

## 1. Details of Module and its structure

Module Detail	
Subject Name	Economics
Course Name	Economics 03 (Class XII, Semester - 1)
Module Name/Title	Short Run Equilibrium under Perfect Competition - Part 2
Module Id	leec_10402
Pre-requisites	Knowledge about perfect competition market
Objectives	After going through this lesson, the learners will be able to understand the following: <ol style="list-style-type: none"><li>1. Distinguish between Industry and Firm</li><li>2. How Price is determined</li><li>3. Concept of Revenue</li><li>4. Producer's Equilibrium</li><li>5. Equilibrium in the short run</li><li>6. Equilibrium in the long run</li></ol>
Keywords	Market, Price, Perfect Competition, Perfect knowledge

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### **1. Introduction**

Under perfect competition, Industry is the price maker while the firm is the price taker. First, let us understand the difference between an industry and a firm.

### **2. Distinction between Industry and Firm**

**Firm:** A firm is a producing unit, which produces goods and services for profit. The form of organization or firm can be individual proprietorship, partnership, or corporation government enterprise. For example, Bata Ltd, Lee Cooper, Relaxo, Puma, Liberty are examples of firms.

**Industry:** An industry is an aggregate of all the firms producing the same commodity. Alternately, all the firms producing and selling the same product is known as an industry. For instance, firms' manufacturer shoes will be collectively called shoe industry. E.g., Bata, Liberty, Woodland are individual firms of shoe industry. In short, firms are part of Industry. A firm is an entity where as industry is a group of firm.

### **3. Price determination under Perfect Competition**

Under perfect competition, price of a commodity is determined by the interaction between demand and supply of the whole industry. Therefore, the industry is called the price maker. No individual firm can influence the price because its share in total supply is insignificant. It is

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because of this reason that firm is said to be price taker and industry the price maker. This price is called equilibrium price because it brings equilibrium between forces of demand and supply. At equilibrium price, quantity demanded is equal to quantity supplied.

Table 1: Price, Quantity demanded and quantity supplied by an industry

Industry		
Price per unit (Rs)	Demand	Supply
2	1000	200
4	800	400
6	600	600
8	400	800
10	200	1000

According to the table, the price of the commodity in the industry will be determined at Rs 6 per unit because at this price, market demand and market supply are equal i.e. 600 units each. Thus, the equilibrium price is Rs 6 and the equilibrium quantity is 600 units. The above table of the firm shows that at the price (here, Rs 6) given by the industry, whatever amount of output firm may sell, at the price fixed by the industry.

The firm, therefore, charges Rs 6 and sells different unit of the product at same price.

#### 4. Concept of Revenue

The income earned by the firm is known as revenue. We will be studying about three different forms of revenue.

- Total Revenue
- Average Revenue
- Marginal Revenue

Firm				
Price per unit (Rs)	Quantity sold (unit)	TR (Rs)	AR (Rs)	MR (Rs)
6	1	6	6	6
6	2	12	6	6
6	3	18	6	6
6	4	24	6	6
6	5	30	6	6

**Table 2: Price, Quantity demanded and quantity supplied by a firm**

**Total revenue (TR)** is the total income earned by seller after selling its product. Therefore, we calculate total revenue by the following formula:

$$\text{Total Revenue} = \text{Price} * \text{Quantity}$$

Therefore, as per the table above the seller earns Rs 6, Rs 12, Rs 18, Rs 24, Rs 30 from the sale of 1, 2, 3, 4 and 5 unit of output respectively.

We would also be interested to know about the income per unit, from the sale of the product, by the seller. This income per unit is known as **average revenue**. Average revenue is calculated by the following formula:

$$\text{Average Revenue (AR)} = \text{Total Revenue} / \text{Quantity Sold}$$

By using the above formula, we find that the average revenue from the sale of the product is constant at Rs 6.

Next, we would also like to know, what is the addition to total revenue with an additional unit of output sold? This is known as **marginal revenue**. Therefore, marginal revenue is change in total revenue due to change in the number of product sold. We calculate marginal revenue by following formula:

$$\text{Marginal Revenue (MR)} = \text{TR}_n - \text{TR}_{n-1}$$

Where  $TR_n$  = Total revenue in period n

$TR_{n-1}$  = Total revenue in period n-1

As per the table above, the addition to total revenue at different level of output is constant at Rs 6.

Therefore, Price = AR = MR = Rs 6

Hence, under perfect competition, a firm's AR = MR because of uniform price.

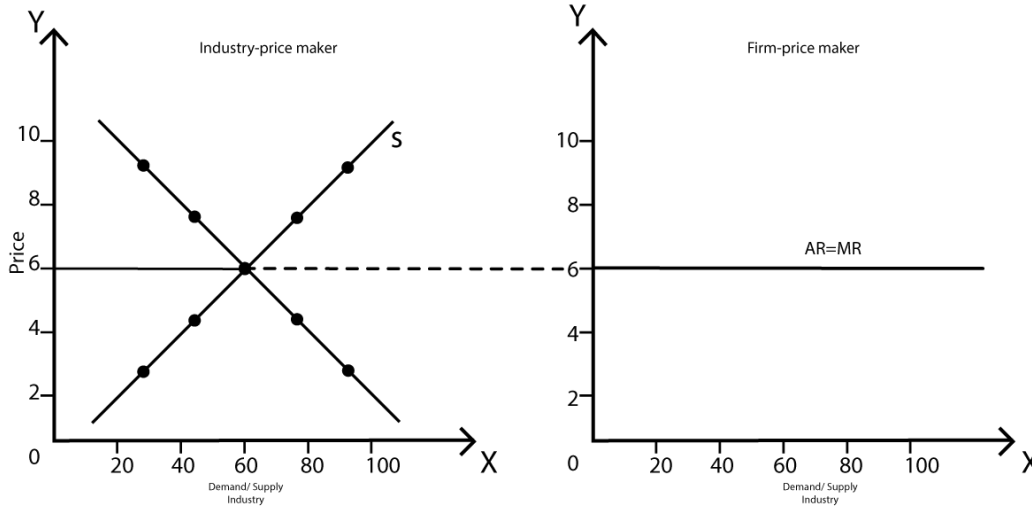


Fig 1: Revenue Curve of Firm and Industry under Perfect Competition

Let us plot the table on the graph. Both AR and MR curves are horizontal straight line parallel to X-axis, which coincides with each other.

Since all the firms are selling goods at uniform price, here Rs.6, we can say that there is no difference between AR (average revenue) and MR (marginal revenue). Firms are able to sell different units at the same price.

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## 5. Producer's Equilibrium under Perfect Competition

Producer's equilibrium is a focal point in explaining behaviour of a producer. The Traditional Economic Theory assumes profit maximisation as sole objective of a firm.

Producer's equilibrium signifies a situation of profit maximisation. A producer chooses that level of output that maximises his/her profit. In order to analyse a firm's profit maximisation problem it is necessary to specify the market in which a firm operates. Here we are studying the behaviour of a firm in a perfect competition market.

**Concept of Profit** The term 'Profit' implies excess of total revenue over total cost. In other words it is calculated as difference between total revenue and total cost. Profit is denoted by Greek work  $\Pi$ .

$$\Pi = TR - TC$$

In short run, TC is sum total of TFC and TVC

$$TC = TVC + TFC$$

Since total fixed cost remain unchanged, we can say that  $\Pi$  is maximised when the difference between TR and TVC is maximised.

**Concept of Gross and Net Profit:** Gross profit shows the difference between TR and TVC

$$\text{Gross Profit} = TR - TVC$$

Net profit shows the difference between Total Revenue and Total Cost

$$\text{Net Profit} = TR - TC \text{ (TVC+TFC)}$$

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**Concept of Super Normal and Normal Profit:** In economics, profits are of two types: supernormal profit and normal profit. Supernormal profit occurs where total revenue exceeds total cost or average revenue exceeds average cost of a firm.

$$\text{Supernormal Profit} = \text{TR} > \text{TC}$$

$$\text{Or, } \text{TR}/\text{Q} > \text{TC}/\text{Q}$$

$$\text{Or, } \text{AR} > \text{AC}$$

Normal Profit occurs when total revenue is equal to total cost or average revenue is equal to average cost. It can be defined as minimum price which a producer expects, to remain in business. If s/he does not get that minimum price, the producer will stop production.

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

$$\text{Or, } \text{TR}/\text{Q} = \text{TC}/\text{Q}$$

$$\text{Or, } \text{AR} = \text{AC}$$

### **Producer's Equilibrium (through the Marginal Revenue and Marginal Cost)**

Under the MR and MC approach, the following condition needs to be fulfilled for striking producer's equilibrium or achieving maximum profit

1.  $\text{MR} = \text{MC}$ ; This is necessary condition
2. MC should cut MR from below or MC should be rising. This is known as supplementary condition.

## Diagrammatic Presentation

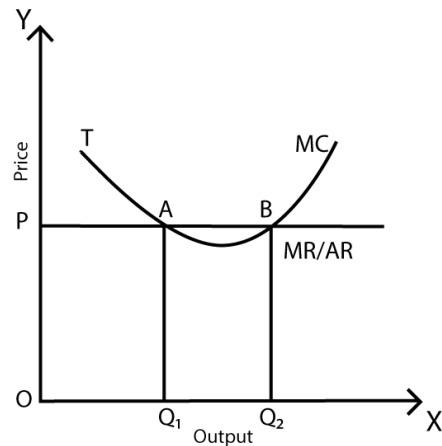


Fig 2: Equilibrium of Firm under Perfect Competition

Under the perfect competition AR and MR are equal to each other as price remains uniform. Thus both AR and MR are indicated by a horizontal straight line parallel to X axis. In the diagram MC and MR are equal at OQ<sub>2</sub> level of output.

At OQ<sub>1</sub> level of output firm is bearing loss while at OQ<sub>2</sub> level firm is getting profit.

**At OQ<sub>1</sub> level of output**

**TR = Area under MR corresponding to a given level of output**

**TR = OQ<sub>1</sub>AP**

**TVC = Area under MC corresponding to a given level of output**

**TVC = OQ<sub>1</sub>AT**

Clearly area OQ<sub>1</sub>AP is less than area OQ<sub>1</sub>AT. So firm bears loss (equal to PAT). Here firm is not able to cover TVC. So, firm would not like to produce.



AT OQ2 level of output

TR = represented by area of OQ2BP

TVC = represented by OQ2BT

Clearly firm is getting profit as  $TR > TVC$  ( $OQ2BP > OQ2BT$ ). This shows the profit. Accordingly producer will strike equilibrium at OQ2 level of output when  $MC = MR$  and  $MC$  is rising.

(I) What will firm do when  $MR > MC$  : When firm produces at any point below producer's equilibrium level of output, gross profit of firm will not be maximized. It can be explained with help of the following diagram.

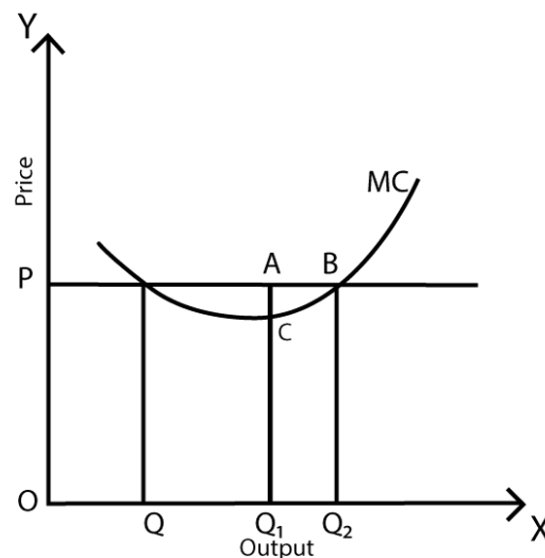


Fig 3: Equilibrium of Firm under Perfect Competition (When  $MR > MC$ )

If firm produces at OQ1 level of output, TR reduces by an area equal to  $Q1Q2BA$  and TVC reduces by an area equal to  $Q1Q2BC$ . Thus, reduction in TVC is less than reduction in TR, the loss of TR is greater than the gain of TVC. Accordingly profit will fall which is equal to an area

of ABC. This departure from state of equilibrium would indicate that difference between TR and TVC will tend to fall which do not maximize profit. So, firm will increase production up to point where  $MR = MC$  and MC is rising.

**(II) What will firm do when  $MC > MR$ :** In such situations profit fall, when firm goes beyond equilibrium point by producing an additional unit. This can be explained with the help of a diagram

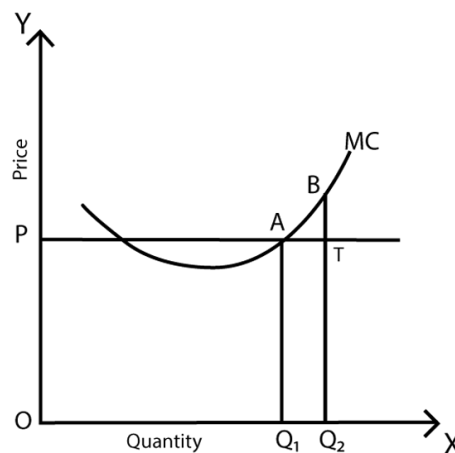


Fig 4: Equilibrium of Firm under Perfect Competition (When  $MC > MR$ )

MR = equal to area of Q1Q2TA

MC= equal to area of Q1Q2BA

MC is more than MR, which is indicated by the area ABT. Area of ABT reflects loss of a firm with production of an additional unit of output. Here TVC exceeds TR by area of ATB. Therefore, gross profit will reduce. A rational producer would prefer to produce at such point which can give maximum profit but here firm's gross profit ( $TR - TVC$ ) is shrinking. So firm will reduce its production of output.

## 6. Short Run Equilibrium of the firm under Perfect Competition

The equilibrium of the firm in the short run can be studied in three circumstances i.e. when the firm earns supernormal profit, when it earns normal profit and when it incurs loss.

### (1) Super Normal Profits

A firm is in equilibrium when its marginal cost is equal to marginal revenue ( $MC = MR$ ) and marginal cost curve cuts marginal revenue curve from below. A firm in equilibrium earns supernormal profit when average revenue (price per unit) determined by the industry is more than its average cost. This situation is shown in fig 5.

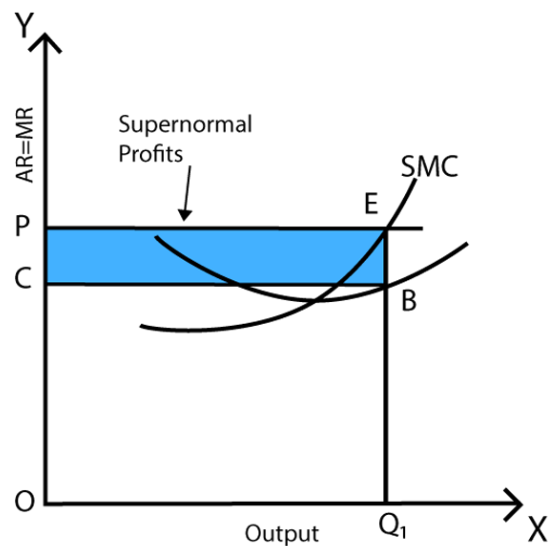


Fig 5: Supernormal Profit of the Firm under Perfect Competition

In this figure 5, output of the firm is shown on OX-axis and Cost/Revenue on OY-axis. MC is marginal cost and AC is average cost curve. Price line is both average revenue and marginal revenue curve, because under perfect competition  $AR=MR$ . Suppose, OP is the price determined by the industry. At this price, firm's equilibrium will be at point E, where marginal cost is equal to marginal revenue and marginal cost curve cuts marginal revenue curve from below.

Equilibrium output is  $OQ_1$ . At this output Average Revenue =  $EQ_1$  and Average Cost =  $BQ_1$ . Since,  $AR > AC$ , firm is earning  $EB$  super normal profit per unit of output. Total super normal profit of the firm is  $BC \times EB = EBCP$  (the shaded area). Thus, firm will be in equilibrium at point  $E$  and produce  $OM$  output at  $OP$  price. At this output, it will be earning  $EBCP$  super normal profit.

## (2) Normal Profits

Normal profits is the minimum profit which is required by the firm to sustain itself. Thus, a firm in equilibrium earns normal profits when its average cost ( $AC$ ) is equal to the price ( $AR$ ) determined by the industry, i.e.  $AC = AR$ .

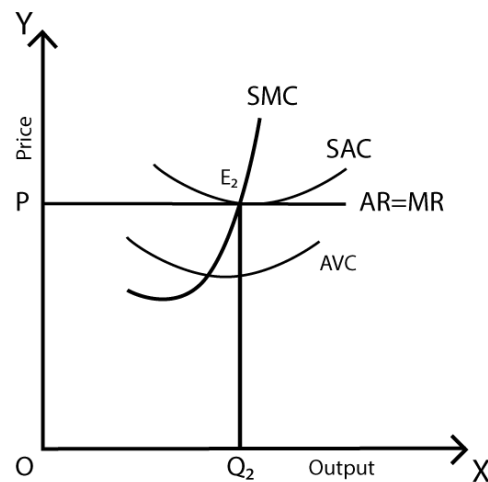


Fig 6: Normal Profit of the Firm under Perfect Competition

This is shown in fig. 6. At  $OP$  price, which is determined by the industry, firm's equilibrium is at point  $E$  and  $OQ_2$  is the equilibrium output. At point  $E_2$ , marginal cost and marginal revenue are equal and marginal cost curve cuts marginal revenue curve from below. The firm earns normal profits at  $OQ_2$  output because at this output it's  $MC = MR = AR = AC$ . In other words, average cost and price per unit (average revenue) are equal. This point is also known as break-even point.

### (3) Loss

This situation occurs when the price set by the industry just covers the average variable cost. As long as price (AR) is more than or equal to average variable cost (AVC), the firm will continue its production. Thus, the price covers only the operational cost of the firm while it bears losses in terms of covering its fixed cost. Any fall in price below this level will lead to shutting down of the firm.

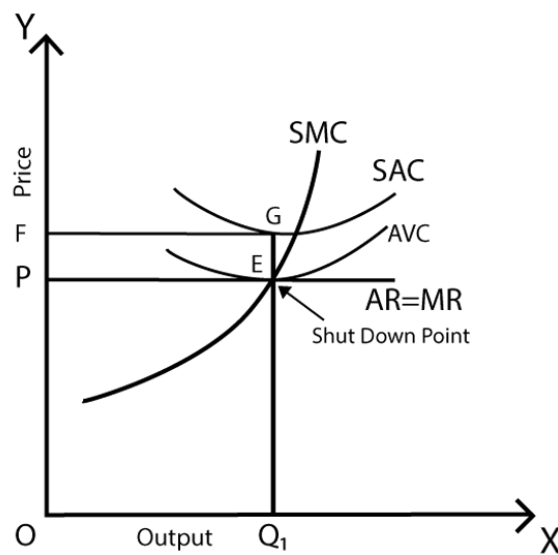


Figure 7: Shut down point of the Firm under Perfect Competition

In fig. 7, at price  $OP$ , firm is equilibrium at point  $E$  with  $OQ_1$  as the equilibrium level of output. However, at point  $E$ , the firm is only able to cover its variable cost. Any fall in price beyond this level of output will lead to shut down of the firm. Thus, a firm in equilibrium in the short period will continue its production as long as its losses are minimum and are confined to its fixed costs only, i.e. the price covers at least the average variable cost. Thus, shutdown price is the price below which the firm chooses not to produce.

## 7. Long Run Equilibrium of the Firm under Perfect Competition

In short run, it is not possible for the firms to enter or exit from the industry. Therefore, firms may come across any of the five situations namely supernormal profit, normal profit, minimum loss, maximum loss or shut down. However, in long run, there is enough time for the firms to enter or exit from the industry depending upon the profitability of the industry.

In long run, the firm will be making only normal profit. The point of equilibrium lies at the point of tangency between price and average cost curve. Look at the diagram below:

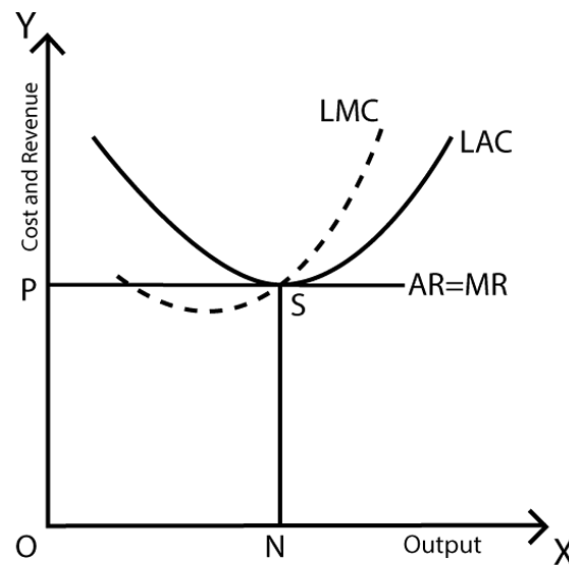


Fig 8: Long Run Equilibrium of the Firm under Perfect Competition

Due to free entry and exit of the firm, any possibility of supernormal profit or loss does not exist in long run.

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### **Effect of free Entry and Exit**

**(i) In case of abnormal profit:** Suppose market price is high enough such that the firms are making abnormal profit. This situation will attract new firms to enter the industry. With new firms entering the industry, the supply of the product will increase leading to fall in the price of the product. With the fall in the price of the product, the profit of the firm will fall down. This process will continue till abnormal profits are completely used off. Hence, free entry will push down the long period price to the minimum point of AC curve.

**(ii) In case of abnormal loss:** If the firms are incurring losses at the existing price, some existing inefficient firms will quit (leave) the industry. Less number of firms in the industry will mean less supply (output) and consequently there will be rise in the price of the product. This process of quitting the industry by firms will continue till there are no abnormal losses.

Thus, the effect of free entry and exit of firms will be zero profit in the long run. Thus, the equilibrium of the firm in the long run will be at the point of tangency between Price and average cost curve such that the firms only makes normal profit.

### **8. Summary**

The total receipt of the seller, from the sale of his/her product, is termed as Revenue. Total revenue is defined as the amount received by the seller from the sale of his products. It can be estimated by multiplying the quantity sold by the price of the commodity. Average revenue is defined as the per unit revenue received by the seller from the sale of his products. It can be estimated by dividing total revenue earned by the producer from the units of the commodity sold. AR curve represents the demand curve for the firm. Marginal revenue is defined as the revenue earned by the producer from the sale of one additional unit of commodity. In other words, marginal revenue may be defined as the change in total revenue due to change in one unit of the commodity sold.

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Normal Profit signifies the situation when total revenue is equal to total cost or average revenue is equal to average cost. Producer's equilibrium signifies a situation of profit maximisation. A producer chooses that level of output that maximises his/her profit. Producer is in equilibrium when  $MC = MR$ , and MC must cut MR from below.

The firm in short run earns supernormal profit, normal profit and loss while in long run, due to freedom of entry and exit, the firm earns only normal profit.