COST OF PRODUCTION

AEM 102 / AEFM

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Topic Outline

Description

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- Explicit costs, implicit costs and economic profit
- The law of diminishing returns
- Short run Total Costs
- Short run per unit costs
- Long run production costs
- Constant, increasing and decreasing returns to scale

Explicit costs, implicit costs and economic profit

- Our discussion will focus on the firm's production costs ie what lies behind the firm's supply curve

- Explicit costs are the actual, out of pocket expenditures of the firm to purchase or hire the services of the factors of production it needs

- Implicit costs are the costs of the factors owned by the firm and used in its own production processes

Explicit costs, implicit costs and economic profit (contd)

- These costs should be imputed or estimated from what these factors could earn in their best alternative use or employment
- In economics, costs include both explicit and implicit costs
- Profit is the excess of revenues over these costs

EXAMPLE

- The explicit costs of a firm are the wages it must pay to hire labor, the interest to borrow money capital and the rent on land and buildings used in production process

- To these, the firm must add such implicit costs as the wage that the entrepreneur would earn as a manager for somebody else, the interest he would get by supplying his money capital if any to someone else in a similarly risky business, and the rent on his owned land and buildings, if he were not using them himself

- Only if total revenue received from selling the output exceeds both its explicit and implicit costs is the firm making an economic or pure profit

THE LAW OF DIMINISHING RETURNS

- The law of diminishing returns is one of the most important and unchallenged laws of production
- It states that as we use more and more units of some factors of production to work with one or more fixed factors of production, after a point we get less and less extra or marginal output or product from each additional unit of the variable factor used

Short run, Long run

- The time period when at least one factor of production is fixed in quantity i.e. cannot be varied is referred to as the short run
- Thus the law of diminishing returns is a short run law
- In the long run, all factors of production are variable

Example

Variable factor (Labour - persons)	Total product (Tons/year)	Marginal Product (MP)
0	0	
		3
1	3	
		5
2	8	
		4
3	12	
		3
4	15	
		2
5	17	

- Table shows the total and marginal product of using each additional unit of labor on the same land, say one hectare of land.
- Note that with zero labor, TP=0
- By adding the second unit of labor, TP=3 and MP, the unit change in TP=3

Example (contd)

- Table shows the total and marginal product of using each additional unit of labor on the same land,say one hectare of land.
- Note that with zero labor, TP=0
- By adding the second unit of labor, TP=3 and MP, the unit change in TP=3
- By adding the second unit of labor, TP=8 and MP=5
- The 3rd unit of labor leads to a TP of 12 and MP of 4
- The law of diminishing returns begins to operate in this example with the addition of the 3rd unit of labor

SHORT RUN TOTAL COST

- In the short run, there are total fixed costs (TFC), total variable costs (TVC) and total cost (TC)

- **Total fixed costs (TFC)** are the costs which the firm incurs in the short run for its fixed inputs.
- These are constant regardless of the level of output and whether it produces or not
- An example of the TFC is the rent which a producer must pay for the factory building over the life of the lease

SHORT RUN TOTAL COST (Contd)

- **Total Variable Costs (TVC)** are the costs incurred by the firm for the variable inputs it uses

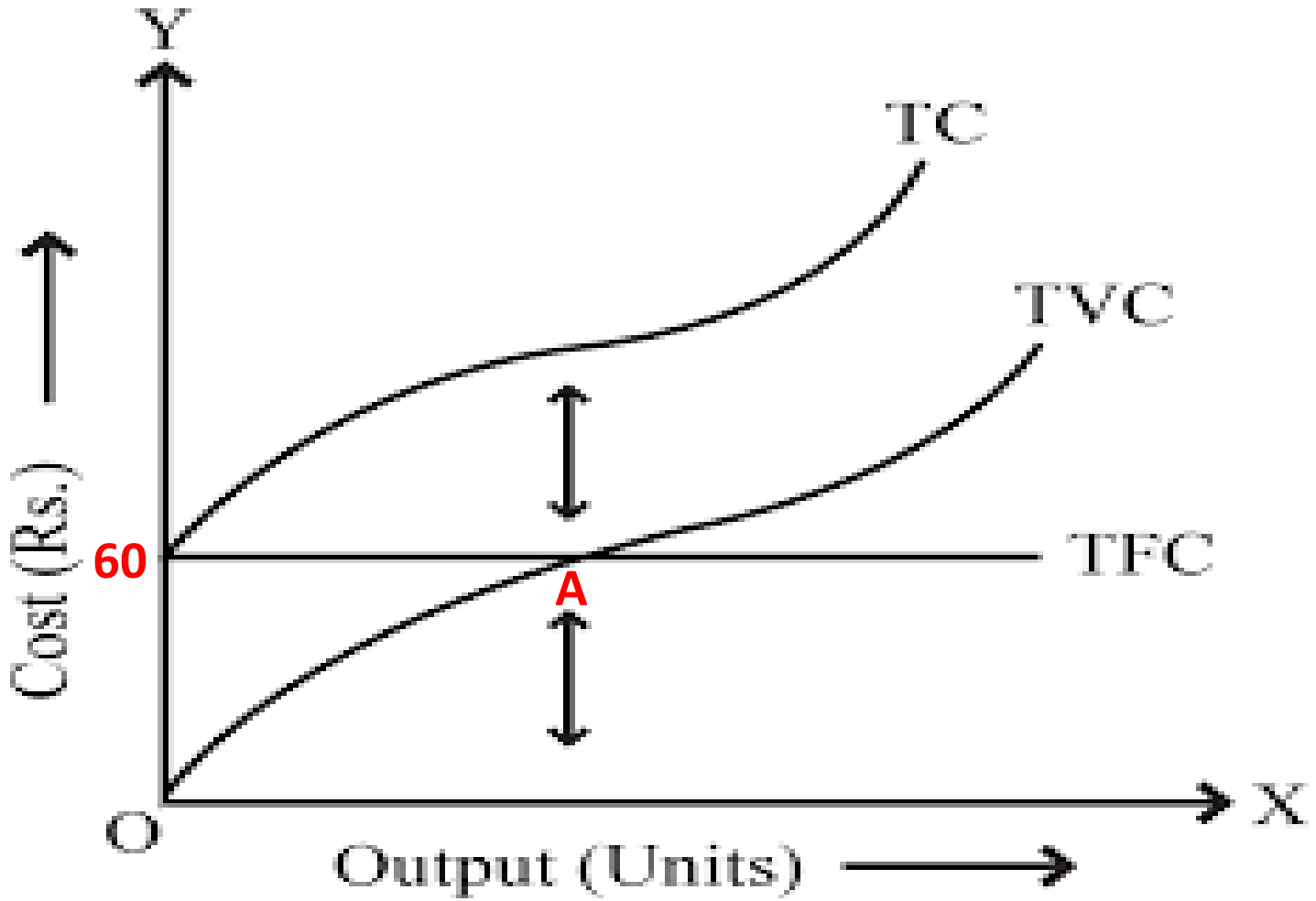
- These vary directly with the level of output produced. Examples of TVC are raw material costs and some labor costs

- Total costs TC, are equal to the sum of total fixed costs and total variable costs

HYPOTHETICAL TFC,TVC and TC

Q	TFC	TVC	TC = TFC +TVC
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

GRAPH OF TFC,TVC and TC



Graph Explained

- See that regardless of the level of output, TFC is 60
- It is reflected in the figure in a TFC curve which is parallel to the quantity axis and N60 above it
- TVC is zero when output is zero and rises as output increases
- The shape of TVC curve follows from the law of diminishing returns
- Up to point A the firm is using so few of the variable inputs together with its fixed inputs that the law of diminishing is not yet operating

Graph Explained (Contd)

- Therefore, TVC increase at a decreasing rate and TVC curve faces down
- Past point A, the law of diminishing returns begins to operate, so that TVC increase at an increasing rate and TVC curve faces up
- At every output level, TC equals TFC plus TVC
- For this reason, the TC curve has the same shape as the TVC curve and in this case , is every where N60 above it

SHORT RUN PER UNIT COSTS

- Though total cost are very important, per unit costs or average costs are even more important in the short run analysis of the firm
- The short run per unit costs that we consider are the:
    - Average Fixed Costs
    - Average Variable Costs
    - Average Total Costs and
    - Marginal Cost

SHORT RUN PER UNIT COSTS (Contd)

- Average Fixed Cost AFC equals total fixed cost divided by output i.e. TFC/Q
- Average variable cost AVC, equals total variable cost divided by output i.e. TVC/Q
- Average cost AC equals total costs divided by output i.e. TC/Q
- AC also equals AFC plus AVC
- Marginal cost MC equals the change in TC or the change in TVC per unit change in output i.e. dTC/dQ or dTVC/dQ

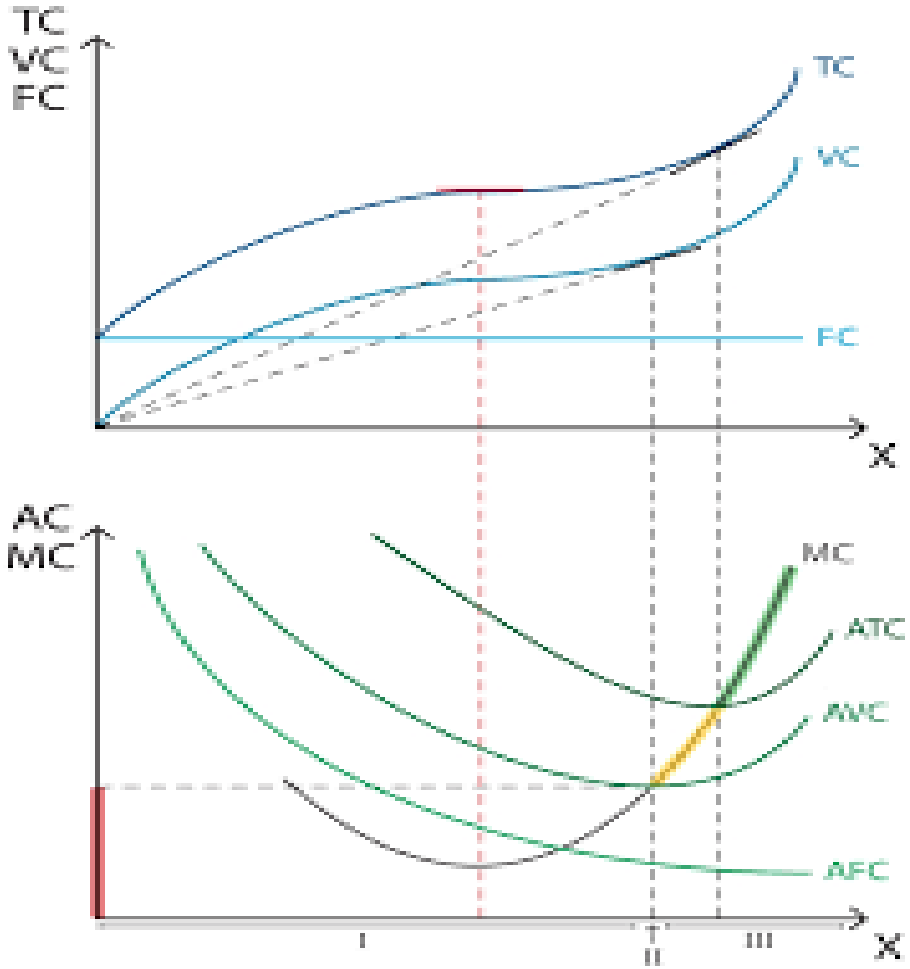
TFC, TVC, TC, AFC, AVC, AC and MC schedules

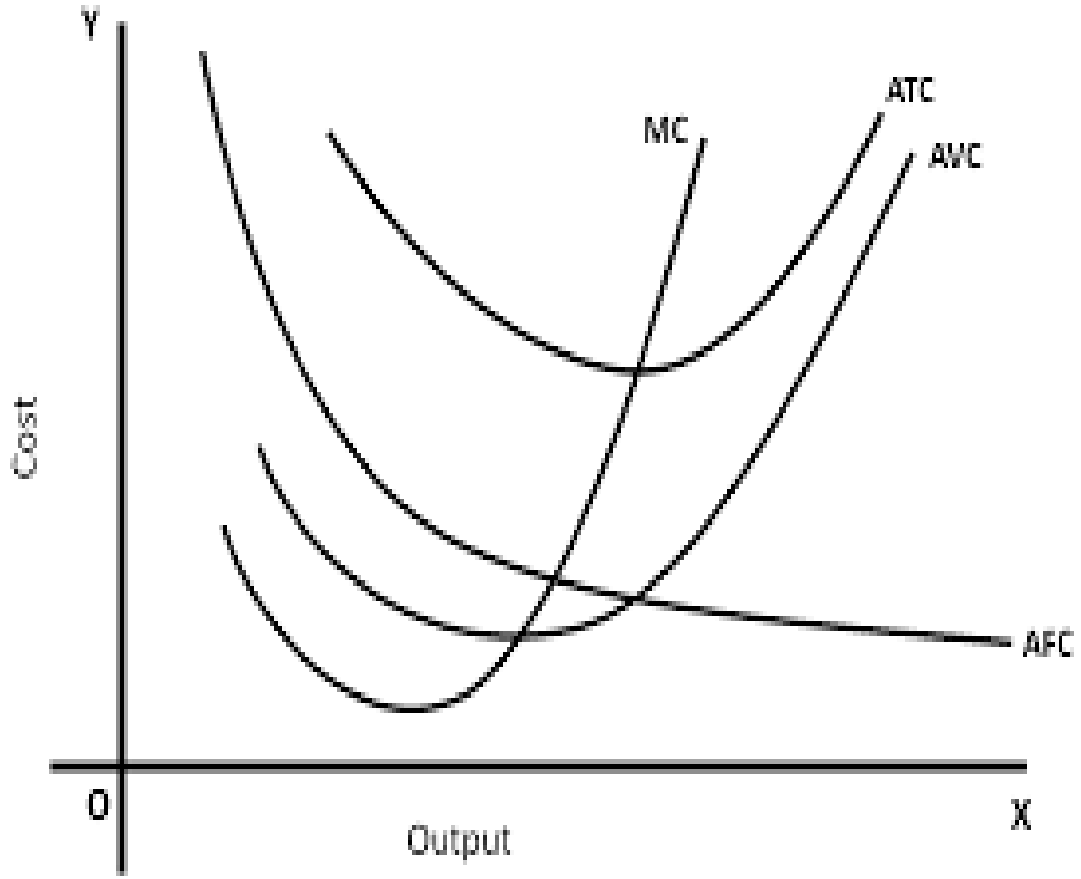
Q	TFC	TVC	TC (TFC+TVC)	AFC (TFC/Q)	AVC (TVC/Q)	AC (TC/Q)	MC (dTC/dQ)
1	60	30	90	60	30	90	10
2	60	40	100	30	20	50	5
3	60	45	105	20	15	35	10
4	60	55	115	15	13.7	28.7	20
5	60	75	135	12	15	27	45
6	60	120	180	10	20	30	

TFC, TVC, TC, AFC, AVC, AC and MC schedules Explained

- Table presents AFC, AVC, AC and MC schedules derived from TFC,TVC and TC
- AFC column is obtained by dividing TFC by corresponding quantities of output Q
- AVC schedule is obtained by dividing TFC by output
- AC schedule is obtained by dividing TC by output
- MC schedule is obtained by subtracting successive values of TC
- Thus MC does not depend on the level of TFC

GRAPH OF AFC, AVC,AC and MC





GRAPH OF AFC, AVC,AC and MC (Contd)

- Note that the values of the MC schedule are plotted half-way between successive levels of output
- Also note that while the AFC curve falls continuously as output is expanded, the AVC, the AC and the MC curves are U-shaped
- The MC curve reaches its lowest level of output than either the AVC curve or the AC curve
- Also the rising portion of the MC curve intersects the AVC and AC curves at their lowest points
- This is always the case

LONG RUN PRODUCTION COSTS

- In the long run, there are no fixed factors, and the firm can build a plant of any size
- Once a firm has constructed a particular plant, it operates in the short run
- A plant size can be represented by its short run average cost SAC curve
- Larger plants can be represented by SAC curves which lie further to the right
- The long run average cost, LAC curve shows the minimum per-unit cost of producing each level of output when any desired size of plant can be built.
- The LAC curve is thus formed from the relevant segment of the SAC curves

HYPOTHETICAL PLANT SIZES THAT FIRM COULD BUILD IN THE LONG RUN

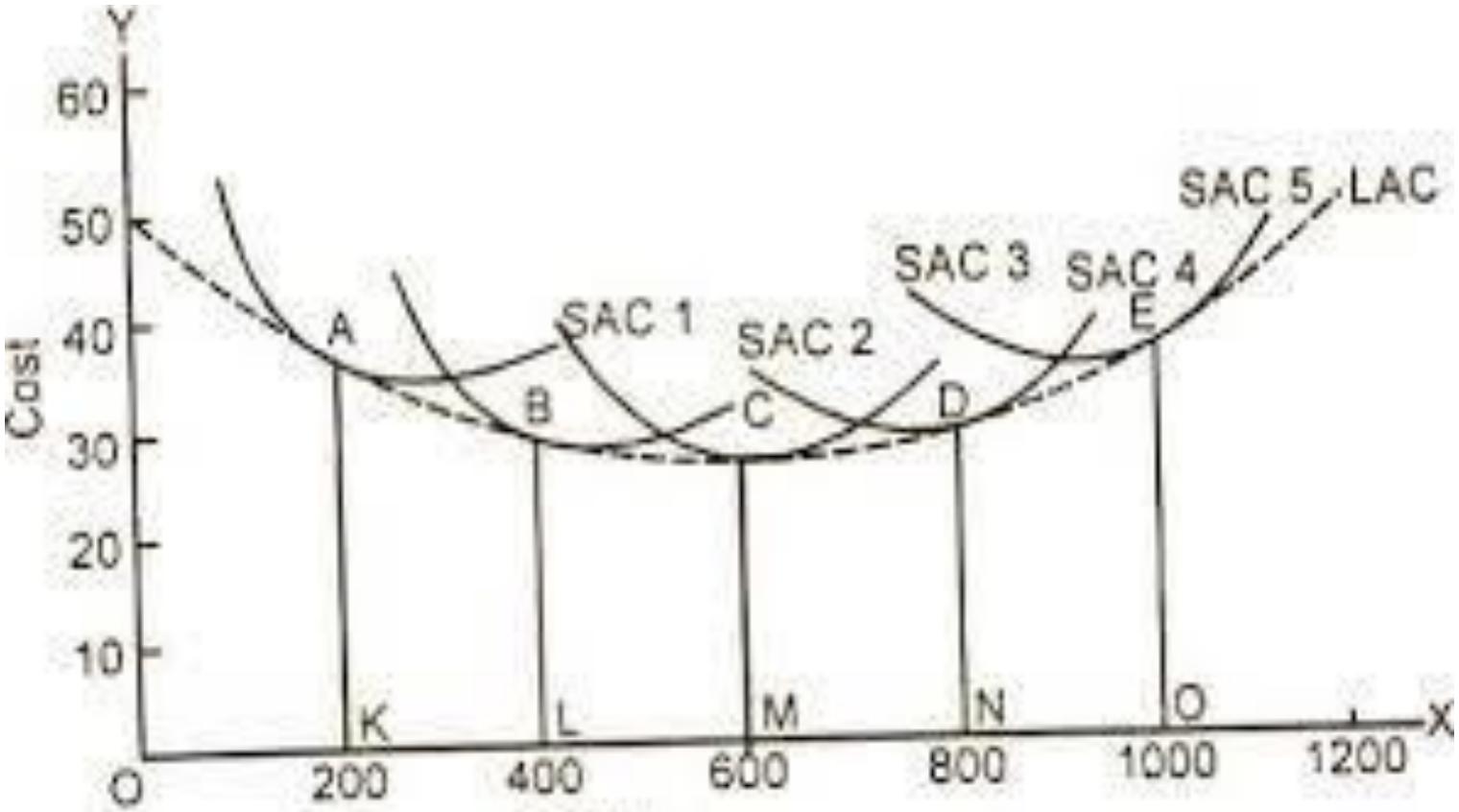


Fig. 13.7

LONG RUN PRODUCTION CURVE Explained

- Each plant is shown by SAC curve
- To produce up to 200 units of output, the firm should build and utilize plant1, given by SAC_1
- From 400 units of output, it should build larger plant given as SAC_2
- From 600 output, it should operate SAC_3 etc
- Note that the firm could produce an output of 400 with plant 1 but only at a higher cost than with plant 2

CONSTANT, INCREASING AND DECREASING RETURNS TO SCALE

- If in the long run we increase all factors used in production by a given proportion, there are three possible outcomes.

1. Output increases in the same proportion, so that there are **constant returns to scale** or constant costs
2. Output increases by a greater proportion, giving **increasing returns to scale** or decreasing costs and
3. Output increases in a smaller proportion, giving **decreasing returns to scale** or increasing costs

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