MODEL QUESTION SET (ECONOMICS)
Introductory Regular Course (IRC-I)
IRC-I – Introduction for Economic Theory

Full Marks – 75 **Time – 3 Hrs**

Candidates will have to answer two very short answer type questions, two short answer type questions, and four long answer type questions.

Group –A **5 ×2 = 10**

1. Very Short Answer Types Questions:

a) What is the difference between deductive and inductive methods?

b) What are the reasons behind downward sloping demand curve?

c) What is cross elasticity of demand?

d) What are the relationship between APP and MPP?

e) What is producer's equilibrium?

Group –B Short Answer type Questions **2 ×5 = 10**

2. What do you mean by economies of scale?
3. What is the shape of AR and MR under perfect, monopoly and monopolistic competition?

Group –C **14+14+14+13 = 55**

LONG QUESTIONS (Answer any four questions)

4. Explain equilibrium of firms under perfect competition in short run.
5. Explain Recardian Theory of Rent
6. Critically Examine the Liquidity Preference Theory of Interest.
7. What do you mean by concept of cost? Explain the relationship between average and marginal cost.
8. Explain Producers Equilibrium with the help of Graph.
9. Define Production Function. Explain the low of variable Proportion.
10. Critically Examine the Returns to Scale.

MODEL SET QUESTIONS & ANSWER
IRC-I

Group –A

Q. No. 1. Very Short Answer Types Questions:

a) What is the difference between deductive and inductive methods?

Answer:

Deductive Method	Inductive Method
1. It does not give any new knowledge.	1. It gives new knowledge
2. It is a method of verification.	2. It is a method of discovery.
3. It is the method of instruction.	3. It is a method of teaching.
4. Child gets ready made information and makes use of it.	4.Child acquires first hand knowledge and information by actual observation.
5. It is quick process.	5. It is a slow process.
6. It encourages dependence on other sources.	6. It trains the mind and gives self confidence and initiative.
7. There is less scope of activity in it.	7. It is full of activity.
8. It is a downward process of thought and leads to useful results.	8. It is an upward process of thought and leads to principles.

b) What are the reasons behind downward sloping demand curve?

Answer: In economics, 'demand' relates to the desire of people to purchase something and the willingness to pay for it. The law of demand explains the functional relationship between the price of a commodity and its demand. The most important tool that explains this relationship is the demand curve. This curve is always downward sloping due to an inverse relationship between price and demand.

According to this principle, the marginal utility of a commodity reduces when the quantity of goods is more. Consequently, when the quantity is more, the prices will fall and demand will increase. Hence, consumers will demand more goods when prices are less. This is why the demand curve slopes downwards.

c) What is cross elasticity of demand?

Answer: The cross elasticity of demand is an economic concept that measures the responsiveness in the quantity demanded of one good when the price for another good changes. Also called cross-price elasticity of demand, this measurement is calculated by taking the percentage change in the quantity demanded of one good and dividing it by the percentage change in the price of the other good.

$$E_{XY} = \frac{\%\Delta\ QUANTITY\ OF\ X}{\%\Delta\ PRICE\ OF\ Y}$$

$$E_{XY} = \frac{\Delta Qx}{\Delta P_y} \times \frac{P_y}{Q_x}$$

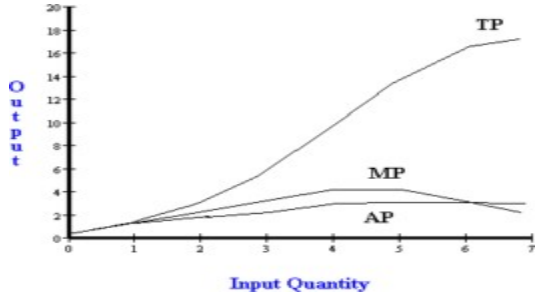
Where, Qx = Quantity of good X

Py = Price of good Y

Δ = Change

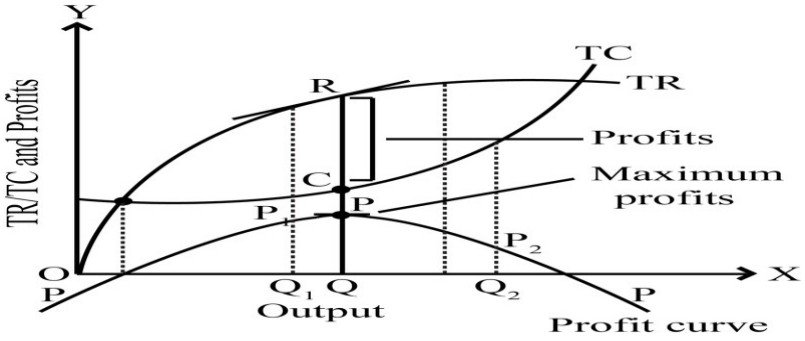
d) What are the relationship between APP and MPP?

Answer: When Average Product is rising, Marginal Product lies above Average Product. When Average Product is declining, Marginal Product lies below Average Product. At the maximum of Average Product, Marginal and Average Product equal each other.



e) What is producer's equilibrium?

Answer: Equilibrium means rest of the point. A producer is said to be in equilibrium when it is producing a level of output at which his profit is maximum. Profits are defined as the difference between total revenue (TR) and total cost (TC). Thus, Profit = TR - TC. Profits will be maximum when the difference between total revenue and total cost is maximum.



Group –B Short Answer type Questions

2. What do you mean by economies of scale?

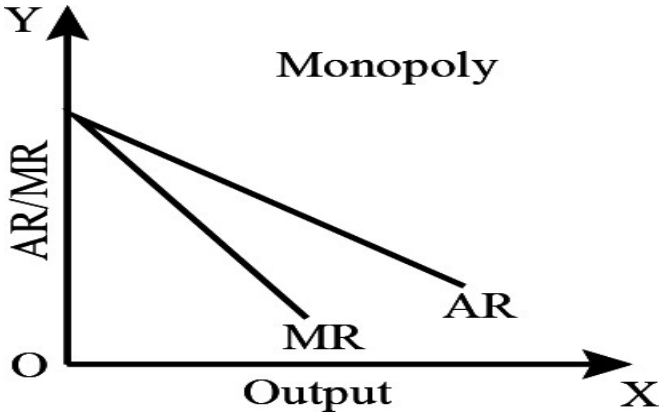
Answer: Economies of scale refers to the phenomenon where the average costs per unit of output decrease with the increase in the scale or magnitude of the output being produced by a firm.

Similarly, the opposite phenomenon, diseconomies of scale, occurs when the average unit costs of production increase beyond a certain level of output. At the point where the average costs are at a minimum, the minimum efficient scale (MES) of output of a firm or plant is reached. A distinction is often made between different types of economies of scale such as:

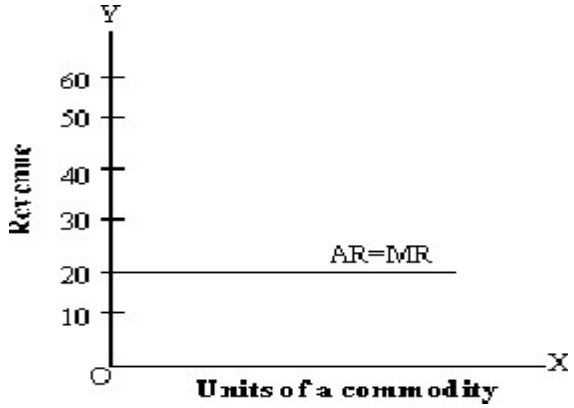
- Product specific economies of scale; and
- Plant specific economies of scale.

3. **What is the shape of AR and MR under perfect, monopoly and monopolistic competition?**

Answer: Under perfect competition, the average revenue and marginal revenue curve of a firm is parallel to the X-axis, whereas under monopoly and monopolistic competition it is negatively sloped. A perfectly competitive firm is a price taker and can sell as much as it wishes to at the prevailing price and monopoly is price maker which aim is maximise its profit through minimum sell. In monopolistic completion commodity discrimination.



Perfect competition



Group – C (Long Answer type Questions)

4. **Explain equilibrium of firms under perfect competition in short run.**

Introduction

A market form refers to the mode in which the firms respond and interact with each other. It is the environment in which the firms make their pricing and output decisions. The market forms are usually studied with respect to the degree of competition prevailing in the market. There are perfectly and imperfectly competitive markets operating in the economic world.

A perfectly competitive market is the extreme case where the market structure is absolutely impersonal and the 'invisible hand' leads to the allocation of resources unhindered. There is

large number of firms behaving in a completely competitive manner. However, it is more of a theoretical model with only close approximations in reality. Nevertheless, it forms the benchmark for studying the market forms and provides some useful insights in the economic world. In order to study the pricing and output decisions of a perfectly competitive market, it is important to look at the basic assumptions of this market and understand the environment in which it functions.

Assumptions

Large Number of Buyers and Sellers

In a perfectly competitive market, there are large number of buyers and sellers. Every consumer demands only a small fraction of the market output and similarly, every individual firm produces a negligible fraction of market supply. Therefore, no single producer/consumer can make an impact on the market price prevailing in the market. The market price in a perfectly competitive market is determined by the interaction of market demand and market supply curves and each firm takes that market price as given.

This assumption implies that the firms and the consumers in a perfectly competitive market are ***price takers***. The firms and the consumers in such a market are independent and correctly believe that their decisions will not affect the market price.

Product Homogeneity

In a perfectly competitive set up, each firm produces and sells a homogeneous product. The homogeneity aspect relates not only to the physical or technical characteristics of the product or commodity but also to the services associated with the product and the 'environment' in which the purchase is made. When the products of all the firms in a market are perfectly substitutable with one another, then no firm can raise the price above the market price without losing its market share to other firms. This reinforces the point that the firms in a competitive market are price takers. The agricultural products, copper, cotton etc could be apt examples for such goods.

On the other hand, if the products are heterogeneous, then the consumers make their buying decisions depending on the quality of the products. As the goods are not perfectly substitutable, each firm has the opportunity to raise its price above that of its competitors without losing any of its sales.

Free Entry and Exit

In a perfectly competitive market, the firms are free to enter or leave the industry in response to the monetary incentives. It means that there are no special costs attached if a firm enters the industry, or exits if it is not making any profit. Moreover, there are no hidden hurdles in terms of copyrights and patents obstructing new firms to enter the market. For example, the aircraft industry is not perfectly competitive as the entry requires immense investment in plant and equipment which has little or no resale value.

An important implication of this assumption is that new firms enter the market if the existing firms are making exorbitant profits, diluting the profits of incumbent firms in the process. Similarly, the firms are free to exit the industry in case of losses thereby increasing the market share (and profits) of the remaining firms. Free entry and exit of firms, thereby implies that in the long run all firms in the industry are making exactly zero economic profits. The assumption is important for the competition to be effective. It means that the consumers can easily switch to a rival firm if the current supplier raises the price.

Other Assumptions

Large number of buyers and sellers, product homogeneity and free entry and exit are the basic three assumption of perfectly competitive market structure. Apart from them, it is assumed that there is no government regulation in this market. The intervention like taxes, subsidies, rationing, patents etc are ruled out when there is free play of market forces as in the case of perfect competition.

Moreover, there is perfect mobility of factors of production implying that the factors are free to move from one firm to another and from one industry to another. The consumers and producers are assumed to have perfect knowledge about the present as well as the future conditions of the market. In other words, they are assumed to possess all relevant information essential for making economic decisions.

Though the assumptions of perfect competition are rigid and unlikely to be fulfilled in reality, however, moderate deviations from them do not undermine the usefulness of the model.

Demand Curve Facing a Competitive Firm

Demand curve

Demand curve of any firm shows the maximum price that consumers are willing to pay for different levels of quantity. Under perfect competition, the firm's demand curve is perfectly elastic – horizontal line parallel to the quantity axis. The market demand curve on the other hand is conventionally downward sloping. To understand this distinction, it is essential to understand the difference between the market demand curve and the firm's demand curve.

A **firm's demand curve** gives the relationship between the 'demand for the output of that particular firm' and the 'market price'. The **market demand curve** gives the relationship between the 'total amount of industry output demanded' and the 'market price'. The market demand curve is influenced by the consumer behavior but the firm's demand curve is influenced by consumer behavior as well as other firms' decisions. The firm's demand curve is flat because every firm believes that it will be unable to sell anything at a price higher than the market price. Moreover, if a firm charges a price lower than market price then the firm would get the entire market demand and would soon be 'sold out'. After this each of the other firms would be able to sell. Further the firm can sell any amount of the homogenous product at the ongoing market price. The firms in perfectly competitive market are thus, **price takers**. The **demand curve facing a competitive firm will be given by a horizontal line facing the quantity axis** as the

firms are price takers and prices will not change for change in output level.

To sum up the 'market price' is determined by the interaction of the market demand and supply curves and is taken to be given for a single firm. This is because each firm is a small part of the industry and it's output decisions have a negligible effect on the 'market price.

INDUSTRY DEMAND CURVE

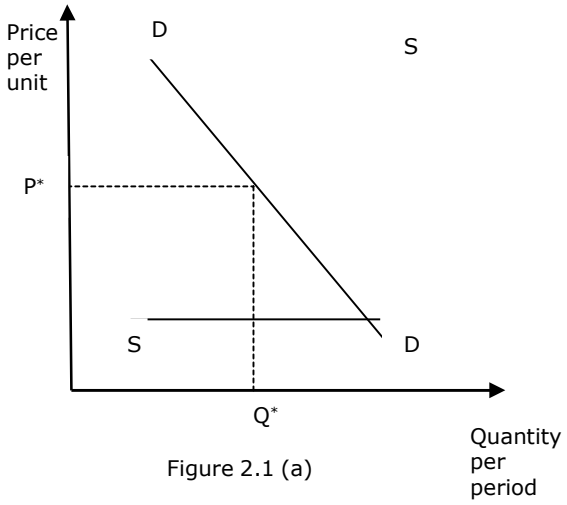


Figure 2.1 (a)

FIRM DEMAND CURVE

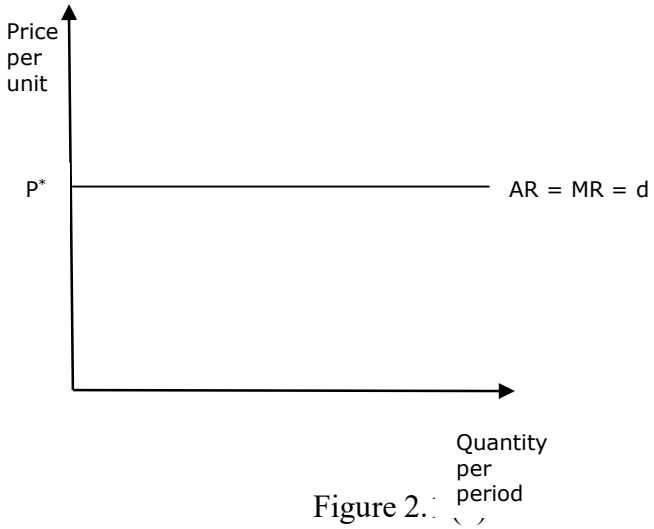


Figure 2.1

The above figures show the industry and firm's demand curve for a perfectly competitive market. In figure 2.1(a), DD represents the industry demand curve. It is downward sloping as the consumers will buy more output at a lower price. The intersection of industry demand curve and market supply curve yields the equilibrium market price as P^* and equilibrium quantity sold as Q^* which represents the total quantity produced by all the firms taken together. The figure 2.1(b) shows the demand curve faced by a single perfectly competitive firm. It is a horizontal line at P^* facing the quantity axis implying that it can sell any additional unit of output without lowering price. As a result, when the firm sells an additional unit of output the total revenue (TR) rises by a fixed amount which is equal to the price of the product. Therefore, the marginal revenue (MR) and average revenue (AR) are equal to the price of the product. The above figures illustrate how the intersection of market demand and supply curves of the industry determines the market price which is taken as given by the firms. It is summarized in table 2.1 below.

Table- 2.1

TOTAL REVENUE	AVERAGE REVENUE	MARGINAL REVENUE
$\mathbf{TR = P^* \times Q}$	$\mathbf{AR} = \frac{TR}{Q} = \frac{P* \times Q}{Q} = \mathbf{P^*}$	$\mathbf{MR} = \frac{\partial TR}{\partial Q} = \mathbf{P^*}$

Firms Equilibrium in the Short Run

In the short run, some factors are fixed and some are variable. The presence of fixed factors distinguishes short run from long run. In the short run, the output per period can only be changed by changing the use of variable inputs, keeping the fixed factors constant.

The profit maximization condition for a firm is to produce at the output level where the difference between TR and TC is maximum. In other words, MR should be equal to MC and steeper than MC at the point of intersection. The profit maximization principle has been discussed in the last module. Let's revisit the point with the help of an example in table 2.2.

Table- 2.2

1	2	3	4	5	6	7	8	9
Price	**Output**	**TR**	**TC**	**MR**	**MC**	**AC**	**Unit Profit**	**Total Profit**
20	1	20	68	20	-	68	-48	-48
20	2	40	74	20	6	37	-17	-34
20	3	60	78	20	4	26	-6	-18
20	4	80	83	20	5	20.75	-0.75	-3
20	5	100	89	20	6	17.8	2.2	11
20	6	120	97	20	8	16.16	3.84	23
20	7	140	110	20	13	15.71	4.28	30
20	8	160	130	20	20	16.25	3.75	30
20	9	180	162	20	32	18	2	18
20	10	200	210	20	48	21	-1	-10

The first two columns show the demand curve faced by the competitive firm. The price is constant at 20 for every output level. Thus, the demand curve is a horizontal line facing the quantity axis. TR (Price × Quantity) is calculated in the third column. The total cost is given in

the fourth column. MR, MC and AC (Average cost) are given in columns 5, 6 and 7 respectively. The unit profit is calculated in column 8 as the excess of price over AC. The unit profit multiplied by output level provides the total profit in column 9.

According to the total approach, profit is maximized where difference between TR and TC is maximum. It happens at the 7^{th} and 8^{th} output level. However, according to marginal approach, profit is maximized at 8^{th} output level where MR = MC and MC is increasing after it (MC is steeper than MR). As the price remains constant in perfect competition, the average revenue (AR) is also constant. Thus, in perfect competition

$$MR = Price = AR$$

Since MR is equals price for the perfectly competitive producer, the short run equilibrium occurs at the output level for which the MC is equal to price. The short run profit maximizing condition for a competitive firm is thus,

$$MC = Price$$

This condition implies that no firm has an incentive to deviate from charging price equal to marginal cost which is same for every firm in the industry. If a firm charges a price more than its marginal cost, then it will lose all its consumers to its competitors as the products are homogeneous. The firm will regain the market share only when it charges the price same as the marginal cost. On the other hand, lowering a price below the marginal cost will result in the firm producing a lesser quantity. This will lower the firm's profits.

It might cross your mind that if all the firms simultaneously start charging a higher price, then all can have profits. But this scenario will not be sustainable because the total demand will be less than the supply and the firm will be left with unsold stock. Thus, every firm will have an incentive to lower the price and grab the entire market share. Therefore, the equilibrium situation, where the firms would want to stay put, will occur only at the level where MC = P.

The profit of a firm is defined as the excess of TR over TC

$$\prod(Q) = TR(Q) - TC(Q)$$
$$\prod(Q) = P.Q - AC.Q$$
$$\prod(Q) = Q(P - AC)$$

Thus, the excess of price over AC multiplied by the quantity gives the profit. There are following three cases

Case I. (P – AC) > 0

In this case, the price is more than the average cost and thus, the profits are positive.

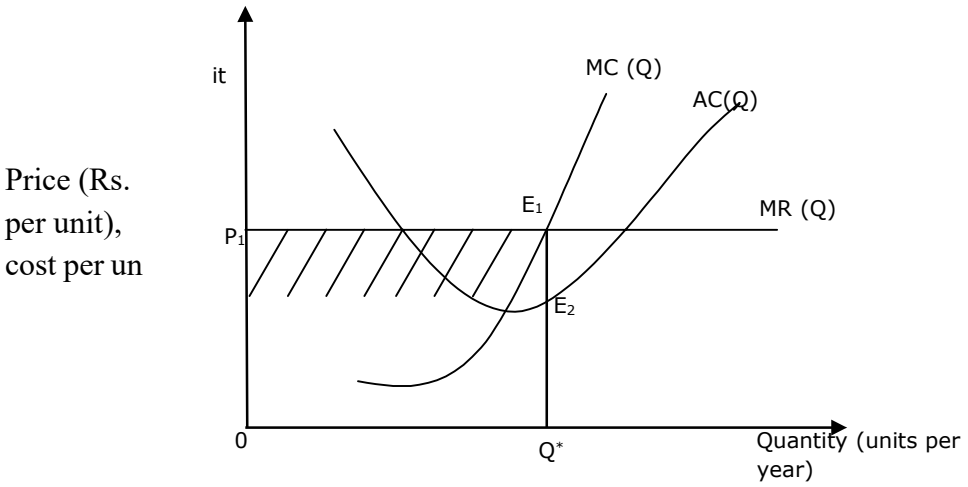


Figure 3.1

In the above figure, the equilibrium is at E1 where MR is equal to MC and the price charged is P1. However, the average cost at Q^* is P2 which is less than the price charged. The dashed area is the economic profit of the firm. It is the excess of price over AC multiplied by the quantity.

Case II. (P – AC) = 0

If the price charged is same as the average cost of the firm, then the profits are zero for the firm. It is a no profit, no loss situation.

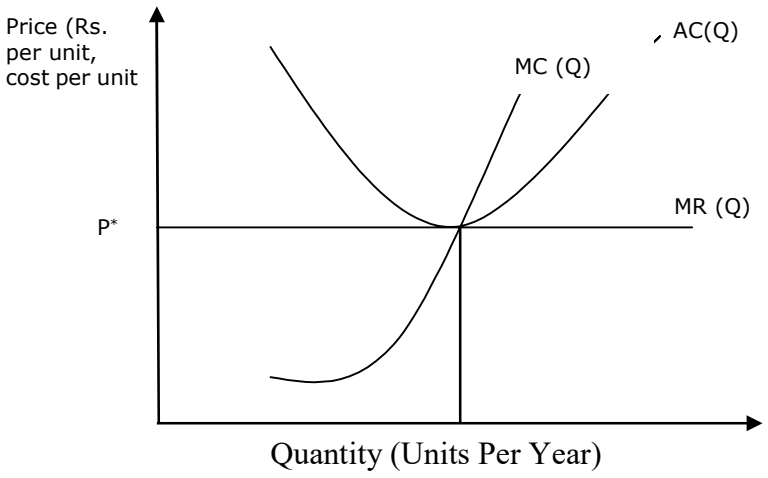


Figure-3.2

In the above figure, price is same as AC at the point of equilibrium. Thus, there are no positive economic profits for the firm.

Case III. (P – AC) < 0

If the price charged is less than the average cost, then the firm receives negative economic profits or losses.

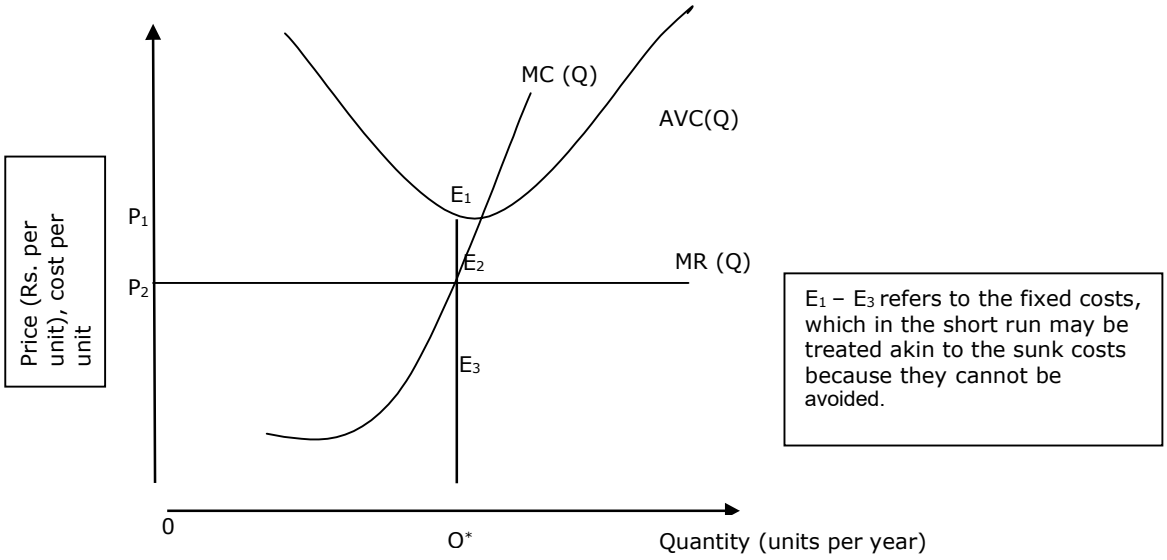


Figure 3.3

In the above figure, the equilibrium is at E2 where MC is equal to MR and price charged is P2. However, at the equilibrium level of output Q^* AC is more than price and therefore, the firm is making losses as shown by the shaded area.

5. Explain Recardian Theory of Rent

Introduction

Unlike variable factor, the marginal productivity theory of distribution fails to determine price of factor whose supply is fixed (e.g. land) or quasi fixed (e.g. capital equipments) as there is zero marginal product of fixed factor. There exists separate body of theory, i.e. theory of rent which helps explain the pricing of these fixed factors. According to classical theory, rent is the price paid for the use of land. However, in modern theory, the concept of rent is not confined to land. It can be applied to any factor whose supply is inelastic in the short run.

There are three different concepts of rent: land rent, economic rent and quasi-rent. The land rent is paid by the tenant to the landlord for hiring land and the landlord obtains this price because of the fact that the supply of land is scarce. The concept of economic rent is widely applicable, in the sense that it is the price paid to any factor on top of what is required to retain the factor in its current employment. In other words, economic rent is a payment to a factor in excess of its opportunity cost. The quasi-rent is the earnings of fixed capital equipments. The capital equipments are quasi-fixed factors in the sense that the supply of these factors are fixed only in short run, while their supply varies in the long run. These three concepts of rent are described in details in sections below.

The classical theory of rent was first defined and explained by David Ricardo. According to him, "Rent is that portion of the produce of earth which is paid to the landlord for the use of the original and indestructible powers of the soil". Ricardian concept of rent has two features. Firstly, it is payment to the landlord just for the use of land. It differs from contractual rent which accounts return on capital invested by the landlord. The portion of landlord's earning which is spent for the improvement of land is considered as rent. Secondly, rent is generated due to the scarcity of land. That is, for an economy the area of land is fixed. In other words, the supply of land is completely inelastic. Therefore a price (i.e. rent) must be paid for the use of land. Since, the land rent appears due to the scarcity of land given the assumption that all plots of the land are homogenous, it is also known as *scarcity rent*. When we relax the assumption that all plots of a land are homogenous, another type of rent appears due to the different quality of lands. This rent is called *differential rent.* These two concepts of rent are analyzed in the following sections.

The principal problem in the political economy by Ricardo is the discovery of those regulations or principles which govern the shares of factor income distribution. Since Ricardo several theoretical models were developed to solve this principal problem of income distribution. In this module first the Classical theory or Ricardian theory of distribution is illustrated this is followed by how Marx developed his own theory of distribution based on Ricardo's surplus theory. The analytical differences between these two theories are explained in the second part.

Ricardo's theory emphasizes the fact that the principal problem in the political economy is the formulation of laws that govern the distributive shares of national income to the factors used in production. At the outset of his theory of distribution he mentioned the historical fact that "in different stages of society the proportions of the whole produce of the earth which will be allotted to each of these (three) classes under the names of rent, profit and wages will be essentially different". Although his major concern in the problem of distribution is not only due to problems related to distributive shares, but to the belief that the whole mechanism of economic system can be understood by the theory of distribution.

Ricardian theory of distribution was based on the marginal principle and surplus principle. The marginal principle is used to explain the share of rent and the surplus principle focus on the distribution of residual part of the value of production between wages and profit. In order to explain Ricardian model, the following assumptions need to be highlighted:

The economy is broadly divided into two sector, agriculture and industry.

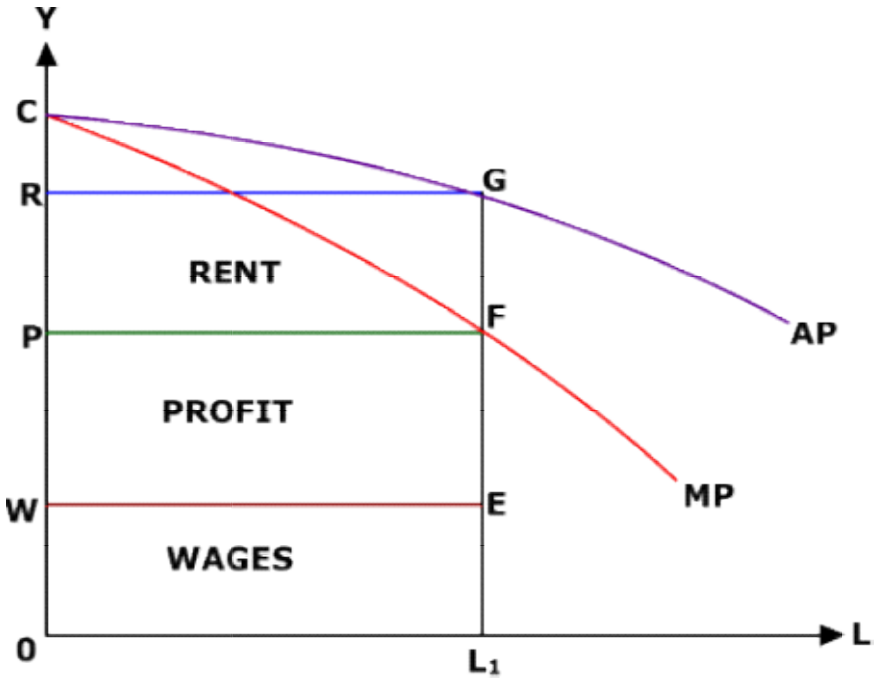
(1) In agricultural sector a giant farm produces only one output, say corn. In order to produce corn three factors land, labour and capital are used. Total land used in production is fixed by the nature. The other two factors labour and capital are also used in fixed proportion to produce corn. But the production technology between land and labour are assumed to be a variable coefficient.
(2) The production technology is subject to diminishing returns. This implies that as more and more of the composite of capital and labour are employed on a given amount of land, the marginal productivity of variable factor diminishes.
(3) The Malthusian law of population is assumed to operate. This implies that the population will increase (or decrease) when wages are above (or below) the subsistence level and in the long run

the population will remain stationary at natural rate of wage (i.e., wage at subsistence level).

(4) Capital employed in production is classified in to fixed capital and circulating capital. As the turnover period is relatively long a small part of annual wage is used as capital, while the circulating capital is equal to the proper 'wage fund'.

Based on the above assumptions we can explain how the forces operating in agricultural sector help determine the distribution of factors' income in industry.

In the agricultural sector the distribution of income can be explained with the help of figure-2.1. In the diagram the vertical axis measures quantities of corn and the horizontal axis measures the amount of labour employed in the production of corn. At given technology, the AP curve represents average product of labour and MP curve shows the marginal product of labour. Because of the assumption of diminishing returns these two separate curves exist. For a given amount of labour the corn output is uniquely determined. That is, at OL_1 unit of labour total output is measured by the rectangle $ORGL_1$. The rent is equal to the difference between product of labour on marginal land and product on average land. That is the difference between average and marginal productivity depends on the elasticity of AP curve. However, the marginal productivity of labour (or produce minus rent) is the sum of both wage and profit rather than simply equal to wage. The wage rate in Ricardian model is determined by the constant supply price in terms of corn and is independent of marginal productivity of labour. According to modern economic theory the Ricardian hypothesis implies that at a given wage OW there is infinitely elastic supply of labour. This assumption of infinitely elastic supply of labour is based on the Malthusian theory of population. It states that population will increase indefinitely when wages are above the subsistence level and decline when wages are below the subsistence level. The demand for labour in the Ricardian model is determined by the accumulation of capital which determines as to how many workers are employed at the wage rate OW. The equilibrium is obtained not by the intersection of MP curve and the supply curve of labour, but by the aggregate demand for labour in terms of corn i.e., wages fund.



When there is accumulation of capital, the labour force will grow. Hence the 'agricultural wages fund' is determined by the area $OWEL_1$. For any given labour L_1, the profits are determined by the residue generated from the difference between marginal product of labour and the rate of wages. Hence, the ratio of profits to wages $(\frac{Profits}{Wages})$ determines the rate of profit per cent on how much capital is employed. This rate of profit per cent of capital employed is indeed equal to the ratio of profit to wages when capital is assumed to be turned over once a year in such a way that capital employed is equal to the annual wage bill. In equilibrium situation, both agricultural sector and industrial sector must generate the same money rate of percentage of profit earned on capital; otherwise the capital will shift from one form of employment to other.

However in agricultural sector the money rate of profit cannot deviate from the rate of profit measured in terms of its own product, that is, 'corn rate of profit'. This happens as in agriculture both input (in terms of wages) and output is comprised of same product, i.e., corn, while in industrial sector, the input and output do not consist of same commodities. In agriculture the cost per worker is fixed in corn, but in industry for a given state of technology the product per worker is fixed in terms of manufacturing goods. Therefore, the equality in the money rate profit in both the sectors may occur only through the price adjustment between industrial and agricultural commodities. The rate of profit in terms of money in industry depends on the rate of profit in terms of corn produced in agriculture. The rate of profit in terms of corn is subject to margin of

cultivation. For a given state of technology this margin of cultivation reflects the extent of capital accumulation. Thus according to James Mill the profit can fall due to diminishing fertility of soil.

In order to make the whole structure of the Ricardian economy more logically consistent it is important to assume that wages are not only fixed in terms of corn, but the entire wage income should be spent on corn. If we relax this assumption, any change in relation between industrial and agricultural prices will change real wages so that it will no longer be possible to derive the size of surplus and the rate of profit on capital from the corn rate of profit. The corn rate of profit can be defined as the relationship between the product of labour and the cost of labour working on the marginal land. Let us assume that the agricultural products are considered as wage goods and industrial products are considered as nonwage goods. Now the annual wages fund can be determined by the total corn output (shown by the area $ORGL_1$in figure-2.1). Of this total corn output $OWEL_1$ is used in agriculture and $WRGE$ is employed in rest of the economy. Now suppose due to protection to agriculture, any increase in $OWEL_1$ will depress the rate of profit and reduce the rate of growth. In the same manner all the taxes other than those levied on land are imposed on profit and these will also reduce the rate of accumulation and growth.

6. Critically Examine the Liquidity Preference Theory of Interest.

The classical theory of interest also known as the demand and supply theory was propounded by the economists like Marshall and Fisher. Later on, Pigou, Cassel, Knight and Taussig worked to modify the theory. According to this theory rate of interest is determined by the intersection of demand and supply of savings. It is called the real theory of interest in the sense that it explains the determination of interest by analyzing the real factors like savings and investment. Therefore, classical economists maintained that interest is a price paid for the supply of savings.

Demand for Savings:

Demand for savings comes from those who want to invest in business activities. Demand for investment is derived demand. Any factor of production is demanded for its productivity. The demand for the factor is high when there are higher expectations from it.Since, all the factors are not equally productive, so, capital demand will be high for more productive uses first and then gradually with the increase in its supply, will shift to less productive uses.

demand for capital can be raised to a point where marginal productivity of capital becomes equal to the interest paid on it. Thus, if marginal productivity of capital is more than the interest paid, then it is beneficial to borrow money and vice-versa. Equilibrium will prevail at a point where marginal productivity of capital equals the rate of interest. This shows that there exists inverse relationship between demand for capital and the interest rate.

This fact can be made clear with the help of the following table 1 and diagram 1:

Table 1

Rate of Interest	Investment (in crores)
10%	500
9%	600
8%	700
7%	800
6%	900
5%	1000

Table 1 shows that rate of interest and investment are inversely related to each other. As the rate of interest increases, the level of investment declines and vice-versa. As in the table, initially, the rate of interest is 10%, investment is Rs. 500 crores. When the rate of interest decreases to 8%, the level of investment increases to Rs. 700 crores from Rs. 500 crores.
Further, as the rate of interest again falls to 5%, the level of investment increases to Rs. 1000 crores.

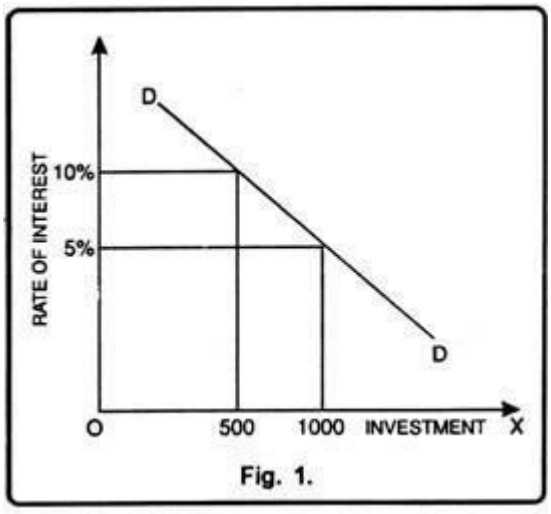


Fig. 1.

The Fig. 1 depicts that there exists inverse relationship between the investment and the rate of interest. Initially, the rate of interest is 10%, the level of investment is Rs. 500 crores. Now the rate of interest falls to 5%. With this decrease in the interest rate, level of investment increases to Rs. 1000 crores. It indicates that more capital is demanded at a low interest rate and vice versa.

Supply of Saving

Supply of capital is the result of savings. It comes from those who have the excess of income over consumption. Thus, savings is the main source of capital which depends on the capacity to save, willingness to save, level of income and rate of interest etc. Capacity to save depends on the size of national income, size of personal income, size of family, price level and purchasing power of money etc. Willingness to save depends on the family affection, further expectations etc.

To a large extent, willingness to save is affected by the rate of interest. On a higher rate of interest people save more to earn the benefits of high rate of interest. On the other hand, at the low rate of interest, people save less. Thus, we may say that there is a direct relationship between the supply of savings and the rate of interest. The following table and diagram justifies this fact in a more vivid way.

Table 2

Rate of Interest	Savings (in crores)
10%	1000
9%	800
8%	700
7%	600
6%	500
5%	400

It is clear from the table 2 that rate of interest and savings have a positive relationship. As the rate of interest increases, savings will also increase. On the other hand, a fall in rate of interest leads to a decrease in savings.
When the rate of interest is 10%, the savings are of Rs. 1000 crores.

In the successive periods, as rate of interest falls from 10% to 5%, the total savings also decline. Suppose as the rate of interest falls to 5%, savings also decrease to Rs. 400 crores.

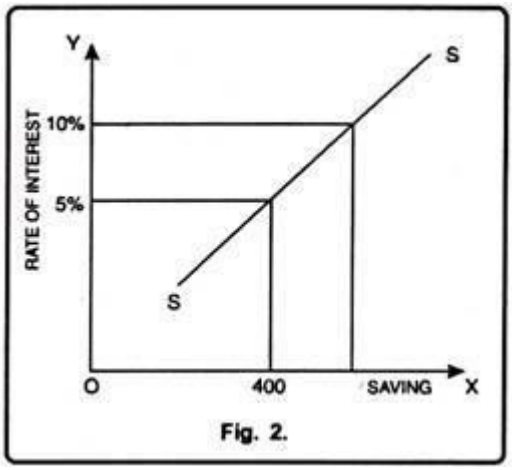


Fig. 2.

In Fig. 2 savings have been represented on X-axis and interest rate on Y- axis. SS is the supply curve which moves upward from left to right. It shows that supply of savings is interest elastic. Higher the interest rate, more will be saved and vice-versa. With 5% rate of interest money savings are Rs.

400 crores. As the interest rate increases to 10% people are persuaded to save more and the money savings rise to Rs. 1000 crores. This signifies that there is a direct relationship between savings and the rate of interest.

Equilibrium Rate of Interest:

According to classical theory, equilibrium interest rate is restored at a point where demand for and supply of capital are equal i.e.

Table 3

Rate of Interest	Investment	Savings
10%	500	1000
9%	600	800
8%	700	700
7%	800	600
6%	900	500
5%	1000	400

The table 3 reveals that equilibrium rate of interest will be determined at a point where demand for and supply of capital are equal. As is clear from the table that equilibrium interest rate 8% is determined because at this level demand for and the supply of capital are equal i.e. Rs. 700 crores.

Now, if the rate of interest increases to 10%, investment is Rs. 500 crores and savings are of Rs. 1000 crores i.e. savings exceed the investment. On the other hand, if the rate of interest falls to 5% investment is Rs. 1000 crores and savings are Rs. 400 crores.

This fact is clearer from the diagram below:

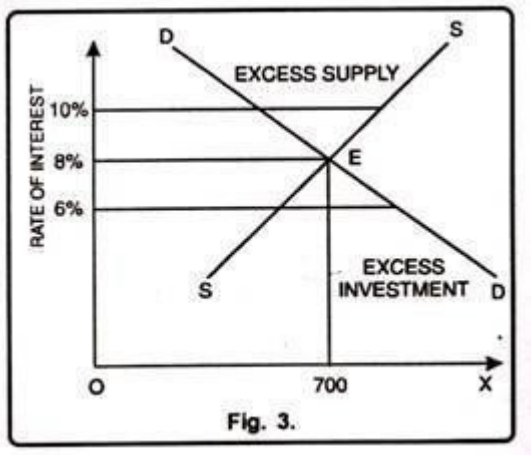


Fig. 3.

In Fig. 3, rate of interest is determined by the intersection of demand and supply curves. Equilibrium is restored at point E which determines rate of interest as 8% and demand and

supply of capital as Rs. 700 crores. Now, if the rate of interest increases to 10% supply of savings exceeds the demand for capital i.e. supply is more than demand. This will lead to a fall in interest rate to the level of 8%.

On the other hand, when the interest rate falls to 6%, demand for savings exceeds the supply of savings which will push up the rate of interest to restore an equilibrium rate i.e. 8%. Therefore, rate of interest is in equilibrium only at a point where the demand for capital equals the supply of capital.

Criticism:

The classical theory of rate of interest has been criticized on the basis of the following shortcomings as discussed below:

1. Indeterminate Theory:

Keynes has maintained that the classical theory is indeterminate in the sense that it fails to determine the interest rate. In this theory, interest is determined by the equality of demand and supply. But the position of savings varies with the income level. Thus, unless we know the income, interest rate cannot be determined.

2. Fixed Level of Income:

Classical theory assumes that the level of income remains constant. But in actual practice income changes with a small change in investment. Thus, it is not correct to assume a fixed level of income.

3. Long Run:

Classical theory determines the interest rate through the interaction of demand and supply of capital in the long run. Keynes pointed out that in the long run we all are dead. Therefore, there was an urgent need of a theory which determines rate of interest in the short-run.

4. Full Employment:

This theory assumes that there is full employment of resources in the economy. But, in reality, unemployment or less than full employment is a general situation. Full employment is only an abnormal case… Thus, this theory does not apply to the present world.

5. Savings and Investment:

Classical economists assume that savings and investment are interring dependent. But actually investment changes, income also changes which leads to a change in savings. Thus, both are interdependent on each other.

6. Ignores Monetary Factors

Classical theory takes into consideration only the real factors for determining the rate of interest and ignores the monetary factors.

KEYNES'S LIQUIDITY PREFERENCE THEORY

Keynes's Liquidity Preference Theory of Interest or Interest is Purely a Monetary Phenomenon.

According to Keynes, Interest is purely a monetary phenomenon. It is the reward of not hoarding but the reward for parting with liquidity for the specified period. It is not the 'Price' which brings into equilibrium the demand for resources to invest with the readiness to abstain from consumption. It is the 'Price' which equilibrates the desire to hold wealth in the form of cash with the available quantity of cash.

Here Liquidity Preference Theory is determined by the supply of and demand for money. Supply of money comes from banks and the government. On the other hand, demand for money is the preference for liquidity. According to Keynes people like to hoard money because it possesses liquidity.

Hence, when somebody lends money he has to sacrifice this liquidity. A reward which is offered to make him prepared for parting with liquidity is called Interest. Therefore, in the eyes of Keynes—"Interest is the reward for parting with liquidity for a specific period."

Liquidity Preference or Demand for Money:

Liquidity preference means demand for cash or money. People prefer to keep their resources **"Liquid".** It is because of this reason that among various forms of assets money is the most liquid form. Money can easily and quickly be changed in any form as and when we like. Suppose, you have a ten rupee note now you can change it into either wheat, rice, sugar, milk, book or in any other form you like. It is because of this feature of liquidity of money, people generally prefer to have cash money.

The desire for liquidity arises because of three motives:

(i) The transaction motive;

(ii) The precautionary motive; and

(iii) The speculative motive.

(i) Transactions Motive:

The transactions motive relates to "the need of cash for the current transactions of personal and business exchanges". It is further divided into the income and business motives. The income motive is meant "to bridge the interval between the receipt of income and its disbursement", and similarly, the business motive as "the interval between the time of incurring business costs and that of the receipt of the sale proceeds." If the time between the incurring of expenditure and receipt of income is small, less cash will be held by the people for current transactions and vice-versa.

(ii) Precautionary Motive:

The precautionary motive relates to **"the desire to provide for contingencies requiring sudden expenditures and for unforeseen opportunities of advantageous purchases."** Both individual and businessmen keep cash in reserve to meet unexpected needs. Individual hold some cash to provide for illness, accidents, unemployment and other unforeseen contingencies. Similarly, businessmen keep cash in reserve to tide over unfavorable conditions or to gain from unexpected deals.

(iii) Speculative Motive:

Money held under the speculative motive is for "securing profit from knowing better than market what the future will bring forth." Individualsand businessmen have funds, after keeping enough for transactions and precautionary purposes, like to gain by investing in bonds.

Money held for speculative purposes is a liquid store of value which can be invested at an opportune moment in Interest bearing bonds on securities.
There is an inverse relationship between interest rate and the demand for money i.e., more demands for money at lower Interest rate and less demand at higher interest rate. Hence, the liquidity preferences curve becomes a downward sloping curve.

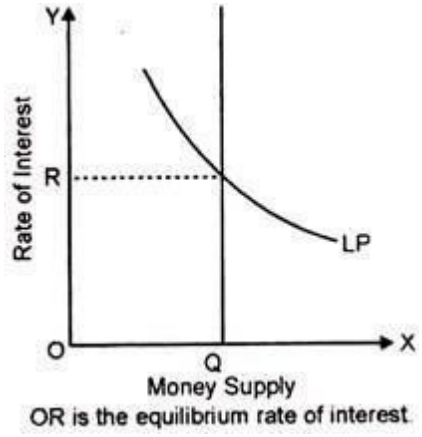
Supply of Money:

The supply of money refers to the total quantity of money in the country for all purposes at any time. Though the supply of money is a function of the rate of Interest to a degree, yet it is considered to be fixed by the monetary authorities, that is, the supply curve of money is taken as perfectly inelastic.

The supply of money in an economy is determined by the policies of the government and the Central Bank of the country. It consists of coins, currency notes and bank deposits. The supply of money is not affected by the Interest rate, hence, the supply of money remains constant in the short period.

Determination of Interest Rate:

According to the Liquidity-Preference Theory the equilibrium rate of interest is determined by the interaction between the liquidity preference function (the demand for money) and the supply of money, as presented in figure below:



OR is the equilibrium rate of interest.

OR is the equilibrium rate of interest. The theory further states that any change in the liquidity preferences function (LP) or change in money supply or changes in both respectively cause changes in the rate of interest. Thus as shown in figure below, it given the money supply the liquidity preference curve (LP) shifts from LP1 to LP2 implying thereby an increase in demand for money, the equilibrium rate of interest also rises from to R%.

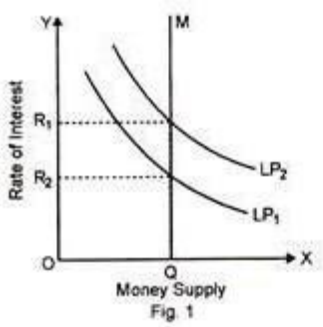


Fig. 1

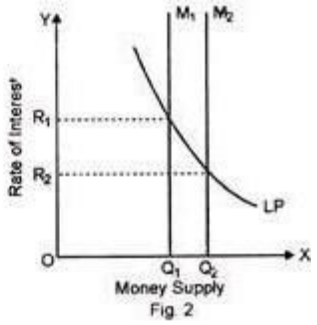


Fig. 2

Similarly, assuming a given liquidity preference function (LP) as in fig. (b) when the money supply increases from M1 to the rate of interest falls from R1 to R2.

Its Criticisms:

The following major criticisms have been levelled against the Keynesian Liquidity Preference theory of interest. By Hansen, Robertson, Knight and Hazlitt etc. This theory has been characterised as "a college bursar's theory", "at best an inadequate and at worst a misleading account".

Important among them are as follows:

1. This theory is indeterminate, inadequate and misleading:

Prof. Hansen and Robertson maintain that the Keynesian theory of interest rate, like the classical theory is indeterminate, inadequate and misleading. In the Keynesian version, the liquidity preference function will shift up or down with changes in the level of income. Particularly the liquidity preference for transactions and out of precautionary motive. This being the function of income and with this we know the income level. And to know the level of income we must know the rate of interest. Robertson regards the liquidity preference theory, "as at best inadequate and at worst a misleading account."

2. Hazlitt's Criticism:

Professor Hazlitt has vehemently criticised the Keynesian theory of interest on the following grounds:

(i) It is one sided theory:

According to Hazlitt, the Keynesian theory of interest appeared to be one sided as it ignored real factors. Keynes considered Interest to be a purely monetary phenomenon and refused to believe that real factors like

productivity and time preference, had any influence on the rate of interest. Similarly, the classicists also were wrong in considering Interest purely as a real phenomenon and ignoring the monetary factors.

(ii) Role of saving has been ignored:

Keynes has ignored the element of saving, which he considered Interest as a reward for parting with liquidity. Professor Jacob Viner has said that "without saving there can be no liquidity to surrender. The rate of interest is the return for saving without liquidity." As such the element of saving cannot be ignored in any theory of Interest.

(iii) The theory has completely failed to explain depressionary situation:

It goes directly contrary to the facts that it presumes to explain. If the theory were right, the rate of interest would be the highest precisely at the bottom of a depression when, due to falling prices, people's preference for liquidity is the strongest. On the contrary the rate of interest is at the bottom during a depression.

(iv) This theory is vague and confusing:

This concept is vague and confusing, because when a man holds funds in the form of time deposits, he will be paid Interest on them; therefore he receives both i.e., Interest cum Liquidity.

3. This theory furnishes narrow explanation of the rate of interest: Keynes' Liquidity-Preference Theory of Interest furnishes too narrow an explanation of the rate of interest. In his view the desire for liquidity—an important factor in determining the rate of interest—arises not only from three main motives (transactions, precautionary and speculative) mentioned by Keynes, but also from several other factors which he has not mentioned in his theory.

4. This theory ignores productivity of capital:

Some critics are of this opinion that Interest is not a reward for parting with liquidity as stressed by Keynes. They have written that Interest is the reward paid to the lender for the productivity of capital. As such, Interest is mostly paid because capital is productive.

5. It focuses attention on short-run ignores the long-period:

The Keynesian theory concentrates only on the short-run and completely ignores the long-period of time. But from capital investment point, it is a long-term rather than a short-term rate of interest which is of course significant.

6. There is fundamental error in Keynesian analysis:

There is confusion in Keynes's analysis about the relation between rate of interest and the amount of money. On the one hand, he says that the demand for money is inversely dependent on the rate of interest and on the other, that the equilibrium rate of Interest is inversely dependent upon the amount of money. Keynes has not made any distinction between the two propositions and often uses them in an identical manner.

In the end it can be said that the Keynesian Theory of Interest is not only indeterminate but is also an inadequate explanation of the determination of the rate of interest. He has emphasised that Interest is purely monetary phenomenon. That is why his theory has been named as "narrow and unrealistic theory.

Can Interest Rate Ever Fall to Zero?

No, the Interest rate, cannot fall to zero, because in the ordinary business of life, I think there is no possibility of the rate of interest ever falling to zero. As we see from the point of view of the demand for loans, zero rate of interest means that marginal net product of capital is nil. As marginal net product is nil, we cannot therefore increase the product further by employing more capital.

We have reached a state in which our productivity has reached the peak. It also means that all our wants have been satisfied. But we cannot conceive of a state of society in which men will have no wants and no desires, so long as these remain, there will always be endless possibilities for employing capital. The rate of interest cannot fall to zero.

Similarly, from the side of supply, a zero rate of interest means that people go on lending without expecting any reward. But there are certain reasons why liquidity-preference will not drop to zero.

As the rate of interest falls, more money will be absorbed to satisfy liquidity- preference on account of the transactions—motive, while the fall in the rate of interest will diminish the loss that one would sustain in keeping larger cash balances in hand.

Hence, "institutional and psychological factors are present which set alimit much above zero to the practical decline in the rate of interest."

7. What do you mean by concept of cost? Explain the relationship between average and marginal cost.

Answer

Introduction

The process of Production involves a number of factors of production. The factors may be fixed and variable. The producers make payments to these factors for their services. These expenses are known as the COSTS OF PRODUCTION.

The cost function shows the relationship between the firms cost and its output.
C = f (Q, P, T….) where C is the cost, Q is the level of output, P is the prices of inputs, T is technology.
Since the cost function combines the information given by the production function with the input prices, the cost functions are called as 'derived functions'. Depending upon the requirements of the firm and upon the time element, cost function can also be 'short run or long run '.

Concept of Cost

The theory of costs revolves around different concepts of cost functions. Since cost functions are derived functions, therefore any change in production function has an impact on the cost.

Private costs:

The process of production involves two types of costs- private and social. Private costs refer to costs incurred on the purchase of inputs or the factors of production and also the implicit costs borne by the producers include the following:

(i) The costs incurred on the factors of production
(ii) Implicit/imputed costs on the resources provided by the producer/entrepreneur
(iii) Normal profits

Social costs:

Besides private costs there are some costs which the producer does not include in his cost of production.

Welfare economics takes account of such costs in addition to the explicit and implicit cost borne by the producer, though such costs are external to the firm. For example, a chemical factory is a great cause of pollution and ill health of the population. The producer is imposing a

social cost on the society. From the society point of view, this cost is very important as society needs to be compensated.

Explicit costs:

Explicit cost is the most widely used concept of costs. It refers to the costs incurred by a firm on the purchase of factors of production. It refers to the expenditure on raw materials, wages, rent, interest payments and so on. It is also known as 'MONEY COSTS' or 'ACCOUNTING COSTS'.

Implicit costs:

The costs that are related with the factor inputs owned by the firm. These costs are also known as 'ECONOMIC COSTS'. The Economist has a wider view of costs in comparison to an accountant. Since such costs do not involve any monetary payments, therefore the Accountant does not take them into account. But if such resources are employed elsewhere, they could have earned returns for themselves. So such resources have an imputed or implicit costs. An entrepreneur who runs his factory on his own land is forgoing the returns he could have got if he had rented it out at market rate. The entrepreneur can work as a manager or a consultant and earn wages.

Opportunity costs:

As we all know that resources are not only scarce but have alternate uses, thus the concept of 'OPPORTUNITY COSTS' arises. Opportunity costs form the basis of the concept of cost. Also known as the Alternative costs. It is the cost linked with the prospects that have been foregone by not putting the firm's resources to the best possible uses. For example, a given amount of resources can produce 1000 kg of rice or 500 kg of sugar and the producer decides to produce one of the option and foregoes the other option. The decision of the producer depends upon many factors like the prices of factors of production, the price of the goods and so on.

. **SHORT- RUN COSTS OF PRODUCTION:**

These broadly comprise of the total, average and marginal costs.

TOTAL COSTS (TC) - It is the sum of total fixed cost and total variable cost TC =TFC+TVC

Total Cost (TC) is the actual cost incurred to produce a given quantity of output.

Total Fixed Costs refer to the sum of all the expenditures by the firm on fixed inputs like land, depreciation of machinery, insurance etc. The payments for such factors are fixed in the short run and independent of the level of output. Even at zero level of production, the firm has to incur fixed costs which remain unchanged at all levels of output. The TFC curve runs parallel to the

X-axis. For e.g. the cost incurred by a firm on fixed machinery, building blocks, remain fixed over a given span of time.

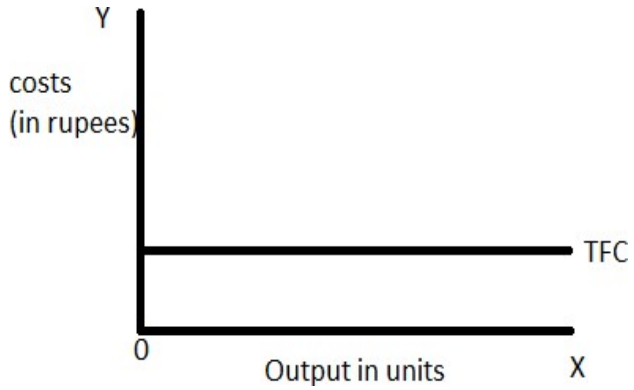


FIGURE I : TOTAL FIXED COST

Fixed cost and sunk costs:

Sunk costs are costs that have been incurred but cannot be retrieved if the firm goes out of business. Fixed costs can be escaped by going out of business. An example of Sunk costs is the expenditure incurred in purchasing a machine which does not have an alternative use when the firm decides to go out of business.

Total Variable Costs - refers to the firm's total expenditure on variable factors. Variable costs vary directly with the change in the level of output. Examples of such costs are costs of labour, raw materials, transportation etc. TVC is zero when output is zero. TVC has an inverse 'S '– shape reflecting the law of variable proportions

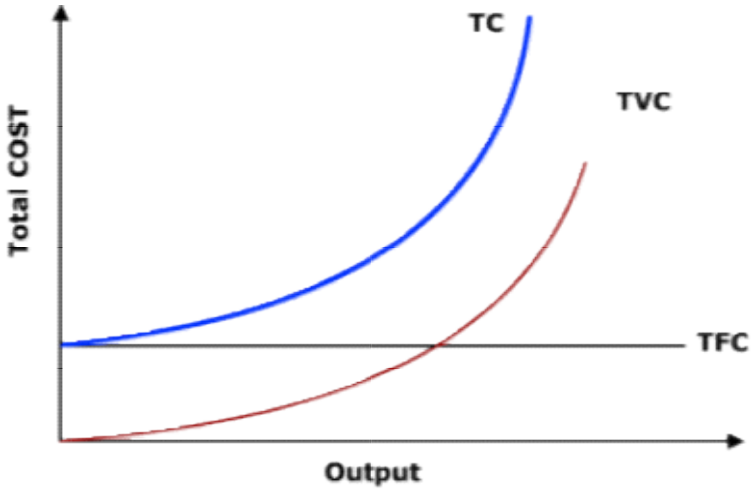


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FIGURE 2: TOTAL COST AND TOTAL VARIABLE COST CURVE

SHORT RUN AVERAGE COSTS

In order to find out the per unit profit, the firm has to make a comparison between the per unit cost or the average costs and the per unit price or simply the price. The Average Cost is the sum of the Average fixed costs (AFC) and the Average variable cost (AVC)

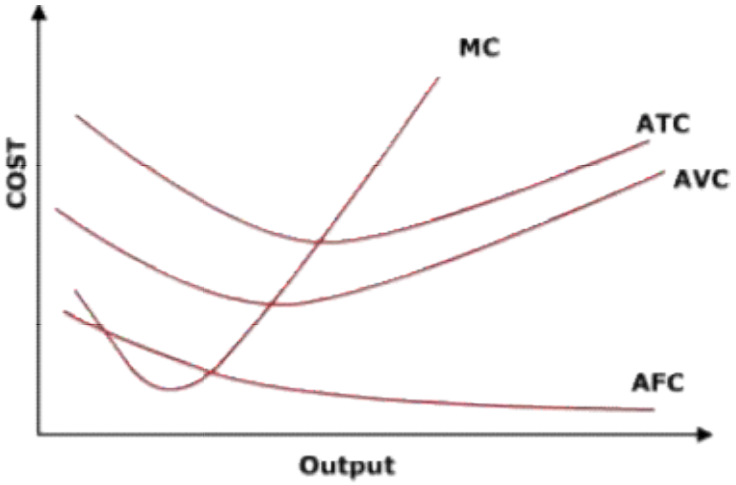


FIGURE 3: MARGINAL COST CURVE, AVERAGE COST CURVE, AVERAGE VARIABLE COST CURVE AND AVERAGE FIXED COST CURVE

AFC is the per unit cost of the fixed factors of production. AFC= TFC/Q .The AFC is a rectangular hyperbola because multiplication of AFC with the quantity of output produced always yields a fixed value. The AFC will never touch the x-axis as the AFC cannot be zero, however large the level of output. Also, AFC curve never touches the Y- axis as TFC is a positive value at zero output and any positive value divided by zero will give an infinite value.

AVC: refers to the per unit cost of the variable factors of production. AVC= TVC/Q, where Q is the level of output
Since the total variable costs (TVC) are determined by the law of variable proportions, the AVC falls initially and rises later. The AVC is a dish –shaped curve

Average costs is the sum of the Average fixed costs and Average variable costs. AC= TC/Q

AC=TFC/Q + TVC /Q AC=AFC + AVC

MARGINAL COST (MC) - refers to the incremental cost and is the addition to the total cost as a result of a unit increase in the output.

MC = ΔTC/ΔQ MC = Δ TVC/ΔQ

Since the fixed cost remains constant in the short-run, the marginal cost is also defined as the increase in total variable cost due to a unit increase in output.
Mathematically, MCn = TCn – TCn-1 , where MCn = marginal cost of producing

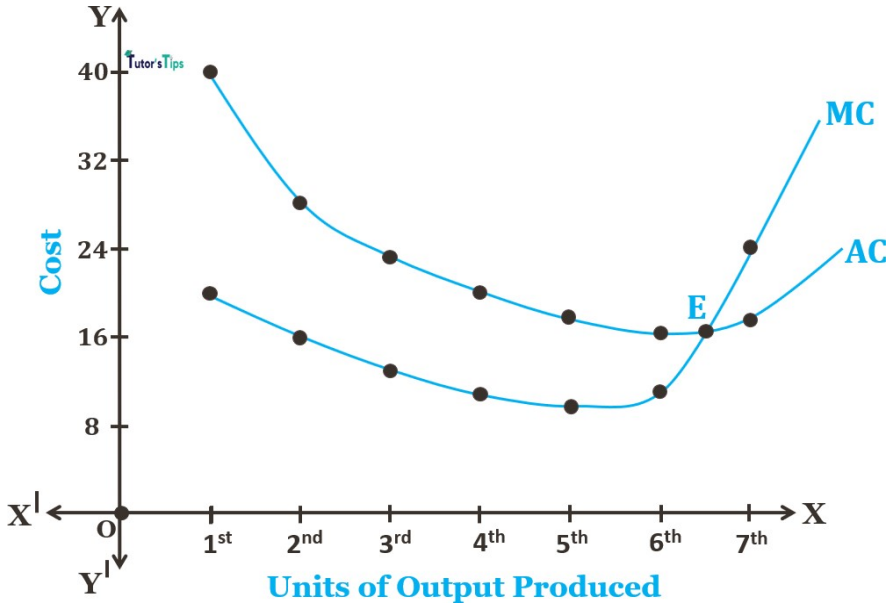
the n^{th} unit TCn= total costs of producing the n units

TCn- 1= total costs of producing 'n-1 'units
\
Marginal costs are the first derivative of the total cost function. MC = ΔTC/ΔQ. Graphically, the marginal cost is the slope of the total cost curve. With an inverse S-shaped of the total cost curve, the MC curve is U- shaped. In the short-run, the AC, AVC and MC curves are U-shaped and AFC is a rectangular hyperbola.

The relationship between AC and MC is as follows:

(1) When MC curve is below the AC curve, the AC falls
(2) When MC curve is above the AC curve, the AC rises
(3) The MC curve intersects the AC curve at its minimum point.

The MC curve intersects AVC curve and AC curve at their minimum points.



RELATIONSHIP BETWEEN AC AND AVC:

The U-shape of AVC and AC curves is due to the law of variable proportions. The behavior of the AC curve depends on the behavior of the AVC and AFC curves. Initially both AFC and AVC are falling leading to the fall in AC. The minimum point of AC occurs to the right of the minimum point of AVC. After reaching its minimum point, it starts rising. However, the AFC continues to fall. The AC reaches its minimum point when the rate of fall of AFC is equal to the

rate of rise of AVC. When the rate of rise in AVC becomes greater than the rate of fall in AFC, the AC starts rising.
The vertical distance between AC and AVC is the AFC, which continues to decline as the output increases.

WHY IS THE LAC CURVE 'U' SHAPED?

In the short run, the shape of the average cost curves essentially reflects the returns to a variable factor as determined by the law of variable proportions. According to this law, as increasing amounts of variable factor are added to the fixed factor, then in the initial stages of production they yield increasing returns but eventually they yield diminishing returns. This explains why per unit costs of production tends to fall initially and ultimately rises up when diminishing returns to the variable factor sets in. Thus, the shape of SRAC curve is 'U' shaped.
The shape of the LAC is however explained by the 'returns to scale'. Returns to scale refers to the change in "optimum cost of production" when the scale of the plant is changed and comprises of-
(a) Constant returns to scale – when the successive plants have the same optimum cost
(ii) Diminishing returns to scale – when the optimum cost increases with an increase in scale
(iii) Increasing returns to scale – when the optimum cost decreases with an increase in scale

The term 'returns to scale signifies two things
(i) it reflects the technical relationship between inputs and output.
(ii) it shows the changes in cost of production due to non-technical reasons also.

These two traits manifest themselves in the form of economies & diseconomies of scale. The 'U' shape of the LAC curve is explained by the economies and diseconomies of scale. Economies means lower per unit cost as output increases and diseconomies is higher per unit cost as output increases.
Economies can be internal and external. Internal economies arise on account of expansion of the firm itself. Internal economies arises due to specialization, choice of more suitable inputs, choice of technology, benefits of large scale production, managerial and supervisory economies and so on. Internal diseconomies arise from exhaustion, difficulties in management, lack of accountability and work culture and so on.
External economies arises from external factors and the firm has no role in it. External economies arises due to expansion of technical knowledge, growth of ancillary industry, development of transport facilities, and availability of banking system and so on. External diseconomies arises due to rise in wages, rise in input prices, pollution and so on.
In case of constant returns to scale, the LAC curve is parallel to the X- axis. The LAC curve is upward sloping in case of diminishing returns to scale and downward sloping in case of increasing returns to scale.

Thus, LAC curve is initially downward sloping, parallel to the X-axis up to a point and then upward sloping. The returns to scale determine the shape of the LAC, given the external economies.

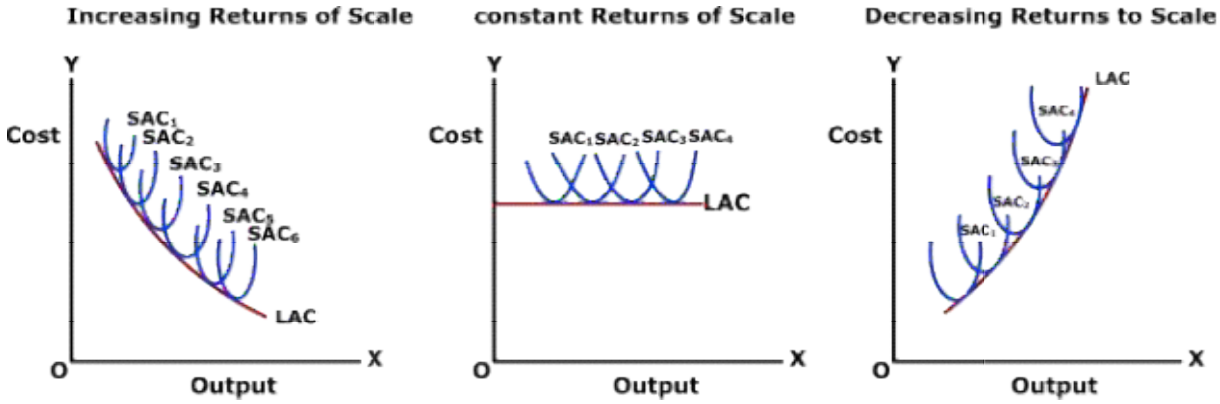


FIGURE 7: DIFFERENT PHASES OF RETURNS TO SCALE

LIMITATIONS:

The traditional theory of costs assumes that each plant is designed to produce optimally a single level of output. Additional production will come at increasing costs. Further, according to the traditional theory, the firm can switch over to a larger plant size only in the long-run and meet the demand at lower costs.

Conclusion

The traditional theory of cost believes in a 'U' shaped Short run and Long run cost curves. In short run the U shaped is explain by the law of variable proportion. On the other hand, the laws of returns to scale explains the 'U' in the long run. Along with this the occurrence of both of economies and diseconomies of scale also explain the shape of long run cost curve.

8. Explain Producers Equilibrium with the help of Graph.

Introduction

In this module we will study the long run production function where it is assumed that the production depends on two inputs namely labour and capital and where both these inputs are variable in nature. We will also see how the changes in the labour and capital lead to a change in the output. But before that it is important to understand the concept of isoquants. Like the indifference curve, isoquant is made from the point of view of producer and it is an important tool for measuring producer equilibrium or the equilibrium of a firm. Let us understand it in detail.

Isoquant: Assumption and Properties

Isoquant means equal quantity. Isoquant is therefore known as the production indifference curve or equal product curve. As the name itself suggests, an isoquant is the locus of all those combinations of inputs (labour and capital) which yield same output. Hence, all the points on an

isoquant represent different combinations of labour and capital which can be used to produce the same quantity of output. Now the question is that how the different combinations of inputs can yield the same output. The answer to this question is that since there are different techniques of production available in the world, thus, the different techniques of production requires different combinations of inputs and thus it is possible to produce the same level of output using different combinations of inputs and techniques of production. The assumptions for deriving an isoquant are as follows:

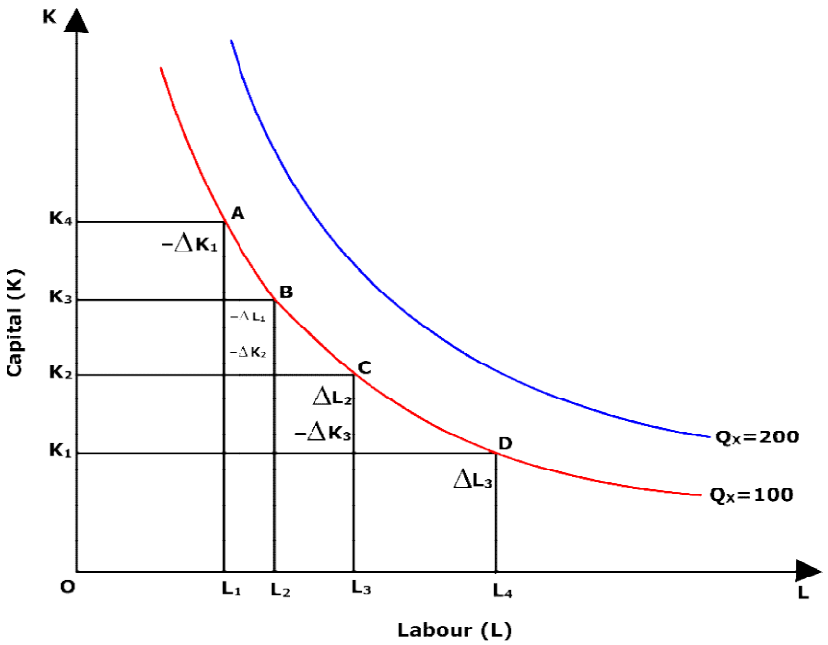
- There are only two inputs/factors (labour and capital) L and K, to produce a commodity X.
- Labour and capital can be substituted for each other up to a certain limit at a diminishing rate of substitution.

The production function is continuous in nature, indicating that both labour and capital are perfectly divisible in nature and can be substituted in any small quantity.

Given these assumptions, isoquant can be derived based on the following way:
Table: Capital–Labour Combinations and Output

Points	Input Combinations K + L	Output
A	OK4 + OL1	=100
B	OK3+ OL2	=100
C	OK2+ OL3	=100
D	OK1+ OL4	=100

As it is quite clear from the above table that different input combinations i.e. point A, B, C, D yield the same level of output, 100. Thus an isoquant should pass through these points. Moreover, as can be seen from these combinations that both inputs are substitute for one another. Now based on all these we can draw the isoquant as shown in the figure 1:



As represented above, IQ1 yields the same level of output i.e. 100 units of X using different combinations of l and k. But it is important to note here that the movement from point A to D indicates an increase in the employment of labour and reduction of capital in the production process. This clearly indicates that labour and capital are perfect substitutes for each other as same quantity of X can be produced by either more of labour/less of capital or by more of capital/less of labour.

A higher isoquant represents higher output produced using more of both labour and capital combinations, as represented by IQ2 in the above diagram which is yielding 200 units of X.

Isoquants vs. Indifference Curves:

An isoquant is analogous to an indifference curve in more than one way. In it, two factors (capital and labour) replace two commodities of consumption. An isoquant shows equal level of product while an indifference curve shows equal level of satisfaction at all points. The properties of isoquants, as we shall study below, are exactly similar to those of indifference curves. However, there are certain differences between isoquants and indifference curves.

Firstly, an indifference curve represents satisfaction which cannot be measured in physical units. In the case of an isoquant the product can be measured in physical units.

Secondly, on an indifference map one can only say that a higher indifference curve gives more satisfaction than a lower one, but it cannot be said how much more or less satisfaction is being derived from one indifference curve as compared to the other,

whereas one can easily tell by how much output is greater on a higher isoquant in comparison with a lower isoquant.

Properties of Isoquant:

- Negative slope of isoquant: The negative slope of the isoquant implies substitution of one input for another so that output remains the same. It means that if one of the inputs is reduced, the other input has to be increased that the total output remains unaffected. Moreover an isoquant is always negative in the economic region, where the substitution between the inputs is technically efficient.
- Convexity: Isoquants are convex to origin because of diminishing marginal rate of technical substitution.
  Here marginal rate of technical substitution implies the rate at which on input is substituted for the other input at different levels without affecting the total output. Symbolically,

$$MRTS = \frac{-\Delta K}{\Delta L} = \text{slope of isoquant}$$

MRTS is always diminishing because of two reasons:

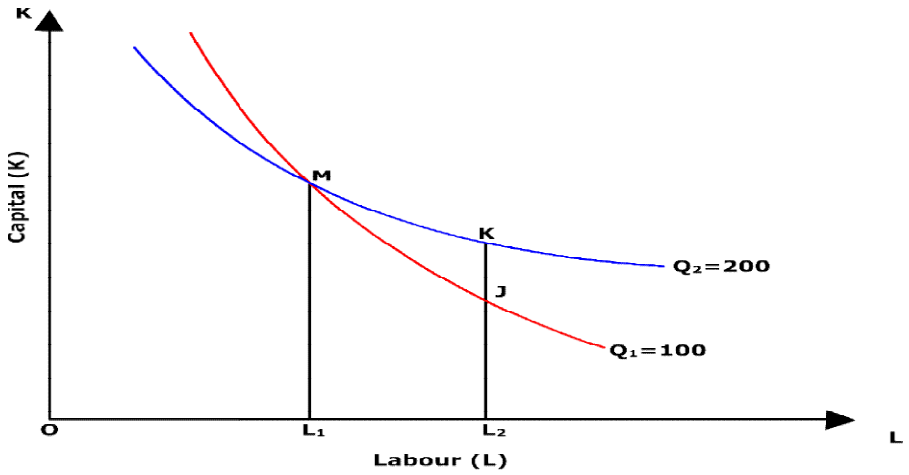
1. No factor is a perfect substitute for another and
2. Inputs are subject to diminishing marginal return.

Hence, if we increase the employment of labour by one unit then it leads to a decrease in the capital and this decrease in the capital reduces with the employment of more and more labour by one more unit, keeping the output level same. Thus, MRTS is diminishing in nature.

Moreover, the isoquants never intersects with each other and are never tangent to each other. Else there will be two possibilities:

- The same combination of inputs can produce two different quantities of the same commodity and
- A given quantity of a commodity can be produced with a smaller as well as a larger input combination.

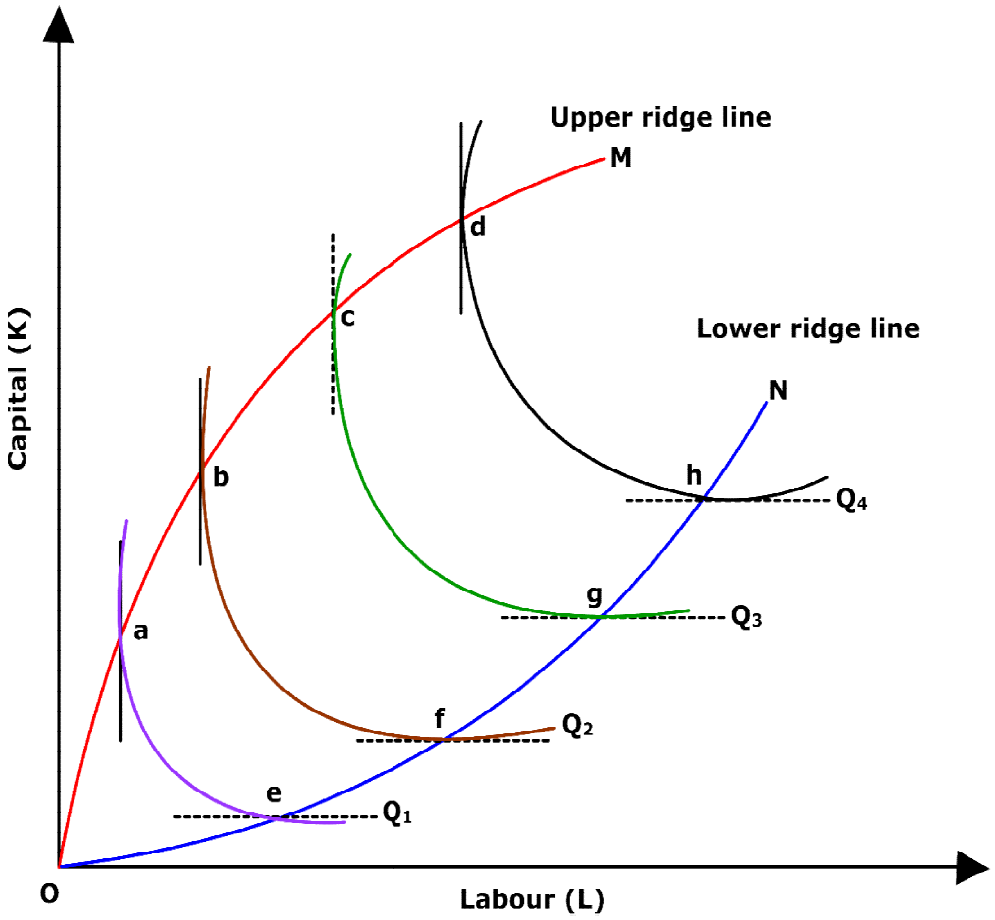
For instance, consider figure 2, if the isoquant are as follows, then:



Additionally, higher isoquant represents a higher level of output produced. This is because any combination on the higher isoquant comprises of larger inputs combinations, which will in turn produce higher level of output.

Isoquant map and Economics Region of Production

Isoquant map is a set of isoquants like IQ1, IQ2, IQ3 and IQ4 in the following figure 3, where each isoquant shows different outputs produced by different combinations of labour and capital.



It is important to note here that, neither an isoquant nor an isoquant map is technically efficient because the MRTS on an isoquant decreases and reaches to zero. This means that zero MRTS marks a limit to which one input can be substituted for another and it also determines the minimum quantity of an input required for the production of an output. Beyond this point, it becomes important to employ both inputs for the production of the output (as the substitution between inputs does not take place anymore beyond this point). Such a point, where MRTS is equal to zero, can be determined by drawing a tangent on the Isoquant such that it is parallel to both the axes. Here in the above diagram it is shown by the dash lines. Hence, points a, b, c, d, e, f, g, h are the points where MRTS
= 0 and one input cannot be substituted for another anymore, i.e. the minimum amount of one input required for the production of the other.

When we join points a, b, c, d, we get an upper ridge line, OM and when we join points e, f, g, h then we get a lower ridge line, ON, as shown above. The upper ridge lines shows that the marginal productivity of capital is zero on OM whereas the lower ridge line shows that the marginal productivity of labour is zero on ON. The area outside these ridge lines are the technically inefficient area where production cannot take place.

Hence, the area which is technically efficient and where the production can take place is the

area between the ridges lines which is also known as the economic region. Thus, any production technique or any combination of labour and capital within this economic region is technically efficient to produce output.

Elasticity of Technical Substitution

MRTS is the slope of an isoquant and depicts the rate at which one input is substituted for the other but it does not determine the degree of substitution between these inputs.

Elasticity of technical substitution is the only measure which determines the substitutability of factors/inputs.

Elasticity of technical substitution is defines as the percentage change in the capital labour ratio (K/L) divided by the percentage change in the MRTS. Symbolically,

$$\sigma = \frac{\text{Percentage change in } K/L}{\text{Percentage change in } MRTS}$$

Or,

$$\sigma = \frac{\partial(K/L)/(K/L)}{\partial(MRTS)/(MRTS)}$$

Since throughout an isoquant, both K/L and MRTS moves in the same direction, therefore the value of σ is always positive. Moreover, the value of elasticity of technical substitution depends on the curvature of the isoquants. It varies between 0 and ∞, depending on the nature of the production function. Production function determines the curvature of the various kinds of isoquants.

The Law of Returns to Scale

When both the inputs become variable and the change in both the inputs affect the change in the output and correspondingly the size of the firm changes, then it is known as the law of returns to scale. It is a long run phenomenon where the supply of both labour and capital is elastic.

When both labour and capital are increased proportionately or simultaneously, then there are possibly three ways in which output can be increased.

- Output may increase more than proportionately to an increase in inputs
- Output may increase proportionately to an increase in inputs
- Output may increase less than proportionately to an increase in inputs

Correspondingly, there are three type of returns to scale.

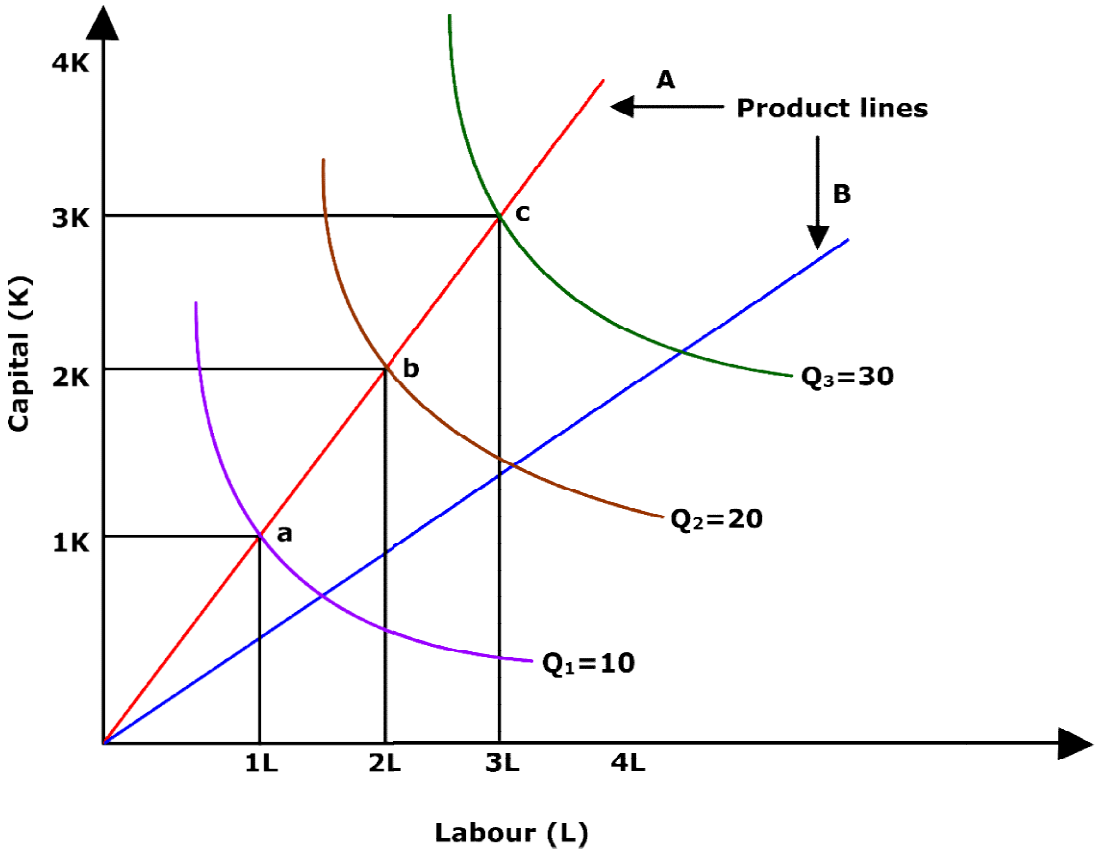
1. When Output increases more than proportionately to an increase in inputs then it is known as increasing returns to scale. For example, if labour and capital both increase by 50% and correspondingly the output increases by more than 50%, then it is known as the increasing returns to scale. Consider figure 4:

As has been shown in the above diagram, 10 units of output (depicted by IQ1) is produced using one unit of labour and capital, but when the labour and capital were doubled, i.e. to 2 units each, then the output (depicted by IQ2) increased more than double, i.e. to 25 units. Similarly, when the labour and capital were again increased by one more units, then the output (depicted by IQ3) was increased to 50 instead of 30 units.

Increasing returns of scale happens because of the economies of scale. Following are the different type of economies of scale which lead to increasing returns of scale in a production process:

- Technical and managerial indivisibility: Since it is difficult to divide any machine or technique in fractions, therefore there is always a minimum amount of employment, machine and technique which are required for the production and which are indivisible in nature. When these inputs are increased then they increased the production exponentially and hence increasing returns to scale takes place.
- Higher degree of specialization: When the labour is specialized for a particular production technique/ process then its productivity increases, leading to an increase in the output per labour. This leads to increasing returns to scale.
- Dimensional relations: For example, when the size of a room (15' × 10' = 150 sq. ft.) is doubled to 30' × 20', the area of the room is more than doubled, i.e., 30' × 20' = 600 sq. ft. When diameter of a pipe is doubled, the flow of water is more than doubled. Following this dimensional relationship, when the labour and capital are doubled, the output is more than doubled over some level of output.

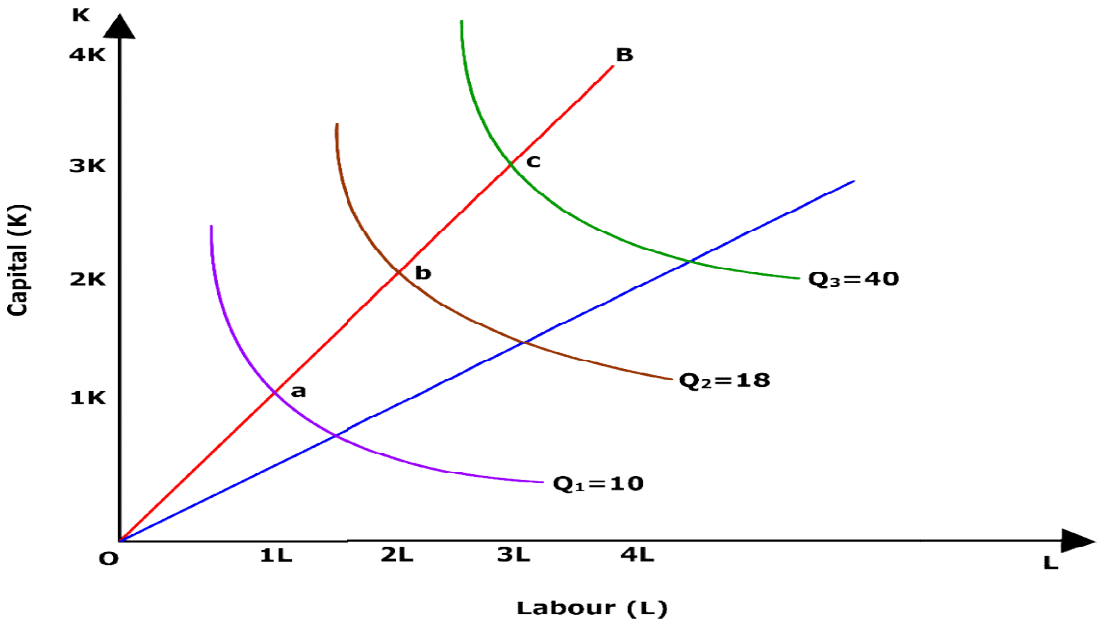
2. When Output increases proportionately to an increase in inputs then it is known as constant returns to scale. For example, if labour and capital both increase by 50% and correspondingly the output also increases by 50%, then it is known as constant returns to scale. Consider figure 5:



As has been shown in the above diagram, 10 units of output (depicted by IQ1) is produced using one unit of labour and capital, but when the labour and capital were doubled, i.e. to 2 units each, then the output (depicted by IQ2) also doubled, i.e. to 20 units. Similarly, when the labour and capital were again increased by one more units, then the output (depicted by IQ3) was increased to 30.

The constant returns to scale happen because there is a limit on economies of scale. When economies of scale disappear and diseconomies are yet to begin, the returns to scale become constant. The diseconomies arise mainly because of decreasing efficiency of management and scarcity of certain inputs. Moreover, constant returns of scale appear when the factors of production are perfectly homogeneous, like the Cobb- Douglas production function.

3. When Output increases less than proportionately to an increase in inputs then it is known as decreasing returns to scale. For example, if labour and capital both increase by 50% and correspondingly the output increases by 30%, then it is known as decreasing returns to scale. Consider figure 6:



As has been shown in the above diagram, 10 units of output (depicted by IQ1) is produced using one unit of labour and capital, but when the labour and capital were doubled, i.e. to 2 units each, then the output (depicted by IQ2) did not doubled, i.e. it increases to 18 units instead of 20 units and so on.

Decreasing returns to scale happens because of diseconomies of scale. Mainly, when there are managerial diseconomies, and the size of the firm expands, managerial efficiency decreases causing decrease in the rate of increase in output. Moreover, when the natural resources exhaust in nature then also decreasing returns of scale appears. For instance, if the coal mines are doubled then it may be possible that the coal production would not be doubles rather it just increases by less than double, because of the limitedness of the coal deposits or difficult accessibility to coal deposits.

Conclusion

It can be concluded that both the returns to a variable factor and returns to scale are compatible because returns to a variable factor prevails in the short run where the production can be increased by increasing the variable input only, and the capital is fixed in nature, on the other hand, returns to scale is a long run phenomenon as all the inputs becomes elastic and variable in long run and therefore production can be increased in the long run by increasing all the inputs. Moreover, depending upon the type of production function, both these laws can also exist simultaneously, but that is not a usual phenomenon

9. Define Production Function. Explain the low of variable Proportion.

Introduction

In this module we will shift from the theory of consumption to the theory of production and will evaluate how the production function is used as a tool in the economic activity. Production is the process of converting the inputs or raw materials into the outputs or the final goods. The rate at which the inputs can be converted into output is governed by the laws of production. Laws of production are also known as theory of production or laws of returns. Theory of production explains the relationship between the inputs and the outputs and how the change in the inputs leads to a change in the outputs. There are various inputs which are required in the production but for simplicity economists have taken only four factors of production namely, land, labour, capital and entrepreneur, where each factor of production renders its services in order to produce the final good and in return it is paid factor payment. Since nothing comes free, therefore, factors of production also have a cost and that cost is known as factor payment, where land earns rent, labour get wages, capital earns interest and entrepreneur gets profit.
Hence, the production of a commodity involves cost of production, which is in turn the main component of the supply of the commodity. Moreover, cost of production shows cost – output relationship i.e. how the change in the output leads to a change in the cost of production.

Production Function

Production function shows the relationship between the output and inputs. In other words it shows that output is a function of inputs (land, labour, capital and entrepreneur) and how the change in inputs affects the change in the output.

Mathematically; $Q = f(LA, L, K, E)$

This is known as production function, where LA is land, L is labour, K is capital and E is entrepreneur.

Moreover, the production function also represents the technology of a firm, of an industry or of the economy as a whole. A production function may take the form of a schedule or table, a graphed line or curve, an algebraic equation or a mathematical model. But each of these forms of a production function can be converted into its other forms.

However, for the simplicity purpose, the economists have modified the above production function into:

$$Q = f(L, K)$$

Where the quantity of goods produced i.e. production depends on labour and capital.

Short run and Long run Production Function

In short run some factors of production are fixed and some are variable, whereas in long run all factors are variable. Thus, a short run production function has inelastic capital i.e., the

capital is fixed in short run and elastic labour i.e., labour is variable. On other words, output can be increased by increasing labour only because capital is fixed. On the other hand, long run production function all the factors of production are variable i.e., output can be increased in long run by increasing either one or both of labour and capital. Hence, in long run the supply of both labour and capital is elastic in nature. Therefore, the short run production is also known as single variable production function and it is termed as: $Q= f(\bar{K}, L)$

Here a bar on K represents that capital is fixed and the producer cannot infuse more capital in the production in short run, whereas labour, L, is variable and changeable.
Hence, the laws of production under short-run conditions is called 'the law of variable proportions', the 'law of returns to a variable input' and the 'law of diminishing marginal returns'; whereas, in the long-run, it is known as the 'law of returns to scale'.

Assumption of Production Function

- Both inputs and output are divisible.
- Only two factors of production, i.e., labour and capital.
- Labour and capital are imperfect substitutes.
- Constant technology i.e. technology is given.
- Inelastic supply of the fixed factors in the short run.
- Elastic supply of the factors in the long run.
- Producer is rational.

Law of Return to a Variable Proportion (Short run low of production)

Assumptions of law of variable proportions:

- Technology is given
- Homogeneous labour
- Capital is fixed/constant

The law of returns to a variable proportions states that when output is increased by using only one variable input, as the all other inputs is fixed, then initially the output increases as an increasing rate, then at a constant rate and finally it keep on increasing at a diminishing rate. In other words, if more and more of labour is used then the output initially increases at an increasing rate, when more labour is again used then the output increases at a constant rate and then when again the labour is increased then the output increases but it increases at a diminishing rate. The ultimate law is that the marginal increase in total output eventually decreases when additional units of a variable factor are applied to a given quantity of fixed factors. Accordingly, there are three laws of returns to variable inputs (i) the law of increasing returns (ii) the law of constant returns and (iii) the law of diminishing returns.

In order to understand this law it is important to understand few concepts first.

Total product (TPL) is defined as the total output produced with the help of labour.

Average product (APL) is defined as total product divided by the number of labour used in the production process.

Marginal product (MPL) is defined as the additional output produced by employing / increasing one more labour. That is, TPL - TPL-1 = MPL.

Hence, given the number of workers and total product, average product and marginal product can be derived in the following way:

Table: Total, Marginal and Average Products

Number of Workers (L)	Total Product (TP_L) (tonnes)	Marginal Product* (MP_L)	Average Product** (AP_L)	Stage of Returns
(1)	(2)	(3)	(4)	(5)
1	24	24	24	I Increasing returns
2	72	48	36	
3	138	66	46	
4	216	78	54	
5	300	84	60	
6	384	84	64	
7	462	78	66	II Diminishing returns
8	528	66	66	
9	576	48	64	
10	600	24	60	
11	594	–6	54	III Negative returns
12	552	–42	46	

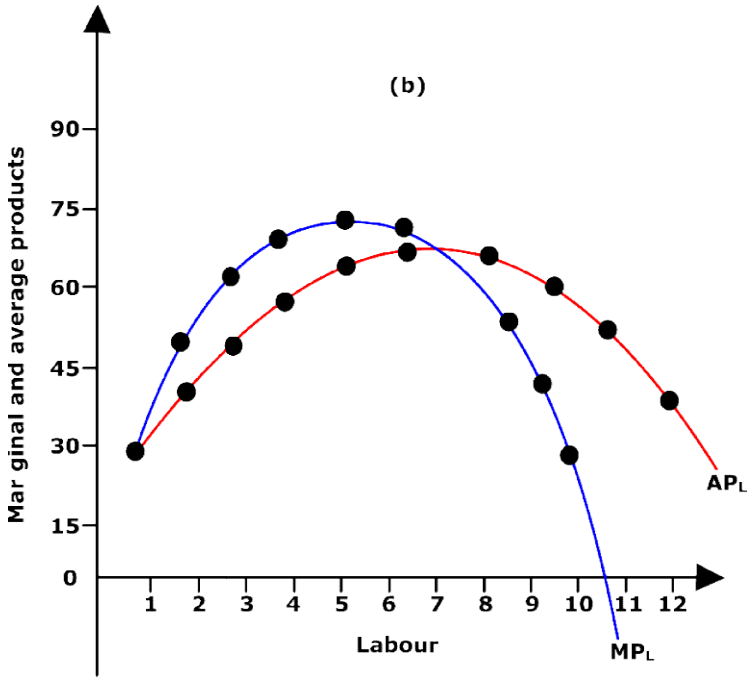
Three Stage in the low of diminishing returns

As represented in the above table, in stage I, total product increases as an increasing rate as labour increases. This is indicated by the rising marginal product until the employment of the fifth worker; after that, the fifth and sixth labour represents a constant return to a variable factor.

In stage II, total product is still increasing but this time it is increasing at a diminishing rate which is indicated by a falling marginal product. This stage is hence known as the stage of diminishing returns to a variable factor, as in this stage when more of labour is used, the total product increases at a diminishing rate. In this stage the total product also reaches to its maximum, as in the table above, total product reaches to its maximum at 600 at tenth labour, but when the labour is increased from tenth to eleventh and twelfth then the total product started falling and correspondingly marginal product becomes negative. This is known as stage III of negative returns.

Hence the three stages represents that the total product initially increases at an increasing rate and marginal product also increases but when more labour is used then it start increasing at a diminishing rate and marginal product start falling but when the total product reaches to its maximum and then when the labour is still increased then the total product do not increase rather it falls and correspondingly the marginal product becomes negative. This can be

represented in the following diagram:



The above diagram can be summarized in the following points:

- Increasing returns: Both TP and MP increases at an increasing rate.
- Decreasing / diminishing returns: TP increases at a diminishing rate and MP starts falling.

- Negative returns: TP reaches to its maximum and then falls and correspondingly MP reaches zero and then becomes negative.

Relationship between AP and MP:

- Increasing returns: Both AP and MP increases but MP increases at an increasing rate as compare to AP and reaches to its maximum.
- Decreasing / diminishing returns: MP starts falling whereas AP increases at a diminishing rate and reaches to its maximum.
- Negative returns: MP touches the x- axis i.e. becomes zero and goes to negative but AP continues to fall.

In other words, the features of the three stages of production may be described as follows:

- **Stage I**: The marginal product of the variable factor (labour) is higher than its average product, i.e., $MP_L > AP_L$
- **Stage II**: The marginal product of the variable factor (labour) falls below its average product, i.e., in Stage II, $MP_L < AP_L$, but both remaining greater than zero.
- **Stage III**: The marginal product of the variable factor (labour) turns negative, while average product remains greater than zero.

Factors behind the low of returns to a variable factor

One of the main factors behind the increasing returns to a variable factor is the indivisibility if the fixed factor capital. It is because when more and more of labour is used with a given amount of capital then the utilization of capital increases along with the increase in the productivity of labour. On the other hand, if the labour is less than the optimum number, then it results into underutilization of capital and lower productivity of labour because since the capital is indivisible so each unit of capital requires an optimum number of labours.
Another reason for the increase in labour productivity is that employment of additional workers gives the advantages of division of labour, until optimum capital–labour combination is reached.

However, once the optimum capital–labour ratio is reached, employment of additional workers amounts to substitution of capital with labour. But, technically, one factor can substitute another only to a limited extent. Hence, to replace the same amount of capital, more and more workers will have to be employed because per worker marginal productivity decreases and this leads to diminishing returns to labour.

Conclusion

The law of diminishing returns is often observed in various production activities but may not apply universally to all kinds of productive activities. It may operate at early stage of production in some productive activities, whereas in other, its operation may be delayed and in some others, it may not appear at all. This law is generally found to be operational in agricultural production than in industrial production because in agriculture, natural factors play a predominant role as the supply of land is generally fixed, whereas man- made factors play the major role in industrial production. Despite the limitations of the law, if increasing units of an input are applied to the fixed factors, the marginal returns to the variable input decrease eventually.

10. Critically Examine the Returns to Scale

Answer:

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- Producer is rational.

The law of returns to scale

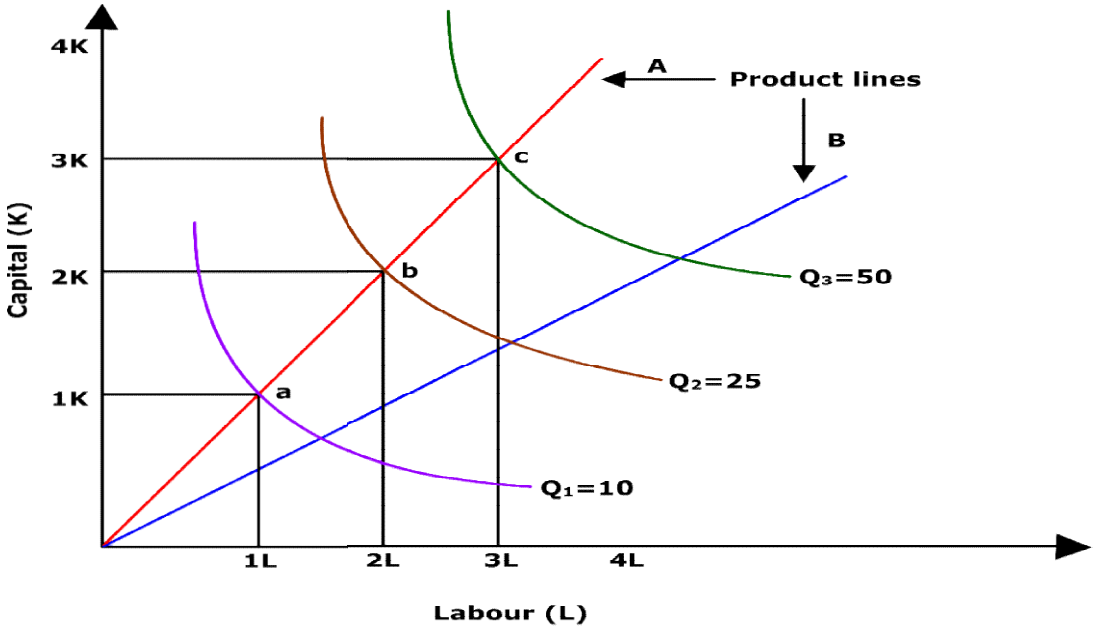
When both the inputs become variable and the change in both the inputs affect the change in the output and correspondingly the size of the firm changes, then it is known as the law of returns to scale. It is a long run phenomenon where the supply of both labour and capital is elastic.

When both labour and capital are increased proportionately or simultaneously, then there are possibly three ways in which output can be increased.

- Output may increase more than proportionately to an increase in inputs
- Output may increase proportionately to an increase in inputs
- Output may increase less than proportionately to an increase in inputs

Correspondingly, there are three types of returns to scale.

1. When Output increases more than proportionately to an increase in inputs then it is known as increasing returns to scale. For example, if labour and capital both increase by 50% and correspondingly the output increases by more than 50%, then it is known as the increasing returns to scale. Consider figure 4:



As has been shown in the above diagram, 10 units of output (depicted by IQ1) is produced using one unit of labour and capital, but when the labour and capital were doubled, i.e. to 2 units each, then the output (depicted by IQ2) increased more than

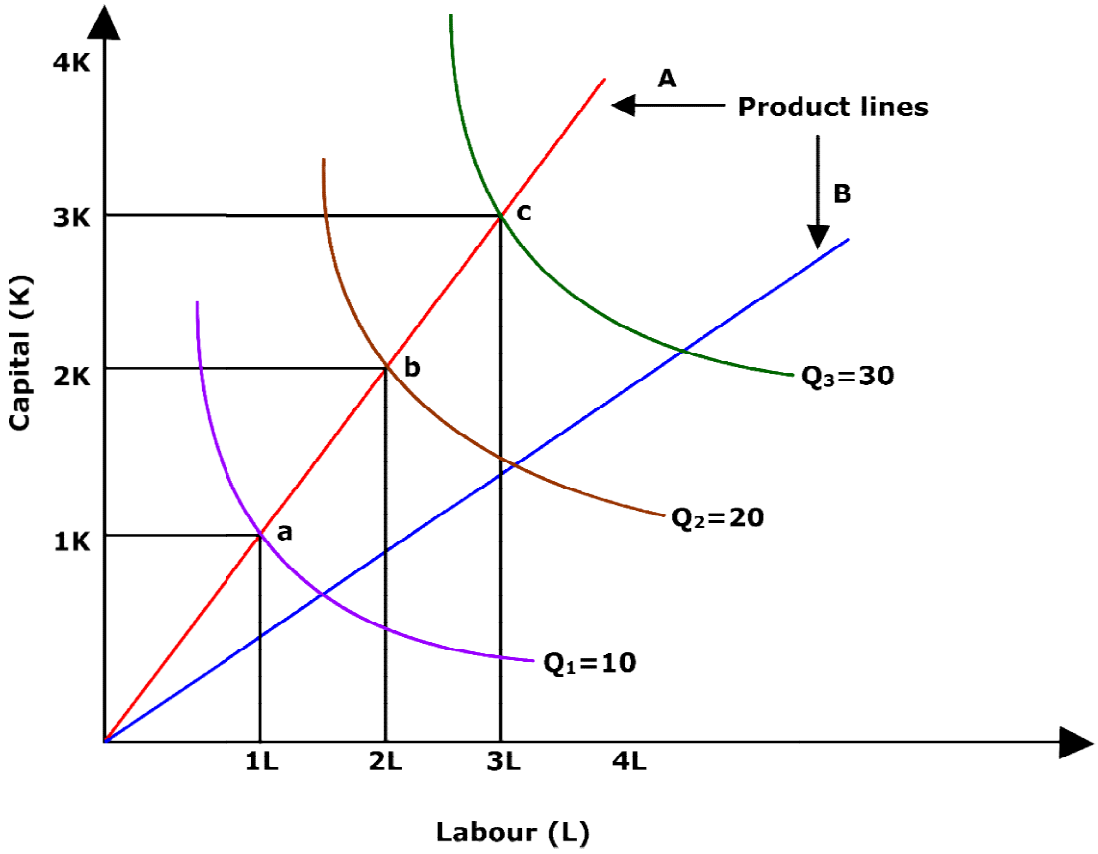
double, i.e. to 25 units. Similarly, when the labour and capital were again increased by one more units, then the output (depicted by IQ3) was increased to 50 instead of 30 units.

Increasing returns of scale happens because of the economies of scale. Following are the different type of economies of scale which lead to increasing returns of scale in a production process:

- Technical and managerial indivisibility: Since it is difficult to divide any machine or technique in fractions, therefore there is always a minimum amounts of employment, machine and technique which are required for the production and which are indivisible in nature. When these inputs are increased then they increased the production exponentially and hence increasing returns to scale takes place.
- Higher degree of specialization: When the labour is specialized for a particular production technique/ process then its productivity increases, leading to an increase in the output per labour. This leads to increasing returns to scale.
- Dimensional relations: For example, when the size of a room (15' × 10' = 150 sq. ft.) is doubled to 30' × 20', the area of the room is more than doubled, i.e., 30' × 20' = 600 sq. ft. When diameter of a pipe is doubled, the flow of water is more than doubled. Following this dimensional relationship, when the labour and capital are doubled, the output is more than doubled over some level of output.

2. When Output increases proportionately to an increase in inputs then it is known as constant returns to scale. For example, if labour and capital both increase by 50% and correspondingly the output also increases by 50%, then it is known as constant returns to scale. Consider

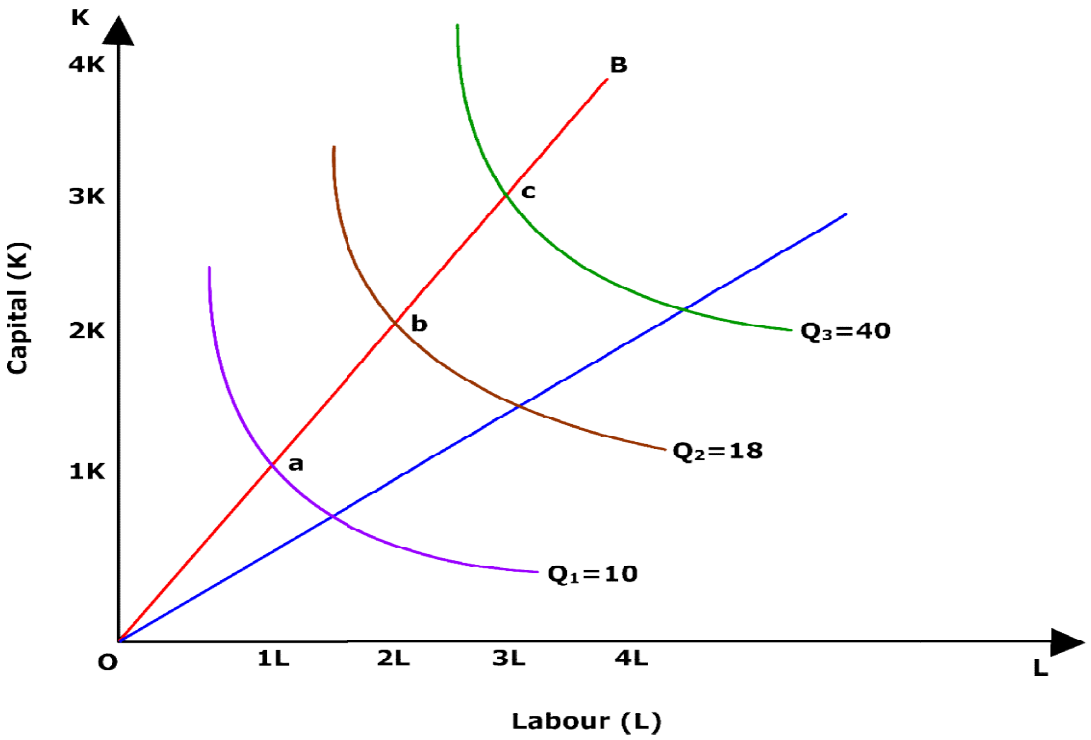
figure 5:



As has been shown in the above diagram, 10 units of output (depicted by IQ1) is produced using one unit of labour and capital, but when the labour and capital were doubled, i.e. to 2 units each, then the output (depicted by IQ2) also doubled, i.e. to 20 units. Similarly, when the labour and capital were again increased by one more units, then the output (depicted by IQ3) was increased to 30.

The constant returns to scale happen because there is a limit on economies of scale. When economies of scale disappear and diseconomies are yet to begin, the returns to scale become constant. The diseconomies arise mainly because of decreasing efficiency of management and scarcity of certain inputs. Moreover, constant returns of scale appear when the factors of production are perfectly homogeneous, like the Cobb- Douglas production function.

3. When Output increases less than proportionately to an increase in inputs then it is known as decreasing returns to scale. For example, if labour and capital both increase by 50% and correspondingly the output increases by 30%, then it is known as decreasing returns to scale. Consider figure 6:



As has been shown in the above diagram, 10 units of output (depicted by IQ1) is produced using one unit of labour and capital, but when the labour and capital were doubled, i.e. to 2 units each, then the output (depicted by IQ2) did not doubled, i.e. it increases to 18 units instead of 20 units and so on.

Decreasing returns to scale happens because of diseconomies of scale. Mainly, when there are managerial diseconomies, and the size of the firm expands, managerial efficiency decreases causing decrease in the rate of increase in output. Moreover when the natural resources exhaust in nature then also decreasing returns of scale appears. For instance, if the coal mines are doubled then it may be possible that the coal production would not be doubles rather it just increases by less than double, because of the limitedness of the coal deposits or difficult accessibility to coal deposits.

Production Function and Returns to Scale

Suppose the production function is given by:

$$Q= f (K, L)$$

Now, let us assume a Cobb- Douglas production function which is homogeneous of degree one, which in turn means that, when all inputs are increased in the same proportion and this proportion can be factored out. For instance, if all inputs are increased in a proportion by 'h' and if output will also increase by 'h', then the production function is said to be of homogeneous of degree one. This is also known as linear homogeneous production function and it implies constant returns to scale. Such a function can be expressed as follows:

$$hQ= f(hK, hL)\ hQ= hf(K, L)$$

However, if all inputs are increased in the same proportion by ‘h’ but the output do not increase by that proportion then in such a case a production function may be written as:

$$kQ= f(hK, hL)$$

Where, ‘k’ denotes the k- times increase in output as a result of h- times increase in both the inputs.

Hence, ‘k’ may be greater than ‘h’, or equal to ‘h’ or less than ‘h’. If

- k>h then it represents an increasing returns to scale
- k=h then it represents constant returns to scale
- k<h then it represents decreasing returns to scale

Conclusion

It can be concluded that both the returns to a variable factor and returns to scale are compatible because returns to a variable factor prevails in the short run where the production can be increased by increasing the variable input only, and the capital is fixed in nature, on the other hand, returns to scale is a long run phenomenon as all the inputs becomes elastic and variable in long run and therefore production can be increased in the long run by increasing all the inputs. Moreover, depending upon the type of production function, both these laws can also exist simultaneously, but that is not a usual phenomenon.