

LECTURE NOTES ON MANAGERIAL ECONOMICS FOR STUDENTS ACADEMIC USE BY- DR.NEHA MATHUR

COST OUTPUT RELATIONSHIP IN THE SHORT RUN

In the short-run a change in output is possible only by making changes in the variable inputs like raw materials, labour etc. Inputs like land and buildings, plant and machinery etc. are fixed in the short-run. It means that short-run is a period not sufficient enough to expand the quantity of fixed inputs. Thus Total Cost (TC) in the short-run is composed of two elements – Total Fixed Cost (TFC) and Total Variable Cost (TVC).

TFC remains the same throughout the period and is not influenced by the level of activity. The firm will continue to incur these costs even if the firm is temporarily shut down. Even though TFC remains the same fixed cost per unit varies with changes in the level of output.

On the other hand TVC increases with increase in the level of activity, and decreases with decrease in the level of activity. If the firm is shut down, there are no variable costs. Even though TVC is variable, variable cost per unit is constant.

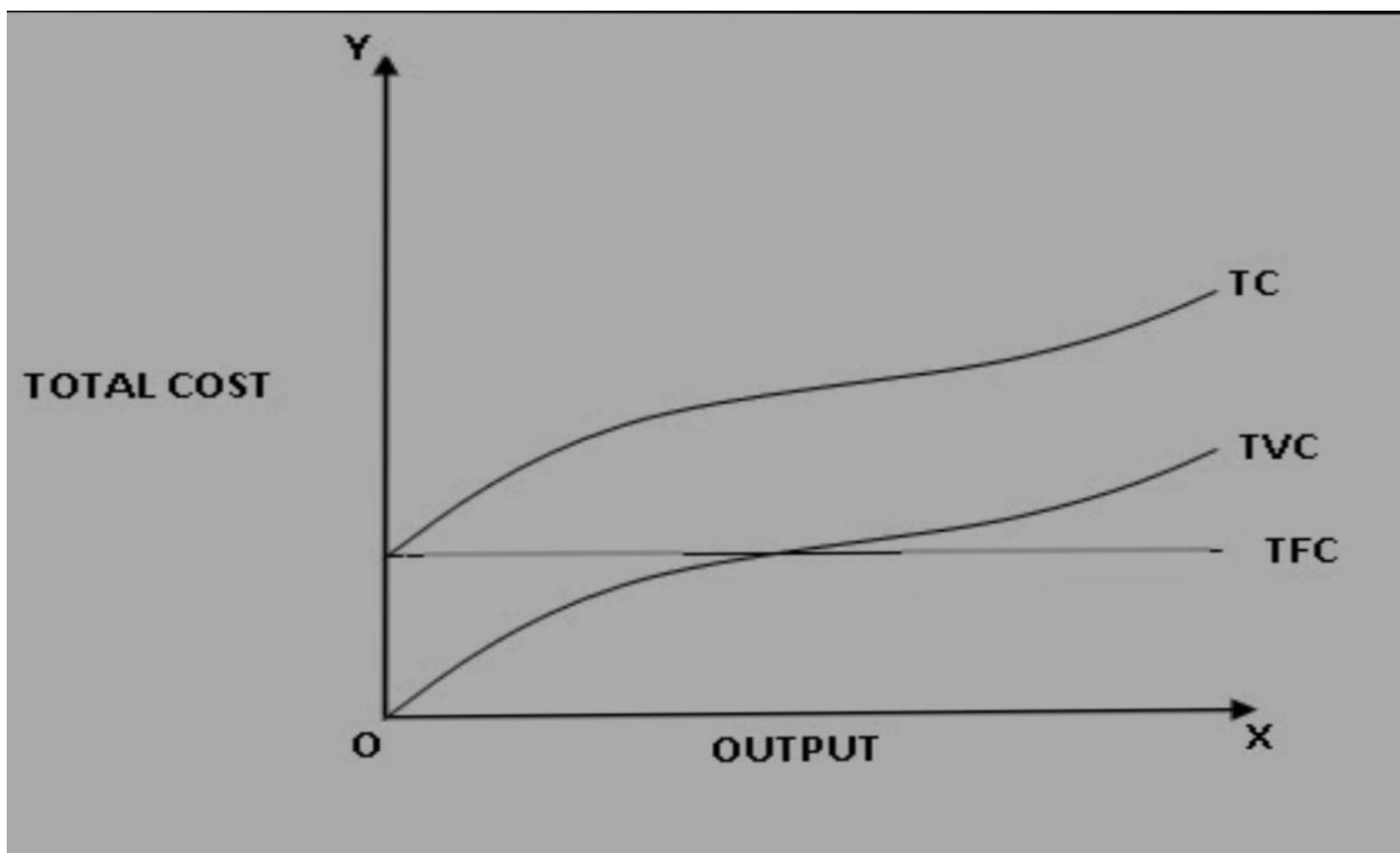
So in the short-run an increase in TC implies an increase in TVC only. Thus:

$$TC = TFC + TVC$$

$$TFC = TC - TVC$$

$$TVC = TC - TFC$$

TC = TFC when the output is zero.



The graph below shows Short-run cost output relationship. In the graph X-axis measures output and Y-axis measures cost. TFC is a straight line parallel to X-axis, because TFC does not change with increase in output.

TVC curve is upward rising from the origin because TVC is zero when there is no production and increases as production increases. The shape of TVC curve depends upon the productivity of the variable factors. The TVC curve above assumes the Law of Variable Proportions, which operates in the short-run.

TC curve is also upward rising not from the origin but from the TFC line. This is because even if there is no production the TC is equal to TFC.

It should be noted that the vertical distance between the TVC curve and TC curve is constant throughout because the distance represents the amount of fixed cost which remains constant. Hence TC curve has the same pattern of behaviour as TVC curve.

Short-run Average Cost and Marginal Cost

The concept of cost becomes more meaningful when they are expressed in terms of per unit cost. Cost per unit can be computed with reference to fixed cost, variable cost, total cost and marginal cost. The following diagram reveals the relationship that exists among these concepts:

Average Fixed Cost (AFC): Average fixed cost is obtained by dividing the TFC by the number of units produced. Thus:

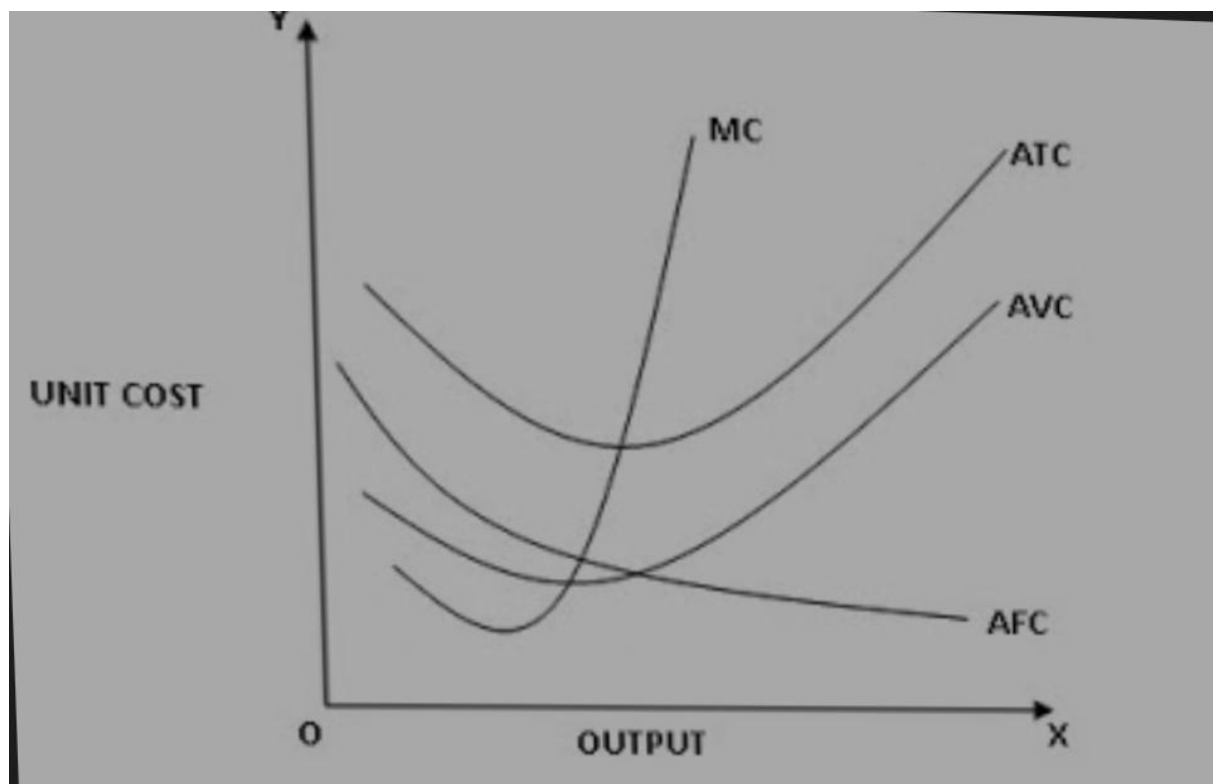
$$AFC = TFC/Q$$

where, 'Q' refers quantity of production.

Since TFC is constant for any level of activity, fixed cost per unit goes on diminishing as output goes on increasing. The AFC curve is downward sloping towards the right throughout its length, with a steep fall at the beginning.

In the graph X-axis measures output and Y-axis measures cost. TFC is a straight line parallel to X-axis, because TFC does not change with increase in output.

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$$AFC = TFC / Q \quad \text{where, 'Q' refers quantity of production.}$$

Since TFC is constant for any level of activity, fixed cost per unit goes on diminishing as output goes on increasing. The AFC curve is downward sloping towards the right throughout its length, with a steep fall at the beginning.

Average Variable Cost (AVC): Average Variable Cost is obtained by dividing the TVC by the number of units produced. Therefore:

$$AVC = TVC / Q$$

Due to the operation of the Law of Variable Proportions AVC curve slopes downwards till it reaches a certain level of output and then begins to rise upwards.

Average Total Cost (ATC): Average Total Cost or simply Average Cost is obtained by dividing the TC by the number of units produced. Thus:

$$ATC = TC / Q$$

The ATC curve is very much influenced by the AFC and AVC curves. In the beginning both AFC curve and AVC curve decline and therefore ATC curve also declines. The AFC curve continues the trend throughout, though at a diminishing rate. AVC curve continues the trend till it reaches a certain level and thereafter it starts rising slowly. Since this rise initially is at a rate lower than the rate of decline in the AFC curve, the ATC curve continues to decline for some more time and reaches the lowest point, which obviously is further than the lowest point of the AVC curve. Thereafter the ATC curve starts rising because the rate of rise in the AVC curve is greater than the rate of decline in the AFC curve.

Marginal Cost (MC): Marginal Cost is the increase in TC as a result of an increase in output by one unit. In other words it is the cost of producing an additional unit of output.

$$MC = \Delta TC / \Delta Q \quad \text{Where, } \Delta TC = \text{Change in Total cost}$$
$$\Delta Q = \text{Change in quantity}$$

MC is based on the Law of Variable Proportions. A downward trend in MC curve shows decreasing marginal cost (i.e. increasing marginal productivity) of the variable input. Similarly an upward trend in MC curve shows increasing marginal cost (i.e. decreasing marginal productivity). MC curve intersects both AVC and ATC curves at their lowest points.

The relationship between AVC, AFC, ATC and MC can be summed up as follows.

1. *If both AFC and AVC fall ATC will also fall because $ATC = AFC + AVC$*

2. When AFC falls and AVC rises (a) ATC will fall where the drop in AFC is more than the rise in AVC (b) ATC remains constant if the drop in AFC = the rise in AVC, and (c) ATC will rise where the drop in AFC is less than the rise in AVC.

3. ATC will fall when MC is less than ATC and ATC will rise when MC is more than ATC. The lowest ATC is equal to MC.

The following Table illustrates cost output relationship in the short-run, with reference to different concepts of cost.

Output	Total Fixed Cost (TFC)	Total Variable Cost (TVC)	Total Cost (TC)	Average Fixed Cost (AFC)	Average Variable Cost (AVC)	Average Total Cost (ATC)	Marginal Cost (MC)
1	2	3	$4 = 2 + 3$	$5 = 2 / 1$	$6 = 3 / 1$	$7 = 4 / 1$	8
0	240	0	240	---	---	---	---
1	240	120	360	240	120	360	120
2	240	200	440	120	100	220	80
3	240	270	510	80	90	170	70
4	240	320	560	60	80	140	50
5	240	420	660	48	84	132	100
6	240	552	792	40	92	132	132
7	240	720	960	34	103	137	168

Least Cost Input Combination

In the short run least cost input combination lies at the output level where marginal cost is equal to average total cost ($MC = ATC$). At this output level the ATC will be the least. It is also called the short-run stage of optimum output.