

Theories of Returns

Production Function:

It shows a mathematical relationship between input factors and the output. Production function may be of the short run or the long run.

A rational producer always looks for the least cost combinations. He evaluates different methods or theories in short run as well as in the long run to get that combination.

Theory of diminishing marginal return

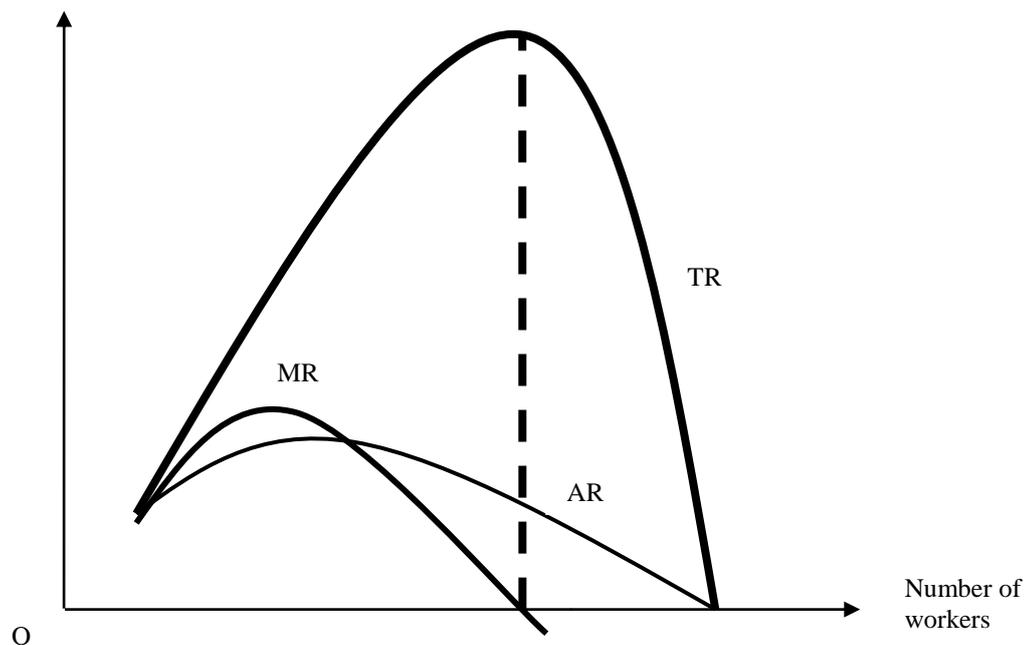
According to this theory, under the given circumstances as a firm adds successive units of variable factors to the fixed factor of production, marginal return increases and eventually diminishes.

Following assumptions should be considered to prove this theory.

- This is a theory of short run where there is minimum of one fixed cost.
- Labour and land are the factors which is used to produce given goods
- Land is the fixed factor, whereas labour is a variable factor of production
- All workers are homogenous
- State of technology is given.
- Price of the product remains the same.

Unit of workers	Total Product	Marginal Product	Average Product
0	0	-	-
1	2	2	2
2	5	3	2.5
3	9	4	3
4	13	4	3.25
5	16	3	3.2
6	18	2	3
7	19	1	2.7
8	19	0	2.4
9	18	-1	2

In the above table it is shown as there is an increase in number of labourers' marginal product increases and then diminishes.



As firm employee's worker 1, 2 and 3, marginal product increases, it is called increasing marginal return. By employing 4th worker marginal product remains the same; it is called constant marginal return. But afterwards marginal product starts decreasing; it is the stage of diminishing return.

Conclusions:

- (a) Marginal product always intersect Average product from its maximum point
- (b) When marginal product approaches to zero total product will be maximum
- (c) When average product approaches to zero total product will be zero too.
- (d) When marginal product is negative, total product starts falling.

A rational producer wants to produce maximum of goods with in the given resources. Therefore, whenever he employs an additional worker he makes the comparison between marginal product and the price of the factor. He will employ up to that extent where marginal product is equal to price of the factor.

That is, $MP=P$

Hence

$$\frac{MP}{p} = 1$$

He employs different factors at one time therefore, in all cases

$$\frac{MPa}{Pa} = 1, \frac{MPb}{Pb} = 1, \frac{MPc}{Pc} = 1$$

Hence,

$$\frac{MPa}{Pa} = \frac{MPb}{Pb} = \frac{MPc}{Pc} = \dots\dots\dots = \frac{MPn}{Pn}$$

It is called law of variable proportions. This states "ceteris paribus a rational producer employs factors up to that extent where ratio of marginal product and price is equal to the ratio of marginal product and price of the other product".

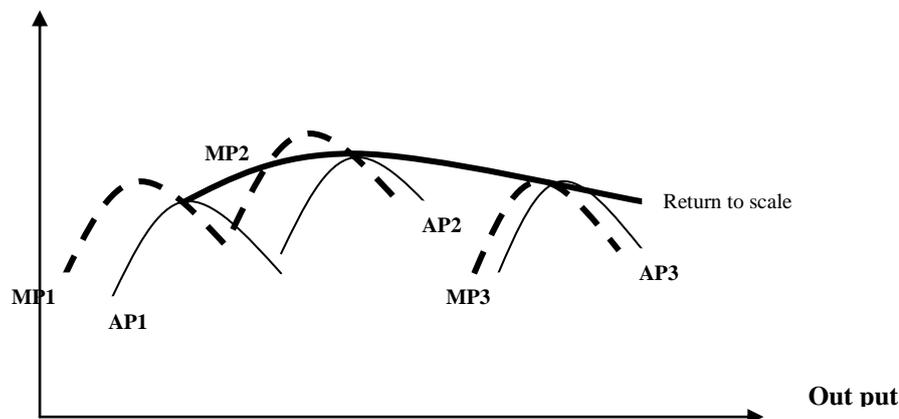
Note that the law of diminishing returns assumes that all units of labor are of equal quality. Each successive worker is presumed to have the same innate ability, motor coordination, education, training, and work experience. Marginal product ultimately diminishes, not because successive workers are less skilled or less energetic but because more workers are being used relative to the amount of plant and equipment available.

Limitations of the Theory

This is a theory of short run but firms usually take long run decisions,

Return to scale

It is a concept of the long run. In this case firm changes its size of production. For example, if firm changes its size of production and output is changed at greater proportion, it will be considered, increasing return to scale. If output changes at the same proportion, it is called as constant return to scale. However if output changes but at lesser proportion, it is called decreasing returns to scale.



Since a long run consist on many short runs, therefore a period of return to scale also consist on many periods of diminishing returns as is shown in the above fig.

Production and time period

Very Short run or momentary time period

In this time period a firm is unable to change its output because all input factors are fixed. In momentary time period supply is perfectly inelastic and is called as fixed elastic.

Short run

In the short run a firm may change its output by bringing changes in some of its variable factors of production. However, minimum of one of the factor remain fixed.

Long run

In the long run firm increases its output by changing its size of production. In this time period all factors of production are varied. Long run is nothing in itself; it is made up of many short runs.

Very long run

In very long run there are some technological changes. In this time period there is a change in pattern of production. For example, from manual work to mechanization or automation.

Fixed factors of production

These factors remain the same in a production process in the given period of time. For example, in the above case land is the fixed factor of production.

Variable factors of production

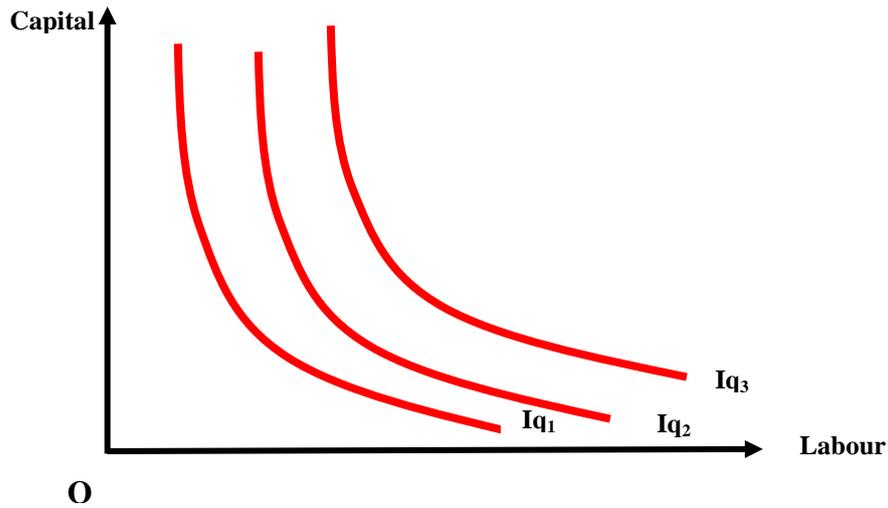
These factors vary in a production process usually in the same direction with the output over a period of time. For example, in the above illustration labour is an example of variable factor of production.

Iso Quant and Iso Cost Curves

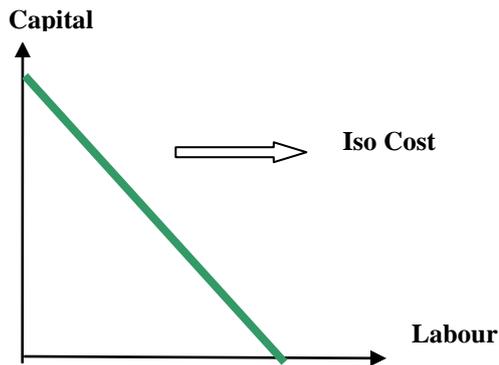
Iso quant curve shows certain level of output even by employing different combinations of given input factors. To draw iso quant curve, it is assumed that there are just two factors of production i.e., capital and labour, and these factors are producing the certain output, e.g., 100 units of the given commodity.

Iso quant map consist on many Iso quant curves, which shows different level of output. As it shifts outwards, it shows better level of production, and if it shifts leftwards, it shows relatively low level of output. Iso quant curves are negatively sloped as increase in one factor of production will decrease another factor, backwards bending due to marginal rate of technical substitution and non-intersecting because each iso quant curve shows certain level of output but as they intersect, level of output will be the same which is not possible.

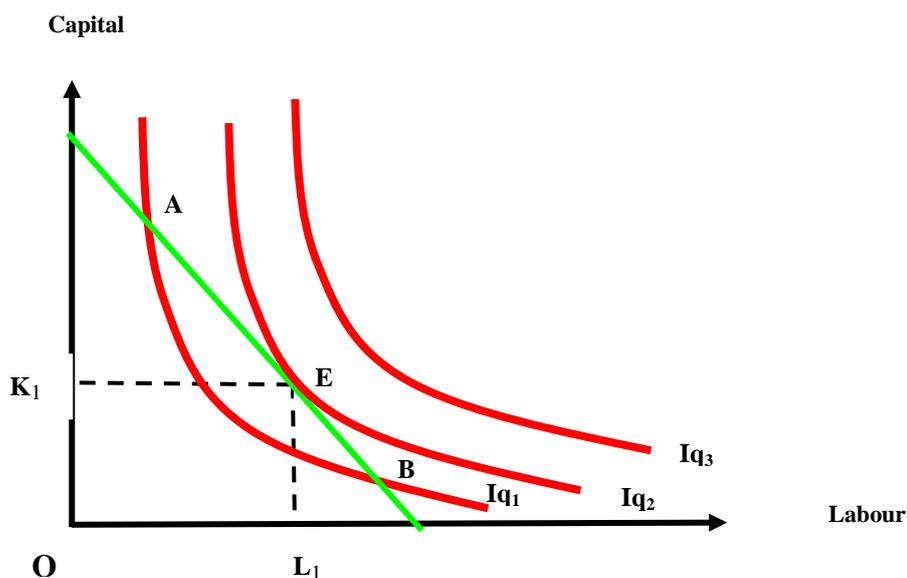
Marginal rate of substitution means the rate at which one factor has to be decreased in order to retain the same level of productivity if another factor is increased. The marginal rate of technical substitution shows the tradeoffs between factors, such as capital and labor, that a firm must make in order to keep output constant. The marginal rate of technical substitution diminishes means that lesser units of one factor has to forgo to employ an additional unit of another factor.



Iso cost curve shows, different combinations of given input factors which can be purchased by a firm under given conditions i.e., budget is given, input factors are given, no change in their prices and firm will have to spend all of its budget. Iso cost curve may be shifted if there is a change in the budget or prices of input factors. Iso cost curve may be shifted completely, or there is a pivotal or intersecting shift.



A firm gains least cost combination at that point where Iso cost curve making tangent to the Iso quant curve.



Short run Cost and cost curves

Short run Total cost

These are expenditures which incur by a firm to produce a given level of output. For instance, if a firm incurs expenditures of \$100 to produce 10 units, it will be considered as total cost of production.

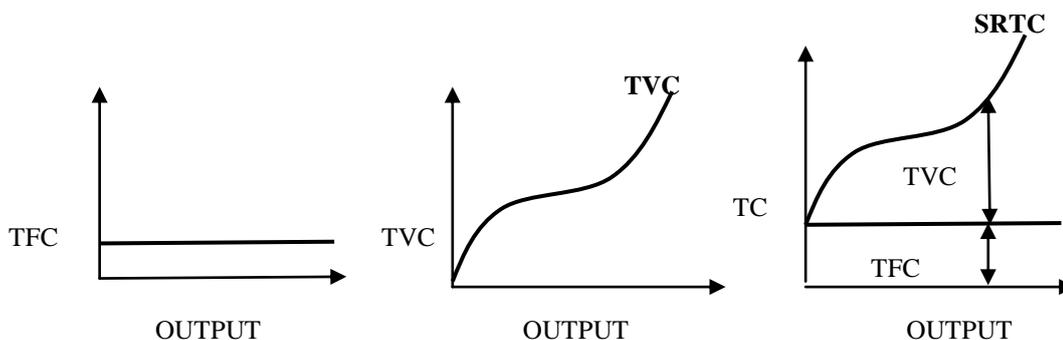
Short run Fixed cost

Fixed costs remain the same in a production process. Such costs do not vary with the output. This cost is incurred by a firm even at zero output. For example, rent, salaries of managers, insurance premium, depreciation etc.

Short run Variable cost

These costs vary with the output. These costs move in the same direction of output. At zero level of output, variable cost will be zero. Raw material, fuel charges are common examples of variable cost.

$$\text{Total cost (TC)} = \text{Total Fixed cost (TFC)} + \text{Total variable cost (TVC)}$$



The shape of the total variable cost is because of average variable cost which is theoretically of 'U' shaped. In the short run it is because of law of diminishing marginal return.

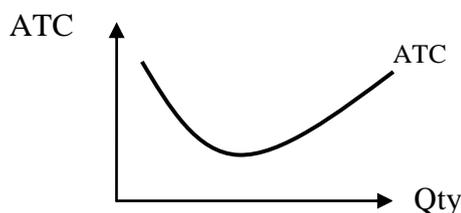
Average total cost

It is the per unit cost of production. It is calculated by dividing total cost of production by output.

$$ATC = \frac{\text{total cost}}{\text{total output}}$$

$$ATC = \frac{TC}{Q} = \frac{TFC}{Q} + \frac{TVC}{Q} = AFC + AVC$$

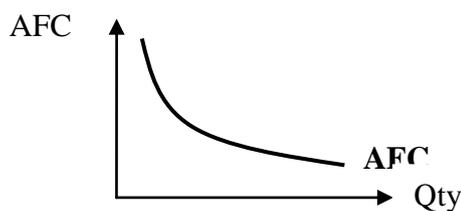
Average total cost is of 'U-shaped' because of diminishing marginal return. When average product increases, short run average cost falls, and, when average product falls, average cost rises. When average product is maximum at the certain level of output, average cost will be minimum.



Average fixed cost

It is the per unit fixed cost of production. It is calculated by dividing total fixed cost by output. Because the total fixed cost is, by definition, the same regardless of output, AFC must decline as output increases. As output rises, the total fixed cost is spread over a larger and larger output.

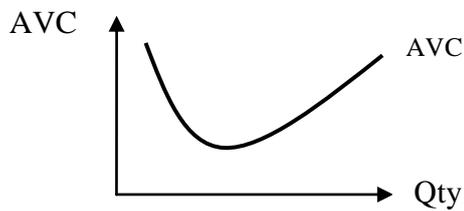
$$AFC = \frac{\text{total fixed cost}}{\text{total output}}$$



Average variable cost

It is per unit variable cost of production. It is calculated by dividing total variable cost by output. As added variable resources increase output, AVC declines initially, reaches a minimum, and then increases again. A graph of AVC is a U-shaped or saucer-shaped curve. Because total variable cost reflects the law of diminishing returns, so must AVC, which is derived from total variable cost. Because marginal returns increase initially, fewer and fewer additional variable resources are needed to produce given units of output. As a result, variable cost per unit declines. AVC hits the minimum and beyond that point AVC rises as diminishing returns require more and more variable resources to produce each additional unit of output.

$$AVC = \frac{\text{total variable cost}}{\text{total output}}$$

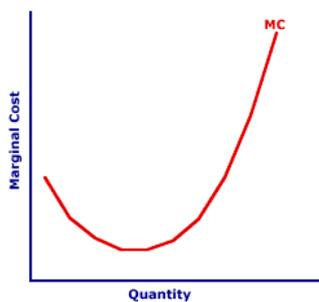


Marginal cost

It is the change in total cost due to production of the next or the last unit of a product. MC can be determined for each added unit of output by noting the change in total cost that unit's production entails.

Marginal costs are costs the firm can control directly and immediately. Specifically, MC designates all the cost incurred in producing the last unit of output. Thus, it also designates the cost that can be "saved" by not producing that last unit. Average cost figures do not provide this information.

$$\text{Marginal cost} = \frac{\text{change in total cost}}{\text{change in output}}$$



Relationship between Cost Curves.

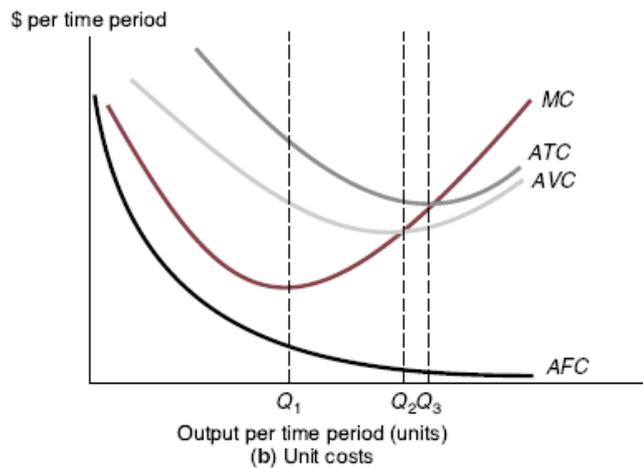
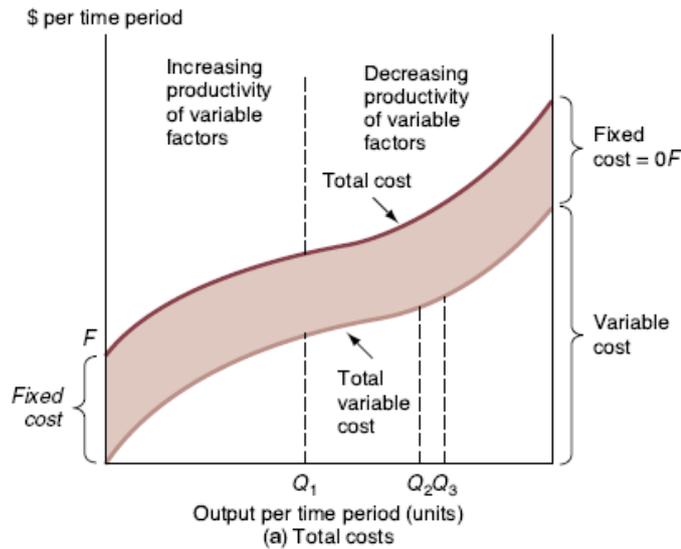
-The gap between TC and TVC is considered as TFC

-In the beginning ATC falls due to increasing return as well as the gradient of TC curve, as output increases firm faces decreasing return, as a result ATC rises and the gradient of TC function too.

-MC always intersects AVC and ATC from their lowest point from below.

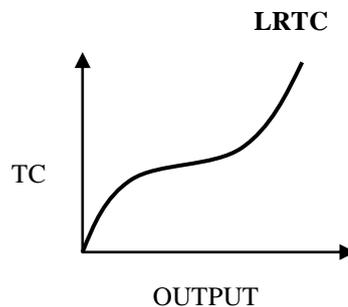
-At low output there is a wider gap between ATC and AVC, but as output increases, the gap is narrowed up. It is because a fall in AFC as output increases

-As output increases AFC falls but will never be zero.



Cost and Cost curves in the Long run

A long run is made up with many short runs. In the long run there is no fixed cost, i.e., all costs are varied. This is why long run total cost emerges from origin.

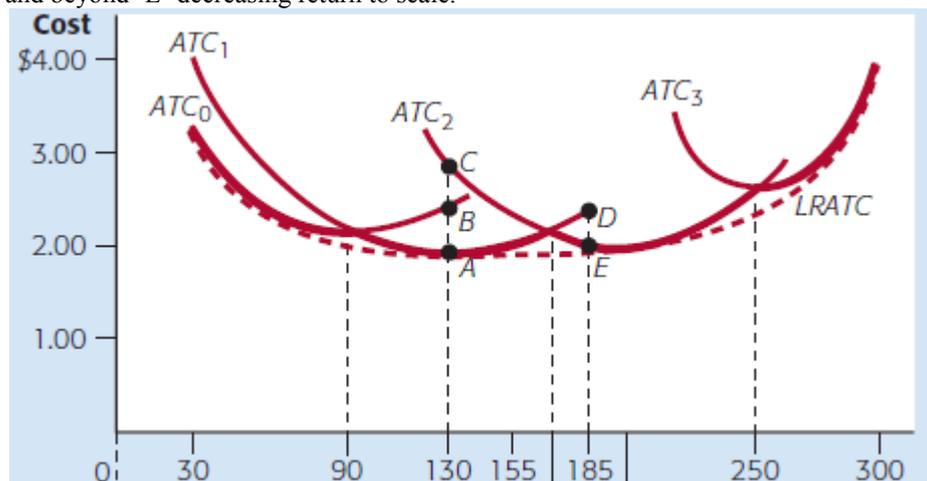


The shape of the LRTC is because of return to scale or because of long run average total cost.

Long Run Average Total Cost (LRATC)

Since long run is made up of with many short run, hence LRATC is also made up of with many SRATC. LRATC curve is also called as envelope curve, because it envelopes many of short run average total cost curves. Theoretically it is of 'U' shaped, because of return to scale. Firstly, firm

experiences increasing return to scale up to point 'A'. From 'A' to 'E' having constant return to scale and beyond 'E' decreasing return to scale.



Increasing return to scale shows that firm is gaining economies of large scale and decreasing return to scale shows diseconomies of large scale. The 'U' shaped LRATC makes tangent with only one SRATC curve from its lowest point.

However, in some cases LRATC curve may be of saucer shape, it means once firm achieves least cost combination i.e., lowest possible avg. Cost then can produce at that cost over a period of time.

LRATC play an important role to achieve main objective of firms i.e. profit maximization. For instance, in the diagram if the firm produces 130 units, it incurs average cost of about \$2.50 at 'B', but as it shifts to the next short run or the long run its cost reduces around \$2. It saves half of the \$ per unit of production, which will definitely contributes towards profit. LRATC curve also helps out to determine Minimum Efficient Scale of production. It is the lowest level of output at which a firm is able to produce at minimum average cost. This is the point where long run marginal cost curve intersect LRATC from its lowest possible point. It enables firm to extend range of constant return to scale and also determine to what extends a firm can produce.

Economies of scale

It is reduction in average cost due to increase in the size of the business. At this stage a firm experiences increasing return to scale. It is a concept of long run because there is a change in the size of business. A firm gains following economies due to its large size. Such economies are also called as 'internal economies'.

Financial economies relate with the sources of finance. Large firms have more sources of finance as compare to small firms. For instance, large firms borrow from banks at favourable terms and conditions, that is, at low rate of interest. Similarly they can raise funds by issuing shares and debentures at the time of need. This facility is not available to small firms.

Technical economies relate with the production. Large firms do apply division of labour and are able to derive advantages of the method. Large firms also prefer to employ skilled workers, who are more productive, as a result production increases ore then the cost. Large firms also prefer to use capital intensive method, due to mechanization and automation once again productivity rises and average cost falls.

Marketing economies relate with buying and selling. Large firms buy raw material in bulk and get better trade discount. They afford to hire services of specialist buyers, who know how to buy right good at right price from the right place. Large firms can advertise their product, which increases turnover. It leads to mass production which saves many costs. Large firms also appoint specialist sellers who search new markets for producer to sell at favourable terms and conditions.

Large firms appoint managers who are specialist in respective areas. Such as production manager, marketing manager, finance manager, etc, as they are specialist, they are more productive as a result output increases more than the cost of production, hence average cost falls.

Large firms are more risk bearing as compare to small firms. The ability of large firms to spread the cost of uncertainty of production over a large level of output and thereby reduce their unit cost is called as risk bearing economy.

For instance, large firms hold larger stocks and if there is a break down on supply side, they can continue their production process. Whereas small firms are unable to cope the situation. Similarly, large firms deal in different lines of products i.e. diversified, hence if there is a fall in demand for one product then they rely on other products.

Diseconomies of Scale

As firm increases its size of production beyond a certain level, its average cost starts rising, it is called as diseconomies of large scale. At this stage firm experiences decreasing return to scale.

-Labour diseconomies: In large firms usually division of labour is applied, where workers may become monotonous due to repetition of task as a result their productivity falls and average cost of production rises. Secondly there is a possibility of alienation which itself a demotivating factor, once again productivity falls.

-Managerial diseconomies: Right decision at right time is the key to success. However, as a business expands, there are possibilities of lack of communication and co-ordination between managers. Therefore, managers may not take right decisions at right time and as a result per unit cost of production rises.

-Increase in supervision cost: as a business expands, firms need to add new lines of managers and supervisors. Usually it increases cost of production at larger proportion as compare to output, once again per unit cost of production rises.

-Increase in prices of input factors (external diseconomy): As an industry expands, there is an increase in demand for input factors, which leads to increase in their prices and as a result there is an increase in average cost of production. For instance, as industry expands, there is an increase in demand for skilled worker which causes an increase in the labour cost as well as there is a shortage of skilled labour, therefore, firms need to employ semi-skilled worker, who have low productivity but they may have the same wage rate, once again average cost will rise. Similarly, there will be an increase in rental cost as well due to expansion of the industry.

Advantages of large scale firms

- Economies of large scale
- more profit
- more retained profit
- more sources to spend on research and development leads to better quality, low cost
- high rate of dividend, increase in creditability, easy to raise finance etc.
- in better position to compete in international market

Disadvantages of large scale firms

- diseconomies of large scale
- may exploit resources
- destruction of infrastructure
- Consumers 'exploitation-low output, high price, excessive profit
- negative externalities etc.

Revenue and Revenue Curves

Total revenue

The amount generated by a firm by selling certain units of the given product in a specified period of time.

Total Revenue = price × quantity

For example, if a firm sells 50 units of a product at the price of £5 each, the total revenue will be £250.

Average Revenue

It is the per unit revenue of the given quantity. Price and average revenue are the same.

$$\text{Average Revenue} = \frac{\text{total revenue}}{\text{total output}}$$

Or

$$\frac{\text{price} \times \text{quantity}}{\text{quantity}} = \text{price}$$

AR curve is considered as a price line or demand curve.

Marginal Revenue

It's the change in total revenue by selling an additional unit of the given product.

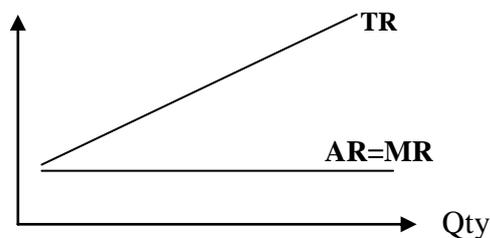
$$\text{MR} = \frac{\text{change in total revenue}}{\text{change in output}}$$

For example, if a firm generates \$50 by selling 10 units and \$54 by selling 11 units, then the marginal revenue of selling the 11th unit is \$4.

Revenue curves under perfect competition

In perfect competition, all firms are price takers, hence are unable to change prices and sell any quantity at the given price. This is why, AR and MR remain the same.

Units	Price	Total Revenue	Marginal Revenue	Average Revenue
0	\$5	-	-	-
1	\$5	\$5	\$5	\$5
2	\$5	\$10	\$5	\$5
3	\$5	\$15	\$5	\$5
4	\$5	\$20	\$5	\$5
5	\$5	\$25	\$5	\$5

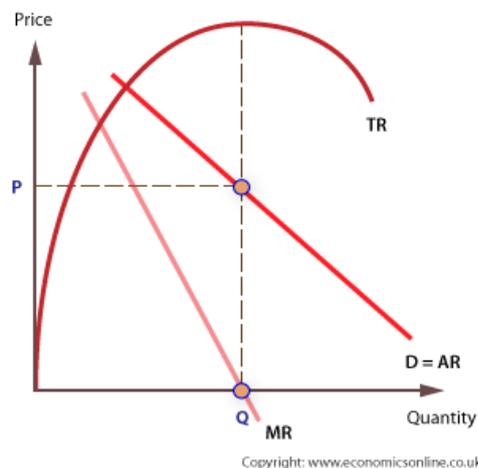


Revenue curves under imperfect competition

In imperfect competition, firms are price makers, therefore to sell more quantity they have to reduce their prices. This is why the demand curve (AR) is negatively sloped and marginal

revenue (MR) curve lies beneath the demand curve. In fact change in MR is always double than the change in AR, hence, MR's x-intercept is half of the x-intercept of AR curve. Imperfect competition includes monopolies, oligopolies, monopolistic competition etc.

Qty (units)	Price (\$)	TR (\$)	MR (\$)	AR (\$)
0	10	0	-	-
1	9	9	9	9
2	8	16	7	8
3	7	21	5	7
4	6	24	3	6
5	5	25	1	5
6	4	24	-1	4
7	3	21	-3	3
8	2	16	-5	2
9	1	9	-7	1



Relationship between AR, MR and TR curves

- MR curve lies beneath the AR curve
- Change in MR is always double as compare to change in AR
- If MR is '+ive', TR will rise
- If MR=0, TR will be maximum
- If MR is '-ive', TR will fall
- If MR is '+ive', then demand will be elastic during that level of output
- Demand will be unitary elastic as MR approaches to zero and at that point TR will be maximum and also that will be the midpoint of the demand curve (AR).
- If MR is '-ive', demand will be price inelastic.

Profit

It is the difference between total revenue and total cost. It is positive if total revenue exceeds total cost and negative if total cost exceeds total revenue. A firm considers loss under this condition. If total revenue is equal to the total cost at the given level of output, it is called as break-even point for the firm, i.e., no profit, no loss.

$$\text{Profit} = \text{TR} - \text{TC}$$

As output changes profit may be changed, for instance, as output increases total revenue will be increased as well as total cost. If increase in total revenue is more than the increase in total cost, firm's profit will be increased and, if, total cost exceeds or then the total revenue, firm incurs loss. Similarly, as a firm reduces its output, total revenue and total cost fall. If total revenue falls more than the total cost, firm incurs the loss. However, if total cost falls more than the total revenue, profit will be increased. As output changes, there may be no change in fixed cost. It also affects the size of the profit. To increase revenue, a firm should consider price elasticity of demand for its product. For instance if demand is elastic then by decreasing price more revenue can be generated but if demand is price inelastic then firm increases price to raise more revenue.

Firms may increase revenue or to reduce average cost through inventions and innovations. As a new product is introduced effectively through promotion will generate revenue for the firm. Similarly, better techniques of production will reduce average cost but also quality of products.

Another way to raise revenue is diversification. It is opposite to specialization where a firm increases lines of products and/or increases branches or number of departments. It helps the firm to spread the risk as well as increase in revenue.

Another option which a firm has is competition or collusion. Competition may be on price basis or a non price competition. Mostly firms reduce prices to increase revenue provided that their demand is elastic, but in certain cases firms increase prices and create quality consciousness and increase revenue. It is called as price skimming. In case of non price competition a firm advertises or uses promotion to increase its revenue.

In collusion, firms avoid competition to save advertising and promotion costs. On the other hand they collectively determine the price which maximizes industry's profit, it may rise profit of the most of the firms.

In the short run, since fixed cost remains the same hence as output increases, average fixed cost will fall, however, if firm should make policies to reduce average variable cost like increase productivity of workers or use better techniques of production.

A firm can reduce its average cost of production by increasing its size of production i.e. economies of large scale. For instance, technical economies, financial economies, marketing economies, managerial economies, risk bearing economies etc. may help out a firm to reduce its average cost of production.

Accountant profit vs Economist profit

According to accountant profit only explicit costs are included, like labour cost, rental cost, capital cost etc. whereas in case of economist profit implicit costs are also considered. An example of an implicit cost is the opportunity cost of a sole proprietor working in her own business. If she works somewhere else, she can earn certain income which is forgone now. Therefore, to calculate economist profit that income must be deducted from the accountant's profit.

$$\text{Accountant's profit} = \text{Total Revenue} - \text{Total Cost}$$

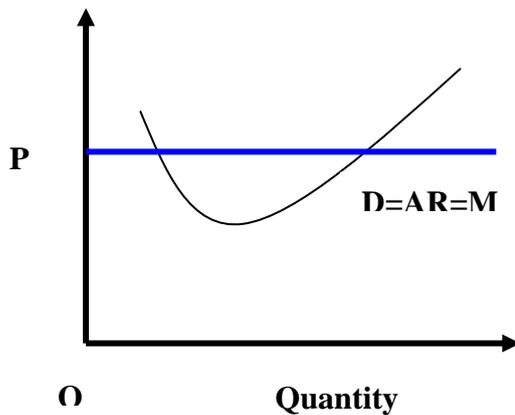
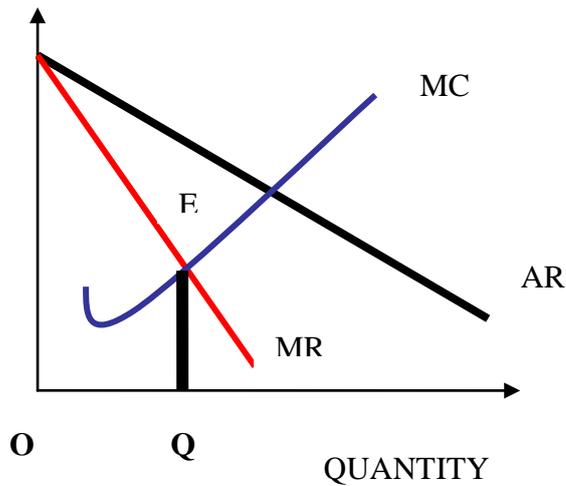
$$\text{Economist's profit} = \text{Accountant's profit} - \text{opportunity cost}$$

Objectives of a firm

Profit maximization

Traditionally it is the main objective of a firm. According to this a firm prefers to produce at that point where it can make maximum of profit. To gain that level of production a firm may follow to different rules i.e. total revenue, total cost rule and marginal cost marginal revenue rule. According to the total revenue and total cost method a firm produces to that extent where there is a maximum difference between total revenue and total cost.

According to marginal cost and marginal revenue rule, a firm produces to that extent where marginal revenue and marginal cost are equal. Before the equilibrium output MR is more than the MC and a firm which wants to maximize its profit wants to earn every profit on each and every unit. It wants to earn maximum profit on the whole.



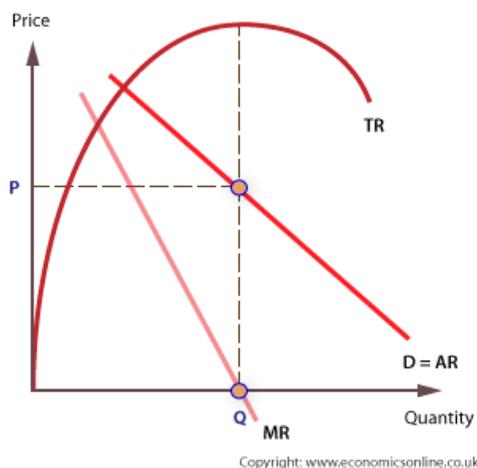
However, in practice it is not possible for a firm to make maximum of the profit in the long run due to following reasons.

Firstly, firms do not make maximum profit because it may attract new firms, hence competition will be increased. Secondly, firms are reluctant to make maximum profit to avoid government watch dogs. Thirdly, it may damage the relationship between stakeholders, such as consumers and workers. Fourthly, it may be possible to the certain scale of production, but it is difficult to calculate MR and MC in mass production. Usually firms work out on their average cost and add on a profit margin to determine the selling price. In some cases management may have some other objectives. It is also not possible, where goods are not divisible by nature. Profit maximization is also not possible in service sector.

Managerial and Behavioural Theories

Sales Revenue Maximization

A firm can maximize its sales revenue by producing up to that extent where MR approaches to zero. A firm is prepared to charge low prices when it wants to increase its market share. This is a price penetration policy. A firm can make abnormal profit if TR is more than TC at the given output. This policy is also chosen when management salaries are linked with the sales. The solution of this conflict of interest is to offer management some shares as a bonus or link their salaries to profit. This policy is also formed by the state when industry experiences growth and a firm want to increase its market share.



Sales Maximization

This policy maximizes sales instead of sales revenue maximization. Theoretically it is possible when a firm produces to that extent where average revenue approaches to zero. In practice a firm may produce up to the breakeven point, where total revenue is equal to the total cost. A higher output implies loss making behaviour. It is possible when a firm may subsidize its loss by using the profit of some other firms. It could be positive in state-owned business organization which has some social objectives. Another possibility may be a firm wants to clear its existing stock at the end of a season or due to an exit from the market, so, to make any recovery.

Satisficing Profit.

According to this policy a firm is determined to make reasonable profit, sufficient to keep on its activities or to satisfy its share holders. It may want to keep all stakeholders happy. It may spend more on wages or on the improvement of working conditions, which increases cost of production. It may charge low prices to keep its customers happy. This profit may be anywhere between normal profit and positive economic profit.

Survival

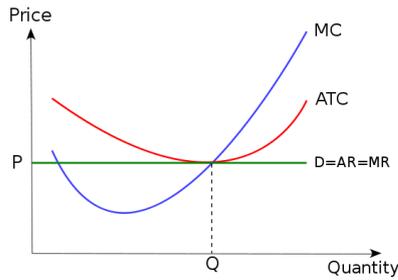
Mainly it will be the objective of a firm when there is question mark on its existence and the firm finds it difficult to survive. Usually it happens at the early stage of the firm, when existing firms make it difficult to penetrate. Secondly, when trading becomes difficult due to fall in demand for the product or due to bad debts or losing confidence of customer. Thirdly, when there is downturn of the economy and presences of recessionary pressure make it difficult for the firm to survive. Under such condition(s) primary objective is the survival.

Conclusion: The ultimate objective of all business organization is profit maximization. All other objective are formed for the short run by forgoing objective of profit maximization.

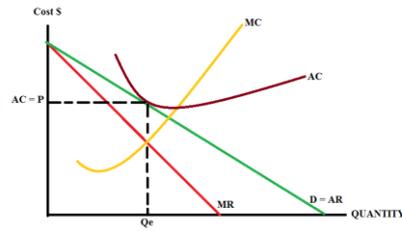
Types of profit

Normal profit

It is the minimum profit which is required to a firm to keep its existence in the long run. At equilibrium output i.e. (where marginal revenue is equal to marginal cost), average revenue is equal to the average cost. At this level of profit 'economic profit' is zero.



Perfect competition

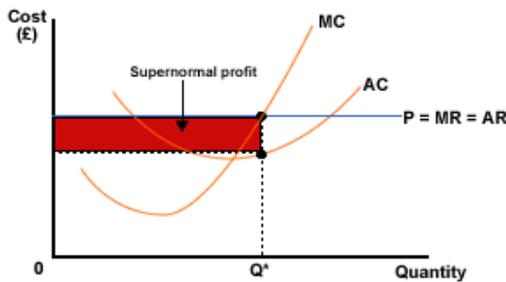


Imperfect competition

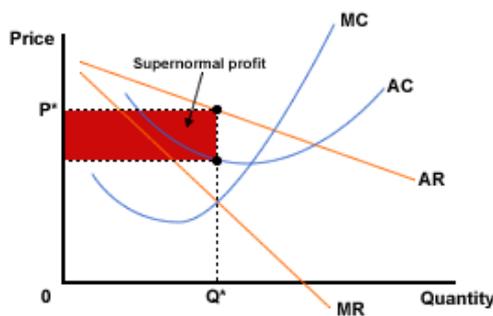
This will be the break- even point for the firm because at this level of output total revenue is equal to the total cost. Usually it is thought that there is no profit for the entrepreneur but actually it takes profit as a reward of a factor of production which is measured as explicit cost.

Abnormal Profit

It is the any profit which in excess of the normal profit. At equilibrium output average revenue exceed average total cost. At this point a firm makes positive economic profit.



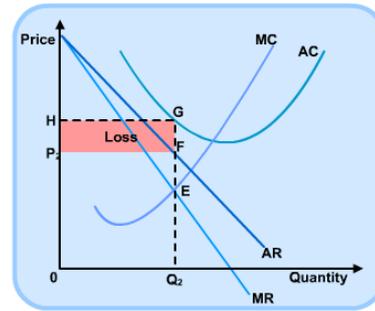
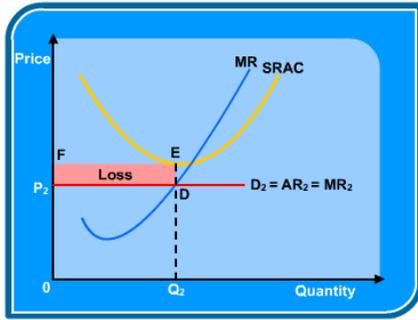
Perfect competition



Imperfect competition

Loss/ Subnormal profit with contribution

A firm incurs loss if at the equilibrium output its average total cost exceeds its average revenue. At this point economic profit of the firm will be negative. However, it will continue its production unless it meets to its average variable cost. As is shown in the following figures, where average total cost is passing above the average revenue curve and shaded area show the amount of loss at output OQ.



Loss/ subnormal profit without contribution- the shut down point

Price at the shutdown point is the minimum price which is acceptable for a firm to continue its production in the short run but if average revenue is below than the average cost of production, the firm stops production and exit from the market.

