[Academic Script]

Cost: Short run & Long run

Subject:	Business Economics
Course:	B.A., 1st Semester, Undergraduate
Paper No. & Title:	Paper – 101 Microeconomics - I
Unit No. & Title:	Unit – 4 Cost
Lecture No. & Title:	Lecture – 1 Cost: Short run & Long run

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1. Introduction

Cost is a sacrifice for gaining some reward. It is to be incurred in both short run as well as long run. Short run cost is incurred on purchase of labor, raw materials, fuel, etc. On the other hand long run cost are incurred during a period which is sufficiently long to allow the variation in all factors of production including land, capital equipment, managerial staff expenses, etc. to produce output. Cost can be reduced to some extent by using efficient machines, division of labor, and indivisibilities of economies of scale. Initially cost is very high, it then starts falling due to increasing returns, then reaches its optimum and then starts decreasing due to decreasing returns to scale. It can also remain same sometimes in long run or may slightly fall due to increase in plant size and thus associate variable factors, cost per unit falls rapidly due to economies of scale .In long run there are number of short run curves, all these curves are enveloped by a long run curve. The shape of long run curve is determined by returns to scale. Equilibrium of a firm can be achieved by calculating difference between total revenue and total cost. If the difference is positive firm earns profit and if negative then loss.

Technical efficiency versus Economic efficiency:

Which is more worthwhile, Economic efficiency or technical efficiency?

For this first of all we should understand the meaning of technical efficiency. By **Technical efficiency** we mean that, what is the

maximum possible amount of output a firm can obtain out of a given set of inputs.

Meaning, if the resources are not technically efficient, then there will definitely be wastage of resources. Though technical efficiency is highly important still economist are generally not much concerned with it. They are more concerned about the price of the resources.

Economic efficiency means thereby as the use of production process or combination of resource, which ensures minimum cost incurred in production of given level of output.

Thus engineers are more concerned in getting Maximum physical output from given inputs while, economists are concerned with maximizing the output value from given level of cost.

COST CONCEPT:

The concept of opportunity cost occupies a very important place in modern economic analysis. But, **what is opportunity cost:** Opportunity cost of any good is the next best alternative good that is sacrificed.

Accounting Cost vs Economic Cost:

Let us begin with the concept of cost in general.

When an entrepreneur undertakes any business or any act of production, he has to pay prices for the factors he employs for production. He thus pays wages to workers employed, prices for the raw materials, fuel and power used, rent for the building he

hires, interest on the money borrowed for doing business. All these are included as cost of production and termed as **accounting costs**.

Then, What is **Economic cost**?
Sometimes entrepreneur also invests certain amount of capital, or some assets like, land, building, vehicles from his own pocket in his business, which he could have invested elsewhere and could earn some amount of interest or dividend. Moreover he also devotes time, his managerial or entrepreneurial skills. All these investments together with accounting cost contribute economic cost.

Thus **economic cost** is sum of Accounting cost and implicit cost ie. Actual cost which can easily be accounted in terms of money, time and resources and the sacrifice for gaining something ie. hidden cost or opportunity cost.

Economic cost = Accounting Cost + Opportunity Cost

For example: Cost of studying in a college is its fees, expenses of books , notebooks etc. But a student is sacrificing for his salary, which he would have earned, if instead of studying he was doing a job. Here cost of paying college fees, expenses of buying books etc, together with the sacrifice of not doing any job is economic cost for that student**.**

Lets take a brief idea about cost function
Cost function:

The concept cost function refers to the mathematical relation between cost of a various products and the various determinants of cost.

Symbolically, we may state the function as:

C = f (O,S,T,U,P…)

Where, C = refers to cost

O = refers to level of output (both unit cost as well as total cost)

S = means size of the plant

T = refers to nature of technology

P = denotes the price of inputs used in production

2. Short run costs

Moving ahead, now we should know the concept of both short – run and Long run cost.

Short run costs are those costs, which are incurred by a firm during a period in which some factors especially, capital equipment, land, management staff are held constant. Short run cost are incurred on the purchase of labor, raw materials chemicals, fuel, etc. which varies with the changes in the level of output.

On the other hand **Long run cost** are incurred during a period which is sufficiently long to allow the variations in all factors of production including capital equipment, land, managerial staff to produce output.

Let us discuss different types of cost in brief.

Total Fixed Cost: Fixed cost is the cost, which is independent of output. It is the cost, which is incurred in hiring the fixed factors of production whose amount cannot be altered within a short period of time.

Total Variable Cost: Total variable cost varies with the change in output. TVC is that cost which are incurred on the employment of variable factors of production, whose amount can be altered in the short run.

Total Cost = Total Fixed Cost + Total Variable Cost

Average Fixed Cost: AFC is total fixed Cost divided by the number of units of output (Q) produced. i.e, AFC= TFC/Q

Average Variable Cost: AVC is total variable cost divided by number of units of output (Q) produced i.e, AVC=TVC/Q

Thus **Average Total Cost (ATC)**= TC/Q=(TFC+TVC) /Q

Marginal Cost (MC): Marginal cost is the addition made to the total cost by production of an additional unit of output.

Moving further lets discuss the **relationship between Average Cost and Marginal Cost** in three points:

(i) If MC < AVC, the AVC declines

(ii) If MC = AVC, the AVC is at its minimum

(iii) If MC > AVC, the AVC is rising.

Exactly the same relationship holds between MC and ATC.

Now let us understand the concept of **short run and long run curves** in detail.

Short run cost curves:

1. Short run total cost curves:

In this diagram **total fixed cost(TFC) curve** is parallel to x-axis. TFC starts from the point on Y-axis meaning thereby, that fixed cost will be incurred even if the output is zero. On the other hand variable cost curve rises upwards showing thereby, that an output increases, **total variable cost** also increases. This curve starts with the origin meaning that if the output is zero variable cost is also nil. The **total cost curve** is obtained by adding TFC and TVC vertically. Thus we can see that the distance between TVC and TC curve is constant throughout, because the vertical distance between TVC and TC curve represents the amount of TFC. Hence the shape of TC is exactly same as TVC, because the same vertical distance always separates both the curves.

2. Short run Average and marginal cost curves:

In short run **average fixed cost** curve slopes downwards throughout its length, but it does not touch X-axis. As output increases average fixed cost curve extends more and more towards right, and will keep on declining. And further increase in production leads it to approach zero, but will not touch any of the axis.

On the other hand **average variable cost** falls first and then thereafter increases. The AVC will generally fall due to increasing returns. But beyond the normal capacity output, AVC will rise steeply due to occurrence of diminishing returns. Thus AVC curve will first fall, then reaches its minimum and then rise again.

Average total cost is sum of both AVC and AFC. The behavior of average total cost depends upon the behavior of AVC and AFC. Therefore, in the beginning, when AFC curve and AVC curves falls, ATC curve also falls. Then as AVC curve begins rising, but AFC curve falls steeply, ATC curve also falls and thereafter, with increase in output, there is a sharp rise in AVC curve, hence ATC curve rises. ATC curve as AVC curve first falls, reaches its minimum and then again rises. Hence ATC curve is almost a 'U'-shaped curve.

3. Long run cost curves:

While, long run is period of time in which the firm can vary all of its inputs unlike short –run in which some inputs are fixed and others are varying, or in other words we can say that in short run firm is tied with only one firm, whereas in long run firm moves from one plant to another; it can acquire a big plant if it wants to expand its business or a small plant if it wants to reduce it. **The long run cost of production is the least possible cost of production of producing any given level of output when all inputs are variable.**

To better understand the concept of long run cost curve, let us take three short run cost curves i.e, SAC1, SAC2, SAC3. Or we can say these are plant curves. The firm will try to operate at that level of output, where the total cost is minimum. It is seen in the diagram that up to OB amount of output the firm will operate on the SAC1, though it could also produce with SAC2 because, up to OB amount of output production on SAC1 will result on lower cost than on SAC2 To minimize the cost firm will try to operate at optimum cost, which is SAC2 ie. the point

where SAC2 IS tangent to LAC curve. Similarly the firm will use SAC3 for output larger than OA2.It is thus clear that in the long run the firm has a choice in the employment of plant, and it will employ that plant, which yields minimum possible unit cost for producing a given output.

Why a long run cost curve is called envelope curve?

Suppose now firm has a choice so that a plant can be varied by infinite number of plants, corresponding to which there are numerous average cost curves. If a firm desires to produce a particular output in long run, it will pick a point on LAC corresponding to that output and will build a plant relevant to that point and operate on that short run average cost curve. .In such a case the long run average cost curve will be a smooth curve enveloping all these short run average cost curves. As it envelops all short run curves, LAC is called **envelope curve.**

Shape of LAC curve:

Let us discuss shape of Long run average cost curves with respect to both traditional and modern theories of cost.

Traditional Cost Theory:

Shape of LAC curve is U-shaped curve. This is so because of returns to scale. As the firm expands its production, returns to scale increase. After a range of constant returns to scale the returns to scale finally decrease. On the same line, the LAC curve first declines and then finally rises. Increasing returns to scale cause fall in average cost curve and decreasing returns to scale causes increase in long run average cost curve. thus the shape of the curve is U-shaped , i.e, initially it is falling due to increasing

returns to scale than it starts increasing due to further expansion in production, due to decreasing returns to scale.

Modern Cost Theory:

Recent empirical studies have indicated that diseconomies are not a necessary consequence of large-scale operations. The main reason for this is reserve capacity to cater to changing demand conditions. Consequence of reserve capacity is the L-shape of Long run average cost curves and saucer shape of short run average variable cost curves.

L-Shaped Long run average cost curve:

Let us discuss how? All costs are variable in long run. In Long run costs can be divided into production cost and managerial cost. The basic reason for the L-shape is that the production cost falls continuously with the increase in the output, while managerial cost rises at very large scales of output. The fall in production costs, more than offsets the increase in the managerial costs, so that the total long run average cost (LAC) continuously falls with increase in scale.

Thus long run average cost curve is L-shaped rather than U-shaped, because of the dual effect of both production cost and managerial cost.

At a very large scale of production, the managerial cost per unit of output may rise, but the technical or production economies more than offsets the managerial diseconomies, so that the total LAC does not rise or fall continuously. Thus the empirical

evidence indicates that LAC curve rapidly falls and will remain flat beyond a certain point, or it may even slope gently downwards.

Now the question is what do we mean by Economies and diseconomies of scale? Let us discuss.

4. Economies and Diseconomies of scale:

The reduction in the unit cost of production as the firm increases its capacity is called **Economies of scale** while, the increase in unit cost of production as the firm increases its capacity is called **Diseconomies of scale.**

U-shaped short run average cost curve is explained with the law of variable proportions. But Long run average cost curve is due to returns to scale. In the beginning due to increasing returns scale LAC curve falls, then beyond certain level due to decreasing returns to scale LAC curve rises.

Why it happens?

This is because of the reason that the firm enjoys increasing economies of scale in the beginning and with further production it suffers internal diseconomies of scale. Two main factors for economies of scale are technically more **efficient forms of factors** and **division of labor**.

Diseconomies of scale: As per Chamberlin and his followers, when the firm has reached a size large enough to allow the utilization of almost all the possibilities of division of labor and the employment of more efficient machinery, further increase in the size of the plant lead to high long run unit cost because of

the difficulties of management. As with expansion in scale of operation it will become difficult for the top management to coordinate with their staff, this will lead to reduce the overall efficiency of management. Thus LAC curve will lead to rise upwards. This movement is caused due to diseconomies of scale arising due to lack of proper management and coordination beyond a certain large scale of production.

Internal economies of scale accrue due to uses of greater degrees of division of labor and the specialized machinery at higher levels of output. These are called internal because they accrue to the firm when its own output or scale increases.

External economies and diseconomies accrues to a firm due to expansion in the output of whole industries, and which are independent of the output of individual firms. They are external in the sense that they accrues to the firm not because of its internal situation, but from outside it i.e, output of the industry. For example, with the expansion of the industry, certain specialized firms also come up for working up for the by-products, waste materials, for supplying raw materials etc.

5. Equilibrium of a firm

Equilibrium of a firm is the optimum point; below it or above it firm will either incur losses or will earn profit.

Total revenue and Total cost approach:

A firm is in equilibrium when it is maximizing its profits. It will keep on increasing its output if its profits are hereby increasing.

And finally it will fix its level of output at maximum profit. As profits are difference between total revenue and total cost.

Let us understand this with the help of a diagram. In this figure we can see that TR curve starts from the origin i.e, when no output is produced revenue is zero, while total revenue goes on increasing with increase in output. TC curve begins from the point F which is on the Y- axis, meaning thereby that even if the firm is not producing anything, it incur some cost ie, fixed cost.

We can see that initially when firm starts its production, TC curve is above TR curve. As production increases TC reaches TR curve and the firm is at breakeven. Now with further production TR curve overrides TC curve, thus we can see that **the difference between TR and TC is maximum here, which means, the profit is maximum**. After this if firm permits further production TR will start declining and will again reach TC, ie. it will be again at breakeven. Beyond this if there will be further production the firm has to incur loss.

Now the question is how to determine total profit of a firm? For this we will draw a total profit curve showing the difference between TR and TC, which indicates the difference between TC and TR. The level of curve at which profit curve is at its highest point is profit-maximizing point of output. As we can see initially TP curve is below x-axis, i.e, negative profit or loss. Then it increases and reaches its maximum point, then it again declining to negative. Now to measure exact point of profit maximizing, we have to draw tangents at different point of TR and TC curves, and

the point where these tangents coincides will be the desired point of profit.

This method of measuring profit-maximizing level of output by curves of total revenue and total cost is quite acceptable and is generally employed by businessmen.

There is a major shortcoming of the TC and TR approach of analyzing firm's equilibrium. It is that in this approach what price will be charged by the firm in its equilibrium position is not directly known. Therefore, in that case, modern MC, = MR approach to firm's equilibrium is preferred.

6. Short and Long run Supply Function:

Moving ahead let us discuss what is supply function?

Looking to the marginal cost curve, we can see that initially marginal cost is declining due to diminishing returns to scale and reaches its minimum, thereafter increases due to increasing returns to scale. The segment of marginal cost curve above average cost curve or after reaching its minimum is called supply curve of a firm.

Market period is divided into two different stages Short run and long run.

In very short run period supply is inelastic, i.e, it is invariable, even if all the variable factors are changed.

But in short period, supply can be increased only with change in variable factors, whereas, in Long run supply can be increased by changing all the factors, both variable and fixed.

If a firm maximizes its profit it does not mean that this profit is non-negative. And if it is incurring negative profit then the firm would be better of not to enter the industry. For taking such decisions concept of supply function is introduced. Short run supply function is firm's optimal quantity for given cost conditions in the factor market and firms technology.

Price of a commodity that will prevail in a market depends upon the time period under consideration. If all of a sudden demand increases in a market, the market price will also increase sharply. Since supply cannot increase within the market period, as firm can only sell the output already produced in the market.

In short run only some limited adjustments in supply will take place as a result of the firm moving along with their short run marginal cost curves by expanding output with the increase in the amount of variable factors.

In Long run the firms would expand its output by building new plants by increasing the size of capital equipment. As in the long run new firms will enter into the industry and will add to the supply of output. Hence the price in long run will be lower than the short run.

Taxes and Subsidies

Let us see how Taxes and Subsidies affect the shape of supply curve?

Taxes and subsidies can change the price of goods and services. A marginal **tax** on the sellers of a good will shift the supply curve to the left until the vertical distance between the two supply curves is equal to the per unit tax; other things remaining equal, this will increase the price paid by the consumers (which is equal to the new market price) and decrease the price received by the sellers. Marginal **subsidies** on production will shift the supply curve to the right until the vertical distance between the two supply curves is equal to the per unit subsidy; other things remaining equal, this will decrease price paid by the consumers (which is equal to the new market price) and increase the price received by the producers.