Module 6

Market structure – Perfect Competition - Partial Equilibrium

Technical terms:

Firm : A unit of production which engage in production activity with the goal of maximising its profits.

Industry : An industry is a group of firms producing homogenous products in a market.

Short-run : In the short run quantity of at least one input is fixed and the quantity of other input can be varied.

Long-run **:** In the long run, for a firm, all costs are adjustable.

Perfect Competition

According to Koutsoyiannis

"Perfect competition is a market structure characterised *by a complete absence of rivalry among the individual firms".*

Characteristics:

1- There are a large number of producers and consumers competing each other.
   - No single buyer/seller can influence the price and output of the industry as a whole.
   - Sellers are considered price takers.
2- Freedom to entry and exit.
   - The firms are in a position to freely enter into or exit from the market.
   - When industry makes profits → firms enter into the market.
   - When industry makes loss → firms exist from the market.
3- Homogenous product.
   - The commodities produced by different producers are homogeneous in nature, meaning that the commodities supplied under perfect competition are perfect substitutes.
   - Eg: Salt, wheat etc.
4- Absence of artificial restrictions.
   - There is complete freedom for the purchase and sale of products.
   - There is no discrimination on the part of buyers and sellers.
   - There is no control over market.
5- Profit maximisation goal among firms/producers.
6- Perfect mobility of goods and factors.
   - Goods are free to move to a place where it fetch the highest price.
7- Perfect knowledge of market conditions.
   - The consumers and producers have full knowledge about the price of the commodity.

8- Absence of transport costs.

Conditions of equilibrium of the firm and industry

A firm is in equilibrium when it has no tendency to change its level of output (in other words, it does not want to expansion or contraction). The firms want to earn its maximum profit by equating its marginal costs and marginal revenue (i.e., MC = MR). Diagrammatically, the conditions of the equilibrium firm are: 1) the MC curve must equal the MR curve. This is the first order or necessary condition. 2) The MC curve must cut the MR curve from below and after the point of equilibrium it must be above MR curve. This is the second order condition.

An industry will be in equilibrium when 1) there is tendency among firm to enter in to or exit from the market, and ii) when each firm is also in equilibrium. An industry will be in equilibrium when the following are satisfied.

AC = AR [first condition]

MC = MR [second condition]

AR = MR

MC = AC = AR

Sort-run equilibrium of the firm and industry

Short-run equilibrium of firm:

Assumptions:

1- All firms use homogeneous factors of production.
2- Firms are of different efficiency.
3- Cost curves of the firm vary from each other.
4- All firms sell their products at the same price determined by demand and supply of the industry. Price (P) will be equal to AR and MR.
5- Firms sell and produce different quantities.

There are two approaches to study short-run equilibrium of the firm under perfect competition. I) Marginal Cost-Marginal Revenue analysis, ii) Total cost and total revenue analysis.

I- Marginal Cost-Marginal Revenue Analysis

- In the short-run the firm will produce only when the price equals Average Variable Costs (AVC) or above AVC. That is the firm should earn minimum revenue equal to AVC.

- If the price is above Average Total Costs (SAC or ATC) → Supernormal (abnormal) profits. That is the firm earns more Average Revenue (AR) compared to Short-run Average Costs (SAC). P=AR>SAC. (Figure, Panel A).

    - Here the firm earn revenue equal to the area P_AE_ACD. (i.e., Price (OP_A) * Quantity (OQ_A)
    - Similarly, the cost of the firm is equal to the area COQ_AD (i.e., Cost (OC) * quantity (OQ_A)

- If the price is equal to ATC, the firm will earn only normal profits (or zero). i.e., P=AR=SAC. This condition is known as "Break-even" point. (Figure, Panel B).

- If price is below AVC, the firm will shut-down, because, the firm is unable to cover its costs. (Figure, Panel C)

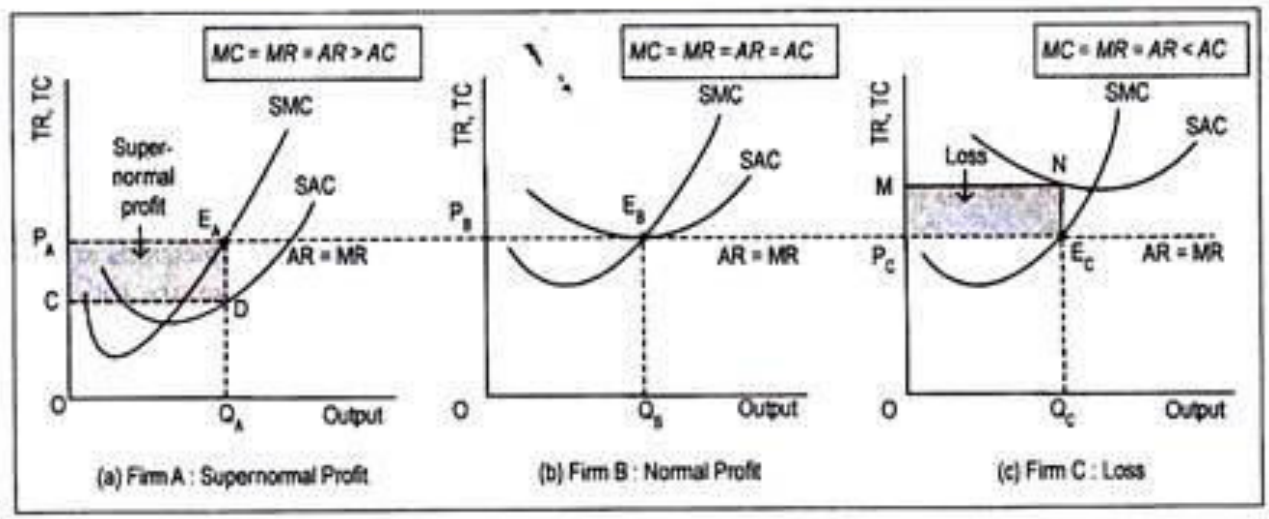


Fig. 4.3: Short Run Equilibrium of Firm

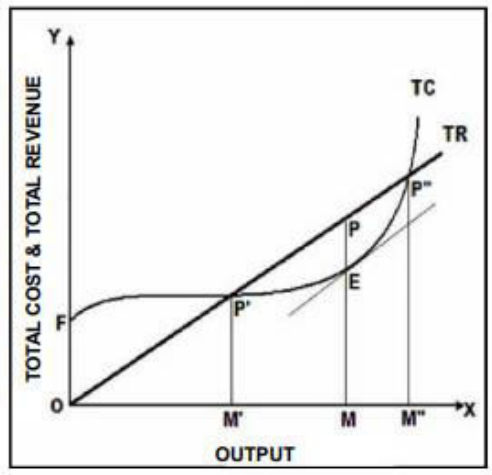
Source: https://www.economicsdiscussion.net/wp-content/uploads/2016/01/clip_image002-31.jpg

Equilibrium under perfectly competitive market:

II- Total Cost and Toral Revenue Analysis

According to this approach, a firm maximises its profit when the firm earns Total Revenue (TR) higher than Total Cost (TC).

- In the following figure, TR curve is a strait line with a positive slope, indicating that the TR will be zero when the firm produce zero output and it increases when the firm sells more.
- When the firm produces at OM^1 level of output, TR and TC are equal (i.e., M^1P^1). (Break-even point).
- Similarly, When the firm produces at OM^{11} level of output, TR and TC are equal (i.e., $M^{11}P^{11}$). i.e., no profit.
- When the firm produces any quantity between OM^1 and OM^{11}, the firm earns profit since TR > TC.
- It is important to note that, the maximum profit is possible when the firm produces OM level of output, where the difference between TR and TC is maximum.



<u>Short-run equilibrium of industry:</u>

In the short run, an industry will be in equilibrium when all firms are in equilibrium and they earn normal profits only. That is, SMC = MR = AR = SAC.

But, in the short run, some firms may earn profit (Panel B in the figure) and some firms may incur loss (Panel C in the figure). Therefore, in an industry, equilibrium is achieved when the total quantity demanded and total quantity supplied are equal at a price which is the market clearing condition.

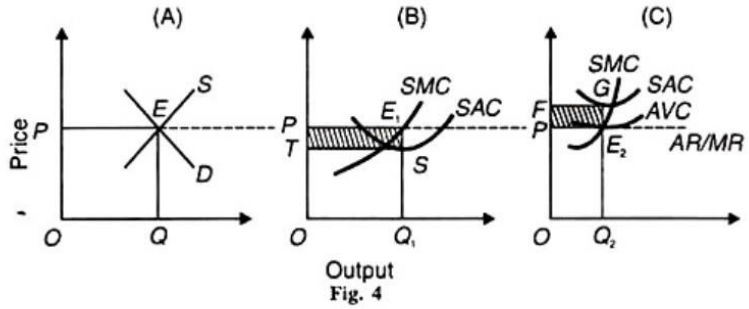


Fig. 4

Source: Micro Economic Theory, ML Jhingan, 7th Edition (2010).

Long run equilibrium of the firm and industry

Long run equilibrium of the firm

In the long run, the firms can change their plant and scale of operations. That is all factor inputs are variable. Therefore, in the long-run there will be no fixed costs all are variable costs. In the long run a firm will be in equilibrium when it does not want to change its equilibrium output. The firm will be earning normal profit only. If at all, any firm(s) earning super profits, new firms will enter in to the market will all firms in the industry earn normal profits.

- In the long run, firms are in equilibrium when they have adjusted their plant so as to produce at the minimum point of their long run AC curve, which is tangent to the demand (AR) curve defined by market price.

Assumptions:

1- Firms are free to enter in to or exit from the market.
2- All firms have equal efficiency.
3- All factors are homogenous. Therefore, all factors can be obtained at uniform prices.
4- Cost curves of firms are uniform.
5- The plants of firms are equal, having given technology.
6- All firms have perfect knowledge about price and output.

Conditions for equilibrium:

1- At equilibrium, i) a firm's short-run marginal cost (SMC) must equal to its long-run marginal cost (LMC) as well as ii) its short-run average cost (SAC) and its long-run average cost (LAC) and iii) both should equal MR=AR=P.

That is, SMC = LMC = MR = AR = P = SAC = LAC at its minimum point.

2- LMC curve must cut MR curve from below

Both these conditions of equilibrium are satisfied at point E in the following where SMC and LMC curves cut from below SAC and LAC curves at their minimum point E and SMC and LMC curves cut AR = MR curve from below. All curves meet at this point E and the firm produces OQ optimum output and sells it at OP price.

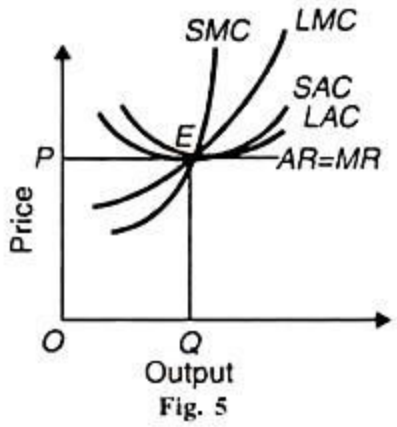


Fig. 5

Source: Micro Economic Theory, ML Jhingan, 7th Edition (2010).

Long run equilibrium of the industry

The industry is in equilibrium in the long-run when all firms earn normal profits. There is no incentive for firms to leave the industry or for new firms to enter it. With all factors homogeneous and given their prices and the same technology, each firm and industry as a whole are in full equilibrium where LMC = MR = AR (=P) = LAC at its minimum.

Such an equilibrium position is attained when the long-run price for the industry is determined by the equality of total demand and supply of the industry.

The long-run equilibrium of the industry is illustrated in the following Figure where the long-run price OP is determined by the intersection of the demand curve D and the supply curve S at point E and the industry is producing OM output. At this price OP, the firms are in equilibrium at point A in Panel (B) at OQ level of output where LMC = SMC = MR =P (= AR) = SAC = LAC at its minimum.

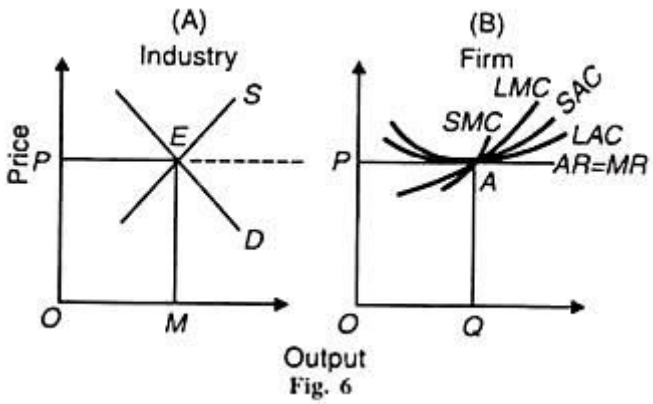


Fig. 6

Source: Micro Economic Theory, ML Jhingan, 7th Edition (2010).

Module 6 Market Structure

Monopoly

Mono' means one and 'poly' means seller. Monopoly refers to a market situation in which there is only one seller of a particular product. The firm itself is the industry and the firm's product has no close substitute. The monopolist is not bothered about the reaction of rival firms since it has no rival. So the demand curve of the monopoly firm is the same as the industry demand curve.

Three features characterise monopoly — market in which there is only one supplier. First, the firm is in its in motivated by profits. Secondly, it stands alone and barriers prevent new firms from entering the industry; and thirdly, the actions of the monopolist itself affect the market price of its output—it is not a price-taker.

Can there be complete monopoly in the real commercial world? Some economists feel that by maintaining some barriers to entry a firm can act as the single seller of a product in a particular industry. Others feel that all products compete for the limited budget of the consumer. Therefore, no firm, even if it is the only seller of a particular product, is free from competition from the sellers of other products. Thus complete monopoly does not exist in reality.

Features if monopoly market:

1- A single producer or seller.
2- Absence of close substitutes.
3- Monopolist firm can control the supply of commodities.
4- A monopolist firm is a price maker.
5- Entry of new firms is restricted.
6- The monopolist need not to advertise products.
7- The equilibrium of the firm and industry will be the same.
8- Monopolist is rational and therefore aims profit maximisation.

Short-run Monopoly Equilibrium

We study the short-run Monopoly equilibrium using marginal revenue and marginal cost approach. A monopolist form will produce only when the price is at least equal to AVC. If price is less than AVC, the monopolist will incur loss. A monopolist will be in equilibrium when two conditions are fulfilled i.e., i) SMC=MR and ii) SMC must cut MR from below. A summary of short run equilibrium of a Monopoly firm is presented below.

Note: Revenue curves slopes download, this is because in order to sell more the firms have to reduce price.

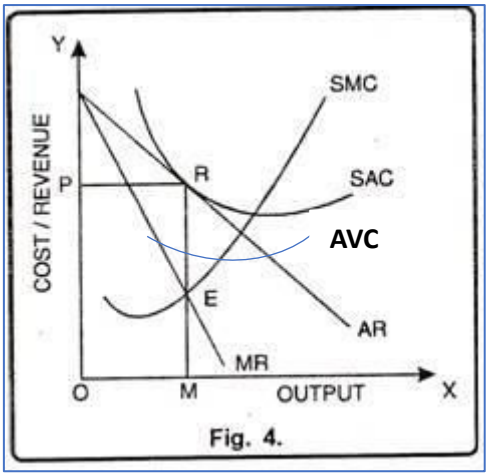


Fig. 4.

The above figure presents a case of normal profit earned by a monopolist form. In the figure, two important things need to be noted. First, the SMC curve cuts MR curve at point E. Second, the SAC is equal AR curve at point R. The monopolist earns normal profit at OM level of output.

If SAC is below the AR curve the firm could make profit. Such condition is shown below. In the following figure, the monopolist is in equilibrium at point E because at point E both the conditions of equilibrium are fulfilled i.e., MR = MC and MC intersects the MR curve from below. At this level of equilibrium, the monopolist will produce OQ_1 level of output and sells it at CQ_1 price which is more than average cost DQ_1 by CD per unit. Therefore, in this case total profits of the monopolist will be equal to shaded area ABDC.

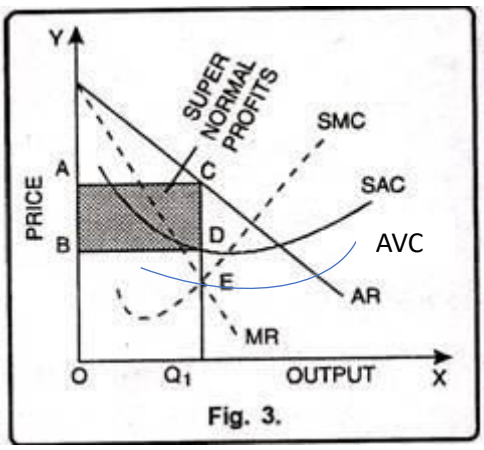


Fig. 3.

A firm will incur loss when the AVC is higher than the price. A simple illustration is provided below. The monopolist is in equilibrium at point E. At point E marginal cost is equal to marginal revenue and he produces OM level of output. At OM level of output, equilibrium price fixed by the monopolist is OP_1. At OP1 price, AVC touches the AR curve at point A. It signifies that the firm will cover only average variable cost from the prevailing price.

At OP_1 price, firm will bear loss of fixed cost. The firm will bear the total loss equal to the shaded area PP_1 AN. Now if the price falls below OP_1, the monopolist will stop production. It is so because if he continues production, he will have to bear the loss of variable costs along with fixed costs.

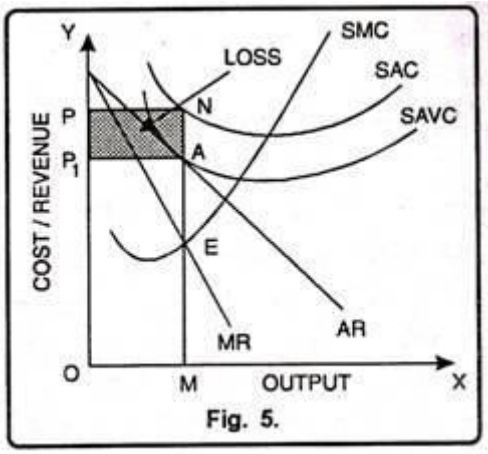


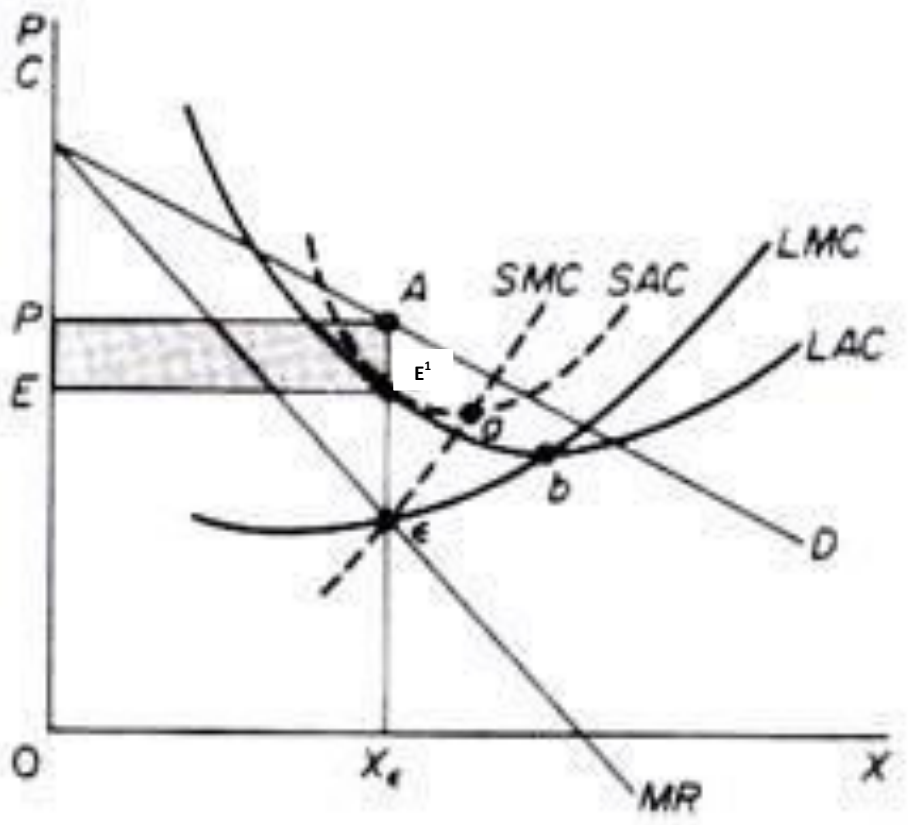
Fig. 5.

Long-run Monopoly Equilibrium

Long-run is the period in which output can be changed by changing the factors of production. In other words, all variable factors can be changed and monopolist would choose that plant size which is most appropriate for specific level of demand. In the long run the monopolist has the time to expand his plant, or to use his existing plant at any level which will maximize his profit. With entry blocked, however, it is not necessary for the monopolist to reach an optimal scale (that is, to build up his plant until he reaches the minimum point of the LAC). Neither is there any guarantee that he will use his existing plant at optimum capacity. What is certain is that the monopolist will not stay in business if he makes losses in the long run.

He will most probably continue to earn supernormal profits even in the long run, given that entry is barred. However, the size of his plant and the degree of utilization of any given plant size depend entirely on the market demand. He may reach the optimal scale (minimum point of LAC) or remain at suboptimal scale (falling part of his LAC) or surpass the optimal scale (expand beyond the minimum LAC) depending on the market conditions.

A graphical illustration is provided below. The most profitable level of output is at the point where the LMC curves intersects MR curve from below and the SMC passes through this point. Additionally, the SAC curve must be tangent to the LAC curve at this level of output.



In the above figure, the LMC curve cuts MR curve from below through point E. The SAC curve is equal to LAC curve at point E^1. Additionally, the SMC curve is equal to LMC at point E, at the equilibrium point (SMC=LMC=MR). It means that the monopoly firm is in long run equilibrium it is also in short un equilibrium.

At equilibrium the monopolist charges OP (=AX_4) level of price and sells OX_4 level of output. The total revenue will be equal to $PAOX_4$. The total cost will be equal to EE_1X_4O. The monopolist will earn a profit equal to EE_1AP.

NOTE: In the above equilibrium, the monopolist reached at equilibrium when the SAC is equal to a declining stage of LAC. This means that the firm can extend its capacity to the minimum point of LAC (with a new SAC) to make higher profit.

Module 6 Market Structure

Monopolistic competition

Theme: The works published by two modern economists, Chamberlin (Harvard University) and Mrs. Joan Robinson (Cambridge University), brought the synthesis of perfect competition and pure monopoly independently of each other. They pointed the unrealistic nature of perfect competition and monopoly and presented a new theory with more realistic approaches.

Monopolistic Competition refers to the market situation in which there is a keen competition, but neither perfect nor pure, among a group of a large number of small producers or suppliers having some degree of monopoly because of the differentiation of their products. Thus, we can say that monopolistic competition (or imperfect competition) is a mixture of competition and a certain degree of monopoly, on the basis of a correct appraisal of the market situation.

Characteristics:

1- Large number of sellers and they function independently.
2- Product differentiation (each firm produces and sell commodities that are different from one another, but are substitutes).
3- No perfect knowledge among consumers.
4- High transportation costs. Since transportation costs are different, commodities are sold at different prices.
5- Advertisement of products.
6- Under monopolistic competition, unlike perfect competition there is no restriction for a firm to enter in to the market or exit from the market. Entry is restricted. Similarly, unlike monopoly market, firms under monopolistic competitive market do not have absolute control over the market.

Short run equilibrium of the firm

Assumptions:

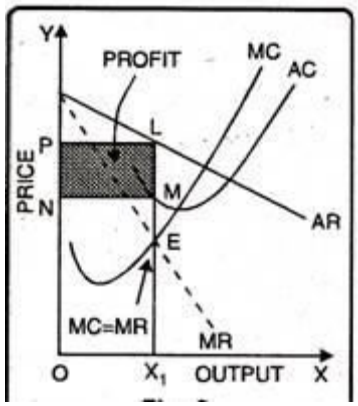
1- The number of sellers is large and they act independently of each other.
2- The products of each firm is differentiated from the other products.
3- The firm has a determinate demand curve (AR) which is elastic.
4- The factor services are in perfectly elastic supply for the production of the product in question.
5- The short run cost curves of each firm differ from each other.

6- No new firms enter the industry.

Note: Revenue curves slopes download, this is because in order to sell more the firms have to reduce price.

It should be recalled here that for maximum profits two conditions are to be satisfied under perfect competition and monopoly; (1) MC = MR and (2) MC must cut MR from below. Under monopolistic competition also, a firm will make the maximum profits when these two conditions are satisfied. However, in short period, it is not necessary that all the firms should have iso-classic demand curves. The elasticity of demand curve under monopolistic competition depends upon the attachment of the buyers. So, this it will depend upon the age of the firm (and of the product) [AR Curve]. If a firm is an old one, it shall be selling its product for a long time and consequently the buyers will have a less elastic or inelastic demand for its products. On the contrary, a comparatively, new firm will have a more elastic demand curve for its product. Thus, older firms will have greater price advantage while newer firms will have lesser price advantage. It follows therefore that older firms will make abnormal profits while newer firms may have normal profits or even losses. To be very clear and simple, it is stated that there may be three equilibrium conditions of a firm in the short period under monopolistic competition (i.e., No profit, profit making, and loss making). The following figures considered each cases separately.

First, we present the case of a profit-making firm. In the following figure, MC curve cuts MR from below at point E. The ac equal to the point M which is equal to E. The monopolist firm sells commodity at price OP (=LX_1). The total revenue is PLX_1O and the total cost is NMX_1O. The firm earns a profit here which is equal to PLMN. [AR>AC]



A case of normal profit is presented in the following figure.

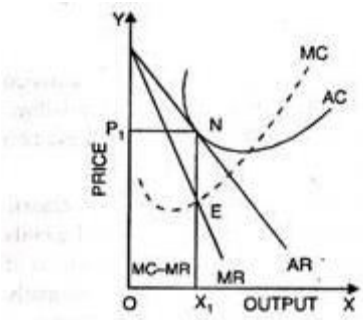


Fig. 3.

In the above figure, MC cuts MR from below at point E. This is the equilibrium point. The price of the product is equal to AC and the firm earn the same revenue (AC=AR). Therefore, it can be said that the firm is earning only normal profits.

Finally, a case of loss-making monopolist firm can be possible and can be presented as follows.

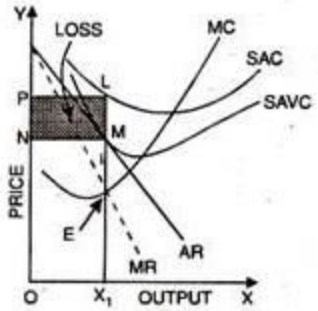


Fig. 4.

In the above figure, the MC curve cuts MR curve from below at point E and is the equilibrium. The price is determined at OP (LX_1), where the AC>AR. The firm is making a loss equal to NPLM.

Long run equilibrium of the firm

As learned previously, long period refers to that time period in which each firm can change its production capacity by changing the fixed as well as variable factors. New firms can enter the industry and old firms can exit it. When existing firms make profits, new firm will enter. Basically, the firms in the long run will get the normal profits. Such case can be learned using the following figure.

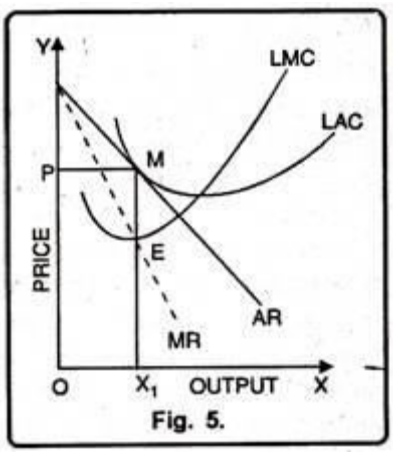


Fig. 5.

In the above figure, the LMC curve cuts MR curve from the bottom through point E. This is the equilibrium point where LAC equals AR at point M. The equilibrium price is attained at point PM (MX_1).

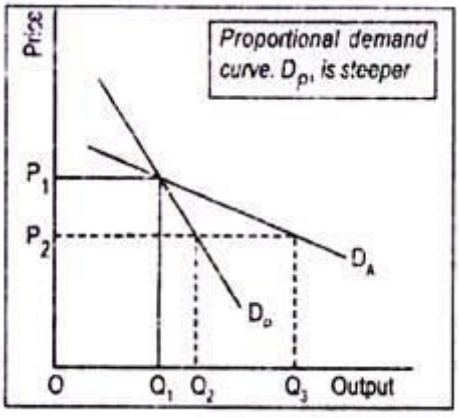
Group Equilibrium (Monopolistic Industry)

Industry Vs group: Under monopolistic competition, the word 'group' is used for industry. There is a difference between an industry and a group. An industry generally consists of firms which produce homogeneous product, whereas a group is composed of firms which produce a differentiated product. Thus, group consists of a number of firms producing close substitutes.

According to Chamerlin "From our point of view, each producer within the group is a monopolist, yet his market is interwoven with those of his competitors, and he is no longer to be isolated from them".

Theory of group equilibrium

To explain the long-run group equilibrium under monopolistic competition by the means of two demand curves as shown in the following figure.



Dp is the market demand curve assuming that all the firms charge the same price and are equal size. D_A represents the demand curve of an individual firm. The firms if selling OQ_1 output at OP_1 price. As a member of the group with product differentiation, the firm can increase its sales by reducing its price for two reasons. First, because it feels that the other firm will not reduce their price, and, second, it will attract some of their customers. On the contrary, if the firm increases its price above OP_1, its sales will be reduced as other will not follow the action. Therefore, the firm faces a more elastic demand curve D_A. If all the firms

in the product group reduce (or increase) their prices simultaneously, the firm will face the less elastic demand curve Dp.

Assumptions:

1- The number of firms is large.
2- Each firm produces differentiated products.
3- There is large number of buyers.
4- Each firm has an independent price policy and faces fairly elastic demand curve, at the same time expecting its rivals not to take any notice of its actions.
5- Each firms knows its demand and cost curves.
6- Factor prices remain constant.
7- Technology is constant.
8- Each firm aims at profit maximisation both in the short run and the long run.
9- Any adjustment of price by a single firm produces its effect on the entire group so that the impact felt by any one firm is negligible.
10- It relates to the long run.
11- No new firm can enter to the market.
12- It is assumed that both the demand and cost curves for all the products are uniform throughout the group.

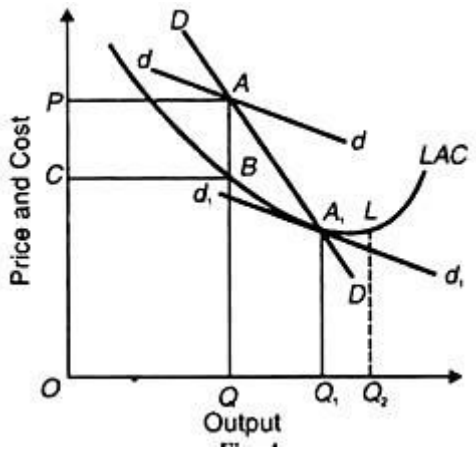
The theory:

Given these assumptions and the two types of demand curves DD and dd, Chamberlin explains the group equilibrium of firms. Further, we assume that

(i) Demand and cost curves of all the firms are identical, and
(ii) No firm can influence the price and output decisions of its rivals.

Chamberlin does not draw the MR curves corresponding to these demand curves and the LMC curve to the LAC curve to simplify the analysis.

The following Figure represents the long-run equilibrium of the group under monopolistic competition. Adjustment of long-run equilibrium starts from point A where dd and DD curves intersect each other so that QA is the short-run equilibrium price level at which each firm sells OQ quantities of the product. At this price- output level, each firm earns PABC super-normal profits.



Regarding dd as its own demand curve each firm applies a price cut for the purpose of increasing its sales and profits on the assumption that other firms will not react to its action. But instead of increasing its quantity demanded on the dd curve, each firm moves along the DD curve.

In fact, every producer thinks and acts alike so that the dd curve **"slides downward"** along the DD curve. This downward movement continues until it takes the shape of the d_1d_1 curve and is tangent to the LAC curve at A_1.

This is the long- run group equilibrium position where each firm would be earning only normal profits by selling OQ_1 quantities at Q_1A_1 price. If the d_1d_1 curve slides below the LAC curve, each firm would be incurring losses (not shown in the figure to keep the analysis simple).

Such a situation cannot continue in the long-run and price would have to be raised to the level of A_1 to eliminate losses. Thus, each firm will be of the optimum size and operate the optimum scale plant represented by the LAC curve and produce ideal or optimum output OQ_1.

Module 6 Market Structure

Duopoly

A duopoly is a type of oligopoly, characterized by two primary corporations operating in a market or industry, producing the same or similar goods and services. The key components of a duopoly are how the firms interact with one another and how they affect one another. There are many duopoly models in Economics. We will be learning the basic model developed by Cournot.

The Cournot Model:

The oldest determinate solution to the duopoly problem is by the French economist, A.A. Cournot in 1838, who took the case of two mineral water springs situated side by side and owned by two firms A and B.

Assumptions:

The Cournot model is based on the following assumptions:

(1) There are two independent sellers. In other words, interdependence of the duopolists is ignored.

(2) They produce and sell a homogeneous product, mineral water.

(3) The total output must be sold out, being perishable and non-storable.

(4) The number of buyers is large.

(5) Each seller knows the market demand curve for the product.

(6) The cost of production is assumed to be zero.

(7) Both have identical costs and identical demands.

(8) Each seller decides about the quantity he wants to produce and sell in each period.

(9) But each is ignorant about his rival's plan about output.

(10) At the same time, each seller takes the supply or output of its rival as constant.

(11) Neither of them fixes the price for its product, but each accepts the market demand price at which the product can be sold.

(12) The entry of firms is blocked.

(13) Each seller aims at obtaining the maximum net revenue or profit.

Explanation:

Given these assumptions, suppose there are two mineral water springs exploited by two firms, A and B. The market demand curve is DD_1, and its marginal revenue curve is MR, as shown in Figure 1. The marginal costs of both A and B are assumed to be zero so that they coincide with the horizontal axis.

Suppose firm A is the only producer in which case it produces and sells OA (=½ OD_1) quantity when it's MR, equals its marginal cost curve (horizontal axis) at point A. It charges the monopoly price AS (=OP) and earns OASP as monopoly profits.

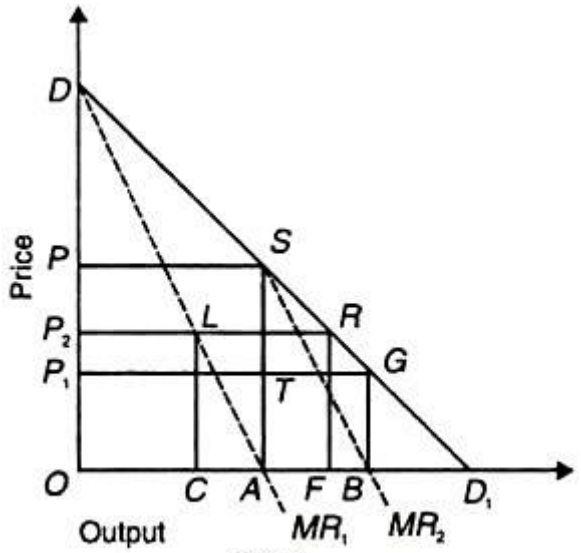


Fig. 1

Now firm B enters the market and expects that A will not change its output level OA. It, therefore, regards SD_1 segment of the market demand curve as its demand curve. Its corresponding marginal revenue curve is MR_2 which intersects the horizontal axis (its marginal cost curve) at point B. Thus it produces and sells AB (= ½ AD_1 = BD_1) quantity at BG (=OP_1) price and it expects to earn BGTA profits.

Firm A finds that with the entry of B, price has fallen to OP_1 from OP. As a result, its expected profits decline to OP JA. In this situation, it tries to adjust its price and output. Accordingly, assuming that B will continue to sell the same quantity AB (=BD_1), it regards the remaining portion of the market OB available to it. It thus sells ½OB. The reduction in its output from OA (=½OD_1) to AB (= ½ OB) causes the price to rise (not shown in the figure to simplify the analysis).

As a result of A's reduction in output, B thinking that A will continue to produce less, reacts by increasing its output to ½(OD_1-AB) which causes the price to fall. In this way, A's reducing its output and causing the price to rise, and B's reaction in increasing its output and causing the price to fall, will ultimately lead to an equilibrium price OP_2. At this price, the total output of mineral water is OF, which is equally divided between the two firms.

Each duopolist sells 1/3 of the market i.e. A sells OC and B sells CF. At this price, A's $OCLP_2$ equal that of B's profits CFRL. It is evident that both the producers sell 2/3 of the total output, OD_1 and each is producing 1/3 of OD_1.

Let us compare the Cournot duopoly solution with the perfectly competitive solution. The duopoly firms A and B in equilibrium charge OP_2 price and sell OF output. Under perfect competition, the total output will be OD at zero prices. The price is zero because the marginal cost is zero. When the MR_1 curve intersects the horizontal axis, which is the MC curve, the price is zero at point A in the figure.

The total output OD_1 will be divided between A and B equally as OA and AD_1 Notice that in the Cournot solution, the price OP_2 exceeds the zero marginal cost and zero prices under perfect competition, and the output OF is less than OD_1 under perfect competition. However, in the Cournot solution the output (OF) is greater than it would be under monopoly (OA). But the price under monopoly (OP) would be higher than under the Cournot solution (OP_2).

Conclusion:

The Cournot model can be extended even to more than two firms. As more and more firms enter the oligopoly industry, the equilibrium output and price of the industry will approach the perfectly competitive output OD_1 and the zero prices.

Its Criticisms:

The cournot model has been criticised on the following grounds:

1. The main defect in Cournot's solution is that each seller assumes his rival's supply fixed, despite repeatedly observing changes in it. Joseph Bertrand, a French mathematician, criticising Cournot in 1883 pointed out that seller A in order to regain all the customers lost to B, will fix a price slightly below that fixed by B and price cutting may continue until the price becomes zero. Thus, Bertrand argued that there would not be any limit to the fall in price since each seller could by doubling his produce, and underbid his rival. This would tend to drive down the price to the competitive level in the long-run.

2. The model is silent about the period within which one firm reacts and adjusts its output to the moves of the other. Thus it is a static model.

3. The Cournot solution is unrealistic because it assumes zero cost of production.

4. It is a closed model because it does not allow entry of firms.

5. The assumption that each duopolist can act without any output reaction from the other is unrealistic. It is, in fact, a no-learning-by-doing model.

6. Marshall, therefore, regarded Cournot's model as "incapable of a universal solution." This is because it is not possible to find an actual duopoly market where each duopolist acts autonomously and output is the 'sole parameter of action'.

Advanced models [not needed as per syllabus]: Stakelberg model, Chamberlin model

Module 6 Market Structure

Oligopoly

An oligopoly is an industry which is dominated by a few firms. In this market, there are a few firms which sell homogeneous or differentiated products.

Also, as there are few sellers in the market, every seller influences the behavior of the other firms and other firms influence it.

Oligopoly is either perfect or imperfect/differentiated. In India, some examples of an oligopolistic market are automobiles, cement, steel, aluminum, etc.

Characteristics of Oligopoly

Now that the Oligopoly definition is clear, it's time to look at the characteristics of Oligopoly:

1- **Few firms:** Under Oligopoly, there are a few large firms although the exact number of firms is undefined. Also, there is severe competition since each firm produces a significant portion of the total output.
2- **Barriers to Entry**: Under Oligopoly, a firm can earn super-normal profits in the long run as there are barriers to entry like patents, licenses, control over crucial raw materials, etc. These barriers prevent the entry of new firms into the industry**.**
3- **Non-Price Competition**: Firms try to avoid price competition due to the fear of price wars in Oligopoly and hence depend on non-price methods like advertising, after sales services, warranties, etc. This ensures that firms can influence demand and build brand recognition.
4- **Interdependence**: Under Oligopoly, since a few firms hold a significant share in the total output of the industry, each firm is affected by the price and output decisions of rival firms. Therefore, there is a lot of interdependence among firms in an oligopoly. Hence, a firm takes into account the action and reaction of its competing firms while determining its price and output levels.
5- **Nature of the Product**: Under oligopoly, the products of the firms are either homogeneous or differentiated.
6- **Selling Costs**: Since firms try to avoid price competition and there is a huge interdependence among firms, selling costs are highly important for competing against rival firms for a larger market share.
7- **No unique pattern of pricing behavior**: Under Oligopoly, firms want to act independently and earn maximum profits on one hand and cooperate with rivals to remove uncertainty on the other hand.

The Sweezy Model of Kinked Demand Curve (Rigid Prices) (Non-Collusive Oligopoly):

In his article published in 1939, Prof. Sweezy presented the kinked demand curve analysis to explain price rigidities often observed in oligopolistic markets.

Sweezy assumes that if the oligopolistic firm lowers its price, its rivals will react by matching that price cut in order to avoid losing their customers. Thus the firm lowering the price will not be able to increase its demand much. This portion of its demand curve is relatively inelastic. On the other hand, if the oligopolistic firm increases its price, its rivals will not follow it and change their prices. Thus the quantity demanded of this firm will fall considerably. This portion of the demand curve is relatively elastic. In these two situations, the demand curve of the oligopolistic firm has a kink at the prevailing market price which explains price rigidity.

Its Assumptions:

The kinked demand curve hypothesis of price rigidity is based on the following assumptions:

(1) There are few firms in the oligopolistic industry.

(2) The product produced by one firm is a close substitute for the other firms.

(3) The product is of the same quality. There is no product differentiation.

(4) There are no advertising expenditures.

(5) There is an established or prevailing market price for the product at which all the sellers are satisfied.

(6) Each seller's attitude depends on the attitude of his rivals.

(7) Any attempt on the part of a seller to push up his sales by reducing the price of his product will be counteracted by other sellers who will follow his move.

(8) If he raises the price, others will not follow him; rather they will stick to the prevailing price and cater to the customers, leaving the price-raising seller.

(9) The marginal cost curve passes through the dotted portion of the marginal revenue curve so that changes in marginal cost do not affect output and price.

The Model:

Given these assumptions, the price-output relationship in the oligopolist market is explained in Figure 5 where KPD is the kinked demand curve and OP_o the prevailing price in the oligopoly market for the OR product of one seller. Starting from point P, corresponding to the current price OP_o, any increase in price above it, will considerably reduce his sales, for his rivals are not expected to follow his price increase.

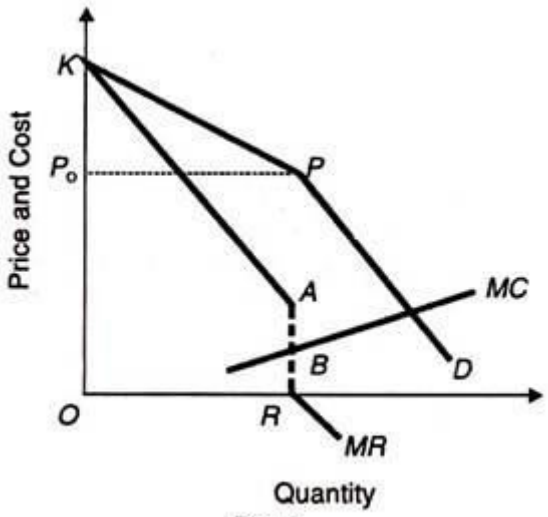


Fig. 5

This is so because the KP portion of the kinked demand curve is elastic, and the corresponding portion KA of the MR curve is positive. Therefore, any price – increase will not only reduce his total sales but also his total revenue and profit. On the other hand if the seller reduces the price of the product below OP_o (or P) his rivals will also reduce their prices. Though he will increase his sales, his profit would be less than before. The reason is that the PD portion of the kinked demand curve below P is less elastic and the corresponding part of marginal revenue curve below R is negative. Thus in both the price-raising and price-reducing situations the seller will be a loser. He would stick to the prevailing market price OP_o which remains rigid. In order to study the working of the kinked demand curve, let us analyse the effect of changes in cost and demand conditions on price stability in the oligopolistic market.

Changes in Costs:

In oligopoly under the kinked demand curve analysis, changes in costs within a certain range do not affect the prevailing price. Suppose the cost of production falls so that the new MC curve is MC_1 to the right, as in Figure 6. It cuts the MR curve in the gap AB so that the profit-maximising output is OR which can be sold at OP_o price. It should be noted that with any cost reduction the new MC curve will always cut the MR curve in the gap because as costs fall the gap AB continues to widen due to two reasons:

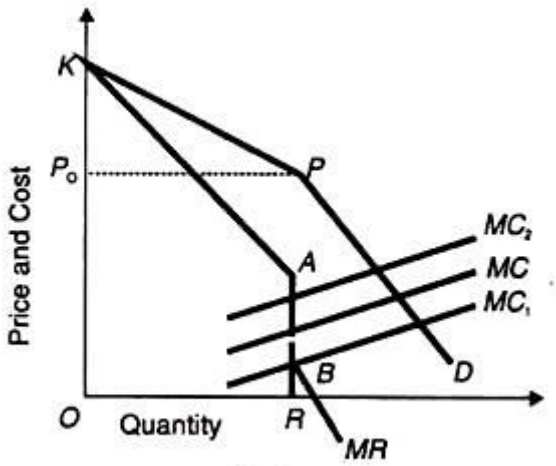


Fig. 6

(1) As costs fall, the upper portion KP of the demand curve becomes more elastic because of the greater certainty that a price rise by one seller will not be followed by rivals and his sales would be considerably reduced.

(2) With the reduction in costs the lower portion PD of the kinked curve becomes more inelastic, because of the greater certainty that a price reduction by one seller will be followed by the other rivals.

Thus the angle KPD tends to be a right angle at P and the gap AB widens so that any AC curve below point A will cut the marginal revenue curve inside the gap. The net result is the same output OR at the same price OP_o and large profits for the oligopolistic sellers.

In case the cost of production rises the marginal cost curve will shift to the left of the old curve MC as MC_2. So long as the higher MC curve intersects the MR curve within the gap up to point A, the price situation will be rigid.

However, with the rise in costs the price is not likely to remain stable indefinitely and if the Ml curve rises above point A, it will intersect the MC curve in the portion KA so that a lesser quantity is sold at a higher price. We may conclude that there may be price stability under oligopoly even when costs change so long as the MC curve cuts the MR curve in its discontinuous portion. However, chances of the existence of price-rigidity are greater where there is a reduction in costs than there is a rise in costs.

Changes in Demand:

We now explain price rigidity where there is a change in demand with the help of Figure 7, D_2 is the original demand curve, MR_2 is its corresponding marginal revenue curve and MC is the marginal cost curve. Suppose there is a decrease in demand shown by D_1 curve and MR_1 is its marginal revenue curve.

When demand decreases, a price-reduction move by one seller will be followed by other rivals. This will make LD_1 the lower portion of the new demand curve, more inelastic than the lower portion HD_2 of the old demand curve.

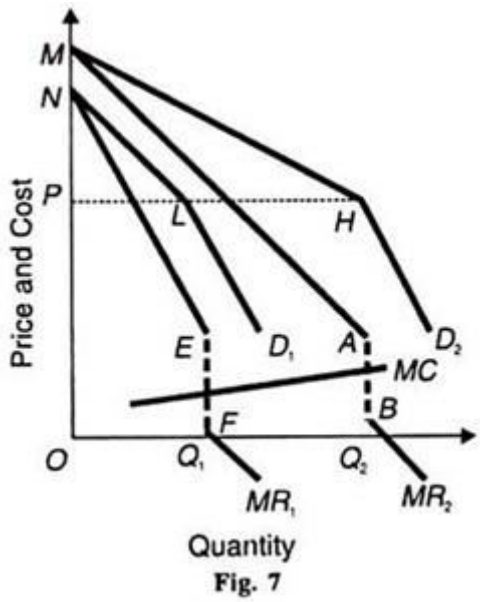


Fig. 7

This will tend to make the angle at L approach a right angle. As a result, the gap EF in MR_1 curve is likely to be wider than the gap AB of the MR_2 curve. The marginal cost curve MC will, therefore, intersect the lower marginal revenue curve MR_1 inside the gap EF, thus indicating a stable price for the oligopolistic industry.

Since the level of the kinks H and L of the two demand curves remains the same, the same price OP is maintained after the decrease in demand. But the output level falls from OQ_2 to OQ_1. This case can be reversed to show increase in demand by taking D_1 and MR_1 as the original demand and marginal revenue curves and D_2 and MR_2 as the higher demand and marginal revenue curves respectively.

The price OP is maintained but the output rises from OQ_1 to OQ. So long as the MC curve continues to intersect the MR curve in the discontinuous portion, there will be price rigidity.

However, if demand increases, it may lead to a higher price. When demand increases, a seller would like to raise the price of the product and others are expected to follow him. This will tend to make the upper portion MH of the new demand curve elastic than the NL portion of the old curve.

Thus the angle at H becomes obtuse, away from the right angle. The gap AB in the MR_2 curve becomes smaller and the MC curve intersects the MR_2 curve above the gap, indicating a higher price and lower output. If, however, the marginal cost curve passes through the gap of MR_2, there is price stability.

Conclusion:

The whole analysis of the kinked demand curve points out that price rigidity in oligopolistic markets is likely to prevail if there is a price reduction move on the part of all sellers. Changes in costs and demand also lead to price stability under normal conditions so long as the MC curve intersects the MR curve in its discontinuous portion.

Module 6 Market Structure

Factor Market and Factor Pricing

To study factor pricing, we should first understand the concept of factor productivity and factor cost.

Concepts of Factor Productivity:

There are two main concepts relating to factor productivity: physical productivity and revenue productivity,

(i) Physical Productivity:

When we express the productively of any factor in terms of goods and services, it is called physical productivity. It is further divided into average and marginal physical productivity.

(a) Average Physical Productivity (APP). APP is the physical units produced per unit of the variable factor. It is arrived at by dividing total physical productivity (TPP) by the number of units of the variable factor employed (N), i.e.

$$APP = TPP/N$$

(b) Marginal Physical Productivity (MPP). MPP is the addition made to total output by employing an additional unit of a variable factor.

$$MPP = TPP - TPP_{n-1,}$$

(c) Value of Marginal Physical Productivity (VMPP). The value of marginal physical productivity (or product) is obtained by multiplying MPP with the price (AR) of the product

$$VMPP \text{ or } VMP = MPP \times Price\ (AR)$$

(ii) Revenue Productivity:

When we express the productivity of a factor in terms of money, it is called revenue productivity. It is further divided into average and marginal revenue productivity.

(a) Average Revenue Productivity (ARP): ARP is the revenue obtained per unit of the factor employed. It is obtained by dividing total revenue productivity (TRP) by the total number of units of the factor employed (N) i.e.

$$ARP = TRP/N$$

It is also obtained by multiplying APP with the price of the product.

$$ARP = APP \times Price\ (AR)$$

(b) Marginal Revenue Productivity (MRP): MRP is the addition made to total revenue productivity by employing one more unit of a variable factor, i.e.,

$$MRP = TRP_n - TRP_{n-1}$$

The relation between physical, marginal and average productivity under perfect competition is shown in Table 1.

TABLE 1 : TOTAL, PHYSICALAND MARGINAL PRODUCTIVITY

(N)	*(TPP)*	*(MPP)*	*(APP)*	*(P)*	*(TRP)*	*(MRP)*	*(ARP)*	*(VMPP)*
(1)	(2)	(3)	(4) (2÷1)	(5)	(6) (2×5)	(7) (3×5)	(8) (4×5)	(9) (3×5)
1	10	10	10	5	50	50	50	50
2	25	15	12.50	5	125	75	62.50	75
3	37	12	12.33	5	185	60	61.65	60
4	45	8	11.25	5	225	40	56.25	40
5	50	5	10	5	250	25	50	25
6	53	3	8.83	5	265	15	44.15	15
7	53	0	7.57	5	265	0	37.85	0

Relation between ARP and MRP:

There is a definite relation between ARP and MRP curves which is based on the Law of Variable Proportions. Both ARP and MRP curves are inverted (u-shaped or bell (∩) shaped. First they rise upward, reach a maximum and then decline, as shown in Figure 1.

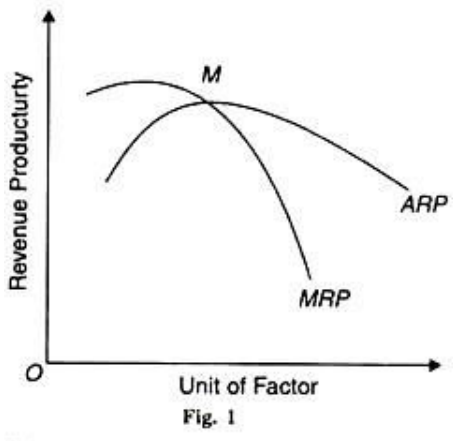


Fig. 1

The relation between the two is as follows:

(1) When the ARP curve rises, the MRP curve is above it.

(2) When the ARP curve is at its maximum, a point M, the MRP curve cuts it from above.

(3) When the ARP curve falls, the MRP curve is below it and falls steeply.

Concepts of Factor Cost:

The total cost of a factor (TFC) is the expenditure incurred by a firm in hiring or buying that factor. It is further divided into average and marginal factor cost.

(a) Average Factor Cost (AFC). AFC is the per-unit cost of the variable factor employed by a firm. It is obtained by dividing total factor cost by the units of the factor employed, i.e..

$$AFC = TFC/Units\ of\ Factor\ Employed$$

(b) Marginal Factor Cost (MFC). It is the addition to the total factor cost by hiring or purchasing an extra unit of that factor:

$$MFC = TFC_n - TFC_{n-1}$$

Table 2 expects the costs concepts and their relation under perfect completion:

Table 2 : Factor Costs

Units of Factor Service	*Price of Factor Rs.*	*Total Factor Cost (TFC)*	*Average Factor Cost (AFC)*	*Marginal Factor Cost (MFC)*
(1)	(2)	(3)	(4)	(5)
1	5	5	5	—
2	5	10	5	5
3	5	15	5	5
4	5	20	5	5

Relation between AFC and MFC:

The relation between AFC and MFC is different in a perfectly competitive factor Market and monopolistic factor market. In a perfectly competitive factor market, the price of a factor is determined by its demand and supply.

The price of that factor is given for the firm at which it buys as many units as are required by it. Therefore, the supply of the factor is perfectly elastic at the given price and the supply curve of the factor is a straight line paralleled to the x-axis.

As the price of the factor is assumed to be given and constant, therefore its average factor cost and marginal factor cost equal the price of the factor i.e., AFC = MFC = Price of the Factor. This relationship is shown in column (2), (4) and (5) of Table 2 and in Figure 2 where the supply curve of the factor is P = AFC = MFC at which its OQ quantity is bought by the firm.

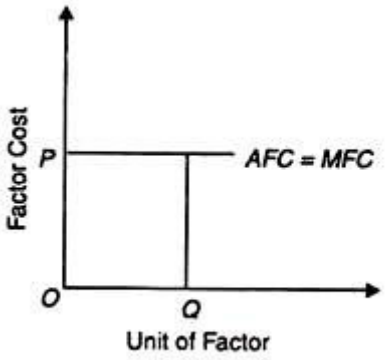


Fig. 2

In a monopolistic (imperfect) factor market, a firm had monopsony, being the sole buyer of a factor.

So its factor supply curve (AFC) is upward sloping to the right and its MFC curve is above its AFC curve, as shown in Figure 3. It means that if the firm wants to employ more units of that factor (say labour), it will have to spend more (wage) not only on additional units but on its all units (workers). Consequently, MFC of that factor will be more than its AFC (actual cost). Therefore, the MFC curve will be above its AFC curve.

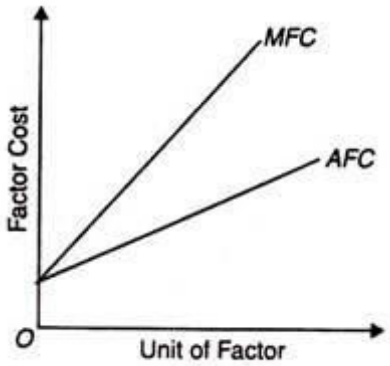


Fig. 3

The Marginal Productivity Theory of Distribution

The below mentioned article provides an overview on the Marginal Productivity Theory of Distribution.

The marginal productivity theory states that the demand for a factor depends on its marginal revenue productivity (MRP). MRP is the addition made to total revenue by employing one more unit of a variable factor, other factors remaining unchanged. As a general rule, the marginal revenue productivity of a factor diminishes with the increase in the units of that factor.

When in the initial stages the units of a variable factor are employed, keeping the other factors constant, the total revenue product may increase more than proportionately for some time. But, sooner or later, a time will come when the marginal revenue product will start diminishing, and will tend to equal the price of the factor. This tendency of diminishing MRP follows from the Law of Variable Proportions.

A firm operating under perfect competition has to pay the same price (reward) to a unit of the factor, which is being paid by the industry. In order to have maximum profits, it acts on the principle of substitution. Cheaper factors tend to displace expensive ones. For example, if a firm finds it more profitable to substitute machines for costly labour, it will do so. The substitution of cheaper factors for the dearer will continue till the marginal revenue productivity of each factor is equal to its price.

At this stage, the factors of production are employed in their most efficient combination or the least cost combination and the profits of the firm will be maximized. Moreover, substitution also takes place between different units of the same factor. There being perfect mobility in the factor market, units of a factor tend to move from one use where their marginal revenue productivity is low to another use where it is high, till it is equalized for all the units in different uses.

In equilibrium, therefore, the price of a factor-service must equal its marginal revenue productivity. If the marginal revenue product of a factor unit is more than its price (cost of employing it), it will be profitable for the firm to employ more units of this factor.

As more units are employed, the marginal revenue product diminishes till it equalises the price. This is the point of maximum profits for the firm. But if more factor units are employed beyond this point, the marginal revenue product will fall below the price and the firm will sustain a loss. This follows from the application of the Law of Non-proportional Returns.

Assumptions of the Theory:

The marginal productivity theory of distribution is based on the following assumptions:

(i) It assumes that all units of a factor are homogeneous.

(ii) They can be substituted for each other.

(iii) There is perfect mobility of factors as between different places and employments.

(iv) There is perfect competition in the factor market.

(v) There is perfect competition in product market.

(vi) There is full employment of factors and resources.

(vii) The various units of the different factors are divisible.

(viii)One factor is variable and other factors are constant.

(ix) Techniques of production are given and constant.

(x) The entrepreneurs are motivated by profit maximization.

(xi) The theory is applicable in the long-run.

(xii) It is based on the Law of Variable Proportions.

Explanation of the Theory:

Given these assumptions, first we explain the determination of the price of a factor in an industry in terms of its demand and supply. In Fig. 4(A), the demand curve D of industry intersects its supply curve S at point E which determines OP price and OQ quantity demanded and supplied. Thus all units of the factor (say, labour) in the industry are paid the same price (wage), OP.

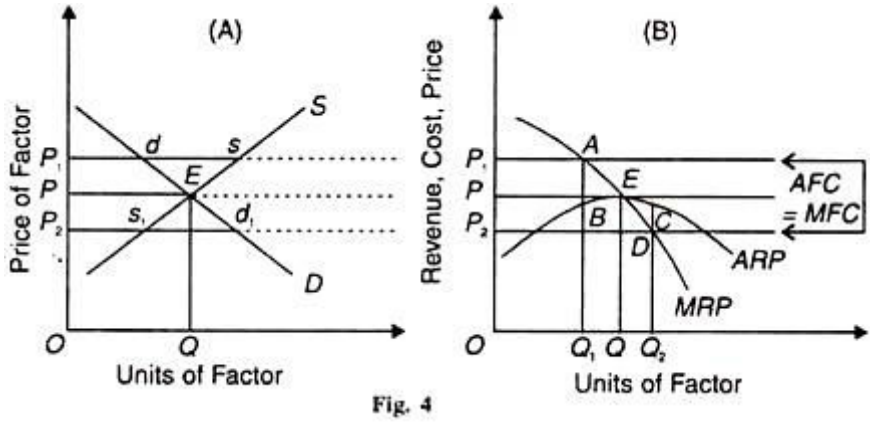


Fig. 4

There being perfect competition, a firm will pay the same price (wage) to each unit of the factor (labour) as paid by the industry. Therefore, for the firm, the supply of this factor at that price will be perfectly elastic. It means that the supply curve of this factor at the given price OP is horizontal curve, shown as AFC = MFC in Panel (B) of the figure. AFC and MFC are the average and marginal factor costs of the firm at which it employs the factor units.

The number of factor units, the firm will employ depends upon its demand for that factor. And the demand for the factor depends on its MRP. For equilibrium, it is essential that the price which the firm pays to the factor must equal its MRP. ARP and MFC, that is, Price of the Factor Unit = AFC = MFC = MRP = ARP. This is shown in Panel (B) where E is the equilibrium point for the firm when ARP = MRP = MFC = AFC and it pays OP price for OQ units of the factor. Suppose the factor-price rises to OP_1.

At this price, the firms will be incurring AB per unit loss, as the price Q_1being paid to factor units is greater them Q_1B, their ARP. This will induce some firms to leave the industry. As a result, the supply of factors will increase by ds, as in Panel (A), and the factor price will fall again to OP where equilibrium will be re-established at point E in both (A) and (B) Panels.

On the other hand, if the factor-price falls to OP_2 firms will be earning DC per unit profit because the price Q_2D being paid to factor units are less than Q_2C, their ARP. Attracted by the profit, some firms will enter the industry. This will raise the factor-demand by s_1d_1 in the industry and the price will again increase to OP. These price changes are only possible in the short-run. In the long-run, equilibrium will stay on at point E, where OP = ARP = MRP = MFC = AFC.