Now, on account of price discrimination between two individuals, different prices of commodities X and Y are charged from the two individuals. Therefore, price lines facing the two individuals would not be the same. Suppose the price line faced by an individual A is P_a and price line faced by an individual B is P_b. These two price lines are shown to be intersecting at point R. At point R, individual A, given the prices of two goods, is maximizing his satisfaction by equating the price ratio for him to his marginal rate of substitution. (Price line P_a is tangent to his indifference curve A_2 at point R). Likewise, at point R individual B is maximizing his satisfaction, by equating the given price ratio with his marginal rate of substitution (price line P_b is tangent to his indifference curve B_2 at point R). Thus in the presence of price discrimination, the distribution of two goods between the individuals A and B is depicted by a point such as R. It should be noted that at point R marginal rate of substitution of A is not equal to that of B, since the tangents drawn to their indifference curves at point R intersect each other.

Now, it can be easily proved that the distribution of two goods as represented by the point R is not one of maximum social welfare. Suppose the quantities of two goods are redistributed between the two individuals so that they are brought to be in equilibrium at point Q which lies on the contract curve CC'. Now, it will be seen that welfare (i.e. satisfaction) of both the individuals is greater at point Q than at R. Point Q lies on the individual A's indifference curve A_3 which is higher than the indifference curve A_2 on which R lies. Similarly, point Q lies on a higher indifference curve B_3 than the indifference curve B_2 of individual B. This means that the redistribution of goods between the two individuals in such a way that their equilibrium lies at a point Q increases the satisfaction of both the individuals by putting them on higher indifference curves than those at point R.

Note that point Q lies on the contract curve and is therefore a tangent point between the indifference curves of the two individuals. Since the indifference curves A_3 and B_3 of individuals A and B respectively are tangent to each other at point Q, their marginal rates of substitution between the two commodities will be here equal to each other. But if the individuals are to be in equilibrium at point Q, they must pay the same price because only with the same price line, both of them would be in equilibrium at a point where their indifference curves are tangent to each other. At point R, the two individuals are not paying the same price for the two goods on account of price discrimination. If price discrimination is removed, and the same price is charged, they will move to the equilibrium position on the contract curve CC'. Thus we see that by removing price discrimination and charging the same price from both the individuals, they would come to be in equilibrium at a point on the contract curve such as Q and in this way their welfare will increase. Hence, *price discrimination is not conducive to optimum distribution of goods and maximum welfare of the individuals.*

It may be noted that between indifference curves A_3 and B_3 there are also points other points other than Q lying on the contract curve CC' where the indifference curves of the two individuals are tangent to each other. All the points between T and S on the contract curve CC' will lie on higher indifference curves than A_2 and B_2 on which the point R lies. The equilibrium at different points between T and S will be there with the different levels of the uniform prices of the two goods charged from the two individuals. If the uniform prices of the two goods charged from the individuals are given by the price line P, the equilibrium of both the individuals will be at point Q. But, as shown above, with price discrimination (i.e., when different prices are charged from the two individuals), equilibrium does not lie at a point on the contract curve, but away from it. In other words, with price discrimination the distribution of goods between the individuals is such that they will be at a lower level of welfare than that at a point on the contract curve. G.J. Stigler rightly writes : "given the quantities of the commodities and the buyer's money incomes, *all buyers can gain by the elimination of price discrimination*, for price discrimination prevents them form reaching the contract curve."[6]

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6. G.J. Stigler, *The Theory of Price*, revised edition, 1952, p. 93.

Price Discrimination Output and Social Welfare

But the above argument against price discrimination is based on the assumption that the quantity of commodities produced of two goods is given. The question of their optimum distribution is analysed, by taking the given outputs of the goods. But a relevant question is when the price discrimination leads to the increase in output, this extra output made possible by price discrimination is socially beneficial effect flowing from it and which should be put against the possible loss of social welfare due to misallocation of goods between the two individuals. As we explained above, following Joan Robinson, price discrimination in many cases leads to the increase in output. That is, output of a commodity in many cases is greater under price discrimination than under simple monopoly. Thus, from the point of view of output, especially when a society prefers a greater output to a smaller output, price discrimination in all those cases where it leads to the increase in output can be held to be promoting social welfare and is therefore justified. We agree with Mrs Joan Robinson when she writes:

"From the point of view of society as a whole, it is impossible to say whether price discrimination is desirable or not. *From one point of view, therefore, price discrimination must be held to be superior to simple monopoly in all those cases in which it leads to an increase of output, and these cases are likely to be more common*. But against this advantage must be set the fact that price discrimination leads to maldistribution of resources as between different uses...Before it is possible to say whether discrimination is desirable or not it is necessary to weigh up the benefit from the increase in output against this disadvantage. In those cases in which discrimination will decrease output, it is undersirable on both counts."[7]

There is another important reason for which in some cases price discrimination is socially justified. This is the case when under a single uniform price, no output of a commodity is produced and only under price discrimination production of a commodity becomes profitable. Rail transportation is a case in point. It has been observed by many that if railway authorities are not permitted to charge higher fare from the rich people who travel in first or AC class, then it may not be profitable for the authorities to run the railways on a single uniform fare from all, rich and poor.

We have already graphically explained above with the aid of Fig. 23.3 that when aggregate demand curve (*AD*) curve for a commodity lies below the average cost curve throughout and therefore at no level of output average revenue (when single price is charged) is greater than the average cost, the commodity would not be produced at all with a single uniform price, because it is not profitable to do so. When in such cases, price discrimination is practised the average revenue under price discrimination (*DAR*) may become higher than the average cost of production, it becomes worthwhile or profitable to produce a commodity (for full explanation of this point, see above the explanation given in connection with Figure 23.3). In those cases, where under single uniform price no production is done and under price discrimination, production becomes possible (to be more exact, becomes profitable), then price discrimination is socially desirable and justified, if the production of that commodity is considered essential and important for the society.

Price Discrimination and Equity

However, *price discrimination may be justified on grounds of equity*. We have discussed above the desirability of price discrimination from the point of view of *efficiency criterion*. As regards *optimum distribution of goods*, (that is, distributive efficiency), we have found that price discrimination leads to the maldistribution of the commodities between the individuals and thus violates the criterion of distributive efficiency. But this *whole analysis of distributive efficiency is based on the given present distribution of income*. If the present distribution of income is not considered equitable, then the mere distributive efficiency is not enough. Under price discrimination when price is raised for the rich and is lowered for the poor, it has a redistributive effect; the poor are benefited at the expense of the rich. Therefore, in order to reduce inequalities

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7. Joan Robinson, *The Economics of Imperfect Competition*, p. 206.

of personal real incomes Government often itself practises price discrimination or when it controls prices in the private sector, it may permit or even encourage price discrimination. We thus see that equity criterion may outweigh the efficiency criterion and may make the price discrimination socially justified.

We, therefore, conclude that from the point of view of distributive efficiency and optimum allocation of resources, given the present distribution of income, price discrimination is not socially desirable. But from the point of view of expansion in output as well as for making the distribution of real incomes equitable, price discrimination is socially justified. Thus, to pass judgement on the social desirability of a particular case of price discrimination, all these various considerations have to be weighed against each other.

QUESTIONS AND PROBLEMS FOR REVIEW

1. Define price discrimination. Under what conditions can a monopolist discriminate between different buyers in fixing the price of his product? Under what conditions price discrimination is profitable? *(C.U., B.Com. (H), 1996)*

2. Explain the conditions under which monopolistic price discrimination is both possible and profitable. *(D.U.B.A.(Hons)1990, C.U., B.Com., (H), 1994)*

3. Discuss the equilibrium of a monopolist, if one of the markets in which he operates is perfectly competitive.

   [**Hint.** This is the situation just like the dumping case discussed in the text]

4. Distinguish between simple and discriminating monopoly. Show graphically how a discriminating monopolist attains equilibrium.

5. Suppose a monopolist sells his product in the home market and also exports a part of it. The foreign elasticity of demand for its product is below that of the domestic market. If consumer arbitrage betwen the two markets is impossible, how do the domestic and foreign prices compare ?

6. A firm supplies its product in two markets, demand being more elastic in one than in the other. Assuming that the firm aims to maximise its profits, show how price and output in each market are determined.

7. A discriminating monopolist finds price elasticity of demand of his product –2.0 in one market and –1.5 in the other. What would be the ratio of prices charged by him in the two markets ?

8. What is Pareto optimality in the distribution of goods between individuals? Show that price distribution is not conducive to optimum distribution of goods.

9. When will a monopolist discriminate prices between buyers of his product ? *Is price discrimination socially justified ?*

Monopolistic Competition

Imperfect Competition : Monopolistic Competition and Oligopoly

So far we have explained how price and output are determined under perfect competition and pure monopoly. But perfect competition and pure monopoly are rarely found in the actual market situation. Therefore, the conclusions which follow from the model of perfect competition and pure monopoly are found to be inapplicable to the behaviour of most of the business firms in the real world. In order to bring the price theory nearer to the real world, the theory of imperfect competition was developed. The credit for the development of imperfect competition theory goes to Joan Robinson of Great Britain and E.H. Chamberlin of America. According to them, in the real world markets, both competitive and monopoly elements are present in varying degrees. This makes the actual world markets imperfect.

Imperfect competition is said to prevail when a firm exercise some influence over the price of his product. This influence over the price of the product is present when either the number of firms is few or if the number of firms is large, products produced by them are differentiated. The important feature of imperfect competition is that the demand curve facing an individual firm working under it is downward sloping. This implies that when a firm working under imperfect competition sells more quantity of its product, its price will fall and when it sells smaller quantity, its price will rise. When the number of firms is few which produce either homogeneous or differentiated product, the market situation is called oligopoly which is a very important form of imperfect competition. When the number of firms is quite large and are producing differentiated products which are close substitutes of each other, the market situation, according to the modern termonology, is called monopolistic competition which is another important form of imperfect competition. Thus imperfect competition covers broadly two types of market structure:

1. Monopolistic competition; and
2. Oligopoly.

In what follows we will explain price and output determination in the case of monopolistic competition. In the next chapters we shall explain price and output determination under oligopoly.

Monopolistic Competition : Meaning

The concept of monopolistic competition put forward by E.H. Chamberlin is more realistic than either perfect competition or pure monopoly. Before Chamberlin, monopoly and competition were regarded as two alternative market structures, one would be absent when the other exists. On the other hand, according to Chamberlin, in most of the real-word economic situation both monopoly and competitive elements are present. Chamberlin's concept of *monopolistic competition is thus a blending of competition and monopoly.* The distinguishing feature of monopolistic competition which makes it as a blending of competition and monopoly is that the products of various firms are not identical but different though they are close substitutes of each other. Besides, under monopolistic competition there are a large number of firms. But unlike perfect

competition, they produce differentiated products which are close substitutes of each other. Further, in monopolistic competition there is freedom of entry into and exit from the industry. *Monopolistic Competition may be defined as the form of market structure in which there is a large number of firms producing differentiated products which are close substitutes of each other.*

Product differentiation. It is thus from clear above that in monopolistic competition, products are not identical as in perfect competition, but neither are they remote substitutes as in monopoly. The products of various sellers under monopolistic competition are fairly similar (but not the same) and serve as close substitutes of each other. Every seller has a monopoly of his own product variety but he has to face a stiff competition from his rival sellers which are selling close substitutes of his product. We thus find that in monopolistic competition there are various monopolists of different product varieties competing with each other.

Many examples of monopolistic competition can be given from the Indian scene. For instance, in India, there are various manufactures of bathing soap which produce different brands such as Lux, Hamam, Godrej, Jai, Dove, etc. Thus the manufacturer of 'Lux' has a monopoly of producing it, nobody else can produce and sell the bathing soap with the name Lux. But he faces competition from the manufacturers of Hamam, Godrej, Jai, etc., which are close substitutes of Lux. The manufacturer of Lux cannot therefore decide about its price-output policies by totally ignoring the other varieties of soap which are its close substitutes. Other examples of monopolistic competition are the producers of toothpastes, the manufacturers of toothbrushes (Colgate, Dr. West's, Wisdom, Binaca, Forhans etc.), retailers' shops in the towns, barbers' shops in the towns etc. We thus see that monopolistic competition corresponds more to the real-world economic situation than either perfect competition or monopoly.

There are, broadly speaking, two bases of product differentiation. First, differentiation may be based upon certain characteristics of the product itself such as exclusive patented features, trade marks and trade names, special types of packages or wrappers if any, or difference in quality, design, colour or style. Real qualitative differences like those of materials and design and workmanship are no doubt important means of differentiating products. But imaginary differences created through advertising, the use of attractive packets, the use of trade marks and brand names are more usual methods by which products are differentiated, even though they are identical or nearly so.

Secondly, differentiation may be based upon the conditions surrounding the sale of the product. This means that product is differentiated if the services rendered in the process of selling the product by one seller or firm are not identical with those rendered by other sellers or firms. Thus, in retail trade, to take only one instance, the conditions surrounding the sale of the product include the convenience- of the seller's location, his general tone or character, his way of doing business, his reputation for fair dealing, courtesy, efficiency, and all others which make consumers prefer to buy from him. If these factors surrounding the sale of a product are different in case of different sellers, product in each case will be different, since the buyers take these factors into consideration while making purchases. These factors like the goodwill, trade marks etc. serve as a basis for perference.

Important Features of Monopolistic Competition

It is important to understand the important characteristics of monopolistic competition. The knowledge of these features will enable the students to know how this form of market structure is different from perfect competition and oligopoly. We explain below its important features.

1. **A large number of firms.** The first important feature of monopolistic competition is that under it there are a relatively large number of firms each satisfying a small share of the market demand for a product. Because there is a large number of firms under monopolistic competition, there exists stiff competition between them. Unlike perfect competition these large number of firms do not produce perfect substitutes. Instead, they produce and sell products which are close substitutes of each other. This makes the competition among firms real and tough.

Further, the fact that there is a large number of firms under monopolistic competition, size of each firm will be relatively small. This is unlike oligopoly where there are a few firms of big size.

2. **Product differentiation.** The second important feature of monopolistic competition is that the products produced by various firms are not identical but are slightly different from each other. Though different firms make their products slightly different from others, they remain close substitutes of each other. In other words, the products of various firms working under monopolistic competition *are not the same but they are similar*. Therefore, their prices cannot be very much different from each other. It is because of the fact that their products are similar and close substitutes of each other that the various firms under monopolistic competition compete with each other.

3. **Some influence over the price.** Each firm under monopolistic competition produces a product variety which is close substitute of others. Therefore, if a firm lowers the price of its product variety, some customers of other product varieties will switch over to it. This means as it lowers the price of its product variety, quantity demanded of it will increase. On the other hand, if it raises the price of its product, some of its customers will leave it and buy the similar products from its competing firms. This implies that demand curve facing a firm working under monopolistic competition slopes downward and marginal revenue curve lies below it. This means that under monopolistic competition an individual firm is not a price taker but will have some influence over the price of its product. If it fixes a higher price, it will be able to sell a relatively smaller quantity of output. And if it fixes a lower price, it will be able to sell more. Thus under monopolistic competition, a firm has to choose a price-output combination which will maximise its profits.

4. **Non-price competition: Expenditure on advertisement and other selling costs.** An important feature of monopolistic competition is that firms incur a considerable expenditure on advertisements and other selling costs to promote the sales of their product. Promoting sales of their products through advertisement is an important example of non-price competition. The expenditure incurred on advertisement is prominent among the various types of selling costs. The advertisement and other selling outlays by a firm change the demand for its product as well as its costs. Like the adjustments of price and product, a seller under monopolistic competition will also adjust the amount of his advertisement expenditure so as to maximise his profits. This problem of adjusting one's selling outlays is unique to monopolistic competition, because the firm under perfect competition has not to incur any expenditure on advertisement. The advertisement expenditure by a purely competitive firm will be without purpose since it can sell as much amounts as it pleases at the going market price without any advertisement expenditure. The rival firms under monopolistic competition keenly compete with each other through advertisement by which they change the consumer's wants for their products and attract more customers. Thus, a full explanation of the equilibrium under monopolistic competition must also involve equilibrium in regard to the amount of expenditure on advertisement and other sales promotion activities.

5. **Product variation.** Another form of non-price competition which a firm under monopolistic competition has to face is the variation in products by various firms. A firm, under pure competition, does not confront this problem, for the product is homogeneous under perfect competition. The problem of product variation under monopolistic competition exists because there is differentiation of products of various firms. The firm will try to adjust its product so as to conform more to the wishes of the buyers. The variation of the product may refer to a change in the quality of the product itself, technical changes, a new design, better materials, it may mean new package or container, it may mean more prompt or courteous service, a different way of doing business. The amount of the product which a firm will be able to sell in the market depends in part upon the manner in which its product differs from others. Where the

possibility of differentiation exists, sales depends upon the skill with which a product is distinguished from others and made to appeal to a particular group of buyers. The profit maximisation principle applies to the choice of the nature of the product as to its price. In other words, a firm will choose that nature of the product, given its price, which gives it maximum profits. Therefore, in a full explanation of the firm's equilibrium under monopolistic competition we have also to explain product equilibrium in addition "price equilibrium" and selling-costs equilibrium.

6. **Freedom of entry and exit.** This is another important feature of monopolistic competition. In a monopolistically competitive industry it is easy for the new firms to enter and the existing firms to leave it. Free entry means that when in the industry existing firm are making super-normal profits, the new firms enter the industry which leads to the expansion of output. As a result, price of product tends to fall in the long run. However, it may be noted that under monopolistic competition entry may not be as easy or free as under perfect competition. Whereas under perfect competition the new firms which enter the industry can produce identical products, but under monopolistic competition, the new firms can produce only new brands or product varieties which may initially find it difficult to compete with the already well-established brands and product varieties.

In brief the following are the main features of monopolistic competition:

(1) There is quite a large number of firms in the industry;

(2) Products produced by the various firms are differentiated but are close substitutes of each other;

(3) Firms spend a large amount of money on advertisements and other types of selling costs to promote the sales of their product. Thus there is a lot of *non-price competition* under monopolistic competition;

(4) There is a free entry into and exist from the industry; and

(5) Firms *try to adjust or vary their product* so as to conform it more to consumers preferences. The product variation is also a form of non-price competition.

The Nature of Demand and Marginal Revenue Curves Under Monopolistic Competition

It is important to understand the nature of the demand curve facing an individual firm under monopolistic competition. As we have explained in previous chapters demand curve facing a firm working under perfect competition is perfectly elastic at the ruling market price since it has absolutely no control over the price of the product. On the contary, a firm working under monopolistic competition enjoys some control over the price of its product since its product is somewhat differentiated from others. If a firm under monopolistic competition raises the price of its product, it will find some of its customers going away to buy other products. As a result, the quantity demanded of its product will fall. On the contrary if it lowers the price, it will find that buyers from other varieties of the product will start purchasing its product and as a result the quantity demanded of its product will increase. It therefore follows that the demand curve facing an individual firm under monopolistic competition slopes downward.

If a firm working under monopolistic competition wants to increase the sales of its product, it must lower the price. It can raise the price if it is prepared to sacrifice some sales. To put it in another way, a firm working under monopolistic competition can lower the price by increasing its level of sales and output. A purely competitive firm merely adjusts the quantity of output it has to produce, price being a given and constant datum for it. But a firm working under monopolistic competition faces a more complicated problem. It cannot merely adjust quantity at a given price because each quantity change by it will bring about a change in the price at which the product can be sold. Consider Fig. 24.1. *DD* is the demand curve facing an individual firm under monopolistic competition. At price *OP* the quantity demanded is *OM*.

Therefore, the firm would be able to sell *OM* quantity at price *OP*. If it wants to sell greater quantity *ON*, then it will have to reduce price to *OL*. If it restricts its quantity to *OG*, price will rise to *OH*. Thus, every quantity change by it entails a change in price at which the product
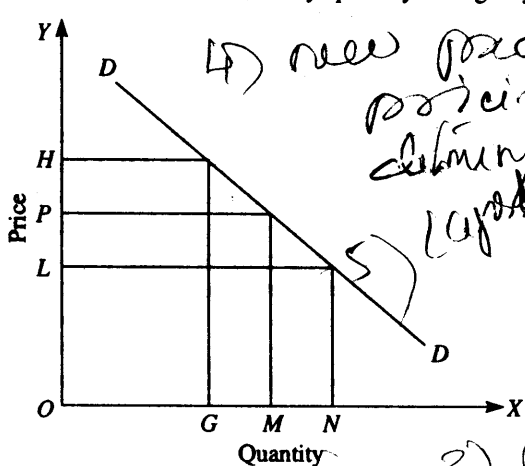

Fig. 24.1. *Demand Curve Facing a Monopolistically Competitive Firm*
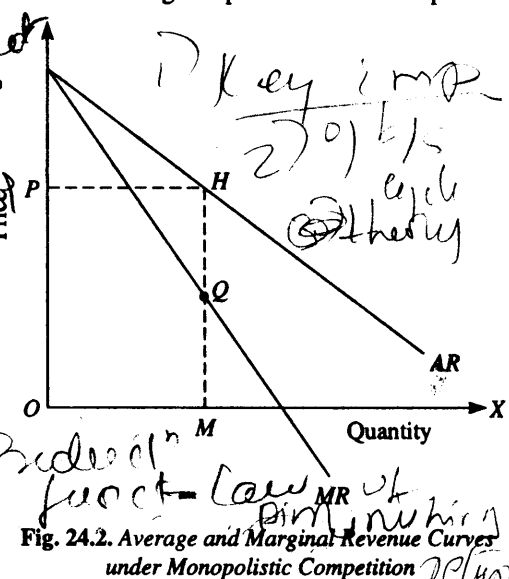
Fig. 24.2. *Average and Marginal Revenue Curves under Monopolistic Competition*

can be sold. Thus the problem. faced by a firm working under monopolistic competition is to choose the price-quantity combination which is optimum for it, that is, which yields it maximum possible profits.

Demand curve facing a firm will be its average revenue curve. Thus the average revenue curve of the monopolistically competitive firm slopes downward throughout its length. Since average revenue curve slopes downward, marginal revenue curve lies below it. This follows from usual average-marginal relationship. The implication of marginal revenue curve lying below average revenue curve is that the marginal revenue will be less than the price or average revenue. When a firm working under monopolistic competition sells more, the price of its product falls; marginal revenue therefore must be less than the price. In Fig. 24.2 *AR* is the average revenue curve of the firm under monopolistic competition and slopes downward. *MR* is the marginal revenue curve and lies below *AR* curve. At quantity *OM*, average revenue (or price) is *OP* and marginal revenue is *MQ* which is less than *OP*. In an earlier chapter we have explained that average and marginal revenue at a level of output are related to each other through price elasticity of demand and in this connection we derived the following formula:

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

where *e* stands for price elasticity of demand.

PRICE-OUTPUT EQUILIBRIUM UNDER MONOPOLISTIC COMPETITION

A firm under monopolistic competition has to face various problems which are absent under perfect competition. Since the market of an individual firm under perfect competition is completely merged with the general one, it can sell any amount of the good at the ruling market price. But, under monopolistic competition, individual firm's market is isolated to a certain degree from those of its rivals with the result that its sales depend upon (1) its price, (2) the nature of its product, and (3) the advertising outlay it makes. Thus, the firm under monopolistic competition has to face a more complicated problem than the purely competitive firm. Equilibrium of an individual firm under monopolistic competition involves equilibrium in three respects, that is, in regard to the price and output, the nature of the

product, and the amount of advertising outlay it should make. However, in this section we shall confine ourselves to explaining the equilibrium of the firm with regard to price and output.

Price-Output Equilibrium of the Firm in the Short run

The demand curve for the product of an individual firm under monopolistic competition, as noted above, is downward sloping. Since the various firms under monopolistic competition produce products which are close substitutes of each other, the position and elasticity of the demand curve for the product of any of them depends upon the availability of the competing substitutes and their prices. Therefore, the equilibrium adjustment of an individual firm cannot be defined in isolation from the general field of which it is a part. However, for sake of simplicity in analysis, conditions regarding the availability of substitute products produced by the rival firms and prices charged for them are held constant while the equilibrium adjustment of an individual firm is considered in isolation. Since close substitutes of a product of an individual firm are available in the market, the demand curve for the product of an individual firm working under conditions of monopolistic competition is fairly elastic. Thus, although a firm under monopolistic competition has a monopolistic control over its variety of the product but its control over price is limited by the fact that there are close substitutes available in the market and that if it sets too high a price for its product, many of his customers will shift to the rival products.

Assuming the conditions with respect to all substitutes such as their nature and prices being cor .ant, the demand curve for the product of a firm will be given. We further suppose that the product of a particular firm is held constant, only variables are price and output in respect of which equilibrium adjustment is to be made. The individual equilibrium under monopolistic competition is graphically shown in Fig. 24.3. AR is the demand curve (or average revenue curve) for the product of an individual firm, the nature and prices of all substitutes being given. SAC represents the short-run average cost curve of the firm, while SMC is the short-run marginal cost curve corresponding to it. It may be recalled that average cost curve first falls due to internal economies and then rises due to internal diseconomies.

Given these demand and cost conditions, a firm will adjust its price and output at the level which gives it maximum total profits. Theory of value under monopolistic competition is also based upon the profit maximisation principle, as is the theory of value under perfect competition. Thus a firm a under monopolistic competition in order to maximise profits will equate marginal cost with marginal revenue. In Fig. 24.3, the firm will fix its level of output at OM
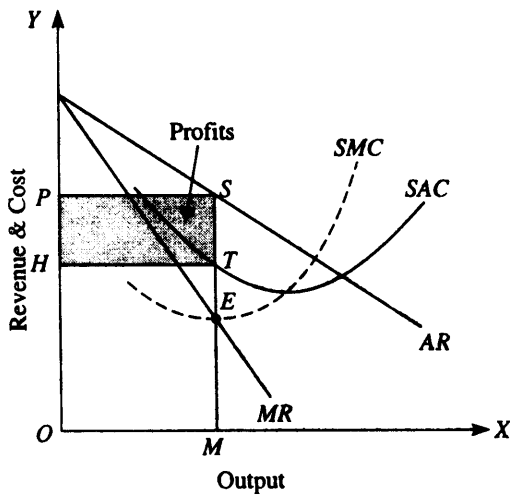

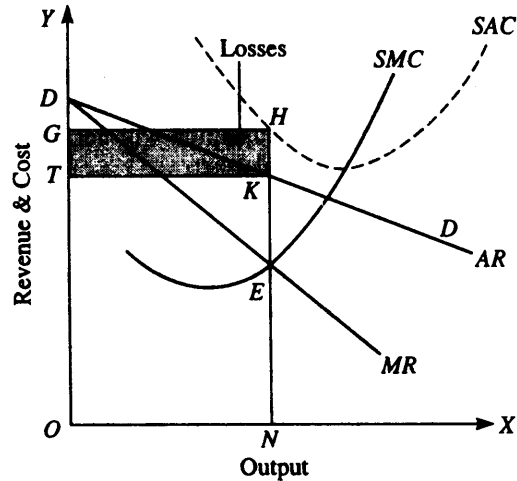Fig. 24.3. *Firm's Equilibrium under Monopolistic Competition (with Profits)*

Fig. 24.4. *Price-Output Equilibrium under Monopolistic Competition (with Losses)*

because at *OM* output marginal cost is equal to marginal revenue. The demand curve *AR* facing the firm in question indicates that output *OM* can be sold at price *MS* = *OP*. Therefore, the determined price will evidently be *MS* or *OP*. In this equilibrium position, by fixing his price at *OP* and output at *OM*, the firm is marking profits equal to the area *HTSP* which is maximum. It may be recalled that profits *HTSP* are in excess of normal profits, for normal profits necessary to secure the entrepreneur's services are included in average cost curve *SAC*. Thus, the area *HTSP* measures the amount of supernormal profits made by the firm.

In the short-run, the firm, in equilibrium, may make supernormal profits, as shown in Fig. 24.3 above, but it may make losses too if the demand conditions for its product are not so favourable relative to cost conditions. Fig. 24.4. depicts the case of a firm the demand or average revenue curve *DD* for whose product lies below the average cost curve throughout indicating thereby that no output of the product can be produced at positive profits. However, the firm is in equilibrium at output *ON*, and setting price *NK* or *OT*, because by fixing price at *OT* and output at *ON*, it is rendering the losses to the minimum. In such an unfavourable situation there is no alternative for the firm except to make the best of the bad bargain and tries to minimise losses.

We thus see that a firm in equilibrium under monopolistic competition, as under pure or perfect competition, may be making supernormal profits or losses depending upon the position of the demand curve relative to the position of the average cost curve. Further, a firm may be making only normal profits even in the short run if the demand curve (*i.e.*, *AR* curve) happens to be tangent to the average cost curve.

It should be carefully noted that in individual equilibrium of the firm both in Fig. 24.3 and Fig. 24.4 the firm having once fixed price at *OP* and *OT* respectively will have no tendency to vary the price any more. If it varies its price upward, the loss due to fall in quantity demanded will be more than made up by the higher price. If it cuts down its price, the gain due to the increase in quantity demanded will be less than the loss due to the lower price. Hence, price will remain stable at *OP* and *OT* in the two cases respectively.

There is significant difference between price-output equilibrium under monopolistic competition and perfect competition. The price under perfect competition is equal to marginal cost, but this is not so under monopolistic or imperfect competition. The firm under monopolistic competition, unlike perfectly competitive firm, faces a downward-sloping average revenue curve and his marginal revenue curve lies below average revenue curve. Therefore, in equilibrium *under monopolistic competition when marginal cost is equal to marginal revenue. it is less than price (or average revenue).* From Fig. 24.3 it will be noticed that at equilibrium output *OM*, marginal cost and marginal revenue are equal and both are here equal to *ME* but price fixed is *MS* or *OP* which is greater than marginal cost *ME*. It thus follows that price under monopolistic competition is greater than marginal cost. But it is worth pointing out that although price under monopolistic competition will not be equal to marginal cost it will stand in the following relation to the marginal cost:

$$\text{Price} = MC \, \frac{e}{e-1}$$

Long-run Price-Output Equilibrium Under Monopolistic Competition

When we explain the long-run price-output equilibrium of the firm working under monopolistic competition, we in fact explain how the "group" of firms producing a differentiated product comes to be in equilibrium. In other words, we have now to explain how the equilibrium adjustment of prices and outputs of a number of firms whose products are close substitutes comes about. As explained above, ea firm within a group has monopoly of its own particular product, yet its market is interwoven with those of his competitors who produce closely related products. The interdependence of the various products upon one another is a prominent feature of monopolistic competition.

A difficulty faced in describing the group equilibrium is the vast diversity of conditions which exist in respect of many matters between the various firms constituting the group. The product of each firm has special characteristics and is adapted to the tastes and preferences of its customers. The qualitative differences among the products lead to the large variations in cost and demand curves of the various firms. The demand curves of the various firms differ in respect of shape and position. As a result of these heterogeneous conditions surrounding each firm, there will be differences in prices, in outputs (scales of production) and profits of the various firms in the group.

In order to simplify the analysis of equilibrium, Chamberlin ignores these diverse conditions surrounding each firm and takes an assumption what has been called *uniformity assumption*. Thus Chamberlin says: "We, therefore, proceed under the heroic assumption that both demand and cost curves for all the products are uniform throughout the group."[1] Further, to facilitate exposition of his theory, Chamberlin introduces a further assumption which has been called *symmetry assumption*. It is that the number of firms being large under monopolistic competition, an individual firm's actions regarding price and output adjustment will have a negligible effect upon his numerous competitors so that they will not think of retaliation for readjusting their prices and output. He thus says, "specifically, we assume for the present that any adjustment of price or "product" by a single producer spreads its influence over so many of his competitors that the impact felt by any one is negligible and does not lead him to any readjustment of his own situation. A price cut, for instance, which increases the sales of who makes it draws inappreciable amounts from the markets of each of his many competitors, achieving a considerable result for the one who makes the price cut, but without making incursions upon the market of any single competitor sufficient to cause him to do anything he would not have done any way."[2]

Group Equilibrium. Given the above assumptions, we proceed to explain how under monopolistic competition an individual firm and a group of firms producing close substitutes come to be in equilibrium position. To begin with, suppose that the demand and cost curves of each of the firms in the group are *AR* and *AC* as depicted in Fig. 24.3 above (see page 372). Each firm will set price *OP* and produce *OM* output at which marginal cost is equal to marginal revenue and hence profits are maximum. Although all firms are making supernormal profits, there is no reason for any one to cut down price below *OP* because the sales gained thereby will be insufficient to make up the loss due to the lower price. These supernormal profits will, however, attract new firms into the field.

When the new firms allured by the supernormal profits enjoyed by existing firms enter the field, the market would be shared between more firms and as a result the demand curve (or average curve) for the product of each firm will shift downward *i.e.*, to the left. This process of entry of new firms and the resultant shift in the demand (average revenue) curve to the left will continue until the average revenue curve becomes tangent to the average cost curve and thus the supernormal profits are completely
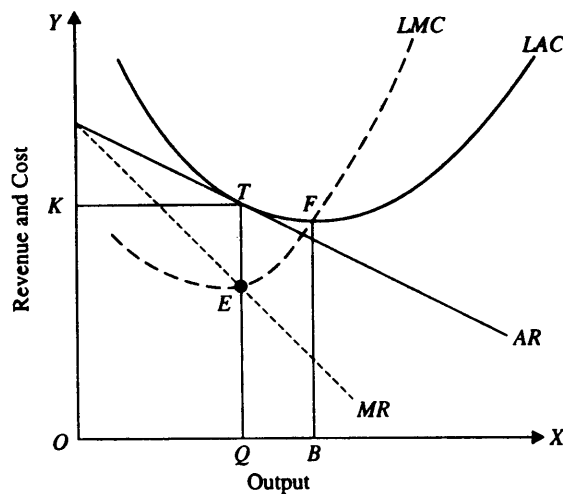

Fig. 24.5. *The Long-Run Equilibrium of the Firm and Group Equilibrium under Monopolistic Competition when Average Revenue Curve of the Firm is Tangent to its Long-Run Average Cost Curve.*

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1. E.H. Chamberlin, *Theory of Monopolistic Competition*, p. 82.
2. *Ibid*, p. 83.

wiped out. This is shown in Fig. 24.5 where average revenue curve is tangent to average cost curve at point T. Marginal cost and marginal revenue curves intersect each other, exactly vertically below T. Therefore, the firm is in long-run equilibrium by setting price QT or OK and producing OQ quantity if its product. Because average revenue is equal to average cost, the firm will be making only normal profits. Since all firms are alike in respect of demand and cost curves (by assumption), the average revenue of all will be tangent to their average cost curves and all firms will, therefore, be earning only normal profits. Because only normal profits are accruing to the firms, there will be no more tendency for the new competitors to enter the field and the group as a whole will, therefore, be in equilibrium.

PRICE-OUTPUT EQUILIBRIUM UNDER MONOPOLISTIC COMPETITION COMPARED WITH THAT UNDER PERFECT COMPETITION

It is useful to explain how price-output equilibrium under monopolistic competition differs from that under perfect competition.

Price is greater than MC under monopolistic competition. A significant difference between the two relates to the relation between price and marginal cost. Whereas in equilibrium under perfect competition, price is equal to marginal cost, in equilibrium under monopolistic competition price is greater than marginal cost. Since under perfect competition, an individual firm cannot influence the price of its product and takes price as given and constant, the demand or average revenue curve is a horizontal straight line and marginal revenue (MR) is equal to average revenue (AR) or price. Therefore, under perfect competition when a firm equates marginal cost with marginal revenue so as to maximize its profits, the former also becomes equal to price.

On the other hand, under monopolistic competition, a firm exercises some control over the price of its product and the demand curve for it, representing prices at various quantities, slopes downward. As a result, marginal revenue (MR) curve lies below average revenue (AR) curve. Therefore, in order to maximise profits when *a firm under monopolistic competition equates marginal cost with marginal revenue, price stands at a higher level than marginal cost.* This is clear from Fig. 24.3 (see page 372) where, in equilibrium, price determined is equal to MS or OP, which is greater than marginal cost ME.

It should be noted that producing level of output much less than at which marginal cost equals price implies a loss of social welfare. It should be noted that social welfare is maximum when output is extended to the point where price is equal to long-run marginal cost. It will be seen from Fig. 24.6 that such point is G where price or $AR = LMC$. But as will be seen from Fig. 24.6 firm produces OQ at which

Fig. 24.6. *Loss of Social Welfare*

its profits are maximum. Thus, the area TEG represents loss of social welfare which is also called dead weight loss. This indicates inefficiency of monopolistic competition.

Long-run equilibrium under monopolistic competition is established at less than optimum size. Another important difference between the equilibrium under monopolistic competition and perfect competition is that *whereas a firm in long-run equilibrium under monopolistic competition produces less than its optimum size of output, under perfect competition long-run equilibrium of the firm is established at the minimum point of the long-run average cost curve.* In other words, a firm under perfect competition tends to be of the optimum size. But a firm
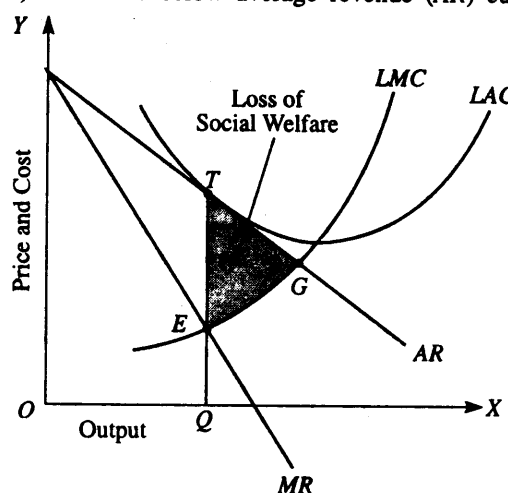
under monopolistic competition, as is evident from Fig. 24.5 (on page 374) stops short of the optimum point and operates in the long run at the point at which average cost is still falling. In Fig. 24.6 the firm produces output OQ, while a firm under pure or perfect competition would have produced output OB at which average cost is minimum. The firm under monopolistic competition can reduce its cost of production by expanding output to the point B but it will not do so because by expanding output beyond OQ it will be reducing price more than the average cost. It is, therefore, clear that by producing OQ instead of OB, in the long run, *the firm under monopolistic competition does not use its capacity fully.* (The firm would be using its capacity fully, if it produces opimum output OB). Thus, capacity equal to QB is lying unused in the firm under monopolistic competition. *This unused capacity is called excess capacity which is a prominent feature of equilibrium under monopolistic competition.*

Price under monopolistic competition is greater than competitive price. Further, it may be noted that in the long-run equilibrium, firms under monopolistic competition make only normal profits as under pure competition, but the price set under *monopolistic competition is higher than competitive price.* In Fig. 24.5, price set in long-run equilibrium under monopolistic competition is QT while competitive price would have been equal to BF. This higher price under monopolistic competition is due to monopoly element contained in it. The monopoly element involved in monopolistic competition makes the demand or average revenue curve facing an individual firm downward sloping and a downward-sloping average revenue curve can be tangent to the average cost curve only to the left of its minimum point.

Thus price under monopolistic competition will be higher than the competitive price due to the monopoly element in monopolistic competition. But, in spite of the higher price, a firm under monopolistic competition will not be making profits above normal in the long run. We may, therefore, say that *a firm under monopolistic competition, in the long-run equilibrium, charges higher price without enjoying monopoly profits.* A significant result follows from this. It is that the non-existence of abnormal profits is no indicator of the absence of monopoly element. In long-run equilibrium under monopolistic competition, as seen above, the firm has monopoly power (it has a sole control over its own differentiated product with the result that demand curve for it slopes downward) but it does not make any super-normal profits.

Excess capacity and other wastes of competition under monopolistic competition. Further, it is evident from the long-run equilibrium situation of a firm under monopolistic competition (see Fig. 24.5 on page 374) that it occurs at the output level which falls short of the output OB at which the long-run average cost is minimum. This implies, that maximum economic efficiency is not achieved under monopolistic competition because the resources are not being used to produce the good at the minimum possible cost. That is why economists such as Harrod, Cassel have called the output-difference QB as the *excess capacity that tends to prevail under monopolistic competition and which represents waste of resources.* However, it is worth noting that some economists do not consider QB as the excess capacity. According to them, *this small loss of output and consequently higher average cost is price which people are paying for product variety which they get under monopolistic competition* due to product differentiation as compared to perfect competition. Further, firms under monopolistic competition spend a lot of money on advertisement and other sales promotion activities which also represents wastes of competition.

According to Chamberlin, a lot of excess capacity is created under monopolistic as a result of entry of a large number of firms only if price competition does not prevail. If price competition prevails then there is not much excess capacity under monopolistic competition. In the long-run too mainy firm enter the industry so that market is shared among many and in the absence of price competition each produces much less than its full capacity.

SELLING COSTS AND ADVERTISING

For determining price and output under monopolistic competition and oligopoly, firms often compete through incurring selling costs or advertisement expenditure. For firms working under

conditions of monopolistic competition and oilgopoly, besides adjustments of price, output and product, an important decision that has to be taken is that of how much selling costs or advertisement expenditure it should undertake so as to achieve its aim of profit maximization. The first problem that is encountered in connection with selling costs is how do they differ from production costs. The other important question which arises is why firms under monopolistic competition and oligopoly incur selling costs and not the firms working udner conditions of perfect competition and monopoly. Further, how the firm will decide about the optimum level of selling costs or advertisement expenditure. And, lastly, what is the influence of selling costs on price and output of the product. We shall discuss all these questions concerning selling costs below.

Selling Costs Distinguished from Production Costs

The term "selling costs" is broader than advertisement expenditure. Whereas advertisement expenditure includes costs incurred only on getting product advertised in newspapers and magazines, on radio and television, selling costs include the salaries and wages of salesmen, allowances to retailers for the purpose of getting their product *displayed* by them and so many other types of promotional activities besides advertisement. Chamberlin who introduced the analysis of selling costs in price theory distinguished selling costs from production costs. According to Chamberlin, cost of production includes all those expenses which are incurred to manufacture and provide a product to the consumer to meet his *given* demand or want, while the selling costs are those which are incurred to *change, alter or create the demand for a product*. Costs of production therefore include manufacturing costs, transportation costs, and cost of handling, storing and delivering a product to the consumers, since all of these activities add utilities to a commodity. And the addition or creation of utilities to satisfy the given wants is called production in economics. To quote Chamberlin, "Cost of production includes all expenses which must be met in order to provide the commodity or service, transport it to the buyer, and put it into his hands ready to satisfy his wants. *Cost of selling includes all outlays made in order to secure a demand or market* for the product. The former costs create utilities in order that given demands may be satisfied; the *latter create and shift the demands themselves*. A simple criterion is this: of all the costs incurred in the manufacture and sale of a given product, *those which alter the demand curve for it are selling costs,* and those which do not are costs of production."[3] The selling costs, according to Chamberlin, include "advertising in its many forms, salaries of salesmen and the expenses of sales departments and sales agencies (except where these agencies actually handle the goods), window displays, and displays and demonstration of all kinds."

It should be noted that transportation should not be construed as *increasing the demand*, as it apparently appears. This is because the transportation does not really increase the demand; it merely enables the producer to meet the demand of the consumer which is already there whether the transport cost is incurred by the producer or by the consumer himself. Likewise, a high site rent for a shop in a well-located area will increase the sales of the firm but cannot be considered as a part of selling costs, since in this the firm is meeting the given or existing demand for the product more accurately or exactly and not *altering* the demand for the product. By paying a high rent for a shop or a concern in the well-located area, the producer is merely adapting the product or himself more exactly to the given demand and not altering the demand or adapting his customers. Therefore, Chamberlin while drawing the distinction between production costs and selling costs writes that those costs which are "*made to adapt the product to the demand are costs of production; those made to adapt the demand to the product are costs of selling.*"[4]

It should, however, be noted that the distinction between production costs and selling costs cannot always be sharply made and there are cases where it cannot be said whether product is

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3. Edward, H. Chamberlin, *The Theory of Monopolistic Competition*, 6th edition, p. 123.
4. *Op. cit.* pp. 125.

being adapted to meet the given demand, or the demand is being adapted to sell the product. For instance, it is difficult to say whether the extra cost on attractive packaging is production cost or selling cost. However, as far as advertisement expenditure is concerned, there is little doubt about its being a selling cost, since purpose of advertisement is to increase or create the demand for the product. Thus Chamberlin's distinction is quite applicable so far as advertisement expenditure is concerned. Because advertising expenditure is the most important and dominant form of selling costs, we in our analysis below shall use them interchangeably and discuss the various questions concerning selling costs by taking the case of advertisement expenditure.

Role of Selling Costs under Perfect Competition, Monopoly and Imperfect Competition

As has been explained in previous chapters, there is no need for a firm working under perfect competition to undertake advertisement expenditure or to incur other types of selling costs, since by assumption, the product produced by all firms in the perfectly competitive industry is homogeneous, and an individual firm can sell as much quantity of the product as it likes at the given price. If a perfectly competitive firm advertises for the product, the consumers who are influenced by it may purchase the product from other firms in the industry, since all are selling homogeneous products. Of course, the whole perfectly competitive industry, that is, all firms together or their association amy advertise to promote the sales of their product at the expense of the *products of other industries.* Such advertising is known as *promotional advertising,* as compared to competitive advertising with which we are here concerned. In India, there has been advertising by *Terene* industry producing terylene fabrics for increasing the demand for its product at the cost of other kinds of fabrics. We, therefore, conclude that under perfect competition, there can be promotional advertising by the whole industry but not competitive advertising by individual firms to snatch away the customers from each other.

Under monopoly also, there is no competitive advertising since, by definition, a monopolist produces a product which has no close substitutes. The monopolist only needs to inform or remind the buyers that his product exists and he need not emphasize the competitive nature of its product. Of course, the monopolist may advertise to promote his sales or demand but it will not be at the expense of its rivals, since no rivals producing close substitutes are there under monopoly. Hence the advertisement by the monopolist is informative and promotional and not competitive.

It is under conditions of imperfect competition, that is, monopolistic competition and oligopoly with product differentiation that advertisement and other selling costs become important as a competitive weapon at the disposal of one firm to increase its sales at the expense of others. This is because differentiated products produced by different firms under monopolistic competition and differentiated oligopoly are close substitutes of each other. Therefore, each firm under monopolistic competition tries to convince the buyers that its product is better than those of others in the industry. A firm under monopolistic competition and differentiated oligopoly may keep its price and product design constant and seek to increase the demand for its product by increasing the amount of advertisement expenditure and through it persuading the buyers that its brand of the product is of superior quality than others. Thus, this is competitive advertising which is aimed at attracting the customers to their product and weaning them away from the closely related products of the rivals. Thus, "the fundamental aim of all 'competitive' advertising is to attract the customers' attention and to imprint the name of a particular product on his mind; the aim is to persuade the consumer to put his hand in his pocket and buy the product in question...... the main aim is to increase the sales of one firm at the expense of others and not to increase the sales of the 'group' as a whole."[5] For instance, we all know that all toothpastes are based upon the same chemical formula recommended by the medical science. But the firm producting Binaca through its radio and television commerical programmes has been propagating that the tooth paste of 'Binaca' variety is very much better than others and

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5. Stonier and Hague, *A textbook of Economic Theory,* Orient Longman, p. 222.

has special and superior qualities which are absent in other bands of toothpaste. The fundamental aim of Binaca advertisment is not to increase the aggregate demand for toothpaste in the country but to increase the demand for 'Binaca toothpaste' by competing away the buyers from other brands of toothpaste. Similarly, the manufactures of other brands of toothpaste such as Colgate, Pepsodent, Signal. Forhans etc. are also incurring expenditure on advertisement through various means and trying to convince the buyers that their particular brand of tooth paste is better than others. Such competitive advertisement by a firm often proves to be successful in its objective of increasing the demand for a particular brand of the product. Thus, as a result of advertisement, demand curve facing an individual firm shifts to the right which indicates that at a given price, a greater quantity of the product can be sold.

It follows from above that in the presence of selling costs or advertisement, demand curve for a product cannot be taken as an objective fact given by the tastes or wants of the consumers. A firm can alter or shift the demand curve for its product through its own efforts by incurring advertisement expenditure and other forms of selling costs.

Effect of Selling Costs (Advertising Expenditure) on Demand

The purpose and effect of successful advertising is to increase the demand, that is, to shift the demand curve for the product to the right. However, these selling costs or advertising outlays are subject to the varying returns. That is, equal increments in advertising outlay first yield increasing returns and then eventually diminishing returns in terms of its effect on demand for the product. In the beginning, increases in advertising outlay will bring about increasing returns in raising demand for the product for two reasons. First, increase in advertising outlay (or selling costs) permits a firm to *repeat many times* the advertisement for the product. And this repetition of advertisement produces favourable effects on demand. "It is well established that repetition is essential if advertising is to make an impact on the consumer's mind. A single advertisement seen once will have at the most a negligible, and probably no effect on the consumer. The outlay for it is wasted. But continued advertising over a period of time and in different media is far more likely to impinge on the consumers' thoughts and consequent consumption choices."[6]

Second reason for occurrence of increasing returns as the advertisement outlay is increased in the beginning is the *economies of large scale* selling operations or advertising. The main economy or adventage is the specialization which is made possible by large-scale selling or advertising activity. To quote Prof. Hibdon again, "Large-scale activities permit the *use of specialised personnel with greater expertise and effectiveness.* There may also be *economies in the use of advertising media.* Greater total spending permits a shift in the technique and media that are used in the selling effort as well as the use of combinations of media."[7] As a result of the increasing returns from advertising outlay in the beginning, the demand increases more than proportionately to the equal increases in advertising outlay.

But as the advertising outlay is stepped up, diminishing returns are likely to set in eventually. First, this is because potential buyers differ in tastes, income and wealth. These differences among the potential buyers of the product mean that they will vary in their responses to selling operations or advertising by a firm. Initial advertisements will cause large increases in demand as the more susceptible buyers respond to advertisement. But further increase in advertisements is likely to bring about relatively less increases in demand as they fail to influence other buyers who do not prefer the good so much.

Second reason for the ultimate occurrence of diminishing returns from the increases in advertisement is that the existing buyers may not further increase the demand for the product as a result of more advertising by the firm. This is because as the consumer buys more of a product, its marginal utility to him falls. Further, in order to purchase one good more, he has

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6. James E. Hibdon, *Price and Welfare Theory,* McGraw Hill, 1969, p. 302.

7. *Op. cit.,* p. 302.

to give up more of some other goods, his income being limited. As a result, marginal utility of 'other goods' increases. Thus, on the one hand, marginal utility of a good declines as it is purchased more under the influence of advertisement, and, on the other hand, the opportunity cost of buying this good increases on account of the rise in the marginal utility of 'other goods'. This makes the existing buyers of a product reluctant to buy more units of it when advertising effort by a firm is greatly increased. Thus this also causes diminishing returns to advertising outlay.
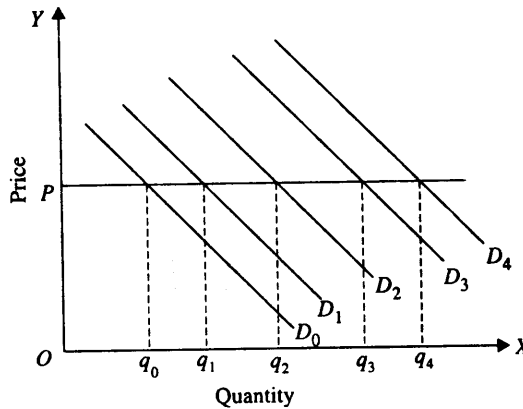
The effect of selling costs on the demand for a product and the varying returns in this connection are illustrated in Fig. 24.7. Demand curve before any advertisement expenditure is undertaken is D_0. Now, equal increments in advertisement expenditure successively bring about rightward shift in the demand curve to D_1, D_2, D_3 and D_4 respectively. We have assumed that the shift in the demand curve is parallel, while in the real world it may not be so. Because in the beginning there are increasing returns and then after a point diminishing returns occur, successive shifts in the demand curve differ in magnitude. At the given price OP, as a result of equal increments in advertising outlay, the quantity demanded increases from q_0 to q_1, q_1 to q_2, q_2 to q_3 and q_3 to q_4. It will be seen from the Fig. 24.7 that after D_3, diminishing returns to extra advertising outlay occur.

Fig. 24.7. *Effect of Selling Cost on Demand*

The Curve of Average Selling Cost

The concept of the curve of average selling cost should be fully understood. There are two concepts regarding average selling cost, and average selling cost curves drawn according to these two concepts are different. Since the shape of the average selling cost curve is different in these two concepts, for analysing selling cost and its effect on equilibrium price and output, it must, therefore, be known according to which concept the curve of average selling cost is drawn. A firm can choose among various amounts of advertising outlay (*i.e.*, selling costs). Therefore, the firm may at the outset treat the selling costs as variable amounts. Thus, with varing amounts of selling costs (advertising outlay) incurred in a period, the average selling
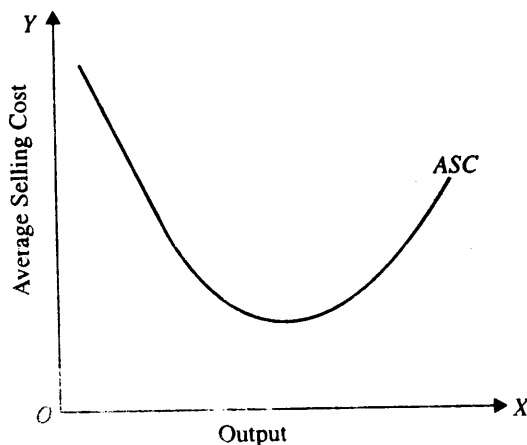

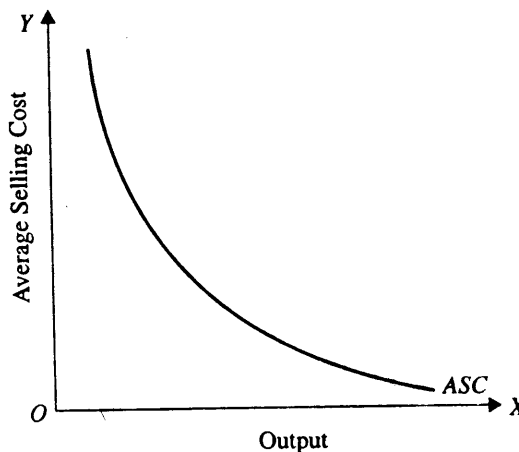Fig. 24.8. *Average Selling Cost Required to Sell Various Amounts of Output*

Fig. 24.9. *Curve of Average Selling Cost with a Given Amount of Total Selling Costs*

cost per unit will depend upon the output sold as a result of the rightward shift in the demand curve brought about by a particular amount of selling costs and shall be obtained by dividing the amount of selling costs incurred by the quantity of output sold. And as a firm plans to increase the amount of selling costs incurred in a period, the average selling cost will change depending, on the one hand, upon the increase in selling costs and, on the other, upon the resultant increase in output demanded (or sold) at a *given price*.

As explained above, it is generally believed that *selling costs (advertisement outlay) is subject to varying returns*. In the beginning, increasing returns to selling costs are obtained, that is, equal increases in advertisement outlay cause more than proportionate increase in the amount demanded of the product at the given price. In other words, selling costs per unit will fall in the beginning. After a point diminishing returns to selling costs set in and increases in advertisement outlay cause less than proportionate increases in the amount demanded of the product. In other words, after a point, average selling cost will rise. Hence, with varying amounts of selling cost average selling cost in the beginning falls due to increasing returns, reaches the minimum level and then rises due to diminishing returns. Thus with varying amounts of selling cost, a curve of average selling cost, like the ordinary average production-cost curve, is U-shaped, which is shown in Fig. 24.8 by the curve *ASC*.

However, the average selling cost curve *ASC* drawn in Fig. 24.8 should be carefully interpreted. It does not mean how the average selling cost per unit changes as output is increased. But *it means the average selling cost per unit which is required to be undertaken to sell various amounts of output*. Ultimately the average selling cost curve *ASC* will become vertical. This is because quite often saturation point regarding the effect of extra selling costs on raising the demand for the product is reached, beyond which no further increases in selling costs can cause any expansion in amount demanded of the product.

We have discussed above the nature of the average selling cost curve when the total selling costs are treated as variable magnitudes and, in fact, the firm treats them as such when it has to plan for an amount of selling or advertisement cost it should incur in a period so as to maximize profits. However, *once a firm commits itself to a particular amount of selling costs or advertisement outlay to be incurred in a period, it may regard that cost as a fixed cost during that period*. In other words, when a *given fixed amount* of total selling costs is decided or considered to be incurred, then greater the level of output sold, the selling cost per unit would continue to decline. In other words, when a firm commits itself to a given amount of selling costs, it will be then treat them as a fixed cost. Given a fixed amount of selling costs, average selling cost will change in the same manner as does the average fixed cost; the average selling cost curve will have a shape of rectangular hyperbola, as shown in Fig. 24.9.

Optimum Level of Advertising Outlay (Selling Costs): With Price and Product Design as Constants

An important question is how much selling costs (advertisement outlay), a firm will undertake so as to maximize profits. In other words, what is the *optimum amount* of advertisement expenditure for a firm. The determination of optimal advertising outlay (selling costs) for the firm can be explained by the average and marginal cost curves. For explaining the optimal amount of advertising expenditure with average and marginal costs, we have to use
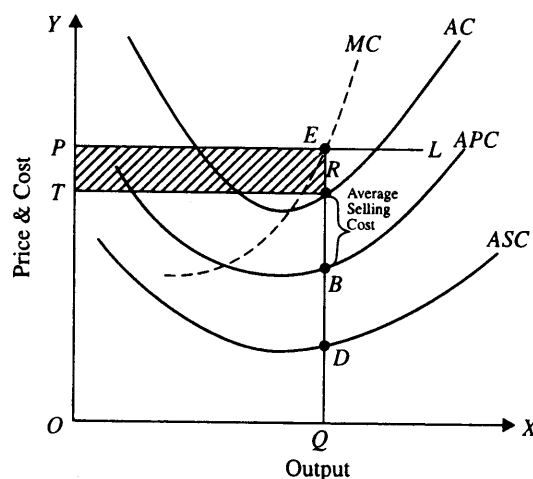

Fig. 24.10. *Optimal Level of Advertising Expenditure*

the concept of average selling cost when advertisement outlay is taken to be variable. Consider Fig. 24.10 where ASC and APC are average selling cost and average production cost curves respectively. Average selling cost curve ASC has been superimposed over the average production cost curve APC to obtain average total curve AC ($AC = APC + ASC$). It should, therefore, be noted that the vertical distance between the AC and APC curves measures the average selling cost. MC is the marginal cost curve to the average total cost curve AC. We assume that price OP has already been fixed by the firm which is kept constant. Further, the nature of the product is also held unchanged and it is only the advertising expenditure which is varied and consequently demand shifts to the right and output sold increases.

Since price of the product remains fixed at OP, the horizontal line PL can be viewed as if it were a marginal revenue curve. This is because through increase in advertisement expenditure, a firm can sell more quantity of the *product without lowering price*. If the firm aims to maximize profits, then it will be in equilibrium regarding advertising outlay where the marginal cost (which is inclusive of both production cost and selling cost) is equal to the marginal revenue, *i.e.*, given price OP. It will be seen from the Fig. 24.10 that marginal cost is equal to marginal revenue (or price) at OQ level of output at which profits will be maximized. With OQ as the output produced and sold, total profits made by the firm are equal $PERT$ and, as is evident from the figure, average selling cost incurred by the firm in its equilibrium position is equal to QD or BR. Therefore, the optimal total amount of advertisement outlay, incurred by the firm will be equal to (QD or BR) multiplied by the output OQ.

Optimal Level of Advertising Expenditure with Price as a Variable and with Product as Constant

We have discussed above how much advertising expenditure a firm will undertake so as to maximize its profits when the price as well as nature of the product remain constant. We shall now explain the case of optimal level of advertising expenditure when price also varies. In other words, we have to explain optimal combination of advertising expenditure, price and output, only the physical make-up of the product will not be varied. We shall illustrate our analysis with two dimensional diagram. Here *we shall be taking a given sum of advertising expenditure* and then analyse its effect on demand, output, price and profits. With a given sum of advertising expenditure, average selling cost per unit will go on declining as more output is produced. It is because of this that the distance between the two successive average cost curves will become smaller and smaller as output is expanded. However, it should be noted that we will be increasing this gtiven sum of advertising expenditure and assess its effect on demand and profits to obtain the optimal levels of advertising expenditure and output.

The optimal amount of advertising outlay and the choice of price-output combination by a firm is illustrated in Fig. 24.11. It should be noted that we continue to assume that the firm aims to maximize profits. Along the Y-axis in Fig. 24.11 price and cost of the product is measured and along the X-axis the amount of output is measured. To begin with, AR_0 is the demand or average revenue curve for the product of the firm and APC is the average production cost curve which does not include any selling or advertising cost. There will be marginal cost curve corresponding to the average production cost curve APC and there will be marginal revenue curve to the average revenue curve AR_0. Suppose these marginal cost and marginal revenue curves are equal at output ON_0 where price P_0 is determined and the firm is making profits equal to P_0LQH. This is the situation before any advertisement is undertaken.

Now suppose that the firm decides to undertake advertisement expenditure equal to 1,000 rupees. This advertisement expenditure will not only increase demand by shifting the average revenue curve to the right, but will also add to costs. Assume that with advertisement expenditure of Rs. 1,000, the demand curve shifts to the curve AR_1 and the new average cost (inclusive of advertising cost) is AC_1. With AR_1, as the new demand curve and AC_1 as the average cost curve, equilibrium is at output ON_1 and price P_1 (this price-output equilibrium is determined

by the equality of *new* marginal revenue and marginal cost curves which are not drawn in the figure for sake of avoiding confusion). It will be seen from the figure that profit has now risen to the area P_1ETK. It should be noted that profits will increase only when the addition to *net* revenue earned from advertising outlay is greater than the advertising outlay incurred. It should be further noted that as a result of advertising outlay, output increases and therefore total production cost also increases. And the addition to *net* revenue attributable to advertising outlay is obtained by subtracing the addition to production cost from the addition to gross revenue.

Since as a result of advertisement expenditure, profits have increased, firm will be tempted to undertake further advertisement

Fig. 24.11. *Optimal Advertising Expenditure*

expenditure. Suppose the firm incurs additional advertising expenditure of Rs. 1,000 (*i.e.*, now total Rs. 2,000) and with this the demand (or average revenue curve) shifts to the position AR_2 and average cost curve to AC_2. Now, the new equilibrium position is reached at output ON_2 and price P_2, and profits are further increased to P_2JSD. It may again be mentioned that profits increase only when additional revenue generated (net of production cost) is greater than the additional advertising cost. "Indeed it will pay the firm to go on increasing selling costs in this way so long as each increment of advertising expenditure adds more to revenue than to costs. Only when the additional revenue generated (net of production costs) equals the extra (marginal) amount spent in order to generate that net revenue, will profit be at the highest possible level."[8]

In Fig. 24.11 now assume that lured by the increase in profits to P_2JSD, firm undertakes additional advertising expenditure of Rs. 1,000 (that is, now total advertising expenditure is raised to Rs. 3,000). With this, the average revenue curve shifts to AR_3 and average cost curve to AC_3. It will be seen from the figure that now profits earned by the firms are equal to the area P_3BWG. It will be observed that profits P_3BWG are less than the previous profits P_2JSD. The decline in profits must be due to the additional net revenue (*i.e.*, additional revenue net of increase in production costs) made possible by the additional advertising expenditure being smaller than the extra cost of one thousand rupees on advertisement.

It is thus clear that the firm will not undertake the third additional outlay of one thousand rupees and will be in equilibrium by incurring advertising expenditure of two thousands rupees at which its profits are largest (that is, equal to P_2JSD) and additional net revenue made possible by the advertising is equal to the additional advertising outlay. Thus in the situation depicted in Fig. 24.11 two thousand rupees per period is the optimal advertising expenditure for the firm.

It should be noted for each level of advertising expenditure, that is, for one thousand, two thousand and three thousand rupees there is profit-maximizing price and output. Various levels of profits P_0LQH, P_1ETK, P_2JSD, and P_3BWG are all maximum with different levels of advertising expenditure. The task for the firm is to choose the combination of advertising expenditure, price and output which yields maximum out of the various maxima of profits. That is, the firm has to determine the combination of advertising expenditure, price and output which yields him *maximum-maximorum* level of profits. And we have seen above that in the situation depicted
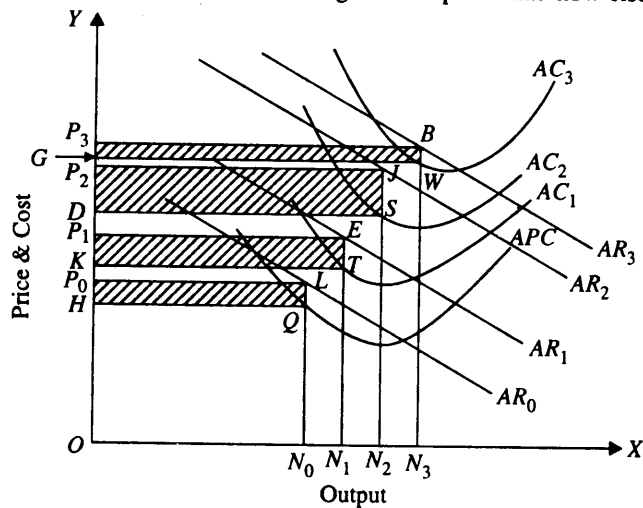
8. Stonier and Hague, *op. cit.*, p. 224.

in Fig. 24.11 this maximum-maximorum equilibrium is reached when advertising expenditure is two thousand rupees, price is P_2 and output is ON_2.

Effect of Advertising (Selling Costs) on Elasticity of Demand

We have seen above that as a result of advertising expenditure demand for the product increases, that is, demand curve shifts to the right. For the sake of convenience, we have assumed that the new demand curves after advertising is undertaken are parallel to the old one, though in actual practice it need not be so. However, in this connection it is useful to consider whether when the demand increases and demand curve shifts to the right, elasticity of demand at each price remains the same, declines or rises. The purpose of competitive advertising or other forms of selling costs is to influence the consumers to buy a particular brand of the product rather than other substitute brands of it. The intention of the producer who advertises for his brand of the product is to differentiate his brand more from the viewpoint of the consumers and try to prove his brand to be superior to others. Thus if the purpose and intention of advertisement is achieved, then the consumers would begin to consider a particular brand of the product much superior to others. That is, they will now regard the other competitive brands as less closely substitutes than they were thinking before. This greater degree of differentiation and consequently fall in the elasticity of substitution will cause a decline in the elasticity of demand for the product at each price as the demand curve shifts to the right under the influence of the advertisement. It is, therefore likely that the elasticity of demand should decline under the influence of advertising or other forms of selling costs. The extent to which elasticity will decline is of course very uncertain. As we shall see below, changes in elasticity of demand as a result of advertisement expenditure have significant implications for price-output equilibrium.

Effect of Advertising (Selling Costs) on Price and Output

The effect of advertising and other forms of selling costs on price and output are quite uncertain. This effect depends, on the one hand, upon the change in price elasticity of demand as a result of advertising expenditure and, on the other, upon the behaviour of average cost of production. If when the demand curve shifts to the right under the influence of advertising, the elasticity of demand at the current price remains the same and *average cost of production is falling* sharply with the expansion in output, then it may be profitable for the firm to set a lower price after advertisement. In this case profit-maximising price will be lower and output larger than those before advertisement. On the other hand, if price elasticity of demand declines very much as demand curve shifts to the right as a result of advertisement, and the average cost of production is rising sharply with the increase in production, then in order to maximize profits in the new situation after advertisement, the firm may raise the price and reduce its level of output. In this case, the advantage of the increase in demand due to advertisement expenditure will be enjoyed in the form of higher price of the product rather than of increased sales of the product. But the most likely case to occur is that the elasticity of demand declines after advertisement and the average cost of product is not rising vary sharply, and as a result of these the firm may find it profitable to raise price of the product somewhat and also increase the output after advertising expenditure is undertaken. Thus, according to Stonier and Hague, "The most probable result for a profit-maximizing firm will be that the elasticity of demand will fall somewhat at each price, that the volume of demand will increase at each price and that price and output will both increase to some extent as a result of advertising campaign."[9] And this is the case which we have considered in our analysis of advertising expenditure as depicted in Fig. 24.11. It will be seen from Fig. 24.11 that with successive increments in advertising expenditure price has risen from P_0 to P_1, P_1 to P_2 and P_2 to P_3 and also output has increased from N_0 to N_1, N_1 to N_2 and N_2 to N_3. Thus in our analysis of Fig. 24.11 both price and output have increased as a result of advertisement outlay.

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9. Stonier and Hague, *op. cit.*, p. 226.

EXCESS CAPACITY UNDER MONOPOLISTIC OR IMPERFECT COMPETITION

Theories of Chamberlin's monopolistic competition and Joan Robinson's imperfect competition have revealed that a firm under monopolistic competition or imperfect competition in long-run equilibrium produces an output which is less than socially optimum or ideal output. This means that firms operate at the point on the falling portion of long-run average cost curve, that is, they do not produce the level of output at which long-run average cost is minimum. Long-run equilibrium of a firm under monopolistic competition is achieved when the demand curve (or average revenue curve) facing a firm becomes tangential to the long-run average cost curve so that it earns only normal profits. Under such circumstances a firm can reduce average cost (and hence price) by expanding output to the minimum level of long-run average cost, but it will not do so because its profits are maximised (equality of marginal revenue with marginal cost is attained) at the level of output smaller than that at which its long-run average cost is minimum.

Society's productive resources are fully utilised when they are used to produce the level of output which renders long-run average cost minimum. Thus a monopolistically competitive firm produces less than the socially optimum or ideal output, that is, the output corresponding to the lowest point of long-run average cost curve. This is in sharp contrast to the position of the firm in long-run equilibrium under perfect competition, which operates at the minimum point of the long-run average cost curve. The amount by which the actual long-run output of the firm under monopolistic competition falls short of the socially ideal output is a measure of *excess capacity* which means unutilised capacity.

The existence of excess-capacity under imperfect or monopolistic competition can be understood from Figures 24.12 and 24.13. Figure 24.13 depicts the long-run position of a perfectly competitive
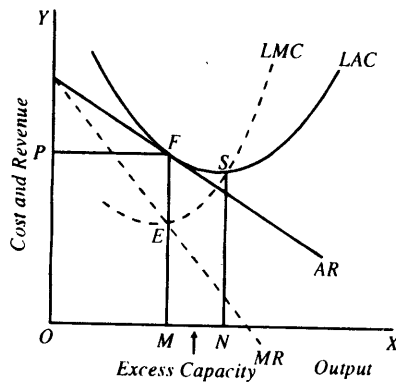

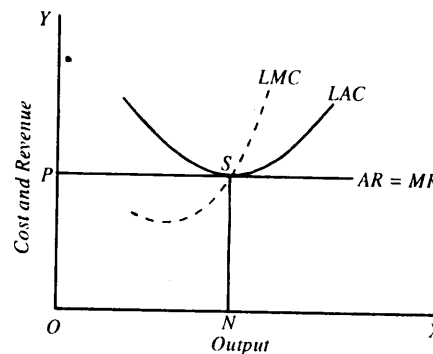**Fig. 24.12.** *Excess Capacity under Monopolistic Competition*

Fig. 24.13. *Ideal or Socially Optimum Output under Perfect Competition*

firm which is in long-run equilibrium at the level of output *ON* corresponding to which long-run average cost is minimum. It is at output *ON* that the double condition of long-run equilibrium, namely Price = *MC* = *AC* is fulfilled. It is thus clear that firms under perfect competition produce socially ideal output. On the other hand, a firm under monopolistic competition depicted in Fig. 24.12 is in long-run equilibrium at output *OM* at which its marginal revenue is equal to marginal cost and price is equal to average cost (Average revenue curve *AR* is tangential to average cost curve *LAC* at point *F* corresponding to output *OM*). It will be noticed that at output *OM* long-run average cost is still falling and goes on falling up to output *ON*. This means that the firm can expand its production up to *ON* and reduce his long-run average cost to the minimum. Ideal output is the output at an which long-run average cost is minimum. Therefore, the firm is *producing MN less than the ideal*

output. Thus MN output represents the excess capacity which emerges under monopolistic competition. It is worth nothing that the concept of excess capacity refers only to the long run. This is because in the short run under any type of market structure (including perfect competition) there can be all sorts of departures from the ideal reflecting incomplete adjustment to the existing market conditions.

Causes of Excess Capacity

What factors are responsible for the existence of excess capacity under monopolistic competition? It is due to the existence of excess capacity that average cost of production and price of product are higher and output smaller monopolistic competition than under perfect competition. There are three main causes of the emergence of excess capacity under monopolistic competition. First, the most important cause of the eixstence of excess capacity under monopolistic competition is *downward-sloping demand curve (or average revenue curve) of the firm.* A downward-sloping curve can be tangent to a U-shaped average cost curve only at the latter's falling portion. It is only the horizontal demand curve or average revenue curve (as is actually found under perfect competition) which can be tangent to a U-shaped average cost curve at the latter's minimum point. From this, it also follows that the greater the elasticity of average revenue (or demand) curve confronting a monopolistically competitive firm, the less the excess capacity and *vice versa.* When the demand curve facing a firm is perfectly elastic, there is no ecess capacity, as is the case under perfect competition.

Now, demand curve facing individual firms under monopolistic competition slopes downward due to *product differentiation* found in it. Various firms produce different varieties and brands of product and each has a certain degree of monopoly power over the variety or brand it produces for fixing price and output. If products were homogeneous the demand curve would not have been downward sloping and equilibrium would have been established at the minimum point of *LAC* without there being any excess capacity.

The second reason for the emergence of excess capacity under monopolistic competition, as has been emphasised by Chamberlin, *is the entry of a very large a number of firms in the industry in the long run.* Lured by excess profits in the short run new firms enter the industry in the long run. This results in sharing of market demand among many firms so that each firm produces a smaller output than its full or optimum capacity. There are too many grocery shops, too many cloth manufacturing firms, too many automobile parts producing firms, too many barber shops each operating with excess capacity. In fact, under monopolistic competition, given the same demand and cost conditions, number of firms will be larger than even under perfect competition. This is because by expanding output to the minimum point of *LAC*, fewer firms will be required to meet the given demand for industry's product.

The conception and the measure of excess capacity as enunciated above is based upon a particular notion of ideal output. Marshall, Kahn[10], Harrod[11], Cassel[12] and Joan Robinson[13] have regarded *ideal output or optimum size of the firm as that output at which its long-run average cost is minimum.* To quote Joan Robinson. In a perfectly competitive industry each firm in full equilibrium will produce that output at which its average costs are minimum. Each firm will then be of the optimum size... If competition is imperfect, the demand curve for the output of the individual firm will be falling and the double condition of equilibrium can only be fulfilled for some output at which average cost if falling. The firms will, therefore, be of less than optimum size when profits are normal...

10. R.F. Khan, "Some Notes on Ideal Output", *Economic Journal,* XIV (1935), pp. 1-35.
11. R.F. Harrod, Doctrines of Imperfect Competition, *Quarterly Journal of Economics,* XLIX (1934-35), pp. 442-70.
12. J.M. Cassels, Excess Capacity and Monopolistic Competition, *Quarterly Journal of Economics,* LI (1936-37), pp. 426-43.
13. Joan Robinson, *Economics of Imperfect Competition,* pp. 96-97.

It is only if conditions of perfect competition prevail that firms will be of the optimum size and there is no reason to expect that they will be of optimum size in the real world since in the real world competition is not perfect."[13]

Benefits of Excess Capacity. However, many modern economists are of the view that excess capacity under monopolistic competition is *desirable in some respects*. According to them, excess capacity under monopolistic competition provides some benefits which increase consumer welfare. As mentioned above, the excess capacity comes into existence mainly due to product differentiation under monopolistic competition. Now, this *product differentiation leads to product variety* which is highly beneficial to the consumers. The ability to choose among a wide variety of clothes, furniture, restaurant meals and other types of styles of product designs add greatly to the satisfaction or welfare of the consumers. Therefore, in our view social benefits of excess capacity should be weighed against the cost to the society of excess capacity.

QUESTIONS AND PROBLEMS FOR REVIEW

1. What is monopolistic competition? Explain the important features of monopolistic competition.
2. What is product differentiation? What role does it play in the determination of price and output under monopolistic competition?
3. Analyse the short-run and long-run equilibrium of a firm working under monopolistic competition. [C.U., B.Com., (H), 1999]
4. What is group equilibrium? Explain how group equilibrium is achieved under monopolistic competition.
5. What is meant by excess capacity? Show that how a firm working under monopolistic competition works with excess capacity in the long run. [D.U.B.Com. (H) 2001]
6. What causes excess capacity under monopolistic competition? Why is it undesirable?
7. *Are there any benefits of excess capacity associated with monopolistc competition?*
8. What are wastes of competition? How are they found under monopolistic competition?
9. Compare price-output equilibrium under monopolistic competition with that under (a) perfect competition, (b) monopoly.
10. Distinguish between selling costs and production cost? Explain the optimal level of advertising expenditure.
11. Explain Chamberlin's concept of excess capacity. What, according to him, is responsible for the emergence of excess capacity under monopolistic competition?
12. Explain the concept of economic efficiency. Evaluate econmic inefficiency of firms operating under monopolistic competition.
13. Distinguish between production cost and selling costs. How does monopolistically competitive firm determine the optimal amount of selling costs ?
14. "Monopolistically competitive industries are characterised by too many firms each of which produces too little"
15. Assuming that a firm operating under monopolistic competition does not engage in price competition and that it has already decided what kind and quality of product it will produce, how will the firm decide how much selling costs to incur in order to maximise its profits?

Price and Output Under Duopoly and Oligopoly*

We have studied price and output determination under three market forms, namely, perfect competition, monopoly, and monopolistic competition. However, in the real world economies we find that many of the markets or industries are oligopolistic. Oligopoly is an important form of imperfect competition. *Oligopoly is said to prevail when there are a few firms or sellers in the market producing or selling a product.* In other words, when there are two or more than two, but not many, producers or sellers of a product, oligopoly is said to exist. Oligopoly is also often referred to as *"Competition among the Few"*. **The simplest case of oligopoly is duopoly which prevails when there are only two producers or sellers of a product.** Analysis of duopoly raises all those basic problems which are confronted while explaining oligopoly with more than two firms.

Although there is no borderline between few and many but when the number of sellers of a product are two to ten, oligopoly situation is said to exist. When products of a few sellers are homogeneous, we talk of *Obligopoly without Product Differentiation* or *Pure Oligopoly*. On the other hand, when products of the few sellers or firms, instead of being homogeneous, are differentiated but close substitutes for each other, *Oligopoly with Product Differentiation or Differentiated Oligopoly* is said to prevail.

CHARACTERISTICS OF OLIGOPOLY

In oligopoly some special characteristics are found which are not present in other market structures. We discuss some of these characteristics below:

Interdependence. The most important feature of oligopoly is the interdependence in decision-making of the few firms which comprise the industry. This is because when number of competitors is few, any change in price, output, product etc. by a firm will have a direct effect on the fortune of its rivals, which will then retaliate in changing their own prices, output or products as the case may be. It is, therefore, clear that the oligopolistic firm must consider not only the market demand for the industry's product but also the reactions of the other firms in the industry to any action or decision it may take. Since more than one reaction-pattern is possible from the other firms, we have to make some assumptions about the reaction of the others before we can provide a definite and determinate solution of price-output fixation under oligopoly.

Importance of advertising and selling costs. A direct effect of interdependence of oligopolists is that the various firms have to employ various aggressive and defensive marketing weapons to gain a greater share in the market or to prevent a fall in their market share. For this various firms have to incur a good deal of costs on advertising and on other measures of sales promotion. Therefore, there is a *great importance of advertising and selling costs* under conditions of market situation characterised by oligopoly. Prof. Baumol rightly says that "it is only under oligopoly that advertising comes fully into its own."[1] Under perfect competition,

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1. William J. Baumal, *Economic Theory and Operations Analysis*, 3rd edition, p. 352.

* **Note.** The students of those universities which do not prescribe duopoly and oligopoly in the syllabi, should omit the study of this chapter.

advertising by an individual firm is unnecessary in view of the fact that it can sell any amount of its product at the going price. A monopolist has also not to make any competitive advertisement since he is the only seller of a product. A monopolist may perhaps advertise when he has to inform the public about his introduction of a new model of his product or he may advertise in order to attract potential consumers who have not yet tried his product. Under monopolistic competition advertising plays an important role because of the product differentiation that exists under it, but not as much important as under oligopoly. "Under oligopoly, advertising can become a life-and-death matter where a firm which fails to keep up with the advertising budget of its competitiors may find its customers drifting off to rival products"?[2]

In view of the fact that a firm in an oligopolistic industry competes by changing the advertisement costs, quality of the product, prices, output etc., *the presence of competitive conditions in it can hardly be denied.* To an oligopolist "Competition can consist not in the quiescent stalemate of perfect competition where there is no battle because there is never anyone strong enough to disturb the peace. Rather to him, true competition consists of the life of constant struggle, rival against rival, which one can only find under oligopoly (or, on a smaller scale, under conditions of monopolistic competition)."[3]

Group behaviour. Further, another important feature of oligopoly is that for its proper solution analysis of group behaviour is important. Theories of perfect competition, monopoly and monopolistic competition (with a large number of firms) present no difficult problem of making suitable assumption about human behaviour. In cases of perfect competition and monopolistic competition (with a large number of firms), the economists assume that the business firms behave in such a way as to maximize their profits. Assumption of profit maximization gives overall good results in these situations where mass of people are involved and there is no interdependence of firms. On the other end, the theory of monopoly deals with a sole individual and it is also appropriate to assume profit-maximizing behaviour on his part.

But the theory of oligopoly is a theory of *group behaviour* not of mass or individual behaviour and to assume profit-maximizing behaviour on the part of a producer of a group may not be very valid. There are few firms in a group which are very much interdependent. Given the present state of our economic and social science, there is no generally accepted theory of group behaviour. Do the members of a group agree to pull together in promotion of common interests or will they fight to promote their individual interests? Does the group possess any leader? If so, how does he get the others to follow him? These are some of the questions that need to be answered by the theory of group behaviour.

Indeterminateness of demand curve facing an oligopolist. Another important feature is the indeterminateness of the demand curve facing an oligopolist. The demand curve shows what amounts of its product a firm will be able to sell at various prices. Now, under perfect competition, an individual firm's demand curve is given and definite. Since a perfectly competitive firm is one among a large number of firms producing an identical product, it is incapable of influencing the price of its product by its own individual action. Therefore, a firm under perfect competition faces a perfectly elastic demand curve at the level of the going price in the market. On the other hand, a monopolist produces a product which has only remote substitutes. Therefore, a monopolist can safely ignore the effects of its own price changes on his distant rivals and therefore the monopolist faces a given and definite demand curve depending upon the consumer's demand for his product. Under monopolistic competition, where there is a large number of firms producing products which are close substitutes for each other, changes in price by an individual firm will have a negligible effect on each of its many rivals. Therefore, a firm under monopolistic competition can validly assume the prices of its rivals to remain unchanged when it makes changes in the price of its product. Thus, the demand curve for a firm under monopolistic competition can be taken as definite and is given by the buyers' preferences for its product.

2. Baumol, *op. cit.*, p. 352

3. *Ibid.*, p. 352.

But the situation under oligopoly is quite different because of interdependence of the firms in it. Under oligopoly, a firm cannot assume that its rivals will keep their prices unchanged when it makes changes in its own price. As a result of this, the demand curve facing an oligopolistic firm loses its definiteness and determinateness because it goes on constantly shifting as the rivals change their prices in reaction to price changes by a firm.

ARE PRICE AND OUTPUT UNDER OLIGOPOLY INDETERMINATE?

We have explained above the various characteristics and problems of oligopoly. The readers will now like to know how the economists analyse the determination of price and output under oligopoly. Because of the interdependence of firms in oligopoly and the uncertainty about the reaction patterns of the rivals, the easy and determinate solution to the oligopoly problem is not possible. In other words, interdependence of firms in an oligopoly and consequently firm's reactions to each other's behaviour poses serious difficulties in establishing the theory of the determination of price and output in an oligopolistic market.

A significant consequence of interdependence of firms in an oligopolistic market situation is that under it a *wide variety of behaviour patterns becomes possible.* "Rivals may decide to get together and co-operate in the pursuit of their objectives, at least so far as the law allows or, at the other extreme, they may try to fight each other to the death. Even if they enter into an agreement it may last or it may break down. And the agreements may follows a wide variety of patterns."[4] Therefore, a large variety of models analysing price-output determination under obigopoly have been evolved by the economists depending upon the different assumptions about the behaviour of the oligopolistic group and the reaction patterns of rivals to a change in price or output by a firm.

Another difficulty that arises out of interdependence of oligopolistic firms is the *indeterminateness of the demand curves facing individual firms.* As has been stated earlier, because of the interdependence an oligopolistic firm cannot assume that its rival firms will keep their price and quantities constant when it makes changes in its price. When an oligopolistic firm changes its price, its rival firms will retaliate or react and change their prices which in turn would affect the demand for the product of the former firm. Therefore, an oligopolistic firm cannot have sure and definite demand curve, since it keeps shifting as the rivals change their prices in reaction to the price changes made by it. Moreover, there is quite uncertainty about the rivals reactions to a price change by one firm. That is, when an oligopoly firm cuts its price, whether its rivals will also cut their prices similarly, or whether they will keep their prices unchanged. If they cut their prices, whether they will cut their prices by the same amount, or by a smaller or greater amount. A definite and determinate demand curve for a firm can be drawn if its rivals' prices remain unchanged or if it is known before hand that they will change their prices in a *certain particular way* in response to price changes by one firm. But under oligopoly there is no certainty about the reactions of the rivals to the price changes made by a firm. Hence the demand curve of an oligopolistic firm cannot be easily determined.

Now, when an oligopolist does not know the demand curve confronting him, what price and output he will fix cannot be ascertained by economic analysis. In other words, in view of the indeterminateness of demand curve for a firm under oligopoly, the solution for the determination of price and output under oligopoly cannot be provided by the economic theory. Under conditions of perfect competition, monopoly and monopolistic competition, an individual firm faces a determinate demand curve which has a corresponding definite marginal revenue curve. Then, on the basis of profit maximization principle, the determinate solution for the price and output fixation under perfect competition, monopoly and monopolistic competition is found by the equality of marginal revenue with marginal cost. This solution cannot be applied to price and output determination under oligopoly without qualification or making some additional as-

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4. William J. Baumol. *op. cit.*, pp. 223-24.

sumptions because the individual firm's demand curve and therefore the marginal revenue curve is indeterminate or unknown. Thus even if profit maximization assumption is considered as valid under conditions of oligopoly, no determinate solution for price-output fixation can be provided because of the indeterminateness of demand curve.

Even when the firms of an oligopoly do not enter into collusion, tacit or formal, or choose a leader from among themselves and instead try to compete with each other no single and simple solution is possible as to how a firm will fix its price and output. This is because of the uncertainty about the reaction patterns of the rivals to a move by one firm. This uncertainty about the reaction patterns of competitors poses a serious analytical difficulty in the way of providing a determinate solution for the oligopoly problem. Quoting Prof. Baumol again. "When a businessman wonders' about his competitors' likely response to some move which he is considering, he must recognized that his competitors, too, are likely to take this interdependence phenomenon into account. The firms' attempts to outguess one another are then likely to lead to an *interplay of anticipated strategies and counterstrategies which is tangled beyond hope of direct analysis.*"[5] Thus under oligopoly a firm is likely to imagine an infinite sequence of compounded hypotheses such as "If I make move *A*, he may consider making countermove *B*, but he may realise that I might then respond by making move *C*, in which case..., and so an *ad infinitum.*"

Again, a determinate solution to the price-output problem in other market forms (perfect competition, monopoly and monopolistic competition) is arrived at by assuming profit-maximising motive on the part of the firms. But some economists have challenged the validity of the profit-maximising hypothesis in oligopolistic situations. According to Prof. Rothschild oligopolists aim at maximising their security or achieving reasonable amount of *stable profits* over a long period of time rather than maximising profits at a time.[6] On the other hand, Prof. Baumol thinks that in oligopolistic circumstances it is legitimate to assume *sales maximising objective* on the part of the firms."[7] Some other economists think that managers of oligopolistic firms maximise their own *utility function.* Still others like R.L. Morris think that firms try to maximise their *growth rate.* Finally, some economists assert that oligopolists do not maximise anything they merely *satisfice.* In other words, they aim to obtain satisfactory profits rather than maximum profits. All this controversy about the real objective of the firms relates especially to the oligopolistic firms. This controversy about the most probable objective of the oligopolists' further introduces indeterminacy in the analysis of price and output under oligopoly.

In view of above, there is no single determinate solution of the oligopoly problem but a wide variety of possible solutions, each depending upon different assumptions. It is worth noting as to what exactly economists mean by *indeterminancy.* When no single solution is possible of a problem, economists generally say that the problem has no determinate solution. Thus economists usually speak of indeterminacy where mathematicians would speak of a multiplicity of solutions.[8]

Various Approaches to Price-Output Problem in Oligopoly

It may, however, be pointed out that in spite of what has been said above, economists have tried to provide a determinate solution to the oligopoly problem. But there is no any *single determinate solution,* but a *number of determinate solutions* depending upon different assumptions. The determinate solution to the oligopoly problem has been provided in the following ways:

First, for providing a determinate solution to the price-output determination, some economists have assumed that oligopolistic firms *ignore interdependence.* Now, when interdependence

5.   *Op. cit.* p. 224.

6.   See for Rothschild's view about security motive in chapter 19.

7.   See for Baumol's view about sales maximization objective, chapter 19.

8.   *Ibid.,* p. 352.

disappears from decision-making of the oligopolistic firms, the demand curve facing them becomes determinate and can be ascertained. With this, the standard analysis of the theory of the firm can be applied to provide a determinate solution for price and output problem of oligopoly. classical models of duopoly put forward by Cournot and Bertrand fall in this category. In both those models, oligopolistic interdependence has been ignored. Cournot in his famous model assumed that each oligopolistic firm would *set its output* in the belief that its rival firm's output would remain constant. On the other hand, Bertrand assumed that an oligopolistic firm would *set its price* in the belief that its rival firm would keep its price unchanged. But for providing a solution for price and output determination under oligopoly by ignoring the interdependence is a fundamentally mistaken approach. Rothschild rightly writes, "The determinate solution can be reached.... if it is assumed that the oligopolists do not take into account the effect of their action on the policy of their rivals as in the famous Cournot and Bertrand's solutions; ...But this type of approach is absolutely valueless, because it only solves the oligopoly problem by removing from the analysis its most essential differentiating aspect: the oligopolists' consciousness of their interdependence."[9]

The second approach to provide a determinate solution to the price and output problem of oligopoly is to assume that oligopolistic firm is able to *predict the reaction patterns and counter moves of his rivals*. In this approach various oligopoly models based on different assumptions regarding the particular reaction patterns have been propounded. Chamberlin[10] while recognizing that oligopolistic firms are conscious of their interdependence took some assumptions regarding the reaction pattern and provided a determinate solution according to which under duopoly or oligopoly, monopoly output and price are determined so that profits of duopolists (oligopolists) are jointly maximised. P.M. Sweezy and Oxford economists, Hall and Hitch, assumed that an oligopolist firm considers that while the price increase by it will not be followed by its rival firms, the price reduction will be matched by them. With such an assumption about the reaction pattern, demand curve facing an individual oligopolistic firm is of a kinked type with a kink at the current price. We shall discuss the *kinked demand curve approach* to oligopoly problem in detail later in this chapter. Many other economists assuming other reaction patterns have propounded various other oligopoly models.

The third approach to oligopoly problem assumes that oligopolistic firms, realising their interdependence, *will pursue their common interest and will form a collusion*, formal or tacit, that is, will enter into agreement and work in the pursuit of their common interest. They will maximise joint profits and share profits, market or output as agreed to between them. A variant of this approach is that firms in an oligopoly would accept one firm as a leader, which may be a dominant or low-cost firm, and they will follow their leader in the fixation of price of the product. Both the collusive and price leadership oligopoly models will be critically examined later in this chapter. In case of collusion and price leadership, the problem of indeterminateness of demand curve is not encountered.

Another significant approach to the oligopoly is that of the *theory of games*, put forward by Neuman and Morgenstern. In the theory of games, an oligopolistic firm does not guess at its rivals' reaction pattern, but *calculates the optimal moves by rival firms*, that is, their best possible strategies and in view of that adopts its own policies and counter moves. The explanation of the application of the theory of games to the oligopoly problem is an advanced-level study and will not be given in this book.

From our above analysis it follows *that there is no single determinate solution to the price-output fixation under oligopoly*. As said above, economists have developed a large number of models by taking different assumptions regarding the behaviour of the oligopolistic group

9. K.W. Rothschild, Price Theory and Oligopoly, *Economic Journal*, Vol. 57, 1947, reprinted in *Readings in Price Theory* (AEA).

10. E.H. Chamberlin, *The Theory of Monopolistic Competition*, chapter 3 and Appendix A.

(that is, whether they will cooperate together or fight with each other), regarding the objective they seek to achieve (that is, whether they are assumed to maximize individual or joint profits or they are assumed to maximize security or sales), and regarding the *different reaction patterns* of rival firms to price and output changes by one firm.

COLLUSIVE OLIGOPOLY : PRICE AND OUTPUT UNDER CARTELS

In order to avoid uncertainty arising out of interdependence and to avoid price wars and cut throat competition, firms working under oligopolistic conditions often enter into agreement regarding a uniform price-output policy to be pursued by them. The agreement may be either formal (open) or tacit (secret). But since formal or open agreements to form monopolies are illegal in most countries, agreements reached between oligopolists are generally tacit or secret. When the firms enter into such collusive agreements formally or secretly, collusive oligopoly prevails. But collusions are of two main types: (*a*) cartels and (*b*) price leadership. In a cartel type of collusive oligopoly, firms jointly fix a price and output policy through agreements. But under price leadership one firm sets the price and others follow it. The one which sets the price is a price leader and the others who follow it are its followers. The follower firms adopt the price of the leader, even though they have to depart from their profit-maximising position, as they think that it is to their advantage not to compete with their leader and between themselves. In this present section we confine ourselves to explain the determination of price and output under the cartel type of collusive oligopoly and in the next section we will explain price and output determination under price-leadership form of collusive oligopoly.

Originally, the term 'cartel' was used for the agreement in whcih there existed a common sales agency which alone undertook the selling operations of all the firms that were party to the agreement. But now-a-days all types of formal or informal and tacit agreements reached among the oligopolistic firms of an industry are known as cartels. Since these cartels restrain competition among the member firms, their formations have been made illegal in some countries by the Governments passing laws against them. For instance, the formation of a cartel is illegal in U.S.A. under the Anti-Trust Laws passed there. However, in spite of the illegality of cartels they are still formed in U.S.A. through secret devices and by adopting some means or the other shrewd businessmen are able to evade the antimonopoly laws.

Formal collusion or agreement among the oligopolists may itself take various forms. An extreme form of collusion is found when the member firms agree to surrender completely their rights of price and output determination to a 'Central Administrative Agency' so to secure maximum joint profits for them. Formation of such a formal collusion is generally designated as *perfect cartel*. Thus under perfect cartel type of collusive oligopoly, the price and output determination of the whole industry as well as of each member firm is determined by the common administrative authority so as to achieve *maximum joint profits for the member firms.*

The total profits are distributed among the member firms in a way already agreed between them. The share from total profits of each member firm is not necessarilv in proportion to the output quota it has to supply and the cost it incurs on it. The output quota to be produced by each firm is decided by the central administrative authority in such a way that the tota! costs of the total output produced is minimum. In fact, under perfect cartel, the central authority determines the separate outputs to be produced by the various members and the price they have to charge in the same way as a monopolist operating multiple plants would do. Now, the question arises as to what outputs different firms in a cartel will be asked to produce so that the total cost is made minimum. Total cost will be minimized when the various firms in the cartel produce such separate outputs so that their marginal costs are equal. This is because if the marginal costs of the member firms are not equal, then the marginal units of output could be produced at a smaller cost by the firms with a lower marginal cost than by those with a higher marginal cost.

Let us now see how the cartel works and determines its price and output. Let us assume that two firms have formed a cartel by entering into an agreement. We assume that the *cartel*

will aim at maximizing joint profits for the member firms. First of all, the cartel will estimate the demand curve of the industry's product. As the demand curve facing a cartel will be the aggregate demand curve of the consumers of the product, it will be sloping downward as is
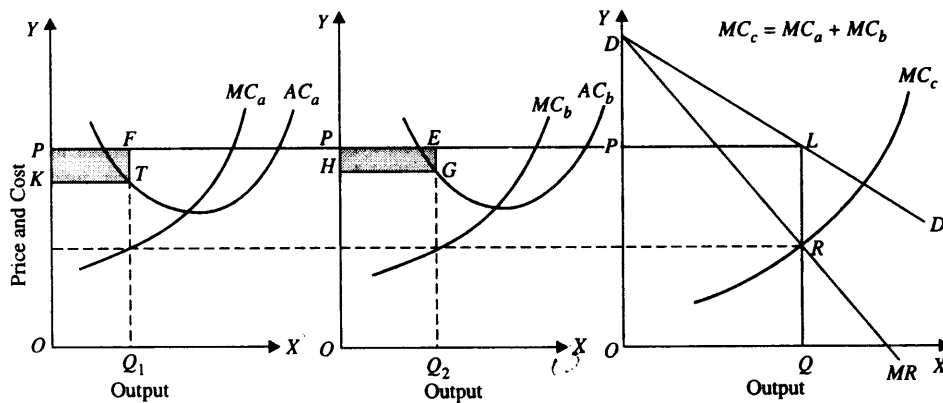

Fig. 25.1. *Price and Output Determination under Cartel: Joint Profit Maximization*

shown by the curve *DD* in Fig. 25.1. Marginal revenue curve *MR* showing the addition to cartel's revenue for successive additions to its output and sales will lie below the demand curve *DD*. Cartel's marginal cost curve (*MC*) will be given by the horizontal addition of the marginal cost curves of the two firms. This has been done in Fig. 25.1 where *MC* curve has been obtained by adding horizontally marginal cost curves MC_a, and MC_b of firms *A* and *B* respectively. It should be noted that cartel's marginal cost curve MC_c, obtained as it is by horizontal addition of marginal cost curves of the two firms, will indicate the minimum possible total cost of producing each industry output on it; each industry output being distributed among the two firms in such a way that their marginal costs are equal.

Now, the cartel will maximize its profits by fixing the industry's output at the level at which *MR* and *MC* curves of the cartel intersect each other. It will be seen in Fig. 25.1 that *MR* and *MC* curves cut each other at point *R* or output *OQ*. It will also be seen from the demand curve *DD* that the output *OQ* will bring in price equal to *QL* or *OP*. Having decided the total output *OQ* to be produced, the cartel will allot output quota to be produced by each firm so that the marginal cost of each firm is the same. This can be known by drawing a horizontal straight line from point *R* towards the *Y*-axis. It will be seen from the figure that when firm A produces OQ_1 and firm *B* produces OQ_2, the marginal costs of the two firms are equal. The output quota of firm *A* will be OQ_1, and of firm *B* will be OQ_2. It is worth noting that the total output *OQ* will be equal to the sum of OQ_1 and OQ_2.

It will be seen from Fig. 25.1 that with output OQ_1 of firm *A* and cartel price *OP*, profits made by it are *PFTK* and with output OQ_2 and cartel price *OP*, profits made by firm *B* are *PEGH*. The sum of the profits of the two firms are joint profits made by the cartel which will be maximum under the given demand and supply conditions because they have been arrived at by equating combined marginal cost MC_c with combined marginal revenue *MR*.

Thus, the determination of output *OQ* and price *OP* and the outputs OQ_1 and OQ_2 by the two firms *A* and *B* will ensure the maximum joint-profits for the member firms constituting the cartel. However, in a perfect or complete cartel the profits made by individual firms will not be retained by them, instead they will be brought under a common pool. These profits will be divided by the member firms according to the terms of agreement reached between them at the time of forming the cartel. There is no reason why the division of profits should necessarily be made in proportion to the separate outputs produced by them. The allocation of output quota to each of them is made on the grounds of minimizing cost and not as a basis for determining profit distribution.

Prof. J.S. Bain rightly says, "There is no particular reason for believing that the operating firms will retain just the profits resulting from the sale of their quotas, which are determined on cost grounds alone. Relative bargaining strengths will presumably determine the division of profits."[11]

Market Sharing Cartels

The formation of perfect cartels, as described above, has been quite rare in the real world even where their formation is not illegal. In a perfect cartel not only the price but also the output to be produced by each member of a cartel is decided by a central management authority and profits made in all of them are pooled together and distributed among the members according to the terms of a prior agreement. But when cartels are loose, instead of being perfect, the distribution of profits and fixation of outputs of individual firms are not determined in a manner perfect cartel does. In a loose type of cartel the market-sharing by the firms occurs. Further, there are two methods of market sharing: non-price competition and quotas.

Market Sharing by Non-Price Competition. Under market sharing by non-price competition, only a uniform price is set and, the member firms are free to produce and sell the amount of outputs which will maximize their individual profits. Though the firms agree not to sell at a price below the fixed price they are free to vary the style of their product and the advertising expenditure and to promote sales in other ways. That is, the price being a fixed datum, the firms compete on non-price basis. If the different member firms have identical costs, then the agreed uniform price will be the monopoly price which will ensure maximization of joint profits. But when there are cost differences between the firms as is generally the case, the cartel price will be fixed by bargaining between the firms. The level of this price will be such as will ensure some profits to high-cost firms.

But with cost differences such loose cartels are quite unstable. This is because the low cost firms will have an incentive to cut price to increase their profits and therefore they will tend to break away from the cartel. However, they may not openly charge lower price than the fixed one and instead cheat the other firms by giving secret price concessions to the buyers. However, as the rivals gradually loose their customers, the cheating by the low-cost firms will be ultimately discovered and consequently open price war may commence and cartel breaks down.

Market-Sharing by Quota. The second type of market-sharing cartel is the agreement reached between the oligopolistic firms regarding quota of output to be produced and sold by each of them at the agreed price. If all firms are producing homogeneous product and have same costs, the monopoly solution (that is, the maximization of joint profits) will emerge with the market being equally shared by them. However, when costs of member-firms are different, the different quotas for various firms will be fixed and therefore their market shares will differ. The quotas and market shares in case of cost differences are decided by bargaining between the firms. During the bargaining process, two criteria are usually adopted to fix the quotas of the firms. One is the past level of sales of the various firms and the second is the productive capacity of the firms. However, the 'past-period sales' and 'productive capacity' of various firms are not very firm criteria as they can be easily manipulated. Ultimately the quotas fixed for various firms depend upon their bargaining power and skill.

The second common basis for the quota system and market sharing is the division of market regionwise, that is, the *geographical division of the market between the cartel firms*. In this arrangement, price and also style of the product of cartel firms may vary.

It is worth noting that all types of cartels are unstable when there exists cost differences between firms. The low cost firms always have a tendency to reduce price of the product to maximize their profits which ultimately result in the collapse of the collusive agreement. Further, if the entry of firms in the oligopolistic industry is free, the instability of the cartel is intensified. The new entrants may not join the cartel and may fix a lower price of the product to sell a

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11. J.S. Bain, *Pricing, Distribution and Employment*, 1953, p. 286.

large quantity. This may start a price war between the cartel firms and the new entrants. We thus see that the stability of the cartel arrangemen' is always in danger.

Instability of a Cartel

Incentive to cheat by members of a cartel is a big problem faced by a cartel and this leads to the collapse of cartel agreement. Let us take two firms A and B which enter into a cartel agreement and fix the price of the product each has to charge and output each has to produce and sell (*i.e.*, share of the market). The choice problem facing each member firm of the cartel is whether to cooperate and abide by the agreement and thus sharing the joint monopoly profits or to cheat the other and try to make higher individual profits. But if both cheat and violate the agreement, the cartel would break down and profits would fall to the competitive level. We will show that though both would lose by cheating others but as seen in case of prisoner's dilemma their selfish behaviour would lead them to cheat others. The payoff matrix for two member firms of a cartel from the various combination of choices to be made by them is presented.

Table: Pay off Matrix of Cartel Members

| | | FIRM A | |
		Cheat	Cooperate
FIRM B	Cheat (lower the price)	A : 5 lakhs B : 5 lakhs	A : 2 lakhs B : 25 lakhs
	Cooperate	A : 25 lakhs B : 2 lakhs	A : 15 lakhs B : 15 lakhs

It will be seen from the above payoff matrix, that if both firms cooperate and abide by cartel agreement, they share monopoly profits; 15 lakhs to each of them. If both firms cheat and thus violate the agreement, profits to each firm fall to the competitive level, Rs. 5 lakh to each firm. If firm A cheats, B's profit drop to low level of Rs. 2 lakh and A's profits rise to Rs. 25 lakhs. On the other hand, if firm B cheats and firm A adheres to the agreement, profits of A declines to Rs. 2 lakh and B's profits shoot up to Rs. 25 lakhs.

It is evident from the payoff from the different choices that each firm has a strong incentive to cheat. Under the prevailing circumstances, A's best strategy is to cheat, rather than cooperate. The same is true for firm B whose best strategy is also to cheat. Again, *it is the pursuit of self-interest rather than common interest that prompts the firms to cheat each other.* Thus, both firms will cheat and this will bring about the break-down of the cartel.
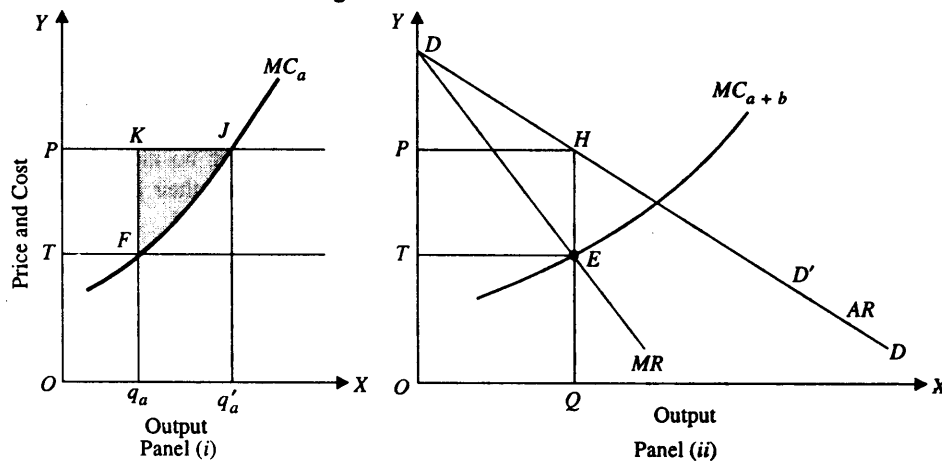

Fig. 25.2. *Instability of a Cartel due to Cheating by a Member*

Graphical illustration. The strong incentive to cheat on the part of cartel members and consequently causing a break-down of a cartel is graphically illustrated in Fig. 25.2, where *DD*

is market demand curve facing the cartel consisting of two firms A and B. MC_a in panel (i) is the marginal cost curve of the firm A. Summing up horizontally marginal cost curves of the two firms forming a cartel we get the combined marginal cost curve MC_{a+b}. The cartel maximises its profits by equating MR with MC_{a+b} and accordingly output OQ and price OP are fixed. The output share of each firm will be fixed where marginal cost of each firm equals the combined marginal cost of the cartel members. Accordingly, the output share of firm A shown in panel (i) is Oq_a at which marginal cost of firm A equals the combined marginal cost curve MC_{a+b}. Oq_a will be the agreed share of output of firm A. To simplify our analysis we have not shown the cost situation of firm B, the other member of the cartel.

Thus, under the cartel agreement, firm A will be producing Oq_a, and charging price OP. Now, a glance at panel (i) in Fig. 25.2, reveals that given the price OP, fixed by the cartel, if the firm A increases its output from agreed share Oq_a to Oq_a', it can increase its profits by the shaded area FKJ. This means that in order to increase its profits the firm A will have incentive to cheat by trying to produce and sell more at the agreed price OP. Similarly, the firm B, other member of the cartel (not shown in Fig. 25.2) will also find that it can increase its profits by violating the cartel agreement by producing and selling more than its agreed output share. To sum up, it is due to the working of *inner pressures and promotion of self-interest* by cartel members that accounts for the instability of cartel arrangements and frequent price wars.

PRICE LEDERSHIP

Price leadership is an important oligopoly problem and is similar to collusive oligopoly model. Price leadership comes into existence either through tacit or formal agreement. But as the formal or open agreement to establish price leadership are generally illegal, price leadership is established as a result of informal and tacit understanding between the oligopolists. The competing oligopolists in an informal meeting choose a leader and agree to follow him in setting price.

Types of Price Leadership

Price leadership is of various types. Firstly, there is a *price leadership by a low-cost firm*. In order to maximize profits the low-cost firm sets a lower price than the profit-maximizing price of the high-cost firms. Since the high-cost firms will not be able to sell their product at the higher price, they are forced to agree to the low price set by the low-cost firm. Of course, the low-cost price leader has to ensure that the price which he sets must yields some profits to the high-cost firms—their followers.

Secondly, there is a *price leadership of the dominant firm*. Under this one of the few firms in the industry may be producing a vary large proportion of the total production of the industry and may therefore dominate the market for the product. This dominant firm wields a great influence over the market for the product, while other firms are small and are incapable of making any impact on the market. As a result, the dominant firm estimates its own demand curve and fixes a price which maximises its own profits. The other firms which are small having no individual effects on the price, follow the dominant firm and accepting the price set by it adjust their output accordingly.

Price-Output Determination under Low-Cost Price Leadership

Economists have developed various models concerning price-output determination under price leadership making different assumptions about the behaviour of price leader and his followers. We shall first explain price-output determination under price leadership by a low-cost firm. In order to simplify our analysis we make the following assumptions:

(1) There are two firms, A and B. The firm A has a lower cost of production than B.

(2) The product produced by the two firms is *homogeneous* so that the consumers have no preference between them.

(3) Each of the two firms has *equal share* in the market. In other words, demand curve facing each firm will be the same and will be half of the total market demand curve of product.

Given the above assumptions, price and output determination under price leadership is illustrated in Fig. 25.3. Each firm is facing demand curve d which is half of the total market demand curve DD for the product. MR is the marginal revenue curve of each firm. AC_a and MC_a are the average and marginal cost curves of firm A and AC_b and MC_b are the average and marginal cost curves of firm B. Cost curves of firm A lie below the cost curves of firm B because we are assuming that firm A has a lower cost of production than firm B.

The firm A will be maximizing its profits by selling output OM and setting price OP, since at output OM, its marginal cost is equal to the marginal revenue. Firm B's profits will be maximum

Fig. 25.3. *Price Leadership by Low Cost Firm*

when it fixes price OH and sells output ON. It will be seen from the figure that profit-maximizing price OP of firm A is lower than the profit-maximizing price OH of firm B. Since the two firms are producing a homogeneous product, they cannot charge two different prices. Because the profit-maximizing price OP of firm A is lower than the profit-maximizing price OH of firm B, firm A will dictate the price to the firm B or in other words, firm A will win if there is price war between the two and will emerge as a price leader and firm B will be compelled to follow. Given these facts, the agreement reached between them, even though tacit it may be, will require that the firm A will act as the price leader and firm B as the price follower.

It should be noted that firm B after having accepted firm A as the price leader will actually charge price OP and produce and sell OM. This is because at price OP, it can sell OM output like firm A because the demand curve facing each firm is the same. Thus both the firms will charge the same price OP and sell the same amount (OM). Note that the total output of the two firms will be $OM + OM = OQ$ which will be equal to the market demand for the good at price OP. But there is an important difference between the two. While firm A, the price leader, will be maximizing its profits by selling output OM and charging price OP, the firm B will not be making maximum profits with this price-output combination because its profits are maximum at output ON and price OH. Profits earned by firm B by producing and selling output OM and charging price OP will be smaller than those of firm A because its costs are greater.

When the products of the price leader and his price-followers are differentiated, then the price charged by them will be different but the prices charged by the followers will be only slightly different either way from that of the price leader and they will conform to a definite pattern of differentials.

Price Leadership by the Dominant Firm

We now proceed to explain the determination of price and output when there exists price leadership by a dominant firm which is having a large share of the market with a number of small firms as followers each of which has a small share of the market. To explain this we assume that the dominant firm knows the total market demand curve for the product. Further,
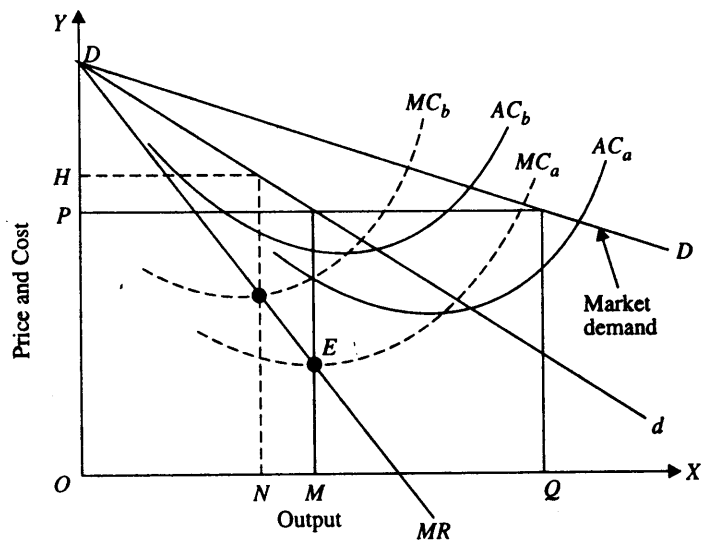
the dominant firm also knows the marginal cost curves of the smaller firms whose lateral summation yields the total supply of the product by the small firms at various prices. This implies that from his past experience the dominant firm can estimate fairly well the likely supply of the product by the small firms at various prices. With this information, the leader can obtain his demand curve. Consider panel (a) of Fig. 25.4 where DD is the market demand curve for the product. At each price the leader will be able to sell the part of the market demand not fulfilled by the supply from the small firms. Thus at price P_1, the small firms supply the whole of the quantity of the product demanded at that price. Therefore, demand for leader's product is zero. At price P_2, the small firms supply P_2C and therefore the remaining part of CT of the market demand will constitute the demand for the leader's product. The demand for leader's product has been separately shown in panel (b) of Fig. 25.4 by the curve d_L. P_2Z in panel B is equal to CT in panel (a). At price P_3, the supply of the product by the small firms is zero. Therefore, the whole market demand B_3U will have to be satisfied by the price leader. Likewise, the other point of the demand curve for the price leader can be obtained. In panel (b) of Fig. 25.4 the MR_L is the marginal revenue curve of the price leader corresponding to his demand curve d_L. AC and MC are his average and marginal cost curves. The dominant price leader will maximize his profits by producing output OQ (or PH) and setting price OP. The followers, that is, the small firms will charge the price OP and will together produce PB. [PH in panel (b) equals BS of panel (a) in Fig. 25.4].
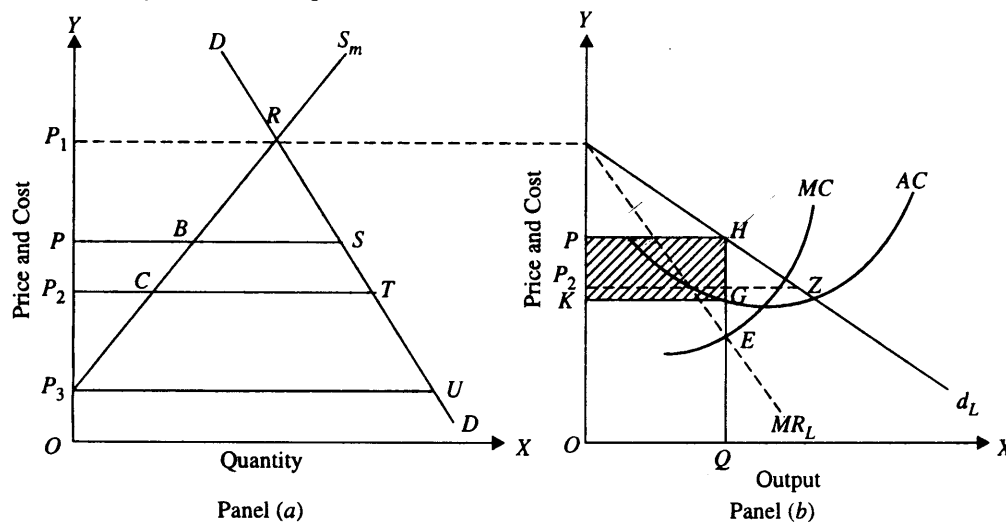

Fig. 25.4. *Price Leadership by Dominant Firm*

It is worth noting that in order that profits of the leader are maximized it is not enough that followers should charge profit-maximizing price OP set by him, he will also have to ensure that they produce PB. If the followers produce more or less than this, given the market demand DD, the leader will be pushed to a non-profit maximizing position. This implies that if price-leadership is to remain, there must be some definite market-sharing agreement tacit though it may be.

Difficulties of Price Leadership

Price leadership involves many difficulties in the real world. First, the success of price leadership of a firm depends upon the correctness of his estimates about the reactions of his followers. If his estimates about the reactions of his rivals to price changes by it prove to be incorrect, then not only the success of his price policy but also his leadership in the market will be jeopardised. Secondly, when a price leader fixes a higher price than the followers would prefer, there is a strong tendency for the followers to make hidden price cuts in order to increase

their shares of the market without openly challenging the price leader. A good number of devices which amount to secret price cutting are used by business firms. Some of these secret price-cutting devices are the offer of rebates, favourable credit terms, 'money back' guarantees, after-delivery free services, sale on the payment of price in easy instalments with low rates of interest etc., and liberal entertainment of the buyers. Price leaders are generally fed up with the increasing number of concessions granted by their rivals and they make an open price cut to prevent further fall in their share of the market. In such circumstances price leadership becomes infructuous.

Another important difficulty of maintaining price leadership is the tendency on the part of the rivals to indulge in *non-price competition* to increase sales while go on charging the price set by the price leader. The devices used under 'non-price competition' include advertising and other methods of the sales promotion, like improvement of the quality of the product, besides the hidden price-product concessions mentioned above. While charging the same price, the rivals try to increase their share of the market by increasing the advertisement expenditure. As a result of this non-price competition, the price leader has also to adopt similar devices to prevent the fall in its sales or has to make outright cut in price in order to achieve his objective. In view of these facts, the price leader may not be able to maintain his leadership for a long time.

Further, there is a great limitation on the price leader to fix a high price of his product. This is because the high price will induce the rivals to make secret price cuts which will adversely affect the sales of the price leader. Moreover, a high price fixed by the price leader will attract new competitiors into the industry which may not accept his leadership. Lastly, differences in costs also pose a problem. If the price leader has higher costs, then the high price fixed by him will, as mentioned above, induce the rivals to undercut price or will attract the entry of new firms into the industry. If the price leader has lower costs than his rivals, he will set a low price which will antagonise his rivals who will distrub him quite frequently.

KINKED DEMAND CURVE THEORY OF OLIGOPOLY

It has been observed that many oligopolistic industries exhibit an appreciable degree of price rigidity or stability. In other words, in many oligopolistic industries prices remain sticky or inflexible, that is, there is no tendency on the part of the oligopolists to change the price even if the economic conditions undergo a change. Many explanations have been given of this price rigidity under oligopoly and most popular explanation is the so-called kinked demand curve hypothesis. The kinked demand curve hypothesis was put forward independently by Paul M. Sweezy[12], an American economist, and by Hall and Hitch[13], Oxford economists.

It is for explaining price and output under *oligopoly with product differentiation*, that economists often use the kinked demand curve hypothesis. This is because when under oligopoly products are differentiated, it is unlikely that when a firm raises its price, all customers would leave it because some customers are intimately attached to it due to product differentiation. As a result, demand curve facing a firm under differentiated oligopoly is not perfectly elastic. On the other hand, under oligopoly *without* product differentiation, when a firm raises its price, all its customers would leave it so that demand curve facing an oligopolist producing homogeneous product may be perfectly elastic. Further, under oligopoly without product differentiation, there is a greater tendency on the part of the firms to join together and form a collusion, formal or tacit, and, alternatively, to accept one of them as their leader in setting their price. No doubt, kinked demand curve has a special relevance for differentiated oligopoly, but it has also been applied for explaining price and output under oligopoly wihtout product differentiation.

The demand curve facing an oligopolist, according to the kinked demand curve hypothesis,

12. Paul M. Sweezy. "Demand under Conditions of Oligopoly", *Journal of Political Economy*, Vol XLVIII. August 1939, reprinted in American Economic Association, *Readings in Price Theory*.

13. R.L. Hall and C.J. Hitch, "Price Theory and Business Behaviour." *Oxford Economic Papers*, No.2, May 1939.

has a 'kink' at the level of the prevailing price. The kink is formed at the prevailing price level because the segment of the demand curve above the prevailing price level is highly elastic and the segment of the demand curve below the prevailing price level is inelastic. A kinked demand curve dD with a kink at point K has been shown in Fig. 25.5. The prevailing price level is OP and the firm is producing and selling the output OM. Now, the upper segment dK of the demand curve dD is relatively elastic and the lower segment KD is relatively inelastic. This difference in elasticities is due to the particular competitive reaction pattern assumed by the kinked demand curve hypothesis.

The competitive reaction pattern assumed by the kinked demand curve oligopoly theory is as follows:

Each oligopolist believes that if he lowers the price below the prevailing level, his competitors will follow him and will accordingly lower their prices, whereas if he raises the price above the prevailing level, his competitors will not follow his increase in price.
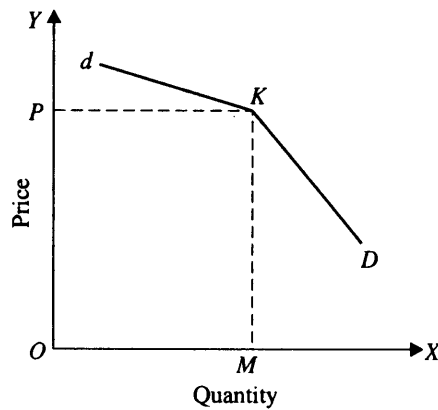

Fig. 25.5. *Kinked Demand Curve under Oligopoly*

In other words, each oligopolistic firm believes that though its rival firms will not match his increase in price above the prevailing level, they will indeed match its price cut. These two different types of reaction of the competitors to the increase in price on the one hand and to the reduction in price on the other make the portion of the demand curve above he prevailing price level relatively elastic and the lower protion of the demand curve relatively inelastic. This is explained below:

(a) **Price reduction.** If the oligopolist reduces its price below the prevailing price level OP in order to increase his sales, the competitors will fear that their customers would go away from them to buy the product from the former oligopolist which has made a price cut. Therefore, in order to retain their customers they will be forced quickly to match the price cut. Because of the competitors quickly following the reduction in price by an oligopolist, he will gain in sales only very little. (His sales will increase not at the expense of his competitors but because of the rise in total quantity demanded due to the reduction in price of the good. In fact each will gain in sales to the extent of a proportionate share in the increase in total demand). Very small increase in sales of an oligopolist following his reduction in price below the prevailing level means that the demand for him is inelastic below the prevailing price. Thus the segment KD of the demand curve in Fig. 25.5 which lies below the prevailing price OP is inelastic showing that very little increase in sales can be obtained by a reduction in price by an oligopolist.

(b) **Price increase.** If an oligopolist raises his price above the prevailing level, there will be a substantial reduction in his sales. This is because as a result of the rise in his price, his customers will withdraw from him and will go to his competitors who will welcome the new customers and will gain in sales. These happy competitors will have therefore no motivation to match the price rise. The oligopolist who raises his price will be able to retain only those customers who either have a strong preference for his product (if the products are differentiated) or who cannot obtain the desired quantity of the product from the competitors because of their limited productive capacity. Large reduction in sales following an increase in price above the prevailing level by an oligopolist means that demand with respect to increases in price above the existing one is highly elastic. Thus, in Fig. 25.5 the segment dK of the demand curve which lies above the current price level OP is elastic showing a large fall in sales if a producter raises his price.

It is now evident from above that each oligopolist finds himself placed in such a position that while, on the one hand, he expects his rivals to match his price cuts very quickly, he does not expect his rivals to match his price increases on the other. Given this expected competitive reaction pattern, each oligopolist will have a kinked demand curve *dD* with the upper segment *dK* being relatively elastic and the lower segment *KD* being relatively inelastic.

Why Price Rigidity?

From what has been said above, it is easy to see why an oligopolist confronting a kinked demand curve will have no incentive to raise its price or to lower it. Since the oligopolist will not gain a large share of the market by reducing his price below the prevailing level, and will have substantial reduction in sales by increasing his price above the prevailing level, he will be extremely reluctant to change the prevailing price. In other words, each oligopolist will adhere to the prevailing price seeing no gain in changing it. Thus, rigid prices are explained in this way by the kinked demand curve theory. In Fig. 25.5, the prevailing price is *OP* at which kink is found in the demand curve *dD*. The price *OP* will tend to remain stable or rigid as every member of the oligopoly will not see any gain in lowering it or in increasing it. It should be noted that if the prevailing price *OP* is greater than average cost, more than normal profits will be made.

Further, it is worth mentioning that the oligopolist confronting a kinked demand curve will be maximizing his profits at the current price level. For finding the profit-maximizing price-output combination, marginal revenue curve *MR* corresponding to the kinked demand curve *dD* has been drawn. It is worth mentioning that the marginal revenue curve associated with a kinked demand curve is discontinuous, or in other words, it has a broken vertical portion. The length of the discontinuity depends upon the relative elasticities of two segments *dK* and *KD* of the demand curve at point *K*. The greater the difference in the two elasticities, the greater the length of the discontinuity. In Fig. 25.6 marginal revenue curve *MR* corresponding to the kinked demand curve *dD* has been drawn which has a discontinuous portion or gap *HR*. Now, if the marginal cost curve of the oligopolist is such that it passes anywhere through the discontinuous portion *HR* of the marginal revenue curve *MR*, as shown in Fig. 25.6, the oligopolist will be maximizing his profits at the prevailing price level *OP*, that is, he will be in equilibrium at point *E* or at the prevailing price *OP*. *Since the oligopolist is in equilibrium, or in other words, maximizing his profits at the prevailing price level, it will have no incentive to change the price.* Furthermore, even if there are changes in costs, the price will remain

Fig. 25.6. *Changes in costs within limits do not affect the oligopoly price.*

stable so long as the marginal cost curve passes through the gap *HR* in the marginal revenue curve. In Fig. 25.6 when the marginal cost curve shifts upward from *MC* to *MC′* due to the rise in cost, the equilibrium price and output remain unchanged since the new marginal cost *MC′* also passes through the gap *HR*.
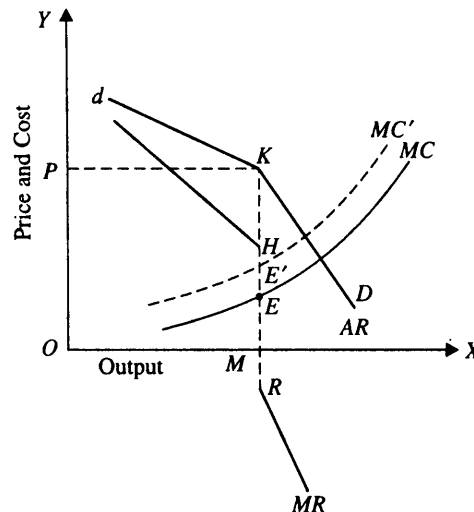
Likewise, the kinked demand curve theory explains that even when the demand conditions change, the price may remain stable. When the demand for the oligopolist increases and if the given marginal cost curve *MC* also cuts the new marginal revenue curve within the gap the same price continues to prevail in the oligopolistic market.

A Critical Appraisal of Kinked Demand Curve Theory

1. We saw above how the kinked demand curve theory of oligopoly provides an explanation of price rigidity under oligopoly. But there is a major drawback in the theory. It only explains why once an oligopoly price has been determined it would remain rigid or stable, it does not explain how the current price has been determined in the first instance. There is nothing in the kinked demand theory which explains how the price which is prevailing is determined. In other words, whereas this theory shows why price tends to stay where it is, it tells us nothing why the price is where it is. In Fig. 25.5 the kink occurs at the price OP because OP happens to be the prevailing or established price. The theory does not explain how the price got to be equal to OP. Commenting upon kinked demand curve theory Prof. Silberston rightly writes, "The most interesting question is not 'why are prices sticky in the short run?' (if they are), but who decides what the price is to be and on what principles."[14]

2. Another shortcoming of the kinked-demand oligopoly theory is that it does not apply to the oligopoly cases of price leadership and price cartels which account for quite a large part of the oligopolistic markets. When price leadership and price cartels exist in oligopolistic markets there is concerted behaviour in regard to the price changes and hence there is no kink in the demand curve in these cases.

3. In the case of pure oligopoly (*i.e.*, oligopoly with homogeneous products), the kinked demand curve theory does not furnish a complete explanation for price rigidity observed in oligopolistic markets. From the kinked demand curve analysis it follows that prices are likely to remain stable when demand or cost conditions change, whereas under pure oligopoly prices are likely to rise in the case of increase in cost or demand.

4. Finally, it has been rightly asserted that explanation of price stability by Sweezy's kinked demand curve theory applies only to depression periods. In periods of depression, demand for the products decreases. In the context of decreased demand, price in kinked demand curve theory is likely to remain sticky. But in periods of boom and inflation when the demand for the product is high and increasing, the price is likely to rise rather than remaining stable. Thus from Sweezy as well as Hall and Hitch's versions of kinked demand curve, it follows that prices are likely to remain stable during depression periods but not during boom and inflationary periods.

QUESTIONS AND PROBLEMS FOR REVIEW

1. What is oligopoly ? Explain the important features of oligopoly. Do you think price and output under oligopoly is indeterminate?

2. There is no unique solution to the problem of determination of price and output under oligopoly. Discuss.

3. What is Collusive Oligopoly ? How are price and output determined under it?

4. What is Cartel ? Explain how a cartel determines price and output of a product to maximise joint profits.

5. Why are cartels generally unstable ? Why is there a tendency on the part of members of cartels to cheat ?

6. Explain Sweezy's kinked demand curve model of oligopoly. How does it explain price rigidity under oligopoly ?

7. What is non-price competition ? What role does it play in oligopolistic market situation ?
   [**Hints** : Selling costs (*e.g.*, advertisement expenditure etc.) and product variation by the firms are two important forms of non-price competition.]

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14. Autbrey silberston, Price Behaviour of Firms, *Econbmic Journal*, September 1990.

8. What alternative objectives to profit maximisation have been proposed which the firms working under oligopoly seek to achieve? Briefly explain them.

   [**Hints** : Three alternative objectives to profit maximization are : (*a*) to seek normal profits which is assumed in the theory of mark-up pricing (*b*) sales maximisation which has been emphasised by Prof. Baumol and (*c*) security motive or to achieve maximum profits in the long run.]

9. What are the different types of price leadership that may be established in oligopolistic market situation ? Assuming that there are two firms producing homogeneous products explain how price and output are determined where there is price leadership by

   (1) the lower cost firm, and

   (2) the dominant firm.

10. Explain determination of price and output under price leadership when the two firms have :

    (*a*) equal market share

    (*b*) unequal market share.

11. W*hat is kinked demand curve ? How does it help in explaining price rigidity under oligopoly*?

12. What is kinked demand curve ? How does the kinked demand curve hypothesis explain price stability under oligopoly.   *D.U. B.Com., (Hons. 1996*

13. Using the kinked demand curve model explain how the increase and reduction in marginal cost need not lead to any change in price or output.

14. What is meant by price rigidity ? Why are prices rigid under oligopoly ? Explain with the help of a model.   *D.U. B.Com. (Hons)* 1998, 1999

15. Can a kinked demand curve arise in a duopoly market with homogenous products ? If so what would be the equilibrium price and output ?

16. What are the chief difficulties of maintaining price leadership in oligopolistic market situation? Examine the view that price leadership is likely to break down as there is generally a tendency on the part of the rival firms to indulge in *non-price competition* to promote their sales.

17. What is meant by interdependence of firms in oligopoly ? How does it affect price-output equilibrium of a firm ?

18. Explain briefly the various approaches that have been offered to explain the determination of price and output under oligopoly.

19. Which of the following statements are true and which false?

    (*a*) Interdependence of firms is an important feature of an oligopolistic market.

    (*b*) Advertisement expenditure does not play any role in an oligopolistic market.

    (*c*) Firms working in oligopolistic market have kinked demand curve.

    (*d*) Demand curve facing a firm working in an oligopolistic market is indeterminate.

    (*e*) There is no unique solution to the determination of price and output under oligopoly.

    (*f*) Price rigidity is one of the features of oligopoly.

    (*g*) It is the pursuit of self-interest by members that is often responsible for break-down of a cartel.

    [**Hint.** (*a*) Correct. (*b*) Incorrect. (*c*) Correct (according to kinked demand curve theory) (*d*) Correct. (*e*) Correct. (*f*) Correct. (*g*) Correct.]

20. An oligopolistic firm suspects that if it cuts price, its rivals will follow suit. How will this action on the part of the rivals affect the elasticity of demand curve facing the firm?

    (*a*) It will make the firm's demand curve more elastic.

    (*b*) It will make the firms demand curve less elastic.

    (*c*) It will not affect the elasticity of firm's demand curve.

    (Which is correct answer and Why?)

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APPENDIX TO CHAPTER 25

Classical Models of Oligopoly

In this appendix we will discuss two important models of oligopoly. A model of oligopoly was first of all put forward by Cournot a French economist, in 1838. Cournot's model of oligopoly is one of the oldest theories of the behaviour of the individual firm and relates to non-collusive oligopoly. In Cournot model it is assumed that an oligopolist thinks that his rival will keep their output fixed regardless of what he might do. That is, each oligopolist does not take into account the possible reactions of his rivals in response to his actions.

Another important model of non-collusive oligopoly which we will discuss below was put forward by E.H. Chamberlin in his famous work *"The Theory of Monopolistic Competition"*. Chamberlin made an important improvement over the classical models of oligopoly, including that of Cournot. In sharp contrast to Cournot and other classical models Chamberlin assumes in his model that oligopoly firms recognise their inter-dependence while fixing their output and price. Through his model Chamberlin arrives at a monopoly solution of pricing and output under oligopoly wherein oligopolistic firms in an industry *jointly maximise their profits*.

COURNOT'S DUOPOLY MODEL

As said above, Augustin Cournot, a French economist, published his theory of duopoly in 1838. But it remained almost unnoticed until 1880's when Walras called the attention of the economists to Cournot's work. Cournot dealt with the case of duopoly. Let us first state the assumptions which are made by Cournot in his analysis of price and output under duopoly. First, Cournot takes the case of two identical mineral springs operated by two owners who are selling the mineral water in the same market. Their waters are identical. Therefore, *his model relates to the duopoly with homogeneous products*. Secondly, it is assumed by Cournot, for the sake of simplicity, that the owners operate mineral springs and sell water without incurring any cost of production. Thus, in Cournot's model, cost of production is taken as zero; only the demand side of the market is analysed. It may be noted that the assumption of zero cost of production is made only to simplify the analysis. His model can be presented when cost of production is positive. Thirdly, the duopolists fully know the market demand for the mineral water; they can see every point on the demand curve. Moreover, the market demand for the product is assumed to be linear, that is, market demand curve facing the two producers is a straight line.

Lastly, Cournot assumes that *each duopolist believes that regardless of his actions and their effect upon market price of the product, the rival firm will keep its output constant*, that is, it will go on producing the same amount of output which it is presently producing. In other words, the duopolist will decide about the amount of output which is most profitable for him to produce in the light of his rival's *present* output and assumes that it will remain constant. In other words, for determining the output to be produced, he will not take into account reactions of his rival in response to his variation in output and thus decides its level of output *independently*.

Cournot's Approach to Equilibrium of the Duopolists

Suppose the demand curve confronting the two producers of the mineral water is the straight line MD as shown in Fig. 25A.1. Further suppose that ON = ND is the maximum daily output of each

mineral spring. Thus, the total output of both the springs is $OD = ON + ND$. It will be seen from the figure that when the total output OD of both the springs is offered for sale in the market, the price will be zero. It may be noted here that if there was a perfect competition, the long-run equilibrium price would have been zero and actual output produced equal to OD. This is because cost of production being assumed to be zero, price must also be zero so as to provide a zero profit long-run equilibrium under perfect competition.

Assume for the moment that one producer A of the mineral water starts the business first. Thus, to begin with he will be the monopolist. He will then produce daily ON output because his profits will be maximum at output ON and will be equal to $ONKP$ (since the costs are zero, the whole of total revenue $ONKP$ will represent profits). The price which that producer will charge will be OP. Suppose now that the owner of the other spring enters into the business and starts operating his spring. This new producer B sees that the former producer A is producing ON amount of output. According to the assumption made by Cournot, the producer B believes that the former producer A will continue producing ON ($= \frac{1}{2} OD$) amount of output, regardless of what output he himself decides to produce. Given this belief, the best that the new producer B can do is to regard segment KD as the demand curve confronting him. With his demand curve KD, and corresponding marginal revenue curve MR_B, the producer B will produce NH ($= \frac{1}{2} ND$) amount of output. The total output will now be $ON + NH$ $= OH$, and as a result the price will fall to OP' or HL per unit. The total profits made by the two producers will be $OHLP'$ which are less than $ONKP$. Out of total profits $OHLP'$, profits of producer A will be $ONGP'$ and profits of producer B will be $NHLG$. Thus entry into the market by producer B and producing output NH by him, the producer A 's profits has been reduced. A will therefore reconsider the situation. But he will assume that producer B will continue to produce output NH. With producer B producing output NH, the best that the producer A can do is to produce $\frac{1}{2}$ ($OD -NH$). He, will, therefore, reduce his output.
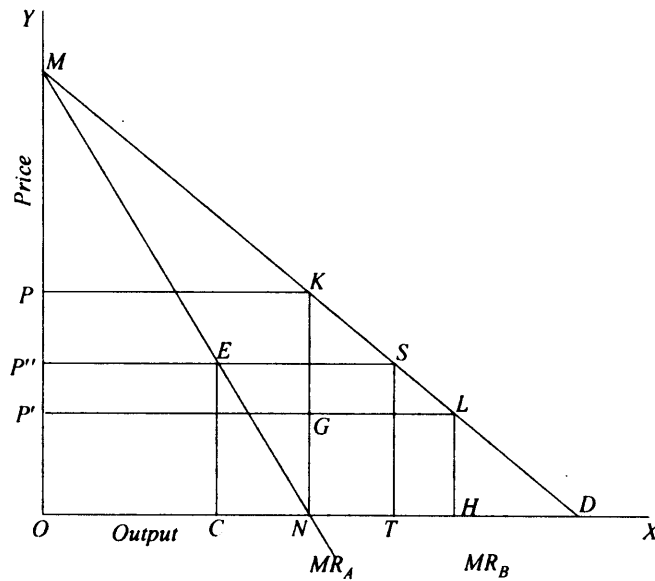

Fig. 25A.1 *Output Cournot's Duopoly Solution*

1. When cost of production is zero, the marginal cost will also be zero. With demand curve MD is a straight line, the marginal revenue curve will pass through the middle of OD, that is, through N so that $ON = ND$. Thus, at ON output MR will zero. Therefore, a monopolist with zero marginal cost will be in equilibrium at output ON where marginal revenue and marginal cost will be equal (both being zero at output ON). In such a situation, the monopolist will make maximum profits by producing output ON, given the linear demand curve MD.

Now that the producer B has been surprised by the reduction of output by producer A and will also find that his share of total profits is less than that of producer A, he will reconsider his situation. Learning nothing from his earlier experience and believing that producer A will continue producing its new current level of output, the producer B will find that he will now be making maximum profits by producing output equal to $\frac{1}{2}$ (OD – New output of A). Producer B, accordingly, will increase his output. With this move of producer B, producer A will find his profits reduced. The producer A will therefore again reconsider his position and will find that he can increase his profits by producing output equal to $\frac{1}{2}$ (OD – Current output of producer B). This process of adjustment and readjustment will continue and producer A being forced gradually to reduce his output and producer B being able to increase his output gradually until the total output OT is produced ($OT = \frac{2}{3}$ OD) and each is producing the same amount of output equal to $\frac{1}{3}$ OD. In this final position, producer A produces OC amount of output and producer B produces CT amount of output, and $OC = CT$. Throughout this process of adjustment and readjustment, each producer assumes that the other will keep his output constant at the present level and then always finds his maximum profits by producing output equal to $\frac{1}{2}$ (OD – the present output of the other).

As seen above, producer A starts by producing $ON = (\frac{1}{2}$ $OD)$ and continuously reduces his output until he produces OC. The final output OC of producer A will be equal to $\frac{1}{3}$ OD ($= \frac{1}{2} OT$). On the other hand, producer B begins by producing $\frac{1}{4}$ th of OD and continuously increases his output until he produces CT. His final output CT will be equal to $\frac{1}{3}$ OD ($= \frac{1}{2} OT$). Thus, the two producers together will produce total output equal to $\frac{1}{3}$ $OD + \frac{1}{3}$ $OD = \frac{2}{3}$ OD ($= OT$).

Cournot's Duopoly Equilibrium

It will be seen from Fig. 29A.1 that when each producer is producing $\frac{1}{3}$ OD (that is, when producer A is producing OC and producer B equal to CT), the best that his rival can do is to produce $\frac{1}{2}$ (OD – $\frac{1}{3}$ OD) which is equal to $\frac{1}{3}$ $OD = OC = CT$. Thus, *when each producer is producing $\frac{1}{3}$ OD so that the total output of the two together is $\frac{2}{3} OD$, no one will expect to increase his profits by making any further adjustment in output. Thus, in Cournot's model of duopoly, stable equilibrium is reached when total output produced is $\frac{2}{3}$ rd of OD and each producer is producing $\frac{1}{3}$ rd of OD.*

It will be useful to compare the Cournot' s duopoly equilibrium with the monopolistic and the purely competitive equilibriums. If the two producers had combined and formed a coalition, then the output produced by them together will be the monopoly output ON and, therefore, the price set will be the monopoly price OP. Monopoly output ON produced in case of coalition is much less than the output OT produced in Cournot's duopoly equilibrium. Further, the monopoly price OP charged in case of coalition is much greater than the price OP' ' determined in Cournot's duopoly equilibrium. In case of coalition, they will enjoy the monopoly profits $ONKP$ which are *maximum possible joint profits*, given the demand curve MD. These monopoly or maximum joint profits can be shared equally by them. It will be seen from Fig. 29A.1, that these monopoly profits $ONKP$ made in case of coalition are much greater than the total profits $OTSP$'' made by them in Cournot's duopoly equilibrium. It is thus clear that in case of the duopolists competing with each other as conceived by Cournot's duopoly solution, the price and the profits are lower and output is greater than if they had combined together and formed a monopoly.

On the other hand, if the market were perfectly competitive, the output would have been OD and price would have been zero. This is because with assumed marginal cost being equal to zero, perfectly

competitive equilibrium will be reached at the output level where price is equal to zero. That is, perfectly competitive solution would have resulted in greater output and lower price than under Cournot's duopoly equilibrium.

To sum up, under Cournot's duopoly equilibrium, output is two thirds of the maximum possible output (*i.e.*, perfectly competitive output) and price is two-thirds of the most profitable price (*i.e.*, monopoly price).

Following Cournot, the cost of production in the above discussion of Cournot's oligopoly solution has been taken to be zero. However, it should be noted that above conclusions will not change if the cost curves with positive cost of production are introduced into the discussion.

Reaction Functions and Cournot Duopoly Solution

Cournot solution of duopoly problem can also be obtained with *reaction functions* of the two firms. An *output reaction function depicts the profit-maximising output of a firm, on the assumption that the other firm's output remains constant.* We have seen above that the profit-maximising output of a Cournot's duopolist is one-half of the difference between the other firm's output and the market demand for output at which price equals marginal cost. This is called reaction function of a firm. This output at which price equals marginal cost (MC) is the maximum output which can be produced because any output beyond this will cause the price to go below marginal cost (which is equal to AC under constant cost conditions) and will therefore not be worthwhile to produce.

The following example will make clear the concept of reaction functions. Let the market demand function is: $Q = 100 - P$ and marginal cost is Rs. *10. In order to determine reaction functions of two duopolist firms, we set price equal to the given marginal cost to determine market demand at price (P) = MC.* Thus, from the given demand function

$$P = 100 - Q \qquad \qquad ....(i)$$

Setting it equal to MC we have

$$100 - Q = 10$$

Or $$Q = 100 - 10 = 90$$

Thus, the reaction function of firm A is :

$$Q_a = \frac{90 - Q_b}{2} \qquad \qquad ....(ii)$$

Where Q_a and Q_b are the outputs of firm A and B respectively.
Similarly, reaction function of firm B is :

$$Q_b = \frac{90 - Q_a}{2} \qquad \qquad ....(iii)$$

The above two equations (*ii*) and (*iii*) representing reaction functions of firms A and B respectively can be solved simultaneously to determine Q_a and Q_b. To do so we substitute the value of

$Q_b = \dfrac{90 - Q_a}{2}$ in equation (*i*) and have :

$$Q_a = \frac{90 - \left(\dfrac{90 - Q_a}{2}\right)}{2}$$

$$Q_a = \frac{90 - 45 + \dfrac{Q_a}{2}}{2} = 45 - 22.5 + \frac{1}{4}Q_a$$

$$Q_a - \frac{1}{4}Q_a = \frac{3}{4}Q_a = 22.5$$

$$Q_a = 22.5 \times \frac{4}{3} = \frac{90}{3} = 30$$

With $Q_a = 30$,

$$Q_b = \frac{90 - Q_a}{2} = \frac{90 - 30}{2} = 30$$

$$Q = Q_a + Q_b = 60$$

Solving equation (i) for P we get

$$P = 100 - Q = 100 - 60 = 40$$

Cournot Equilibrium as Nash Equilibrium. John F. Nash, a noted American Mathematician and a Nobel Prize winner in economics, has put forward the concept of equilibrium known as *Nash Equilibrium.* Cournot duopoly equilibrium is an example of Nash equilibrium. *According to Nash equilibrium, competing firms reach their equilibrium state when each of them thinks that it is doing its best, that is, maximising its profits in response to the given strategy adopted by others which think they are also maximising their profits with the given strategies of others.* As a result no one has a tendency to change its strategy. Therefore, we have a stable equilibrium. Since in Cournot duopoly equilibrium each firm choses to produce an output level that maximises its profits, given the profit-maximising level of output of the other firm, Cournot duopoly is generally called *Cournot-Nash duopoly equilibrium.*

Cournot's Duopoly Equilibrium Explained with the Aid of Reaction Curves

Some economists have employed the reaction curves to explain Cournot's duopoly equilibrium. The reaction curves may be output reaction curves or price reaction curves depending upon whether it is the output or the price which is the adjustment viable. Since, in Cournot's model, it is the output which is subject to the adjusting variation, output reaction curves are relevant. It should be carefully noted that these *reaction curves refer not to the reactions which a seller expects will be forthcoming from his rivals but to the sellers' own reactions to the moves of his rival.*
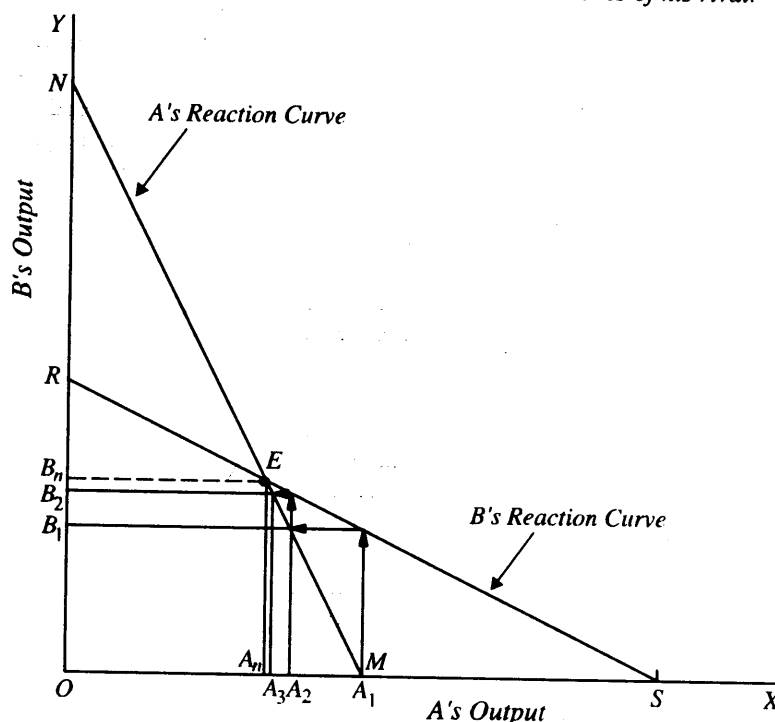

Fig. 25A.2. *Output Reaction Curves According to Cournot's Model*

In Fig. 25A.2 output reaction curves of two producers (sellers) A and B are shown, MN is the output reaction curve of A and RS is the output reaction curve of B. The output reaction curve MN of seller A shows how A will react to any change in output by B, that is, A's output reaction curve shows how much output A will decide to produce for each given output of producer B. In other words, A's output reaction curve MN indicates the most profitable output for A for each given output of B. Likewise, B's output reaction curve RS shows how much output B will decide to produce (that is, what will be B's most profitable output) for each given output of A. For example, if B produces output OB_1, A's output reaction curve MN shows that A will produce output OA_2 in response to B's output OB_1. Similarly, for all other outputs. On the other hand, if A produces OA_2, B's output reaction curve shows that B will produce OB_2 and so forth for all other outputs.

It will be seen from Fig. 25A.2, that output reaction curves have been drawn to be straight lines. This is because we are assuming that market demand curve for the product of duopolist is a straight line and that the marginal costs of production of both producers A and B are constant (at zero). It should be noted that output OM is the monopoly output since producer A will produce output OM if producer B's output is zero. In other words, producer A will produce and sell output OM if he were the monopolist. On the other hand, A will produce zero output if B'S output is ON. Given the marginal cost equal to zero, a producer will be forced to produce zero output when the price has fallen to zero and, therefore, production is no longer profitable. Output ON will be produced under conditions of perfect competition since at output ON the price will be zero and therefore equal to marginal cost which is assumed to be zero in the present case. Thus, *while OM is the monopoly output, ON is the perfectly competitive output*. We assume the two producers A and B to be completely identical, OR will, therefore, be equal to OM, and OS will be equal to ON.

Output reaction curves, as interpreted above, can be used to explain Cournot's duopoly equilibrium. Each producer, as before, assumes that his rival will continue producing the same amount of output regardless of what he might himself decide to produce. To begin with, suppose producer A goes into business first and is therefore initially a monopolist. Therefore, in the beginning A will produce output OM which is a monopoly output as output by the firm B is zero. Suppose now B also enters into business, B will assume that A, will keep his output constant at OM. B's output reaction curve RS reveals that for output OM of A, he will produce OB_1. But when A sees that B is producing OB_1 he will reconsider his last decision but will assume that B will go on producing OB_1. Output reaction curve NM of seller A shows that he will produce OA_2 in reaction to output OB_1 of firm B. Now when B sees that A is producing OA_2, he will think of readjusting his output but will assume that A will continue producing OA_2. B's ,output reaction curve RS, shows that he will produce output OB_2 for output OA_2 of producer A. But when A knows that B is producing OB_2 he will again readjust his output and will produce OA_3. This process of adjustments and readjustments will continue until point E is reached where the two reaction curves intersect each other and A and B are producing OA_n and OB_n respectively. *The duopolists attain stable equilibrium at the intersection point, since they will not feel induced to make any further adjustments in their outputs. With B producing OB_n, A's most profitable output is OA_n as indicated by his reaction curve NM, and with A producing OA_n, the most profitable output for B is OB_n as shown by his reaction curve RS.* Therefore, no one will have a tendency to make any further changes in their output. It is thus evident also from the reaction curve analysis that Cournot's solution yields a unique and stable equilibrium under duopoly.

A Critique of Cournot's Oligopoly Model

Cournot model of oligopoly is perhaps the first model which describes the behaviour of an individual firm under conditions of monopoly and competition. Therefore, it has occupied an important place in economic theory as a reference model or as a starting point of explaining the behaviour of individual firms under oligopolistic market structure. In our analysis of Cournot's duopoly model, we have seen that he makes an important assumption,, namely, while deciding about his output policy,

each duopolist believes that his rival will hold output constant at the present level whatever output he himself might produce. Further, a producer remains unshaken in this erroneous belief even when he constantly finds himself to be proved incorrect since after his action the rival does react and changes his output. This is a chief logical error in Cournot's model.

Furthermore, by assuming that duopolist (oligopolist), will think that his rival will continue producing the current level of output *Cournot model ignores the mutual interdependence* between the duopolist which is the chief characteristic of oligopoly, Thus, Cournot model provides solution for oligopoly problem by removing from it its most important feature.

BERTRAND'S DUOPOLY MODEL

Joseph Bertrand, a French mathematician, criticized Cournot's duopoly solution and production a substitute model of duoply. According to Betrand, there was no limit to the fall in price since each producer can always lower the price by underbridding the other and increasing his supply of output until the price becomes equal to his unit cost of production. There are some important differences in assumptions of Bertrand and Cournot's models of duopoly. In Bertrand's model, producers do not produce any output and then sell whatever price it can bring in. Instead, the producers first set the price of the product and then produce the output which is demanded at that price. Thus, in Bertrand's adjusting variable is price and not output.

In Cournot's model, each producer adjusts his output believing that rival will continue to produce the same output as he is doing at present, but in *Bertrand's model each producer believes that his rival will keep his price constant at the present level whatever price he might himself set.* Thus, inBertrand's adjusting variable is price and not output.

Furthermore, in Bertrand's model, it is not very important that the producer should know the correct market demand of their product, or should have identical view about the market demand. It is enough for each producer to know that he can capture the whole market by undercutting his rival. The other assumptions of Bertrand's model are the same as those of Cournot's model though their implications may be somewhat different. Thus, in Bertrand's model the products produced and sold by the two producers are completely identical and in no way differentiated. Its implications is that if a producer underbids the other, it can conquer the whole market (that is, snatch away all the customers from his rival). Further, the two producers have identical costs and also work under condition of constant marginal cost. Moreover, the productive capacity of the producers is unlimited, that is, there is no limit to their increase in the supply of output up to the maximum requirement of demand.

Let there be two producers A and B. Market demand curve for the product produced by them is given by linear curve DD'. Suppose that producer A goes into business first. Because A is the only producer at present he sets the price at the monopoly level, which is the most profitable for him. This monopoly price is P_m and producer A produces monopoly output ON which is half of perfectly competitive output Q_Y assuming constant average or marginal cost equal to OG. Now, suppose that B also enters into the business and starts producing the same product as produced by A. But B assumes that A will go on charging the same price P_m which he is doing at present, irrespective of whatever price he himself might set. Further B finds that he can capture the whole market by slightly undercutting the price and thereby make substantial amount of profits. Accordingly, B sets a price slightly lower than A's price P_m and as a result gets the entire demand of the product. A's sales, for the moment, falls to zero. Now, threatened with the loss of his entire business, producer A will reconsider his price policy. But while deciding about his new price policy he assumes that B will continue to charge the same price which he is doing at present. There are two alternatives open to him. First, he may match the price cut made by B, that is, he may charge the same price as B is now charging. In this case, he will secure half the market, the other half going to the producer B. Secondly, he may undercut B and set a slightly lower price than that of B. In this case, A thinks he will seize the entire market. Evidently, the latter course looks more profitable and thus A undercuts B and sets a price lower than B's price.

But with the above move of A, producer B finding himself deprived of all his sales will react and think of changing his price. Since B also assumes A's price to remain fixed at the present level, whatever price he himself might set. Producer B has similarly two alternatives : he may match A's price or undercut him. Finding the undercutting more profitable, B will set a bit lower price than A and thus seize the whole market.

But again, A will be forced to undercut B. This *price war* (*i.e.* the process of undercutting) will go on until the price falls to the competitive levels that is, equal to average or marginal cost of production. Once the price has fallen to the level of average or marginal cost of production, neither of them will like to cut the price further because in that case total cost would exceed total revenue and will therefore bring losses to the duopolists. Also, neither of them would like to raise the price, since in doing so either of them would be afraid of losing his entire business given the belief that the other will go on charging the same lower price. Thus, when the price has fallen to the
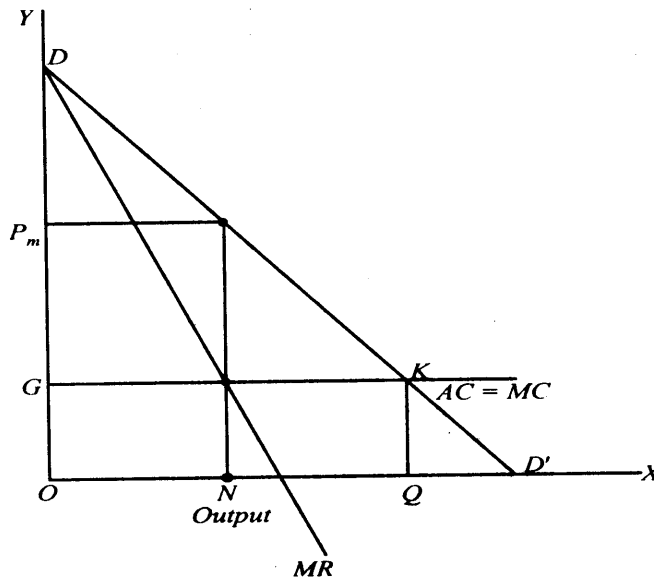

Fig. 25A.3

competitive level of average cost of production, neither of the duopolists have any incentive to lower the price further, or to raise it and, therefore, the equilibrium has been achieved. *In Bertrand's model equilibrium is achieved when as a result of price war market price has fallen to the average cost of production and the combined equilibrium output of the two duopolists is equal to the competitive output.*

It is evident from the above analysis of the Cournot and Bertrand's models of duoply that the fundamental assumption about the behaviour of the duopolists in the two models is similar. The duopolists in both models have erroneous and incorrigible belief that the rival will continue to do what he is presently doing regardless of what he himself might do. However, the basic assumption in the two models is not exactly the same. In Cournot's model, the basic assumption relates to the output policy, but in Bertrand's model, it relates to the price policy. Therefore, the two models yield different results. According to Cournot's model, equilibrium output is less than the purely competitive output and, therefore, the price is higher than the purely competitive price. But, according to Bertrand's model, output and price under duopoly are equal to those under pure competition.

EDGEWORTH DUOPOLY MODEL

F.Y. Edgeworth, a famous French economist, also attacked Cournot's duopoly solution. He criticised Cournot's assumption that each duopolist believes that his rival will continue to produce the same output irrespective of what he himself might produce. According to Edgeworht (as in Bertrand's model), each duopolist believes that his rival will continue to charge the same price as he is just doing irrespective of what price he himself sets. With his assumption, and taking the example of Cournot's "mineral wells', Edgeworth showed that no determinate equilibrium would be reached in duopoly.

The main different between Edgeworth's model and Bertrand's model is that whereas in Bertrand, productive capacity of each, duopolist is practically unlimited so that he could satisfy any amount of

demand but in Edgeworth's model, the productive capacity of each duopolist is limited so that neither duoplist can meet entire demand at the lower price ranges. Each duopolsit accepts as much demand of the product at a price as he can meet. It is not essential in Edgeworth's model that the products of duopolits should be perfectly homogeneous, his argument will apply even if the products were close substitutes so that a slight price differential is sufficient for a good proportion of customers to switch from a higher priced product a lower-price product. However, in our analysis below we assume that the products of the two duopolists are perfectly homogeneous. Moreover, the cost conditions of the two duopllists need not be exactly same but must be similar.

Fig. 25A.4 illustrates Edgeworth's model of duopoly. Since it is assumed that the products of two duopolists are completely identical, the market would be equally divided between the two duopolists at the same price of the product. Suppose DC and DC represent the demand curves facing each duopolist. Suppose OB and OB' are the maximum possible outputs of the two duopolits respectively. If the doupolists from a collusion, they will set the monopoly price OP and will make maximum joint profits. Price OQ represents the price at which both duopolists sell their maximum possible outputs.

Suppose that the two doupolists happen to charge the price OP, then producers 1 and 2 will be producing and selling OA and OA' amounts of output respectively. Suppose now producer 1 thinks of revising his price policy. Producer 1 will believe that producer 2 will keep his price unchanged at OP regardless of whatever price he himself might charge. With producer 2's price remaining fixed at OP, producer 1 realises that if he sets the price slightly lower than OP, he will be able to attract a sufficient number of producer 2's customers so that the he can sell his whole maximum output which he can produce. This would yield greater profits to producer 1 than he is making at present. Thus in Fig. 25A.4 if producer 1 lowers his price from OP to OR, he will be able to sell his entire maximum which are greater than $OAEP$. Thus A would increase his profit by lowering his price.
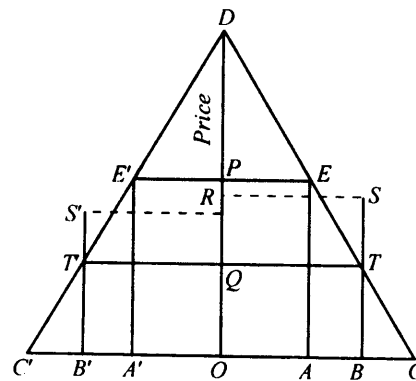

Fig. 25A.4. *Edgeworth's Duopoly Solution.*

But when producer 1 reduces his price, producer 2 will find most of his customers deserting him and his sales considerable reduced.Profits of producer 2 will according fall considerably. As a result, producer 2 will think of making a counter move, but he too will assume that producer 1 will hold his price constant at OR. Producer 2 sees that if he cuts his price slightly below producer 1's price OR, say he fixes OR' he can take away enough customers of A to sell his entire maximum possible output OB'. Thus when producer 2 cuts his price to OR', he sells his entire output OB' and makes profits equal to $OR'S'B$ which are greater than he was making before. As a result of this, sales and profits of proucer 1 will greatly decline. Producer 1 will then react and will think that if he reduces his price a bit below OR', he will be able to sell his whole maximum possible output OB by attracting customers of producer 2, still believing that producer 2 will keep his price fixed at OR'. Thus when producer 1 reduces his price, his profits will rise for a moment. But producer 2 will then react and reduce his price further in order to increase his profits. In this way, according to Edgeworth, the price cutting by two producers will continue until the price falls to the level OQ at which both producers sell their entire maximum possible outputs.

It will be seen in Fig. 25A.4 that at price OQ, producers 1 and 2 are selling OB and OB' respectively ($OB = OB'$) and are making profits equal to $OBTQ$ and $OB'TQ$ respectively. When the price has been bid down to the level OQ, none of the producers will see any advantage to cut the price further. Since at price OQ each is selling the entire output he can produce, he will not be able to increase his