

ECONOMICS

MODULE-III

* Production Theory and function

Production function: Functional

relation that relates the

Inputs and outputs of a

production process.

↳ basically a mathematical function that relates the maximum amount of output that can be obtained from a given no. of inputs (capital, labour)

* Factors of production

↳ land

↳ labour

↳ capital

↳ entrepreneurship

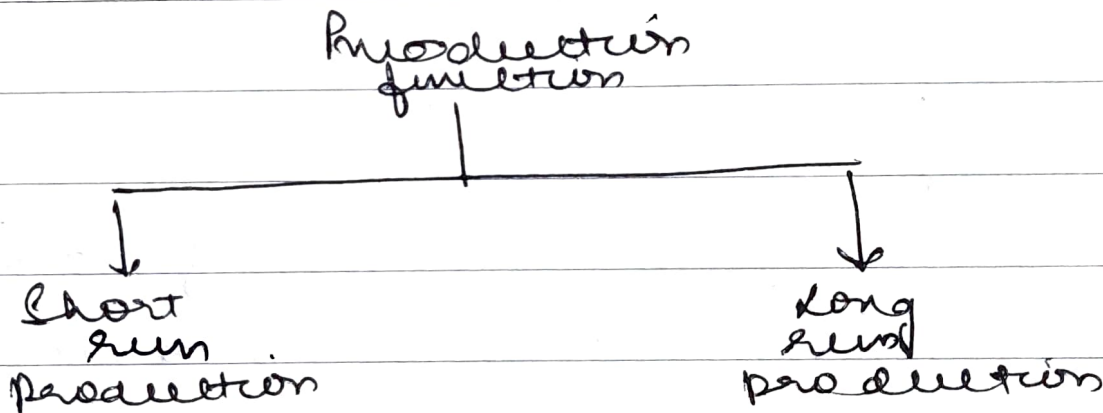
↳ the process of creating utility



production function: $Q = f(L, L_a, K, Org)$

↑ Labour
 ↓ Land
 ↓ Capital
 ↗ Organization

→ on the basis of factors of production



- ↳ fixed factor of production
- ↳ Increasing the production by variation of other factors

- ↳ all inputs are variable
- ↳ all factors are varied proportionately.



* Short run production function /
Law of variable proportions

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

output can be measured by

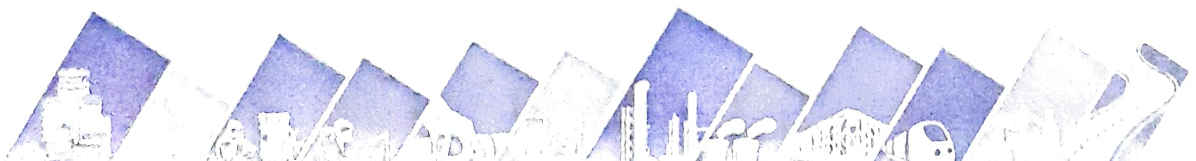
① Total product: sum total of ~~product~~

output produced

$$TP = \sum MP = \text{AP} \times L$$

Average product $\rightarrow$ quantity of a factor

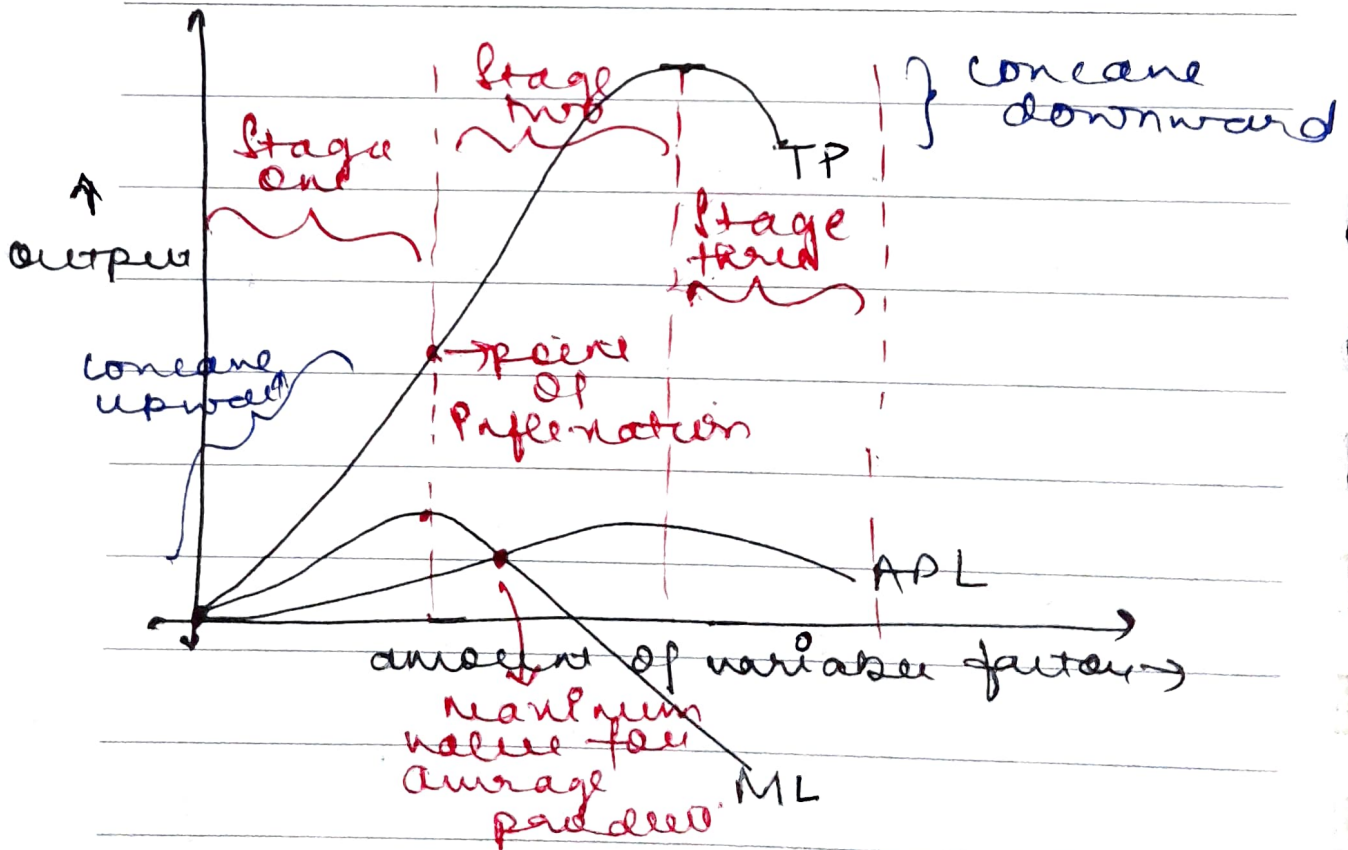
② Marginal product: Addition made to total product by employing one additional unit of a variable factor in p.m.



$$MP_L = \frac{\partial Q}{\partial L}$$

③ Average Product (AP): Avg. output produced by a unit of a variable factor input

$$AP_L = \frac{Q}{L}$$



Stage two → stage of operation

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Date

all factors of production are efficiently used

Three Stages

- ↳ Increasing (TP)
 - ↳ Decreasing (TP)
 - ↳ Negative (TP, AP, MP decreasing) negative
- ↳ all factors are variable.

* Long Run Production Relation

↳ use of Isoquants

• Return to Scale

- ↳ explains the behaviour of output in response to a proportional & simultaneous change in inputs.
- ↳ proportionate change in output to the proportionate change in input.

$$h \cdot Q = f(\lambda L, \lambda K)$$

Tf

$h > 1$: Increasing return to scale (IRS)

$h < 1$: decreasing return to scale (DRS)



Marginal rate of Technical
 Substitution (MRTS) =
 Slope of Isoquant
 $MRTS = MP_L / MP_K$

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$h = \lambda$: constant return to scale (CRS)

• Isoquants (equal product curve)

↳ production indifference curve

↳ represents the various combinations of two factor input representing a particular level of output

Slope: $\frac{MP_L \text{ (labour)}}{MP_K \text{ (capital)}}$

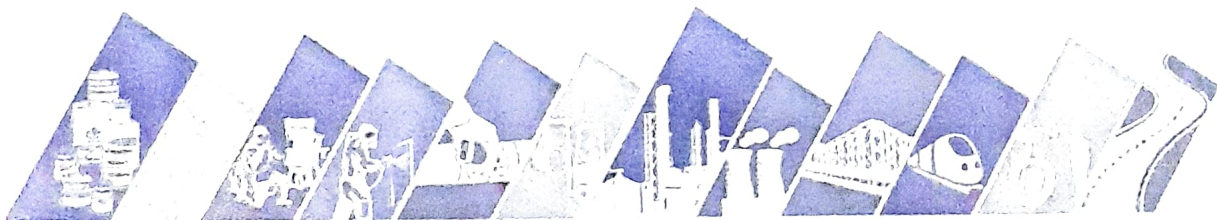
→ Properties of Isoquants

↳ negatively sloped

↳ convex to the origin

↳ higher Isoquants represent higher levels of output

↳ two independent Isoquants never intersect each other.



Cobb-Douglas

Production function.

$$Q = A L^{\alpha} K^{\beta}$$

L → Labour
 K → Capital

Date

$\alpha + \beta = 1$; CRS

$\alpha + \beta < 1$; DRS

$\alpha + \beta > 1$; IRS

α, β → output elasticity of the inputs

• Isoquant Map

Use of Isoquants

representing different levels of output

Subsequent Isoquants

will have diminishing Isoquant map.
distance b/w each other.

subjected to output maximization and input minimization.

• Optimum factor combination

Different combination of two or

more factor inputs for least cost of production

~~production~~ for profit minimization

↳ subjected to output maximization & input minimization.

• Homogeneous Production Function

↳ If the multiplier of all the



Independent variables by the same constant λ , results in the multiplication of dependent variable by λ^n .

- Cobb-Douglas Production Function
 $\rightarrow$ reflects the relationships b/w inputs and the amount of output produced.

$$Q(L, K) = AL^\alpha K^\alpha$$

- constant elasticity of substitution
(CES) function

$$Q = A[\alpha C^{-\theta} + (1-\alpha)L^{-\theta}]^{-1/\theta}$$



* cost

↳ expenditure incurred in a production process by employing factor inputs to produce goods and services.

→ Types of cost

↳ Money cost

↳ Implicit cost

↳ Explicit cost

↳ Real cost

↳ Opportunity cost

① Implicit cost ~~scribbled out~~

↳ Includes entrepreneur's self owned and self employed resources.

↳ non-expenditure cost.



② Explicit Cost Accounting ~~cost~~

↳ cost actually paid by the firm for goods purchasing

↳ payment made for factor input for production process.

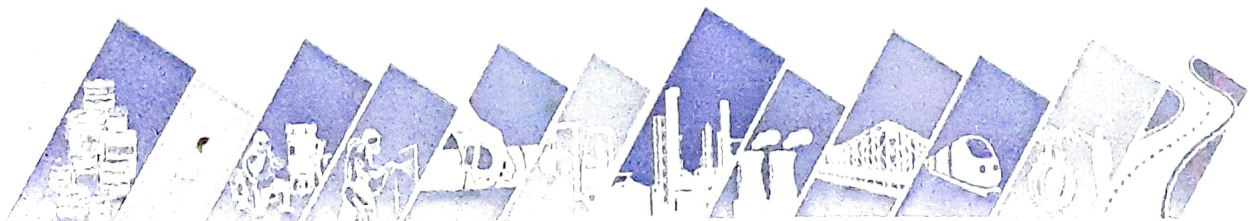
$$\text{Economic Cost} = \text{Accounting Cost} + \text{Implicit Cost}$$

③ Opportunity Cost

↳ cannot be employed anywhere else; for involved for organization

④ Replacement Cost

→ amount of money a business must currently spend to replace an essential asset like a real estate



property, etc.

⑤ Short run cost function

↳ costs incurred on materials, operating expenses like cost of labour & utilities.

↳ Fixed cost (TFC)

↳ do not change with the change in quantity of output

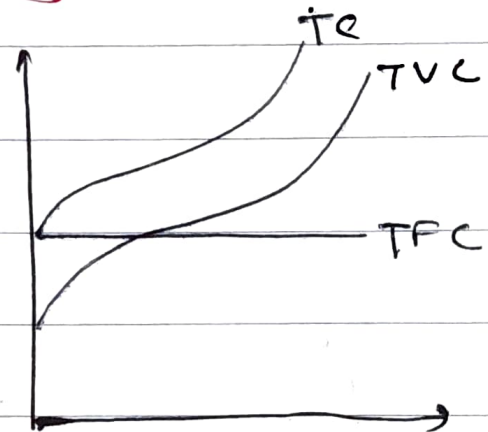
↳ Variable cost (TVC)

↳ varies as the level of output.

↳ directly proportional related to the volume of production.



$$\{ \text{Total Cost} = \text{TFC} + \text{TVC} \}$$



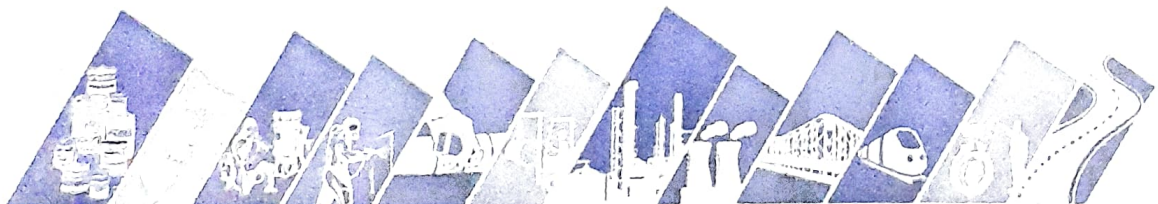
• average cost

↳ per unit cost at a different level of production activities

$$AC = \frac{TC}{\text{no. of units produced}}$$

• marginal cost

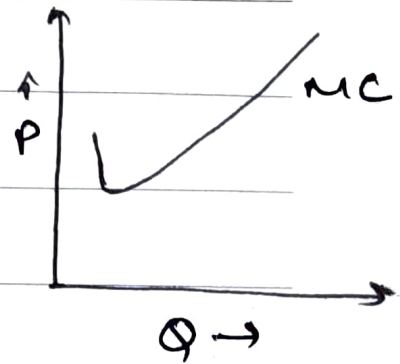
↳ change in total costs with one unit increase or decrease in the current



quantity produced.

$$MC = \frac{\Delta \text{Total cost}}{\Delta \text{Quantity produced}}$$

Δ Quantity produced



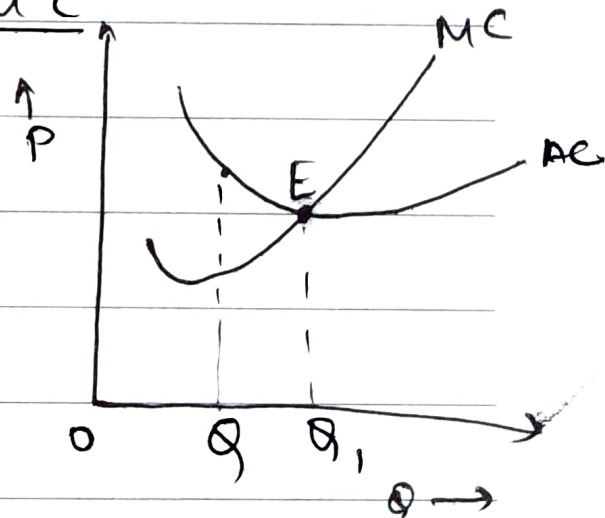
→ relation b/w AC and MC

When $AC \downarrow$, $MC < AC$

When $AC \uparrow$, $MC > AC$

When AC is constant;

$$MC = AC$$



• Long run cost curve

↳ minimum cost over time

↳ Inputs are not fixed

↳ scaling their means of production to reduce the costs of production.

