Prepared
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Costs of Production

Destruction/Reduction of Utility

What is Cost?

Cost refers to the total expenditure made on inputs or resources that are used for the production of final goods or services. The resources used by a firm are limited in nature and thus require efficient allocation to maximise the firm's profit.

Concept of Costs:

In order to understand the general concept of costs, it is important to know the following types of costs:

1. Accounting costs and Economic costs

2. Outlay costs and Opportunity costs

3. Direct/Traceable costs and Indirect/Untraceable costs

4. Incremental costs and Sunk costs

5. Private costs and Social costs

6. Fixed costs and Variable costs

1. Concept of Costs in terms of Treatment

A. Accounting costs

Accounting costs are those for which the entrepreneur pays direct cash for procuring resources for production. These include costs of the price paid for raw materials and machines, wages paid to workers, electricity charges, the cost incurred in hiring or purchasing a building or plot, etc. Accounting costs are treated as expenses. Chartered accountants record them in financial statements.

B. The cost or economic cost of a firm consists of all the expenses it faces, can manage, and are beyond its control. For example, cost of labor, capital, and raw materials. Besides other resources, a firm may also use those resources whose expenses are not that clear but are still essential for the firm.

The cost is the sum of the **Explicit Cost** and **Implicit Cost**.

a. Explicit Cost: *The actual expenditure made on the inputs or the payments made to the outsiders to hire their factor services* is known as Explicit Cost.

For example, wages paid to the workers, payment for land, payment for raw materials, etc.

b. Implicit Cost: *The estimated value of the inputs supplied by the owners along with the normal profits* is known as Implicit Cost.

For example, estimated rent on own land, imputed salary for the entrepreneur's services, etc.

2. Concept of Costs in terms of the Nature of Expenses

A. Outlay costs

The actual expenses incurred by the entrepreneur in employing inputs are called outlay [costs](#). These include costs on payment of wages, rent, electricity or fuel charges, raw materials, etc. We have to treat them are general expenses for the business.

B. Opportunity costs

Opportunity cost can be defined as the potential benefit that an individual misses out on by choosing one option over another. In other words, *Opportunity costs are incomes from the next best alternative that is foregone when the entrepreneur makes certain choices. Thus, e*very decision to choose a product over another has an opportunity cost associated with it. Opportunity cost helps to determine the most efficient allocation of resources. Opportunity Cost theory is given by **Gottfried Haberler** and opportunity cost is also called *alternative cost*.

For examples: the entrepreneur could have earned a salary had he worked for others instead of spending time on his own business. These costs calculate the missed opportunity and calculate income that we can earn by following some other policy. Opportunity cost example is choosing to prepare for an exam instead of hanging out with friends has an opportunity cost in terms of the enjoyment and social contact you will lose.

3. Concept of Costs in terms of Traceability

A. Direct costs

Direct costs are related to a specific process or product. They are also called traceable costs as we can directly trace them to a particular activity, product or process. They can vary with changes in the activity or product.

Example of direct costs include manufacturing costs relating to production, customer acquisition costs pertaining to sales, etc.

B. Indirect costs

Indirect costs, or untraceable costs, are those which do not directly relate to a specific activity or component of the business.

For example, an increase in charges of electricity or taxes payable on income. Although we cannot trace indirect costs, they are important because they affect overall profitability.

4. Concept of Costs in terms of the Purpose

A. Incremental costs: *These costs are incurred when the business makes a policy decision*. For example, change of product line, acquisition of new customers, upgrade of machinery to increase output are incremental costs.

B. Sunk costs: *Suck costs are costs which the entrepreneur has already incurred and he cannot recover them again now*. These include money spent on advertising, conducting research, and acquiring machinery.

5. Concept of Costs in terms of Payers

A. Private costs: *These costs are incurred by the business in furtherance of its own objectives. Entrepreneurs spend them for their own private and business interests*. For example, costs of manufacturing, production, sale, advertising, etc.

B. Social costs: *As the name suggests, it is the society that bears social costs for private interests and expenses of the business. These include social resources for which the firm does not incur expenses*, like atmosphere, water resources and environmental pollution.

C. Real Costs: As you know, the producer does not tell us nothing about what lies behind these production (Other than the money cost incurred by them). According to Marshall, '*the efforts and sacrifices undergone by the various members of the society in producing a commodity are the real costs of production*'. The efforts and sacrifices made by the capitalist to save and invest, by the workers in foregoing leisure, and by the landlords in the use of land, all constitute real costs.

6. Concept of Costs in terms of Variability

A. Fixed costs
Fixed costs are those which do not change with the volume of output. The business incurs them regardless of their level of production. Examples of these include payment of rent, taxes, interest on a loan, etc.

B. Variable costs
These costs will vary depending upon the output that the business generates. Less production will cost fewer expenses, and vice versa, the business will pay more when its production is greater. Expenses on the purchase of raw material and payment of wages are examples of variable costs.

Solved Examples on Concept of Costs
Question: Describe the nature of the following costs and give reasons for your answers.
Answer:
1. The cost incurred in advertising: This expense can be –
Direct cost (traceable to sales)
Sunk cost (not recoverable)
Private cost (spent for business interests)
Variable cost (will vary depending on the volume of output)
2. Income earned from a job: This expense can be –
Economic cost (the person could earn more money by working for his business)
Opportunity cost (same reason as above)
3. Rent paid for factory premises: This expense can be –
Accounting cost (spent on procuring facilities for production)
Direct cost (directly affects manufacturing)
Outlay cost (spent on procuring access to input, i.e. factory)
Private cost (used for private business interests)
Fixed cost (does not change with variance in production levels)

The Costs of Production:

- There are many different types of costs.
- Invariably, firms believe costs are too high and try to lower them.

Cost Function: shows the relationship between costs & output. *Cost functions are the derived function because they are derived from the production function*, i.e., **C= f (X, T, Pf, K)**.

where, c= total cost, X= total output, T=technology, Pf= Prices of factors & K=Fixed factors.

Cost

Short Run* *and* *Long Run

- ***Short Run***
  - Only some inputs (e.g. labor) can be adjusted
  - Not enough time to adjust all inputs (such as capital)

- ***Long Run***
  - long enough time to adjust all inputs (capital as well as labor)

A. The Traditional Theory of Costs: Short-Run Theory

- Fixed Costs,
- Variable Costs, and
- Total Costs

https://intactone.com/cost-curves-analysis-short-run-and-long-run-cost/

Fixed Costs, Variable Costs, and Total Costs

- *Fixed costs* are those that are spent and cannot be changed in the period of time under consideration.

- In the long run there are no fixed costs since all costs are variable.

- In the short run, a number of costs will be fixed.

- *variable costs :* Workers represent variable costs – those that change as output changes.
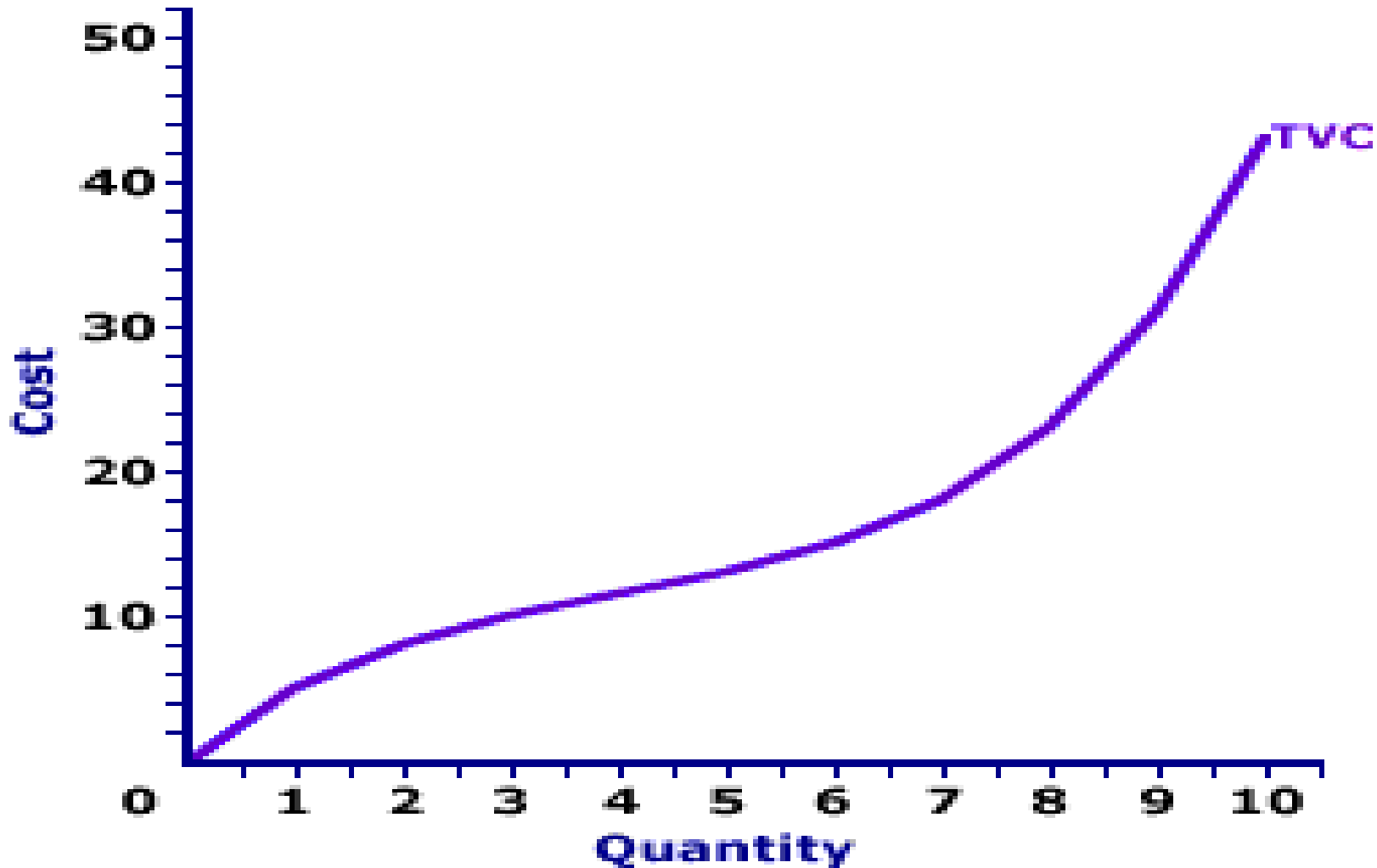
Fixed Costs vs. Variable Costs

Fixed Costs

The costs associated with your business's product that must be paid regardless of how much you sell

Rent for office space or storefront

Weekly payroll

Equipment depreciation

Variable Costs

The costs directly related to the sales volume of your business

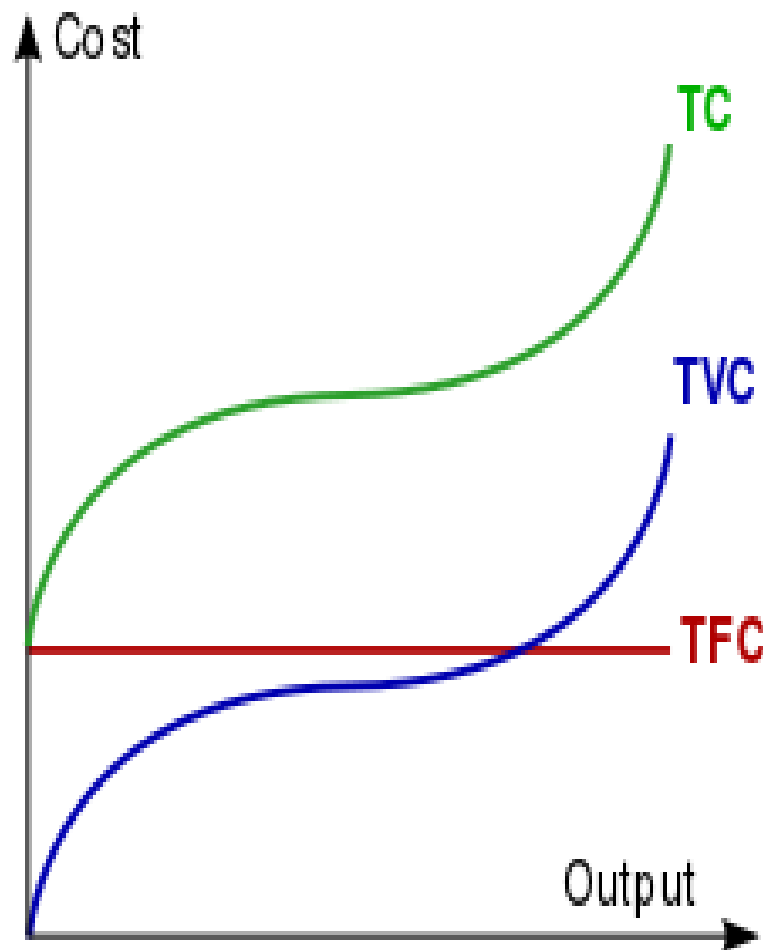Delivery/shipping charges

Sales commissions

Advertising and publicity
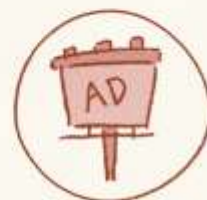
Total Cost Curves

- The total variable cost curve has the same shape as the total cost curve—increasing output increases variable cost.

| Q	TFC	TVC	TC
0	60	0	60
1	60	30	90
2	60	40	100
3	60	45	105
4	60	55	115
5	60	75	135
6	60	120	180

Costs of Production: Per Unit Cost (Average Costs)

Average Fixed Cost (**AFC**),

Average Variable Cost (**AVC**),

Marginal Cost (**MC**) and

Average Total Cost (**ATC or AC**)

- Average costs are *costs per unit of output*
- Much of the firm's discussion is of average cost.

Average Costs

- **Average fixed cost** equals fixed cost divided by quantity produced.   *AFC = TFC/Q*
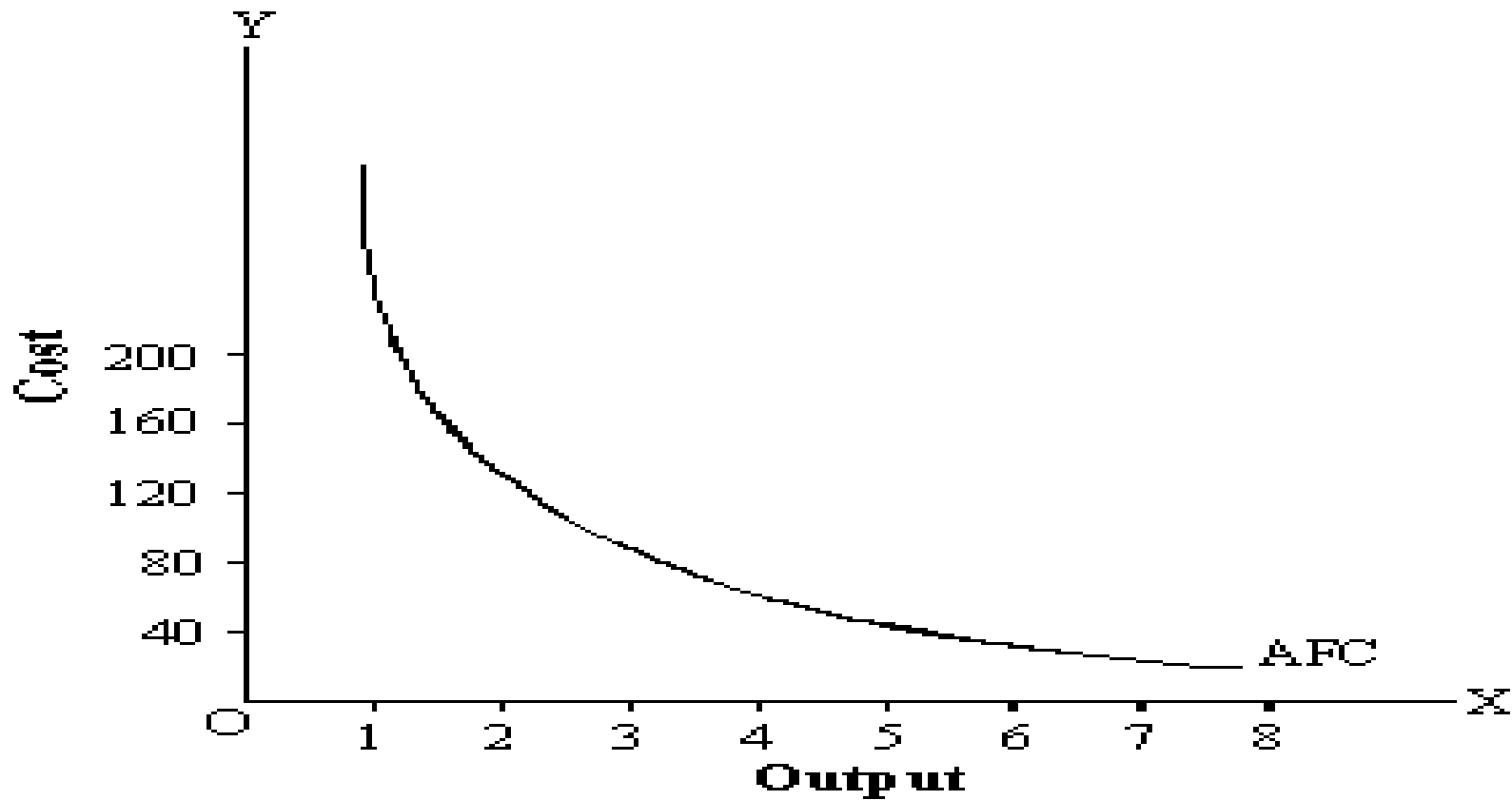
Average fixed cost

Fig. 4.4

Average Fixed Cost Curve (AFC)

- The average fixed cost curve slopes down continuously.

- The average fixed cost curve looks like a child's slide – it starts out with a steep decline, then it becomes flatter and flatter.

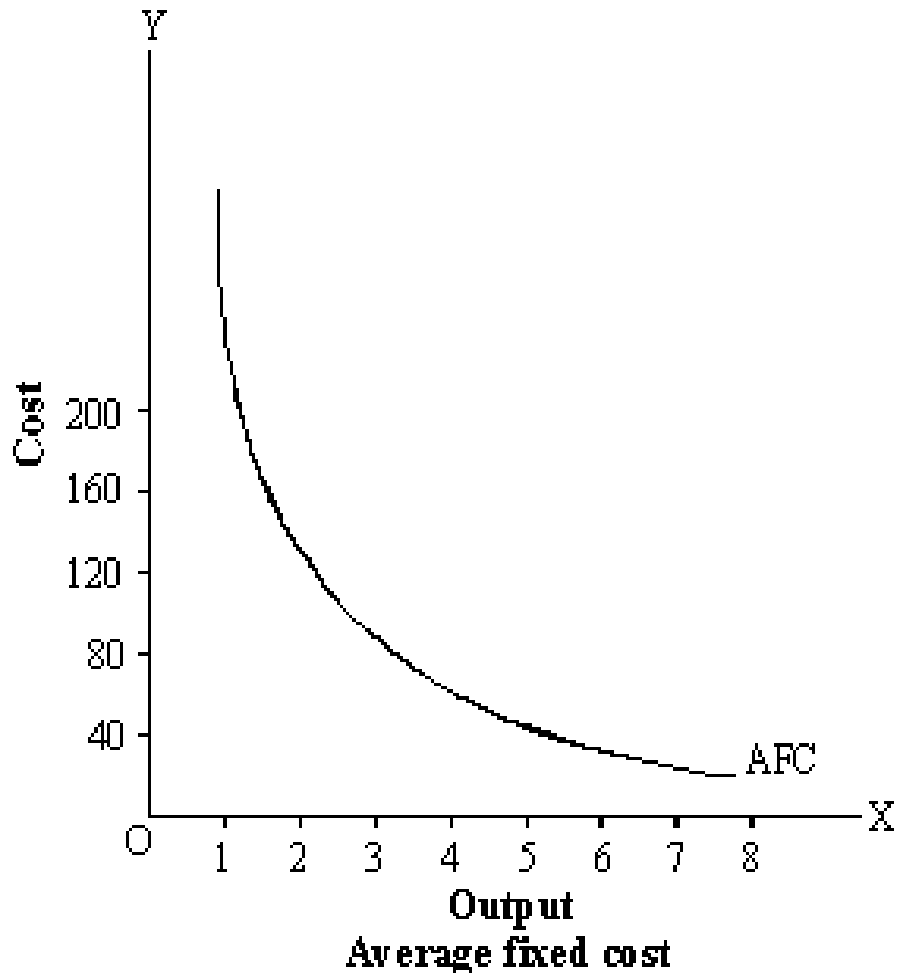- It tells us that as output increases, the same fixed cost can be spread out over a wider range of output.
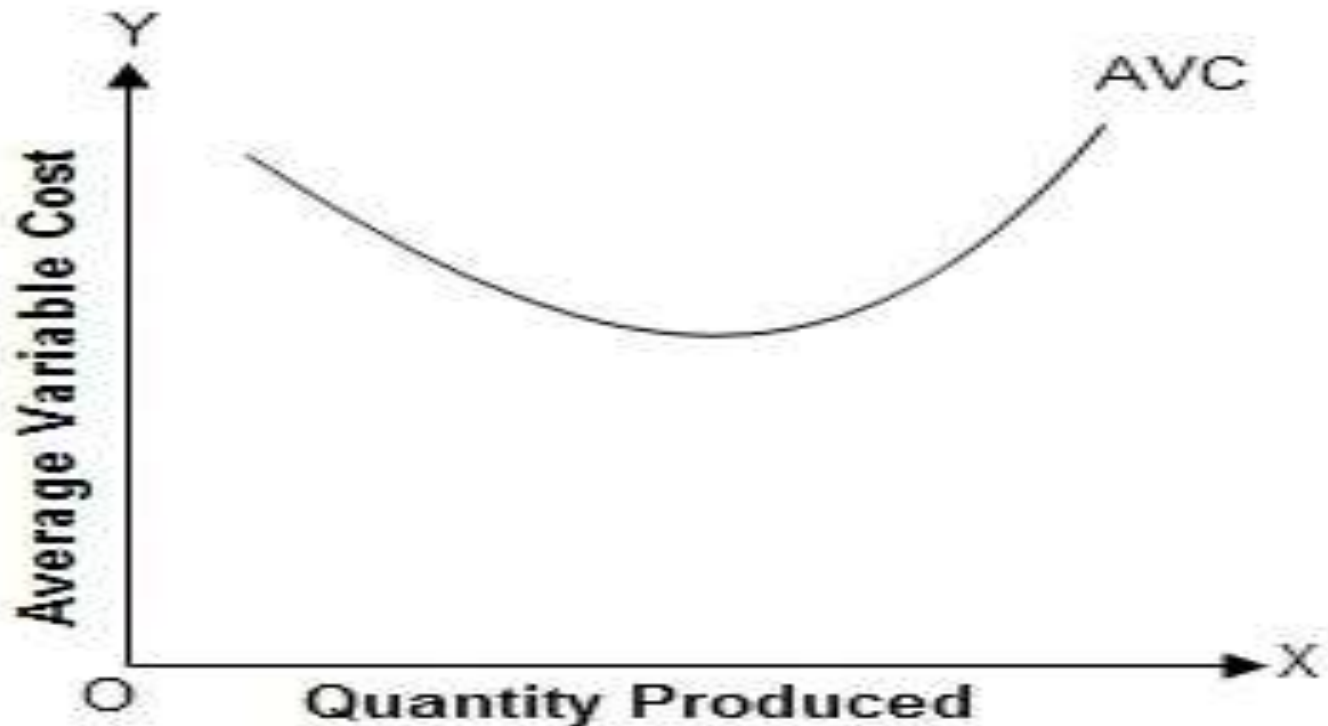

Average fixed cost

Fig. 4.4

- ***Average variable cost (AVC)*** equals variable cost divided by quantity produced.
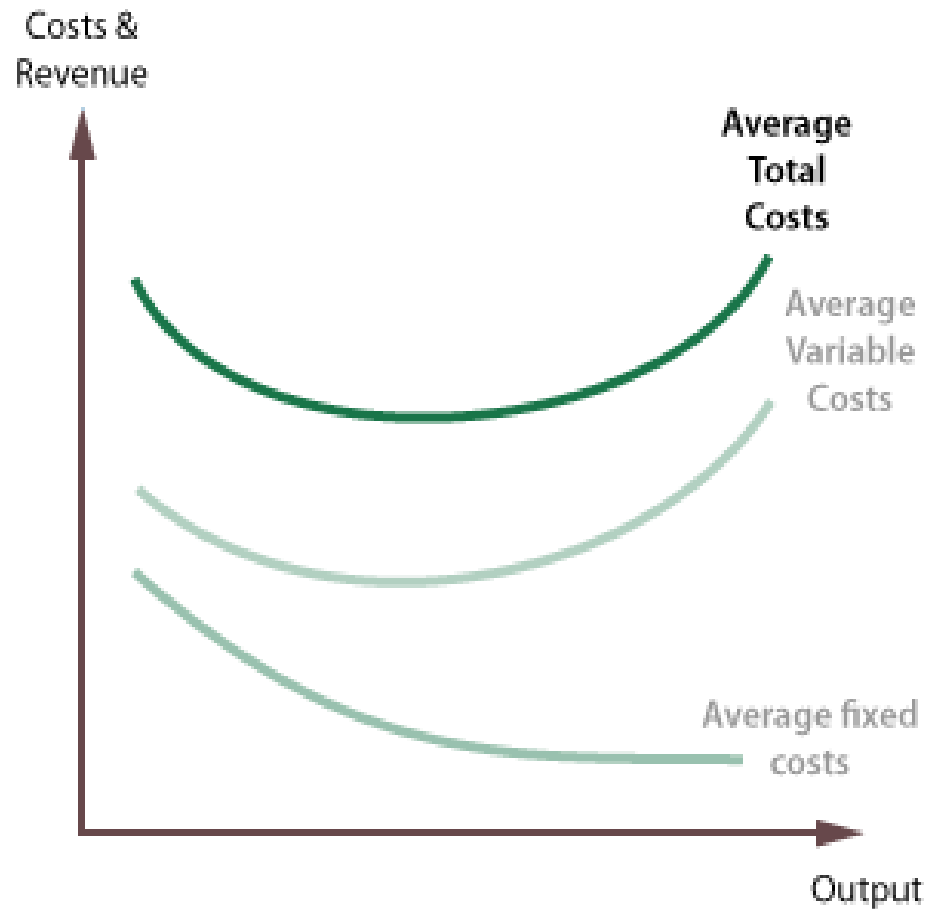
AVC = TVC/Q

Average Costs

- ***Average total cost*** (ATC/AC) (often called average cost) equals total cost divided by the quantity produced.

- Average total cost can also be thought of as the sum of average fixed cost and average variable cost.

  ATC = TC/Q *or*

  ATC= AFC+AVC

Costs & Revenue

Average Total Costs

Average Variable Costs

Average fixed costs

Output

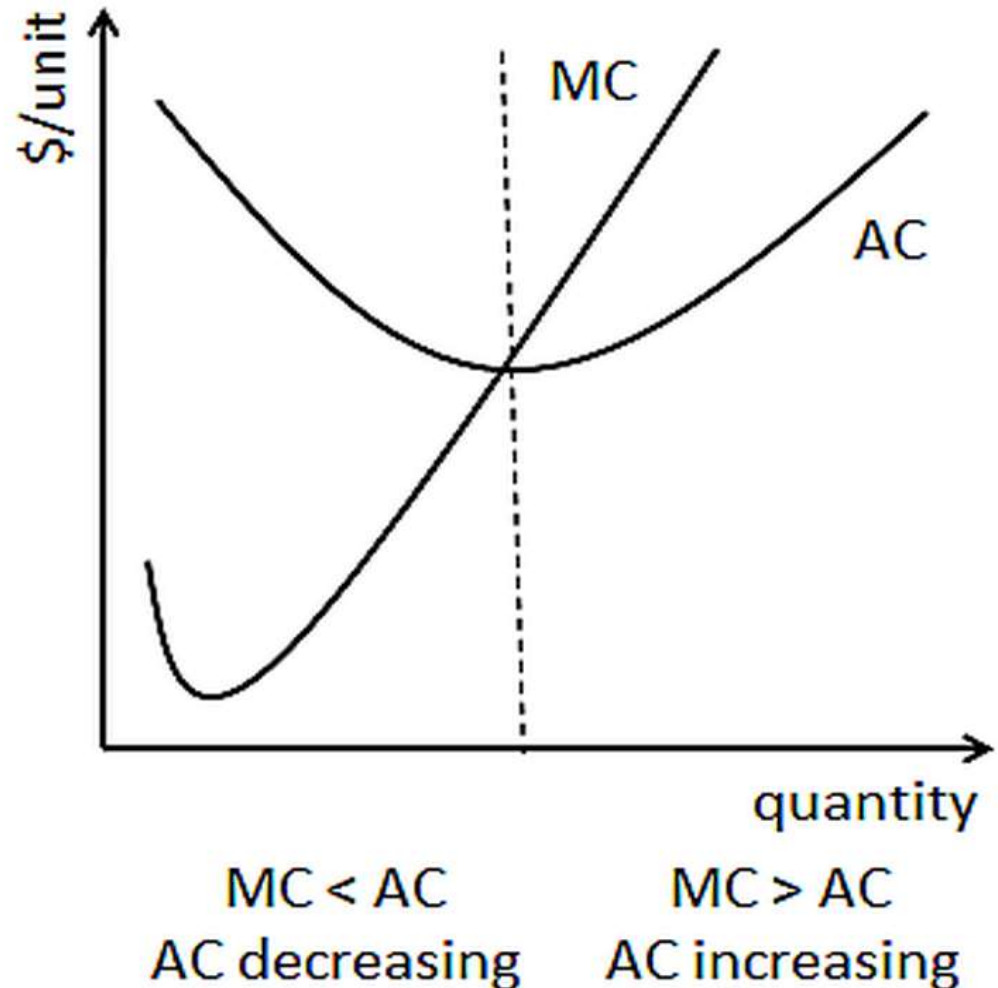# Average and Marginal Cost Curves

- The marginal cost curve goes through the minimum point of the average total cost curve and average variable cost curve.

- Each of these curves is U-shaped.

The U Shape of the Average and Marginal Cost Curves

- And when average productivity of the variable input falls, average variable cost rise.

- The average total cost curve is the vertical summation of the average fixed cost curve and the average variable cost curve, so it is always higher than both of them.

- If the firm increased output enormously, the average variable cost curve and the average total cost curve would almost meet.

- The firm's eye is focused on average total cost—it wants to keep it low.

The U Shape of the Average and Marginal Cost Curves

- When output is increased in the short-run, it can only be done by increasing the variable output.

- ***The law of diminishing marginal productivity sets in as more and more of a variable input is added to a fixed input.***

- Marginal and average productivities fall and marginal costs rise.

MC < AC
AC decreasing

MC > AC
AC increasing

Marginal Cost

- ***Marginal cost*** is the increase (decrease) in total cost of increasing (or decreasing) the level of output by one unit.

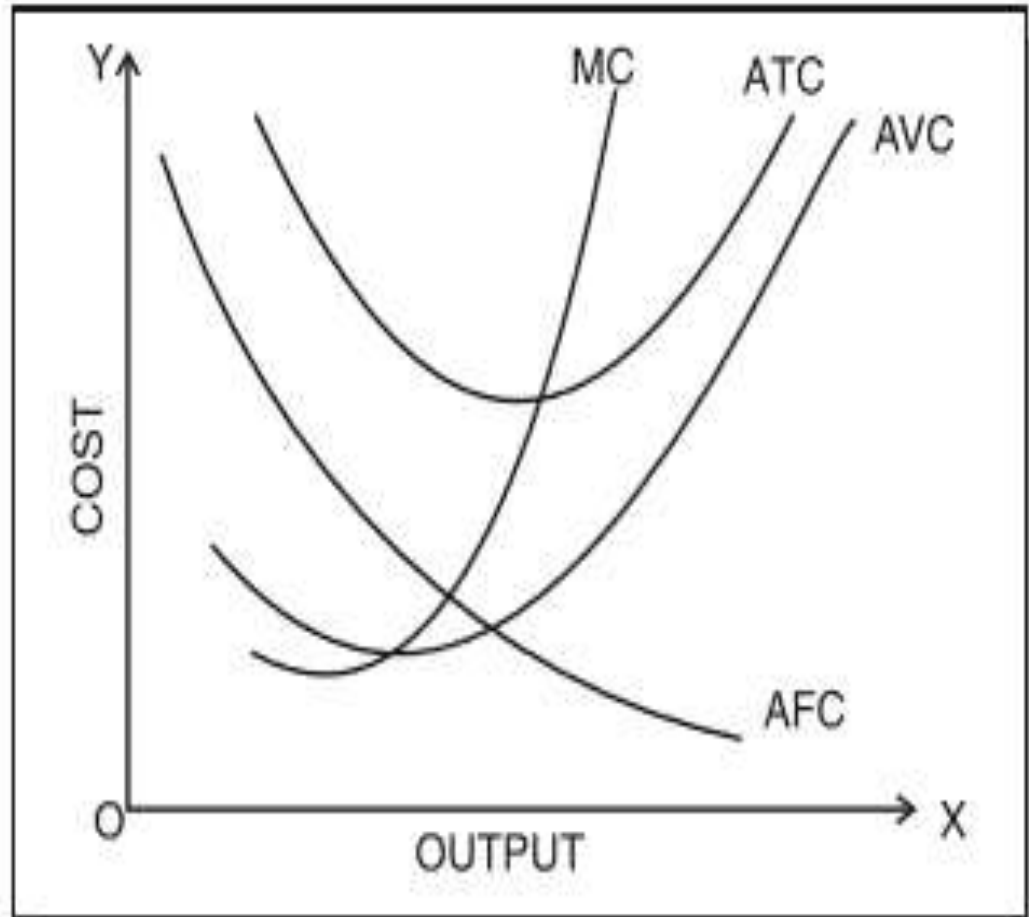- In deciding how many units to produce, the most important variable is marginal cost.

Fig. 1 : Short run Average and Marginal Cost Curves

The Cost of Producing Earrings

| Output	FC	VC	TC	MC	AFC	AVC	ATC
3	50	38	88	—	16.67	12.66	29.33
4	50	50	100	12	12.50	12.50	25.00
9	50	100	150	—	5.56	11.11	16.67
10	50	108	158	8	5.00	10.80	15.80
16	50	150	200	—	3.13	9.38	12.50
17	50	157	207	7	2.94	9.24	12.18
22	50	200	250	—	2.27	9.09	11.36
23	50	210	260	10	2.17	9.13	11.30
27	50	255	305	—	1.85	9.44	11.30
28	50	270	320	15	1.79	9.64	11.42

The Relationship Between Productivity and Costs

- The shapes of the cost curves *are mirror-image reflections of the shapes of the corresponding productivity curves*.

The Relationship Between Productivity and Costs

- When one is increasing, the other is decreasing.

  - When one is at a maximum, the other is at a minimum.

The Relationship Between Productivity and Costs
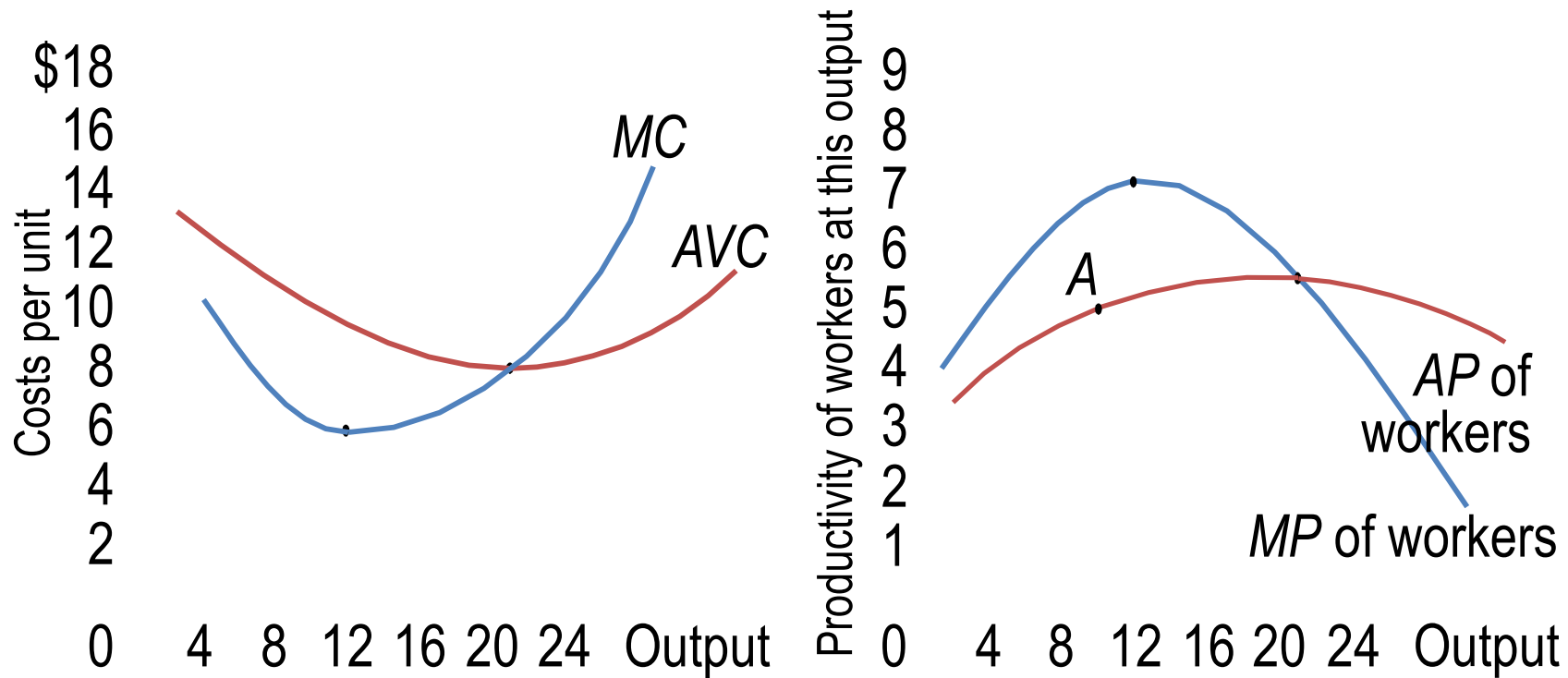
Relationship Between Marginal and Average Costs

- The marginal cost and average cost curves are related.
  - When marginal cost exceeds average cost, average cost must be rising.
  - When marginal cost is less than average cost, average cost must be falling.
- The position of the marginal cost relative to average total cost tells us whether average total cost is rising or falling.
- To summarize:

  If MC > ATC, then ATC is rising.
  If MC = ATC, then ATC is at its low point.
  If MC < ATC, then ATC is falling.

# Relationship Between Marginal and Average Variable Costs

- Average total cost will fall when marginal cost is above average variable cost, so long as average variable cost does not rise by more than average fixed cost falls.

- Marginal and average total cost reflect a general relationship that also holds for marginal cost and average variable cost.

  If MC > AVC, then AVC is rising.
  If MC = AVC, then AVC is at its low point.
  If MC < AVC, then AVC is falling.

Relationship Between Marginal and Average Costs
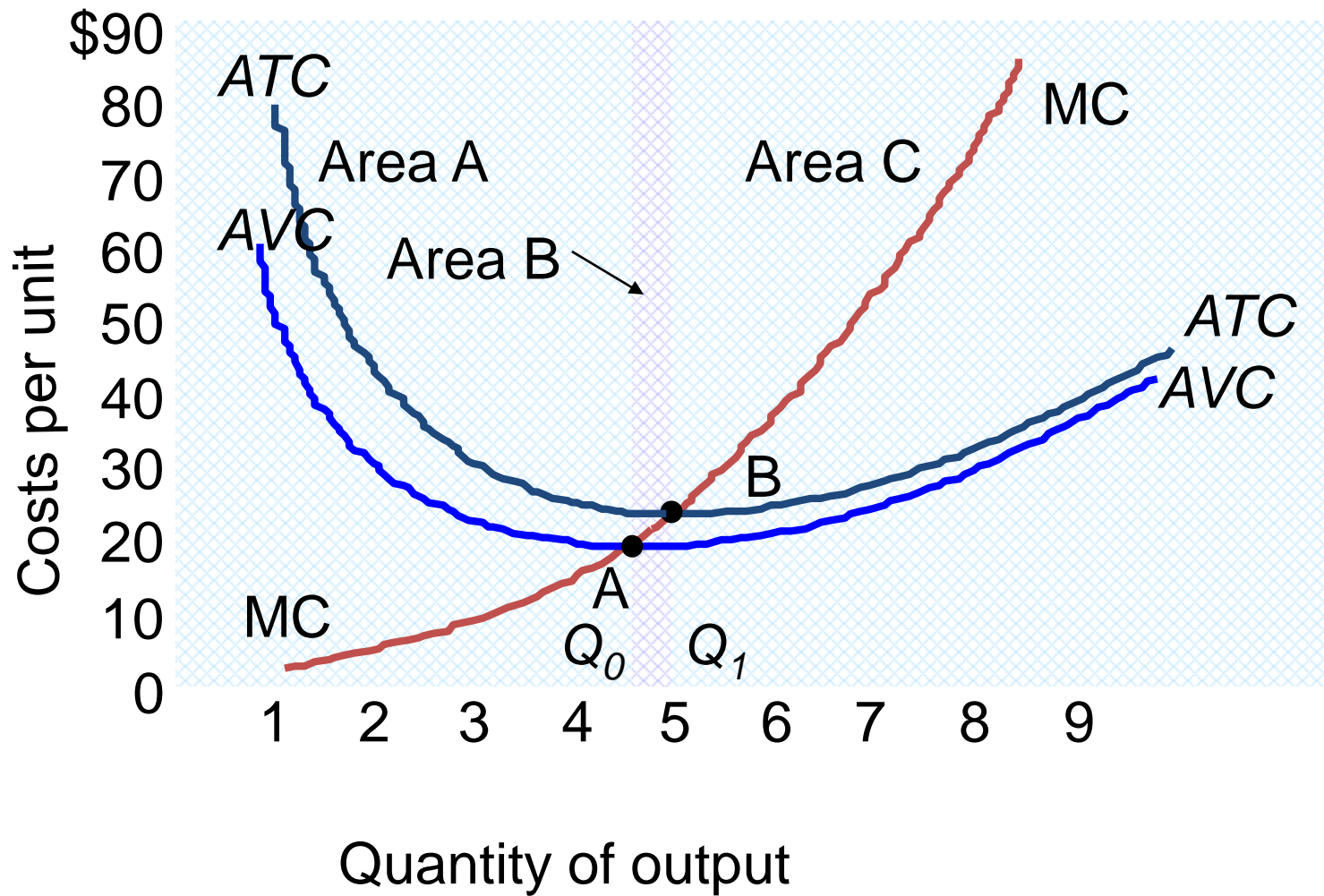
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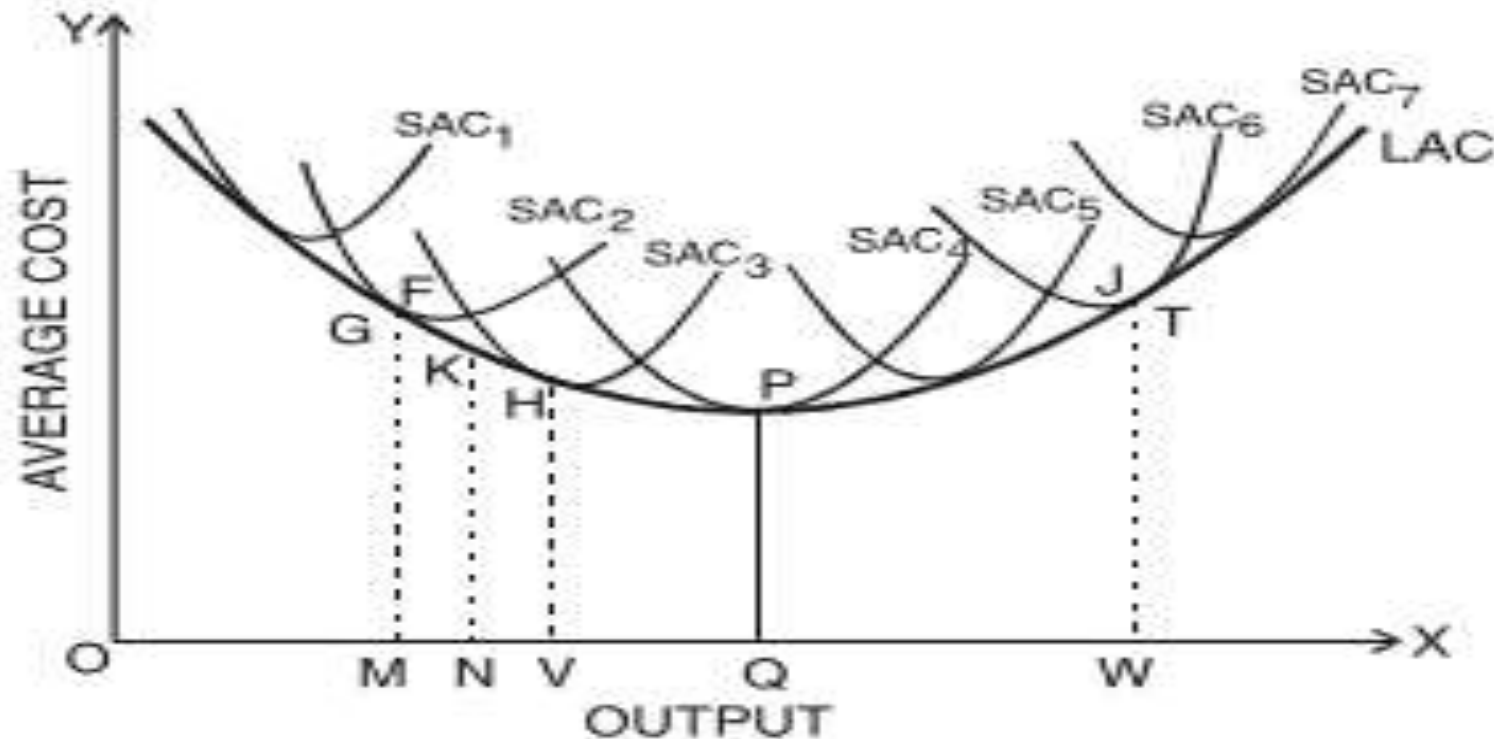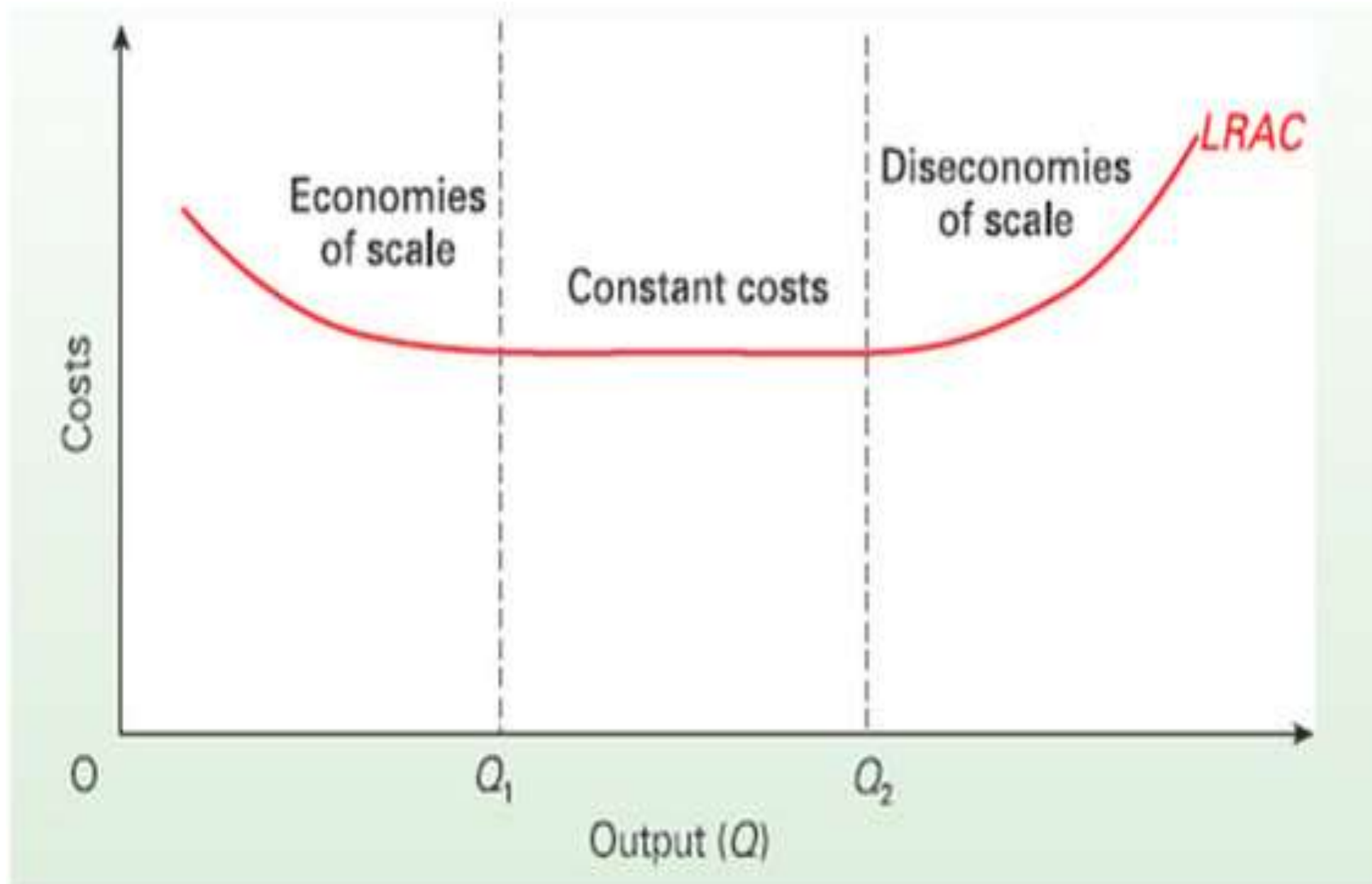# The Traditional Theory of Costs: Long Run Theory

Fig. 2 : Long run Average Cost Curves

Long-Run Average Cost (LRAC/LAC)

Why is LAC Curve Flatter than SAC Curve

1) Long run average cost curve is flatter than the short run average cost curve, **because short run average cost curve relates to one plant, or the constant scale of output**. Long run average cost curve, on the other hand, relates to several plants or the expanding scale of output.

2) The long-run average total cost curve is flatter compared to the corresponding curve in the short-run. **This is because of greater flexibility that the firm enjoys in the long-run.**
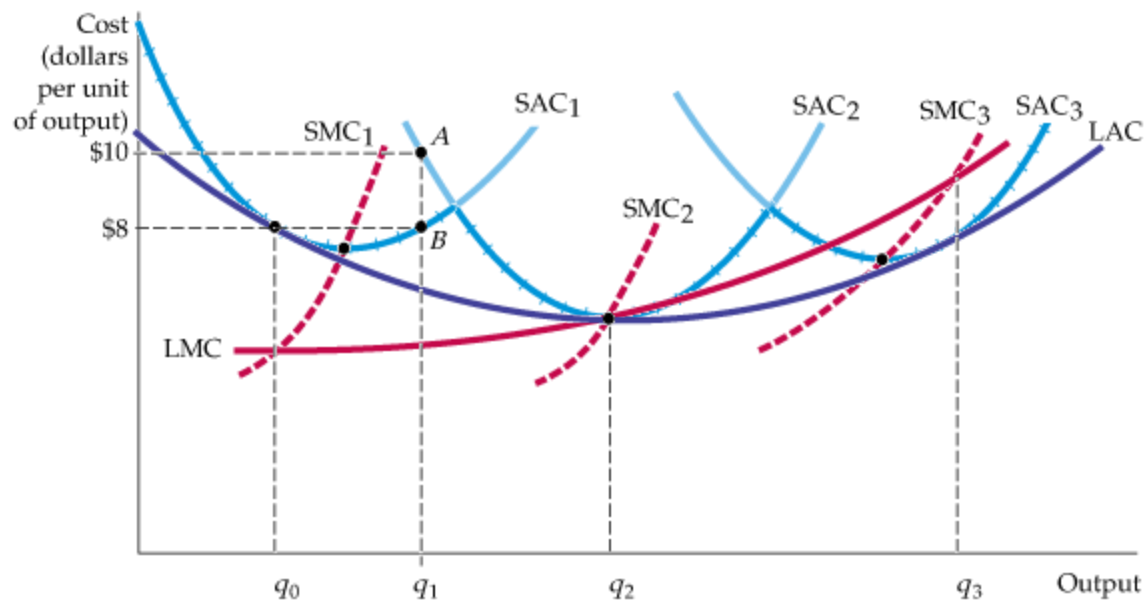
LONG-RUN VERSUS SHORT-RUN COST CURVES

The Relationship Between Short-Run and Long-Run Cost

Long-Run Cost with Economies and Diseconomies of Scale

The long-run average cost curve LAC is the envelope of the short-run average cost curves SAC_1, SAC_2, and SAC_3.
With economies and diseconomies of scale, the minimum points of the short-run average cost curves do not lie on the long-run average cost curve.

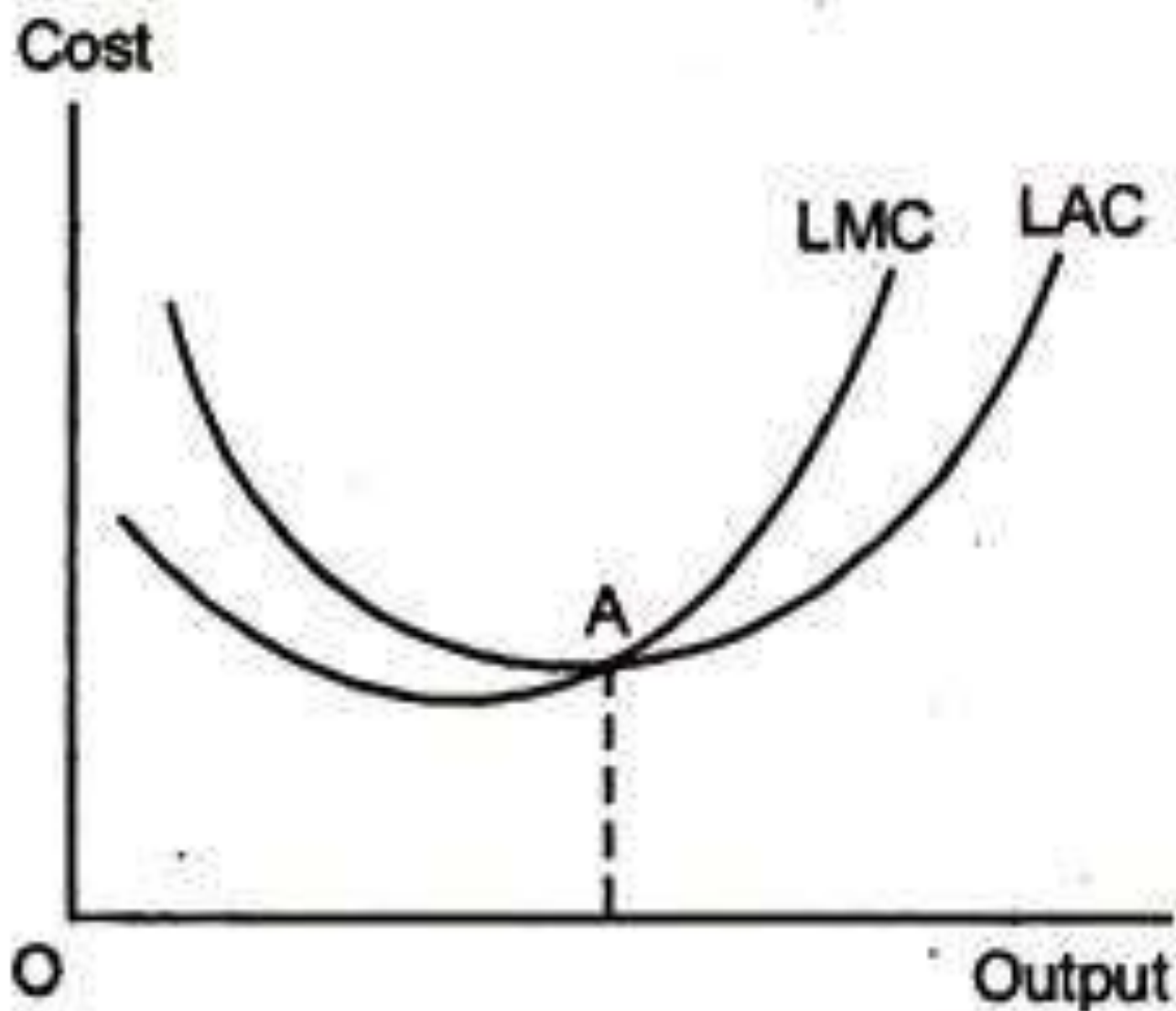Long run Average cost curve is also called *Envelope curve*

Fig. 7.6 : Long-run Average and Marginal Cost

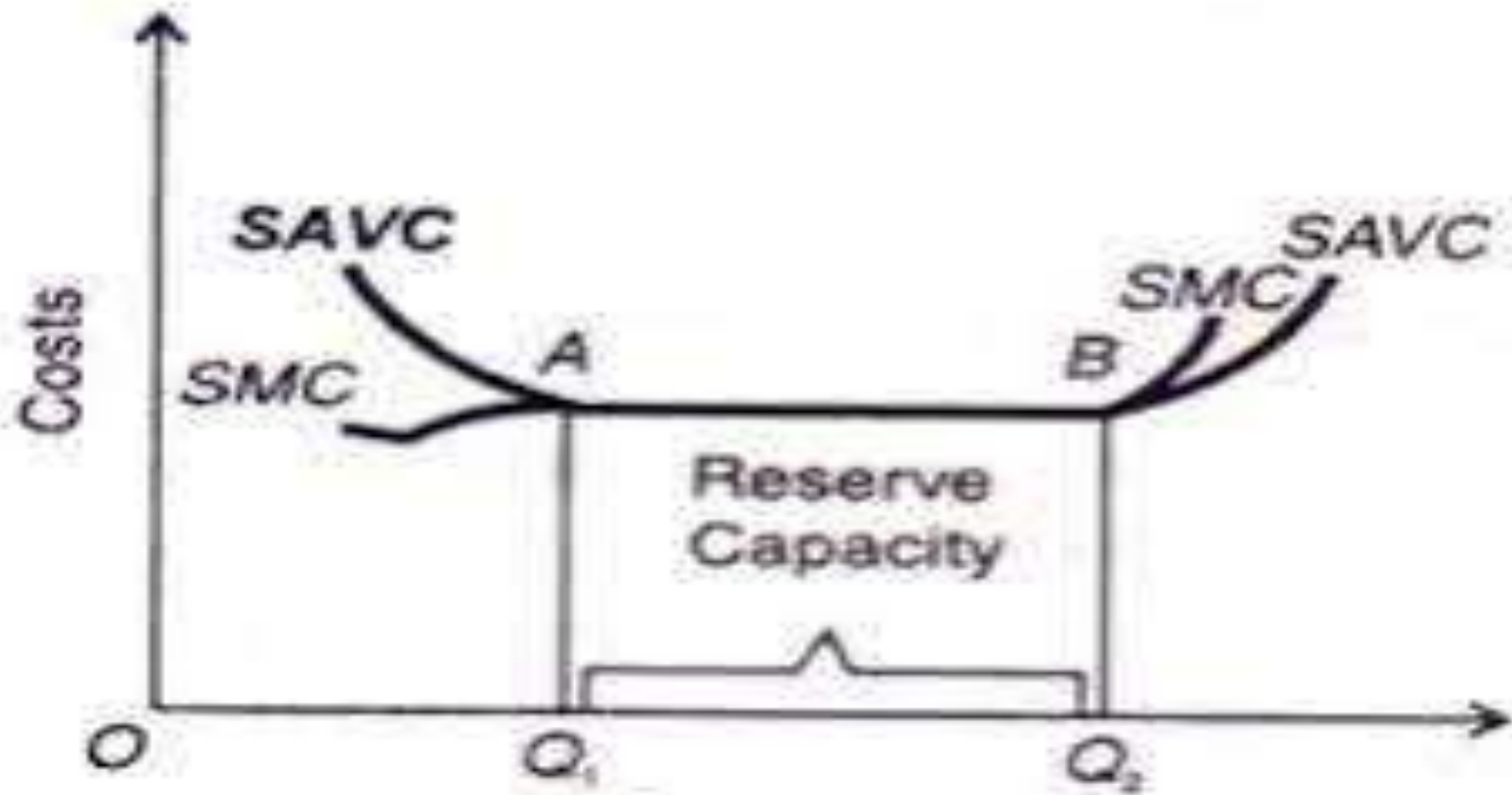# B. The Modern Theory of Costs: Short-Run Theory

In the traditional Theory the cost curves are U-shaped. This has been challenged by modern economists. According to them the S-R AVC and the L-R AVC curves are not U-shaped. The **short-run cost curve** has a saucer- type shape whereas the long-run Average cost curve is either L-Shaped or inverse J-shaped. According to the Modern theory of costs, the firm can produce a range of output and not a single level of output as under the traditional theory of cost.

a. Short-Run AVC: The Saucer-Shaped Curve

According to economists like George Stigler, the S-R AVC curve has a saucer-type shape. This shape implies that the S-R AVC has a flat stretch over a certain range of output. The flat portion is attributed to the reserve capacity that is purposefully built in the plant size while designing it.
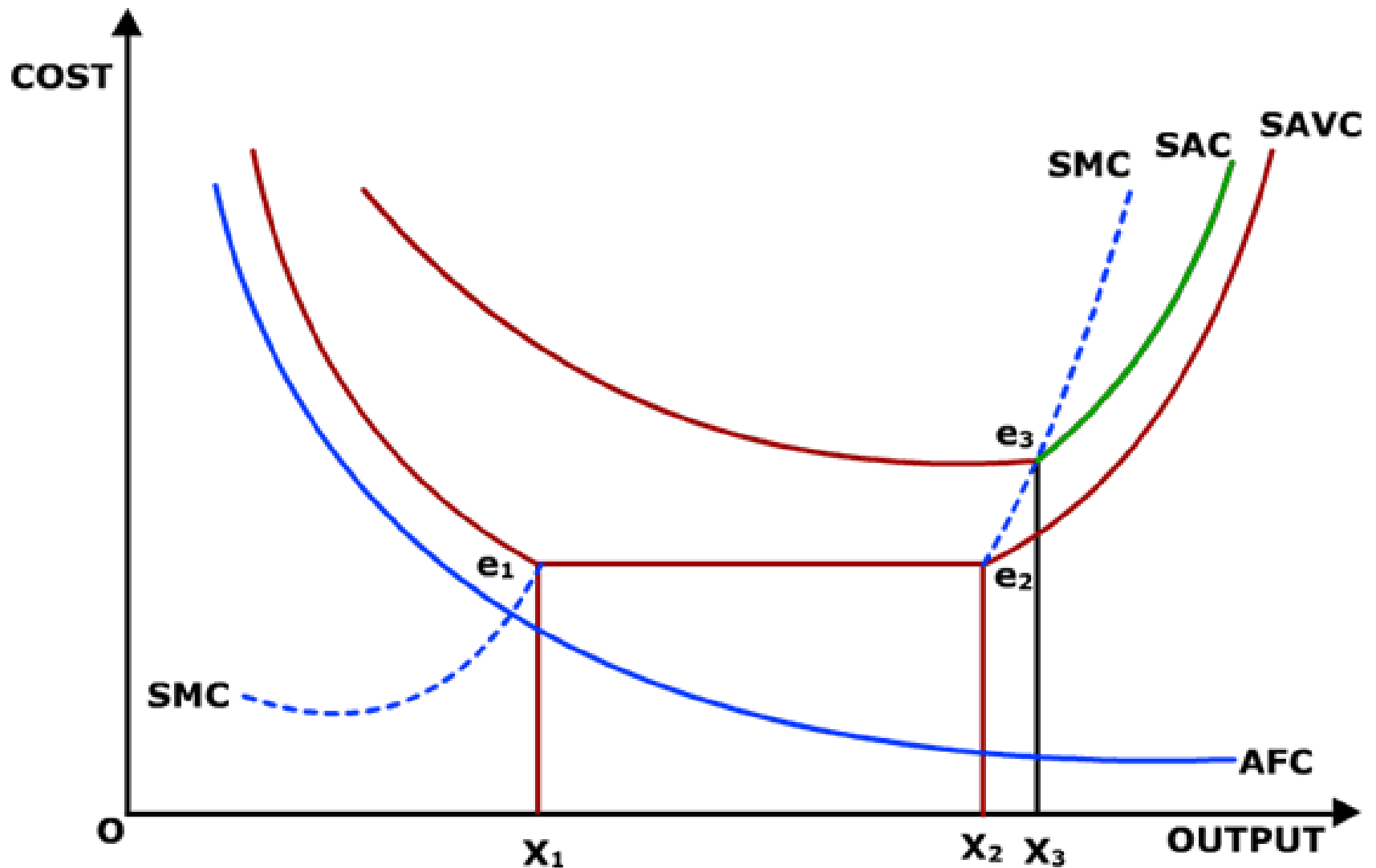
https://academistan.com/modern-theory-of-cost-long-run/

Fig. 7

S-R Average Total Cost:
Empirical Evidences on the Shape of Cost Curves

B. The Modern Theory of Costs: Long-Run Theory

Why is the LAC curve L-shaped?

Johnston in his empirical study of cost functions found strong evidence for L-shaped long-run average cost curve. He reveals the reason for the L-shape is that, **in the long-run, there is a minimum optimum level of production at which all related economies are obtained**. These economies results into fall in costs.

According to the modern theory of costs, the long-run average costs are essentially comprised of production and managerial costs, where the fall in production costs more than offsets the rise in managerial costs; thus, the LAC curve either falls continuously or remains constant at very large scales of output.

The modern theory contends that the long-run average costs essentially comprised production and managerial costs, of which the average production costs continue to fall even at large scales while the managerial costs per unit of output may rise only gradually and at large scales of output. Thus, the long-run Average cost curve is 'L-Shaped' or inverse 'J-shaped' under the modern theory of cost.

B. The Modern Theory of Costs: Long-Run Theory

Why is the LAC curve L-shaped?

The long-run Average cost curve LAC can be derived from the short-run Average cost curves. **Under the modern theory of costs, the falling portions of SAC curves are considered to obtain/ derive the LAC Curve**. A firm is assumed to operate till its load factor and not full capacity is achieved. The load factor generally lies between two-thirds and three-fourths of the total capacity and corresponds to the falling portion of the short-run Average cost curve.

Thus, the long-run Average cost curve does not envelop the SACs but intersects them at the level of output defined by the load factor of each plant. **The existence of economies of scale checks the increase in cost and decreasing returns under the modern theory of costs**.

Economies and Diseconomies of Scale:

The economies and dis-economies of scale explain why under the traditional theory of costs, the LAC curve is U-shaped and under modern theory, the LAC is L-shaped. **Alfred Marshall** classified Economies of scale into internal economies and external economies.

Internal economies are internal to a firm and are not shared by its competitors in the industry while external economies are those benefits of large-scale production which accrue from outside due to the growth of the whole industry.

Measurement of Economies of Scale:

Economies of scale are usually measured in terms of cost-output elasticity (Ec), where Ec is defined as the percentage change in the cost of production resulting from a 1- percent increase in output, $Ec = (\Delta C/C) / (\Delta Q/Q)$, Ec relates to the traditional measures of cost and does not show this relationship; therefore we can rewrite this equation as $Ec = (\Delta C/\Delta Q) / (C/Q = MC/AC)$. This equation can be used to measure Ec in different cases and also to know whether there are economies or diseconomies of scale.

*If Ec = 1,* then the firm's economies of scale are equal to the dis-economies of scale.
If Ec < 1, then the firm enjoys economies of scale.
If Ec >1, finally, the dis-economies of scale exceed the economies of scale.
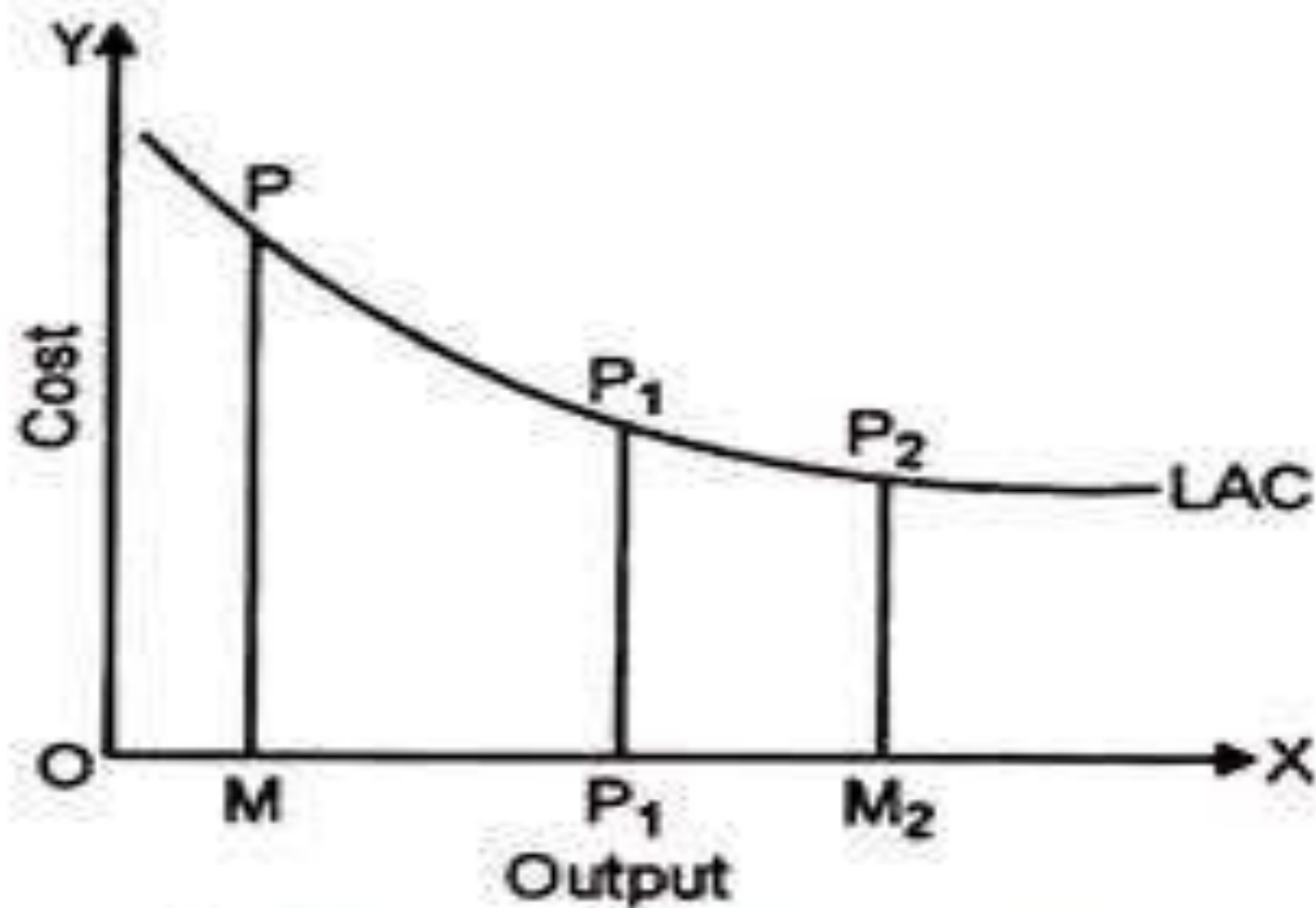
L-shaped Cost Curve

Different Shapes of Long-Run Average Cost (LAC) Curves Under Modern Theory of Costs:
L-Shaped Long Run Average Cost (LAC) Curve

COST

LAC

Economies of scale

economies of scale = diseconomies of scale

LAC

LAC = LMC

LMC

O   X₁   OUTPUT   Q
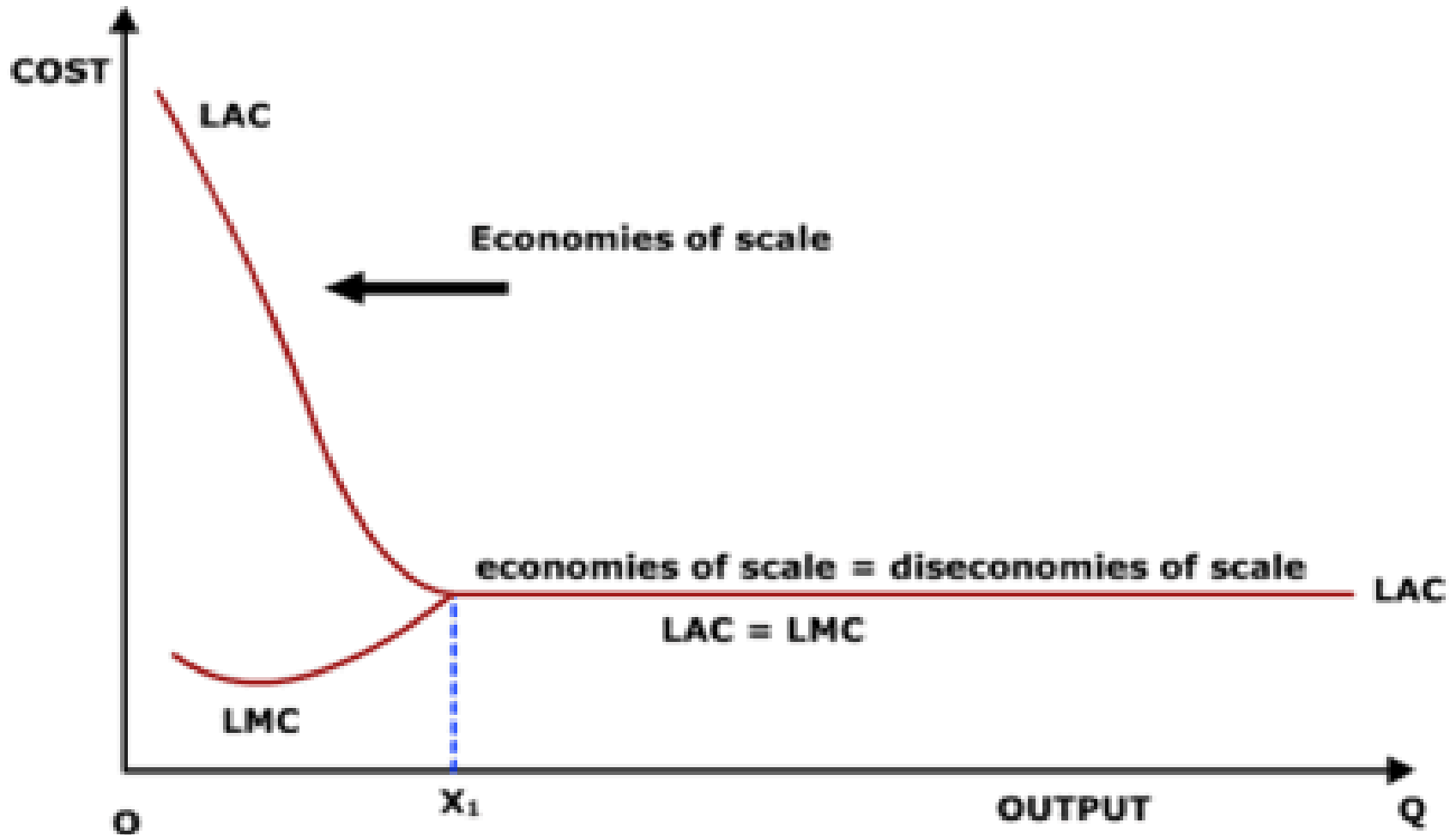
Inverse J-Shaped Long-Run Average Cost Curve

Explanation Figure-2

In Fig 2, we find that as the average costs of production fall continuously with the increase in the level of output, the LAC curve assumes an inverse J-shaped which signifies that there are no diseconomies of scale even at very large scales of output. If the average costs of production continue to fall only till a certain optimal level ox1 and beyond that it becomes constant, then the LAC curve is roughly L-shaped, and this signifies that the economies and diseconomies of production balance out each other beyond the optimal level of output ox1.

In the case of an inverse J- shaped LAC curve, the LRMC will lie below the LAC curve at all output levels since the average costs of production can fall continuously if and only if the LRMC pulls them downwards by remaining below it.

If there is a minimum optimal scale of the plant. OX1, at which all possible scale economies are reaped, beyond that level of output, the LAC remains constant. In this case, the LRMC lies below the LAC curve until the minimum optimal scale is reached and coincides with the LAC beyond that level of output.

According to the modern theory of costs, the long-run average costs are essentially comprised of production and managerial costs, where the fall in production costs more than offsets the rise in managerial costs; thus, the LAC curve either falls continuously or remains constant at very large scales of output.

Cost Related Problems

Example-1. Q. A biscuit producing company has the following variable cost function, i.e. $TVC = 200Q - 9Q^2 + 0.25Q^3$. If the companies fixed costs are equal to Rs. 150 lakhs, find out-

Total cost function (TC)?

Average Total Cost (ATC)?

Marginal cost (MC)?

Average Variable Cost (AVC)?

and also find out at what levels AVC & MC will be minimum?

∴ the AVC = $\frac{TVC}{q} = \frac{4q + q^2}{q} = 4 + q$

An we know
MC is the 1st derivation of total cost function/ total variable cost function -

Thus, $MC = \frac{\Delta TVC}{\Delta q} = \boxed{4 + 3q}$

(120)

A biscuit producing company has the following variable cost function: $TVC = 200q + 9q^2 + 0.25q^3$

If the company's fixed costs are equal to Rs. 150 lakhs find out —
- a/- Total cost function ? (TC)?
- b/- Marginal " " ? (MC)?
- c/- Average variable " " ? (AVC)?
- d/- " Total cost function ? (ATC)?
- e/- At what level AVC & MC will be minimum ?

Ans: As we know TC = TFC + TVC. & then the

$$TC = 150 + 200Q - 9Q^2 + 0.25Q^3$$

- To determine the MC we take the first derivative of the total & TVC with respect to output Q.

Thus, $MC = \frac{\partial(TC)}{\partial Q} = 200 - 18Q + 0.75Q^2$

- To derive the ATC & AVC we divide the respective total cost by the output level.

$$AC = \frac{TC}{Q} = \frac{150}{Q} + \frac{200Q}{Q} + \frac{9Q^2}{Q} + \frac{0.25Q3}{Q}$$

$$= \frac{TC}{Q} = \frac{150}{Q} + 200 + 9Q + 0.25Q^2$$

$$AVC = \frac{TVC}{Q} = 200 + 9Q + 0.25Q^2$$

– To determine the level of output at which AVC is minimum, we have to take 1st derivative of the AVC function & set that derivative equal to zero.

$$\frac{\partial (AVC)}{\partial Q} = \frac{\partial (900 - 9Q + 0.25Q^2)}{\partial Q} = \boxed{-9 + 0.50Q}$$

Setting it equal to zero we have –

$$-9 + 0.50Q = 0$$
$$\Rightarrow 0.50Q = 9 \quad \Rightarrow \frac{1}{2}Q = \frac{9}{}\quad \Rightarrow \boxed{Q = 18}$$

Thus, at output level equal to ~~zero~~ 18, AVC will be minimum.

Output at which MC function is Minimum –

$$MC = 200 - 18Q + 0.75Q^2$$

– To find out the output level at which MC is minimum, we have to set the 1st derivative of MC function equal to zero.

The 1st derivative of MC function is –

$$\frac{\partial (MC)}{\partial Q} = -18 + 1.50Q$$

Setting $\frac{\partial (MC)}{\partial Q}$ equal to zero, we have –

$$-18 + 1.50Q = 0 \quad \Rightarrow 1.50Q = 18$$
$$Q = \frac{18}{1.50} = 18\frac{10}{15} = \frac{180}{15} = \boxed{12}$$

Thus, at output level 12, MC is minimum.

(13) Q// If $Q = A(KL)^{0.5}$, what is short-run cost function when $K = 100$? What is MC function?

Ans:– with $K = 100$, the SR short-run-production function can be written as – $Q = A(100L)^{0.5} = \boxed{10A(L)^{0.5}}$

squaring both sides we have
$$Q^2 = 100A^2L \quad \dots \dots \quad (i)$$

Example-9. Q. The wage rate of labour is Rs. 6 and price of raw material is Rs. 2. The MP_L is Rs. 16 & the Marginal productivity of raw material is Rs.4. Can the firm operating under these conditions be maximising profits?

Ans.

Example-11. Q. Suppose the firm faces the cost function, i.e. **C= 8+4Q+ Q²** . What is the firm's fixed cost? Derived an expression for the firm's AVC & MC?

Ans.

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Thank You All

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