17 Price and Output Determination Under Monopoly

CHAPTER OUTLINE

In the preceding chapter, we have explained price and output determination in a perfectly competitive market. In this chapter, we will explain how price and output are determined in a ***monopoly*** market. *Monopoly* is an extreme opposite of perfectly competitive market. In a perfectly competitive market, the number of sellers is so large that no single seller can influence the market price — all firms

are *price takers*. In contrast, in a monopoly market, there is a single seller who has an absolute power to determine the price of its product: a monopoly is a ***price maker***. In this chapter, we will discuss:

(a) meaning and sources of monopoly power,
(b) price and output determination in the short and long runs,
(c) price discrimination by a monopoly firm,
(d) comparison of price and output under monopoly and perfect competition,
(e) government control of monopolies, and
(f) measures of monopoly power.

17.1 MONOPOLY AND SOURCES OF MONOPOLY POWER

17.1.1 Definition and Features

The word monopoly has been derived from Greek word *monos*, meaning 'alone' and *polein* meaning 'seller'. By definition, *monopoly is market situation in which there is a single seller of a commodity of 'lasting distinction' without close substitutes.*[1] A monopoly firm enjoys an absolute power to produce and sell a commodity. This, however, does not mean that a monopoly firm is absolutely free from any kind of competition. Monopoly firms too, have to face *indirect competition*, especially in regard to setting the price of the product. There are at least ***two potential sources of indirect competition***.

One potential source of indirect competition is the rivalry between monopoly good and other goods produced by other monopolies and competitive firms, for claiming a considerable share in consumers' budget. Therefore, a monopolist cannot charge any price for its product. For example, Delhi Vidyut Board (DVB), a public sector electricity producing and supplying company is at present a monopolist in Delhi. When it is privatized (which it is likely to be), it will have to take into account in its pricing policy, not only its cost of production and distribution, but also what people can afford after meeting such essential needs as food, clothing, shelter, education and medicine.

The *second* source of potential indirect competition comes from the availability and price of *inferior substitutes*. For example, consider again the case of DVB. In its pricing policy, DVB will have to take into account the availability and price of other sources of energy for lighting, cooking and cooling, e.g., diesel operated generator sets, cooking gas, etc. These substitutes are not close substitutes but their availability at a relatively lower price is in all probability likely to influence the pricing strategy of the DVB. Similarly, the Mahanager Telephone Nigam Limited (Delhi) still a monopolist in telecommunications, is facing competition from the cellphone companies: its monopoly power is considerably eroded. So is the case with Delhi Transport Corporation with increasing number of private operators of charted buses.

Given these problems confronting the monopolies, one can hardly find many cases of a ***pure*** or ***absolute monopolies***. However, notwithstanding these problems in defining an absolute monopoly firm, the discussion on price and output determination under monopoly confines, in general, to the case of a ***pure monopoly***, i.e., a monopoly firm enjoying absolute power in determining the price and output of its product.

Finally, an ***important feature*** of a pure monopoly is that a monopolized industry is a single-firm industry, i.e., there is no distinction between the firm and the industry. Therefore, there is no distinction between market demand curve and monopoly firm's own demand curve, i.e., the demand curve for the monopoly firm's product is same as the market demand curve.

17.1.2 Sources and Kinds of Monopolies

The emergence and survival of monopoly is attributed to the factors which prevent the entry of other firms into the industry. The barriers to entry are, therefore, the sources of monopoly power. The major sources of barriers to entry are: (i) legal restrictions, (ii) sole control over the supply of certain scarce and key raw materials; (iii) efficiency; and (iv) patent rights. How these factors prevent the entry of new firms is described below.

(i) Legal restrictions. Some monopolies are created by law in public interets. Such monopolies may be created in both public and private sectors. Most of the **state monopolies** in the public utility sector, including postal, telegraph, and telephone services, generation and distribution of electricity, railways, airlines and state roadways, etc., are **public monopolies**. Such monopolies are created by the public law. The state may create monopolies in the private sector also through licence or patent. Such monopolies are intended to reduce cost of production by the economies of scale and investment in technical innovations. Such monopolies are also known as **franchise monopolies.**

(ii) Control over key raw materials. Some firms acquire monopoly power from their overtime control over certain scarce and key raw materials that are essential for the production of certain other goods, e.g., bauxite, graphite, diamond, etc. For instance, Aluminium Company of America had monopolised the aluminium industry before the World War II because it had acquired control over almost all sources of bauxite supply.[1] Such monopolies are often called **'raw material monopolies'**. The monopalies of this kind emerge also because of monopoly over certain specific technical knowledge or techniques of production.

(iii) Efficiency. A primary and technical reason for growth of monopolies is the economies of scale. In some industries, long-run minimum cost of production, i.e., the most efficient scale of production, coincides almost with the size of the market. In such industries or prodcuts, a large-size firm finds it profitable, in the long-run, to eliminate competition by cuttnig down its price for a short period. Once a monopoly is established, it becomes almost impossible for the new firms to enter the industry and survive. Monopolies born out of efficiency are known as ***natural monopolies***. A natural monopoly may emerge out of the technical conditions of efficiency or may be created by the law on efficiency grounds in public interest.

(iv) Patent rights. Another source of monopoly is the patent rights of the firm for a product or for a production process. Patent rights are granted by the government to a firm to produce a commodity of specified quality and character or to use a specified technique of production. Patent rights give a firm exclusive rights to produce the specified commodity or to use the specified technique of production. Such monopolies are called ***patent monopolies***.

17.2 REVENUE CURVES UNDER MONOPOLY

The cost curves—the *AC* and *MC* curves—faced by the monopoly firm are U-shaped, just as those faced by the firms under perfect competition. However, the demand or *AR* and *MR* curves that a monopoly firm faces are different from those faced by the firms under perfect competition. Therefore, before we discuss price and output determination and firm's equilibrium under monopoly, it will be useful to look into the nature of revenue curves faced by a monopoly firm.

As we have noted earlier, in a perfectly competitive market, there is dichotomy between the firm and the industry; firms face a horizontal, straight-line demand curve and industry faces a downward

1. C.E. Ferguson, *Microeconomic Theory*, 2nd Edn., p. 286.

sloping demand curve. Under monopoly, however, there is no distinction between the firm and the industry. *The monopoly industry is a single-firm-industry and industry demand curve has a negative slope.* A monopoly firm faces, therefore, a downward sloping demand curve—it may be a linear or a non-linear demand curve. It is important to note here that, given the demand curve, a monopoly firm has the option to choose between price to be charged or output to be sold. Once it chooses price, the demand for its output if fixed. Similarly, if the firm decides to sell a certain quantity of output, then its price is fixed—it cannot charge any other price inconsistent with the demand curve.

For example, suppose that the demand curve for a monopolised industry is given as *DM* in Fig. 17.1. Demand curve, *DM*, shows the quantities that can be sold at different prices. For instance, if monopoly firm chooses price *OP*, the quantity that it can sell at this price if fixed at *OQ*—no other quantity can be sold at this price. Similarly, if it decides to sell quantity *ON*, its price is fixed at *OP'*—it cannot sell *ON* output at a higher price. This means that if demand curve is given, the options of monopoly firm becomes limited—it can choose either price or quantity at a time, not a price and a quantity inconsistent with the demand curve.

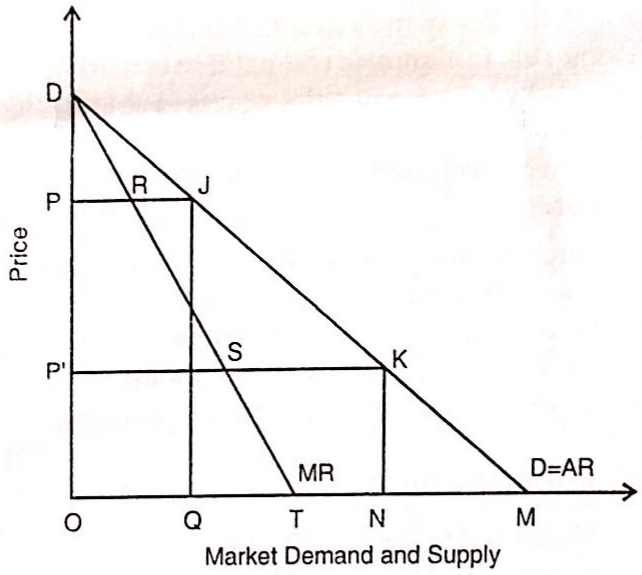

Fig. 17.1 AR and MR Curves for Monopoly

AR and MR Curves

Irrespective of the nature of the market, *AR* curve for a firm is the same as its demand curve. So is the case with a monopoly firm. Since a monopoly firm faces a downward sloping demand curve, its *AR* also slopes downward to the right. For example, the demand curve *DM* in Fig. 17.1 is the same as the firm's *AR* curve.

What is much more ***important*** in the analysis of equilibrium of a monopoly firm is the ***relationship between the AR and MR*** curves. As we have seen in the previous chapter, when price is fixed, as in case of perfect competition, firm's demand curve takes the form of a horizontal line. In that case, *AR* = *MR* and *MR* is a straight line too. But, in case of a monopoly firm, demand curve has a negative slope. Therefore, its *MR* curve too has a negative slope. There is, however, a ***specific relationship*** between *AR* and *MR*, i.e., *the slope of MR curve is twice that of that AR curve.* That is, given the linear demand function, marginal revenue curve is twice as steep as the average revenue curve.

This relationship can be proved as follows. Let us assume that a monopoly firm is faced with a price function[1] or average revenue function as

$$P = a - bQ \tag{17.1}$$

We know that $TR = Q \cdot P$

By substituting Eq. 17.1 for P, we get

$$TR = Q(a - bQ)$$
$$= aQ - bQ^2 \tag{17.2}$$

Since MR equals the first derivative of the TR function,

$$MR = \frac{\partial TR}{\partial Q} = \frac{\partial(aQ - bQ^2)}{\partial Q} = a - 2bQ \tag{17.3}$$

Note that the slope of the price function (17.1) equals b whereas the slope of the MR-function (17.3) equals $2b$, it means that the slope of the MR-function is *twice* that of the AR-function. It implies that MR curve is always to the left of AR curve and MR bisects the demand at all levels of price. For example, in Fig. 17.1, if price is OP, demand is PJ, and MR passes through point R which divides PJ in two equals parts. Geometrically, PR = RJ. Similarly, at price OM, demand equals $P'K = P'S + SK$ where P'S = SK. And, at P = 0, demand equals OM and $OT = TM = 1/2\,(OM)$.

17.3 SHORT-RUN EQUILIBRIUM OF THE MONOPOLY: PRICE AND OUTPUT DETERMINATION

According to the traditional theory of firm, a monopoly firm (or otherwise) is said to be in equilibrium where it maximises its profit. Maximisation of total profit is a matter of time. Therefore, as in case of perfect competition, equilibrium of a monopoly is studied under both ***short-run*** and ***long-run*** conditions. In this section, we will explain price and output determination under monopoly in the ***short-run***. The equilibrium of monopoly in the ***long-run*** will be discussed in the next section.

The ***short-run equilibrium of monopoly*** can be explained by two approaches:

(a) total revenue-total cost (TR-TC) approach, and
(b) marginal revenue-marginal cost (MR-MC) approach

The short-run equilibrium of monopoly is explained below by both the approaches—first by *TR*-TC approach and then by MR-MC approach.

17.3.1 Total Revenue-Total Cost Approach

According to the *total revenue-total cost* (TR-TC) approach, a profit maximising monopoly firm is in equilibrium at the level of output and price at which its TR – TC = *Total Porfit* is maximum. The equilibrium of monopoly by TR – TC approach is illustrated graphically in Fig. 17.2 under the following assumptions:

(i) The monopoly firm faces a *cubic TC function* of the form $TC = F + bQ - cQ^2 + dQ^3$ (where F = *fixed cost*), and
(ii) Its demand curve is given by a demand function of the form $Q = a - bP$.

When TC *function* is graphed, it produces a TC curve as shown in Fig. 17.2. From the demand function, we can derive a price function as $P = a/b - Q/b$. Using this price function, we can deriv

1. A price function can be derived directly from the demand function. (See Chapter 2, section 2.9).

monopoly's *TR function* as

$$TR = P.\,Q = (a/b - Q/b)\,Q$$
$$= aQ/b - Q^2/b$$
$$= \frac{aQ}{b} - \frac{Q^2}{b}$$
$$= \frac{1}{b}(aQ - Q^2)$$

The *TR function* when graphed produces a *TR* curve as shown in the figure. The *TC* curve shows monopoly's *total cost* at different level of output and *TR* curve shows its total revenue at different level of output and price. As Fig. 17.2 shows, the monopoly firm faces a loss till output OQ_1 and beyond output OQ_3. That is, monopoly's profitable range of output lies between OQ_1 and OQ_3 because it is only in this range of output that monopoly's *TR* > *TC*. Now a question arises: how to find the most profitable level of output?

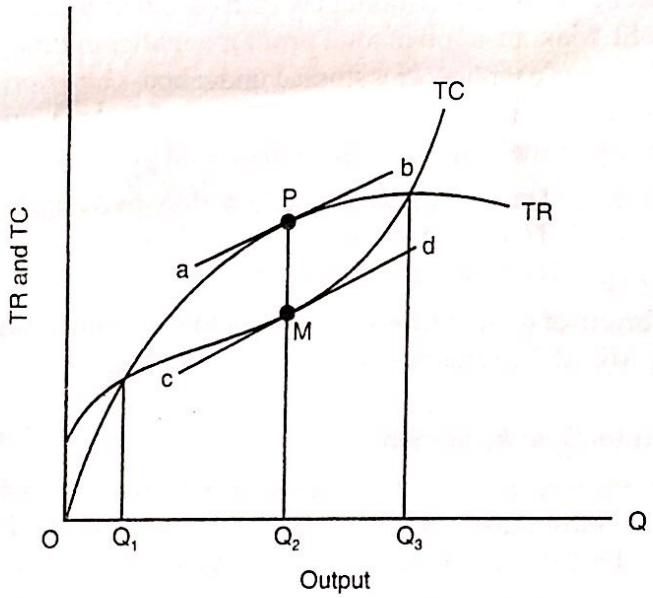

Fig. 17.2 Short-run Equilibrium of Monopoly: TR - TC Approach

It is obvious that total profit is maximum where the vertical difference between *TR* and *TC* curves is maximum. The maximum difference between the *TR* and *TC* curves can be obtained by a simple technique, i.e., by drawing *parallel tangents* to *TR* and *TC* curves as shown by the tangent *ab* and *cd*. Note that the line *ab* is tangent to the *TR* curve at point *P* and line *cd* is tangent to the *TC* curve at point *M* and line *ab* and *cd* are parallel. As a matter of rule, the vertical gap between tangential points *P* and *M* is maximum. That is, given the revenue and cost conditions, the monopoly firm can make a maximum profit of *PM*. A line drawn from point *P*, through point *M* to *X*-axis determines profit maximising output at OQ_2. It means that a profit maximising monopoly reaches its equilibrium at output OQ_2.

This equilibrium solution satisfies the necessary condition of profit maximization that profit is maximum where *MR* = *MC*. Recall that the slope of the *TR* curve gives $\partial TR/\partial Q = MR$ and the slope of the *TC* curve gives $\partial TC/\partial Q = MC$ at their respective points of tangency. Since tangents *ab* and *cd* are parallel, their slopes are equal. It means that at the tangential points, *MR* = *MC*. This satisfies the necessary condition of profit maximisation.

17.3.2 Marginal Revenue-Marginal Cost Approach

The equilibrium of the monopoly firm by *marginal revenue-marginal cost approach* is illustrated in Fig. 17.3. The short-run revenue curves of the monopoly firm are shown by the *AR* and *MR* curves and its short-run cost curves are shown by the *SAC* and *SMC* curves. The *AR* and *MR* curves, as shown in Fig. 17.3, can be derived from the *TR* function used in *TR-TC* approach. Similarly, *SAC* and *SMC* curves given in the figure can be derived from the *TC* function. Given the revenue and cost conditions and the profit maximisation rule, the equilibrium of the monopoly firm can easily be traced. Recall once again that profit is maximum where *MR* = *MC*. It can be seen in the figure that *MR* and *MC* curves intersect at point *N*. Note that point *N* satisfies both the conditions of profit maximisation: (i) *MR* = *MC*, and (ii) MC curve intersects MR curve from below. Point *N*, therefore, determines the equilibrium output and price. An ordinate drawn from point *N* to X-axis determines the profit maximising output at OQ. The ordinate NQ extended upward to the *AR* curve gives the price *PQ* at which output *OQ* can be disposed of, given the demand function. Thus, the *MR-MC* approach to monopoly equilibrium determines both equilibrium output and price simultaneously. No other output and price can increase the monopoly's profit.

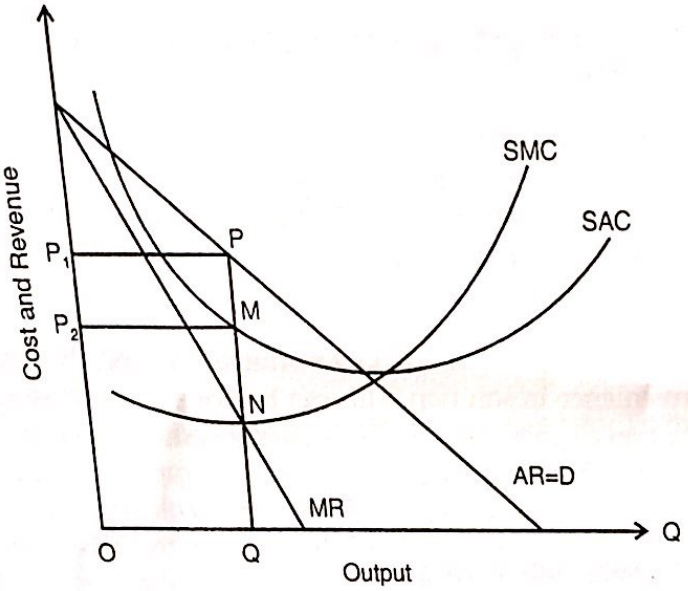

Fig. 17.3 Monopoly Equilibrium: MR-MC Approach

Once equilibrium price and output are determined, given the revenue and cost curve, the maximum monopoly profit can be easily determined as follows.

$$\text{Per unit monopoly profit} = AR - SAC$$
$$= PQ - MQ = PM$$

Given the equilibrium output OQ, total monopoly profit equals unit profit *PM* multiplied by the equilibrium output, OQ. That is,

$$\text{Total monopoly profit} = OQ \,.\, PM$$

Since $OQ = P_2M$, total monopoly profit at equilibrium can be written as

$$P_2M \,.\, PM = P_1PMP_2$$

The total monopoly profit is shown by the shaded area in the Fig. 17.3. Since cost and revenue conditions of the monopoly firm are supposed to be given, the monopoly equilibrium is supposed to be stable.

17.3.3 Algebra of Profit Maximization: A Numerical Illustration

Price and output determination by monopoly in the short-run has been discussed above theoretically by *TR-TC* and *MR-MC* approaches and illustrated graphically. Now we illustrate the determination of equilibrium price and output by a monopoly firm through a numerical example assuming hypothetical demand and cost functions.

Let us suppose that demand and total cost functions of a monopoly firm are given as follows.

Demand function : $Q = 100 - 0.2\,P$ (17.4)

Cost function : $TC = 50 + 20Q + Q^2$ (17.5)

The problem before the monopoly firm is to find the profit maximising output and price. The problem can be solved as follows.

We know that profit is maximum at an output which equalizes *MR* and *MC*. So the first step is to find *MR* and *MC* functions from the demand and cost functions, respectively. We have noted earlier that *MR* and *MC* are the first derivation of *TR* and *TC* functions, respectively. *TC* function is given, but *TR* function is not. So, let us find *TR* function first.

$$TR = P \,.\, Q$$

Since *TC* - function is expressed in terms of *Q*, *TR* - function too needs to be expressed in terms of *Q* for the purpose of convenience in solution. This can be done by converting demand function in Eq. (17.4) into a price function as given below. Given the demand function (17.4), price function can be derived (See Section 17.3.1) and written as

$$P = 500 - 5Q \tag{17.6}$$

Since $P = 500 - 5Q$, by substitution, we get

$$TR = (500 - 5Q)Q$$
$$TR = 500Q - 5Q^2 \tag{17.7}$$

Now *MR* function can be obtained by differentiating the *TR*-function given in Eq. (17.7).

$$MR = \frac{\partial TR}{\partial Q} = 500 - 10Q$$

Likewise, *MC* function can be obtained by differentiating the *TC* function given in Eq. (17.6).

$$MC = \frac{\partial TC}{\partial Q} = 20 + 2Q$$

Now that *MR* and *MC* functions are known, profit maximising output can be easily obtained. The profit maximising output can be obtained by equating the *MR* and *MC* functions given above and finding the solution as shown below.

$$MR = MC$$
$$500 - 10Q = 20 + 2Q$$
$$480 = 12Q$$
$$Q = 40$$

The output $Q = 40$ is the profit maximising output.

Now profit maximising price can be obtained by substituting 40 for *Q* in the price function.

Thus,

$$P = 500 - 5\,(40)$$
$$= 300$$

Profit maximising price is Rs 300.

Given the price, total profit (π) can be obtained by using *TR-TC* approach as follows.

$$\pi = TR - TC$$

By substitution, we get

$$\pi = 500Q - 5Q^2 - (50 + 20Q + Q^2)$$
$$= 500Q - 5Q^2 - 50 - 20Q - Q^2$$

By substituting profit maximising output (40) for Q, we get

$$\pi = 500(40) - 5(40)(40) - 50 - 20(40) - (40 \times 40)$$
$$= 20,000 - 8,000 - 50 - 800 - 1600$$
$$= 9,550$$

Thus, the maximum profit is Rs 9,550. No other output and price can increase firm's profit.

17.3.4 Does a Monopoly Firm Always Make Pure Profit?

There is no certainty that a monopoly firm will always earn a pure or supernormal profit. Whether a monopoly firm earns supernormal profit or normal profit or incurs loss depends on (i) its cost and revenue conditions; (ii) threat from potential competition; and (iii) government policy in respect of monopoly. If a monopoly firm operates at the level of output where *MR* = *MC*, its profit depends on the relative levels of *AR* and *AC*. Given the level of output, there are three possibilities:

(i) if AR > AC, there is economic profit for the firms,
(ii) if AR = AC, the firm earns only normal profit, and
(iii) if AR < AC, the firm makes losses: a theoretical possibility in the short run.

Two Common Misconceptions

There are two common misconceptions about monopolies: (i) monopolies always make profits, and (ii) they can charge any price arbitratily. These misconceptions must be clarified before we proceed to discuss other related issues.

(a) A monopoly does not necessarily make profit in the short-run. There is no guarantee that a monopoly firm will always make profits in the short-run. In fact, as noted above, whether a monopoly makes profit or loss in the short-run depends on its revenue and cost conditions. It is quite likely that its SAC curve lies above its *AR* curve as shown in Fig. 17.4. At profit maximising output (*OQ*), *SAC* exceed *AR* by PM. The monopoly firm therefore, makes losses to the extent of $PM \times OQ = P_2MPP_1$ in the short-run. The firm may yet survive in the short run, in the hope of making profits in the long-run when economics of scale become available to the firm and it does happen. The monopoly firm will however stick to the profit maximisation rule (i.e. *MR* = *MC*) in order to minimise its losses in the short run. Furthermore, if monopoly firm operates in the short-run at a level of output where its MR = SMC and AR = SAC, it makes just normal profits like a competitive firm in the long run.

(b) Monopolies cannot charge an arbitrary price. Another common misconception about monopoly is that a monopoly firm, by virtue of being a single seller of a commodity, can charge *any* price or an exhorbitantly high price for its product. In fact, the demand curve faced by a monopolist, is also the industry's demand curve. And, most market demand curves are negatively sloped, being highly elastic in the region of upper half and highly inelastic in the lower half. As shown in Fig. 17.5, point M marks the mid-point of the demand curve PQ. As proved earlier, at mid-point of the demand curve, i.e., at point M, $e = 1$. Over the upper half of the demand curve, $e > 1$; and over its lower half, $e < 1$. (For proof, see Chapter 4, Section 1.3). Therefore, a monopoly firm cannot charge any price. If it does so, it will do so at the cost of revenue and profit.

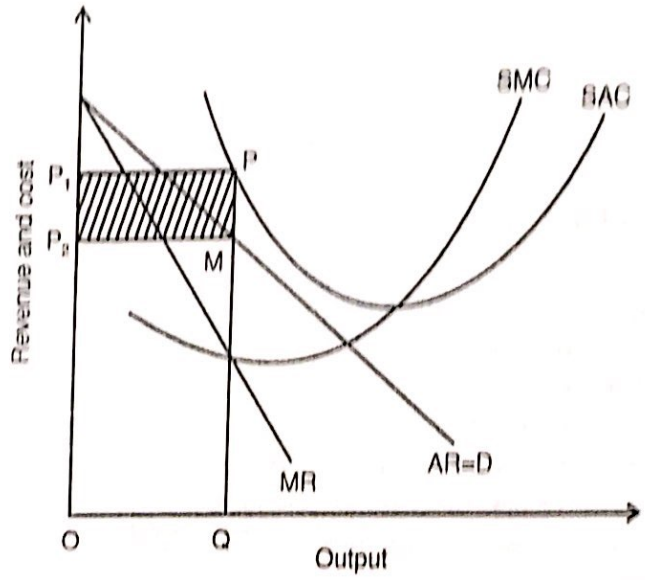

Fig. 17.4 Monopoly Equilibrium in the Short-Run: Losses

Where will the monopoly firm fix its price? This question has already been answered in Sections 17.3.2 and 17.3.3. Here we answer this question without udsing cost curves. To answer this question in the absence of cost curves, a convenient starting point is point M on the AR curve in Fig. 17.5. Let the firm set its price at MN. At this price, $e = 1$, and $MR = 0$. It means that for profit to be maximum, MC must be equal to zero. It follows that if $AR < MN$, MR will be negative. And then the firm's MC must be less than 0 for its profit to be maximum. This is an impossibility, unless the government subidises the monopoly to the extent of its loss. It may, thus, be concluded that no price less than MN will maximise monopoly's profit. So any price less than MN is ruled out. In fact, the point on the demand curve where $e = 1$ is the lower limit of price of a profit maximising monopoly.

Can a monopoly firm set any price between points P and M? The answer is 'no'. The range of demand curve between points P and M, no doubt, marks the profitable range of prices. But any price in this range will not maximise monopoly's profit. To find the exact (profit maximizing) price,

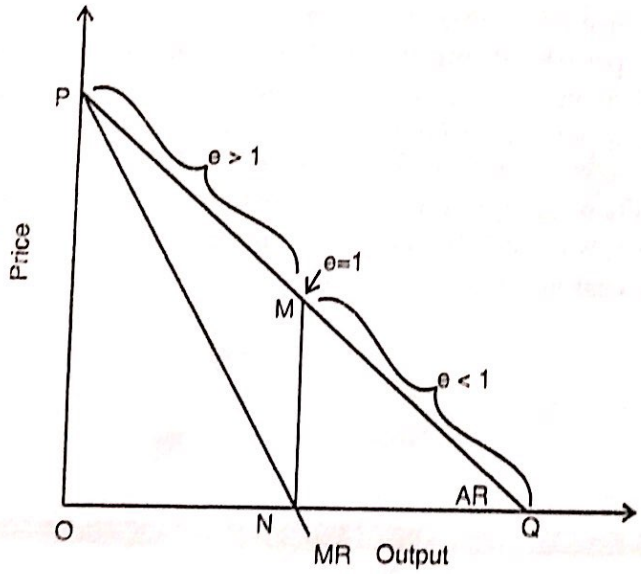

Fig. 17.5 Demand Elasticity and Monopoly Pricing

(*e*) of demand for its product, it can easily find out its profit-maximising price using the relationship between *AR* and *MR*. Suppose firm's *MC* = 4 and elasticity of its demand curve $e = -2$. Given these variables, the profit maximising price can be obtained as follows.

Profit is maximum where

$$MC = MR$$

Since *MC* = 4, at equilibrium, *MR* must be equal to 4, i.e.,

$$MC = 4 = MR$$

We know that

$$MR = P\left(1 - \frac{1}{e}\right)$$

Since $MC = 4 = MR$, and $e = -2$, by substitution, we get

$$4 = P\left(1 - \frac{1}{2}\right)$$

or

$$P = 4 / \left(1 - \frac{1}{2}\right)$$

$$P = 8$$

Thus, *under the given conditions*, profit-maximising price = 8. Note that if *MR* is known, *MC* can be found out, and if *P* and *e* are known, *MC* and *MR* can be worked out for the equilibrium output.

17.4 THERE IS NO SUPPLY CURVE UNDER MONOPOLY

In chapter 16 (section 16.4), we have shown the derivation of supply curve of a firm under perfect competition. In this section, we will answer the question whether there exists a supply curve under monopoly. As mentioned earlier, economists believe that, ***there is no unique or precise supply curve under monopoly***. In order to examine this issue, let us try to trace supply curve under monopoly by using the logic of supply curve.

A supply curve exhibits a unique relationship between price and quantity supplied. This unique relationship between market price and quantity supplied does not exist under monopoly, at least at the theoretical level. A profit maximising monopoly firm determines its equilibrium output where *MR* = *MC* and *P* > *MC*. Therefore, a *unique* relationship between price (*AR* = *P*) and quantity supplied cannot be established. The reason is that there are two different possibilities: (i) that given the *MC*, the same output is supplied at different prices, and (ii) that at a given price, different quantities may be supplied if the two downward sloping demand curves have different elasticities. The two cases are illustrated in Figs. 17.6 and 17.7, respectively.

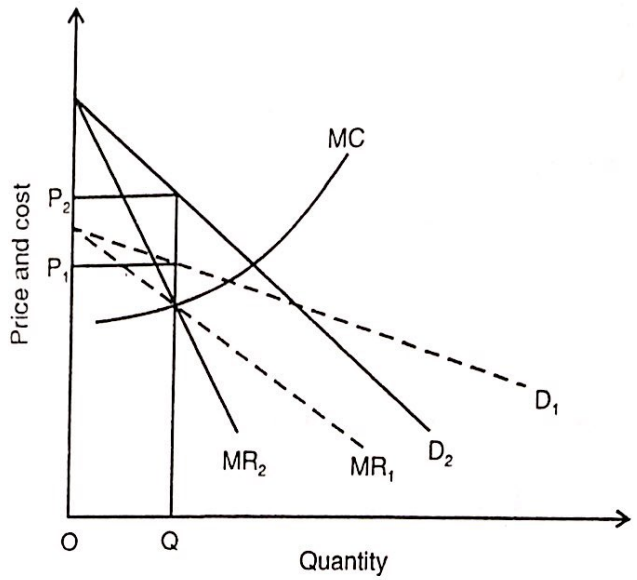

Fig. 17.6 Same Quantity Supplied at Two Different Prices: Case I

Figure 17.6 shows that, given the *MC* curve, if there are two demand curves with different slopes, the same quantity (*OQ*) can be supplied at two different prices—OP_1 when demand curve is D_1 and OP_2 when demand curve is D_2. Obviously, there is no unique relationship between price and quantity supplied.

Figure 17.7 presents the case of different quantities supplied at the same price, *OP*. Given the *MC* curve, quantity OQ_1 is supplied when demand curve is D_1 and quantity OQ_2 is supplied when demand curve is D_2 at the same price, *OP*. In this case too, there is no unique relationship between price and quantity supplied. These points lead one to the conclusion that *there is no unique supply curve under monopoly.*

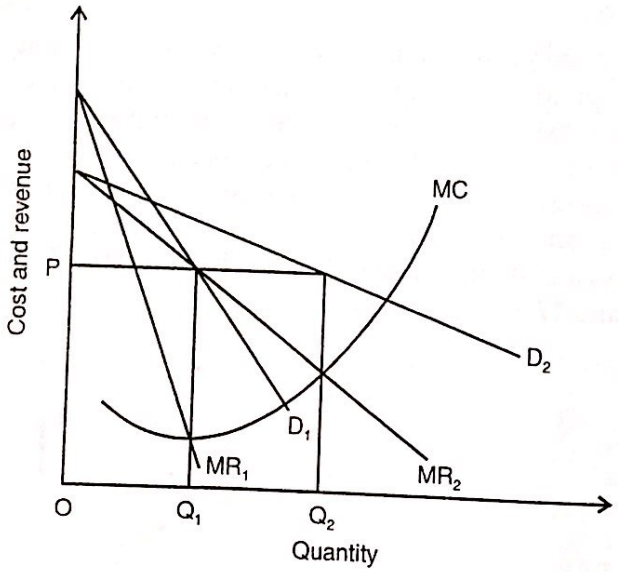

Fig. 17.7 Different Quantities Supplied at the Same Price: Case II

CHAPTER OUTLINE

19.1 INTRODUCTION

In the previous chapter, we have discussed Chamberlin's theory of price and output determination under monopolistic competition, a market organization in which there is *a large number of sellers.* Due to inapplicability of Chamberlin's model, attention was drawn towards a more realistic form of market organisation, called ***oligopoly***[1], a market organisation in which there are few sellers, though

1. The word "Oligopoly" has been derived from Greek words '*oligi*' meaning 'few' and '*polien*' meaning 'sellers'.

the first oligopoly model (in the form a duopoly model) was developed by a classical economist, Augustin Cournot, as early as 1838. In this chapter, we will discuss theories of price and output determination in oligopoly. A number of complex theories were developed over time to analyse price and output determination in an oligopolistic market. This, however, added more complication and confusion to the subject rather than offering a non-controversial theory. In this chapter, however, we will confine to theories considered to have made significant contribution to the theory of oligopoly. We begin our discussion with meaning and characteristics of oligopoly.

19.2 OLIGOPOLY: A MARKET OF FEW SELLERS

19.2.1 Definition of Oligopoly

Oligopoly is a form of market organization in which there are a few sellers selling homogeneous or differentiated products. Economists do not specify how few is the number of sellers in an oligopolistic market. However, two sellers is the ***limiting case*** of oligopoly. When there are only two sellers, the market is called ***duopoly***.

In any case, if oligopoly firms sell a homogeneous poduct, it is called *pure* or *homogeneous oligopoly*. For example, industries producing bread, cement, steel, petrol, cooking gas, chemicals, aluminium and sugar are industries characterised by *homogeneous* oligopoly. And, if firms of an oligopoly industry sell *differentiated products*, it is called *differentiated* or *heterogeneous oligopoly*. Automobiles, television sets, soaps and detergents, refrigerators, soft drinks, computers, cigarettes, ec. are some examples of industries characterized by *differentiated* or *heterogeneous oligopoly*.

In the opinion of some authors, "Oligopoly is the most prevalent form of market organization in the manufacturing sector of the industrial nations...."[1] In non-industrial nations like India also, a majority of big and small industries have acquired the features of oligopoly market. The market share of 4 to 10 firms in 84 big and small industries[2] of India is given below.

Market share (%) of 4-10 firms	*No. of industries*
1 – 24.9	8
25 – 49.9	11
50 – 74.9	15
75 – 100	50
Total	**84**

As the data presented above shows, in India, in 50 out of 84 selected industries, i.e., in about 60 per cent industries, 4 to 10 firms have a 75 per cent or more market share which gives a *concentration ratio*[3] of 0.500 or above. All such industries can be classified under oligopolies.

19.2.2 Factors Causing Oligopoly

The main sources of oligopoly are described here briefly.

1. Huge capital investment. Some industries are by nature capital-intensive, e.g., manufacturing

1. Salvatore, D., *Managerial Economics* (NY, McGraw Hill, 1989), p. 475.

investment requirement works as a natural barrier to entry to the oligopolistic industries.

2. Economies of scale. By virtue of huge investment and large scale production, large units enjoy *absolute cost advantage* due to economies of scale in purchase of industrial inputs, market financing, and sales organization. This gives the existing firms a comparative advantage over new firms, especially in price competition. This works as a deterrent for the entry of new firms.

3. Patent rights. In case of *differentiated oligopoly*, firms get their differentiated product patented which gives them monopoly power, i.e., an exclusive right to produce and market the patented commodity. This prevents other firms from producing the patented commodity. Therefore, unless new firms have some thing new to offer and can match the existing products in respect of quality and cost, they cannot enter the industry. This keeps the number of firms limited.

4. Control over certain raw materials. Where a few firms acquire control over almost the entire supply of important inputs required to produce a certain commodity, new firms find it extremely difficult to enter the industry. For example, if a few firms acquire the right from the government to import certain raw materials, they control the entire input supply.

5. Merger and takeover. Merger of rival firms or takeover of rival firms by the bigger ones with a view to protecting their joint market share or to put an end to waste of competition is working, in modern times, as an important factor that gives rise to oligopolies and strengthens the oligopolistic tendency in modern industries.

19.2.3 Features of Oligopoly

Let us now look at the important characteristics of oligopolistic industries.

1. Small number of sellers. As already mentioned, there is a small number of *sellers* under oligopoly. How small is the number of sellers is not given precisely: it depends largely on the size of the market. Conceptually, however, the number of sellers is so small that the market share of each firm is so large that a single firm can influence the market price and the business strategy of its rival firms. The number may vary from industry to industry. Some examples of oligopoly industries in India and market share of the *dominant* firms[1] in 1997-98 is given below.

Industry	*No. of firms*	*Total market share (%)*
Ice-cream	4	100.00
Bread	2	100.00
Infant Milk Food	6	99.95
Motorcycles	5	99.95
Passenger cars	5	94.34
Cigarettes	4	99.90
Fruit Juice, pulp & conc.	10	98.21
Fluorescent lamps	3	91.84
Automobile tyres	8	91.37

Source: CMIE, *Industries and Market Share*, August 1999.

1. Market share of individual firms vary to a great extent. For example, in 1997-98, Hindustan Lever had a share of 74% of the ice cream market; Surya Roshini had 61% share in fluorescent lamp market; MUL had 76.1% market share in passenger cars; and ITC had 75.38% market share in cigarettes.

2. Interdependence of decision-making. The *most striking feature* of an oligopolistic market structure is the ***interdependence*** of oligopoly firms. The characteristics fewness of firms under oligopoly brings the firms in keen competition with each other. The competition between the firms takes the form of action, reaction and counteraction in the absence of collusion between the firms. Since the number of firms in the industry is small, the business strategy of each firm in respect of pricing, adevertising, product modification is closely watched by the rival firms and it evokes imitation and retaliation. What is equally important in strategic business decisions is that firms initiating a new business strategy anticipate and take into account the counteraction by the rival firms. This is called ***interdependence*** of oligopoly firms.

An illuminating example of strategic maneuvering is cited by Robert A. Meyer.[1] To quote the example, one of the US car manufacturing companies announced in one year in the month of September[2] an *increase* of $ 180 in the price list of its car model. Following it, a second company announced a few days later an increase of $ 80 only and a third announced an increase of $ 91. The first company made a counter move: it announced a *reduction* in the enhancement in the list price from $ 180 to $ 71. This is a pertinent example of interdependence of firms in business decisions under oligopolistic market structure. In India, when Maruti Udyog Limited (MUL), announced a price cut of Rs. 24,000 to Rs. 36,000 in early 1999 on its passenger cars, other companies followed the suit. However, *price competition* is not the major form of competition among the oligopoly firms as price war destroys the profits. A more common form of competition is *non-price competition* on the basis of product differentiation, vigorous advertising and provision of services.

3. Barriers to entry. Barriers to entry to an oligopolistic industry arise due to such market conditions as (i) huge investment requirement to match the production capacity of the existing ones, (ii) economies of scale and absolute cost advantage enjoyed by the existing firms, (iii) strong consumer loyalty to the products of the established firms based on their quality and service, and (iv) resistance by the established firms by price cutting. However, the new entrants that can cross these barriers can and do enter the industry, though only a few, that too mostly the branches of *MNCs*.

4. Indeterminate price and output. Another important feature, though controversial, of the oligopolistic market structure is the indeteminateness of price and output. The characteristic fewness and interdependence of oligopoly firms makes derivation of the demand curve a difficult proposition. Therefore, price and output are said to be indeterminate. However, price and output are said to be determinate under collusive oligopoly. But, collusion may last or it may breakdown. *An opposite view is that price under oligopoly is sticky*, i.e., if price is once determined, it tends to stabilize.

19.3 THE OLIGOPOLY MODELS: AN OVERVIEW

As already mentioned, under oligopolistic conditions, rival firms adopt an intricate pattern of actions, reactions and counteractions showing a variety of behaviour patterns. The uncertainty arising out of unpredictable behaviour, actions and reactions of oligopoly firms makes systematic analysis of oligopoly an extremely difficult task. As Baumol puts it, "Under [these] circumstances, a very wide variety of behaviour pattern becomes possible. Rivals may decide to get together and cooperate in the pursuit of their objectives, ... or, at the other extreme, may try to fight each other to the death. Even if they enter an agreement, it may last or it may breakdown."[3] Economists have, therefore,

1. *Micreconomic Decisions*, Houghton Miflin Company, Boston, 1976, p. 249.
2. The month in which automobile manufacturers introduce new models.
3. Baumol, W.J., *Economic Theory and Operations Analysis* (New Delhi, Prentice Hall of India), 4th Edn., 1985, p. 410.