Managerial Economics

M.Com. IVth Sem.
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Market Structure – Perfect Competition

Objectives

After studying this unit, you will be able to:

- State the assumptions of perfect competition
- Discuss the price and output determination under perfect competition

Introduction

The function of a market is to enable an exchange of goods and services to take place. A market is any organisation whereby buyers and sellers of a good are kept in close touch with each other. It is precisely in this context that a market has four basic components (i) consumers (ii) sellers (iii) a commodity (iv) a price. Price determination is one of the most crucial aspects in microeconomics. Business managers are expected to make perfect decision based on their knowledge and judgment. Since every economic activity in the market is measured as per price, it is important to know the concepts and theories related to pricing under various market forms.

Perfect competition is a market structure characterised by a complete absence of rivalry among the individual firms. Thus, perfect competition in economic theory has a meaning diametrically opposite to the everyday use of this term. In practice, businessmen use the world competition as synonymous to rivalry. In theory, perfect competition implies no rivalry among firms.
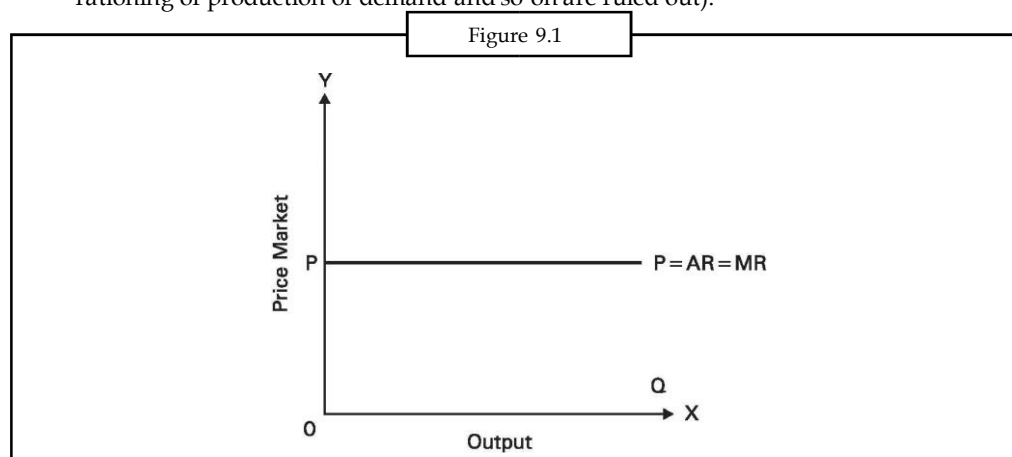
9.1 Assumptions of Perfect Competition

In a perfectly competitive market structure there is a large number of buyers and sellers of the product and each seller and buyer is too small in relation to the market to be able to affect the price of the product by his or her own actions. This means that a change in the output of a single firm will not perceptibly affect the market price of the product. Similarly, each buyer of the product is too small to be able to extract from the seller such things as quantity discounts and special terms.

The model of perfect competition is based on the following assumptions:

1. Large numbers of sellers and buyers: The industry in perfect competition includes a large number of firms (and buyers). Each individual firm, however large, supplies only a small part of the total quantity offered in the market. The buyers are also numerous so that no monopolistic power can affect the working of the market. Under these conditions each firm alone cannot affect the price in the market by changing its output.

2. Product homogeneity: The technical characteristics of the product as well as the services associated with its sale and delivery is identical. There is no way in which a buyer could differentiate among the products of different firms. If the products were differentiated the firm would have some discretion in setting its price. This is ruled out in perfect competition.

The assumption of large number of sellers and of product homogeneity implies that the individual firm in pure competition is a price-taker: its demand curve is infinitely elastic, indicating that the firm can sell any amount of output at the prevailing market price.

3. Free entry and exit of firms: There is no barrier to entry or exit from the industry. Entry or exit may take time but firms have freedom of movement in and out of the industry. If barriers exist, the number of firms in the industry may be reduced so that each one of them may acquire power to affect the price in the market.

4. Profit maximisation: The goal of all firms is profit maximisation. No other goals are pursued.

5. No government regulation: There is no government intervention in the market (tariffs, subsidies, rationing of production or demand and so on are ruled out).

Figure 9.1

The above assumptions are sufficient for the firm to be a price-taker and have an infinitely elastic demand curve. The market structure in which the above assumptions are fulfilled is called pure competition. It is different from perfect competition, which requires the fulfilment of the following additional assumptions.

6. Perfect mobility of factors of production: The factors of production are free to move from one firm to another throughout the economy. It is also assumed that workers can move between different jobs. Finally, raw materials and other factors are not monopolised and labour is not organised.

7. Perfect knowledge: It is assumed that all the sellers and buyers have complete knowledge of the conditions of the market. This knowledge refers not only to the prevailing conditions in the current period but in all future periods as well. Information is free and cost less.

Market Condition

The assumptions of perfect competition imply that a particular relationship exists between the firm and its market.

Figure 9.2(a) shows the market demand curve for a product. It shows the total amount of this product demanded by consumers at different prices. It is a normal downward sloping demand curve showing that for the industry as a whole quantity demanded increases as price falls.
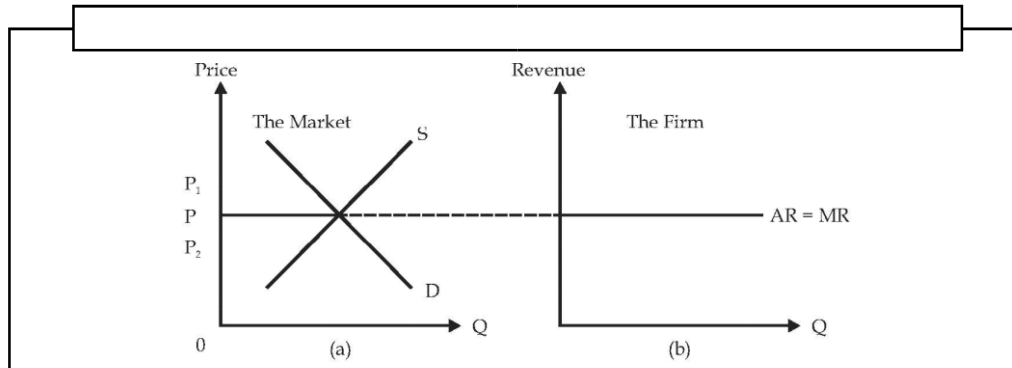

Figure 9.2: Relationship between the Market and the Firm in Perfect Competition

Figure 9.2(b) shows the seller perceived demand curve which is horizontal, i.e., it is perfectly elastic demand with respect to price. It hits the vertical axis at the current market price, P. Two factors are stopping the producer from charging a price such as P_1, which is higher than P-perfect knowledge and homogeneous product. If a higher price is charged, customers would know immediately that a lower price is available elsewhere, and that the product for sale at the lower price is a perfect substitute for the more expensive product. The producer is also not undercutting its rivals and charging a price, P_2 which is lower than P. The firm's output is small compared to the industry as a whole and so its entire output can be sold at the current market price of P. At a price lower than P the firm would not maximise its profit. Thus, over any feasible range of output, the demand curve for the product of the individual firm is perceived to be horizontal.

Notes   Equilibrium of the Firm

Firms aim to maximise profit and they can be in equilibrium only when they achieve this. For all firms, profit maximisation is achieved when marginal revenue, (MR), equals marginal cost (MC). If MR>MC, the firm adds more to revenue than it does to costs by increasing output and sales. When this happens profits will rise. On the other hand, if MR<MC, the firm adds more to costs than it does to revenue by expanding output and sales. When this happens profits will fall. It follows thus, that the firm is in equilibrium when MC=MR.

Equilibrium of the Industry

The industry is in long run equilibrium when a price is reached at which all firms are in equilibrium (producing at the minimum point of their LAC curve and making just normal profits). Under these conditions there is no further entry or exit of firms in the industry, given the technology and factor prices. At the market price P, the firms produce at their minimum cost, earning just normal profits. The firm is in equilibrium because at the level of output Q

      LMC = SMC= P = MR

This equality ensures that the firm maximises its profit.

At the price P, the industry is in equilibrium because profits are normal and all costs are covered so that there are no incentives for entry or exit.

9.2 Price and Output Determination under Perfect Competitive Firm

9.2.1 Short Run Analysis of a Perfectly Competitive Firm

The aim of a firm is to maximise profits. In the short run some inputs are fixed and these give rise to fixed costs which have to be incurred whether the firm produces or not. Thus, it pays for the firm to stay in business in the short run even if it incurs losses. Thus, the best level of output of the firm in the short run is the one at which the firm maximises profits or minimises losses.

This is possible when the marginal revenue (MR) of the firm equals its short run marginal cost (MC). As long as MR exceeds MC, it pays for the firm to expand output because by doing so the firm would add more to its total revenue than to its total costs. On the other hand, as long as MC exceeds MR, it pays for the firm to reduce output because by doing so the firm will reduce its total cost more than its total revenue. Thus, the best level of output of any firm is the one at which MR=MC.

⚠️

Caution Since, a perfectly competitive firm faces a horizontal or infinitely, elastic demand curve, P=MR, so that the condition for the best level of output can be restated as one of which P=MR =MC. This can be seen in figure diagrammatically and with calculus as follows.

A firm usually wants to produce the output that maximises its total profits. Total profits (T) are equal to total revenue (TR) minus total costs (TC). That is,

$$\pi = TR–TC \quad\quad\quad ....\,(1)$$

where TR and TC are all functions of output (Q).

Taking the first derivative of p with respect to Q and setting it equal to zero gives

$$\frac{d\pi}{dQ} = \frac{d(TR)}{dQ} - \frac{d(TC)}{dQ} = 0 \quad\quad\quad ....(2)$$

so that

$$\frac{d(TR)}{dQ} = \frac{d(TC)}{dQ} \quad\quad\quad .....(3)$$

Equation (3) indicates that in order to maximise profits, a firm produces where marginal revenue (MR) equals marginal cost (MC). Since for a perfectly competitive firm, P is constant and TR = (P).(Q) so that

$$\frac{d(TR)}{dQ} = MR = P$$

the first order condition for profit maximisation for a perfectly competitive firm becomes P = MR = MC.

The second order condition for profit maximisation requires that the second derivative of p with respect to Q be negative. That is

$$\frac{d^2\pi}{dQ^2} = \frac{d^2(TR)}{dQ^2} - \frac{d^2(TC)}{dQ^2} < 0 \qquad \qquad \dots(4)$$

$$\frac{d^2(TR)}{dQ^2} < d^2(TC)/dQ^2 \qquad \qquad \dots(5)$$

According to equation (5) the algebraic value of the slope of the MC function must be greater than the algebraic value of the MR function. Under perfect competition, MR is constant (MR curve is horizontal). So that equation (5) requires that the MC curve be rising at the point where MR=MC for the firm to maximise its total profits.

The top panel of Figure 9.3 shows d which is the demand curve for the output of a perfectly competitive firm. The marginal cost cuts the SATC at its minimum point. The firm is in equilibrium (maximises its profits) at the level of output defined by the intersection of the MC and the MR curves (point E in Figure 9.3). To the left of E profit has not reached its maximum level because each unit of output to the left of X_e brings revenue greater than its marginal cost. To the right of X_e each additional unit of output costs more than the revenue earned by its sale so that a loss is made and total profit is reduced.


Figure 9.3
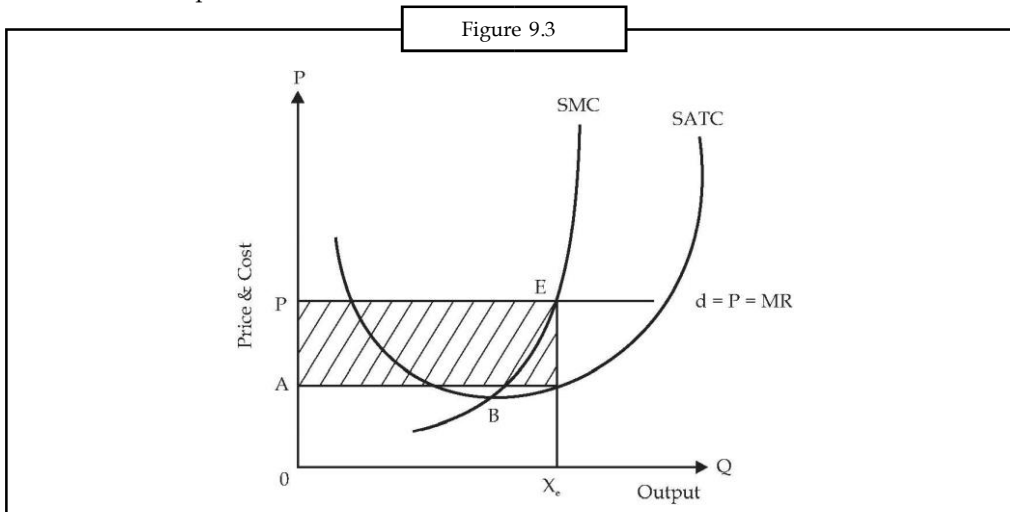
The fact that a firm is in short run equilibrium does not necessarily mean that it makes excess profits – whether the firm makes excess profits or losses depends on the level of the ATC at the short run equilibrium. If the ATC is below the price at equilibrium (Figure 9.4), the firm earns excess (equal to the area PABE). If, however, the ATC is above the price (Figure 9.5), the firm makes a loss (equal to the area FPeC). In the latter case the firm will continue to produce only if it covers its variable costs. Otherwise it will close down, since by discontinuing its operations the firm is better off: it minimises its losses. The point at which the firm covers its variable costs is called "the closing down point". In Figure 9.6 the closing down point of the firm is denoted by point W. If price falls below P_w the firm does not cover its variable costs and is better off if it closes down.

Figure 9.4

Figure 9.5

Figure 9.6
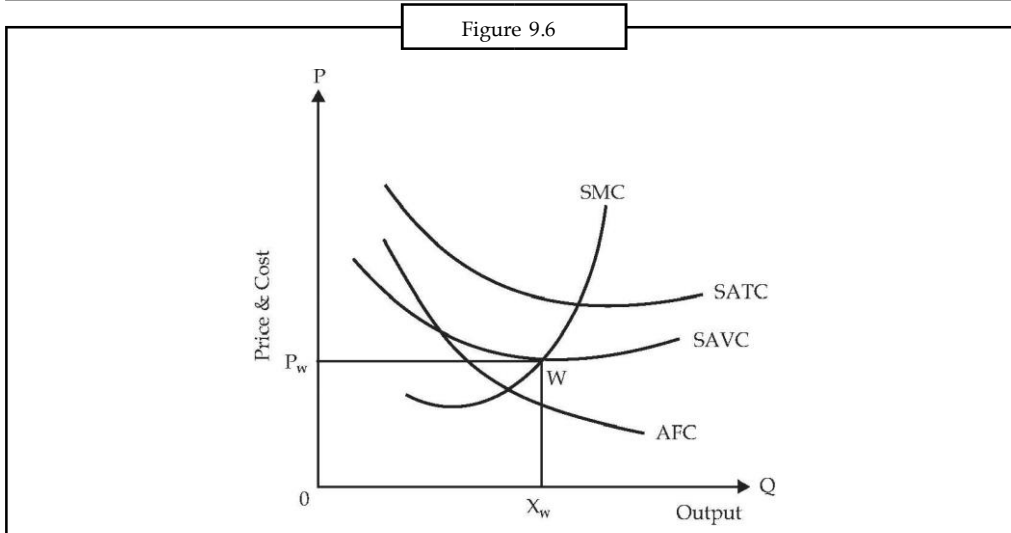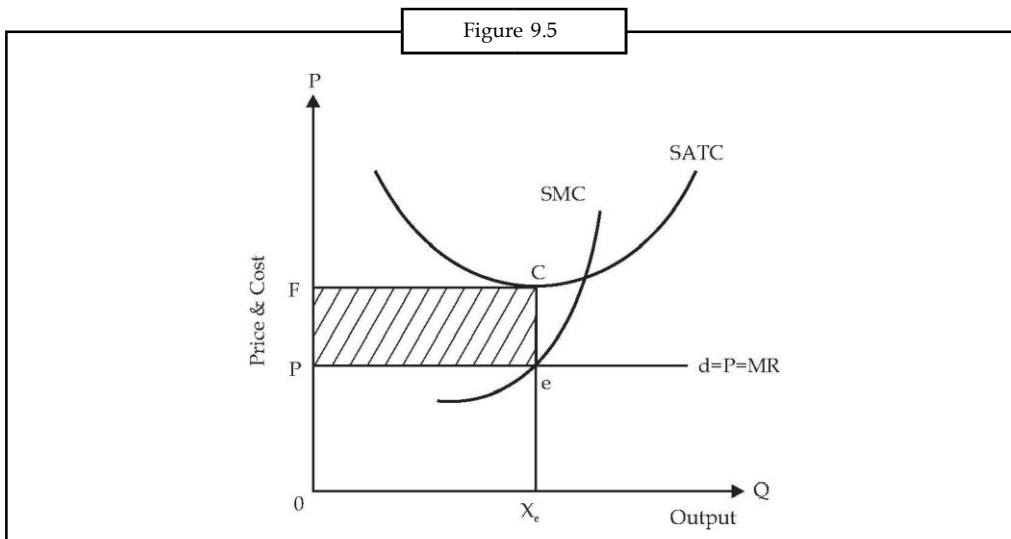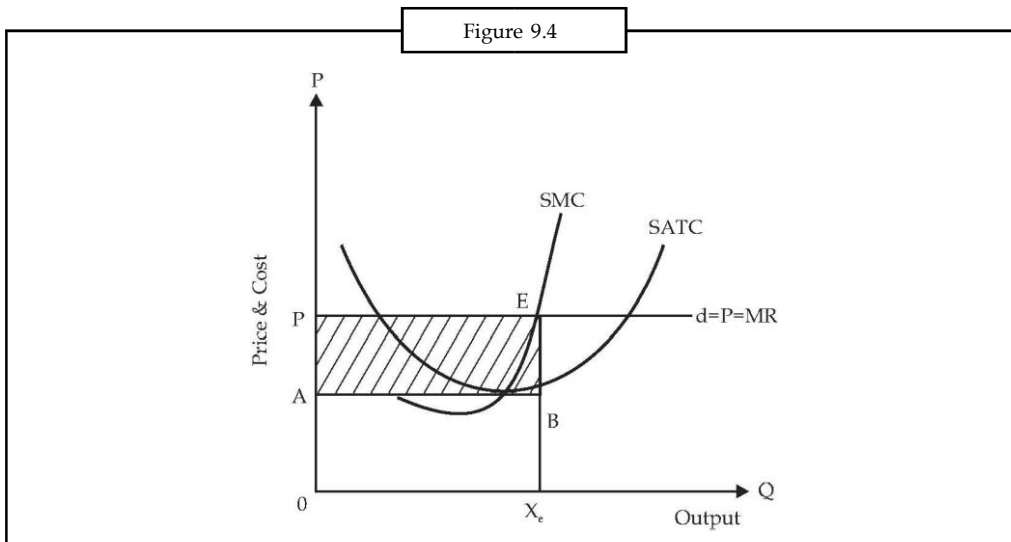
Did u know? All firms in the industry have the same minimum long run average cost. This, however, does not meant have all firms have the same efficiency.

9.2.2 Long Run Analysis of a Perfectly Competitive Firm

In the long run, all inputs and costs of production are variable and the firm can construct the optimum or most appropriate scale of plant to produce the best level of output. The best level of output is one at which price P=LMC equals the long run marginal cost (LMC) of the firm. The optimum scale of the plant is the one in which short run average total cost (SATC) curve is tangent to the long run average cost of the firm at the best level of output. If existing firms earn profits, however, more firms enter the market in the long run. This increases the market supply of the product and results in a lower product price until all profits are squeezed out. On the other hand, if firms in the market incur losses, some firms will leave the market in the long run. This reduces the market supply of the product until all firms remaining in the market just breakeven. Thus, when a competitive market is in long run equilibrium, all firms produce at the lowest point on their long run average cost (LAC) curve and break-even. This is shown by point E in Figure 9.7.

Figure 9.7
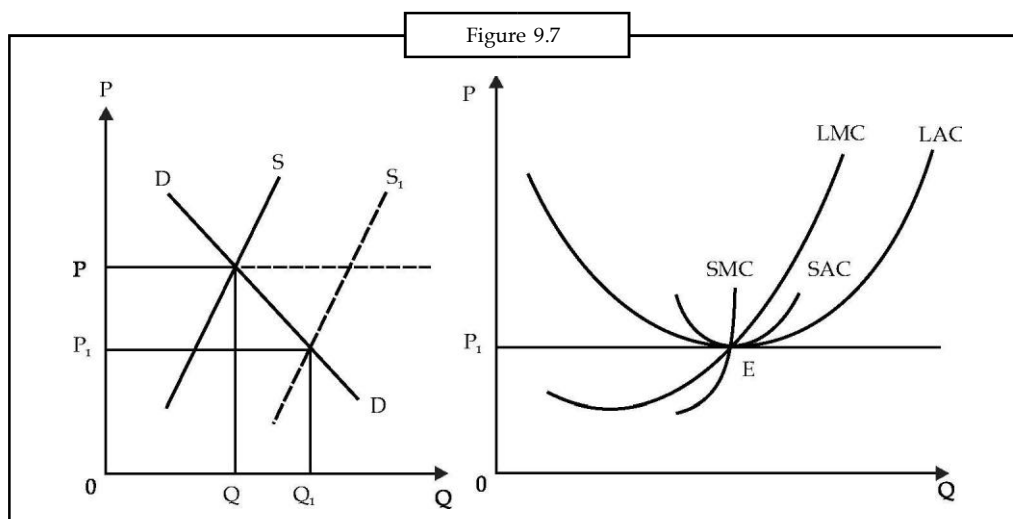
The condition for the long run equilibrium of the firm is that the marginal cost be equal to the price and to the long run average cost.

$$LMC = AC = P$$

At equilibrium the short run marginal cost is equal to the long run marginal cost and the short run average cost is equal to the long run average cost. Thus, given the above equilibrium condition, we have

$$SMC = LMC = LAC = SAC \; P = MR$$

This implies that at the minimum point of the LAC the corresponding (short run) plant is worked at its optimal capacity so that minimum of LAC and SAC coincide. On the other point, the LMC cuts the LAC at its minimum point and the SMC cuts the SAC at its minimum.

Example: For a firm operating in a perfectly competitive market, the following data are available

$$\text{Price } P = AR = MR = ₹20/\text{- unit}$$

Total cost function is $C = 8 + 17Q - 4Q^2 + Q^3$

Let us find out the profit maximising output and the maximum profit.

Marginal cost will be available if the first derivative of the total cost function is obtained. Thus,

$$MC = \frac{d(C)}{dQ} = 17 - 8Q + 3Q^2$$

Maximum profit will be earned when MC and MR are equal:

$$20 = 17 - 8Q + 3Q^2$$

Solving this equation gives two values for Q as –1/3 and 3. Obviously, negative output cannot be produced; hence at Q = 3, the firm will maximise profits. Total revenue will be ₹ 60 and total cost ₹ 50. The maximum profit at the output of 3 units is ₹ 10.

9.2.3 Shut-down Decision

The supply curve of a competitive firm is its marginal curve. It is that part of the marginal cost curve which is above the average variable cost curve.

At a price P, the firm is incurring a loss, but it does not shut down because of fixed costs (Figure 9.8). In the short run, a firm knows it must pay these fixed costs regardless of whether or not it produces. The firm only considers the costs it can save by stopping production and those costs are its variable costs. As long as a firm is covering its variable costs, it pays to keep on producing. It makes a smaller loss by producing. If it stopped producing, its loss would be the entire fixed costs.
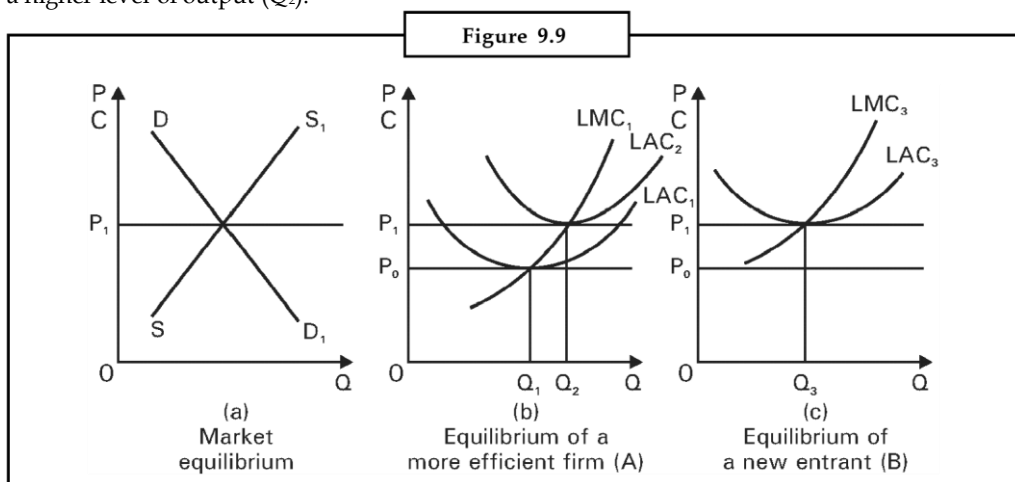

Figure 9.8
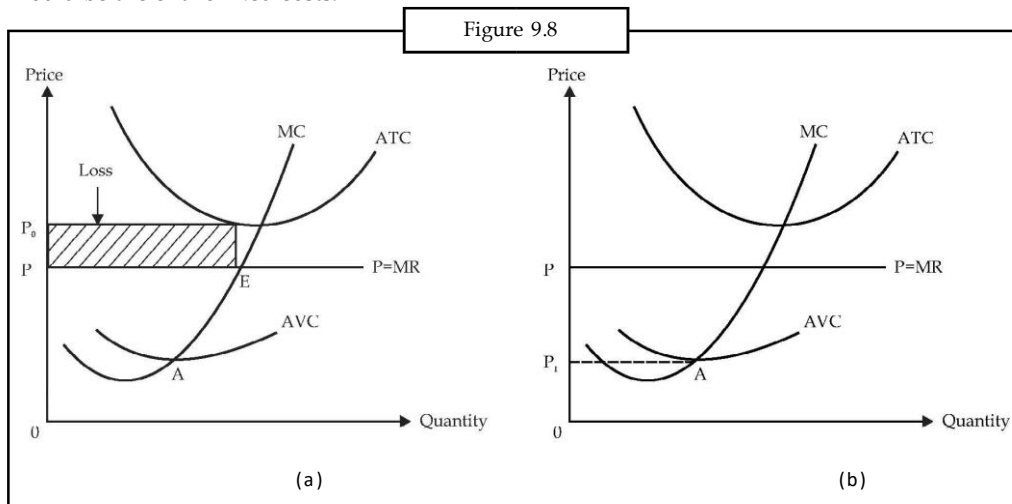
However, once the price falls below AVC it will pay to shut down (point A). In that case the firm's loss from producing temporarily and save the variable cost. Thus, the point at which MC = AVC is the shut-down point (that point at which the firm will gain more by temporarily shutting down than it will by staying in business. When price falls below the shut-down point, the average variable costs the firm can save by shutting down exceed the price it would get for selling the good. When price is above AVC, in the short run, a firm should keep on producing even though it is making a loss. As long as a firm's total revenue is covering its total variable cost, temporarily producing at a loss is the firm's best strategy because it is making less of a loss than it would make if it were to shut down.

9.2.4 Efficiency of a Firm

Since the price in the market is unique, this implies that all firms in the industry have the same minimum long run average cost. This, however, does not mean that all firms are of the same size or have the same efficiency, despite the fact that their LAC is the same in equilibrium. The more efficient firms employ more productive factors of production and/or able managers. These more efficient factors must be remunerated of their higher productivity, otherwise they will be bid off by the raw entrants in the industry. Or, as the price rises in the market the more efficient firms earn a rent which they must pay to their superior resources. Thus rents of more efficient factors become costs for the individual firm, and hence the LAC of the more efficient firm shifts upwards as the market price rises, even if the factor prices for the industry as a whole remain constant as the industry expands. In this situation, the LAC of the old, more efficient firms must be redrawn so as to be tangent at the higher market price. The LMC of the old firms is not affected by the rents occurring to its more productive factors. It will be shifted only if the prices of factors for the industry in general increase. Thus, the more efficient firms will be in equilibrium, producing that output at which the redrawn LAC is at its minimum (at which point the LAC is cut by the initial LMC given that factor prices remain constant). Under these conditions, with the superior, more productive resources properly costed at their opportunity cost, all firms have the same unit cost in their long run equilibrium.

In Figure 9.9, at the initial price P_0 the second firm was not in the industry as it could not cover its costs at that price. At the new price P_1, firm B enters the industry, making just normal profits. The established firm A earns rents which are imputed costs, so that its LAC shifts upward and it reaches a new long run equilibrium producing a higher level of output (Q_2).

Figure 9.9

(a)
Market
equilibrium

(b)
Equilibrium of a
more efficient firm (A)

(c)
Equilibrium of
a new entrant (B)

9.3 Supply and Demand Together

The following three conditions exhibit how adjustment is likely to take place in the firm and in the market under different situations.

Market Response to an Increase in Demand

Faced with an increase in demand which it sees as an increase in price and hence profits, a competitive firm will respond by increasing output (from A to B) in order to maximise profit (Figure 9.10). As all firms increase output and as new firms enter, price will fall until all profit is competed away. Thus the long run supply curve will be perfectly elastic as is S_{LR} in (a). The final equilibrium will be at the original price but a higher output. The original firms return to their original output (A) but since there are more firms in the market the market output increases to (C).
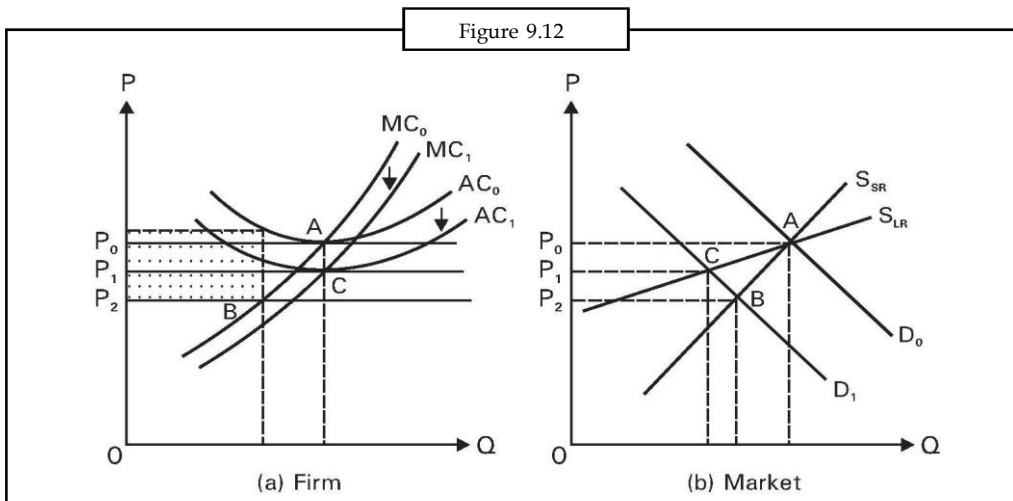

Figure 9.10

(a) Market

(b) Firm
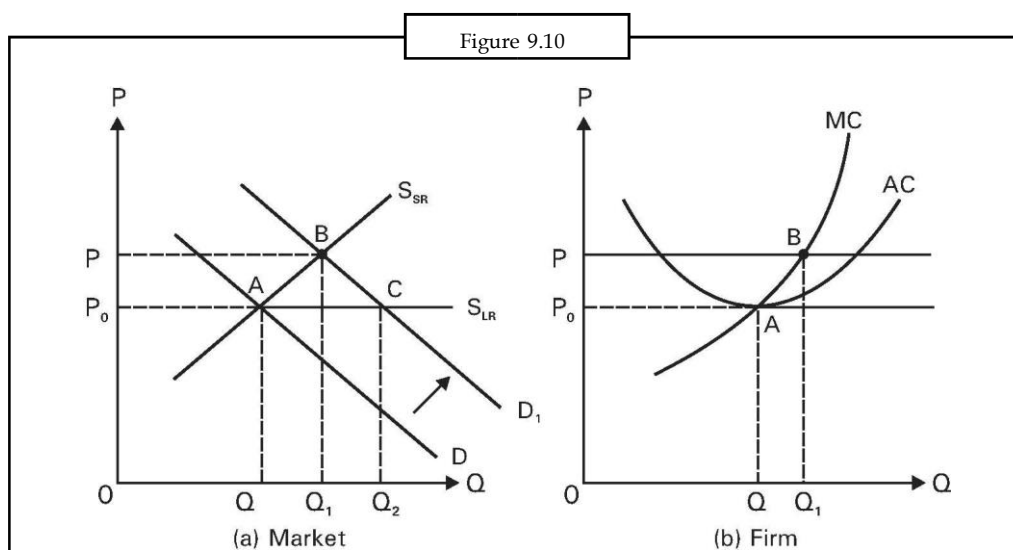
Market Response to a Technological Improvement

Figure 9.11

(a) Firm

(b) Market
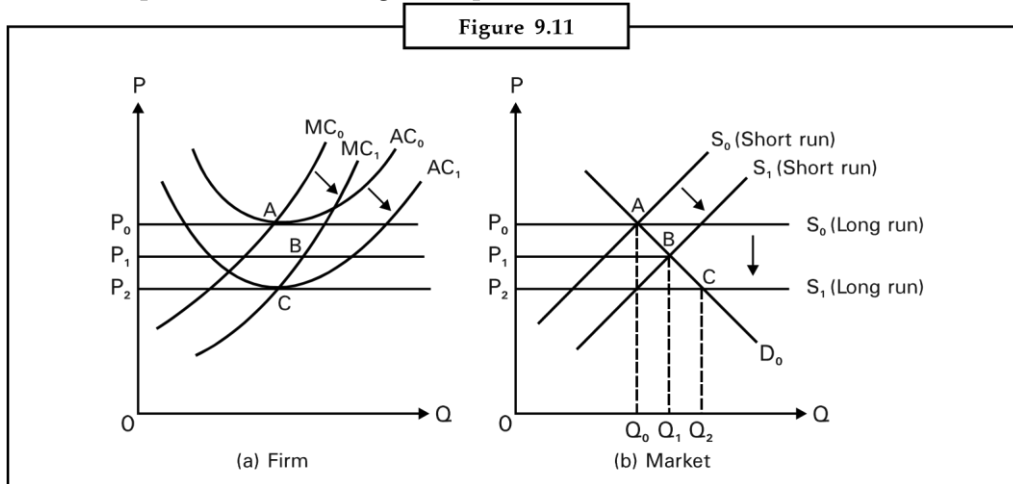
A technological improvement will shift AC and MC curves down, creating short run profits. As existing firms expand output and as new firms enter, these profits will be competed away until the price has once again fallen to equal average total costs (initially point B in the short run) and ultimately point C in the long run (Figure 9.11).

Market with Specialised Inputs Response to a Decrease in Demand

Figure 9.12

(a) Firm

(b) Market

Faced with a decrease in demand which it sees as fall in price and hence profit, a competitive firm will respond by decreasing output in order to minimise losses. Firm output and market output will fall. Figure 9.12 is the market response: as all firms decrease output, the demand for specialised inputs will fall, causing the firm's cost in (a) to fall from AC_0 to AC_1. The long run equilibrium price will be lower than the original price, and the long run supply curve S_{LR} will be upward sloping, rather than perfectly elastic.

9.4 Summary

- In theory, perfect competition implies no rivalry among firms.

- In a perfectly competitive market structure there is a large number of buyers and sellers of the product and the product is homogeneous.

- There is free mobility of factors of production and the buyers and sellers have perfect knowledge of the market.

- In the short run the best level of output of the firm is the one at which the firm maximises profits or minimises losses. This is possible at P = MR = MC. The point at which the firm covers its variable costs is called "the closing down point".

- In long run the best level of output is one at which price P=LMC. At equilibrium the short run marginal cost is equal to the long run marginal cost and the short run average cost is equal to the long run average cost. Thus, given the above equilibrium condition, we have SMC = LMC = LAC = SAC P = MR

9.5 Keywords

Equilibrium: Condition when the firm has no tendency either to increase or to contract its output.

Minimum price: Price at which the sellers refuse to supply the goods at all and store it with themselves.

Perfect competition: A market structure characterized by a complete absence of rivalry among the individual firms.

Profit: Difference between total revenue and total cost Market period: A very short period in which the supply is fixed, that is no adjustment can take place in supply conditions.

9.6 Self Assessment

1. State true or false for the following statements:

    (a)   In a perfect market there are large number of sellers.

    (b)   In a perfect market there is products differentiation.

    (c)   In a perfect market a change in the output of a single firm will affect the market price of the product.

    (d)   In perfect market, market agents are not fully aware of market.

    (e)   In a perfect market there is perfect mobility of resources.

    (f)   Under perfect competition the price curve and the marginal revenue curve are the same.

    (g)   Industry has no role in the determination of price under perfect competition.

    (h)   When the supply of a commodity decreases and its demand remains constant then it leads to decrease in price.

    (i)   For equilibrium MC curve should cut the MR curve from below.

2. Fill in the blanks:

    (a)   A perfectly competitive firm faces an .... elastic demand curve.

    (b)   The closing down point is at which the firm covers its .... cost.

    (c)   In the long run all costs are ....

    (d)   In the long run the best level of output is, where P = ...

    (e)   The LMC cuts the LAC at its .... point.

(f)   The .... LRS is generally a feature of rapid growth.

(g)   The .... of an industry might lead to a fall in prices of some of its input.

(h)   The factors of production are .... to move in perfect competition.

1. Answers: Self Assessment

1. (a)   True   (b)   False   (c)   False

    (d)   False   (e)   True   (f)   True

(g)   False   (h)   False   (i)   True

2. (a)   Infinitely   (b)   variable (c)   variable

    (d)   LMC   (e)   minimum   (f)   rising

(g)   expansion   (h)   free