**Dr.SNS Rajalakshmi College of Arts & Science (Autonomous)**

**Department of Commerce with Information Technology**

**21UCY302: MANAGERIAL ECONOMICS**

**Unit II: Supply and cost functions**

Supply meaning and determinants - Production decisions - production functions - Isoquants, Expansion path - Cobb-Douglas function. Cost concepts - cost - output relationship - Economies and diseconomies of scale – cost functions.

**Meaning of supply:**

Supply means the commodity offered for sale at a price. Supply is the willingness and ability of producers to produce for sale various amounts of goods and services at each specific price in a set of possible prices during a specified period of time.

**Definition of Supply:**

According to Dooley, “The law of supply states that the higher the price, the greater the quantity supplied or the lower the price the smaller the quantity supplied.”

**Exceptions to the law of supply:**

Though the case of upward sloping curve is true in all cases, it has its limitations.

The law of supply does not apply to rare articles like ancient coins etc. their supply being fixed cannot change with change in price.

The law of supply does not hold good to speculators. They sell less and more at higher and lower prices respectively in anticipation of profit.

Seller will be ready to sell in case of perishable goods.

In case seller is hard pressed for cash he will like to sell his stock at the lower price. He may also lower the price further to attract the purchases.

**Factors determining supply:**

**1. Number of firms or sellers:**

Supply in a market depends on the number of firms or sellers producing and selling in the market. When the sellers are few, the supply will be small, if they are in large numbers, the supply will also be a large.

**2. State of Technology:** It is assumed that the level of technology of production remains constant. Generally, any improvement in technology will reduce the cost of production and consequently there will be an increase in supply.

**3. Cost of production:** The cost of production is an important item affecting the supply and so this is assumed to remain constant wages, rate of interest, prices of machinery and equipment, raw materials etc. remain unchanged. If the cost of production gets reduced, the supply curve will shift down.

**4. Prices of related goods:** It is assumed that supply of a commodity depends purely on its price and not on the prices of other commodities related to it. If prices of related products fall, the firm producing many goods may increase the supply of a particular product even though its price has not gone up.

**5. Price Expectations:** It is assumed that the seller sells the commodity or supplies commodity on the basis of the prevailing prices and he does not expect any change in prices of the commodity.

**6. Natural factors:** It is assumed that there is no change in natural factor as the supply is governed by natural factors like rain drought etc. This is so in agro industries.

**7. Labour trouble:** It is assumed that there is no labour trouble and consequent strike or lockout reducing the quantity of supply.

**8. Change in Government Policy:** Any change in government policy will affect the supply. A fresh tax or levy of excise duty on a commodity will affect the price of the commodity and as a result the supply will get affected. Hence it is assumed that there is no change in the government policy.

**Production Function:**

The production function of an enterprise is an association between inputs utilised and output manufactured by an enterprise. For various quantities of inputs utilised, it gives the utmost quantity of output that can be manufactured. The inputs that an enterprise utilises in the production procedure are called as factors of production.

**Definition production function**.

The production function expresses a functional relationship between physical inputs and physical outputs of a firm at any particular time period. Mathematically production function can be written as,



Where Q stands for the quantity of output and A, B, C, D are the various input factor such as land, labour, capital and organisation. Hence output becomes the dependent variable and inputs are the independent variables.

In order to express the quantitative relationship between inputs and output, production function has to be expressed in a precise mathematical equation which shows that there is a constant relationship between application of input and the amount of output produced.

**Assumptions of production functions:**

* The production function is related to a particular period of time.
* There is no change in technology.
* The produces is using the best technique available.
* The factors of production are divisible.
* Production function can be fitted to short run or to a long run.

**Short run and long run production function:**

**1. Short run production function:**

The short run production function is related to the situation where some input factors [e.g. plant, equipment and land) are fixed and the quantities of one input factor (e.g. labour) are varied. The short run corresponds to the period of time in which one or more of the inputs are fixed. This input-output relationship gives rise to the operation of the law of variable proportion.

**2. Long run production function:**

The term long run is defined as a sufficiently long period of time in which all factors of production are varied. In the long period, there is no distinction between short period and long periods. Adjustments among the various inputs can be easily made in the long period.

The size of the plant, technology etc., which are fixed in short period can be varied in the long period. In the long run, the firm operations with the changing scale of output and the whole programme can be manipulated.

**Uses of production function.**

* The production function explains how the maximum quantity of output can be produced.
* It also states the minimum quantities of inputs required to produce a given quantity of output.
* The knowledge of production function is very much indispensable to managers.
* The iso-quant curves are necessary to choose the optimum factor combination.
* The iso-cost line plays an important role in determining the combination of factor inputs.
* The knowledge of production function is very much useful to business economics. It helps in better management of the industry, better sales and better profitability.

**Meaning of Isoquants:**

The Greek word**‘iso’** means **‘equal’** or **‘same’** and **‘quant’** is the short form of quantity. Thus an isoquant is a curve along which output is the same. For the sake of analysis, we are assuming that a producer employs two inputs—labour (L) and capital (K).

**Properties of an Isoquant:**

i. An isoquant normally slopes downward from left to right. Or it has a negative slope.

ii. An isoquant is convex to the origin.

iii. No two isoquants can intersect each other

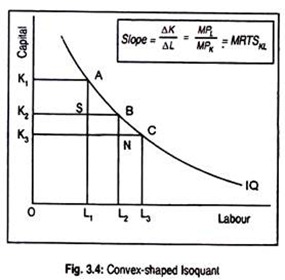
**i. An Isoquant is negatively Sloped:**

As we move along an isoquant the amount of one input must increase while that of another must decline. If both labour and capital yield positive marginal products, then increasing the number of labour while holding the number of capital constant would increase output.

So, if we want to maintain a constant level of output when the quantity of labour (or capital) is increased, the quantity of capital (or labour) must decrease. This implies a negatively sloped isoquant. In other words, a downward slope suggests that both the inputs have positive marginal products.

**ii. An Isoquant is Convex to the Origin:**

Isoquant analysis assumes that the two inputs needed for producing a given level of output are substitutes, though not perfect substitutes. Thus, an isoquant is convex to the origin because of the diminishing **“marginal rate of technical substitution between labour and capital”** (MRTSK for Lor MRTSL for K)—a concept analogous to MRSXYof an indifference curve. The rate at which one input is substituted for another is called the MRTS.



The rate at which labour is substituted for capital (i.e., MRTS) is:

OK1 – OK2 /OL1 – OL2 =AS/SB

**iii. Isoquants cannot Intersect:**

There is necessity to prove this property here as we did so in connection with the consumer indifference curve. The same logic can be applied here.

**COBB – DOUGLAS PRODUCTION FUNCTION:**

Production function of the linear homogeneous type which has been very popular is that invented by Knut Wicksell and first tested by C.W.Cobb and P.K.Douglas in 1928. This famous statistical production function is known as Cobb-Douglas production function. Originally the function is applied on the empirical supply of the American manufacturing industry. Output in this function is that manufacturing production. Cobb and Douglas production function takes the following mathematical form.

Y = (A Kα L1-α  )

Where Y = output, K = capital L = Labour A, α – Positive constants.

**Assumptions:**

1. The function assumes that output is the function of two factors, viz. capital and labour.

2. It is a linear homogeneous production function of the first degree.

3. The function assumes that the logarithm of the total output.

4. There is a constant return to scale.

5. All inputs are homogeneous.

6. There is perfect competition.

7. There is no change in technology.

**Properties:-**

* The cobb-douglas production function is homogeneous of degree one. Suppose the quantities of labour and capital are increased in equal proportions λ. Then the output will also increase in the same proportion λ.
* The constant α and 1- α in the C – D production function are the output elasticity of capital and labour respectively.
* If one of the inputs is zero, output will also be zero,

Y= A Kα L1-α

Y= A (o) α L1-α = 0

* If K is zero, naturally other input is held to be zero and the consequent output will be zero.
* The value of α + (1 – α) is the returns to scale.
* If α + (1 – α) = 1. Then constant returns to scale will operate.
* If α + 1 – α >1, then increasing returns to scale will operate.
* If α + 1 – α <1, then decreasing returns to scale will operate.
* Elasticity of substitution in the Cobb-douglas production function is equal to one.
* Expansion path generated by the Cobb-Douglas production function is linear and passes through the origin.
* Cobb-Douglas production function satisfies Euler’s theorem.
* Α represents the capital share and 1-α represents labour share of the output.
* Marginal product of capital is  and the marginal product of labour is 
* Cobb-Douglas production function becomes linear in logarithm.



* Taking Log on both sides log Y= Log A + α log K + (1- α) Log L

Thus the cobb-douglas production function is the famous production function and widely used in economic research works due to its unique properties.

**Meaning of cost:**

Cost generally refers to the outlay of funds for productive services. It means the actual expenditure incurred for acquiring or producing a good or service. Cost is the amount measured by the current monetary value of economic resources given up or to be given up in obtaining goods and services.

The term “Cost of production” means the expenses incurred in the production of a commodity. The terms cost of production may be used in three different senses. It may mean (i) Money cost (ii) Real cost, (iii) opportunity cost.

**Money Cost:**

Money cost of product for the producer would mean the aggregate money expenditure incurred by the producer on various items entering into the production of a product. E.g. actual wages paid, prices of raw-materials, full cost, rent for building, rent paid for machinery hired, interest on money bonded

**Real Cost:**

The real cost of product would be the efforts and sacrifices undergone by the producer in producing that commodity. The real cost is useful in making long run decisions involving problems of major strategy.

**Opportunity cost or alternative Cost:**

Opportunity cost refers to the loss of earnings due to opportunities foregone due to scarcity of resources. Resources are scarce but have alternative uses with different returns.

**Different types of cost:**

**(1)Total cost:** Total cost of production means the total money expenses incurred for buying the input required for producing a commodity or a service. In other words, total cost includes all payments made in cash to various factors of production and all those charges which would have otherwise been paid for the use of owner’s factors of production in producing a commodity or service. Total cost is composed of two major elements:

**Total Fixed Cost (TFC) and Total Variable Cost (TVC), so TC = TFC +TVC.**

Total fixed cost is the expenditure incurred on the purchase of fixed inputs whereas total variable cost is the sum spent for the variable inputs.

**(2)Average cost:** Average cost (AC) is the cost per unit of output. It is obtained by dividing the total cost by the total quantity produced. According to Dooley, “The average cost of production is the total cost per unit of output”.



Average total cost or average cost is the sum of average fixed cost, and the average variable costs. The per unit fixed costs are known as the average fixed cost.



Average variable cost refers to the variable cost per unit of output.



**(3)Marginal Cost:** Marginal cost is the addition to the total cost by the last unit of output. It is addition to the total cost of producing ‘n’ units instead of n-1 units. Symbolically,

MCn = TCn – TC n-1

According to Dooley, “Marginal cost is the change in total cost associated with a change in output”.

Marginal cost = =

**Cost classification:**

**(1)Opportunity costs Vs Outlay costs:**

**Opportunity costs** are the costs of displaced alternatives. They represent only sacrificed alternatives and hence are not recorded in any financial accounts.

**Outlay costs** on the other hand, are those costs which involve financial expenditure at some time and hence are recorded in the books of account. For example, actual wages paid cost of materials purchased, interest paid etc.

**(2) Real costs Vs Money cost:**

**Money cost** of product for the producer would mean the aggregate money expenditure incurred by the product on various items entering into the production of a product.

**The real cost** of a product would be the efforts and sacrifices undergone by the producer in producing that commodity but the main difficulty with this concept is that efforts and sacrifices are subjective phenomenon and this cannot be subjected to accurate measurement. The real cost is useful in making long run decisions involving problems of major strategy.

**(3) Past Vs Future costs:**

**Past costs** are actual costs incurred in the past and generally find place in the books of the accounts. These costs are incurred by the firms at the time of purchase of specialized plant or equipment past costs are beyond the control of management.

**Future costs** are costs that are likely to be incurred in future periods. Managerial decisions are always forward looking and therefore, they require estimates of future costs and not past costs. The management can have control over future costs and hence these costs can be planned or avoided.

**(4) Traceable Vs Common Cost:**

**A traceable cost** is one which can be identified easily and indisputably with a unit of operation, e.g. product, a department or a process.

**Common costs** are used broadly to cover costs that are not traceable to individual final products. For example, electricity charges may not be separable, department-wise in a single product firm or even product wise in a multiple product firm.

**(5) Out –of pocket Vs Book Costs:**

**Out-of packets cost or cash costs** refer to those costs which require immediate and current payments to outsiders. Example, Salaries paid to the staff, electricity bill, payments made to other productive services, the purchase price of a new equipment etc.

**Book cost** on the other hand, are those costs which do not require current cash expenditure. For example, wages and salaries paid to the employees are out-of-pockets costs while salary of the owner manager, if not paid, is a book cost.

(**6) Incremental Costs Vs sunk costs:**

**Incremental costs** refer to the additional costs incurred due to a change in the level or nature of activity. A change in the activity may occur in various forms such as addition of a new product, change in the distribution channels, addition of new machine, expansion of market area etc. Incremental costs are also known as differential costs.

**Sunk cost** is one which is not affected or altered by a change in the level or nature of business activity. It will remain the same whatever the level or nature of business activity. It will remain the same whatever the level of activity. It is also known as specific cost. The best example of sunk cost is depreciation allowance.

**(7) Escapable Vs Unavoidable costs:**

The distinction between escapable and unavoidable costs is based on the contraction of business activity. **Escapable costs** refers to those costs which can be avoided by a reduction in the business activities of a firm. **Unavoidable costs** are those costs which cannot be avoided by reduction in the business activities of a firm.

**(8) Shut down Vs Abandonment Costs:**

**Shut down costs** are those costs which would be incurred in the event of suspension of the plant operations and which would be saved if the operations are continued.

**Abandonment costs** on the other hand, are those costs which are incurred in abandoning a particular fixed asset from service.

**(9) Urgent and Postponable Costs:**

**Urgent costs** are those costs which must be incurred in order to continue operations of the firm. **Postponable costs**, are those costs which can be postponed for the time being.

**(10) Controllable and Non-Controllable Costs:**

**Controllable costs** are those costs which can be controlled by an executive on whom the responsibility of cost is vested. It depends on the level of management. **Non-Controllable costs,** are those costs which are beyond regulation.

**(11) Historical Cost Vs Replacement cost:**

The **historical cost** of an asses is the actual cost incurred at the time that asset was originally acquired. In contrast to this **replacement cost** is the cost which will have to be incurred if that asset is purchased now.

**(12) Private Vs Social Cost:**

Private costs are those which are actually incurred or provided for by an individual or a firm on the purchase of goods and services from the market. Social costs on the other hand imply the total cost to the society on account of production of a commodity.

**Cost and output relation in the short run cost analysis:**

The cost of production depends on many forces and an understanding of the functional relationship of cost to various forces will help us to provide the informational foundation for different cost forecasts.

The relation between the cost and output is technically described as the cost function. In economic theory there are mainly two types of cost functions viz,

(i) The short run cost function and

(ii) The long run cost function.

**Cost Output Relationship:**

**1. SHORT- RUN COST – OUTPUT RELATIONSHIP:**

The short-run cost – output relationship refers to a particular scale of operation or to a fixed plant. That is it indicates variations in cost over output for the plant of a given capacity and this relationship will vary with plants of varying capacity. Hence, the short run function relating cost to output variations is of the following type:

TC = f(x) + A

Where TC = Total cost

A = Total fixed cost

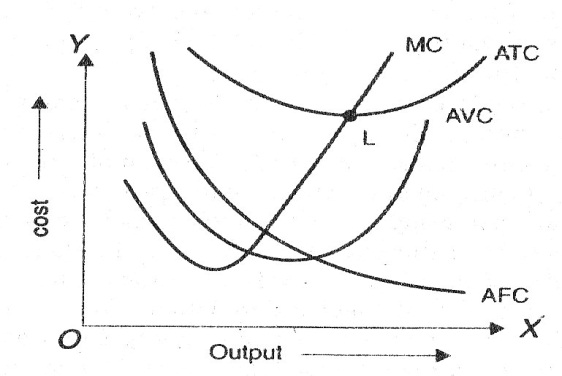
F(x) = Total variable cost.

The short –run cost output relationship needs to be studied in terms of Fixed cost and output.Variable cost and outputTotal cost and output.

Fixed cost does not vary with output. The larger the quantity produced, the lower will be the fixed cost per unit and marginal fixed cost will always be zero. The following table shows that the total fixed cost is same irrespective of the units of output and the average cost declines monotonically as output increases.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Rate of Output Units | TFC  Rs. | TVC  Rs. | TC  Rs. | AFC  Rs. | AVC  Rs. | AC  Rs. | MC  Rs. |
| 0 | 1000 | 0 | 1000 | - | - | - | - |
| 1 | 1000 | 200 | 1200 | 1000 | 200 | 1200 | 200 |
| 2 | 1000 | 367 | 1367 | 500 | 184 | 684 | 167 |
| 3 | 1000 | 510 | 1510 | 333 | 170 | 503 | 143 |
| 4 | 1000 | 677 | 1677 | 250 | 169 | 419 | 167 |
| 5 | 1000 | 877 | 1877 | 200 | 175 | 375 | 200 |
| 6 | 1000 | 1127 | 2127 | 167 | 188 | 355 | 250 |
| 7 | 1000 | 1460 | 2460 | 143 | 209 | 351 | 333 |
| 8 | 1000 | 2460 | 3460 | 125 | 307 | 432 | 1000 |

The relationship among AVC, ATC and MC can be explained with a help of a following figure.

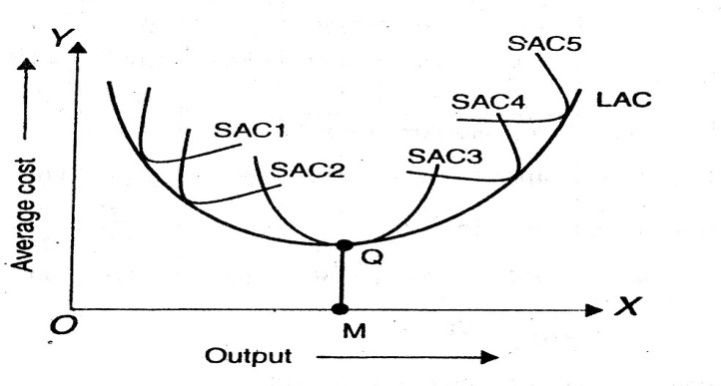


The short-run cost output relationship can be established as.

* AFC falls as output rises from lower levels to higher levels.
* AFC first falls and then rises, so also the ATC curve.
* The AVC curve starts rising earlier than ATC curve.
* The least cost level of output corresponds to the point ‘L’ on ATC curve.
* The marginal cost curve intersects both the AVC curve and the ATC at their minimum points.

**2. Long run cost-output relationship:**

Firms operate in the short run but plan in the long run. In the long run, all the inputs become variable. There is no fixed factor of production and hence there is no fixed cost. The long run output relations therefore imply the relationship between the total costs and the total output.



In the long run the firm moves from one plant to another plant, as the scale of operation is altered, a new plant is added. The long run cost of production is the least possible cost of production of producing any given level of output, when all inputs become variable, including the size of the plant. The curve LAC depicts the least possible average cost of production at different levels of output. It is the cumulative picture of short run average cost curves. The short run average cost curves are also called plant curves, since in the short run SAC curve corresponds to a particular plant. The existence of economies and diseconomies of scale are responsible for the ‘U’ shaped LATC curve.

**Economies and diseconomies of scale**

**Economies of Scale:**

**(1) Internal Economies:**

Internal economies of scale are those economies which are on account of the size and operations of an individual firm itself and not from the outside factors.

**(a) Managerial Economies:**

Managerial economies means that with the expansion of the output on account of the change in scale of production the whole expanded scale is looked after by the personnel in the organisation and administrative cost decreases with the increase in output.

**(b) Marketing Economies:**

Marketing economies are concerned with the bulk purchases of raw material while producing on the large scale leads to decrease in the cost of production. Selling in lot saves time, money and energy. Transportation cost will also be reduced.

**(c) Specializations Economies:**

Specialisation economies are on account of division of labour and specialisation when large scale production is carried on. The cost of production reduces due to specialisation and division of labour in a business firm.

**(d) Technical Economies:**

Technical economies arise on account of large scale production in the use of plant, machinery and work processes. Advanced technology is used which reduces the cost of production when the production is carried on large scale.

**(2) External Economies:**

External economies arise on account of the external factors and they are enjoyed by all the firms in the area or industry as a whole. When an area is industrially well developed then there will be development of labour market, banking, insurance, financial institutions, means of communication and transportation, social overhead and cheap water, electricity and ancillaries. When a new firm or new industrial unit is set up all these benefits will be available in that area. All these facilities will reduce the cost of production of all the industrial units in that area.

**Diseconomies of Scale:**

Diseconomies mean the losses incurred by the firms or industrial units in an area.

**(1) Internal Diseconomies:**

These diseconomies are concerned with the size and operation of individual firm or industry.

**(a) Managerial Diseconomies:**

When the size of operation of a firm increases the span of control becomes large and thereby the employer-employee relations are adversely affected leading to increase in the cost of production. It is resulted into managerial diseconomies.

**(b) Technical Diseconomies:**

Under technical diseconomies when the output is taken on large scale after a given point the break down rate may increase in the cost of production.

**(c) Marketing Diseconomies:**

Marketing diseconomies arise on account of the adverse effect on the control and coordination over marketing activities because of the large scale production and it increases the cost of production.

**(d) Specialisation Diseconomies:**

Specialisation diseconomies are concerned with the division of labour and specialisation introduced by a firm with the operation of the large scale production. But after a point due to monotony, fatigue and lack of coordination between different layers of personnel administration the cost of production increases that gives birth to these diseconomies.

**(2) External Diseconomies:**

Such loss or external diseconomies are incurred by business firms or industrial units in an area. Concentration and localisation of industries adversely affect the industrial peace in that area and strikes, lockouts, go slow tactics, gheraos, industrial accidents, emergence of dirty colonies, water pollution, air pollution, etc., increase the cost of production of all firms and industrial units. Means of communication and transportation are overburdened.