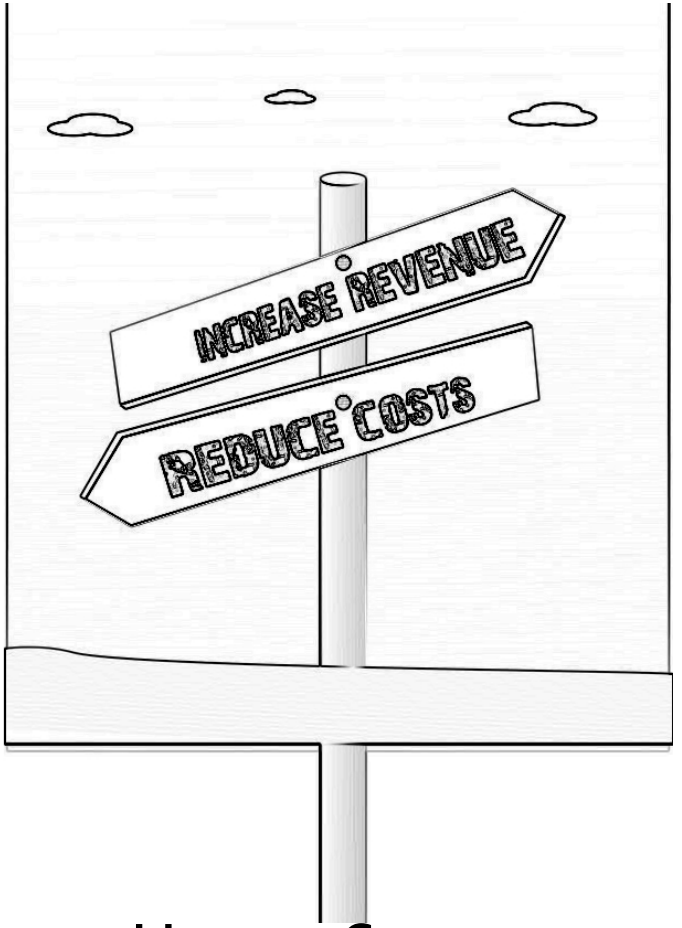
Cost and Revenue Curves



Unit 4

Lecture Hours 6

Contents

- Cost function. Various concepts of costs: opportunity cost, explicit and implicit costs, accounting and economic costs.
- Short run costs: Behavior of short run total costs, Behavior of average and marginal cost curves, Relation between AC and MC, TVC and MC, AC and AFC and AVC.
- Long run costs, Meaning, Derivation of U-shaped and L-shaped LAC with reasons.
- Revenue: Revenue under perfect competition, Revenue under imperfect competition, Relationship of Revenues (TR, AR and MR) with price elasticity of demand.

Cost and Cost Function

- **Cost:**
  - Cost is defined as the amount that is incurred by any firm while production of goods and services.
- **Cost Function:**
  - Cost function expresses a relation between cost and output.
  - C = f (Q, T, P) where Q is quantity of output, T is the technology and P is the price of factor input (labour and capital).

Various Concept of Costs

- **Actual Cost:**
  - Actual expenses of hiring land, labor, capital and management.
  - Recorded in books of account.
- **Opportunity Cost:**
  - The opportunity cost of a particular alternative is the payment related to the best of the alternatives that are not chosen.
  - It is the value of the next best alternative that is forgone when another alternative is chosen.
  - Always present when a choice is made.

Opportunity Cost

Explicit and Implicit Costs

- **Explicit Cost:**
  - Actual expenses of hiring land, labor, capital and management.
  - Recorded in books of account.
  - Monetary payments made and involve cash transactions. Eg: Land, Labour, Capital.
- **Implicit Cost:**
  - The value of inputs owned and used by the firm
  - They are the opportunity costs of using the resources that it already owns to make the firm's product rather than selling those resources to outsiders for cash.
  - Use of time, capital, opportunity missed.

Accounting and Economic Costs

- **Accounting Cost:**
  - Costs that would appear on accounting statements of a firm under government auditing regulations and standards.
  - They are explicit cost incurred in the past.
  - Includes amount spent on labour, materials, administration, depreciation, etc.
- **Economic Cost:**
  - Wider concept. Cost to a firm of utilizing economic resources in production.
  - Includes explicit and implicit costs (like opportunity costs).

Short Run Costs

- **Short Run Cost:**
  - ✳ Includes day-to-day production decisions faced by most firms as they combine labour and other variable inputs with a factory, production facility, for fixed capital.
    - $TC = f(Q, T, P_f, \check{K})$
    - TC – Total cost
    - Q – Output, T – Technology, P_f – Price of Factors, Ǩ- Fixed Factors.
  - – Technology here is related to the efficiency of entrepreneur, physical quantity of inputs while organizing production activity.

Short Run Total Costs

I. Total Fixed Cost (TFC):

- Total amount of price or money paid to the fixed factors in the production process in a period of time is known as total fixed cost (TFC).
- This cost remains constant whatever be the level of production.
- Example: rent of buildings, cost of leased capital equipment, cost of full time contracted salaried staff, interest rate on loans, depreciation of fixed capital, property taxes, insurance payments, etc.
- Must be paid even when output is zero.

Short Run Total Costs

II. Total Variable Cost (TVC):

- Total amount of price or money that varies with the amount of factors involved in production process in a period of time is known as total variable cost (TVC).
- This cost varies with the level of production.
- Example: wages of part time workers, expenses on electricity, fuel, raw materials, etc.
- TVC = f(Q)
- Must be paid even when output is zero. Inverted S shape.

III. Total Short Run Costs:

- Sum of fixed and variable cost at each output level. Inverted S shape.
- **TC = TFC + TVC**

Short Run Average Fixed and Variable Costs

I. Average Fixed Cost (AFC):

- Total fixed cost divided by total produced quantity.
- Also called per unit cost of fixed factor. When output increases, it falls continuously at diminishing rate.
- **AFC = TFC÷Q**
- Must be paid even when output is zero.

II. Average Variable Costs (AVC):

- Total variable cost divided by the total produced quantity.
- Also called per unit cost of variable factor.
- When, TVC increases at decreasing rate, the AVC decreases and vice versa.
- **AVC = TVC÷Q**

Short Run Average Costs

III. Average Cost (AC):

- The outcome of total cost divided by total produced quantity is average cost.
- In short run, AC = AFC + AVC. i.e.

$$AC = \frac{TC}{Q}$$
$$= \frac{[TFC + TVC]}{Q}$$
$$= \frac{TFC}{Q} + \frac{TVC}{Q} = AFC + AVC$$

Short Run Marginal Costs (SMC)

- **Marginal Cost (MC):**
  - Additional increase in the total cost while producing additional quantity of output.
  - In short run, marginal cost is the ratio of change in the total variable cost with change in output. i.e.

$$MC = \frac{\Delta TVC}{\Delta Q}$$

$$\text{Also}, MC_n = TC_n - TC_{n-1}$$

$$= [TFC + TVC_n] - [TFC + TVC_{n-1}]$$

$$= TFC + TVC_n - TFC - TVC_{n-1}$$

$$= TVC_n - TVC_{n-1}$$

Output	TFC	AFC	TVC	AVC	AC	MC
0	200	-	0			
1	200		20			
2	200		36			
3	200		48			
4	200		64			
5	200		100			
6	200		160			
7	200		248			
8	200		360			
9	200		520			

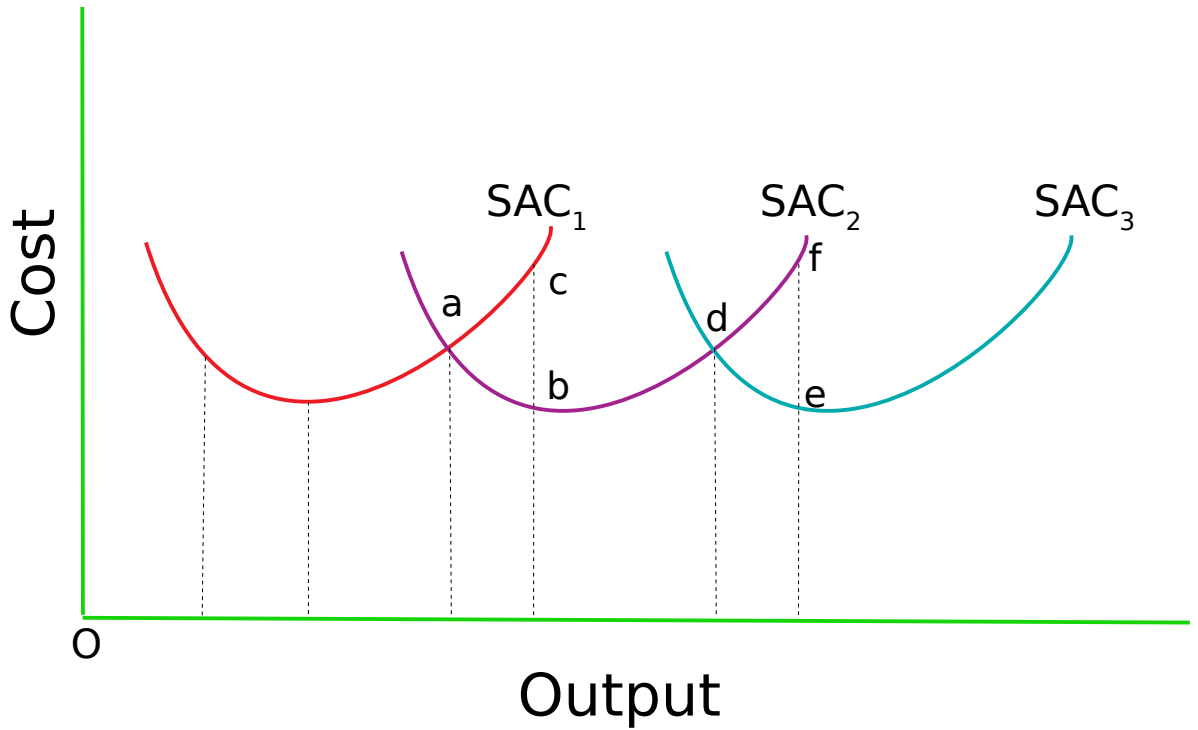
Behaviour of Short Run Costs

- **Behavior of short run Total Costs**
  - Page 199, S shaped Question.
  - Relationship between TP and TC
- **Behavior of Average and Marginal cost curves:**
  - Refer Page 201 and 202.
- **Relation between AC and MC**
  - Page no. 205.
- **Relation between AC and AFC and AVC.**
  - Page 207.
- **Relation between TVC and MC**
  - Page 208

Long Run Costs and Cost Curves

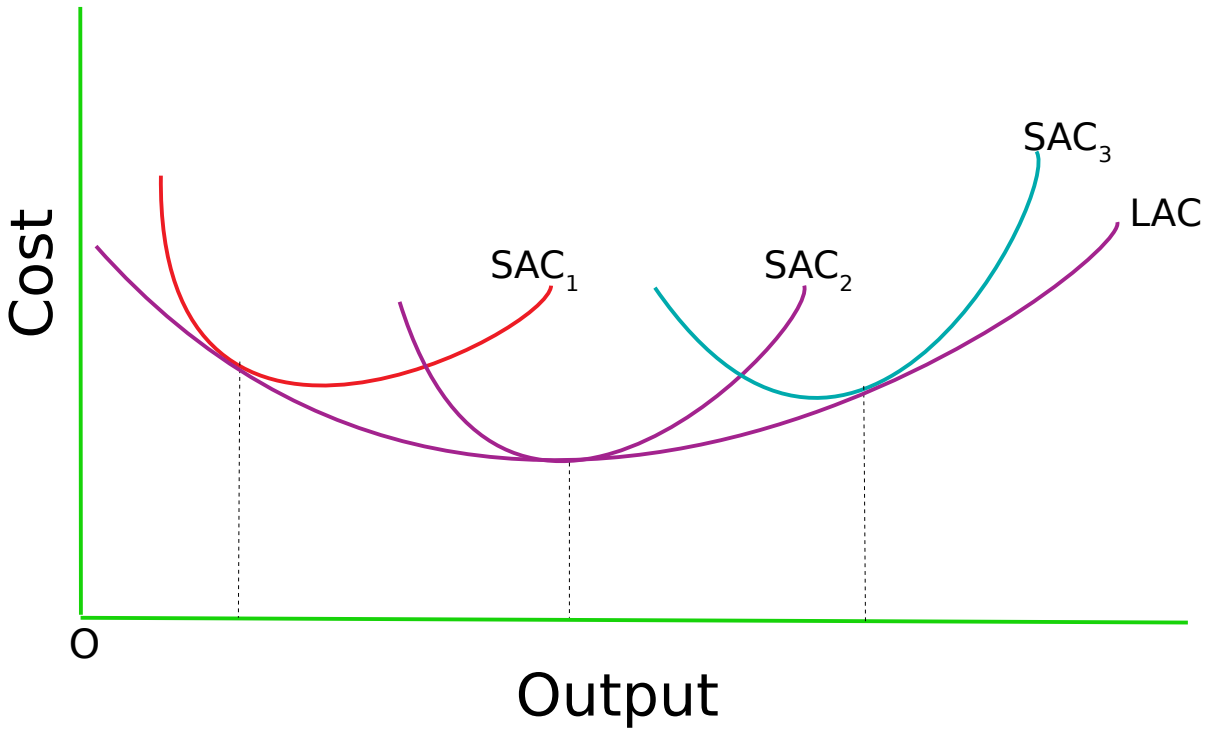
- **Long Run Cost:**
  - It can be defined as the cost incurred while production of goods and services in the long run.
  - In the long run all costs are considered variable costs.
- **Long Run Average Cost (LAC):**
  - The per unit cost of factors of production in the long run .
  - Total long run cost divided by total quantity produced.
  - Derived by joining all points of short run average cost curves then the firm can shift from one plant to the another.

Long Run Costs Derivation

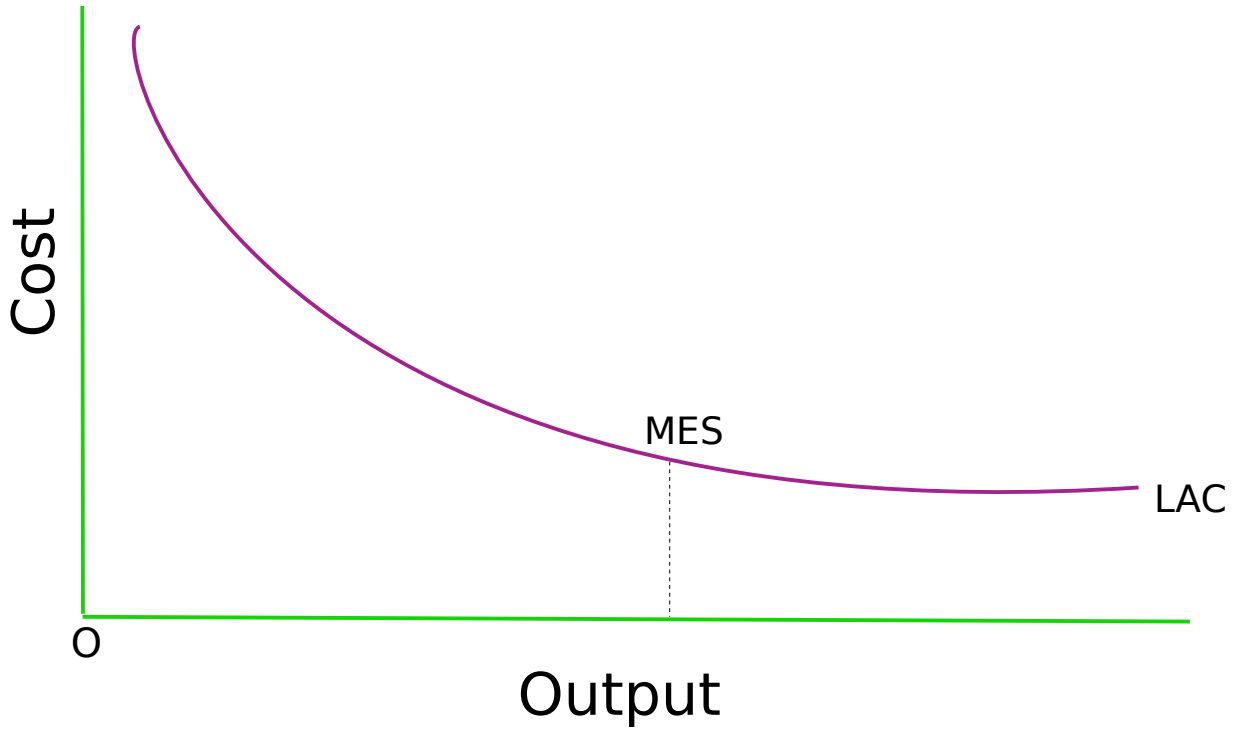


Why is LAC 'U' Shaped ? Follow page 210.

Long Run Costs Derivation



L Shaped Scale Curve



Revenue: Meaning and Types

- **Revenue:**
  - Sales receipts that a firm receives after selling the output at a given price.
  - In the long run all costs are considered variable costs.
- **Types/Concepts:**
  - **Total Revenue (TR):**
    - Total sales receipts that a firm receives from the sale of its products,
    - TR = P x Q
  -

Revenue: Meaning and Types

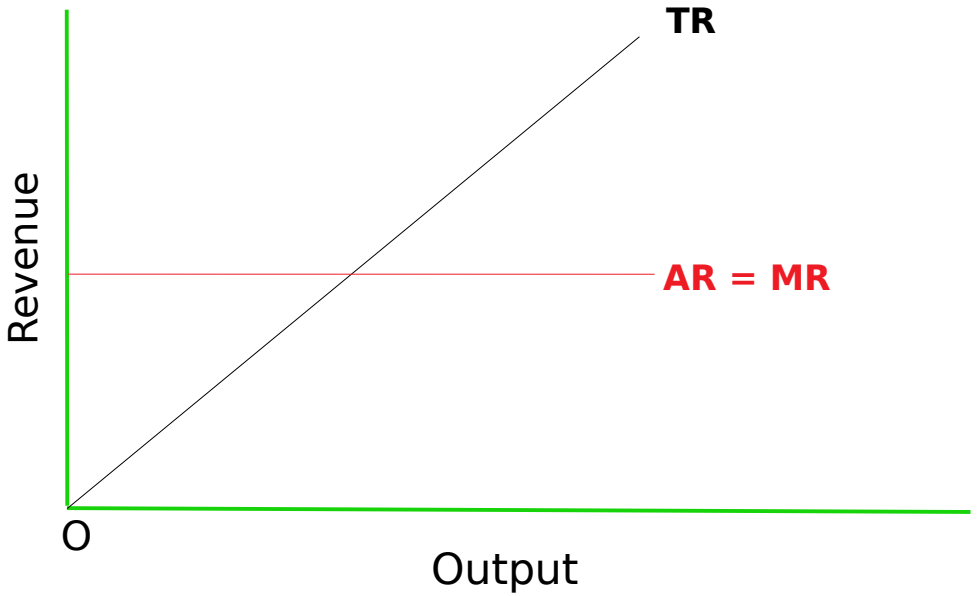
- **Types or Concepts of Revenue:**
  - **Average Revenue (AR):**
    - Revenue received per unit of output. It is per unit price.
    - AR = TR ÷ Q = (P x Q)÷Q = P
  - **Marginal Revenue (MR):**
    - The rate of change in revenue due to the change in output.
    - The addition made to total revenue by selling one more unit of output.
    - MR = ΔTR ÷ ΔQ or, MR = TR_n - TR_{n-1}

Revenue Under Perfect Competition

- Perfect competition is a market structure where there are large number of buyers and sellers of homogeneous product.
- Price determined by interaction of buyers and sellers.
  - Firm is a price taker.
- Everyone has perfect knowledge about market.
- Perfect price elasticity of demand as MR never changes.

Revenue Under Perfect Competition

Output	Price	TR	AR	MR
1	40	40	40	40
2	40	80	40	40
3	40	120	40	40
4	40	160	40	40



Revenue Under Imperfect Competition
a. Monopoly

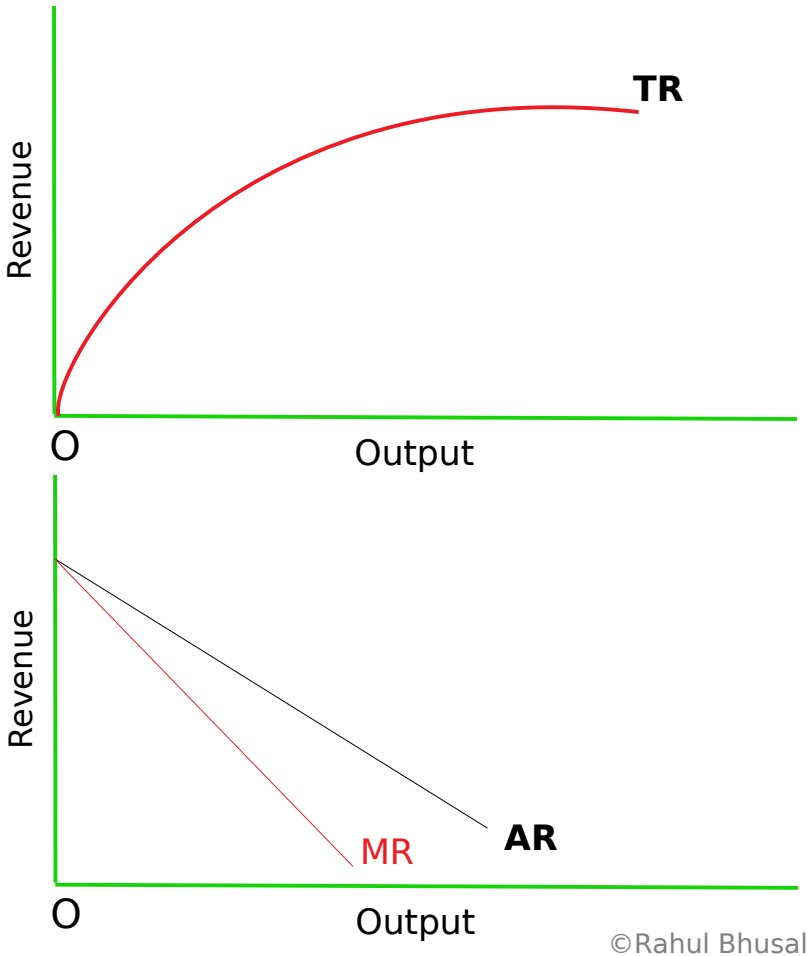
- Monopoly is a market structure where there is a single seller and there is no close substitutes.
- Price determined by demand of the product.
  - Inverse relation between demand and price.
  - Firm is a price maker.
- Due to inverse relation between price and output , the total revenue increases at a diminishing rate.
- Both AR and MR fall continuously
  - Decreasing rate of MR is greater than AR.

Revenue Under Imperfect Competition
b. Monopolistic Competition

- Monopolistic competition is a market structure where there is firms produce differentiated products with close substitutes.
- Price determined by demand of the product.
  - Inverse relation between demand and price.
  - Firm is a price maker due to differentiated product.
  - Enjoy monopoly power.
- Property of MR, AR and TR is same as in monopoly.

Revenue Under Imperfect Competition

Output	Price	TR	AR	MR
1	16	16	16	-
2	14	28	14	12
3	12	36	12	8
4	10	40	10	4



Relation between AR and MR and Price Elasticity of Demand 'e'

We know that Total Revenue (TR)

$TR = PQ$

Where P is Price per unit or Average Revenue (AR) and Q is Quantity of output

Now,

$TR = AR \times Q$

$$\text{Also, } MR = \frac{dTR}{dQ} = \frac{d\,PQ}{dQ}$$

$$\text{or, } MR = P + Q\frac{dP}{dQ}$$

$$\text{or, } MR = P\left[1 + \frac{Q}{P}\frac{dP}{DQ}\right] \ldots\ldots \text{eqn}(i)$$

We know,

$$\text{Price Elasticity}(e) = -\frac{dQ}{dP} \cdot \frac{P}{Q}$$

$$\text{or, } \frac{1}{e} = -\frac{1}{\frac{dQ}{dP} \cdot \frac{P}{Q}}$$

$$\text{or, } -\frac{1}{e} = \frac{Q}{P}\frac{dP}{DQ}$$

So, from equation (i), We have

$$MR = P\left(1 + \frac{Q}{P}\frac{dP}{DQ}\right)$$

$$\text{or, } MR = P\left(1 + \left(-\frac{1}{e}\right)\right)$$

$$\text{or, } MR = AR\left(1 - \frac{1}{e}\right)$$