

Cost and Revenue Concepts:

Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization

Text Book for Reading :

1. Principles of Economics by Deviga Vengedasalam & Karunagaran Madhavan, Oxford Publication

Some of the e-resources of the book have taken from the book for explaining to the students in the class purposes only

What is Cost?

- The amount of expenditure (actual or notional) incurred on or attributable to a specified thing or activity (ICMA)
- In producing a good or service, a firm has to employ an aggregate of various factors of production such as land, labour, capital and entrepreneurship.
- These factors are to be compensated by the firm for their contribution in producing the commodity,
- This compensation (factor price) is the cost.

On the basis of Nature or **Element** of Cost

- Material Cost : Direct Material & Indirect Material
- Labour Cost : Direct Labour & Indirect Labour
- Expenses : Direct Expenses & Indirect Expenses
- Examples :
 - Direct Material : Cotton in Cotton Textiles
 - Indirect Material : oil, cotton waste etc.
 - Direct Labour Cost : Cost of labour directly engaged in production
 - Indirect Labour Cost : Salesman Commission.
 - Direct Expenses : Wages and Salaries
 - Indirect Expenses : Hospital Expense of employees

Types of costs

Explicit (or paid out) and Implicit (or, imputed)Costs:

A firm's cost of production include *explicit costs* and *implicit costs*.

- Explicit costs** is the value of resources purchased for production . (Wages and salaries to workers, payments for fuel, transportation, electricity and power)
- Implicit costs** is the value of input services that are used in production which are not purchased in the market . It is the value of self-owned, self employed resources utilized in production.

Types of costs

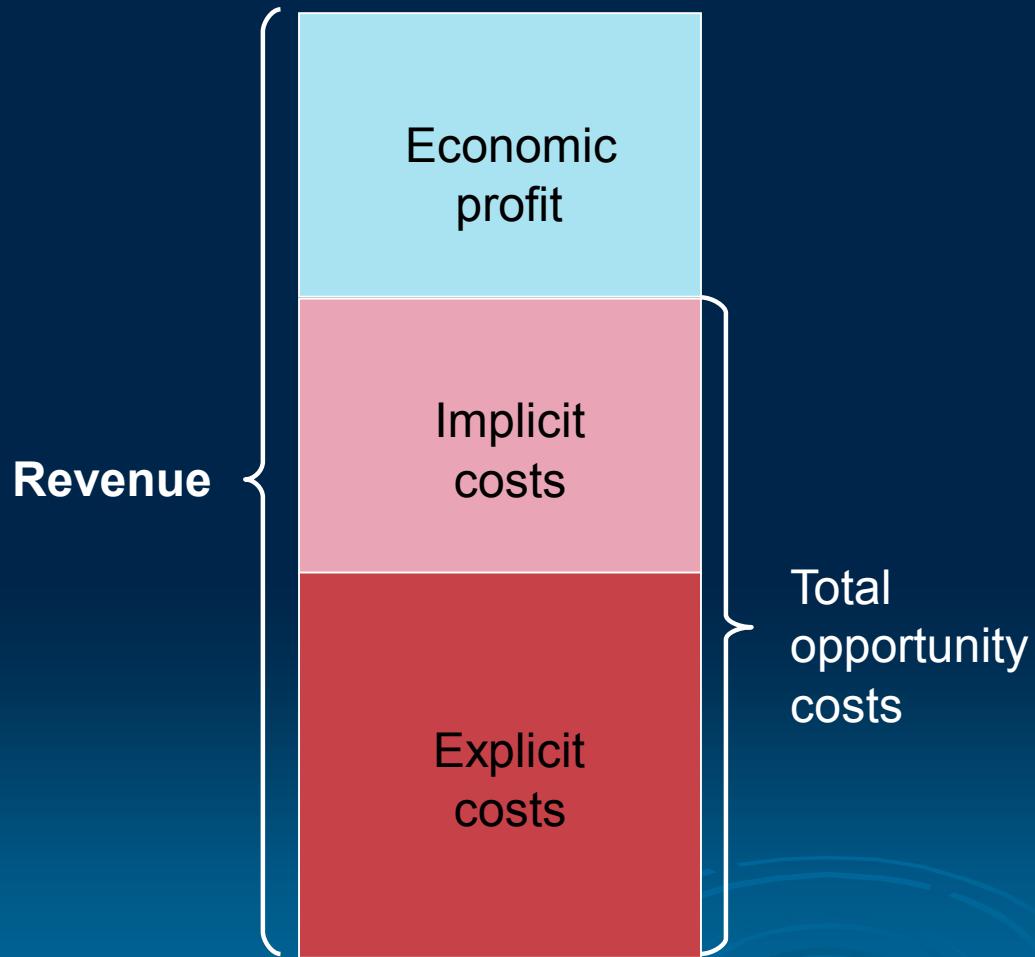
Economic Cost versus Accounting Cost :

- Accounting cost : Actual expenses plus depreciation charges for capital equipment.
- Economic cost : Cost to a firm of utilizing economic resources in production, including opportunity cost.
- Economic Cost = Implicit cost + Explicit Cost

Accounting Cost < Economic Cost

Economic Profit versus Accounting Profit

How an Economist
Views a Firm



How an Accountant
Views a Firm



Types of costs

- **opportunity cost** : Cost associated with opportunities that are forgone when a firm's resources are not put to their best alternative use.
 - Ex: A businessman can go for a printing machine or paper cutting machine with his resources.

Alternative – I (Printing Machine)	Alternative – II (Paper cutting Machine)
1,00,000	80,000

- A rational businessman will certainly buy printing machine which gives him a higher return.
- Opportunity cost is Rs 80,000
- Economic Profit = Rs 20,000
- **As long as economic profit is above zero, it is rational to invest resources in printing machine**

Types of costs

sunk cost : Expenditure that has been made and cannot be recovered. Because a sunk cost cannot be recovered, it should not influence the firm's decisions.

- Ex: A specialized equipment for a plant is purchased but not being utilized. As *it has no alternative use, its opportunity cost is zero*. Thus it should not be included as part of the firm's economic costs.
- **Social Cost** : is the total cost of production of a product, and includes direct and indirect costs incurred by society.
 - Ex . Water pollution, air pollution, solid waste

COST OF PRODUCTION

SHORT RUN

A production period in which at least one of the input is *fixed**.

LONG RUN

A production period in which all the inputs are *variable***.

- * A *fixed* input is an input which the quantity **does not change** according to the amount of **output**. E.g. machinery
- ** A **variable** input is an input which the quantity **varies** according to the amount of **output**. E.g. labour

Total Costs, Fixed cost, Variable cost

TOTAL COST (TC)

- ✓ The sum of cost of all inputs used to produce goods and services.
 - ✓ *Total cost (TC) also defined as total fixed cost (TFC) plus total variable cost (TVC).*

TOTAL FIXED COST (TFC)

- ✓ The cost of inputs that are independent of output.
- ✓ Examples: Factory, machinery and etc.

TOTAL VARIABLE COST (TVC)

- ✓ The cost of inputs that *changes* with output.
- ✓ Example: Raw materials, labours, etc.

AVERAGE TOTAL COST (ATC)

- ✓ The total cost per unit of output.
- ✓ The formula for average total cost (ATC) is the total cost (TC) divided by the output (Q).

$$\text{ATC} = \frac{\text{TC}}{\text{Q}}$$

$$\text{TC} = \text{TVC} + \text{TFC}$$

SHORT-RUN PRODUCTION

AVERAGE FIXED COST (AFC)

Total fixed cost (TFC) divided by total output:

$$AFC = \frac{TFC}{Q}$$

AVERAGE VARIABLE COST (AVC)

Total variable cost (TVC) divided by total output:

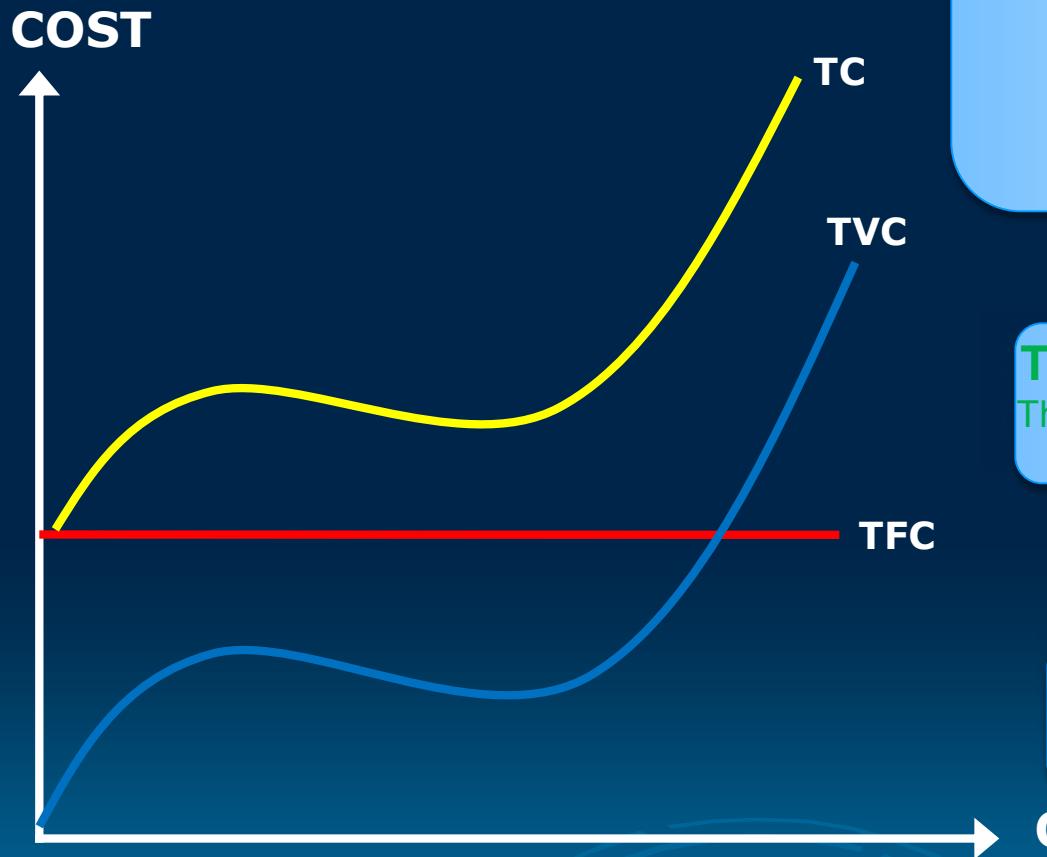
$$AVC = \frac{TVC}{Q}$$

MARGINAL COST (MC)

The change in total cost that results from a change in output; the extra cost incurred to produce another unit of output:

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

SHORT-RUN COST CURVES



TOTAL COST (TC)

The sum of cost of all inputs used to produce goods and services.
Also defined as *TFC plus TVC*

$$TC = TVC + TFC$$

TOTAL VARIABLE COST (TVC)

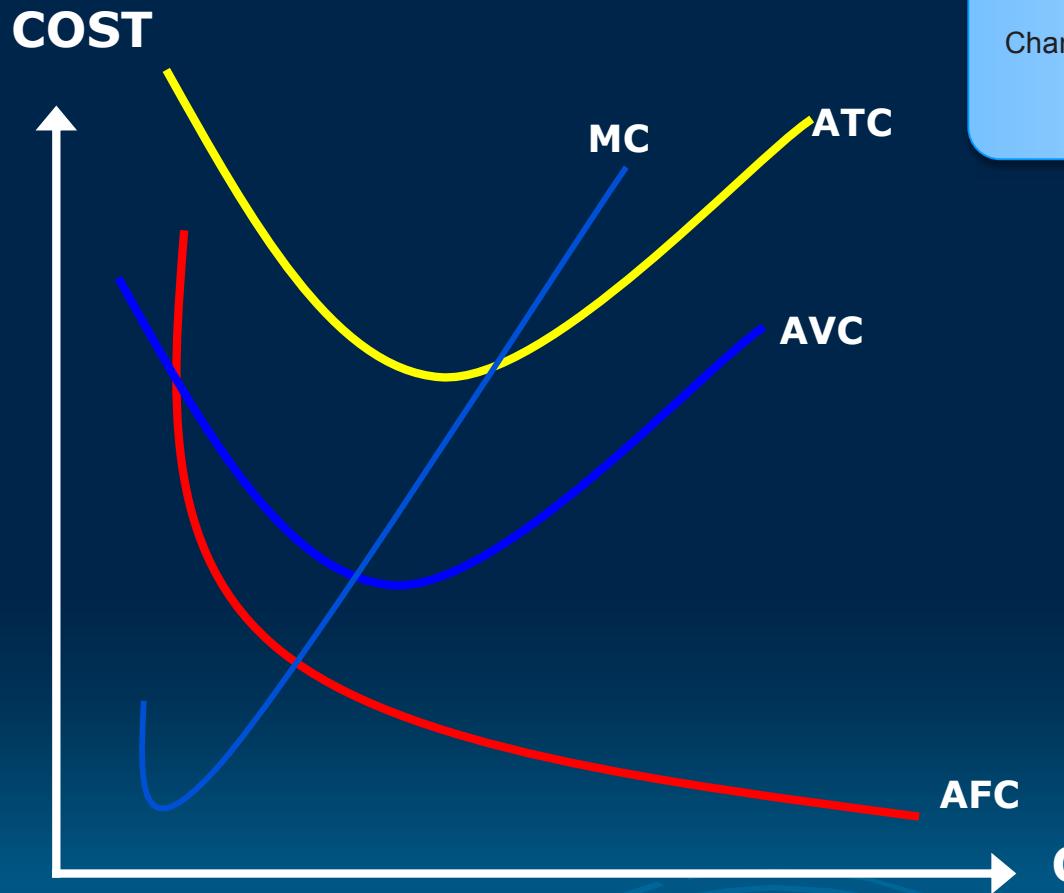
The cost of inputs that changes with *output*.

TOTAL FIXED COST (TFC)

The cost of inputs that is independent of output.

QUANTITY

SHORT-RUN COST CURVES (cont.)



MARGINAL COST (MC)

Change in total cost that results from a change in output

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

AVERAGE TOTAL COST (ATC)

Total cost per output

$$ATC = \frac{TC}{Q} \quad ATC = AFC + AVC$$

AVERAGE VARIABLE COST (AVC)

Total variable cost (TVC) divided by total output

$$AVC = \frac{TVC}{Q}$$

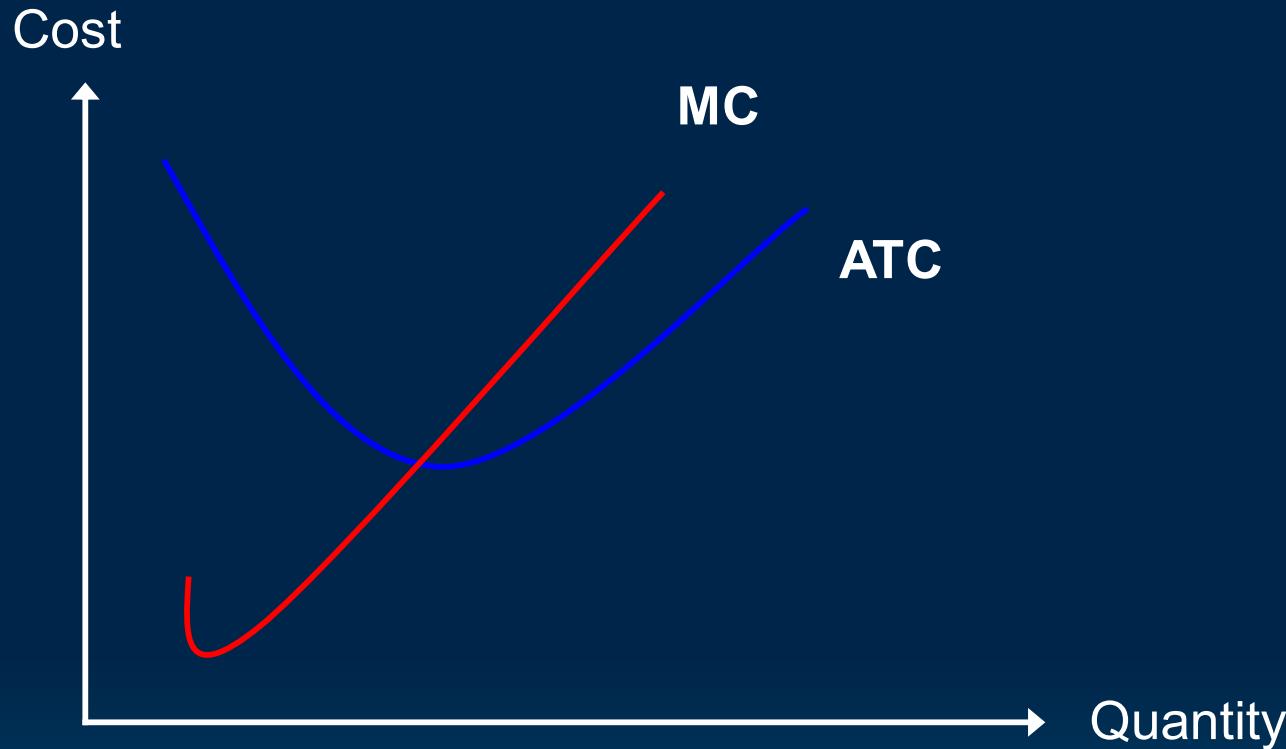
AVERAGE FIXED COST (AFC)

Total fixed cost (TFC) divided by total output

$$AFC = \frac{TFC}{Q}$$

	Total costs			Average costs			
(1) Quantity (Q)	(2) Total fixed cost (TFC)	(3) Total variable cost (TVC)	(4) Total cost (TC) $TC=TFC + TVC$	(5) Average fixed cost (AFC) $AFC = TFC/Q$	(6) Average variable cost (AVC) $AVC = TVC/Q$	(7) Average total cost (ATC) $ATC = TC/Q$	(8) Marginal cost (MC) $MC = \Delta TC/\Delta Q$
0	20	0	20	-	-	-	-
1	20	15	35	20	15	35	15
2	20	25	45	10	12.50	22.50	10
3	20	30	50	6.67	10	16.67	5
4	20	35	55	5	8.75	13.75	5
5	20	45	65	4	9	13	10

RELATIONSHIP BETWEEN MC AND ATC



ATC falling, MC curve lies below ATC curve.

ATC is at minimum point, ATC curve and MC curve are equal.

ATC starts to increase, MC curve lies above ATC curve.

ANALYSIS OF COSTS

Firms make production and sales decisions on the basis of a good's cost and price. A profit-minded firm will keep an eagle eye on its costs to maintain profitability.

Total Cost: Fixed and Variable

1	2	3	4
Qty	Fixed Cost (FC)	Variable Cost (VC)	Total Cost (TC)
0	55	0	55
1	55	30	85
2	55	55	110
3	55	75	130
4	55	105	160
5	55	155	210
6	55	225	280

Output (Q)	Total Cost (TC)	Marginal cost (MC)	Behavior of MC
0	55	-	
1	85	30	
2	110	25	↓
3	130	20	↓
4	160	30	↑
5	210	50	↑

How to calculate MC

(1) To calculate the MC of i^{th} unit we subtract the total cost of the $i-1^{\text{th}}$ unit from the total cost of i^{th} unit.

$$\text{MC of } 4^{\text{th}} \text{ unit} = 160 - 130 = 30$$

$$\text{MC of } 5^{\text{th}} \text{ unit} = 210 - 160 = 50$$

We could also get MC by subtracting VC of $i^{\text{th}}-1$ from VC of i^{th} term. Why?

Average Cost or Unit Cost

One of the most important cost concept is average cost, which, when compared with price or average revenue will allow a business to determine whether or not it is making a profit.

1. Average Fixed Cost: $AFC = FC/q$

Since Total Fixed Cost is a constant dividing it by an increasing output gives a steadily falling AFC & looks like a hyperbola approaching the horizontal axis as the constant FC gets spread over more and more units. (Asymptotic to X-axis.)

2. Average Variable Cost: $AVC = VC/q$

AVC falls initially and then rises.

3. Average Cost or Average Total Cost (AC or ATC)

$AC = TC/Q$

AVC & AC are 'U' shaped on the short run.

COST CALCULATION

FIXED COST = 55

Qty .	V.Cost	T.C.	M.C. per Unit	AC TC/q (Unit)	AFC/Unit	AVC/Unit AVC = VC/q
0	0	55				
1	30	85	30	85	55	30
2	55	110	25	55	27.5	27.5
3	75	130	20	43.3	18.3	25
4	105	160	30	40	13.7	26.2
5	155	210	50	42	11	31
6	225	280	70	46.6	9.1	37.5
7	335	370	90	52.8	7.8	45
8	425	480	110	60.0	6.8	53.1
9	555	610	130	67.7	6.1	61.6
10	705	760	150	76	5.5	70.5

ISOCOST

- An **isocost line** shows various combinations of two inputs, capital and labour, which can be purchased with a given amount of money for a given total cost.
- An **isocost equation** shows the relationship between the inputs (capital and labour) used in the production and the given total cost by a firm.
- The isocost equation can be written as:

$$TC = wL + rk$$

Where: TC = Total Cost

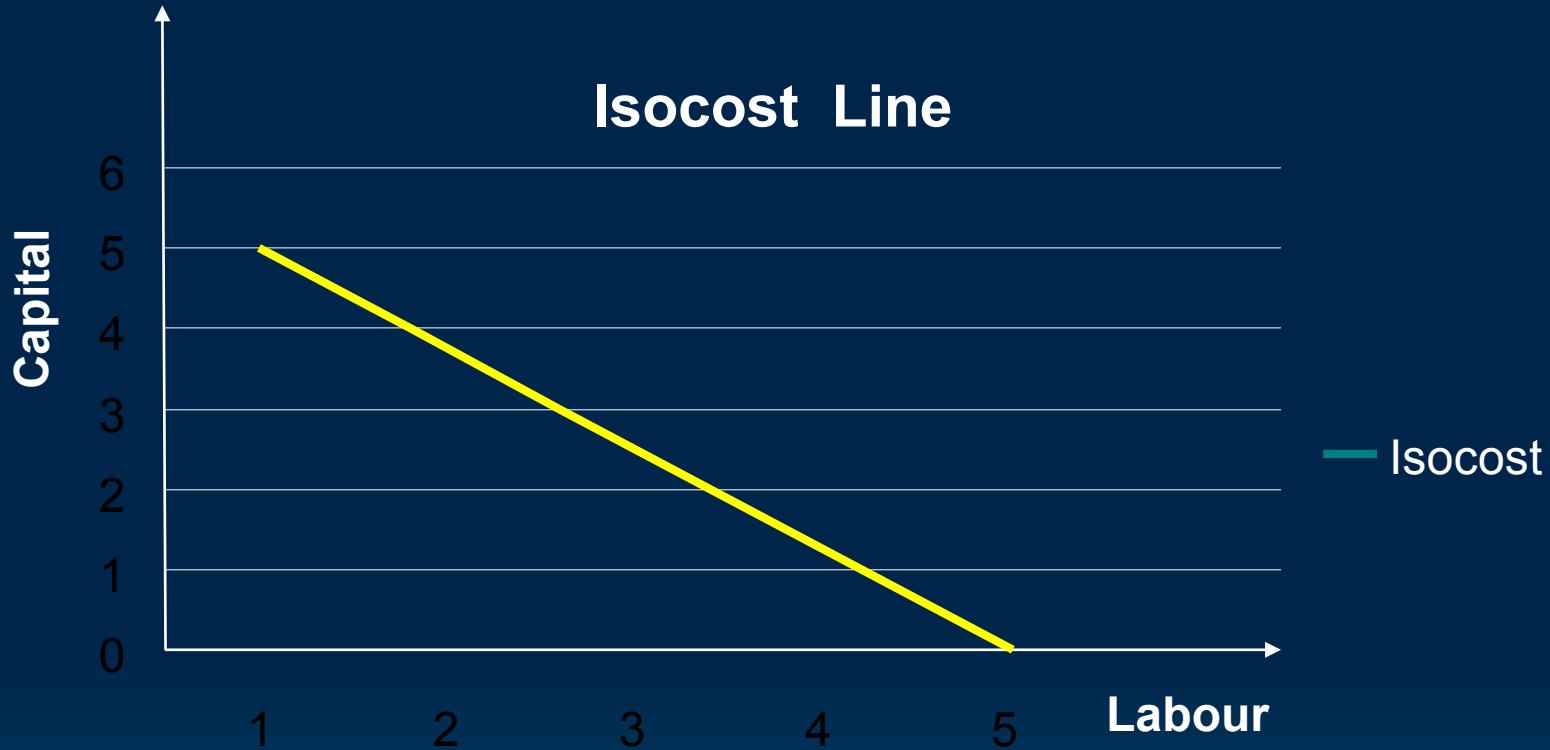
L = Labour

K = Capital (fixed)

w = Price of labour

r = Price of capital

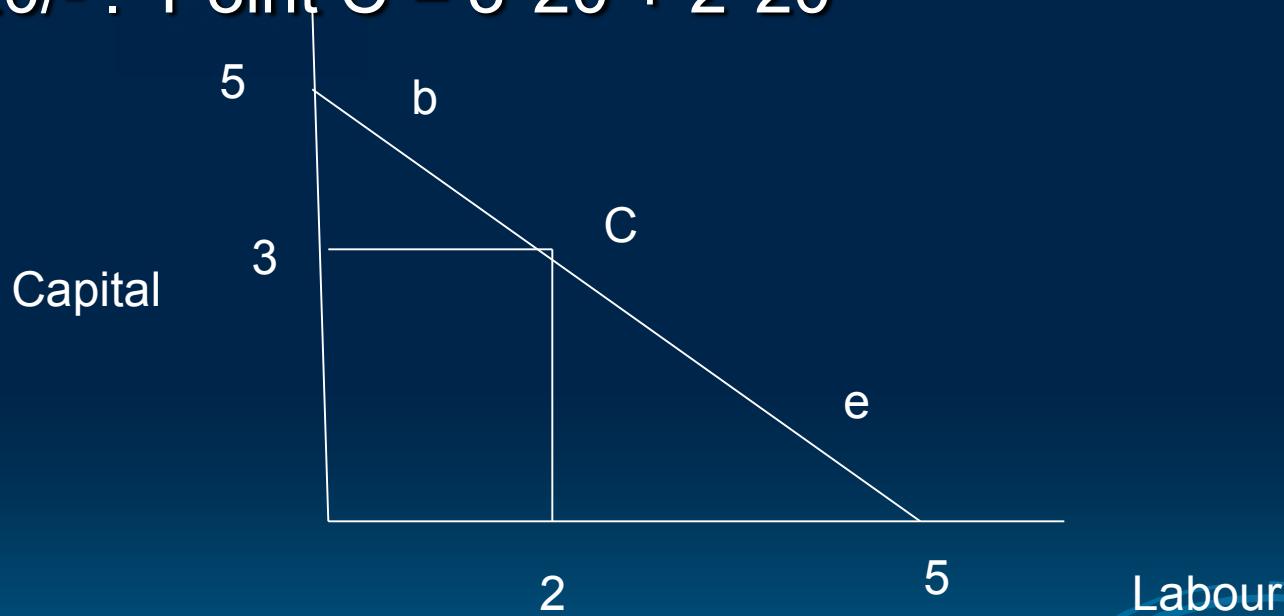
ISOCOST (cont.)



Iso-cost line shows the various combinations of labour and capital with given total cost for a firm in the production of shoes.

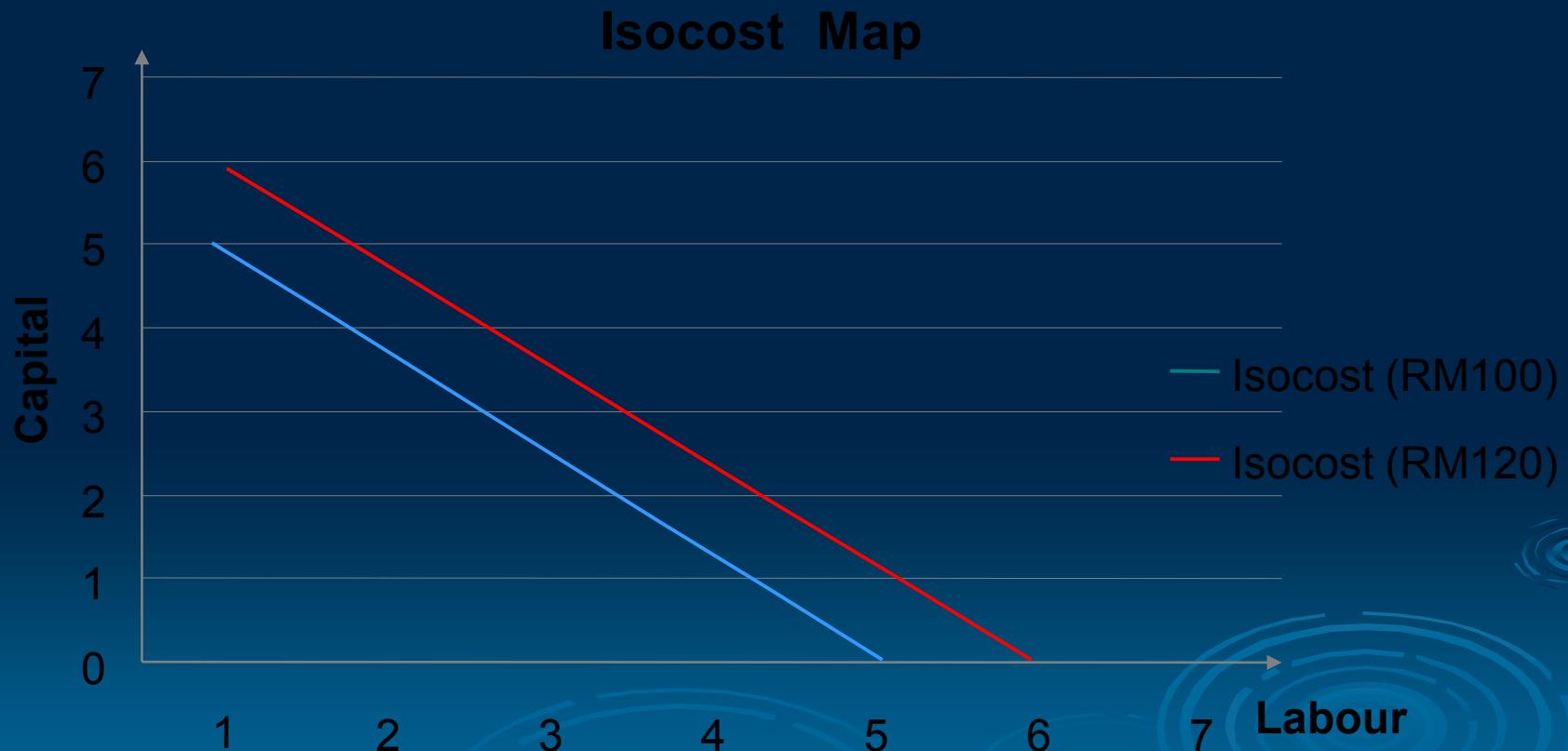
Example to understand the concept of Iso-cost

- Producer wants to spend Rs 100 a day producing shoes . Labour Rs 20 /- per day and rented machine Rs 20/- . Point C = $3*20 + 2*20$



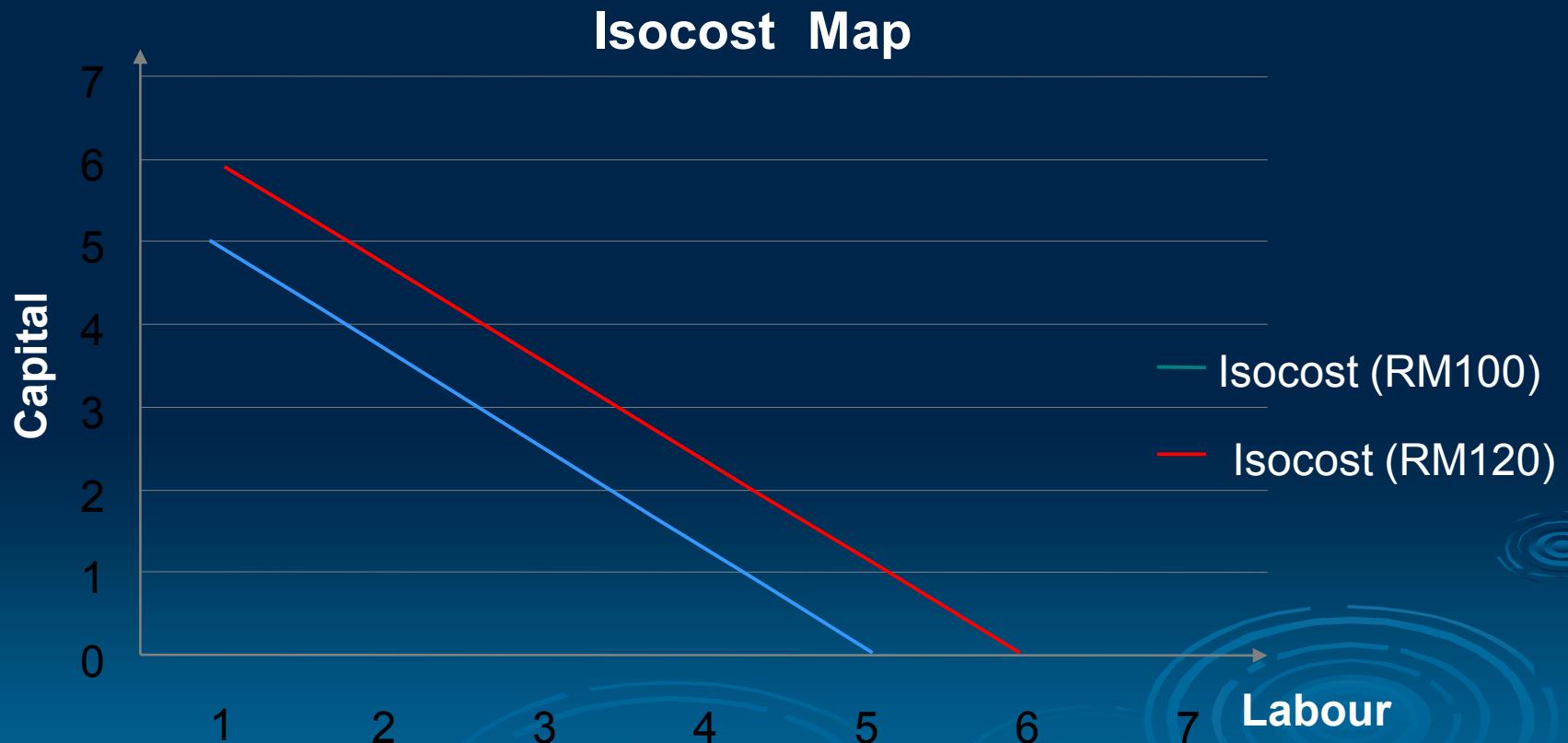
ISOCOST MAP

An isocost map is a number of isocost lines that show different levels of total cost in one diagram.



ISOCOST MAP

An iso-cost map is a number of iso-cost lines that show different levels of total cost in one diagram.



COST MINIMIZING TECHNIQUES

The cost minimizing technique is selecting combinations of inputs that minimize the total cost at the given level of output.

At point y, the slope of isoquant curve is equal to that of isocost line and this is the most efficient technique for production.



Points x and z are not efficient because the cost of production is exceeding RM120.

COST CURVES IN THE LONG RUN

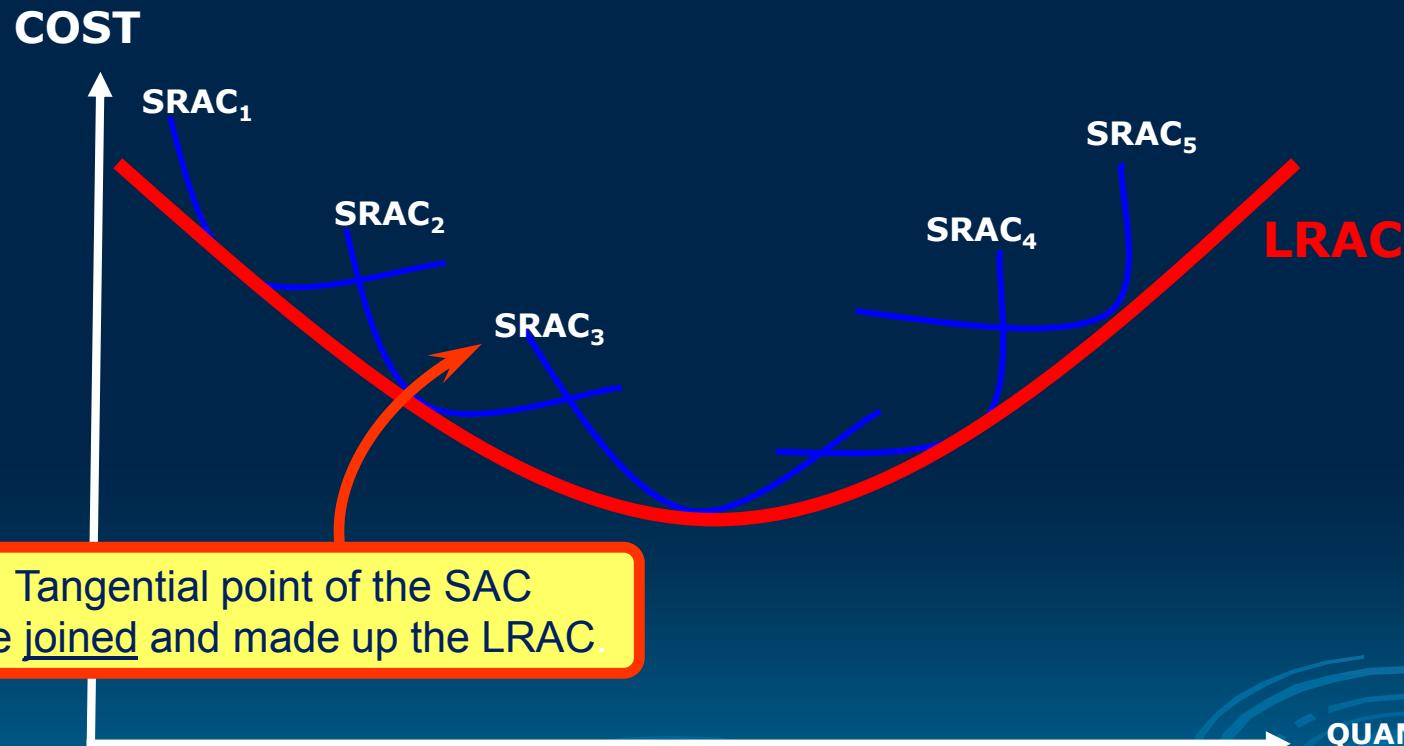
- Long run is a period where there are only variable factors and no fixed cost involved.
- Long run total cost (LRTC) starts from origin because of the absence of total fixed cost.

LONG RUN AVERAGE COST CURVE (LRAC)

- Shows the minimum cost of producing any given output when all of the inputs are variable.
- Long run is a period where firms plan how to minimize average cost.

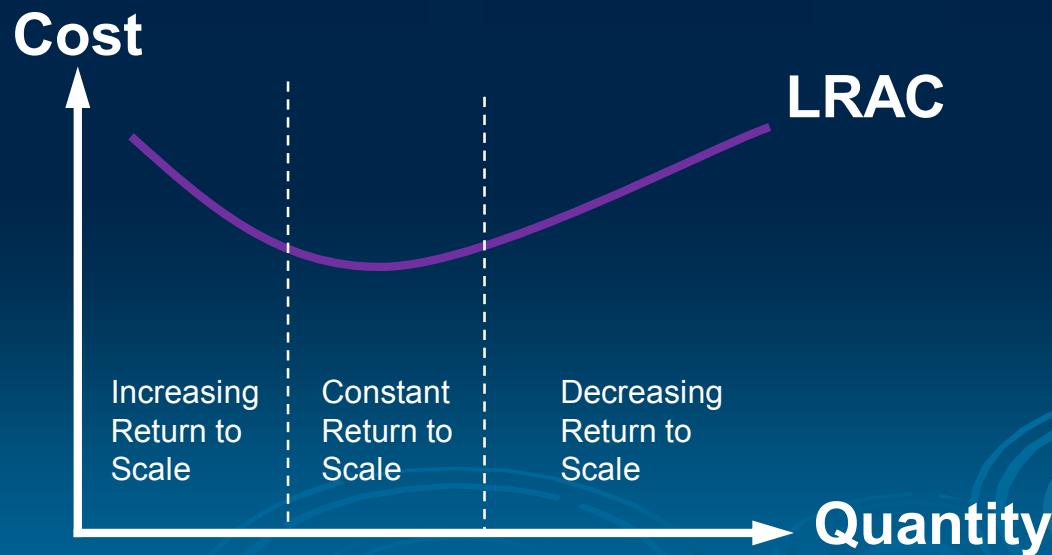
LONG-RUN PRODUCTION COST

LRAC curve are derived by a series of short run average cost curves



LONG-RUN PRODUCTION COST (cont.)

- Long run average cost curve (LRAC) is “U-Shaped” due to the Law of Returns to Scale.
- **Law of Returns to Scale** states that as the firm expand its size or scale of production, its long run average cost (LRAC) will decrease and increase at later stage.



ECONOMIES OF SCALE

Economies of scale are benefits and advantages of a firm as it expands its production.

- Reduce the average cost.

INTERNAL

Internal economies happen inside an organization



EXTERNAL

Advantages of the industry as a whole

Economies of Government Action

Economies of Concentration

Economies of Information

Economies of Marketing

ECONOMIES OF SCALE (cont.)

Diseconomies of scale are problems and disadvantages faced by a firm when it expands production.

- Increase the average cost.

INTERNAL

Raise the cost of production of a firm as the firm expands

Labour Diseconomies

Management Problem

Technical Difficulties

EXTERNAL

The disadvantages faced by the industry as a whole

Scarcity of Raw Material

Wage Differential

Concentration Problem

CONCEPT OF REVENUE

TOTAL REVENUE (TR)

The total amount received from the sale of a firm's goods and services

$$\text{Total Revenue (TR)} = \text{Price (P)} \times \text{Quantity (Q)}$$

AVERAGE REVENUE (AR)

Average revenue is the total revenue per unit output sold.

- Average revenue (AR) is also equal to the price (P) of the good.

$$\text{Average Revenue (AR)} = \frac{\text{Total Revenue (TR)}}{\text{Quantity (Q)}}$$

$$AR = \frac{P \times Q}{Q} = \text{PRICE}$$

CONCEPT OF REVENUE (cont.)

MARGINAL REVENUE (MR)

The change in total revenue resulting from one unit increase in quantity sold.

$$\text{Marginal Revenue (MR)} = \frac{\text{Change in Total Revenue}}{\text{Change in Quantity}}$$

$$MR = \Delta TR / \Delta Q$$

(1) Quantity	(2) Price	(3) Total Revenue (1) x (2)	(4) Average Revenue (3) / (1)	(5) Marginal Revenue $\Delta(3) / \Delta(1)$
10	50	500	50	50
20	45	900	45	40
30	40	1200	40	30
40	35	1400	35	20
50	30	1500	30	10
60	25	1500	25	0
70	20	1400	20	-10