

INTRODUCTION

Costs have a variety of meanings from the economists and accountants point of view. There are several types of costs which will be related to the classification of the factors of production.

The theory of cost is important in economic analysis because of its influence, especially on supply. A rise in cost tends to curtail supply, while a fall has the tendency to bring about increase in supply. This phenomenon influences demand.

OBJECTIVES

At the end of this chapter, students should be able to:

- ◆ Explain the meaning of cost and its basic concepts;
- ◆ Explain cost through the schedules and curves;
- ◆ Explain the difference between the Economist's and the Accountant's views of cost;
- ◆ Explain the short and long run costs through their respective curves;
- ◆ Define the concept of revenue, total revenue, average revenue and marginal revenue;
- ◆ Construct hypothetical table of total revenue, average revenue and marginal revenue and draw their respective curve;
- ◆ Derive the average revenue and marginal revenue from a given revenue table.

5.1 Meaning of Cost

Cost is the amount measured in monetary values in the form of cash expenditure. It is a form of property that is transferred or capital stock issued; it also involves services performed or liability incurred in consideration of goods and services received or to be received.

Cost, therefore, has a direct relationship with money which, in modern times, is the most acceptable means of payment as well as the best measure of value. This is one of the reasons for the payment of wages, interests, rents and profits as rewards in money values. These rewards are the costs of bringing things into existence (production).

5.2 Basic Cost Concepts

The basic cost concepts show the various forms of classification of costs. Fig 5.1 simplifies the concept before we take a detailed look at the various costs.

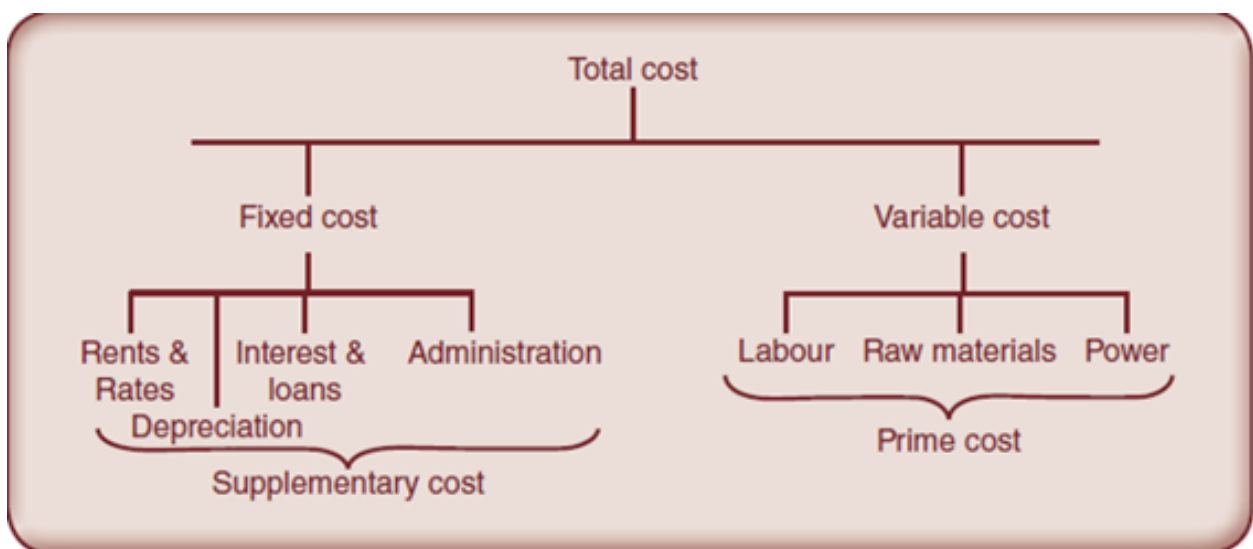


FIG. 5.1 Basic Cost Concepts

- a. **Fixed Cost (FC):** These are costs that do not change even if the output varies. They are fixed and remain the same whether the firm is working at full capacity or not. These include: costs of and/building, administration, rates, rents, interests on loans and depreciation. Sometimes they are broadly classified as overhead or supplementary costs.
- b. **Variable Cost (VC):** These are costs that normally change directly with output. For instance, if a firm decides to increase or decrease its output, it will affect labour requirements and other input factors to increase or decrease, respectively. Wages for labour, cost of raw materials and payments for power are prime actors to run an industry. Thus, they are classified as running or prime costs.

TABLE 5.1

S/N	Output	Total FC	Total VC	Total Cost	Average FC	Average VC	Average TC	Marginal Cost
	a	b	c	d	e	f	g	h
1	10	44	20	64	4.4	2.0	6.4	–
2	15	44	50	94	1.9	3.3	6.2	6.0
3	20	44	60	104	2.2	3.0	5.2	2.0
4	25	44	80	124	1.8	3.2	5.0	4.0
5	30	44	100	144	1.5	3.3	4.8	4.0
6	37	44	110	154	1.2	3.0	4.2	1.4
7	40	44	120	164	1.1	3.0	4.1	3.3
8	44	44	140	184	1.0	3.2	4.2	5.0
9	50	44	160	204	0.9	3.2	4.1	3.3

Note: $b + c = d$; $\frac{b}{a} = e$; $\frac{c}{a} = f$; $\frac{d}{a} = g$ or $e + f = g$; $\frac{d_n - d_{n-1}}{a_n - a_{n-1}} = h$

- c. **Total Cost (TC):** These costs are simply the addition of fixed and variable costs. They are costs that the firm incurs in producing its commodity and are otherwise called factory costs.
- d. **Average Cost (AC):** This is the unit cost of production. The average costs of a firm shows the total cost of a given volume of output divided by the number of units in the production process. Other average costs can be derived thus based on fixed or variable costs.
- e. **Average Fixed Cost (AFC):** This is defined as the total fixed cost divided by the total output.
- f. **Average Variable Cost (AVC):** This is obtained by dividing the total

variable cost by the total output.

- g. Average Total Cost (ATC):** This is the total cost divided by the output as stated earlier. It is obtained in a more realistic method of adding the average fixed cost and the average variable cost.
- h. Marginal Costs (MC):** This is the addition to the total cost of production resulting from increasing the total output by one extra unit of output. Marginal costs reflect increase or decrease of output, while average costs focus attention on the average of the production that has taken place.

To calculate the marginal cost (MC) as shown in the schedule, find the difference in increase in total cost and divide the result by the differences in increases in the total units of output.

5.3 Difference Between the Economist's and the Accountant's Views of Cost

The literary meaning of cost is the price of purchase of a commodity. The price, therefore, involves an expenditure on the part of the consumer as well as the producer or supplier of a product that spends in purchasing the product or making the commodity available to the final consumer.

In the theory of cost, economists attach a deeper meaning to cost than accountants. Their different view to cost can be differentiated as follows:

- a. Economist's view of cost:** The economists view that the word 'cost' has varieties of classification from which they can give different interpretations to the meanings. This distinction is clearly brought out by the concept of opportunity cost. In economic theory, opportunity cost, which is the real cost of satisfying a want, expressed in terms of the cost of alternative activities that are forgone (see Chapter of Book One) is used instead of the money value along which is the sum of all payments made to the factors of production engaged in the production of that commodity. In this concept, the importance attached to a unit cost becomes clearer if we realize that in a given capital outlay the unit cost of producing 50 copies of this textbook will be higher than the unit cost of producing 1,000 copies of it. The cost of a unit factor to the firm is, therefore, the maximum amount, in which the factor could have earned in alternative usage (employment).
- b. Accountant's view of cost:** The accountants see the cost of producing a certain commodity as the sum of all payments made to the factors of production of that commodity which they interpret based on the monetary values of these factors of production. Thus, for an accountant, the cost of production of a commodity is the cost of money for producing that commodity.

5.4 Cost Schedules and Curves

An entrepreneur who hires a factory must pay the annual rent for it, no matter the level of his productivity. We have already referred to such type of cost as fixed cost and is represented by FC, that is 'F' for fixed and 'C' for cost.

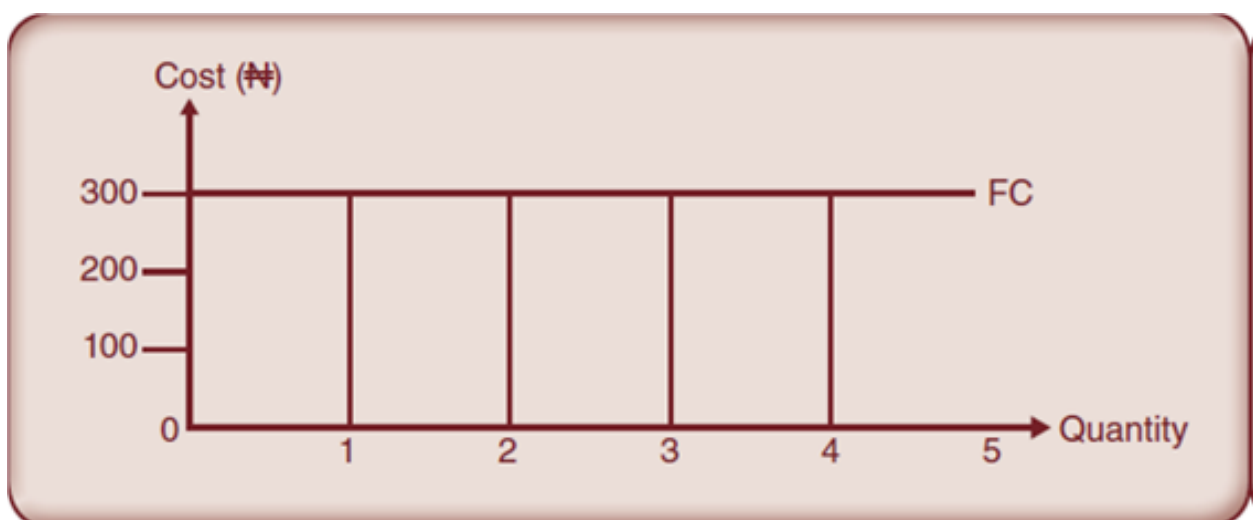


FIG. 5.2 Fixed Cost

The opposite of fixed cost is variable cost, which varies with the level of output costs. However, they vary with output in different ways or proportions – they increase either at fixed ratios or at varying rates.

As an example of the first type of variable cost, we assume that fixed quantity of raw material input is necessary for a unit of output. The simple law connecting quantity of output and variable costs of this type can be expressed by the equation $VC = Kq$ (variable cost is equal to k times quantity) where K is a constant and q is quantity of output which is also a variable, but K gives the ratio between them.

TABLE 5.2: Showing the Quantity and Variable Cost

Quantity	Variable Cost
1	3
2	6
3	9
4	12
5	15
6	18

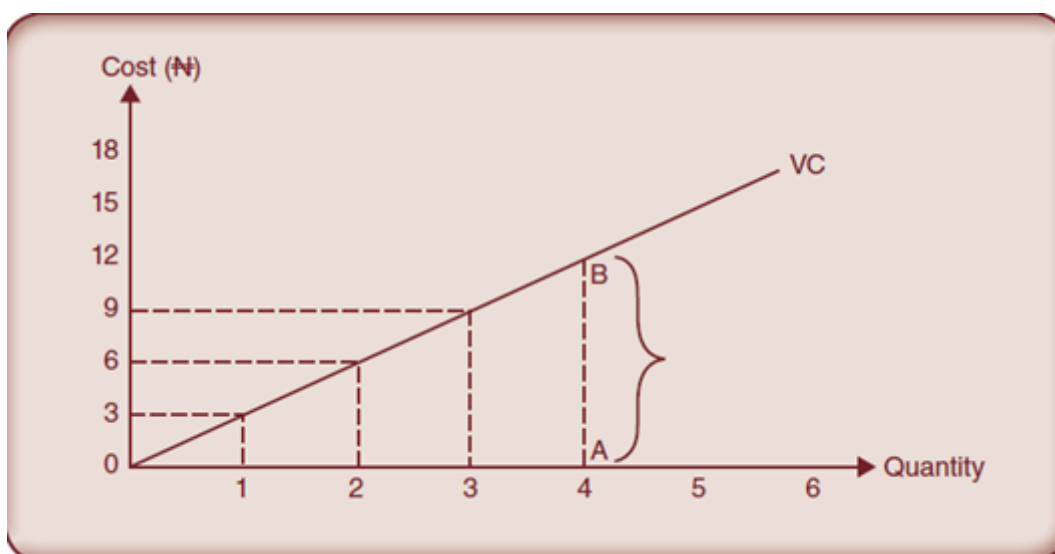


FIG. 5.3 Variable Cost

The second type of variable cost which is increasing at a varying rate, is in real life more usual because components making up the total variable costs are not only raw material but also wages, power, fuel etc. Each of these costs may vary at different rates with output. If the increase in variable cost is less in proportion to the increase in output, we speak of decreasing variable cost.

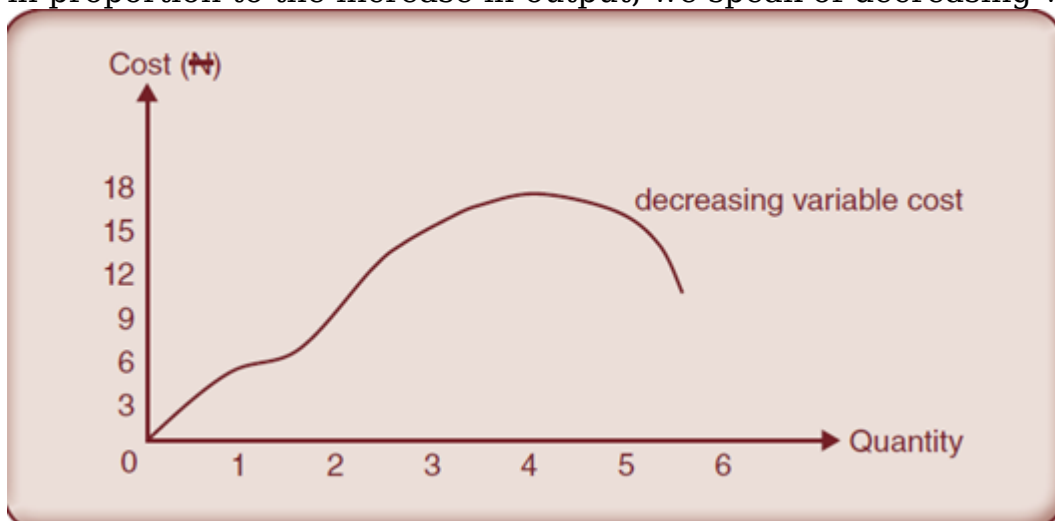


FIG. 5.4 Decreasing Variable Cost

If, on the contrary, the total variable cost increase more in proportion to the increase in output we speak of increasing variable costs. As a basis for comparison, we take the difference in variable costs between the first and second units of output. To represent these concepts graphically below.

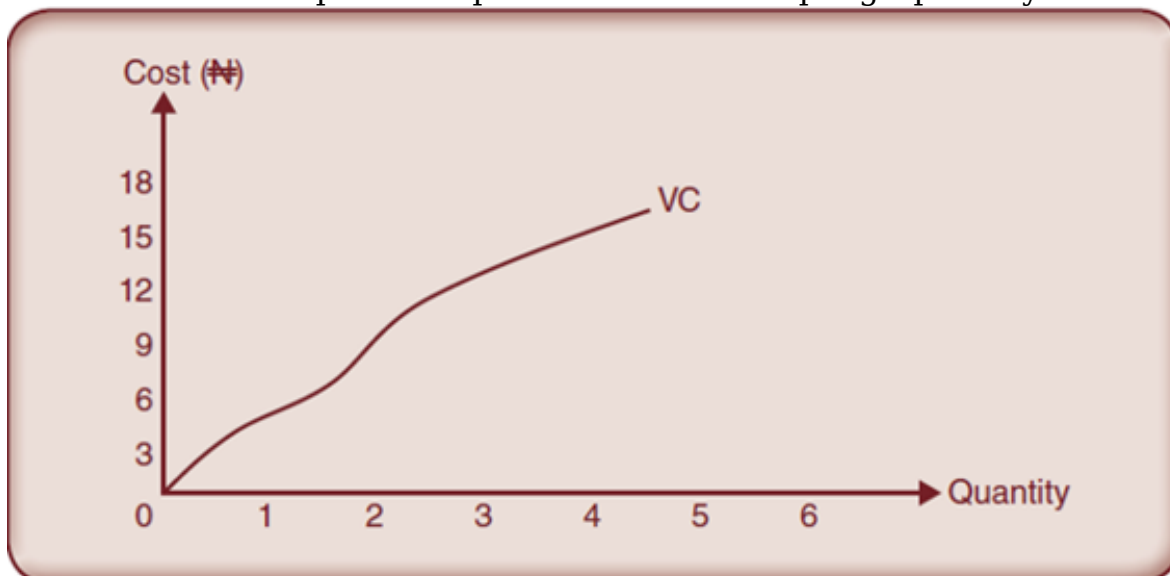


FIG. 5.5 Increasing Variable Cost

It must be noted that when the variable cost and the average fixed cost vary

disproportionately or irregularly, their values for different quantities of output will be different; and where the average variable cost decreases with output at a certain output, it reaches the minimum and then increases again. Its graphical representation is U-shaped curve. Before proceeding further let us represent these basic cost concepts TC, VC and FC graphically.

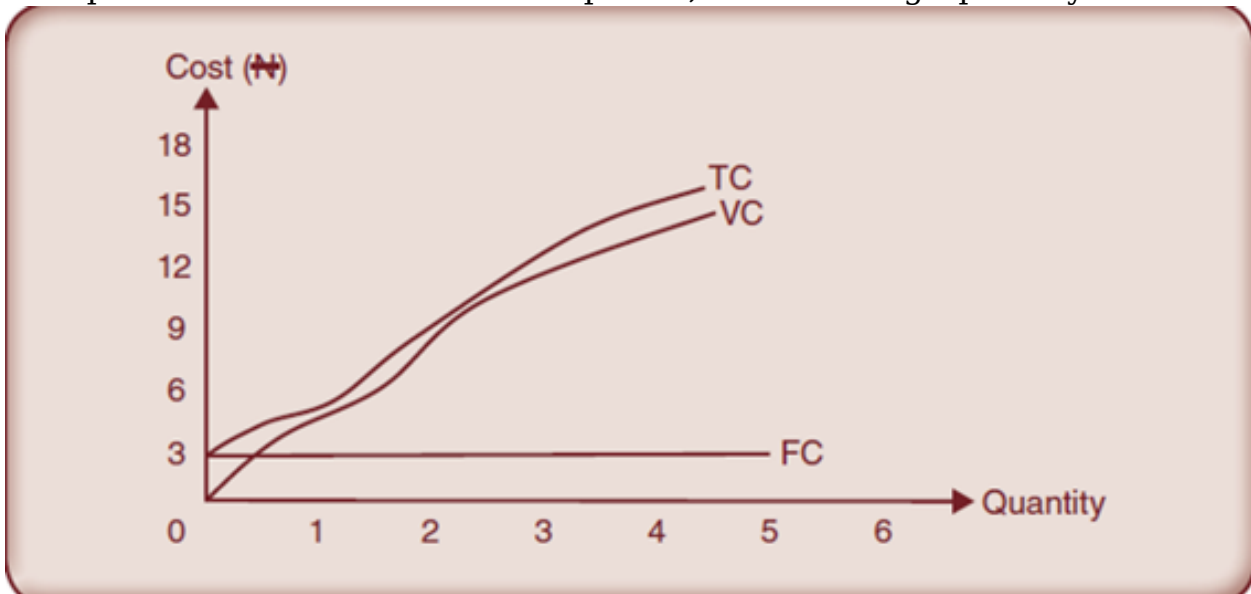


FIG. 5.6 Total Cost

Similarly, the average total cost is composed of the average variable cost and the average fixed cost. So, $ATC = AFC + AVC$. Again, it is necessary to distinguish whether Variable Cost is the type that varies proportionately, decreasingly or increasingly with output.

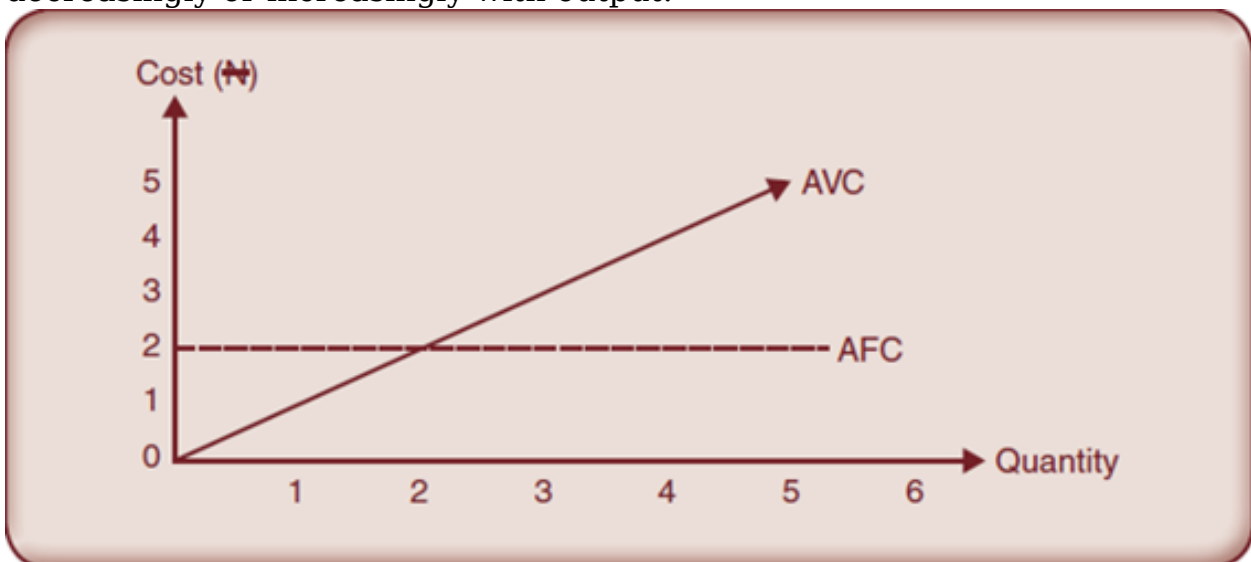


FIG. 5.7 Average variable cost, varying proportionately

In the case of variable cost, the calculation of AC from the basic formula is $VC = Kq$ (variable cost equal K times q) and the result is $K = VC/q$. In a graph, average variable cost varies proportionately and will be straight line. When the Variable Cost varies disproportionately or irregularly, its value for different quantities of output is different. But when average variable cost decreases with increasing output, at a certain point, it reaches the minimum, and it increases again. Its graphical representation assumes a U-shaped curve, while the AFC curve would be decreasing, approaching zero but never reaching it as we have on figures 5.8 and 5.9.

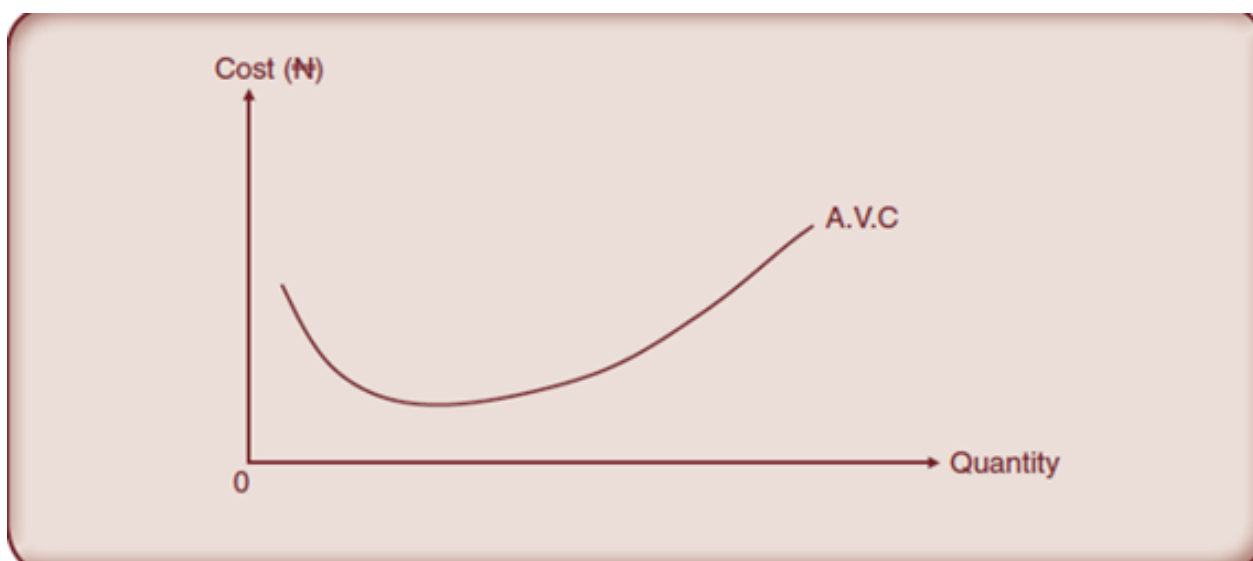


FIG. 5.8 AVC decreasing with increasing output

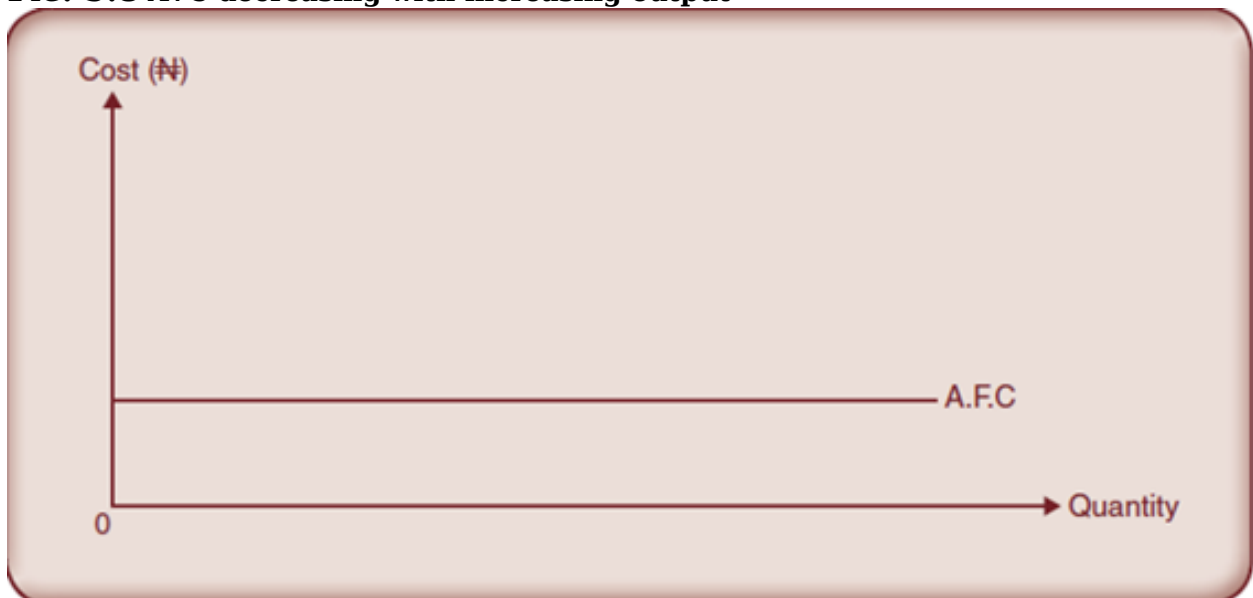


FIG. 5.9 AFC curve

Let us consider the behaviour of the average total cost as a whole, to distinguish again whether the variable component varies in a fixed or variable proportion given that $ATC = TC/Q$. If it varies in fixed proportion, the TC curve will be a straight line starting at a point of the axis corresponding with the fixed cost.

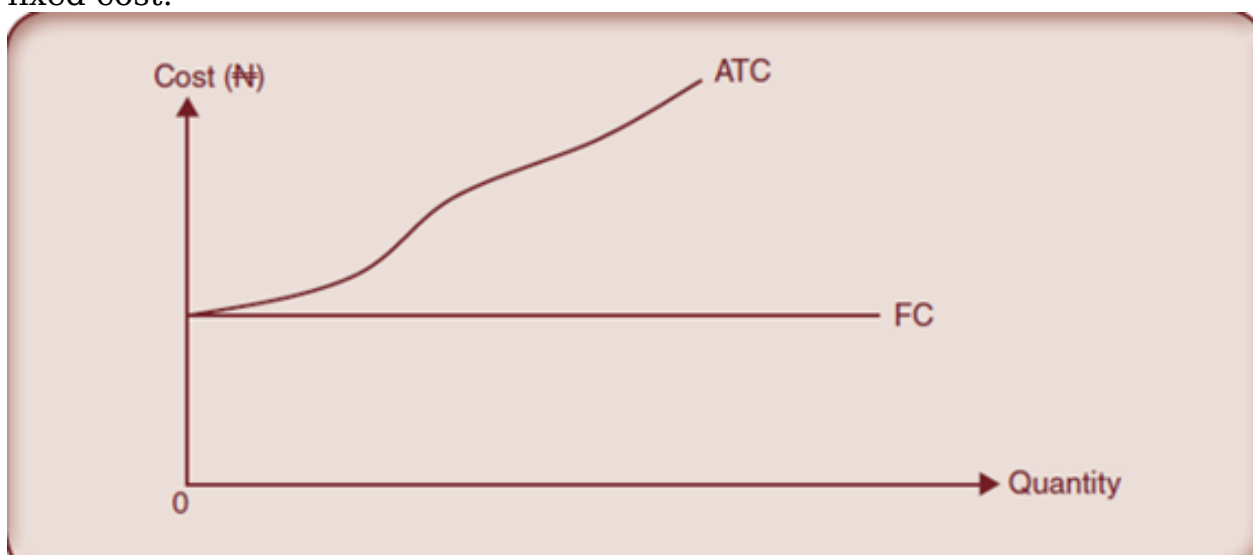


FIG. 5.10 ATC curve varying in a fixed proportion

Furthermore, the average cost in this particular case is such that

$$ATC = \frac{TC}{Q} = \frac{FC}{Q} + \frac{KQ}{Q} = \frac{FC}{Q} + K$$

The graphical representation of ATC in this particular case when the variable component of the total cost varies proportionately with the output is a curve falling to the right with a diminishing shape as the quantity of product increases.

If the variable cost component of the TC is of the type that varies irregularly containing the AFC and AVC, the ATC will assume a U-shaped curve entirely. The following points should be noted:

- a. In industries, the larger the output, the lower the average total cost.
- b. Since the ATC is composed of the AFC and AVC, if the VC varies irregularly, the behaviour of the ATC curve depends on how gradual decreases and increases of ATC and AVC off set each other. When the decreases of the AFC are so small in absolute amounts as to fail to off set the increase in the AVC, then the ATC begins to increase, until it assumes a U-shaped curve.
- c. Evidently, the behaviour of the ATC is dependant, to a large extent, on the proportion of fixed cost to variable cost. In industries where FC represents by far the largest proportion of TC, this gives rise to a situation of decreasing ATC. Industries with a high proportion of VC tend to be those operating under conditions of increasing ATC.
- d. If we know the ATC for the succeeding quantities of output, we are able to forecast how profitable a given market price will be for the enterprise without much calculations.
- e. Marginal cost (MC), which is the amount added to the total costs when the output is increased by one unit, decreases to a certain point with the increase of output and then rises again. This behaviour of MC shows how easy or difficult the firm finds it to expand production in different ranges of qualities and quantities produced. If the MC is small and varies only insignificantly, it shows that no new investment is necessary to expand production. If on the contrary, an increase in production would cause significant rise in the marginal costs, showing that the optimum capacity of the plant has been exhausted, an expansion of production would necessitate either usually high VC or installation of new plant.
- f. Marginal cost is the difference between TC of successive units of the products which is quite independent of the fixed components of the TC as far as the components remain fixed.

5.4.1 Relationship between Average Total Cost(ATC) and Marginal Cost(MC)

The relationship is such that when the ATC is falling, it means that the increase in cost is less than proportionate to the increase in output, thus, the MC will be smaller than AC, on the contrary, when the AC is rising, the MC is greater than the average cost and when the AC is constant, the MC is equal to it.

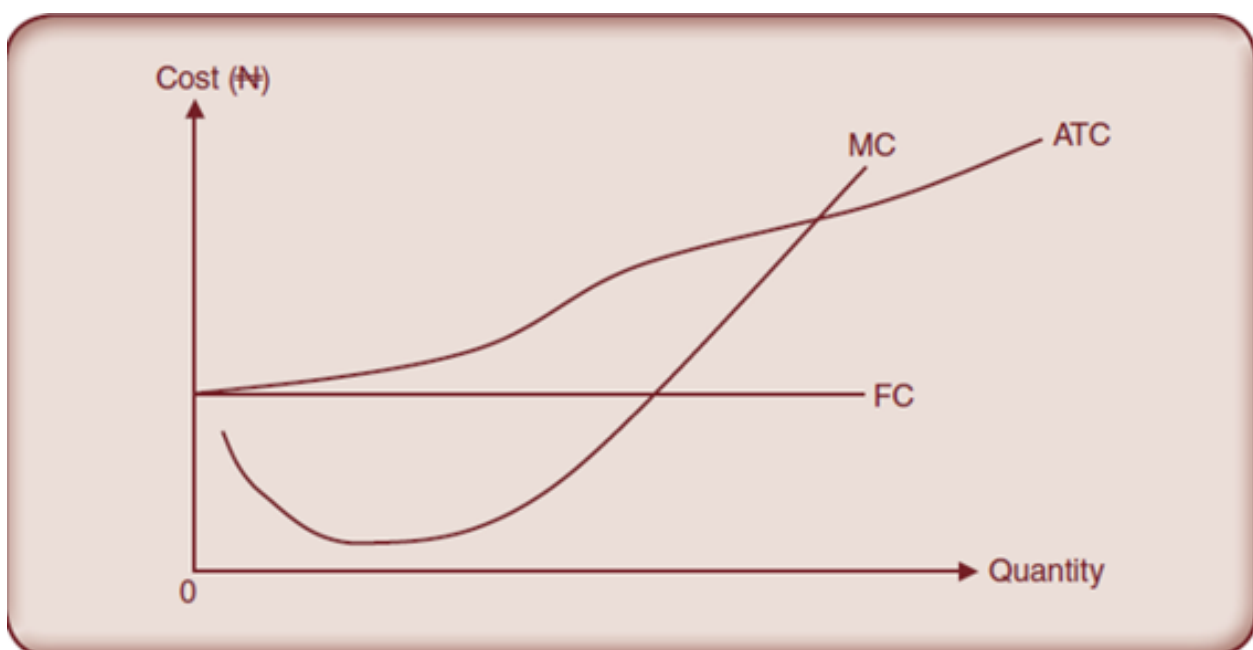


FIG. 5.11 Relationship between ATC and MC

5.4.2 Direct and Indirect Costs

Total cost can be divided into two basic cost concepts, i.e. direct and indirect costs.

- a. **Direct Cost:** This cost considers the element of costs which can easily and conveniently be identified with specific units of products. There are two types of direct cost.

- **Direct Material Cost:** This term is applied to any material, the use of which can be related to individual product or product group being processed. Exceptions may apply to materials of negligible values and quantities.

- **Direct Labour Cost** This is measured by the wages paid for work applied directly to the product or group of products, as well as wages for the so-called set-up work.

- b. **Indirect Costs:** These are expenses that cannot be easily associated in a convincing manner with a particular product. They are burden overhead expenses including expenses on manufacturing.

This includes all costs which are not capable of being directly charged to the product. Many examples of such abound e.g. building expenses, general plant expenses, salaries to office clerks, insurance expenses and equipments, stand by cost for power.

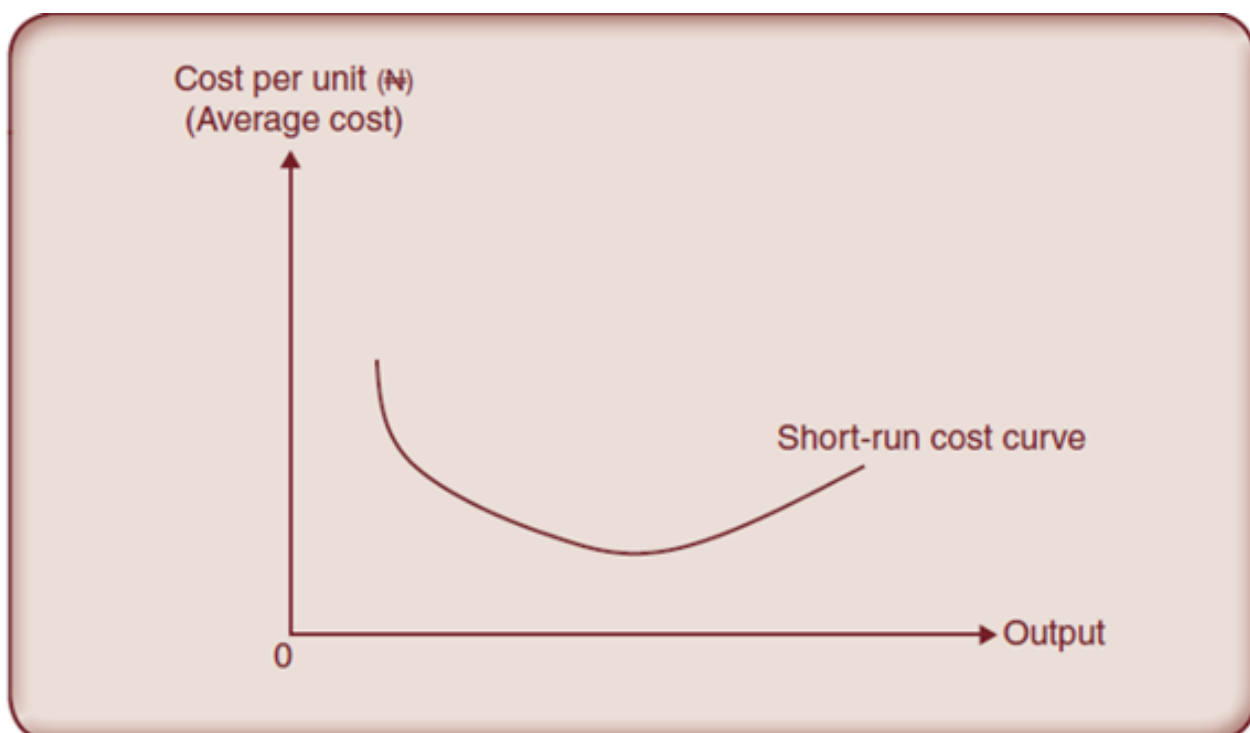


FIG. 5.12 Short-Run Cost Curve

On the other hand, if the entrepreneur makes decisions about production which requires changes in the existing factors e.g. baker deciding to exchange their bakery ovens to bigger capacities, then the period of production here to be long enough to acquire new ovens, dismantle and dispose off the ones of smaller capacities and thus equip the bakery fully before starting off with production. This process is bound to mean longer periods in which the factors of production can vary, assuming there are no fixed factors and costs. These are therefore, known as the long-run periods, and the cost associated with them are long-run costs. Within the periods of long run, entrepreneurs are allowed time enough to choose the best combinations of factor and produce. The curve of long-run cost is shown below.

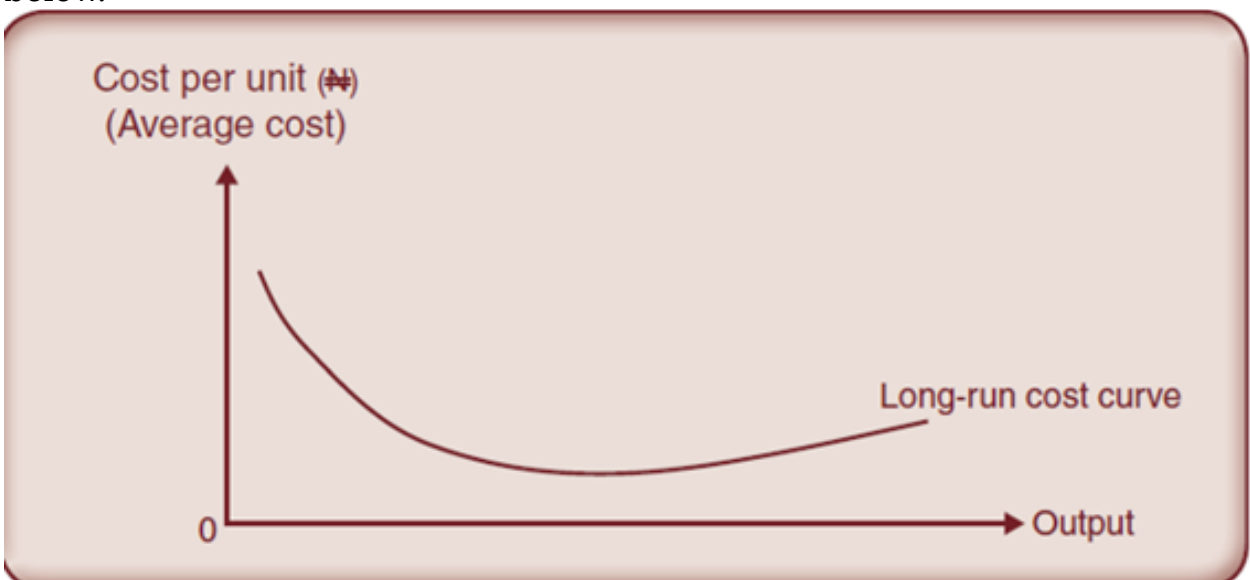


FIG. 5.13 Long-run cost curve

Therefore, the short-run problem concerns the optimum utilization of plant of a given size F i.e. $C = F$. In the long run, the entrepreneur is free to vary F and select a plant of optimum size. The number of his alternative equals the number of different values which F may assume.

Once he has chosen a value for F , he is faced with the conventional short-run cost function i.e. $FC = f(q) + b$ (where b is fixed).

The entrepreneur's long-run total cost function gives the minimum costs of producing each output level if he is free to vary the size of the plant. This is

graphically represented as shown in figure 5.14 below.

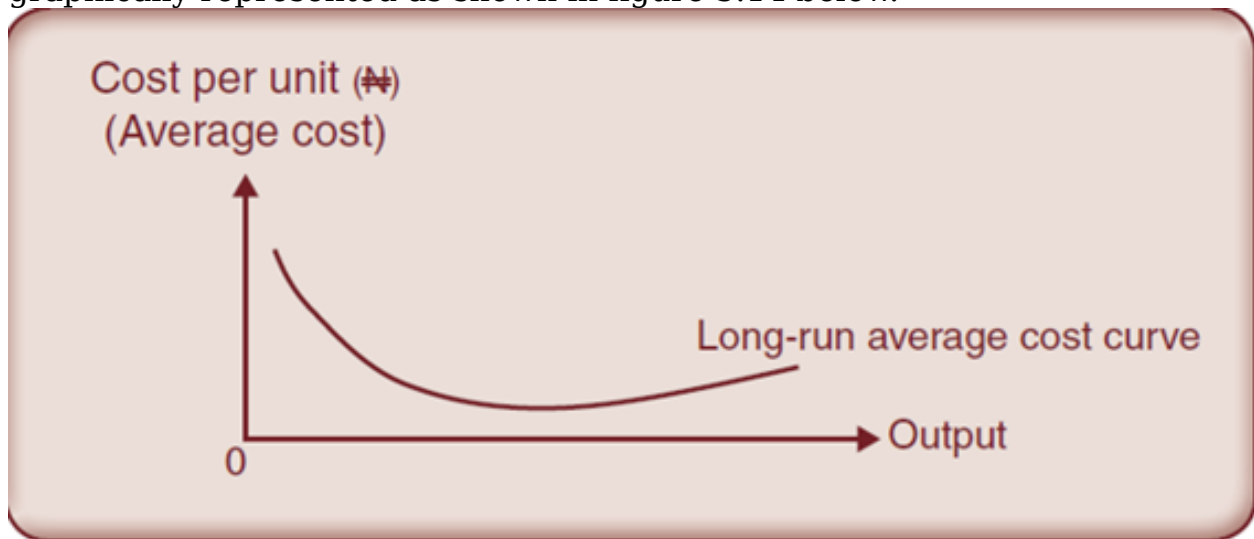


FIG. 5.14 Long-run average cost curve

For a given output level, the entrepreneur computes the total costs for each possible plant size and selects the plant size for which the total costs would be minimum.

The plant F_1 gives the minimum production cost for the output at R since the volume R is comparatively small, while plant sizes F_2 and F_3 have their optimum output at a far higher level. Therefore, the point 5 lies on the long-run total cost curve. The process is repeated for every output level. The long-run cost curve is the envelope of the short curves. It touches each other and intersects none. Since we know that the average cost equals the total cost divided by the quantity of output, the minimum average cost is attained in the same plant size as the minimum cost of producing the output level. The long-run average curve can be realized also by dividing the long-run total cost by output level or by constructing the envelope of the short-run cost curve.

Short Run and Long Run Average Cost Curves:

Short run Average Cost Curve

In the short run, the shape of the average total cost curve (ATC) is U-shaped and the short run average cost curve falls in the beginning.

It reaches a minimum and then begins to rise. The reasons for the fall of the average cost at the beginning of production are that the fixed factors of a firm remain the same and do not change but there are changes only in the variable factors such as raw material, labor, etc.

As much as the fixed cost gets distributed over the output when production is expanded, the average cost, therefore, starts to fall. When a firm totally utilizes its scale of operation (or otherwise called plant size), the average cost is then at its minimum. The firm is therefore said to be operating at its optimum capacity. If a firm in the short-run increases its level of output with the same fixed plant; the economies of that scale of production change into diseconomies and the average cost then begins to rise sharply.

Long Run Average Cost Curve

In the long run, all costs of a firm are variable, and the factors of production can be used in varying proportions to deal with an increased output. The firm has a time-period that is long enough to be able to build larger scale or a type of plant that will help to produce the anticipated output.

The shape of the long-run average cost curve is also U-shaped though it is flatter than the short-run curve as is illustrated in the figure 5.15 below:

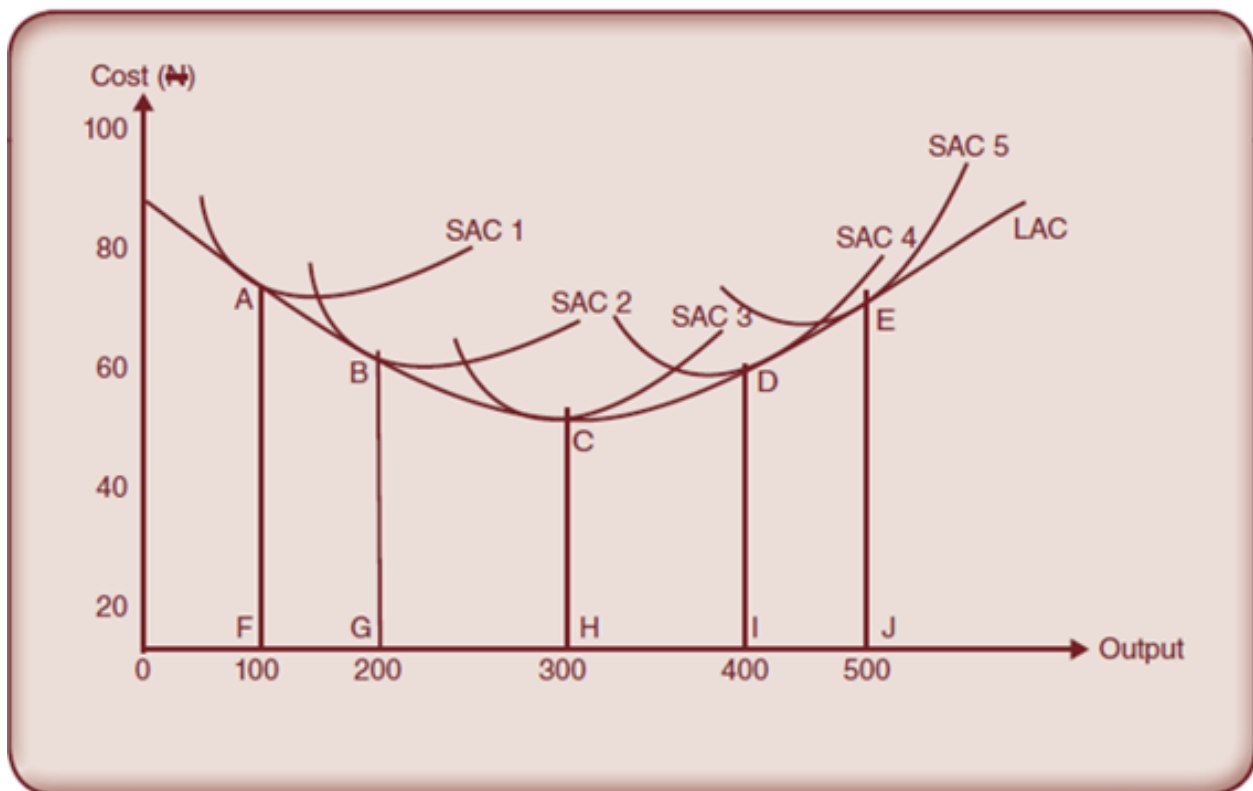


FIG. 5.15 Short run and Long run Average Cost Curves

In figure 5.15 above, there are five alternative scales of plant SAC1, SAC2, SAC3, SAC4 and, SAC5. In the long run, the firm will operate the scale of plant which is most profitable to it. If the anticipated rate of output is 100 units per unit of time, the firm will choose the smallest plant. It will build the scale of plant given by SAC1 and operate it at point A. This is because of the fact that at the output of 100 units, the cost per unit is lowest with the plant size 1 (SAC1) which is the smallest of all the five plants. In case, the volume of sales expands to 200 units, the size of the plant will be increased and the desired output will be attained by the scale of plant represented by SAC2 at point B. Further, if the anticipated output rate is 300 units, the firm will build the size of plant given by SAC3 and operate it at point C where the average cost is N58 and also the lowest. The optimum (best) output of the firm is obtained at point C on the medium size plant SAC3. If the anticipated output rate is 500 per unit of time, the firm would build the scale of plant given by SAC5 and operate it at point E. If we draw a tangent to each of the short run cost curves, we get the Long run Average Cost (LAC) curve which is U-shaped but is flatter than the short run cost curves. If mathematically expressed, the long-run average cost curve is the envelope of the SAC curves. In this figure 5.15, the long-run average cost curve of the firm is lowest at point C. CH is the minimum cost at which optimum output OH can be, obtained.

5.5 Concept of Revenue

Revenue in the sense of being total, consists of the receipts from sales. It is therefore the same as sales value i.e. revenue equal price times the quantity sold.

Total Revenue = N (Price \times Quantity)



FIG. 5.16 Average revenue in a competitive market

Hence, revenue may also be seen as the total sum of money which consumers would spend on a commodity. In Nigeria, revenue is always measured in Naira and kobo. Apart from the total revenue, there are also average and marginal revenues.

Average revenue (AR) is simply defined as the total revenue (TR) divided by the total sales (X)

That is,

$$\frac{\text{Total Revenue}}{\text{Total Sales}} = \frac{TR}{X}$$

Average Revenue (AR) =

In a free market economy, this will always equal the price. That is

$$AR = P = TR/X$$

Like the total revenue, average revenue is also measured in terms of naira but in per unit quantity. The average revenue curve in the competitive market will be a straight line parallel to the quantity of X-axis.

Marginal revenue (MR) is defined as the additional total revenue resulting from the sale of one extra unit of output.

$$MR_{N+1} = TR_{N+1} - TR_N$$

Where N is the number of units sold

$$\text{Or } MR_N = TR_N - TR_{N-1}$$

It is thus, the revenue which is received when another unit of the product is sold. If the price of a product remains unchanged even where the output is increased, the marginal revenue is said to be equal to price. Where the price falls as a result of increased output, then marginal revenue is equal to the new price minus the revenue lost as a result of a reduction in the price of the other unit output

$$\text{That is, } MR_N = TR_{N-1} - TR_N$$

If Adusco booksellers at Ado Ekiti can sell 100,000 copies of Evans Senior Secondary School Economics textbook at N70 a copy and 125,000 copies at N50 a copy then, find the marginal revenue.

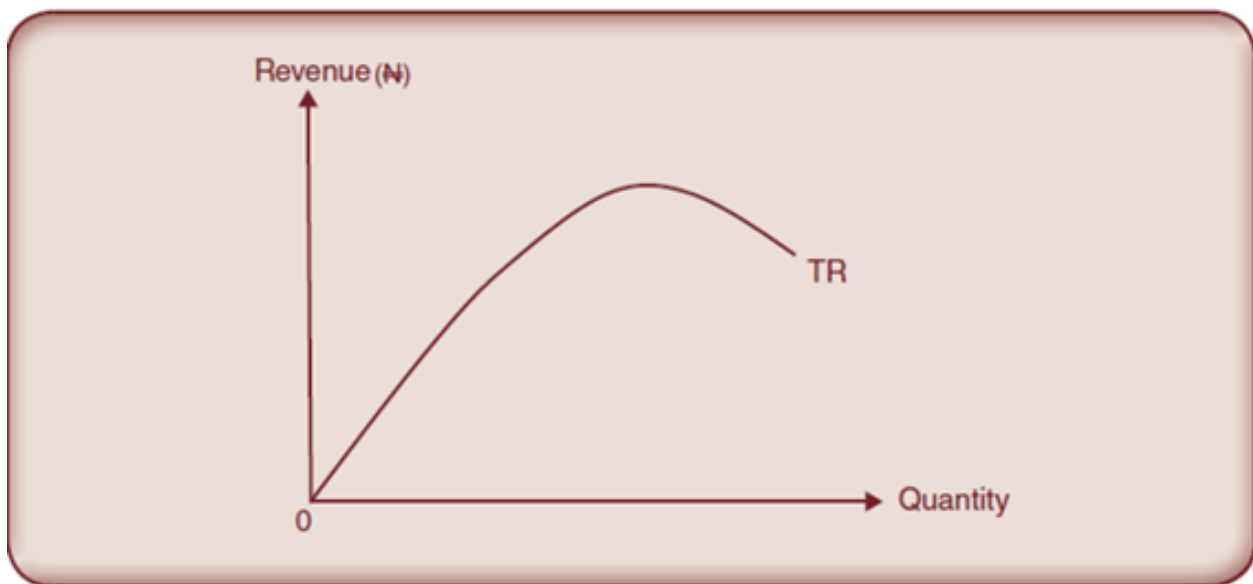
Solution:

$$MR = N50 \times 125,000 - N20 \times 100,000$$

$$= \text{New Revenue} - \text{Revenue lost}$$

$$= N6,250,000 - N2,000,000$$

$$= N4,250,000$$



The economic meaning of marginal revenue is that as long as the marginal revenue of a firm is equal to the extra cost of increasing output (Marginal Cost), it pays such a firm to produce more. We shall deal explicitly with this in Book Three.

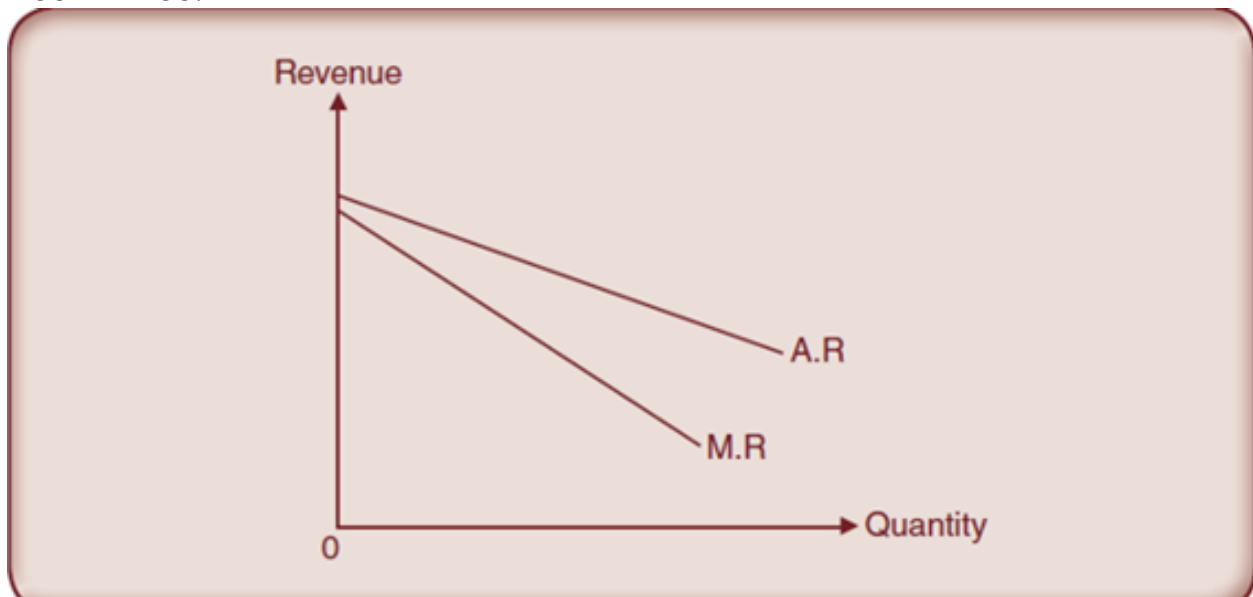


FIG. 5.18 Graphical representation of average and marginal revenues

Derivation of Average and Marginal Revenues

The average revenue is obtained by using simple arithmetic procedure like we have demonstrated on Table 5.2. Given the total revenue function as $TR = 16X - X^2$

The Average Revenue =

$$\frac{16X - X^2}{X} = \frac{X(16 - X)}{X} = 16 - X$$

There are two ways of arriving at the marginal revenue. The first way is the technique we demonstrated in column (IV) of Table 5.2. From the table, when $N = 4$, $TR = 48$; when $N = 5$, $TR = 50$ and we have defined MR_{N+1} as $TR_{N+1} - TR_N$.

Therefore, $MR = 50 - 48 = 2$

The other way is through elementary calculus. All we need to do here is that, given a total revenue function, we take its first derivation. This will give us marginal revenue. For example, given the total revenue as

$$TR = 16X - X^2$$

$$MR = 16 - 2X$$

This is because by definition, the marginal revenue is defined geometrically as the slope along the revenue curve itself.

TABLE 5.3 Total Revenue, Average Revenue and Marginal Revenue

Total Quantity (X)	Average Revenue AR or Price = $TR(X)$		Total Revenue $TR(X) \times AR$	Marginal Revenue $MR_{N+1} = TR_{N+1} - TR_N$	
0	0	$\frac{10}{0}$	$0 \times 0 = 0$	-	-
1	18	$\frac{18}{1}$	$1 \times 18 = 18$	18	$18 - 0$
2	16	$\frac{32}{2}$	$2 \times 16 = 32$	14	$32 - 18$
3	14	$\frac{42}{3}$	$3 \times 14 = 42$	10	$42 - 32$
4	12	$\frac{48}{4}$	$4 \times 12 = 48$	6	$48 - 42$
5	10	$\frac{50}{5}$	$5 \times 10 = 50$	2	$50 - 48$
6	8	$\frac{48}{6}$	$6 \times 8 = 48$	-2	$48 - 50$
7	6	$\frac{42}{7}$	$7 \times 6 = 42$	-6	$42 - 48$
8	4	$\frac{32}{8}$	$8 \times 4 = 32$	-10	$32 - 42$
9	2	$\frac{18}{9}$	$9 \times 2 = 18$	-14	$18 - 32$
10	0	$\frac{0}{10}$	$10 \times 0 = 0$	-18	$0 - 18$

Summary

This chapter has discussed:

- v The meaning of cost from the angle of an economist and of an accountant. The various basic cost concepts were also examined. It consists of total cost, fixed cost, variable cost etc
- v The various cost curves which include; Decreasing variable cost, Increasing variable cost, Total Cost, Average variable cost, Marginal cost, short-run cost, long-run cost, etc
- v The various concepts of revenue such as: total revenue, average and marginal revenues and their various graphs. Derivation of the average and marginal revenues were also examined

Class Activities

(a) The teacher should guide the students to draw up some hypothetical cost tables and calculate the: average total cost, average variable cost, average fixed cost and the marginal cost.

(b) Students should be encouraged to mathematically derived the marginal cost.

(c) Hypothetical revenue table should be derived by the students such that they will be able to calculate the marginal revenue and other revenues on the table.

(d) The teacher should ensure that the students can draw the different revenue curves by using the graph sheets.

(e) different revenue curves by using the graph sheets.

Revision Questions

Objective Questions

1. Marginal cost can be derived from:

(a) total product

- (b) total revenue
- (c) total cost
- (d) average fixed cost (**SSCE 2003**)

2. Revenue is the:

- (a) total profit made after sales
- (b) amount spent on purchases
- (c) amount of goods produced
- (d) total money realized from sales (**SSCE 2007**)

3. The relationship between Marginal Product(MP) and Average Product(AP) is such that they are equal when:

- (a) Average product is maximum
- (b) Average product is minimum
- (c) Marginal product is maximum
- (d) Marginal product is increasing (**SSCE 2009**)

4. What accounts for the 'U-shape' of the short-run average cost (AC) curve?

- (a) The law of variable proportions
- (b) Increasing returns to scale
- (c) Decreasing use of inputs
- (d) Changing output during the production period (**SSCE 2009**)

5. If TC, FC and VC represents total cost, fixed cost and variable cost respectively, which of the following is correct?

- (a) $TC = FC - VC$
- (b) $FC = TC + VC$
- (c) $TC > FC + VC$
- (d) $TC = FC + VC$ (**SSCE 2010**)

Essay Questions

1. Distinguish between the:

- (a) Fixed Cost and Variable Cost
- (b) Marginal Cost and Marginal Revenue
- (c) Total Cost and Total Revenue
- (d) Average Cost and Average Revenue (**SSCE 2001**)

2. (a) State the law of diminishing returns.

(b) What is: (i) marginal product (ii) average product.

(c) Explain any three factors that determine the size of the firms. (**SSCE 2007**)

3. (a) Define the term 'profit of a firm'.

(b) With appropriate formulae, explain the following revenue and cost concepts: (i) total revenue (TR) (ii) average revenue (AR) (iii) marginal revenue (MR) (iv) average fixed cost (AFC).

(c) Explain any three factors that determine the size of firms. (**SSCE 2008**)

4. (a) Distinguish between the following pairs of cost concepts:

- (i) Fixed Cost and Variable Cost
- (ii) Real Cost and Money Cost
- (iii) Implicit Cost and Explicit Cost

(b) (i) What would you recommend to a firm whose average cost is greater than its price?

(ii) Give a reason for your answer in (4)(i) above. (**SSCE 2009**)

Glossary

Revenue: It consists of the receipts from sales

Fixed Costs: These are costs that do not change even if the output varies.

Variable Costs: These are costs that normally change directly with output.

Total Cost: These costs are simply the addition of fixed and variable costs

Indirect Cost: These are expenses that cannot be easily associated in a convincing manner with a particular product. They are burden overhead

expenses including expenses on manufacturing

Marginal cost (MC): It is the amount added to the total costs when the output is increased by one unit

Average Total Cost (ATC): This is the total cost divided by the output

Average Variable Cost (AVC): This is total variable cost divided by the total output

Average Fixed Cost (AFC): It is the total fixed cost divided by the total output

Average revenue (AR): This is the total revenue (TR) divided by the total sales (X)

Marginal revenue (MR): It is the additional total revenue resulting from the sale of one extra unit of output.