of output of the production division, the excess demand can be covered by purchases of the intermediate product in the external market. The transfer price, however, depends on whether or not the external market for the intermediate product is perfectly competitive. The determination of the transfer price when the external market is perfectly competitive is shown in Figure 11.4.

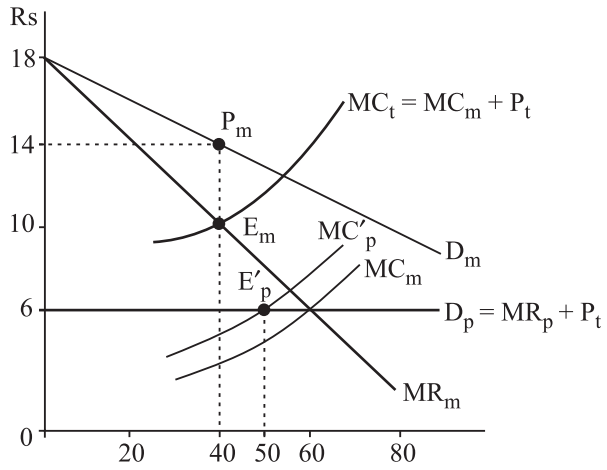

Figure 11.4 Transfer Pricing With a Perfectly Competitive Market for the Intermediate Product

Figure 11.4 is identical to Figure 11.3, except that the marginal cost curve of the production division MC_p is lower than in Figure 11.3. The production division then produces more of the intermediate product than the marketing division demands and sells the excess in the perfectly competitive external market for the intermediate product. With a perfectly competitive market for the intermediate product, the production division faces horizontal demand curve D_p for its output at the given market price P_t for the intermediate product. Since D_p is horizontal, $D_p = MR_p = P_t$ (see the Figure). The best or profit-maximizing level of output of the intermediate product by the production division of the firm is 50 units and is given by point E; at which $D_p = MR_p = P_t = MC$ = Rs 6.

Since the marketing division can purchase the intermediate product either internally or externally at P_t = Rs 6, its total marginal cost curve is given by MC_t, which is the vertical sum of its own marginal cost of assembling and marketing the product (MC_m) and the price of the intermediate product (P_t), Thus, the best level of output of the final product by the marketing division of the firm is 40 units (the same as when there was no external market for the intermediate product) and is given by point Em at which $MR_m = MC_t$. At $Q_m = 40$, P_m = Rs 14 (the same as in Figure 11.3).

Thus, the production division of the firm produces 50 units of the intermediate product and sells 40 units internally to the marketing division at P_t = Rs 6 and sells the remaining 10 units in the external market, also at P_t = Rs 6. The marketing division will not pay more than the external price of Rs 6 per unit for the intermediate product, while the production division will not sell the intermediate product internally to the marketing division for less than Rs 6 per unit Thus, when a perfectly competitive external market for the intermediate product exists, the transfer price for intracompany sales of the intermediate product is given by the external competitive price for the intermediate product.

The analysis shown graphically in Figure 11.4 can also be seen algebraically. The demand and marginal revenue curves for the final product faced by the marketing division in Figure 11.4 can be represented algebraically as

$$Q_m = 180 - 10P_m \quad \text{or} \quad P_m = 18 - 0.1Q_m$$

And $$MR_m = 18 - 0.2\ Q_m$$

Assuming that the marginal cost functions of the production and marketing divisions of the firm are, respectively,

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$$MC_p = 1 + 0.1\ Q_p \quad \text{and} \quad MC_m = 0.1\ Q_m$$

and that the perfectly competitive external price for the transfer product is P_t = Rs 6, we can find the best level of output of the intermediate product for the production division by setting its marginal cost equal to the transfer price.

That is, $MC_m = 1 + 0.1\ Q_m = \text{Rs } 6 = P_t$

so that $Q_p = 50$

The best level of output of the final product for the marketing division is determined by finding the total marginal cost of the marketing division (MC_t and setting it equal to its marginal revenue).That is,

$$MC_t = MC_m + P_t$$

Then

$$MC_t = 0.1\ Q_m + 6 = 18 - 0.2\ Q_m = MR_m$$

so that $Q_m = 40$

and $P_m = 18 - 0.1(40) = \text{Rs } 14$

Thus, the production division sells 40 units of the intermediate product internally to the marketing division and the remaining 10 units on the external competitive market, all at P_t = Rs 6. The marketing division uses the 40 units of the intermediate product purchased internally from the production division at P_t = Rs 6 to produce 40 units of the final product to be sold on the external market at P_m = Rs 14. These are the same results obtained graphically in Figure 11.4, except that we have assumed linear rather than curvilinear MC functions in the above algebraic solution.

11.7 TRANSFER PRICING WITH AN IMPERFECTLY COMPETITIVE MARKET FOR THE INTERMEDIATE PRODUCT

When an imperfectly competitive external market for the intermediate product exists, the transfer price of the intermediate product for intra-firm sales will differ from the price of the intermediate product in the imperfectly competitive external market. The determination of the internal and external prices of the intermediate product by the production division of the firm becomes one of third-degree price discrimination. This is shown in Figure 11.5.

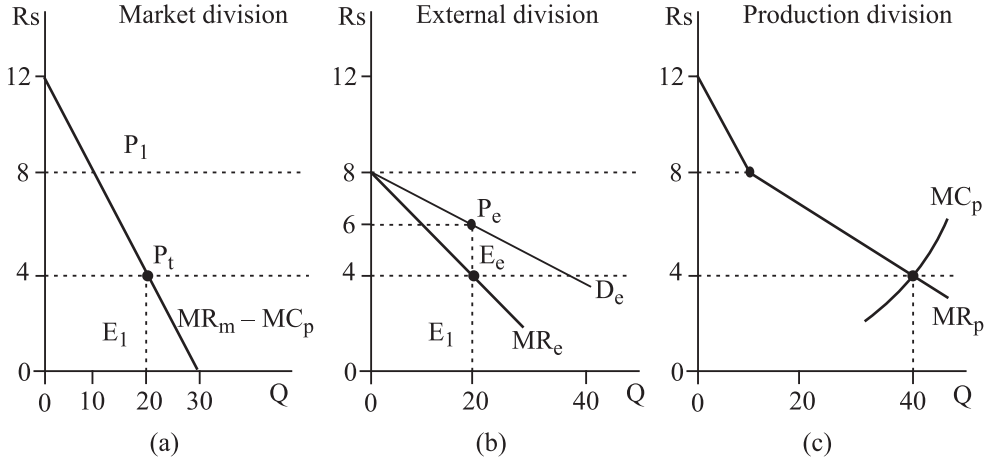

Figure 11.5 Transfer Pricing With an Imperfectly Competitive Market for the Intermediate Product

Panel *a* of Figure 11.5 shows the marginal revenue of the marketing division of the firm (that is, MR_m) after subtracting from it the transfer price of the intermediate product (P_t), which is equal to the marginal cost of the production division (MC_p). Thus, the $MR_m - MC_p$ curve in the left panel shows the net marginal revenue of the marketing division.

Panel *b* presents the negatively sloped demand curve for the intermediate product of the firm in the imperfectly competitive external market (D_e) and its corresponding marginal revenue curve (MR_e).

In panel *c*, the MR_p curve is the total revenue curve of the production division of the firm, which is equal to the horizontal summation of the net marginal revenue curves for internal sales to the marketing division of the firm and to the external market (that is, $MR_p = MR_m - MC_p + MR_e$). The MC_p curve, on the other hand, shows the marginal cost to the production division of the firm of producing the intermediate product for internal sales to the marketing division of the firm and to the external market.

The best level of output of the intermediate product by the production division of the firm is 40 units and is given by point E_p, at which $MR_p = MC_p$ in panel *c*. The optimal distribution of the 40 units of the intermediate product produced by the production division of the firm is 20 units internally to the marketing division of the firm (given by point P_t in panel *a*) and 20 units to the external market (given by point E_e in panel *b*), so that $MR_m - MC_p = MR_e = MR_p = MC_p$ = Rs 4. Thus, the production division of the firm operates as the monopolist seller of the intermediate product in the segmented internal and external markets for the intermediate product. Setting the internal transfer price at $P_t = MC_p$ = Rs 4 ensures that the marketing division of the firm (in panel *a*) demands 20 units of the intermediate product, which leads to profit maximization for the marketing division and for the firm as a whole. With optimal sales of 20 units of the intermediate product in the external market (given by point E_e in panel *b*), the market-clearing price for the intermediate product is P_e = Rs 6.

Self-Assessment Questions

1. What do you understand by dumping? What are different forms of dumping?
2. Answer briefly the following:

   Is persistent dumping good or bad for the receiving country?
3. What do you understand by transfer pricing? Why is it main concern for modern large-scale enterprise?
4. How is the transfer price of an intermediate product determined when there is no external market for the intermediate product?
5. How is the transfer price of an intermediate product determined when there is a\ perfectly competitive external market for the intermediate product?
6. How is the transfer price of an intermediate product determined when there is an imperfectly competitive external market for the intermediate product?

CHAPTER 12 TECHNOLOGICAL CHANGE AND THE GLOBAL MARKET ECONOMY

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✣ STRUCTURE ✣

- ☆ Meaning of Technology
- ☆ Concept of Technology
- ☆ Determinism versus Choice of Technology
- ☆ Strategies of Technology
- ☆ Sources of Technology
- ☆ The Impact of Technological Change
- ☆ Technological Change, Productivity and Economic Growth

In this article we will discuss about the Technological Progress in a Global Economy: 1. Meaning of Technology 2. Concept of Technology 3. Determinism versus Choice of Technology 4. Strategies of Technology 5. Sources of Technological Change 6. The Impact of Technological Change 7. Technological Change, Productivity and Economic Growth.

12.1 MEANING OF TECHNOLOGY

The term "technology" is of course in common, everyday use and, as with the term "personality", gives rise to problems of definition. We will look at how different commentators have defined the term.

As in the words of Takashi Watanabe, technology often takes the blame for social and organizational problems. It is important, therefore, that we are clear about how we use the term. Different commentators have used contrasting and overlapping definitions, and this is confusing.

One dimension concerns breadth. Some use the term narrowly and refer to machinery, equipment or to "apparatus". Some uses of the term are broad and systemic and refer, for example, to office or manufacturing processes, or to "technique".

A second dimension concerns the inclusion of human agency. Some definitions of technology refer exclusively to the "hardware", while others refer to the hardware and organizational arrangements, and thus to the people who make it function in the desired manner.

It is important to note these different uses when comparing research in technological implications, and in interpreting arguments about the social or organizational role of "technology".

Thus, one should also be able to:

1. Recognize the problems of defining the term "technology".
2. Analyse and compare different definitions of the concept of technology.
3. Recognize different levels of mechanization.
4. Recognize "determinist" arguments about technology.

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12.2 CONCEPT OF TECHNOLOGY

During the 1980s, applications of computing and information technology spread into just about every area of our working lives and too many aspects of our social and leisure activities too. Computerized systems today contribute to the design, production and test of many manufactured goods.

Offices in all sectors are now typically equipped with word processing, computerized information systems, electronic mail, facsimile transmission, and other communications tools such as local and wide area networks. We get cash from a computer terminal outside the bank.

Our hotel reservation is stored on the computer which calculates our bill when we check out, including telephone calls which are logged by computer. In some larger restaurants, when we order a meal, the waiter keys the order into a computer terminal and a printout of the order appears in the kitchen for the chef.

In short, most organizations are today computer-dependent. Large organizations, in particular, now typically spend considerable sums of money on backup arrangements to cope with system failures, and "disaster recovery" has become a major new consulting business, helping organizations deal with major catastrophes such as fire and flood which can threaten to wipe out the business as well as its computer system.

This is a picture of slow evolution, not radical revolution. Unmanned factories and paperless offices are not as common in practice as predictions of their arrival.

Tom Forester (1989) argues that most of the evidence now shows new technology creating jobs rather than creating redundancy, and improving quality of working life instead of de-skilling. How did those myths about the "information technology revolution" arise? Friedman and Cornford describe the tendency of the computing profession to "advance the clock".

It is important to appreciate that technology has to be studied as something that changes. It is not static. It is also useful to remember that technology is pervasive. Those aspects of our surroundings that are most familiar to us are often the most difficult to consider objectively.

If we were to examine the effect that technology has on anything at all, then we must be clear what we mean by the term. The term "technology" is now used with such a wide variety of meanings that it has become ambiguous. We must therefore begin by exploring that variety and ambiguity.

Sociologists, and others, have "discovered" that technological developments are major sources of social, economic and political change, for both good and evil. Alvin Toffler, for example, refers to "that great, growling engine of change—technology". It has become fashionable to study and to make pronouncements on "technological implications".

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This concern began to replace the human relations school in the study of organizational behaviour in the 1950s. The promises, and threats, of the microprocessor revolution revived this concern in the 1980s. And -despite the fact that computers have been around since the 1940s, the term "new technology" is still in common contemporary use.

Langdon Winner, an American commentator on modern technology, has pointed out that the term has widened in meaning as concern for technology implications has grown. It has been transformed from a precise, limited and rather unimportant term "to become a vague, expensive and highly significant one.

But today, it is widely used in ordinary and academic speech to talk about an unbelievably diverse collection or phenomena—tools, instruments, machines, organizations, methods, techniques, systems, and the totality of all these and similar things in our experience.

How has this confusion arisen? Rapid technical developments leave the language behind. The word "technology" is a convenient umbrella term that enables those of us with a poor technical understanding to talk about such important phenomena.

So this ambiguity in the use of the term paradoxically reflects its pervasive and profound influence on modern society and our realization that we need to discuss and understand it.

We can also argue that this convenient way of using this language leads us to oversimplify and polarize technological issues. It is either a good thing or it is bad; you are either for it or against it.

We need a more precise definition in order to study technology and its implications from a social scientific point of view. Group psychotherapy, pocket calculators and space shuttles do not appear to have much in common. But they have all been described as "technology" at some time.

The word that, "has come to mean everything and anything threatens to mean nothing." Winner identified three broad but distinct uses of the term "technology"— apparatus, technique and organisation.

Apparatus

This simply means physical, technical devices such as tools, instruments, machines, appliances, gadgets and weapons that are used to accomplish a variety of tasks. This is probably the most common and is certainly the most simple conception of technology.

Technique

This refers to technical activities such as skills, methods, procedures or routines with which people perform to achieve particular purposes. The Greek word technique means art, craft or skill. Apparatus is not purposive. Techniques are related to specific human goals.

Organization

Winner reserves this term for social arrangements such as factories, bureaucracies, armies, research and development teams and so on, that are created to achieve technical, rational and productive ends.

So when someone uses the term "technology", they could be speaking either about a physical device, a human skill, a social arrangement, or some combination, or all of

these. This confusion can be seen in the work of those who have studied the implications of technology for organizational behaviour.

We are concerned here with technology applied to production and administrative processes. This is different from the application of technology in new products. Many researchers in the field of technological change have used this distinction between process and product innovation. Here we are concerned with the former.

Here are three definitions of technology that have been used by well known and influential organizational behaviour researchers. Consider each definition and identify what, if anything, is being confused using Winner's distinctions as a guide.

1. Technology is the actions that an individual per¬forms on an object, with or without the assistance of mechanical devices, in order to make some change in that object.
2. The specific technology of the organization is, then, the collection of plant, machines, tools, and recipes available at a given time for the execution of the production task and the rationale underlying their utilization.
3. Technology is the application of science to invent technique and its supportive artifacts (machines) to accomplish transformations of objects (materials, information, people) in support of specific objectives.

There are two additional definitions:

Material technology: "The technology that can be seen, touched and heard"; and Social technology "which seeks to order the behaviour and relationship of people in systematic, purposive ways through an elaborate structure of co-ordination, control, motivation, and reward systems."

Material technology is what Winner calls apparatus. Social technology is Winner's organisation and includes job definitions, payment systems, authority relationships, communications channels, control systems, disciplinary codes, "all of the many other rules and decision-making procedures which seek to govern what work is done, how it is done, and the relationships that prevail between those doing it".

12.3 DETERMINISM VERSUS CHOICE OF TECHNOLOGY

Different technologies make different demands on those who work with them. It is clear that the technology of an organisation determines, at least to some extent, the nature of work in that organization.

If we compare a hospital with a biscuit-making factory, a consultancy firm with a coal mine, it seems reasonable to argue that the technology of these organization determines:

1. The kinds of tasks that have to be done.
2. Job design, or the horizontal division of labour.
3. The organization of work or the grouping of jobs.
4. The hierarchy through which work is planned and coordinated, or the vertical division of labour, or organization structure.
5. The knowledge and skills required to carry out the work.
6. The values and attitudes and behaviour of workers.

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The argument that technology can be used to explain the nature of jobs, work groupings, hierarchy, skills, values and attitudes in organizations, is called technological determinism. The determinist assumption that work has to be organized to meet the requirements is widespread.

Technical innovation has three main phases. The first phase is invention someone has a creative idea. The second phase is exploitation practical applications are developed. The third phase is diffusion more people see the advantages of the new idea and apply it. This third phase then triggers more creative ideas.

Technical change thus encourages more technical change. Andrew Friedman and Dominic Corn- ford (1989) argue that computing technology is auto-generative, a term they use to describe how innovations derive from the users of computer systems as well as from their original designers.

The process of technology development is intrinsically self-stimulating and self-perpetuating. From this perspective, technology does appear to be out of our control and organisation structures appear to be locked in to its demands.

The logic of technical development appears to block choices as to the direction of those developments and their applications. Organizations may simply be forced to use new technologies as a result of competitive pressures.

Continuous innovation is also a way of life in the capitalist industrialized world, both in the development of new products and services and in new production processes. Technical innovation is central to maintain "competitive advantage" in international trade.

There is, therefore, an economic determinism behind technical innovation. Companies that do not introduce the improved technologies that their competitors use must inevitably fail when their customers desert them.

There is now evidence to show that the technological determinist argument is over simplified. In Toffler's view, technology suggests ways in which it may be used. That is different from the claim that it determines what happens. There are three broad areas of choice in the process of technical change which weaken the technological determinism argument.

First, there are choices in the design of equipment, tools and machines—apparatus. The main choice appears to be the extent to which the control of operations is built into the machine, or left to human intervention and discretion.

There are cases of automated controls being taken out of aircraft cockpits, ship bridges, and railway engine cabs when it was discovered that pilots and drivers lost touch with the reality of their task, surrounded by sophisticated automatic controls which functioned without their help. The task in each case had been automated to the extent that when human intervention really was required, mistakes were made.

Second, there are choices in the goals that technologies are used to achieve. Competitive pressure is just one reason for using a particular technology. Organisations also innovate to reduce costs and solve production bottlenecks and other problems. These reasons may reflect the demands of internal accounting procedures as well as the desire to improve price and delivery for the customer.

Managers also promote technical innovation for personal and political reasons, to give them more power over resources and influence over decisions, more status and prestige in the competition for promotion, and tighter control over their subordinates.

Third, there are choices in the way in which work is organized around technology. Demands made on human skill and knowledge depends partly on the technology and partly on the design of jobs. Job design depends on management decisions as well as on the type of machinery in use.

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The redesign of car assembly work by the Swedish company Volvo shows how even this type of work is not dictated by the machinery of production. There are thus choices about the ways in which given technologies can be used by an organization.

These are called "strategic choices" because they depend on management decisions about the strategy behind the development and application of specific pieces of apparatus. Managers have discretion about the design of technology and about the organization of jobs around technology.

The use of that discretion depends more on the assumptions that managers make about human capabilities and constraints than on the technical capabilities of specific pieces of apparatus. These are called "psychological assumptions" because they concern managers' beliefs about the behaviour of individuals and groups of people at work.

To consider the impact of a particular technology is to consider the wrong questions, or at best to consider only a part of the issue.

Both technology and its effects are the result of a series of management decisions about the purpose of the organisation and the way in which people should be organized to fulfil that purpose. This implies that we should not be studying technology at all, but that we should instead be analysing managers' beliefs, assumptions and decision-making processes.

The argument regarding technical change viz-a-viz decision making process have five related components:

1. What: The characteristics of the technology.
2. Why: The goals pursued by management.
3. How: The organisation of work around the technology.
4. Consequences: Human, organizational, financial.
5. Feedback: The effects of past changes on future decisions.

In this perspective, technical change acts as a trigger to the processes of management decision-making. The choices that form in those processes, concerning why and how the technology is to be used, determine the outcomes of technical change.

Technology, thus, has limited impact on people or performance in an organization, independent of the purposes of those who would use it and the responses of those who have to work with it. The technological determinism case is, therefore, weak: the strategic choices are crucial.

12.4 STRATEGIES OF TECHNOLOGY

Competition is essential both to the innovation process and to capitalist economic development. But so, is co-operation. The perennial challenge to policy-makers and to managers alike is to find the right balance of competition and co-operation which can take place.

Today this problem has taken on a new importance, for several reasons. One is that the manner in which technological innovation is organized is changing worldwide. These changes, which will only intensify under liberalized trading regimes, relate not only to the way in which research is organized but also to the way in which new technology is acquired and commercialized.

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Accordingly, corporate technology strategies are no longer simply matters of setting R&D budgets and identifying projects on which to lay bets. With an interdependent global economy, technology strategy must attend to both technology acquisition and commercialization issues.

While there is usually some consideration given to the impact of monopoly and competition on incentives to innovate, it is always implicitly assumed that the price mechanism can effect whatever co-ordination the economic system requires.

Typically there is no discussion how inter-firm agreements, vertical, lateral and horizontal, can positively impact the process. It is not surprising, therefore, that the economics textbooks do not convey a sense that corporate technology-acquisition strategies or inter- firm co-operation are desirable, or even subjects worthy of study.

Paul Samuelson has always acknowledged the importance of technological change in his leading text, but then, like many others, he proceeds to ignore it. While it is the dynamic properties of capitalism that constitute the basis of our confidence in its superiority to other forms of economic organization, the theory is based on a model that assumes an unchanging technology.

When technology is taken into account, the economics profession at large has treated it as events transpiring inside a black box, and has "adhered rather strictly to a self-imposed ordinance not to inquire too seriously into what transpires inside that box."

Therefore, it is not surprising that economists have not had much to say about corporate technology strategies and the role of cooperation. Policy analysts and policy-makers have instead both stressed the value of pluralism and rivalry as the best organizational arrangement to promote innovation.

Co-operation will become increasingly necessary to promote competition, particularly when industries are fragmented and market barriers are low. Very few firms can successfully "go it alone" any more.

The sources of know-how are dispersed globally, and the capabilities needed to commercialize new technology are rarely found inside a single firm or a single country. Thus global co-operation along firms has become increasingly relevant to national economic development and growth.

Co-operation in turn requires inter-firm agreements and alliances, as well as a well-functioning price system. In this regard, the Japanese form of industrial organization, with complex inter-firm relationships, may have distinct advantages. European and US firms are now only beginning to learn how to co-operate effectively in order to compete.

One consequence of this adaptation to the enlarged scope of the market will be that managers must become more adept at managing inter-firm relationships. Indeed, the very concept of the corporation may well have to be reconsidered when enterprise performance is intimately linked to the performance of one's co-ventures.

Similarly, at the level of public policy, technology and competition policy must be crafted so as to be sensitive to the needs of innovating firms.

In some countries this is likely to require greater inter-agency co-ordination. In the USA this will need to be coupled with judicial and legislative changes that recognize that some co-operation, even among competitors, is generally beneficial when it serves the requirements of innovation.

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The concept that is necessary for technological development must become embedded in a firm's global technology strategy, if it is to compete successfully in a world where the sources of know-how are globally diffused, where imitation is often easy and where governmental barriers to trade and investment are evaporating.

The following section explores how inter-firm (co-operative) agreements to access technology and complementary assets can be made an integral part of a firm's technology strategy.

Sourcing Strategies

There are a number of modes by which technology lying external to the firm can be acquired. It may be easy to copy, if it lacks intellectual property protection, and can be reverse engineered at low cost, as with some microprocessors.

Thus imitation is often a viable acquisition strategy. When the technology is legally protected, it is hard to copy and the innovator is willing to sell. They include licensing, contract R & D, R & D Joint Ventures and bilateral collaborative arrangements.

Licensing is the most familiar of these approaches. A firm possessing valuable know-how that is protected can contract to let others use the technology in question.

A license agreement will often be accompanied by a know-how agreement under which the owner of the intellectual property in question will contract to assist the buyer in developing a comprehensive understanding of the technology in question. Contract R & D is also an important mode, though it is also fraught with hazards.

When a buyer commissions R&D work to be performed under contract, it is usually in recognition of the fact that the provider of the R&D services is better positioned to generate a desirable output from R&D than is the buyer itself.

Unless the technology to be developed can be specified with great precision, and the costs of the requisite development activities can be gauged with considerable accuracy, contracting to develop technology using fixed-price contracts is not easy, as it is difficult to specify and cost-out the object of the development activity at issue.

Modest technological endeavour can be arranged this way more satisfactorily than ambitious ones but are exposed to obvious incentive hazards.

R&D joint ventures make sense as external procurement mechanisms when the other party can bring certain capabilities to the venture that the collaborating party does not possess. Other properties of joint ventures are that they reduce risk when project costs are high; and in the R&D area, they may reduce duplication without necessarily reducing variety.

An inherent flaw of capitalist market economics is that they often cause patent races and other forms of socially wasteful R&D duplication. There may not be a better system for promoting in-novation than capitalism, and gross inefficiencies associated with duplication can be reduced by joint ventures.

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Another collaborative mechanism involves bilateral exchanges of know-how and other assets, as with cross-licensing, patent-pooling and, more recently, technology transfers, in return for some other non-pecuniary commercial favour, such as access to distribution facilities.

These services are often difficult to obtain otherwise, particularly under simple purchase contracts; and the reciprocal nature of collaboration can bring a degree of incentive capability to the arrangement that would not otherwise be available.

12.5 SOURCES OF TECHNOLOGICAL CHANGE

When we think of technological innovation, we often distinguish between product innovation (new product introductions) and process innovation. While conceptually distinct, the two are often related.

In the early portion of a product's life, product design is critical. A product's early users are almost always more interested in product performance than in price. Considerable product redesign is under-taken to make the product even more useful and desirable for its users. Abernathy has referred to this early phase of product technology as the search for the "dominant design".

Dominant designs are those products that make a market such as Ford's Model T car, the DC-3 airplane, the Xerox 914 copier, Kodak's "brownie" camera and the IBM PC. In this early going, the production process is most apt to be a job shop or a near-job shop.

As acceptance of the dominant design proceeds, however, cost reduction becomes increasingly important. Process innovation—geared primarily to lowering costs, increasing yield, and gaining production speed—commands management attention. Changes become less and less radical as the product, the process, and the organization become more and more standardized.

Product Innovation: Assessing the Technological Fortunes

Spotting the product designs that will be commercially successful is an uncertain business at best. It has been suggested that a new "technological winner" must score high on a mix of separate criteria.

To the extent that a product's inventive merit is strong, its marketing features attractive, and any required engineering and operational changes either slight or fully anticipated, a new product is likely to be a commercial success. A failure in any of these dimensions can spoil an otherwise promising prod.

Pinpointing a promising technological advance is unavoidably subjective. A number of these approaches to forecasting the success of a new product use the Delphi method, combining an expert panel with probability measures.

Each panel expert is asked to indicate his or her own view of an R & D project's success. These opinions are collected, tabulated, and usually reviewed again by the expert panel, which can then revise its initial probability selections. Such assessments can be made at regular intervals over the years.

Process Innovation

The sources of process innovation are similarly, perplexing. Some innovations stem from a company's own work, some stem from advances made by equipment or materials suppliers, and some result from copying or acquiring the technology developed by others.

Although the sources of process innovation are often baffling, the character of process innovation is less so. Moreover, an understanding of the character of process innovation carries with it some important lessons about how productivity can be enhanced.

A useful touchstone for a discussion of the nature of process innovation is the empirical phenomenon typically referred to as the "learning curve."

The notion underlying the learning curve derives from the actual experiences of manufacturers in some diverse industries. The universality of the learning curve has been demonstrated in a variety of industries, and most notably in the electronics industry.

For the mathematically inclined, the learning curve relationship can be expressed as:

$$y = ax - b$$

where X is the cumulative volume of units produced from the first unit, and Y is the cost of producing the Xth unit. The coefficient '*a*' represents the cost of the first unit and the exponent '*b*' indicates the sensitivity of unit cost to cumulative volume.

Composition of the Learning Curve

So much for the mathematics. What does the learning curve really represent and how can it be of use? Many factors stand behind the learning curve, and all of them can systematically reduce costs over the life cycle of the product.

These factors can be grouped into major categories: Workforce-related factors are mere short-run in character, and for some, distinguished the learning curve from the broader notion of the "experience curve."

The experience curve is also a relationship between cost and accumulated volume, but it is generally associated with longer term factors dealing with process and product modifications as well as factors related to the workforce. Nevertheless, the terms "learning curve" and "experience curve" are often used interchangeably.

12.6 THE IMPACT OF TECHNOLOGICAL CHANGE

Technological change may involve new products, improvements or cost reductions for existing products, or better ways of managing the operations of a business. In some cases, the changes may seem simple and the results rather trivial, such as coating paper clips with colored plastic to prevent them from leaving marks on a page or tapering one side of the buttons on a shirt to make them easier to fasten.

In other cases, the technological advances may be brilliant and the impact on society highly significant. Consider the development and evolution of the electron microscope. The best optical microscopes can focus on objects as small as 1000 angstroms in width. During the 1930s, scientists learned to focus streams of electrons in the same way that optical devices focus light.

The first electron microscopes achieved resolution of about 100 angstroms—ten times better than the optical microscopes. During the next sixty years, research efforts

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significantly improved the instruments. Today, commercially available electron microscopes can focus on objects as small as one angstrom—a thousand times better than the best optical devices.

This capability has allowed biologists, chemists, and physicists to make important discoveries. For example, it has enabled medical researchers to examine and manipulate bacteria, viruses, and genetic structures as they search for cures for diseases.

12.7 TECHNOLOGICAL CHANGE, PRODUCTIVITY AND ECONOMIC GROWTH

Economists use several measures to assess the performance of the economy. One of the most important is productivity, defined as the ratio of output to one or more inputs. Productivity is a key concept because it determines the standard of living that a country can achieve.

In any given year, the total value of income received by individuals is based on the total value of goods and services produced. Thus, the only way for all consumers to have more real income is for the productivity of the inputs, used to produce those goods and services, to increase.

The most common productivity measures is labour productivity—output divided by the quantity of labour. If labour productivity can be increased, workers may be able to earn higher wages. Labour productivity has increased over time. However, there have been significant differences between countries.

Percentage changes in labour productivity between 1970 and 1989 are provided in Table 28.1 for selected countries. Note that the rate of increase for the United States is less than every nation except Canada and Sweden. Slow growth in labour productivity has been a major concern in the United States in recent years.

Table 12.1 Percentage increases in Labour Productivity

Country	*Increases : 1972-1989*
United States	2.9%
Canada	2.5%
Denmark	3.3%
France	4.1%
Italy	4.9%
Japan	6.0%
Netherlands	4.9%
Sweden	2.9%
United Kingdom	3.8%
Germany	3.2%

Technological change is an important source of increased labour productivity. Labour-saving technological change allows the same number of workers to produce more output. However, technological change is not the only component of increased labour productivity.

Productivity increases as workers accumulate more human capital and as the capital stock of the economy increases. Changes in relative input prices can also affect the measured rate of labour productivity.

For example, if capital becomes relatively more expensive, firms will use more labour and less capital. Thus, the ratio of output to labour input will decrease. Conversely, higher wage rates tend to reduce labour usage and to increase the measured rate of labour productivity.

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The output-labour ratio is commonly used to measure productivity because it is easy to quantify. However, a better indicator is total factor productivity, which compares changes in output with changes in both labour and capital inputs. Using this approach, it is possible to identify the sources of economic growth over time.

A study by Denison focused on economic growth as measured by the change in real income in the United States between 1929 and 1982. The average annual growth rate in real income over the period was 2.8 percent. The estimated components of growth are shown in Table 12.2.

Table 12.2 Sources of Growth in Real GNP

Sources of Growth	*Percent Attributable to Source*
Increase in inputs	20%
Labour Education	19%
Capital	14%
Technological change	31%
Other factors*	16%
Total	100%

[* Economics of scale, improved worker-safety and health conditions, pollution abatement, and fewer labour disputes.]

Note that the single-most important source of economic growth between 1929 and 1982 was technological change. Almost one-third of the increase is attributable to improvements in technology.

It is also important to observe that about 20 percent of growth was due to higher education levels of workers. Clearly, knowledge, whether associated with new or improved products or embodied in workers, is crucial to economic progress.

Industrial Innovation

The famous Harvard economist distinguished among invention, innovation, and diffusion. Invention can be thought of as the creation of new ideas. Innovation represents taking those ideas and transforming them into something that is useful for society. Diffusion is the process whereby the new product or process becomes available throughout the society.

In many cases, inventions never get to the innovation stage. In other cases, innovations fail to become widely adopted. Sometimes the problem is that an invention or innovation provides no real technical advantage or is not economically viable. But there are also instances when truly beneficial ideas languish for many years.

In the early days of sailing, scurvy was the worst killer of sailors. In 1601, an English sea captain found that two or three teaspoons of lemon juice a day provided almost complete protection against the disease. His finding was quite well known at the time, but it was not until 1865, over two hundred and fifty years later, that the remedy was widely used and scurvy ceased to be a threat among British sailors.

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Product versus Process Innovation

Innovation can be divided into two broad categories. Product innovation involves the bringing of new goods or services to the market, while process innovation is concerned with new techniques that reduce costs of producing and distributing existing products.

For a successful product innovation, the good or service will generate a stream of economic profit. In the early years, the firm may lose money as it attempts to launch the product and gain consumer acceptance. Later, there may be a period of rapid growth as the good or service becomes widely used and competitors provide substitutes.

After the product has been available for a number of years, sales may stagnate or even decline.

In evaluating a product innovation, the firm can use the techniques of capital budgeting. An innovation usually involves a substantial initial cost and a stream of future profits. Basically, the question is whether the present value of profits is likely to exceed the upfront cost of bringing the product to the market.

Evaluation of process innovation is similar. The initial cost of implementing the innovation must be balanced against the future cost-savings that will result from the improved process. If the net present value is positive, then the new technique should be incorporated into the production process.

To illustrate the firm's decision, consider the example of a new process that could reduce the fuel cost of producing electricity. Suppose that an electric utility has generators that have been in service for many years. At present, there is no capital cost— the total cost of generation is the cost of fuel plus the firm's operation and maintenance expense.

If the, new generation technology is adopted, the firm could reduce its operating costs but would have to pay the initial capital cost. For the process innovation to be profitable, the operating cost-savings would have to be greater than the initial cost.

Successful Innovation: The Gillette Sensor Razor:

Gillette's Sensor razor is an example of successful product and process innovation. In the mid 1980s, engineers at Gillette perfected the design of a new hand razor with flexible twin blades that adjusted to the contours of the shaver's face. The new design provided a closer and smoother shave than any razor on the market.

When it was introduced in 1990, the Sensor was a near instant success. In the first two years, the company sold 50 million razors and more than two billion of the twin-blade cartridges. Today, the product is by far the top-selling razor in the United States, with over 40 per cent of the market for non-disposable razors—nearly triple that of its nearest competitor.

The design of the new product was the easy part of the Sensor project. The challenging problem was finding technology that would allow the firm to profitably manufacture millions of razors and blade cartridges each year. With that volume, a reduction of even a tenth of a cent per unit cost could mean a large increase in profits.