

Revision Notes

Class 12 Micro Economics

Chapter 3 - Production and Costs

Production: It is primarily concerned with the transformation of resources into commodities.

Production Function: Physical inputs are used in the production function. A firm's production function describes the relationship between output and production factors used in the manufacturing process. It displays the number of inputs required to produce the highest level of final output.

The production function is expressed using the following formula:

$$Q = f(x_1, x_2)$$

Here, Q is equal to final units of output, x_1 and x_2 are the amount of production factor 1 and amount of production factor 2 respectively.

The above equation shows that production factors 1 and 2 can be used to produce the final units of output.

Types of Production Function:

There are two types of Production Function.

1. Short-run Production Function: In this production function, one production factor is variable while the others are fixed. As a result, the law of return to a factor is applied. It is also referred to as the variable proportion type of production function.

It is a time frame that is insufficient to effect change in all inputs. The variable factors in this level of production can be changed.

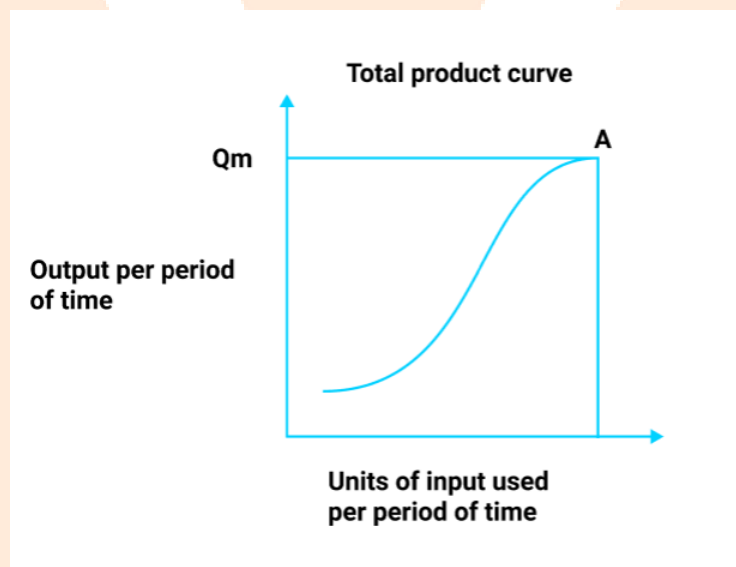
2. Long-run Production Function: All production factors are variable in this production function. As a result, the law of diminishing returns to scale is applied. It is also referred to as the constant proportion type of production function.

It is a time period long enough to change all inputs, and all inputs are variable in the long run.

Total product or Total physical product: - Total product is the sum of the final units of output produced by a firm using a given amount of inputs over a given time period. When all other factors of production are held constant, total product is the relationship between variable factors of production and final units of output. The total product can be expressed using the formula below:

$$\text{Total Product} = \sum Q_x$$

The formula above depicts the relationship between variable factors of production and the total output.



Average production

The average production is the variable factor's per unit production.

$$AP = \frac{TP}{\text{Variable input}}$$

Marginal product: It refers to the change in total product resulting from the employment of an additional unit of variable factor. In other words, it is the contribution of each additional unit of variable factor to output.

$$\text{Marginal Product of an Input} = \frac{\text{Change in Total Product}}{\text{Change in Variable Product}}$$

Relation between Total, Average and Marginal Product

$$MP = \frac{\Delta TP}{\Delta L}$$

$$MP_n = TP_n - TP_{n-1}$$

1. When TP rises at an increasing rate, MP rises as well.
2. MP decreases as TP increases at a decreasing rate.
3. When TP is at its maximum, MP equals zero.
4. When TP starts to fall, MP becomes negative.

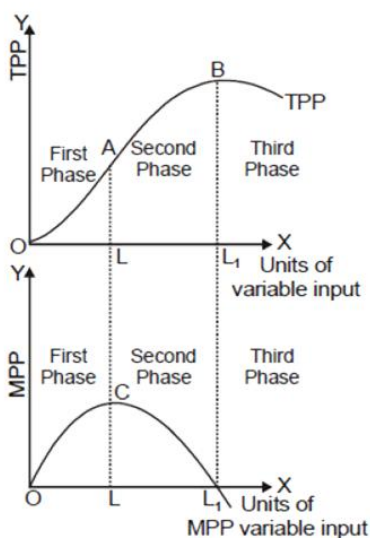
Labour	MP	TP	AP
1	2	2	2
2	3	5	2.5
3	4	9	3
4	3	12	3
5	1	13	2.6

6	0	13	2.16
7	-2	11	1.6

1. When MP is greater than AP, AP increases.
2. When MP equals to AP, AP is maximum and constant.
3. When MP is less than AP, AP decreases.
4. MP can be zero or negative, but AP remains positive.
5. AP rises even when MP falls, but MP should be higher than AP.

Returns to a factor: It describes the output behavior when only one variable factor of production is increased in the short run while fixed factors remain constant.

Law of variable proportion: The law of variable proportion states that when more and more units of variable factors are used to increase output, output initially increases at an increasing rate before falling.



1. Stage I (Stage of Increasing Return to factor): TP Increases at an ever-increasing rate: Initially, as more units of variable factors are combined with fixed factors, total physical production increases at an increasing rate, and MP rises.

The following are the reasons for the increased return:.

- (a) Underutilisation of fixed factor
- (b) Indivisibility of factor
- (c) Increased efficiency of variable factor

Stage II (Stage of Diminishing Return to factor): TP increases at a decreasing rate: As more units of variable factors are combined with fixed factors, total product increases at a decreasing rate, while MP decreases but remains positive. At the end of this phase, TP is at its maximum and MP is zero.

The cause of diminishing returns is:

- (a) best use of fixed factor
- (b) unsatisfactory factor substitutability

Stage III (Stage of negative return to factor): TP falls: As more units of variable factors are combined with fixed factors, total output begins to fall and marginal product becomes negative.

Cause of negative return:

- (a) Inadequate coordination between fixed and variable factors.
- (b) Excessive use of fixed factors

Economic Cost: Economic cost is the sum of explicit and implicit costs.

Explicit Cost: The actual money spent by a firm on the purchase and hiring of factor inputs for production is referred to as explicit cost. These are recorded in accounting books. For example, wage payments, rent, interest payments, raw material purchases, and so on.

Implicit cost: This is the cost of self-owned production resources used in the manufacturing process. Or the estimated value of inputs supplied by the owner. These are not recorded in the accounting books.

Normal profit: This is the bare minimum needed to keep the producers in business. In other words, it is the entrepreneur's minimum supply price. It is also known as an entrepreneur's wage.

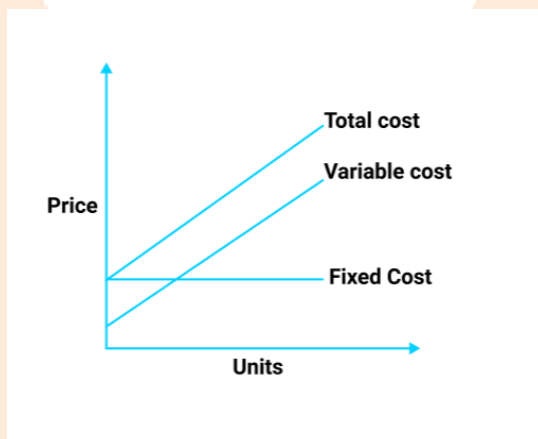
Total cost: It refers to the total amount of money spent by a company on producing a given quantity of a commodity. The total cost is the sum of the total fixed and variable costs.

$$TC = TFC + TVC \text{ or } TC = AC \times Q$$

$$TFC = TC - TVC \text{ or } TFC = AFC \times Q$$

Features of Total Fixed Cost:

- (a) It remains constant at all output levels. Even at zero output level, it is not zero. As a result, the TFC curve is parallel to the X-axis.
- (b) Total cost at zero output level equals total fixed cost.



Total variable cost

It is the cost that varies with the amount of output produced. It is zero at the output level of zero. The TVC curve is perpendicular to the TC curve. Excluding raw material costs, power expenses, and so on.

$$TVC = TC - TFC \text{ or } TVC = AVC \times Q$$

Features of Total variable cost: -

- (a) When the output is zero, it is zero.
- (b) It rises in proportion to the increase in output.
- (c) Initially, TVC grows at a diminishing rate due to increasing returns, but later, it grows at an increasing rate due to diminishing returns.

Average cost

It is the cost of producing a commodity per unit. It is the sum of the average fixed and variable costs.

Average fixed cost

It is the fixed cost of producing a commodity per unit.

$$AC = \frac{TC}{Q} \text{ or } AC = AFC + AVC$$

$$AFC = \frac{TFC}{Q} \text{ or } AFC = AC - AVC$$

Features of AFC :-

- (a) As output increases, AFC decreases.
- (b) A rectangular hyperbola is the shape of the AFC curve.
- (c) It cannot cross the X or Y axes.

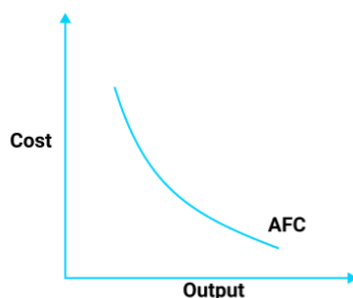


Fig. AFC Curve

Average variable cost:

It is the variable cost of producing a commodity per unit. Because of the law of variable proportion, AVC is U-shaped.

$$AVC = \frac{TVC}{Q} \text{ or } AVC = AC - AFC$$

$$MC = \frac{\Delta TC}{\Delta Q} \text{ or } MC_n = TC_n - TC_{n-1}$$

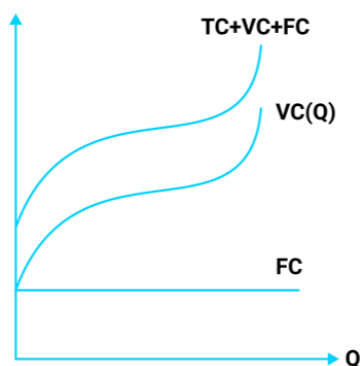
$$MC_n = TC_n - TC_{n-1}$$

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

Relation between Short-Term Costs

The total cost curve and the total variable cost curve remain parallel. Total fixed cost is equal to the vertical distance between these two curves. The TFC curve remains parallel to the X-axis, while the TVC curve remains parallel to the TC curve.

As the level of output increases, so does the vertical distance between the AFC and AC curves. The vertical distance between the AC curve and the AVC curve, on the other hand, continues to decrease, but these two curves never intersect because the average fixed cost is never zero.

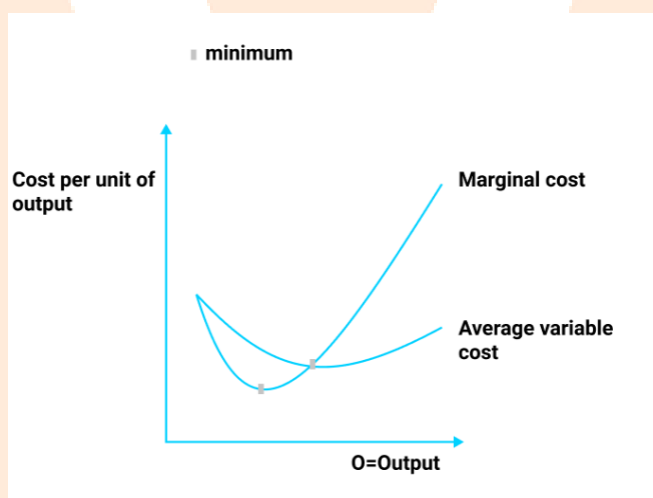


Relation between MC and AVC:

When $MC < AVC$, AVC falls.

When $MC = AVC$, AVC is minimum and constant.

When $MC > AVC$, AVC rises. MC curve cuts AVC curve at its lowest point. Both curves are U-shaped and starts from same point.



Relation between MC and AC:

(i) when AC falls, $MC < AC$.

(ii) when AC rises, $MC > AC$.

(iii) when AC is constant and minimum, $MC = AC$.

Revenue:

Revenue is the amount of money earned from the sale of a product.

Total revenue is the total amount of money received by a company from the sale of a specific number of units of a commodity.

$$TR = AR \times Q \text{ or } TR = \sum MR$$

$$TP = \text{Price} \times \text{Quantity sold.}$$

$$\text{Price} = AR$$

Average revenue is the revenue received per unit from the sale of a commodity. The average revenue equals the price. The price of a commodity per unit is also referred to as AR.

$$AR = \frac{TR}{Q} \text{ or } \frac{P \times Q}{Q} = P = \text{Price}$$

When one more unit of output is sold, marginal revenue is added to total revenue.

$$MR = \frac{\Delta TR}{\Delta Q} \text{ or } MR_n = TR_n - TR_{n-1}$$

Relation between TR, AR, and MR when more quantity sold at the same price: under perfect competition.

(a) At all levels of output, average revenue and marginal revenue remain constant, and the AR and MR curves are parallel to the x-axis. $AR = MR$

(b) Total revenue grows at a constant rate. The MR is constant, and the TR curve is a positively sloped straight line through the origin.

Relation between TR, AR and MR when more quantity by sold at the lower price or there is monopoly or monopolistic competition in the market.

(a) The slope of the average revenue and marginal revenue curves is negative. The MR curve is located beneath the AR curve. $MR < AR$

(b) Marginal revenue declines twice as fast as average revenue.

$$MR = \frac{1}{2} AR$$

(c) As long as marginal revenue is decreasing and positive, total revenue increases at a decreasing rate. Total revenue is at its highest when marginal revenue is zero, and when marginal revenue becomes negative, TR begins to fall.

Relation between AR and MR (General relationship)

AR is maximum and constant when $MR = AR$. MR, can be negative but not AR.

When $MR < AR$, AR falls. When TR rises at an increasing rate, MR and AR rise as well.

Concept of Producer's Equilibrium: It refers to the stage in which the producer is making the most profit for the least amount of money and has no incentive to increase or decrease the level of output.

MR and MC Methodology: According to this approach, the conditions of producer equilibrium are:

- (a) $MC = MR$ and also $AR = MR$, so $AR = MR = MC$. MC should be on the rise.
- (b) At the point of equilibrium, the MC curve should cut the MR curve from below.

Alternatively, after the equilibrium point, MC should be greater than MR due to an increase in output.

Normal Profit: -

This is a no-profit, no-loss situation that occurs when $P = AC$. It is the minimum return on investment that a producer expects from his capital in the business.

Break-even Point: - It happens when $AR = AC$ or when $(TR = TC)$. At this point, the firm generates no economic profit or normal profit. OR we can say it is simply covering all of its expenses.

Shut-down Point: - This occurs when a company only covers its variable costs; in this case, the company suffers a loss of fixed costs. $(TR < TVC \text{ OR } AR < AVC)$

Supply: The amount of a commodity that a firm or seller is willing to sell at different prices during a given period of time is referred to as supply..