(UNIT-3)
MANAGERIAL ECONOMICS
AND
FINANCIAL ACCOUNTING

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MANAGERIAL ECONOMICS
(UNIT-3)

Production and Cost analysis-

Theory of production- production function.

Law of variable proportions.

Laws of returns to scale.

Production Optimization.

Least cost combination of inputs, isoquants.

Cost concepts-explicit and implicit cost, Fixed and variable cost, Opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.

CONCEPT OF PRODUCTION

Production consists of various processes to add utility to natural resources for gaining greater satisfaction from them by:

1. Changing the form of natural resources. (**Form Utility**)

2. Changing the place of the resources. Making available materials at times when they are not normally available. (**Place Utility**)

3. Making use of personal skills in the form of services. (**Personal Utility**)

   Thus the entire process of production is nothing but creation of form utility, place utility and/or personal utility.

   Assumptions:

   a) Specified period of time.

   b) Technical knowledge does not change.

   c) Most efficient technique available.

   d) Factors of production are divisible into units.
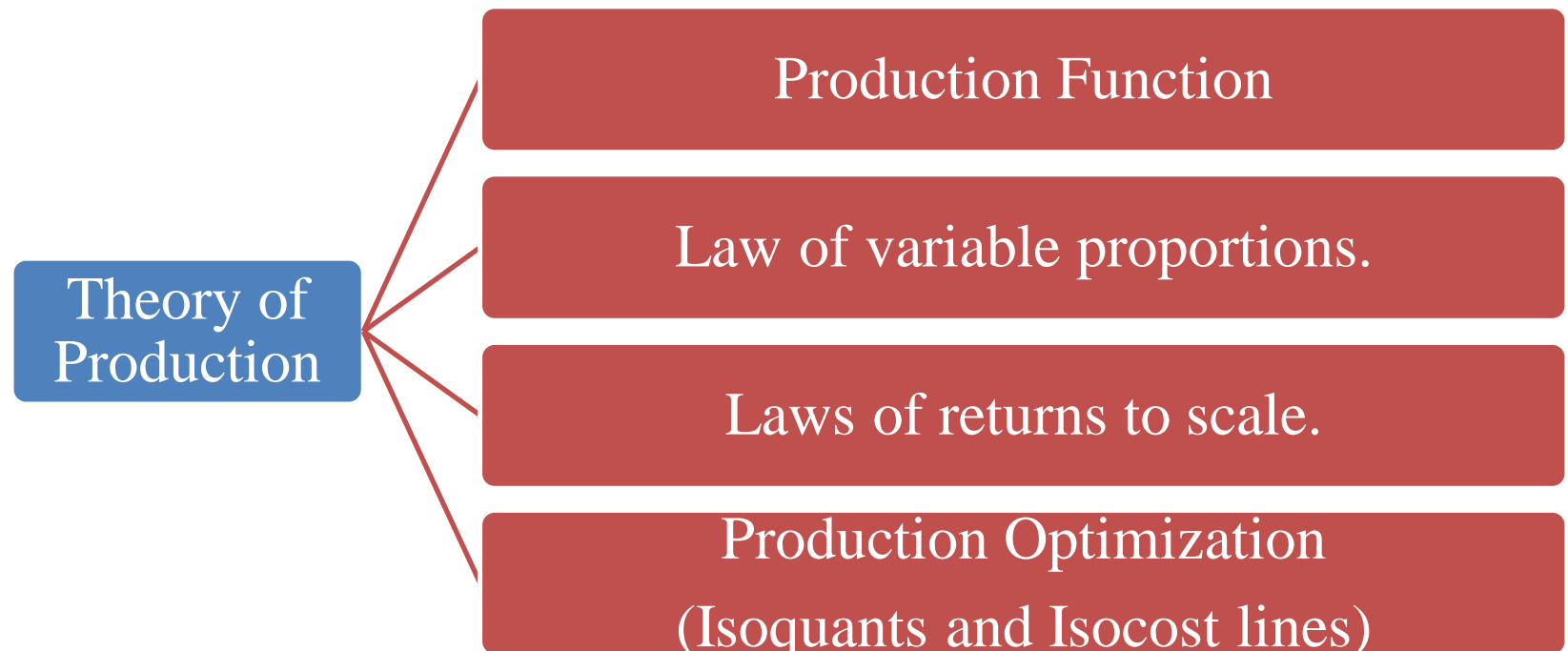
CONCEPT OF PRODUCTION

- Production is a very important economic activity.

- It is important both from the individual as well as the social points of view.

- The standard of living of a people is the ultimate analysis which depends on the volume and variety of production.

- The performance of an economy is judged by the level of its production. i.e. Those countries which produce goods in large quantities are rich and those which produce little of them are poor.

- The term 'Production' in economics refers to the creation of those goods and services which have exchange value.

- The process by which man utilises or converts the natural resources in one form to another and working upon them to satisfy the human wants.

"Production as any activity whether physical or mental, which is directed to the satisfaction of other people's wants through exchange."

– Prof. J. R. Hicks

THEORY OF PRODUCTION

In economics, theory of production explains the principles in which the business has to take decisions on how much of each commodity it sells and how much it produces and also how much of raw material ie., fixed capital and labor it employs and how much it will use. It defines the relationships between the prices of the commodities and productive factors on one hand and the quantities of these commodities and productive factors that are produced on the other hand.

Theory of Production

- Production Function
- Law of variable proportions.
- Laws of returns to scale.
- Production Optimization (Isoquants and Isocost lines)

PRODUCTION FUNCTION

The Production function signifies a technical relationship between the physical inputs and physical outputs of the firm, for a given state of the technology. It is a tool that analysis the qualitative input – output relationship and also represents the technology of a firm or the economy as a whole.

According to citowiski, "Production of a firm is the function of factors of production. If it is presented mathematically, it is called production function."

$$Q = f (a, b, c, \ldots \ldots z)$$

Where:

a,b,c ....z are various inputs such as land, labor, capital etc.

Q is the level of the output for a firm.

PRODUCTION FUNCTION

The long run production function (Q) is usually expressed as

      Q = f (LB, L, K, M, T, t)

      Where: LB = Land and Building

                L   = Labour

                K   = Capital

                M = Raw Material

                T   = Technology

                t   = Time

If labor (L) and capital (K) are only the input factors, the production function reduces to −

      Q = f (L, K)

LAW OF VARIABLE PROPORTIONS

The law of variable proportions states that as the quantity of one factor is increased, keeping the other factors fixed, the marginal product of that factor will eventually decline.

The Law of Variable Proportions concerns itself with the way the output changes when you increase the number of units of a variable factor. Hence, it refers to the effect of the changing factor-ratio on the output.

In other words, the law exhibits the relationship between the units of a variable factor and the amount of output in the short-term. This is assuming that all other factors are constant. This relationship is also called returns to a variable factor.

ASSUMPTIONS OF LAW OF VARIABLE PROPORTIONS

1. It operates in short run, as factors are classified as variable and fixed factor.

2. The law applies to all fixed factors including land.

3. Under law of variable proportions, different units of variable factor can be combined with fixed factor.

4. This law applies to the field of production only.

5. The effect of change in output due to change in variable factor can be easily determined.

6. It is assumed that, factors of production become imperfect substitutes of each other beyond a certain limit.

7. The state of technology is assumed to be constant during the operation of this law.

8. It is assumed that all variable factors are equally efficient.

LAW OF VARIABLE PROPORTIONS

- **What is Total Product?**

Suppose we differ a single input and keep all other inputs unchanged. Then for different degrees of that input, we get different degrees of output. This association between the variable input and output, keeping all other inputs unchanged, is often referred to as Total Product (TP) of the variable input. This is also sometimes termed as total return to or total physical product of the variable input. it will be helpful to elucidate the concepts of average product (AP) and marginal product (MP). They are useful in order to explain the contribution of the variable input to the production procedure.

- **What is Average Product?**

Average product is explained as the output per unit of variable input. We calculate it as **:**

$AP_L = TP_L / L$

- **What is Marginal Product?**

Marginal product of an input is explained as the change in output per unit of change in the input when all other inputs are held unchanged. When capital is held unchanged, the marginal product of labour is **:**

MP_L = Change in output / Change in input

$\Delta TP_L / \Delta L$

LAW OF VARIABLE PROPORTIONS

Labour	TP	MP	AP
0	0	-	-
1	2	2	2
2	6	4	3
3	12	6	4
4	16	4	4
5	18	2	3.6
6	18	0	3
7	14	-4	2
8	8	-6	1

LAW OF VARIABLE PROPORTIONS
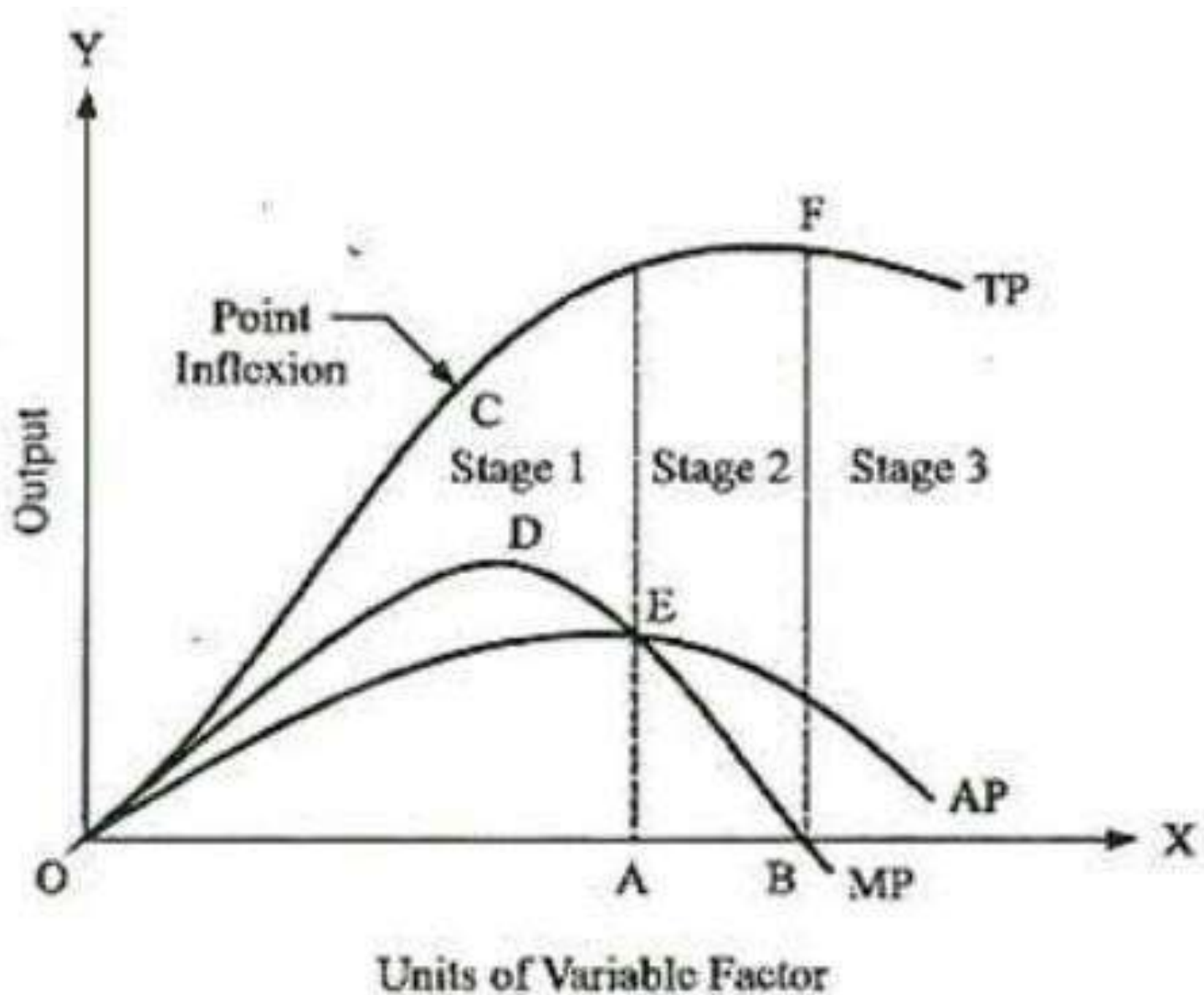
LAW OF VARIABLE PROPORTIONS

Three Stages of the Law of Variable Proportions:
These stages are illustrated in the following figure where labour is measured on the X-axis and output on the Y-axis.

Stage 1. Stage of Increasing Returns:
In this stage, total product increases at an increasing rate up to a point. This is because the efficiency of the fixed factors increases as additional units of the variable factors are added to it. In the figure, from the origin to the point C, slope of the total product curve TP is increasing i.e. the curve TP is concave upwards up to the point C, which means that the marginal product MP of labour rises. The point C where the total product stops increasing at an increasing rate and starts increasing at a diminishing rate is called the point of inflection. Corresponding vertically to this point of inflection marginal product of labour is maximum, after which it diminishes. This stage is called the stage of increasing returns because the average product of the variable factor increases throughout this stage. This stage ends at the point where the average product curve reaches its highest point.

LAW OF VARIABLE PROPORTIONS

Stage 2. Stage of Diminishing Returns:

In this stage, total product continues to increase but at a diminishing rate until it reaches its maximum point F where the second stage ends. In this stage both the marginal product and average product of labour are diminishing but are positive. This is because the fixed factor becomes inadequate relative to the quantity of the variable factor. At the end of the second stage, i.e., at point B marginal product of labour is zero which corresponds to the maximum point F of the total product curve TP. This stage is important because the firm will seek to produce in this range.

Stage 3. Stage of Negative Returns:

In stage 3, total product declines and therefore the TP curve slopes downward. As a result, marginal product of labour is negative and the MP curve falls below the X-axis. In this stage the variable factor (labour) is too much relative to the fixed factor.

LAW OF VARIABLE PROPORTIONS

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

ISO-QUANT OR EQUAL PRODUCT CURVES

- A production function with two variable inputs can be represented by a family of isoproduct curves or isoquants.

- They are also known as equal product curves or production indifference curves.

- It is a curve along which the maximum achievable rate of production is constant.

- It represents all possible combinations of the two factors that will give the same total product per unit of time.

ISO-QUANT OR EQUAL PRODUCT CURVES
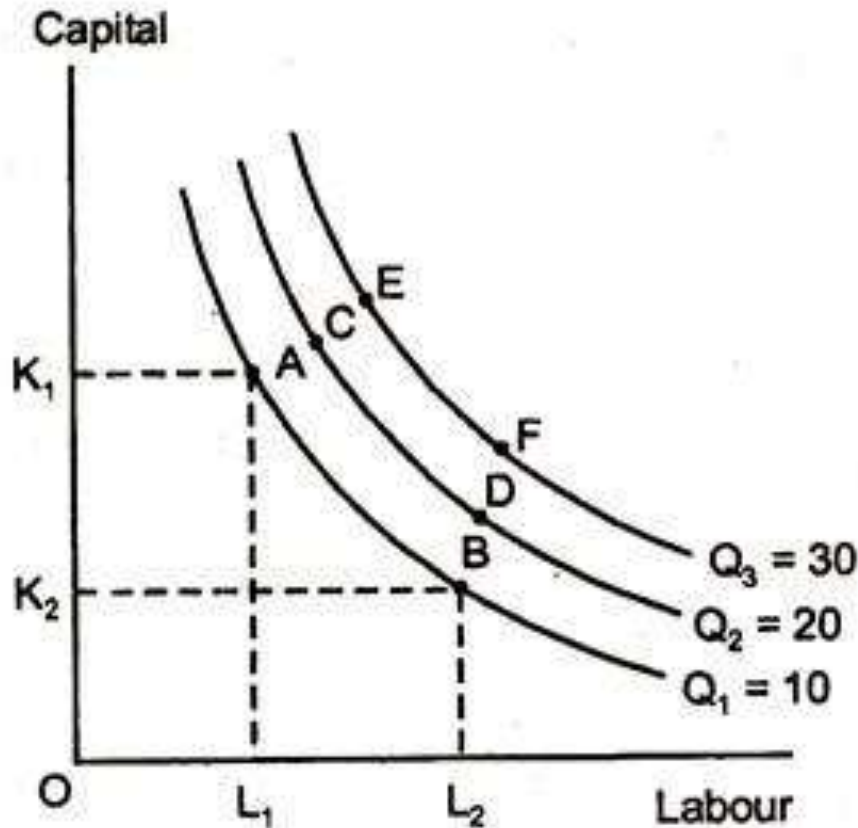
- **Properties of isoquants:**

1. Slope downwards from left to the right(Negative slope)

2. Convex to the origin

3. Isoquants to the right represent a larger output

4. Never cut each other

5. Units of output shown on isoquants are purely arbitrary

6. Between two isoquants there can be a number of isoquants

7. No isoquants can touch either axis.

RETURN TO SCALE

- **Returns to scale:**

- The theory of returns to scale studies the production function in the long run. The rate of change in output, when all factors of production, in a particular production function are increased or decreased in some proportion simultaneously. Returns to scale may be constant, increasing or decreasing.

- In the other words, the law of variable proportions emerges with the change in one factor and no change in others where in the long run, when both the factors are raised by the same amount of factors are known as Returns to scale.

RETURN TO SCALE

- **Constant returns to scale**: The increase in the scale in some proportion, output increases in the same proportion. It has been found that production function for the economy as a whole corresponds to production function exhibiting constant returns to scale. Also, firm passes through a long phase of constant returns to scale in its lifetime.

- **Increasing returns to scale:** The output increases in a greater proportion than the increase in inputs. When a firm expands and the indivisibility of factors are the reasons for increasing returns to scale. This leads greater possibilities of specialization of land and machinery.

- **Decreasing returns to scale:** When output increases in a smaller proportion with an increase in all inputs, decreasing returns to scale are said to prevail. When a firm goes on expanding by increasing all inputs, finally leads to diminishing returns to scale. Difficulties of management, coordination and control are the reasons for decreasing returns to scale.

# RETURN TO SCALE

Numerical example of long run returns to scale					
Units of Capital	Units of Labour	Total Output	% Change in Inputs	% Change in Output	Returns to Scale
20	150	3000			
40	300	7500	100	150	Increasing
60	450	12000	50	60	Increasing
80	600	16000	33	33	Constant
100	750	18000	25	13	Decreasing

Increasing returns to scale occur when the % change in output > % change in inputs

Decreasing returns to scale occur when the % change in output < % change in inputs

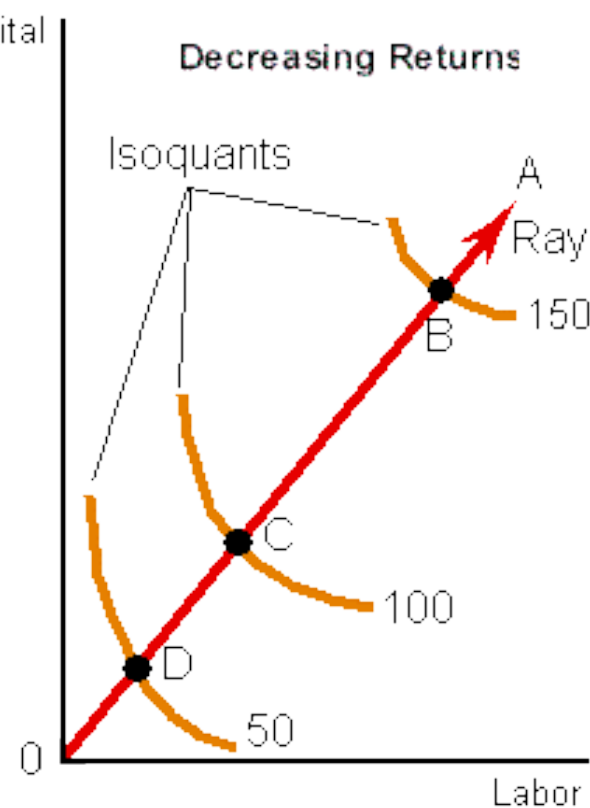**Constant returns** to scale occur when the % change in output = % change in inputs

RETURN TO SCALE
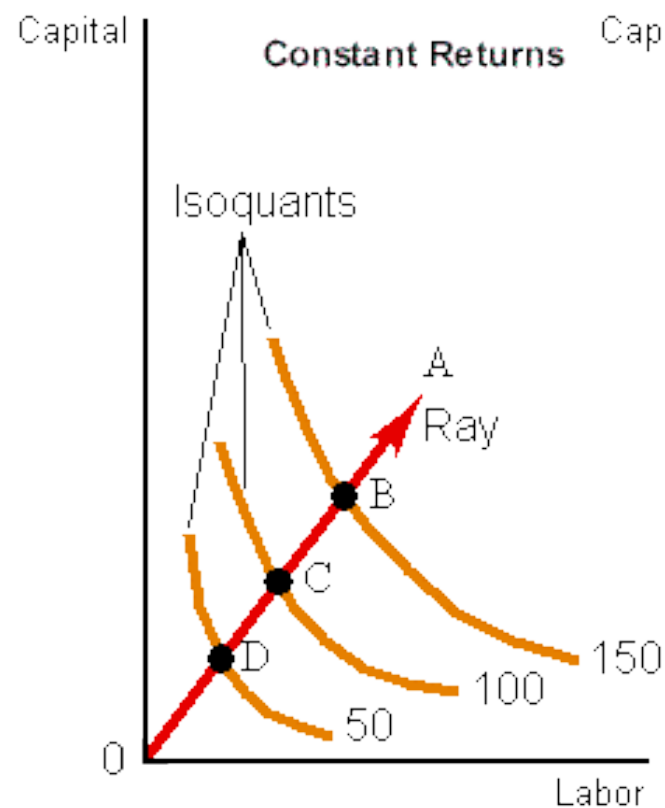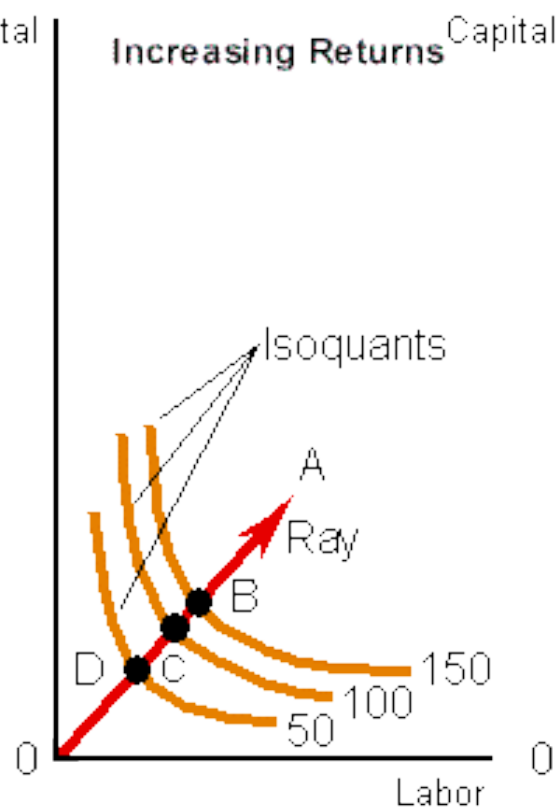
CONCEPT OF COST

- Cost function refers to the mathematical relation between cost of a product and the various determinants of costs. In cost function, the dependent variable is unit cost or total cost and the independent variables are the price of a factor, size of the output. Cost function can be linear or curvilinear depending upon the cost behaviour and response to the dependent variable.

- **C = f (O, S, T, U, P.....)**

- Where,

- C is cost

- O is level of output

- S is the size of plant

- T is time under consideration

- P is the prices of factors of production

DETERMINANTS OF COST

1. Operation of law of returns.

2. Size of the plant or firm.

3. Term of period under consideration

4. Level of capacity utilisation

5. Prices of factors of production

6. Technology

7. Efficiency in use of inputs

TYPES OF COST

1. **Total Fixed Cost** **(TFC)**

2. **Total Variable Cost** **(TVC)**

3. **Total Cost** **(TC=TVC+TFC)**

4. **Average Fixed Cost** **(AFC=TFC/Q)**

5. **Average Variable Cost** **(AVC=TVC/Q)**

6. **Average Total Cost** **(AC=AFC+AVC)**

7. **Marginal Cost** **(MC= ΔAC/ΔQ)**

COST

- **Opportunity Cost Principle-** the economic cost of an input used in a production process is the value of output sacrificed elsewhere. The opportunity cost of an input is the value of foregone income in best alternative employment.

Implicit vs. Explicit Costs

- **Explicit costs** – costs paid in cash. explicit costs are used to calculate accounting profit and economic profit. **Implicit cost** – imputed cost of self-owned or self employed resources based on their opportunity costs. Implicit costs help managers calculate overall economic profit.

TYPES OF COST

TOTAL, FIXED AND VARIABLE COSTS

- **Variable costs:** Some factors which can be easily adjusted with changes in the level of output. Thus a firm can readily employ more workers if it has to increase output.

- **Fixed costs:** Factors like capital assets cannot be readily varied and require a longer period to adjust.

- **Total cost:** The total money of cost of production of a commodity. Total cost of a business is thus sum of total variable cost and total fixed cost.

PRODUCTION OF COST

Variable Cost   =10 Rs Per Unit

Production   = 1000 Units

Rent   = 20000

Salary Of Manager= 15000

TOTAL COST = VARIABLE COST + FIXED COST

$$(10 \times 1000) + (20000 + 15000)$$

$$TC = 10000 + 35000$$

TC = 45000

DIFFERENCE BETWEEN FC AND VC

| BASIS	FIXED COST (FC)	VARIABLE COST (VC)	SEMI VA RIABLE COST (SVC)
Other Known Name	Period cost, capacity cost and supplementary cost.	Marginal Cost	Semi-fixed or mixed cost.
Meaning	It is a cost that does not change with an increase and decrease in the amount of goods or services produced. All expenditures remain constant up to the installed capacity (100% production capacity) of the firm.	Variable Costs are costs that change in proportion to the goods or services that a business produced.	It includes all the expenditure that are not changes according to proportionate change in the volume of production. It remains constant upto a certain level of production and change after the specified levels with uneven proportion.
Nature	Time Related	Volume Related	
Incurred When	FC is definite, that are incurred whether the units are produced or not.	VC are incurred only when the units are produced.	
Examples	Depreciation, Rent, Salary, Insurance, Tax etc.	Material Consumed, Wages, packing Expenses, Commission on sale etc.	Telephone Exp, Electricity Exp. Sundry office Exp, Repair and maintenance, Indirect material, Indirect labour.

TFC, TVC AND TOTAL COST

Output (Units)	TC	TFC	TVC
0	40	40	0
1	100	40	60
2	120	40	80
3	130	40	90
4	140	40	100
5	190	40	150
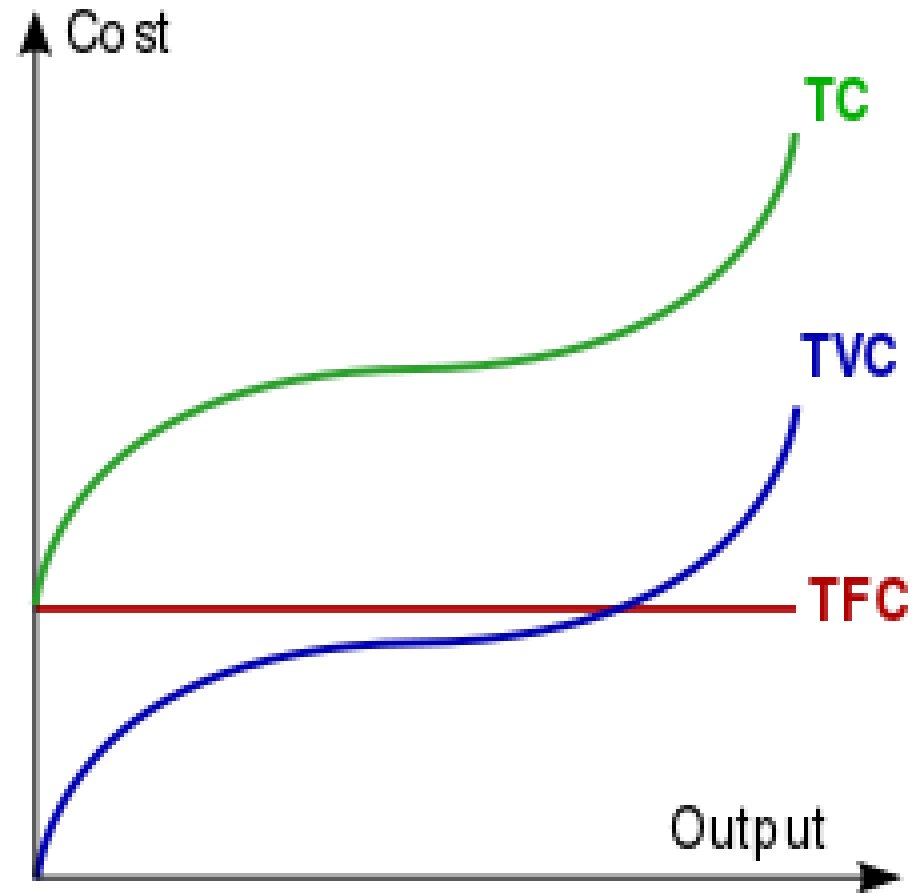
1. Average fixed cost (AFC):

Average fixed cost is the total fixed cost divided by the number of units of output produced. AFC= TFC/ Q where Q is the number of units produced. Thus AFC is the fixed cost per unit. AFC cannot be zero. Since total fixed cost is a constant amount, average fixed cost will be steadily fall as output increases.
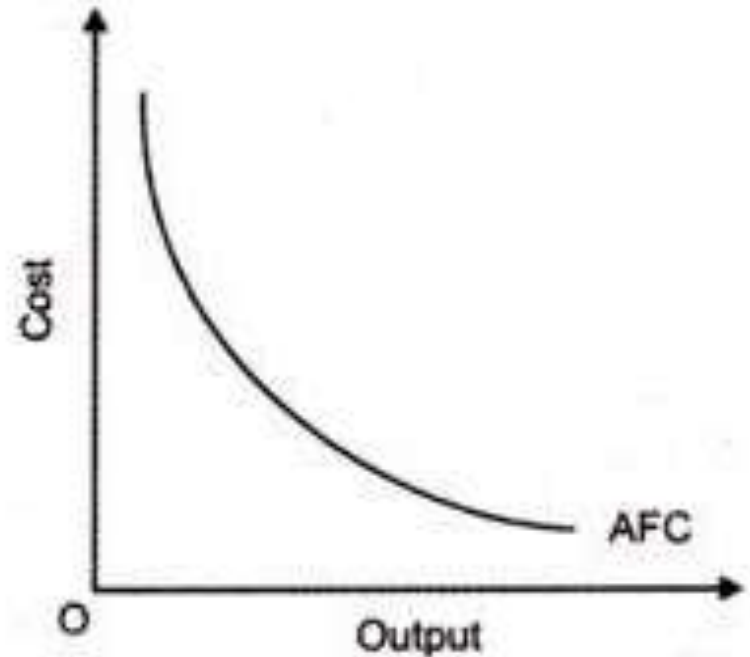
2. Average variable cost (AVC)

Average variable cost is the total variable cost divided by the number of units of output produced.

AVC=TVC/Q where Q is the number of units produced. Thus AVC is the variable cost per unit of output. AVC normally falls as output increases from zero to normal capacity output due to occurrence of increasing returns. Beyond this, AVC will rise steeply because of the operation of diminishing returns. AVC will first fall, then reach a minimum and then rise again.
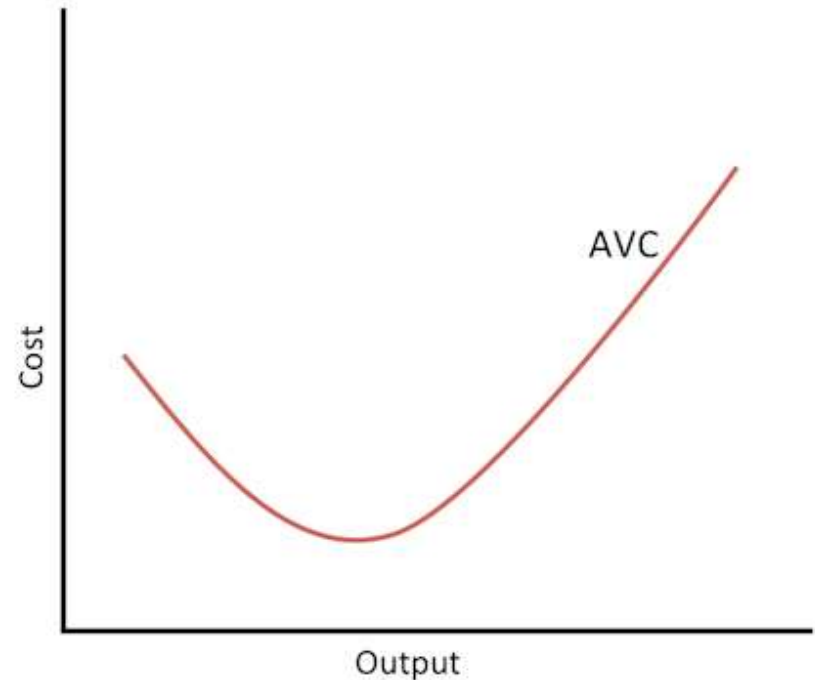
3. Average total cost (ATC)

• Average total cost is a sum of average variable cost and average fixed cost. ATC=AFC+AVC.

• The behaviour of average total cost curve depends upon the behaviour of average variable cost curve and average fixed cost curve.

• It is 'U' shape curve.

• When both AVC and AFC curves fall, the ATC curve will also fall sharply in the beginning.

• When AVC curve begins to rise, but AFC curve still falls steeply, ATC curve continues to fall.

• The fall in AFC curve is greater than the rise in the AVC curve but as output increases, there is a rise in AVC which makes AFC to fall.
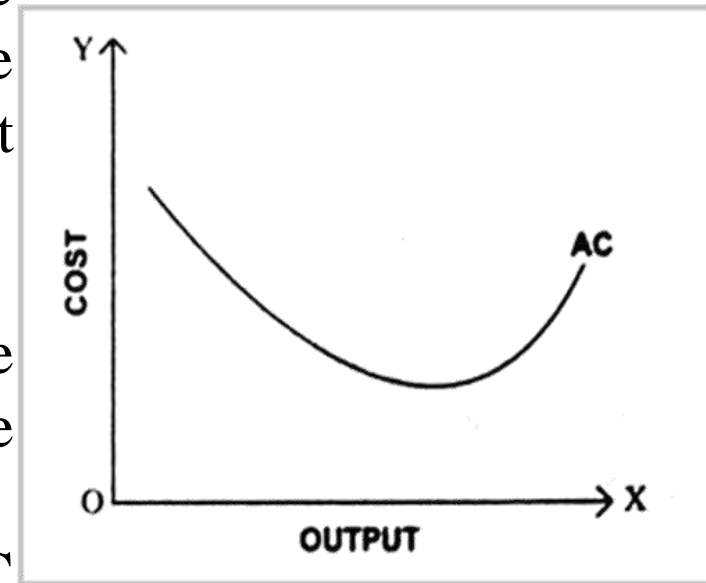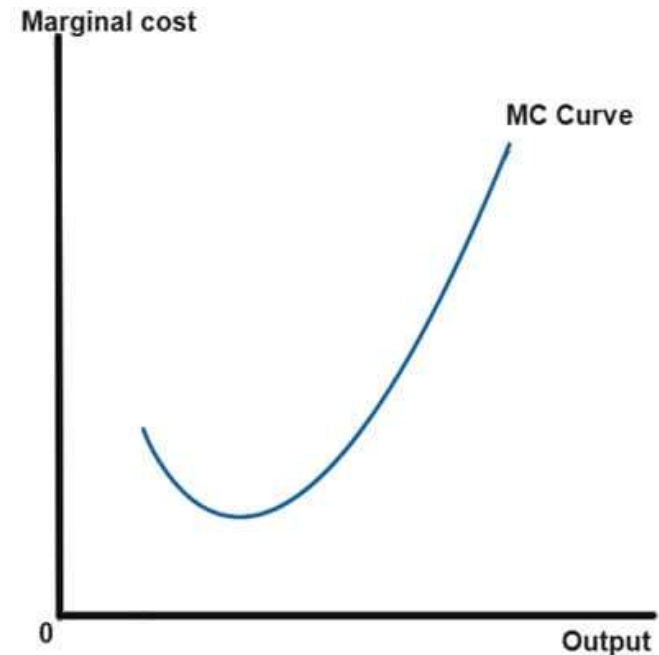
4. Marginal cost   (MC)

•Marginal cost is the addition made to the total cost by production of an additional unit of output.

•It is independent of fixed cost and dependent on variable costs.

•Marginal cost curve falls as output increases in the beginning.

•It starts rising after a certain level of output.

•The curve is U shaped.

•This influences the law of variable proportions.

Marginal cost

MC Curve

0   Output

RELATION BETWEEN THE COSTS

| Units of Labor	Total Fixed Cost	Total Variable Cost	Total Cost	AFC	Marginal Cost	Average Cost
L	TFC	TVC	TC	AFC	MC	AC
0	100	0	100	-	-	
1	100	30	130	100	30	130
2	100	50	150	50	20	75
3	100	60	160	33.33	10	53.3
4	100	65	165	25	5	41.25
5	100	75	175	20	10	35
6	100	95	195	16.67	20	32.5
7	100	125	225	14.28	30	32.14
8	100	165	265	12.5	40	33.12
9	100	215	315	11.11	50	35
10	100	275	375	10	60	37.5

RELATION BETWEEN THE COSTS
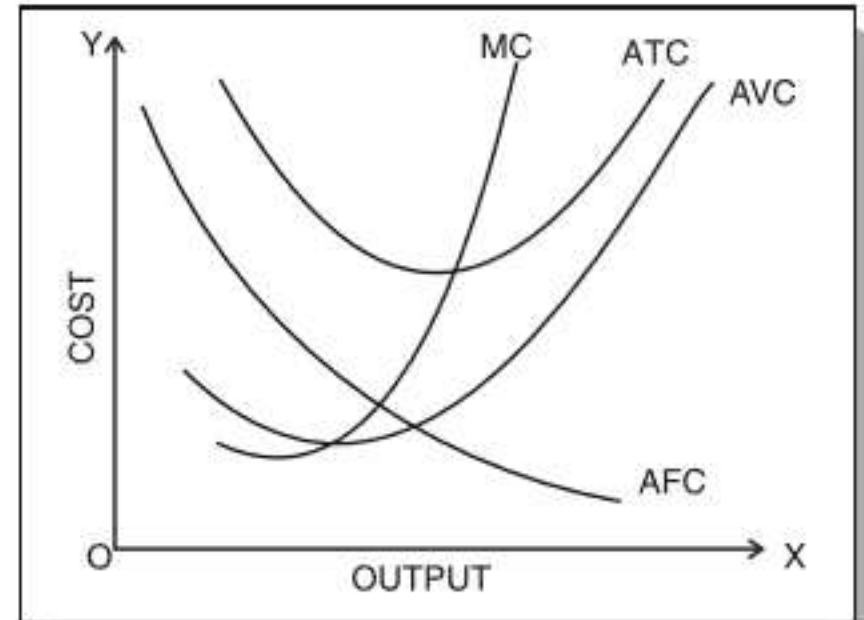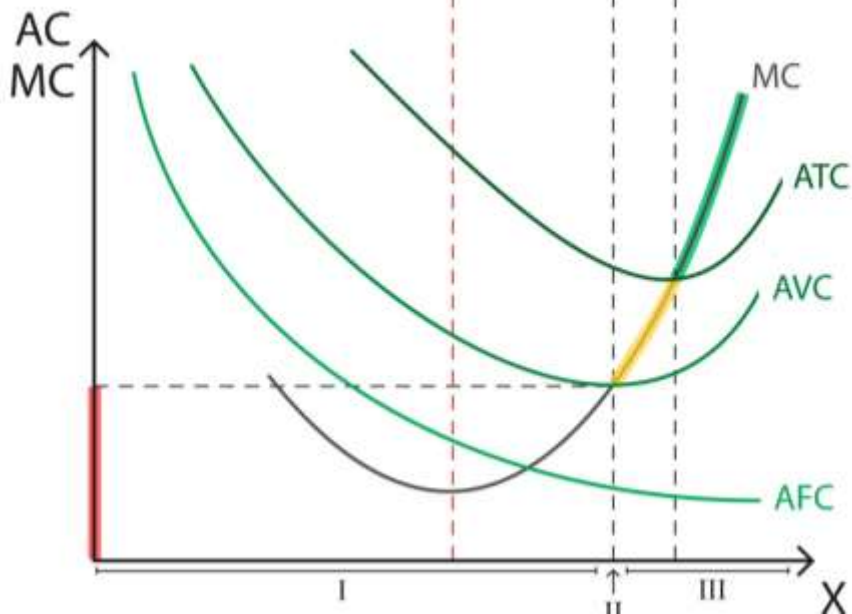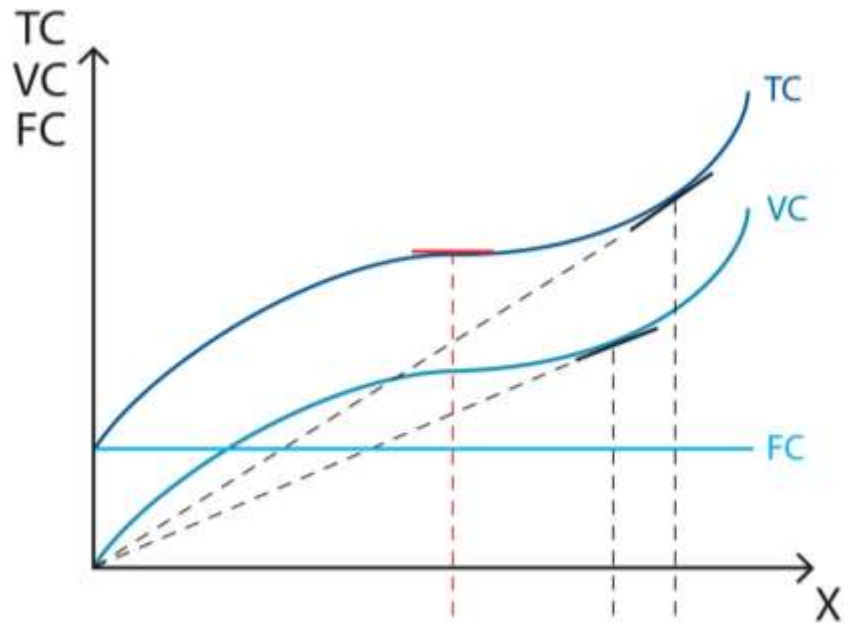
LONG RUN AVERAGE COST CURVES

Long run is a period of time during which the firm can vary all of its inputs- unlike short run where some inputs are fixed and others are variable.

• It is the least possible cost of producing any given level of output when all individual factors are variable.

• It depicts the functional relationship between output and the long run cost of production.

• The firm will examine with the short average cost curve. It will operate to produce a given level of output so that total cost is at minimum.

• The firm has a choice in the employment of plant which yields minimum possible unit cost for producing a given output.

• It is often called a planning curve because a firm plans to produce any output in the long run by choosing a plant corresponding to the given output.

• It helps the firm in the choice of the size of the plant for producing a specific output at the least possible cost.

• Long run curve is U-shape curve and depends upon the returns to scale.

LONG RUN AVERAGE COST CURVES
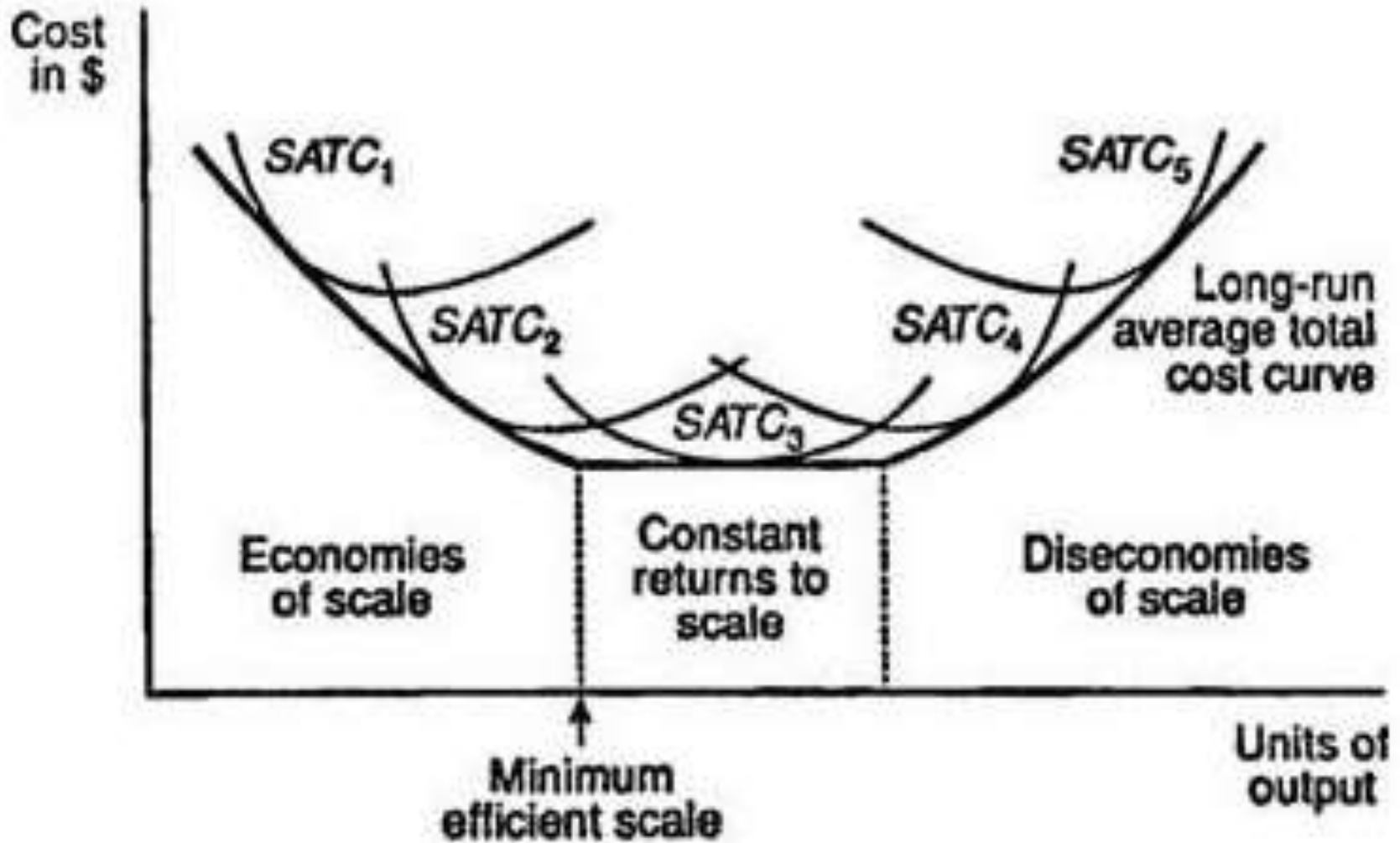
LONG RUN AVERAGE COST CURVES

Economies and Diseconomies of Scale

Economies of Scale-

Long run average cost decreases as output increases.
- Technological factors
- Specialization

Diseconomies of Scale:-

Long run average cost increases as output increases.
- Problems with management – becomes costly, unwieldy

Thank You!