7

IMPERFECT COMPETITION: MONOPOLISTIC COMPETITION AND OLIGOPOLY

The models of perfect competition and monopoly discussed in the previous two chapters represent two extreme market structures. Although these models are useful in explaining how markets operate, in practice most markets fall somewhere between the two extremes. In this chapter we discuss two such market forms, namely monopolistic competition and oligopoly. The theoretical analysis in this chapter can be far more easily reconciled with reality than the preceding market structures could.

As the name indicates, monopolistic competition is a hybrid: it constitutes a fair amount of competition but it also contains elements of a monopoly. The theory of monopolistic competition was developed in the early thirties by a British economist, Joan Robinson, and an American economist, Edward Chamberlin, working independently of one another. Neither of these economists had been satisfied with the two models (perfect competition and monopoly) which had been used up to that stage to analyse markets. They pointed out that most goods and services are heterogeneous rather than homogeneous, and that many sellers are really monopolists in respect of their own goods and services. These monopolists compete with one another in markets for goods which are much the same but nevertheless show slight differences. Many firms can therefore be regarded as 'competing monopolists', hence the term monopolistic competition. The theory of monopolistic competition is applied mainly to the retail trade and is therefore important not only to economists but also to marketers, managers, manufacturers and other businessmen.

In the second half of the chapter we discuss oligopoly as a market form. A characteristic of oligopoly is that the market is dominated by a few big firms and that there is usually a great deal of interdependence between the firms. Interdependence refers to the extent to which the actions of one firm are influenced by the actions of other firms. Because there are so few firms in an oligopoly, any change in a firm's policy on factors such as price or output could affect its competitors' sales and profits. Any firm which forms part of an oligopoly would therefore be likely to bear in mind the possible reaction from other firms when formulating its policy. Another important characteristic of the oligopoly is market uncertainty. Because firms are interdependent, and no firm can ever be sure of the policy of its competitors, companies function in a very uncertain environment. As a result there is often collusion between oligopolistic firms, that is to say, they agree on the prices they

will charge and the quantities they will manufacture. Oligopoly is the market structure most frequently found in modern economies, for example in the motor industry and in general manufacturing. The study of this market form is therefore extremely important for people in a wide variety of occupations.

After having studied this chapter you should be able to

- define the monopolistic competitor
- explain how the monopolistic competitor achieves equilibrium in both the long run and the short run
- compare the monopolistic competitor with the perfect competitor
- explain non-price competition by monopolistic competitors
- describe the characteristics of an oligopoly and explain how this market form arises
- describe cartels and explain how they work
- explain why cartels frequently fail
- describe price leadership (and in particular the dominant price leader)
- analyse the model of the kinked demand curve

MONOPOLISTIC COMPETITION

Characteristics

The two most important characteristics of a market in which there is monopolistic competition are that a large number of firms manufacture differentiated products, and entry to the market is unrestricted.

Product differentiation

Differentiated products are products which are much the same but are not identical. Similarities between products arise because they satisfy the same consumer need. A few examples of differentiated products which are sold by monopolistic competitors in South Africa are the large varieties of men's clothing, women's clothing, shoes, beauty preparations, stationery, wine and furniture which are available in the trade. Product differentiation may involve real differences, as in wines, which may differ in origin, vintage and variety, or men's clothing, where there are differences in cut and quality. The differences may be imaginary, as in medicines which bear different trade names but contain the same basic ingredient. Sometimes merely the service offered by the seller sets his product apart. Even the packaging of a product can make it different from other similar products. Because the products of monopolistic competitors are differentiated this creates opportunities for non-price competition, that is competition which is not based on prices but on factors related to the uniqueness of the product. As will become apparent later, advertising is of major importance here.

Some monopolistic power

As we have already said, monopolistic competition is a combination of competition and monopoly. The competitive element arises because there are many sellers of the differentiated product, and each is relatively small in comparison with the market as a whole. Firms are able to enter or leave a monopolistically competitive market quite freely in the long run and this also contributes to the element of competition. On the other hand, the element of monopoly is the result of product differentiation. Each monopolistically competitive firm possesses a certain amount of monopolistic power and is a mini-monopolist, since it is the only producer of that specific trademark or variant of the product.

Monopolistic competition is common in the retail and services sector of the economy. We have already mentioned products such as clothing, wine and furniture which are examples of monopolistic competition at the national level. At the local level the best examples of monopolistic competition are the large numbers of filling stations, pharmacies, grocers, hairdressers, restaurants, take-aways and bottle stores, particularly in urban areas. Each of these enterprises enjoys a certain degree of monopolistic power over its competitors as a result of the uniqueness of its product, or possibly because of a better location, or slightly lower prices, better service, a greater variety of products, etc. This monopolistic power is not very strong, however, because good substitutes are always available.

Under a system of monopolistic competition each firm has its own identity and produces its own variant of a differentiated product. It is therefore impossible to define an industry for monopolistic competition (an industry refers to producers of an identical product). A further consequence is that a general theory or model of a monopolistically competitive industry cannot be formulated either. Although there is a market for, say, men's clothing, there is not just one product or one market price in that market, but a whole range of similar products and a range of prices. Chamberlin overcame this problem by grouping the sellers of products that are virtually the same into *product groups*. For convenience the term 'industry' is used in this discussion, but it actually refers to all the sellers of a differentiated product in a particular product group (eg men's trousers). Because of product differentiation we cannot derive demand and supply curves for an industry, as we did under conditions of perfect competition; a single equilibrium price is not determined for the differentiated product either, because there would have to be a range of prices. Our graphic analysis therefore has as its subject not the industry but a typical or *representative firm*.

Representative firm

The characteristics of monopolistic competition may be summed up as follows:

- Each firm produces a particular differentiated product.
- Each firm therefore encounters a demand curve for its specific product, and these curves have a downward slope.
- There are a large number of firms in the industry.
- There are no restrictions on entry (or exit).

The equilibrium of the firm under monopolistic competition

Because the product of any firm operating under conditions of monopolistic competitive differs slightly from those of its competitors, giving that firm a certain amount of competitive power, the demand curve for its product also slopes downwards like that of a monopolist. This similarity with a monopolist does not mean that a monopolistic competitor will necessarily make big profits. Because entry to the industry is unrestricted, in the long run economic profit will attract new firms with competitive products to the industry and this will eventually put paid to the economic profit.

Short-run equilibrium

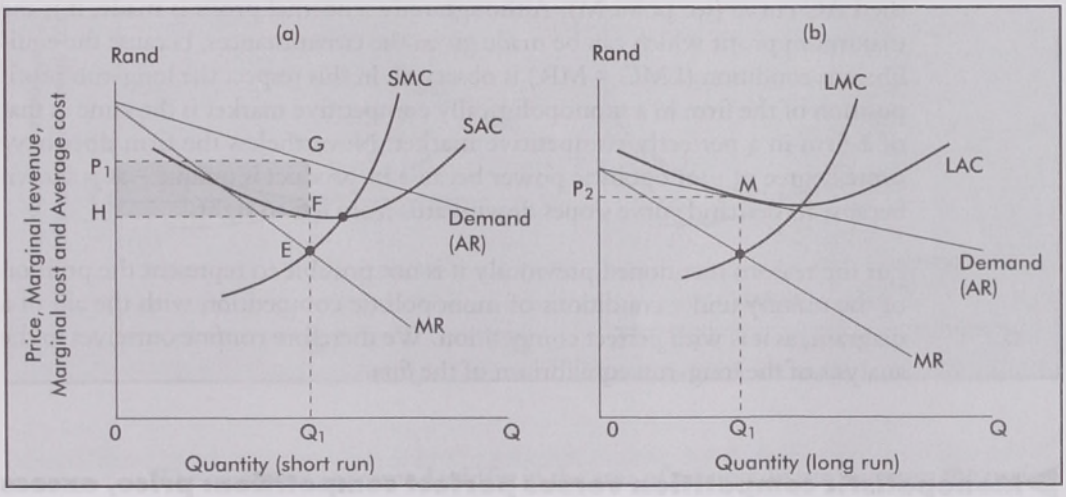
The short- and long-run equilibrium of a firm operating under conditions of monopolistic competition will now be analysed. The *short-run equilibrium* of a monopolistic competitor corresponds with that of a monopolist, except that the demand curve of a product of a monopolistic competitor will be more price-elastic than that of a monopolist. There would be a number of good substitutes for the product of the monopolistic competitor, which is not true of the product of a monopolist. Figure 7-1(a) illustrates the short-run situation of the representative firm. The figure shows the downward sloping demand curve of

the monopolistic competitor, which is also his average revenue curve (AR), and the corresponding marginal revenue curve (MR). The SAC and SMC curves are also shown. The profit maximising price P_1 and output Q_1 are again determined by the point where marginal revenue is equivalent to marginal costs (MR = MC), that is point E in Figure 7-1(a). Since the price P_1 exceeds the average costs (see points F and G), the monopolistically competitive firm would make an economic profit, as indicated by the shaded area. (The firm could naturally also make a loss, but that is not discussed here.)

Figure 7-1

Equilibrium of the monopolistic competitor in the short and long run

Because the monopolistic competitor is the only producer of his particular product, his demand curve slopes downwards. In the short run the firm will earn an economic profit (Fig 7-1(a)), but in the long run it will attract other firms to the industry. The firm's demand curve shifts to the left (Fig 7-1(b)) and the firm makes only normal profit.



In the *long run* there are major differences between the situation of the monopolistic competitor and the monopolist. The monopolist is protected by restrictions on entry into the industry and is therefore able to make an economic profit in the long run. In contrast, monopolistic competition is characterised by free entry. The economic profit which the firm makes in the short run (Fig 7-1(a)) attracts new entrants to the industry in the long run. This increase in the number of firms in the industry will cause the demand curve for the product of the representative firm to shift to the left, because the market demand has now to be divided among more firms so that each firm's share is correspondingly smaller. The demand curve will also become more elastic, because there are

now more substitutes for the firm's product than before. The demand curve shifts to the left, which may mean that some firms in the industry are unable to survive because the demand for their products is too small. Such firms are likely to leave the industry, which would cause the demand curve to shift to the right again. This process will continue until a condition is reached where no firms are entering or leaving the market and all economic profit has been eliminated. Long-run equilibrium has then been achieved, where all the representative firms are making a normal profit; in this situation the firm's demand curve would form a tangent to the long-run average cost curve. (Understandably this is also known as the tangential situation of the monopolistic competitor.)

Tangential situation

Figure 7-1(b) contains a graphic illustration of the long-run equilibrium of the monopolistically competitive firm. The economic profit which the firm made in the short run (Fig 7-1(a)) attracted new firms to the market, with the result that the demand curve shifted to the left. The competition caused all economic profit to disappear, which meant that the average costs were equal to the price. Given the slopes of the cost curve and the demand curve (AR) of the monopolistic competitor, the implication is that the AR curve must form a tangent to the LAC curve (see point M). Although only a normal profit is made, it is the maximum profit which can be made given the circumstances, because the equilibrium condition (LMC = MR) is observed. In this respect the long-run profit position of the firm in a monopolistically competitive market is the same as that of a firm in a perfectly competitive market. Nevertheless the firm does have some degree of monopolistic power because its product is unique – as is shown because its demand curve slopes downwards from left to right.

For the reasons mentioned previously it is not possible to represent the position of the *industry* under conditions of monopolistic competition with the aid of a diagram, as it is with perfect competition. We therefore confine ourselves to the analysis of the long-run equilibrium of the *firm*.

Monopolistic competition versus perfect competition: price, excess capacity and product variety

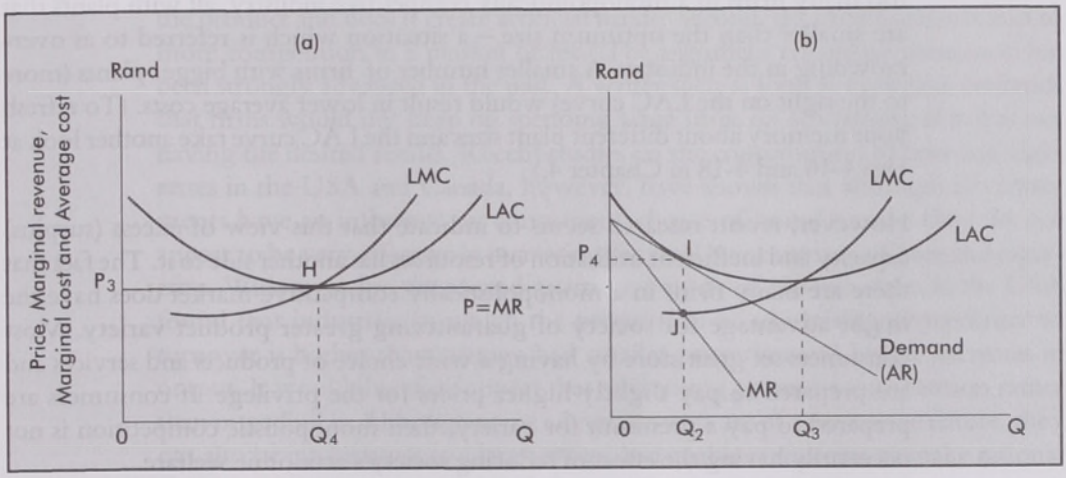
Perfectly competitive markets lead to economic efficiency and are therefore a model to strive for. As long as nothing hampers the operation of the market mechanism, producers will make normal profit in the long run and consumers will be able to buy the product at the lowest possible cost. Production therefore takes place at the minimum point of the long-run average cost curve (LAC). Monopolistic competition shows certain similarities with perfect competition, but the question is whether it is an equally effective market structure. To answer this question, we shall compare the long-run equilibrium position of a monopolistic competitor with that of a perfect competitor.

In Figures 7-2(a) and 7-2(b), the long-run equilibrium position of a firm is represented under conditions of perfect competition and monopolistic competition respectively. For comparison it is assumed that the two firms are the same size and have the same cost structures. In both cases the price of the product is equal to the average cost (see points H and I) and therefore only a normal profit is made. From the point of view of profit, therefore, there is no difference between the perfect competitor and the monopolistic competitor.

Figure 7-2

Monopolistic competition versus perfect competition

In both cases only a normal profit is made. Consumers pay a higher price for the product of the monopolistic competitor, as indicated in (b). The monopolistic competitor does not produce at the minimum point of the LAC curve and the output is therefore less than that of the perfect competitor in (a). There is also excess capacity.



The two market forms do differ in the area of pricing. In the long run the perfect competitor produces at point H, where the price is equivalent to the marginal cost and the average cost is a minimum. In contrast, the monopolistic competitor produces at point I in the long run, which means that the price of his product is higher than the marginal cost and the average cost is not a minimum. Consumers therefore pay a higher price under conditions of monopolistic competition than under conditions of perfect competition (compare P_3 with P_4 in Fig 7-2). Because the price is higher than the marginal cost this also means that society attaches greater value to an additional unit of the product than to the resources required to produce it. This points to an inefficient utilisation of resources because social welfare could be increased by producing more of the product.

Another comparison which could be made between the two market forms relates to quantities produced. As we all know, the perfect competitor has a horizontal demand curve and production takes place in the long run at the minimum point of the long-run average cost curve (LAC). The output is indicated as Q_4 in Figure 7-2(a). For the monopolistic competitor the demand curve slopes downwards from left to right and the tangent with the LAC curve must necessarily be on the downward section of that curve, that is left of the minimum point of the LAC curve. Consequently the firm's output (Q_2) will be less than the 'ideal' output (Q_3) where the LAC is a minimum. Because the firm is producing less than the output which would keep long-run average costs to a minimum, this means that the firm did not build the plant size that would reduce long-run average costs to a minimum, but instead built a smaller plant. The difference between Q_3 and Q_2 in Figure 7-2(b) is known as *excess capacity* (and could probably better be described as unused economies of scale). According to critics this is indicative of the inefficient utilisation of resources. They contend that there are too many firms in a monopolistically competitive industry, all with plants that are smaller than the optimum size – a situation which is referred to as overcrowding in the industry. A smaller number of firms with bigger plants (more to the right on the LAC curve) would result in lower average costs. (To refresh your memory about different plant sizes and the LAC curve take another look at Figs 4-16 and 4-18 in Chapter 4.)

However, recent research seems to indicate that this view of excess (surplus) capacity and inefficient utilisation of resources has another side to it. The fact that there are many firms in a monopolistically competitive market does have the major advantage for society of guaranteeing greater product variety. Most consumers set great store by having a wide choice of products and services and are prepared to pay slightly higher prices for the privilege. If consumers are prepared to pay a premium for variety, then monopolistic competition is not necessarily having the effect of reducing society's economic welfare.

Product variation and sales expenditure (nonprice competition)

Because the products in a monopolistically competitive market are differentiated this makes it possible for a firm in this kind of market to use marketing campaigns and further product variation not only to cause the demand for its product to increase but also to make it less price-elastic. This is known as nonprice competition. *Product variation* (or product differentiation) has already been discussed (see 'Characteristics' on p 193). This refers to changes which a monopolistic competitor may effect in the properties of a product to make it more attractive to consumers and to distinguish it from other products. For example, the producer of a certain foodstuff could reduce the sugar content of the product and increase the fibre content to make it more attractive to health-conscious shoppers. We mentioned previously that product differentiation may involve

Product variation

Sales expenditure

real differences, or differences that are mainly imaginary. *Sales expenditure* refers to the expenditure incurred by a firm to advertise its products, increase its sales staff, provide a better service for the product, etc. Product variation and sales expenditure can boost a firm's sales figures and profits but they obviously have additional cost implications at the same time. A firm can go on increasing its expenditure on product variation and sales promotion as long as the resulting marginal revenue (MR) exceeds the marginal costs (MC); however, when MR = MC it is time to stop increasing this type of expenditure. (This is another application of this well-known rule in micro-economics.) Although expenditure on product variation and sales promotion can boost the profits of a monopolistic competitor in the short run, the firms in the industry will only make normal profits in the long run, because other firms will imitate the monopolistic competitor's product and new firms will enter the industry.

Advertising

Two important questions arise with regard to sales expenditure in general and advertising in particular. Does advertising persuade consumers to buy more of the product and does it create artificial needs? Second, do advertisements lead to more competition in a market or less? The argument regarding persuasion has been strongly advanced in the past. A writer such as John K Galbraith contends that firms would not keep on spending large sums on advertising if it was not having the desired results. Recent studies on the consumption of beer and cigarettes in the USA and Canada, however, have shown that although advertisements have an influence on consumers' choice of brand names, they do not appear to be very effective in increasing the total consumption of beer and cigarettes. With regard to the second question, a study of 150 industries in the USA found that industries in which the proportion of advertising expenditure to turnover is higher than average had smaller price rises and bigger increases in output. It would therefore appear that advertising promotes competition rather than impeding it. Although some advertisements are of a persuasive nature, they can also be informative to a large extent and enable consumers to make rational choices.

The very interesting debate on the advantages and disadvantages of advertising is by no means over. It falls outside the scope of our syllabus, however, and the discussion will therefore not be pursued here.

Practical problems for the monopolistic competitor

Non-price competition, which was discussed in the previous section, has the effect of making the attainment of the equilibrium situation more complicated for the monopolistic competitor than it might appear from the graphic analysis, at least at first glance. In the explanation based on Figures 7-1(a) and (b), a particular product and level of sales expenditure were accepted as given. This is not so easy in practice, where the monopolistic competitor has to keep three variables

continually in mind – price, product and sales promotion – in his attempt to maximise profit. He needs to obtain answers to the following questions:

- Which specific variation of the product is the best?
- At what price should the product be sold?
- How much money should be spent on sales promotion?

The monopolistic competition model, although a very useful one, is essentially (like all models) a simplification and does not fully reflect the complexity of this problematic situation. Every possible combination of price, product and sales promotion strategy results in a different demand and cost situation for the firm, only one of which would lead to maximum profit. In practice the optimum combination cannot be predicted in advance, but must be worked out by trial and error. Also, the possible actions of competitors do not make the situation any easier for the monopolistic competitor.

Despite these comments, the theory of monopolistic competition does provide important insights, especially into product differentiation and non-price competition.

OLIGOPOLY

Characteristics

Few firms

Under the conditions of oligopoly the market is dominated by a few big firms. There could even be just two firms, a situation known as a duopoly. The product manufactured could be homogeneous (eg cement or aluminium) but is usually heterogeneous (eg cigarettes or toothpaste). When the product is homogeneous, the market is described as a pure oligopoly and when the product is heterogeneous (ie differentiated), the market is described as a differentiated oligopoly. Entry to an oligopoly market is unrestricted, but that does not mean that it is easy, as is shown because there are only a few firms in the market.

The oligopoly is the market structure most commonly found in all the modern economies of the world. Table 7-1 shows examples of industries in which only a few firms are found, or in which a couple of firms dominate the market. This table shows the number of firms that were responsible for over 75% of the sales of certain goods in the South African markets during the eighties.

In South Africa, as in most other countries, the major portion of the total value of manufactures is produced by oligopolies. A researcher who analysed the South African manufacturing sector in the seventies classified 181 industries in seven market structures. The results of his investigation appear in Table 7-2. It

can be concluded from this table that by far the majority of industries are characterised by oligopolistic conditions.

Table 7–1

Examples of oligopolistic markets in South Africa

Product	Number of firms that supply over 75% of the market
Aspirin	2
Sugar	2
Breakfast oats	3
Cement	3
Maizemeal	3
Fertiliser	3
Washing powder	4
Petrol	5
Toothpaste	5

Source: Finance Week 45(12), 21–27 June 1990:34, as quoted in P Mohr *et al*, 1996, *Ekonomie vir Suid-Afrikaanse studente*, Pretoria: Van Schaik.

Table 7–2

Market structures in the South African manufacturing industry, 1972

Market structure	Number of industries in each market structure
Monopolistic	12
Duopolistic	16
Highly oligopolistic	87
Moderately oligopolistic	20
Slightly oligopolistic	6
Unconcentrated	23
Competitive	17

Source: P G du Plessis, 1978. Concentration of economic power in South African manufacturing, *Tydskrif vir Studies in Ekonomie en Ekonometrie*, 3 (September):15.

Because only a few firms sell a homogenous or differentiated product in an oligopoly, each firm is affected by the actions of other firms in the industry. Every oligopolist should therefore always bear in mind the possible reaction of his competitors to any action he may take. The chief characteristic of an oligo-

Interdependence

poly is therefore the *interdependence* between the firms of which it consists. The term 'interdependence' refers to the extent to which the actions of one firm are determined by the actions of other firms. For example, we frequently find that when one South African motor vehicle manufacturer starts a sales campaign and sells motor vehicles at a special discount or on very favourable terms (eg no interest on the loan) his immediate competitors follow suit with a very similar offer. Because price competition can lead to destructive price wars, oligopolists normally prefer to compete on the basis of product differentiation and good service, backed by advertising. Even then, when one oligopolist launches an advertising campaign his competitors often swiftly follow with campaigns of their own.

Clearly interdependence and competition are the most important characteristics of an oligopoly. This is the natural consequence of there being only a few firms in the market. As a result of this interdependence, policy decisions by firms are more complicated under an oligopoly than under other market structures. Because every oligopolist knows that his actions will have a significant influence on other firms in the industry, every firm has to take the possible reactions of its competitors into account when taking decisions on prices, product differentiation, advertising, service, etc. Because competitors may react in many different ways (depending on factors such as the type of product and the nature of the industry, etc), it is impossible to formulate a single, general theory on the price and product decisions of a firm in an oligopoly. The behaviour of oligopolists cannot be predicted with any certainty, because virtually anything can happen in an oligopoly. Instead of a single general theory that would be applicable to a firm under an oligopoly, we therefore find a number of theories, each of which depends on different assumptions about the reactions of competitors to the price and product decisions of the firm which is the subject of the study. These theories include those of economists such as Cournot, Bertrand, Chamberlin, Sweezy and Stackelberg. Remember, though, that all these models apply only to particular circumstances and are not generally valid. In the rest of this chapter we will concentrate only on the most important models.

The characteristics of an oligopoly can be summed up as follows:

- There are only a few firms in the market.
- Interdependence and competition are very important.
- Uncertainties in the market create the need for collaboration.
- The product may be homogeneous or heterogeneous.
- Entry to the market is unrestricted, but difficult.

- It has not proved possible to formulate a single, general theory on oligopoly, because the reactions of competitors may differ.

Origins of oligopolies

The reasons that oligopolies develop are similar to those for monopolies. They can be summed up as follows:

- Economies of scale may apply right up to such large production volumes that only a few firms are able to supply the entire market.
- Large-scale capital investment and specialised equipment are often required if a firm wishes to enter an oligopoly, as in the motor industry and the steel manufacturing industry. This creates a 'natural' barrier to entry.
- A few firms may possess a patent for a manufacturing process or the production of a certain product.
- Established firms may have a loyal following as a result of the quality of their product or the service they provide; this may be such a strong factor that new firms do not feel able to penetrate the market.
- A few firms may possess most or all of the raw materials required for the production process.
- The government may have granted a concession to a few firms only.

These are not only the reasons that oligopolies develop, but they also reflect the obstacles to entry encountered by other firms. If entry were not relatively difficult, the industry would not have remained an oligopoly over a long period.

The formation of cartels within an oligopoly

We have already mentioned that no firm within an oligopoly can ever be certain about the policy and actions of its competitors. Companies therefore operate in a very uncertain environment. In order to reduce or eliminate this uncertainty, oligopolistic firms often collude; that is to say they agree on the prices they will charge and the quantities they will produce. The advantages of such collusive agreements are obvious: higher profits, less uncertainty, and the means to make it even more difficult for other firms to enter the market. Collusive agreements are difficult to sustain because there are always some participants who break the agreement in the hope that the others will not find out, or will do nothing about it if they do. For obvious reasons governments often legislate against collusion between firms.

Collusion

Cartel When collusion takes place openly and formally, this is known as a *cartel*. A cartel may be defined as *an organisation of oligopolistic firms in an industry which has been formed with the specific aim of creating a collective monopoly*. Cartels are fairly common in many European countries, where they are not forbidden by the governments. In the United States of America most forms of collusion, both overt and covert, are illegal. Naturally this does not mean that such agreements do not exist. South Africa has a statutory Competition Board, which investigates the actions of companies and proceeds against them if necessary. The best-known example of a cartel in South Africa was formed by the three principal cement producers, Pretoria Portland Cement (PPC), Anglo-Alpha and Blue Circle, which are jointly responsible for over 90% of the total cement sales in the country. These three firms have colluded over a long period in price fixing and market share. The firms obtained official permission to continue to collude after practices of this kind were prohibited in 1986. In October 1994 the government withdrew its permission and the cartel was given until September 1995 to end its collusion. The best-known international example of a cartel is the Organisation of Petroleum Exporting Countries (OPEC), which includes a number of important oil-producing countries.

The operation of a cartel

The easiest way to explain the operation of a cartel is to start by supposing that a large number of firms (say 100) initially functioned in a perfectly competitive market. The firms produced a homogeneous product and were all equally efficient. Study Figure 7-3(b). The price at which each firm sells its output is equal to the market price P_0. The market price is determined by the point of intersection F of the market demand curve D_m with the market supply curve (that is the industry's supply curve) ΣSMC; the latter is the horizontal summation of the 100 marginal cost curves (SMC) of the firms (the assumption that input prices are not rising therefore applies). The matching MR curve also appears in Figure 7-3(b). The typical firm's short-run average cost curve (SAC) and short-run marginal cost curve (SMC) are shown in Figure 7-3(a). Because perfect competition applies, the demand curve for the individual firm shows a horizontal trend and the market price P_0 is equal to MR. Since the firm wants to maximise profits it will produce at point E (where $P_0 = MR = MC$) and will therefore produce an output of q_1 at the market price P_0. (Only normal profits are made.) The industry as a whole will function at point F in Figure 7-3(b), that is a total output of Q_1 will be produced at the market price P_0. (The output Q_1 is the sum total of the output of the 100 individual firms.)

Suppose that the 100 firms get together and form a cartel with a head office from which the price and production decisions of the firms are coordinated. The object of the collusion is to maximise the cartel's profits and so increase the members' profits. In order to determine the profit-maximising price and pro-

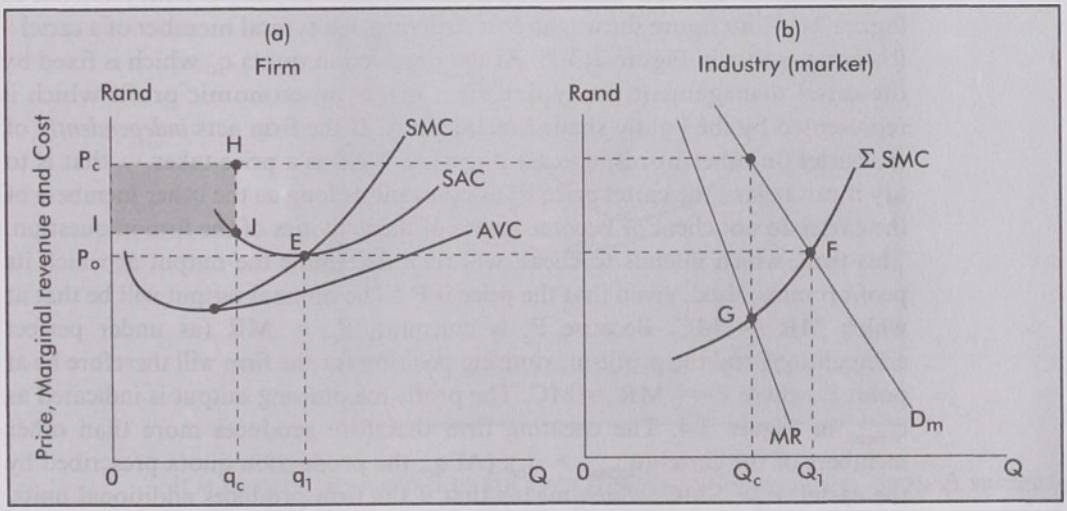
duction quantity, the cartel acts like a monopolist and applies the marginal principal (MR = MC). To achieve the aims of the cartel, the management would fix the cartel's total production quantity at Q_c in Figure 7-3(b); the latter is determined by the point of intersection of the MR with the ΣSMC curve at point G. At G MR = MC and the profit of the cartel as a whole is therefore maximised. To ensure that the joint production of the members of the cartel does not exceed Q_c, the management will prescribe a quota q_c for each firm, which means that each firm's production decreases from q_1 to q_c. (If the 100 firms were all the same size, the quota $q_c = Q_c/100$.) Point G also determines the cartel price P_c, which is higher than the original price P_0. To sum up: for the cartel the profit-maximising output and quantity are Q_c and P_c respectively. Each firm produces q_c, which means that its production has decreased from q_1 to q_c; this production will be sold at the cartel price P_c which is higher than P_0.

Quota

Figure 7-3

The operation of a cartel

With perfect competition the market price is determined by point F, which is where the market supply curve and the market demand curve intersect. The total supply on the market will be Q_1 and each firm will offer q_1; only normal profit will be made at E. In a cartel point G (where MR = MC) determines the market price P_c and the quantity offered Q_c; each firm will produce the quota q_c and make economic profit.



Before the cartel was formed, each firm made only normal profit. After the establishment of the cartel each firm makes economic profit – which is apparent because the total revenue $0P_cHq_c$ exceeds the total costs $0IJq_c$. The economic profit each firm earns is indicated by the shaded area IP_cHJ. It is quite clear that all the firms have been placed in a better position after the establishment of the

cartel than when each firm operated under conditions of perfect competition. Naturally the assumption is that all the firms cooperate and do not exceed their quotas.

The rationale behind the formation of a cartel is obvious. It provides an opportunity to make more profit than under conditions of perfect competition. Cartels are not established for unethical reasons but are merely organisations that arise as a result of entrepreneurs' pursuit of maximum profit. The final result achieved by a cartel in terms of price, output and profit is the same as the result achieved by a monopolist, as discussed in the previous chapter. For this reason cartels, like monopolies, are not regarded in a favourable light by the authorities and measures are taken to curb their activities.

Although cartels are able to increase the profits of their members, in the past they have usually been unsuccessful in the long run, even in the absence of government action against them. The reasons for this will be discussed in the following section.

Why cartels fail: cheating by members

There is a big temptation for an individual member of a cartel to cheat and not to stick to the cartel agreement. Similarly, there are good reasons that a firm might choose not to become a member of a cartel. This is explained with reference to Figure 7-4. This figure shows the cost structure of a typical member of a cartel – the same as that in Figure 7-3(a). At the production quota q_c which is fixed by the cartel management the typical firm makes an economic profit which is represented by the lightly shaded rectangle A. If the firm acts *independently* of the cartel (in other words, cheats) it can see itself as a price taker — that is to say it can regard the cartel price P_c as constant as long as the other members of the cartel do not cheat or become aware of the activities of the firm in question. This firm, which intends to cheat, will then determine the output at which its profit is maximised, given that the price is P_c. The optimal output will be that at which MR = MC. Because P_c is constant, P_c = MR (as under perfect competition) and the profit-maximising position for the firm will therefore be at point L, where P_c = MR = MC. The profit-maximising output is indicated as q_{cheat} in Figure 7-4. The cheating firm therefore produces more than other members of the cartel ($q_{cheat} > q_c$). (At q_c, the production quota prescribed by the cartel, $P_c >$ SMC, which means that if the firm produces additional units, these units will generate more revenue than they cost to produce; the cheating firm therefore has a good reason to increase its output to q_{cheat} where P_c = MR = MC.) At an output of q_{cheat} the firm would earn an economic profit equal to the rectangle A *plus the shaded area* which is indicated as B. The firm that cheats can therefore make more economic profit than a firm which honestly adheres to the cartel agreement.

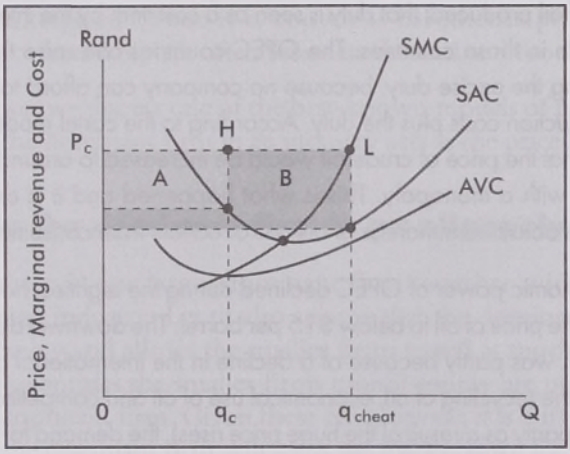
Cheating members

Because far more economic profit can be made by cheating, the members of the cartel are continually tempted to break the cartel agreement. There is therefore a very strong possibility that a cartel will collapse after a while. If the members of the cartel start acting independently and producing more than the prescribed quota, the total market supply will increase, which will cause the market price to drop. Higher production volumes and lower prices will reduce the economic profit. There is also a strong possibility that firms will build up extra stocks as a result of the increased production volumes. Competition among the firms will increase with the passage of time and practices such as selling products at 'secret' discounts will emerge. Such practices do not remain secret for long, however, and the firms which are still sticking to the cartel agreement get wind of the cheating – and then start breaking the agreement themselves. Before long the entire cartel will collapse and firms will find that their situation is the same as before the establishment of the cartel, when only normal profits could be made.

Figure 7–4

The reason that members of cartels often cheat

If the member of the cartel sticks to the prescribed quota q_c it would produce at point H and make an economic profit equivalent to the rectangle A. If the firm exceeds the quota and produces at point L (where $P_c = MR = MC$) it would make an economic profit equivalent to the rectangle A plus the shaded area B.



It is possible for a cartel to fail even if none of the members cheat. A successful cartel which secures economic profit for the members is likely to attract firms from outside the industry. If this happens, the market supply will also increase, which will reduce the economic profit. There is a strong possibility that the members of the cartel would then start to cheat in an attempt to counteract the decrease in their economic profit, and this would eventually lead to the downfall of the cartel.

As is apparent from the above discussion, the history of cartels does not contain many success stories. Ironically, the reason for the establishment of cartels (the pursuit of maximum profit) usually also leads to their downfall.

To conclude our explanation of how cartels operate, we shall discuss the best-known international example of a cartel, namely OPEC, in Box 7-1.

Box 7-1

THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES (OPEC)

The Organization of Petroleum Exporting Countries is the best-known international example of a cartel. Although there have been problems from time to time, OPEC has succeeded in surviving since the seventies.

The cartel attracted worldwide attention for the first time in 1973 when it curtailed oil exports and took steps to raise the price of crude oil. The price of Saudi Arabian crude oil rose from $4 per barrel in 1973 to over $10 per barrel in 1974, for example. In 1979 OPEC raised the price of crude oil to over $30 per barrel.

What is OPEC and how does the organisation function? The cartel has thirteen members, all of whom are leading oil-producing countries. The members include Saudi Arabia, Iran, Venezuela, Libya and Nigeria. The OPEC countries levy an excise duty on every barrel of oil produced; that duty is seen as a cost item by the international oil companies that trade in those countries. The OPEC countries can raise the price of crude oil by increasing the excise duty, because no company can afford to sell the oil for less than the production costs plus the duty. According to the cartel model discussed, one would expect that the price of crude oil would be increased to around the level it would have been at with a monopoly. This is what happened and it is estimated that the OPEC countries obtained hundreds of billions of dollars from consumers in this way.

The economic power of OPEC declined during the eighties, however, as shown by the drop in the price of oil to below $15 per barrel. The downward pressure on the oil price, however, was partly because of a decline in the international consumption of oil. As a result of the recycling of oil, economical use of oil and competition from other sources of energy (partly as a result of the huge price rises), the demand for oil decreased. Also, the oil production of the non-OPEC oilfields (eg in Mexico and the North Sea) greatly increased, which placed further pressure on OPEC.

The OPEC cartel has a very interesting way of proceeding against countries that exceed their quota. Saudi Arabia, OPEC's biggest producer, often increases its oil production temporarily in order to force the world price of oil down so that any members of the cartel who may be cheating derive no benefit from their actions. When their profits suddenly drop, the guilty parties usually apologise and ask for new quotas so that the world price of oil will rise again.

Price signals and price leadership in an oligopoly

In oligopolies firms have a big incentive to collude in order to eliminate or reduce the uncertainties which are characteristic of this market form. Because formal collusions among firms (ie cartels) are generally forbidden and also quite often meet with failure, instead of entering into formal collusions oligopolists often do so tacitly. Without formally communicating with one another or concluding agreements they try to find a way of reducing uncertainties in the market.

Price signals

One of the problems of tacit collusion is that it is difficult for firms to reach agreement on the price of the product (without discussing it with one another). For this reason price signals often form an important element in tacit collusion. For example, a firm can announce that it intends to increase the price of its product and hope that its competitors will take this as a sign that they should fix their prices at a higher level as well. If the competitors fall in with this, this could give rise to a pattern of price leadership that would solve the problem of how to agree on a price. One firm fixes the price and the others act as price followers.

The price leader is usually the biggest or the dominant firm in the industry. Occasionally it is the firm with the lowest production costs; it could merely be the firm which is regarded as the best interpreter or barometer of demand and cost conditions in the marketplace. (Then it is known as barometric price leadership.) Examples of price leadership are often found in the steel and food industries.

In the next section we discuss one of the best-known models of price leadership, namely where the dominant firm in an industry acts as the price leader.

Price leadership by the dominant firm in an oligopoly

Dominant firm

Suppose that there is one large, dominant firm together with a number of smaller firms in an industry. Let us also assume that the dominant firm sets the price in the industry and allows the smaller firms to sell as much as they like at that price. The quantities the smaller firms cannot supply are produced for the market by the dominant firm. Given these assumptions, it is fairly easy to determine the price the dominant firm will set as the market price for the industry, if the dominant firm wants to maximise profits. Since each small firm accepts the price as a given and is permitted to produce as much as it wants to, the small firms would behave in the same way as under conditions of perfect competition and produce an output at which the price is equal to the marginal costs. We know that under perfect competition price is also equal to marginal revenue, therefore the small firms will produce at the point where P = MR = MC. A combined supply curve for all the small firms could be drawn by making a horizontal summation of their marginal cost curves. This supply curve is repre-

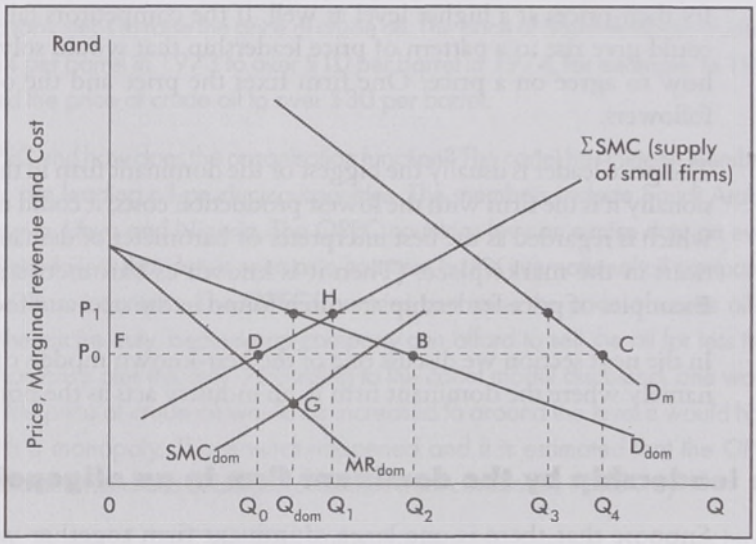
Small firms

sented as ΣSMC in Figure 7-5. The output that the small firms are unable to supply is produced for the market by the dominant firm; the demand curve for the dominant firm can therefore be derived by subtracting the quantity the small firms offer at each price from the total market demand. This means that if D_m represents the total market demand in Figure 7-5, the dominant firm's demand curve D_{dom} can be determined by calculating the horizontal difference at each price between D_m and the supply curve (ΣSMC) of the small firms.

Figure 7-5

Price leadership

The dominant firm will set the price at P_1 and produce the quantity Q_{dom}. The small firms will produce Q_1 (which is equal to $Q_3 - Q_{dom}$).



The graphical derivation of the demand curve (D_{dom}) for the dominant firm may be explained as follows. Suppose the dominant firm sets the price of the product at P_0. The supply curve ΣSMC shows that at the price P_0 the small firms will offer the quantity Q_0 (see point D), whereas the market demand curve indicates that the total quantity for which there is a demand will be Q_4 (see point C). The quantity the dominant firm will have to supply to the market is therefore $Q_4 - Q_0$, which is indicated at the price P_0 at point B and represents one point on the demand curve D_{dom}. In other words: Q_2 is equal to $Q_4 - Q_0$ (or, differently stated: FB = FC – FD = DC). Other points on the demand curve D_{dom} are determined in the same way by repeating the calculation at different prices.

Given that the demand curve D_{dom} for the dominant firm has been derived as above and that the marginal cost curve for the dominant firm, SMC_{dom}, is known, it is fairly easy to determine the price and output at which the dominant firm would maximise profits.

The marginal revenue curve MR_{dom} of the dominant firm is derived in the usual way from its demand curve D_{dom}. The profit-maximising output for the dominant firm is determined by the point G where its marginal revenue is equivalent to its marginal cost (MR = MC) and will therefore be Q_{dom}. This output (Q_{dom}) is produced when the dominant firm sets the price at P_1. At P_1 the total output of the industry is Q_3, of which the small firms will supply Q_1 (ie $Q_3 - Q_{dom}$) (see point H).

If the dominant firm fixes the market price at P_1 and the above solution is obtained, all the firms in the industry will be in equilibrium, that is to say they will maximise profits. The dominant firm produces at a point where the profit-maximising condition MR = MC (point G) is observed, whereas the small firms, which operate as if under conditions of perfect competition, are in the same position at point H (we are assuming that the small firms all have the same cost structure). This solution should therefore satisfy everyone in the industry.

Everyone satisfied

An explanation for oligopolistic behaviour: the kinked demand curve

The need oligopolists have to collude in order to eliminate uncertainties in the market has been mentioned a number of times. Earlier we said that such collusion is frequently against the law and in any case often results in failure on account of cheating by the members. The need by oligopolists for stability, particularly in the price of their product, still applies, however. The result is that price rigidity (that is, relatively inflexible prices) can be a characteristic of an oligopolistic industry. Even if costs drop or the demand declines, firms are reluctant to reduce their prices for fear of giving competitors the wrong message and initiating a price war. When costs or demand increases firms are also reluctant to raise their prices for fear that their competitors might not follow suit.

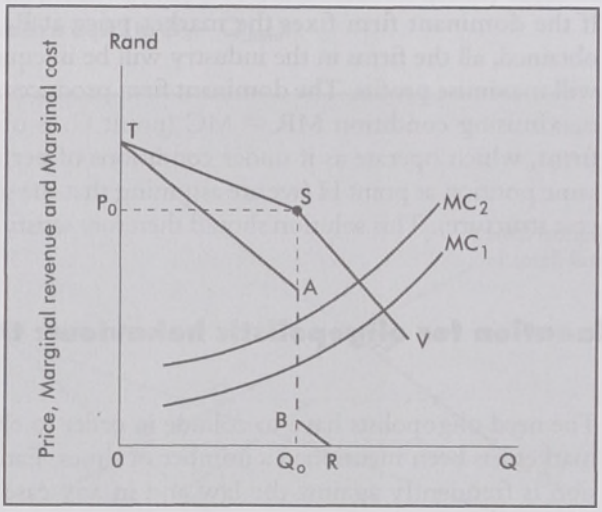
Price rigidity is the basis of the well-known model of the *kinked demand curve,* which was formulated in 1939 by the American economist Paul Sweezy. The model also illustrates the importance of interdependence and uncertainty, both of which are characteristic of oligopolistic markets. Refer to Figure 7-6. According to Sweezy's model, each firm is faced with a demand curve which shows a kink at the prevailing market price P_0 (see point S). Above the kink, that is at the prices above P_0, the demand curve is very elastic (see the section TS). The reason is that the firm believes that if it sets its price above P_0 other firms would not do the same, with the result that its sales would decline sharply and its market

Reason for kink

share would shrink. On the other hand the, demand curve below the kink, at prices below P_0, is very inelastic (see section SV) because the firm believes that if it were to price its product lower than its competitors they would immediately do the same to prevent losing part of their market share. Therefore the firm cannot increase its market share by reducing its price; its sales will increase at a rate which is no higher than that of its competitors.

Figure 7-6
The kinked demand curve

As a result of the kink in the demand curve P_0 remains the equilibrium price even if the marginal cost curve moves upwards or downwards (provided it intersects the MR curve in the discontinuous area).



Discontinuous MR

Because the firm's demand curve is kinked, the marginal revenue curve is not continuous, but shows a discontinuous section between points A and B. (As a result of the kink in the demand curve the total revenue of the firm, if calculated (P × Q), suddenly undergoes a major change at point S, which means that the marginal revenue, MR, also changes drastically immediately below point S – hence the 'fall' in the MR curve from A to B. The remainder of the marginal revenue curve, from B to R, is related to the demand curve between points S and V.) Profit is maximised at the production level where MR = MC. Suppose that MC_1 is the marginal cost curve of the oligopolist. MC_1 intersects the marginal revenue curve MR in the discontinuous section AB; profits are therefore maximised at the prevailing price and quantity (P_0 and Q_0). However, Figure 7-6 shows that the firm's costs may change without the price changing. If the marginal cost increases from MC_1 to MC_2, it would still intersect the MR curve at the same output level Q_0 and the price P_0 would also remain unchanged. The marginal cost curve MR can move either upwards or down-

P and Q unchanged

wards but as long as it intersects the MR curve in the discontinuous section the equilibrium price and quantity will remain the same.

Sweezy's model was initially regarded by some economists as a generally applicable theory of oligopoly, but it is no longer so highly regarded. While the model is a visual method of illustrating the phenomenon of price rigidity, it does not provide a full explanation of price formation under an oligopoly. For instance, it does not explain how the firms arrived at the price P_0 in the first place; the model simply takes the prevailing price P_0 as given. Empirical research has also questioned the basic premise of the model – the indications are that competitors will imitate both price increases and price decreases. In that event the demand curve would not show a kink.

The model of the kinked demand curve is currently regarded as one of a whole range of theories to explain oligopolistic behaviour. The importance of this model is that it illustrates the underlying interdependence and uncertainty which are characteristic of oligopolistic markets and can be used to explain price rigidity, something which is often observed in practice.

Product variation and sales expenditure (nonprice competition) in an oligopoly

Most oligopoly models lead us to the conclusion that prices are fairly stable in this market form – and indeed observation in practice bears this out. Price wars do occur from time to time, but do not usually last long. In order to avoid price wars, oligopolists prefer to keep prices unchanged as far as possible and to compete by means of advertising, product differentiation and the services they offer (ie nonprice competition). (The attentive reader will immediately see the similarity to monopolistic competition.) Only when a price change is unavoidable as a result of changes in demand conditions and cost structures do oligopolists consider a price adjustment. If there is a price leader in the industry, a price adjustment of this kind can take place in a fairly orderly manner.

Like a monopolistic competitor, an oligopolist uses advertisements in an attempt to boost the demand for his product, that is to shift his demand curve to the right. If this is successful, the firm will be able to sell a larger quantity of the product at the same price. The problem, however, is that as soon as other firms see that their sales are dropping, they will probably react by expanding their advertising as well. It is possible that the only result will be an all-round increase in advertising costs, with each firm simply retaining its own market share and making less profit. This serves to emphasise how careful one has to be about advertising campaigns.

The same argument applies to product differentiation. Producers frequently differentiate their products in order to boost their sales, but this usually leads to

a counter-reaction from other firms, the result again being higher costs and prices. Products are sometimes changed simply for cosmetic reasons – as when car manufacturers bring out different models. Other changes may involve real improvements which are to the advantage of the consumers – an example being a new kind of razor blade which is not only better but lasts longer as well. Product differentiation is sometimes aimed at a particular market segment, as when a car manufacturer brings out a model which is aimed specifically at young working people or at students.

The same arguments which arose with regard to advertising and product differentiation for the monopolistic competitor could well be repeated here. The principle that a firm's optimum expenditure on advertising and product variation is reached when the marginal revenue generated is equal to the marginal cost is equally valid here. That there are only a few firms in an oligopoly and that each firm must take the possible reactions of its competitors into account makes the marketer's task a bigger challenge.

Welfare effect of oligopoly

Because there is no general theory on oligopolies and we have discussed only a few models in this chapter, the welfare effect of an oligopoly cannot be compared in detail with that of perfect competition or a monopoly, for example. The following is a summary of the most important differences or similarities which can generally be identified:

- As in a monopoly or monopolistic competition, the producer in an oligopoly does not produce at the minimum point of the long-run average cost curve (LAC). The product is therefore not supplied to consumers at the lowest possible price.
- Firms in an oligopoly can make economic profit in the long run. This is in contrast to monopolistic competition and perfect competition, where only normal profit can be made in the long run. Note, however, that oligopolies use a large portion of their profits for research and development in order to find new and better products and cheaper production methods.
- As in monopolistic competition and monopoly, the price of the product in an oligopoly is higher than the marginal cost ($P > MC$), which also means that society attaches greater value to an additional unit of the product than to the resources required to produce it. This points to an inefficient utilisation of resources and a welfare loss.

Oligopolies – a worldwide phenomenon

As has already been stated, oligopoly is the market structure most commonly found in all the modern economies of the world. During the past decade the trend towards increasingly large oligopolies with international interests has increased, as is apparent from the fact that the biggest companies in the world are becoming even bigger as a result of mergers and internal growth.

Mergers

More and more small companies have merged with bigger companies, regarding this as the only way to survive. Impetus has also been given to the establishment and growth of international companies by the worldwide improvement in communications and transport, the disappearance of measures that impede international trade and the investments which originated from the formation of large trading blocs (eg in Europe and North America).

The sector where there has been the biggest growth in large corporations during the past few decades is banking. The growth of the world's largest banks has been described as spectacular. Another sector where rapid growth has taken place is communications. The merging of Time with Warner Communications and Japan's Sony with American Paramount Pictures are just two examples of this. The same trend has been evident in manufacturing. In the tyre industry three companies (Goodyear, Bridgestone and Michelin) have been responsible for more than half the world's total sales. At the time of writing of this chapter negotiations were taking place between Daimler-Benz and Chrysler which would lead to the establishment of the fifth biggest motor vehicle manufacturer in the world.

The movement in the direction of corporate expansion (and oligopoly formation) has not passed South Africa by. It was apparent from Table 7-2 that manufacturing in South Africa was already being dominated by oligopolies in the seventies. Reports appear regularly in the financial press on further mergers or proposed mergers. The banking and financial sector in South Africa has also seen a number of takeovers and mergers in the past few years. Various mergers of banks and building societies have taken place, such as between the Allied, Trust-Bank, United and Volkskas, to name one example. Brokerage firms have also merged their interests, acquiring international interests in the process. Auditing firms and advertising companies have done the same.

We should mention that mergers are not the only kind of operation that is taking place. In South Africa quite a few big companies have also been unbundled recently, that is to say they have split up into smaller enterprises. The unbundling has mainly affected companies with a wide variety of divergent, heterogeneous activities. As might be expected, mergers generally take place between companies conducting the same type of business, for example in the banking sector.

Because oligopolies are so widespread, it is a pity that no general economic theory has been developed for this market form. Further research in this field is still taking place; the emphasis appears to be on the expansion and application of what is known as 'games theory'. This is a challenging subject but unfortunately it is beyond the scope of the syllabus covered in this book.

IMPORTANT CONCEPTS

- Monopolistic competition
- Differentiated products
- Short-run equilibrium of the monopolistic competitor
- Long-run equilibrium of the monopolistic competitor
- Surplus capacity
- Non-price competition
- Sales expenditure
- Oligopoly
- Interdependence
- Collusion
- Cartels
- Price signals
- Price leadership
- Dominant firm
- Kinked demand curve
- Price rigidity

QUESTIONS

(1) Discuss the assumptions that make monopolistic competition as a market form unique. (10)

(2) Discuss equilibrium price determination of the monopolistic competitor in the short term. Use a figure to illustrate your answer. (20)

(3) In your opinion, does the greater variety that differentiated products offer, justify the higher price that the consumer has to pay? (4)

(4) Discuss the formation of a cartel. Use a diagram to illustrate your answer. (12)

(5) Discuss the reasons why cartels fail. (6)

(6) Discuss fully how the dominant firm divides the market between itself and the smaller firms. Use a diagram to illustrate your answer. (25)

(7) Explain why the kinked demand curve of Paul Sweezy has a kink in it. (5)

(8) Illustrate and explain how Sweezy's model can be used to explain the rigidity of prices and outputs in the case of an oligopoly. Refer to the effect of changes in cost on the price and output decisions of an oligopoly. (15)

(9) What criticism can be levelled against Sweezy's model? (4)

8

GENERAL EQUILIBRIUM ANALYSIS AND WELFARE ECONOMICS

In the previous chapters we analysed the reaction of producers and consumers to the economic problem of scarcity. We saw how consumers use their limited income to maximise utility, and firms allocate production factors and set prices to maximise profit. Because each agent (participant) and each market was analysed separately, it may appear as if microeconomics considers such agents and markets in complete isolation. However, this impression is false. It is also important for microeconomists to understand how various agents and markets interact with each other. In fact, one of the most interesting and stimulating fields of study in microeconomics concerns precisely the interrelationships between different agents and markets. This chapter will try to establish the theoretical underpinnings for studying such interrelationships in the economy.

After having studied this chapter, you should be able to

- describe the difference between partial and general equilibrium
- understand the criterion for Pareto optimality
- discuss consumption efficiency with the aid of an Edgeworth Box Diagram
- discuss production efficiency with the aid of an Edgeworth Box Diagram
- explain the interrelation between production and consumption efficiency with the aid of a diagram
- summarise the three Pareto conditions for general equilibrium efficiency
- describe the concept of welfare economics

PARTIAL VERSUS GENERAL EQUILIBRIUM ANALYSIS

The kind of analysis conducted in the previous chapters is generally known as *partial equilibrium analysis*. The effects of changes in a given market are confined to that specific market. No attempt is made to see what the repercussions are for other markets. This approach is like that of a film producer who, seated in a helicopter, is shooting a battle scene with his camera which has a telephotolens – first, he focuses on what the infantry is doing, then what is going on with the artillery and, finally, he homes in on what the generals are discussing. After all the scenes have been shot, he will have somewhat of a problem to integrate them in such a way that an outsider can gain a clear view of how the battle developed.

In a certain sense, economists have the same problem as this film producer, namely to present an integrated model of the economy as a whole. This chapter introduces the concept of *general equilibrium analysis,* which is a theoretical model which attempts to take account of the implications of changes in one market for other markets. The last part of this chapter will also touch on welfare economics, which is that aspect of economic analysis which studies the relative desirability of various distributions of wealth or productive resources.

General equilibrium analysis is also used to answer a question which has occupied economists for a long time, namely whether a perfectly competive market will yield a set of prices which will cause all markets simultaneously to clear. Recent research by mathematical economists seems to have confirmed such a notion, to which this chapter, however, will not be giving any further attention – it would require us to consider a set of mathematical equations which would make it too complicated. We will concentrate on presenting an introduction to general equilibrium analysis and welfare economics, leaving aside their mathematical technicalities.

The Pareto criterion

An important problem in economic analysis needs to be faced from the outset, namely the difficulty of making normative pronouncements about economic situations, that is whether one situation may be considered better than another. For example, is one distribution of production factors (or consumer goods) better than any other? The fundamental reason that it is so hard to decide such issues is that we cannot determine whether (say) a loaf of bread brings more satisfaction to Jones than to Smith, or whether Smith attaches greater value to an additional R100 income than Jackson. Subjective considerations play an unavoidable part in such interpersonal comparisons, which therefore cannot be decided without making value judgements.

Pareto optimality

The well-known criterion for Pareto optimality, formulated in 1909 by the Italian economist Vilfredo Pareto, was designed to circumvent this problem. According to the Pareto criterion, any change which leaves at least one person better off without making anybody else worse off is desirable. Such a change is referred to as 'Pareto efficient'. When all possibilities for making such Pareto-efficient changes have been exhausted and we can no longer improve one person's position without worsening the position of someone else, a situation is achieved which is described as a 'Pareto-optimal distribution of resources'.

The Pareto criterion therefore steers clear of the problem of making interpersonal comparisons. The central question according to this criterion is: Can A's position be improved without making the position of B (or any other participant) worse off? A's position is compared with himself, whilst the position of B (or any other participant) stays the same.

The Pareto criterion is obviously not perfect either. For example, it is undecided about changes which make some individuals better off while leaving others worse off. Since most economic policy changes produce results of this kind, the Pareto criterion is clearly of limited use. Other more explicit methods have therefore been suggested to supplement the Pareto criterion, such as the Kaldor-Hicks criterion. Nonetheless, in spite of its limitations, the Pareto criterion is used in just about all the studies which attempt to measure the relative desirability of economic situations. It gives us a criterion to gauge the suitability of a specific changes in the distribution of production factors.

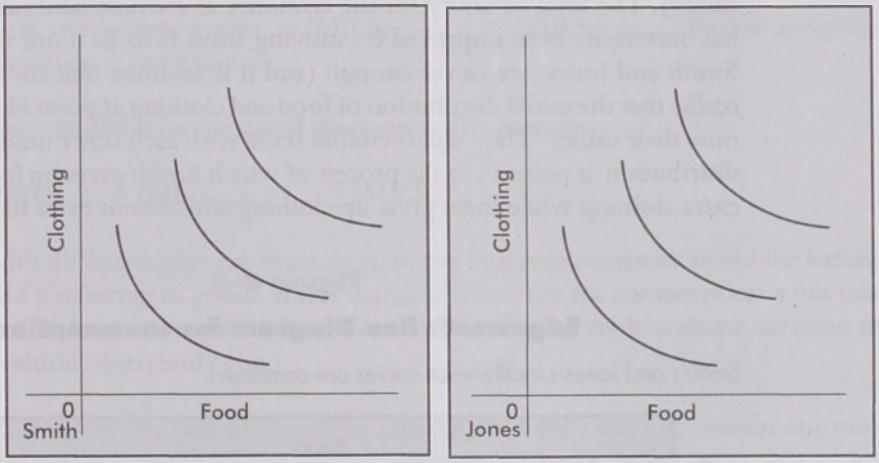
General equilibrium

As already mentioned, a general equilibrium model takes explicit account of the interrelationships between various sectors in the economy. To keep the complicity of such a model manageable, it is common to assume a simple economy in which only two consumers (Smith and Jones) play a role, only two goods (food and clothes) are produced, with the aid of only two production factors (capital and labour) – a so-called $2 \times 2 \times 2$ economy. First, we will investigate when consumption efficiency is achieved – for a given combination of goods produced, consumption efficiency requires that goods should be distributed among consumers in such a way that it is impossible to enhance the utility of one consumer without reducing the utility of the other. Second, we will look at production efficiency, which is achieved when it is impossible to increase the production of the one good without decreasing the production of the other good. Third, we will attempt to establish when production and consumption are compatible with each other, that is when that combination of goods is produced which consumers also wish to buy.

CONSUMPTION EFFICIENCY

Figures 8-1 and 8-2 show the indifference maps of the two consumers, Smith and Jones, of our simplified economy. We explained in a previous chapter how an indifference curve indicates a constant level of utility (or satisfaction) and how higher levels of utility are represented by higher indifference curves.

Figures 8-1 and 8-2
Indifference map of Smith; Indifference map of Jones



Edgeworth Box Diagram

The two indifference maps can now be combined to form an Edgeworth Box Diagram for consumption. This is achieved by rotating Jones's indifference map 180° and linking the two maps – see Figure 8-3. Jones's indifference map will now have to be viewed from the upper right-hand corner – for him, an indifference curve representing a low level of utility will lie close to the upper right-hand corner (eg J_1) and an indifference curve representing a higher level of utility further away from that corner (eg J_2). The 'bulge' of Jones's indifference curves also points towards the upper right-hand corner of the diagram. Smith's indifference map remains as in Figure 8-1 and can be interpreted in the normal way.

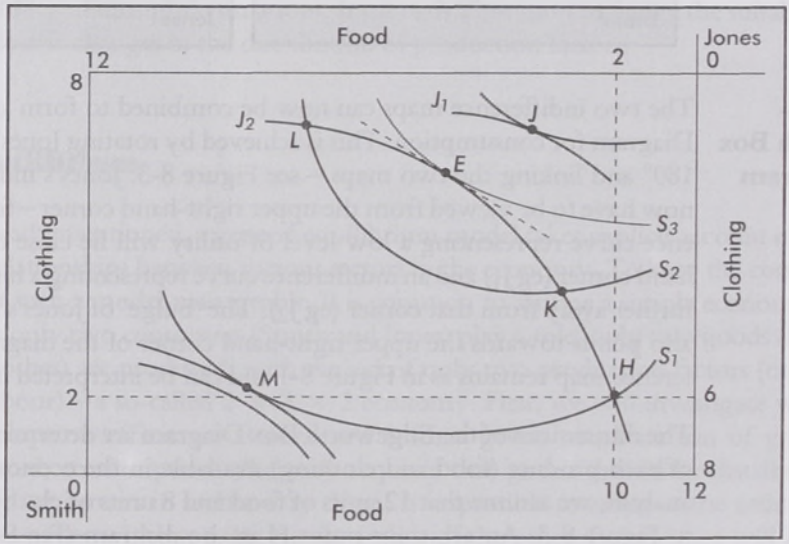
The dimensions of the Edgeworth Box Diagram are determined by the quantity of each product (food and clothing) available in the economy. In our present analysis, we assume that 12 units of food and 8 units of clothing are available, as in Figure 8-3. An arbitrary point H in the diagram (Fig 8-3) is now chosen, which is assumed to represent the initial distribution of goods among Smith and Jones. As can be seen from the figure, point H means that Smith receives 2 units of clothing and 10 units of food, while Jones obtains 6 units of clothing and 2 units of food. The question now arises whether the distribution at point H is optimal from the point of view of the economy as a whole, and also whether it

would be possible to improve on this distribution. As we move from point H to point K, it is apparent that Smith reaches a higher indifference curve (from S_1 to S_2), while Jones remains on the same indifference curve (J_2). Smith thus experiences a higher level of utility, while the utility of Jones has remained the same. Therefore, according to the Pareto criterion, this is a desirable change or, in other words, a Pareto-efficient change. The economy as a whole (Smith and Jones) has been made better off by going from point H to point K. However, as we move further on, from point K to point E in Figure 8-3, it is clear that Smith can once again reach a higher indifference curve (S_3), with Jones's position not being compromised as he can stay on the same indifference curve (ie the same level of utility). The level of utility for the economy as a whole (and hence its welfare) has once more been improved by moving from K to E. If our two consumers, Smith and Jones, are clever enough (and it is assumed that they are) they will realise that the initial distribution of food and clothing at point H does not maximise their utility. They will therefore trade with each other until they reach the distribution at point E, in the process of which Smith gives up food and obtains extra clothing while Jones gives up clothing and obtains extra food.

Figure 8–3

Edgeworth Box Diagram for consumption

Smith's and Jones's indifference curves are combined.



After Smith and Jones have exchanged goods to arrive at point E, they will have reached a Pareto-optimal distribution of goods. If, however, they were to move beyond point E to some other point in the diagram, say L, this would be at the expense of one of the consumers (in this case, Smith), who will move to a lower

indifference curve (S_2) – this is therefore not a Pareto-efficient change. Given that we started off at a distribution at point H, it is impossible to improve on point E by way of exchange between the consumers. At point E, Smith and Jones's indifference curves just touch – a line through E (like the dotted line) will therefore be a tangent to both indifference curves, which means that at E the marginal rate of substitution of food for clothing (MRS_{FC}) is equal for both consumers. This is called the *first Pareto condition* for general equilibrium in the economy, which can formally be expressed as follows:

First Pareto condition

The efficient distribution of consumer goods requires that the marginal rate of substitution between any two consumer goods should be equal for all individuals using these goods, ie $(MRS_{FC})_{Smith} = (MRS_{FC})_{Jones}$ for the simplified economy of our example.

This condition can be stated more generally, namely

$$(MRS_{xy})_a = (MRS_{xy})_b = ... = (MRS_{xy})_n$$

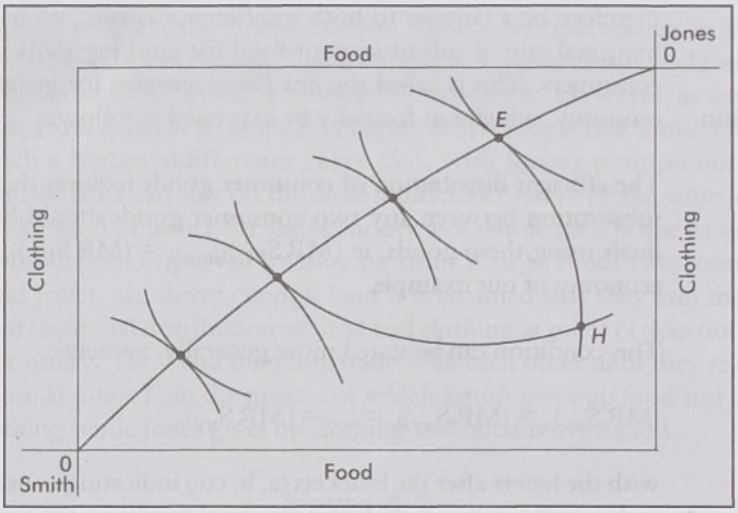
with the letters after the brackets (a, b, etc) indicating consumers and the letters x and y referring to goods. If this marginal condition for consumption is not satisfied, at least one individual will benefit from further trade without harming the position of anybody else.

An Edgeworth Box Diagram for consumption does not just contain one point such as E where $(MRS_{FC})_{Smith} = (MRS_{FC})_{Jones}$ holds. In fact, an endless variety of such points exists. Two more are shown in Figure 8-3, namely M and J. If a line is drawn through all these points, we obtain a curve known as the *contract curve for consumption*. Figure 8-4 shows it as the curve which runs from the origin of Smith's indifference map to the origin of Jones's. Consumption equilibrium (ie a Pareto-optimal distribution of goods between individuals) is obtained at any point on the contract curve, while consumption equilibrium fails at any point away from the contract curve. The basic assumption of microeconomics is that consumers will always act to maximise their utility, which implies that consumers, if they are not already on the contract curve for consumption, will move towards it.

Contract curve

The question arises which of any two points on the contract curve for consumption, say E and J in Figure 8-3, is preferable from the point of view of the economy as a whole. A movement from E to J in Figure 8-3 means that Smith goes to a higher indifference curve and Jones to a lower one. Smith is therefore better off while Jones loses out. As mentioned earlier in this chapter, the Pareto criterion cannot be used to decide whether E or J is a better position for the economy as a whole. We will come across this problem again later in this chapter.

Figure 8–4
Contract curve for consumption
Points on the curve represent consumption efficiency (first Pareto condition).



PRODUCTION EFFICIENCY

Edgeworth Box Diagram

The way an Edgeworth Box Diagram portrays production efficiency is similar to how it portrays consumption efficiency. We also start with two isoquants, one for the production of food and one for clothing, which are combined to form an Edgeworth Box Diagram for production. (In Figure 8-5, the isoquant map for the production of clothing has already been rotated 180° and combined with the isoquant map for the production of food to form a box diagram.) The dimensions of the box are determined by the amounts of inputs, that is, the amounts of production factors capital (K) and labour (L) available to the economy.

Assume that point A represents the initial distribution of inputs over the two producers (ie the producer of food and the producer of clothing). Again, the question arises whether, from the vantage point of the economy as a whole, these producers can improve on point A. It is once more apparent how a movement from point A to point B, and afterwards to point C, brings the production of clothing up to a higher isoquant (from C_1 to C_2 to C_3) while maintaining the production of food at the same isoquant (F_1). Hence the production of clothing increases, while food remains the same – this is therefore a Pareto-efficient change. It typifies an increase in the overall level of production of the economy, achievable with the given amounts of production factors available. The slopes of

the isoquants at point C are equal, which means that the marginal rate of technical substitution of labour for capital ($MRTS_{LK}$) is the same for the production of clothing and for the production of food. This is called the *second Pareto condition* for general equilibrium in the economy, which can formally be expressed as follows:

Second Pareto condition

An efficient allocation of production factors requires that the marginal rate of technical substitution between any two production factors be equal for all production processes using both inputs, ie $(MRTS_{LK})_{Food} = (MRTS_{LK})_{Clothing}$ for the simplified economy of our example.

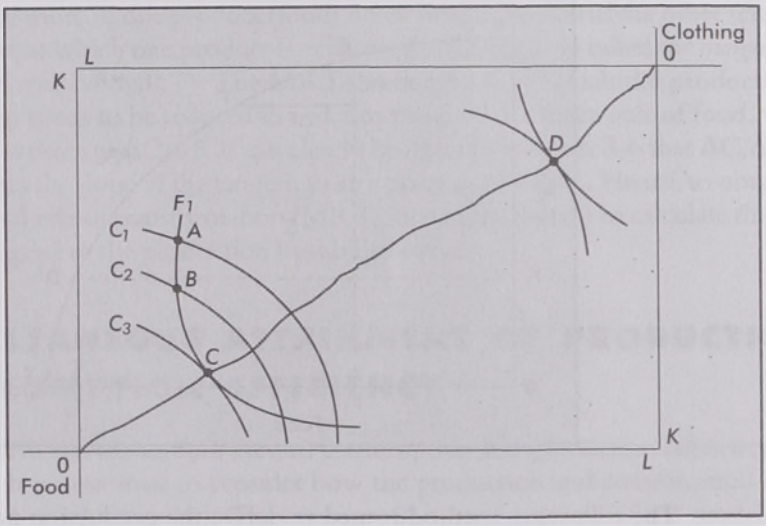
This condition can more generally be expressed as:

$$(MRTS_{LK})_x = (MRTS_{LK})_y = ... = (MRTS_{LK})_n$$

where x, y and n indicate production processes for food, clothing, etc.

Figure 8–5
Edgeworth Box Diagram for production

The isoquant maps of food and clothing have been combined. Points on the contract curve represent production efficiency (second Pareto condition).



If this condition is not satisfied, the re-allocation of production factors over production processes can increase the production of at least one good without decreasing the production of any other good; hence, the overall level of production of the economy can be enhanced without employing any additional production factors.

Because each producer has an endless number of isoquants, there is an endless variety of points like C. All such points taken together form the contract curve

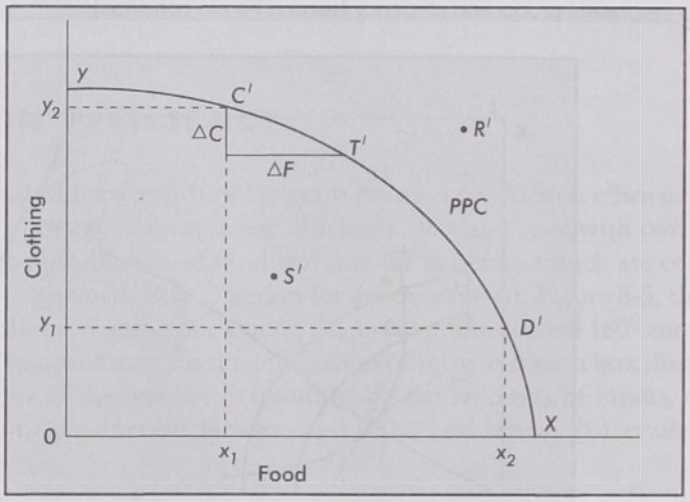
for production (see Figure 8-5), which in accordance with the Pareto criterion reflects production-efficient input combinations.

The production possibility curve

The output levels represented by the production-efficiency points on the contract curve can be used to construe a production possibility curve (PPC) as in Figure 8-6. Such a curve shows the maximum attainable combinations of goods which the community can generate with the given amounts of production factors available. The PPC is derived under the assumption that all inputs are fully utilised as well as efficiently allocated, and that technology and the available inputs remain constant.

Figure 8-6
Production possibility curve

This shows the maximum attainable combinations of goods which the economy can generate with available production factors and technology.



The following method is used to derive the production possibility curve. The isoquants in Figure 8-5 indicate production levels for food and clothing respectively. A point such as C in Figure 8-5 lies close to the origin of the isoquant map for food, but far from the origin of the isoquant map for clothing. Hence it displays a product combination where many clothes are produced (say, y_2 units) but little food (say, x_1 units). When we transpose this information to the PPC in Figure 8-6, it is represented by point C′ which reflects the same information. On the other hand, a point such as D in Figure 8-5 represents a product combination with a lot of food (say, x_2 units) but few clothes (say, y_1 units) – the same combi-

nation which in Figure 8-6 is depicted by point D′. By thus redrawing in Figure 8-6 all the product combinations on the contract curve in Figure 8-5, we obtain the production possibility curve.

The vertical and horizontal intersects of the production possibility curve (points X and Y) in Figure 8-6 depict situations where all available production factors are used to produce only food (at X) or only clothing (at Y). Point Y in Figure 8-6 corresponds with the origin at the lower left-hand corner of the Edgeworth Box in Figure 8-5, where only clothing is produced but no food. Similarly, point X in Figure 8-6 accords with the upper right corner of the Edgeworth Box in Figure 8-5, where only food is produced but no clothing.

Incidentally, two further points, S′ and R′, appear in Figure 8-6. Point S′ lies inside the production possibility curve and thus indicates that the production factors are not fully and efficiently used – subsequent analysis will disregard such points. Point R′ cannot be attained with the available amount of inputs and technology and will therefore also be ignored.

The PPC allows us to make a further deduction. A movement from C′ to T′ in Figure 8-6 means that the economy produces more food but fewer clothes. Hence, when all production factors are fully utilised, the economy can only produce more of one product (food) when producing less of the other (clothes). The rate at which one product is exchanged for another is called the *marginal rate of transformation* (MRT). The MRT denotes by how much the production of clothing needs to be reduced in order to produce one extra unit of food, which can be written as $\Delta C/\Delta F$. It can clearly be seen from Figure 8-6 that $\Delta C/\Delta F$ also measures the slope of the tangent to any point on the PPC. Hence, to obtain the marginal rate of transformation (MRT), one needs merely to calculate the slope of a tangent to the production possibility curve.

THE SIMULTANEOUS ATTAINMENT OF PRODUCTION AND CONSUMPTION EFFICIENCY

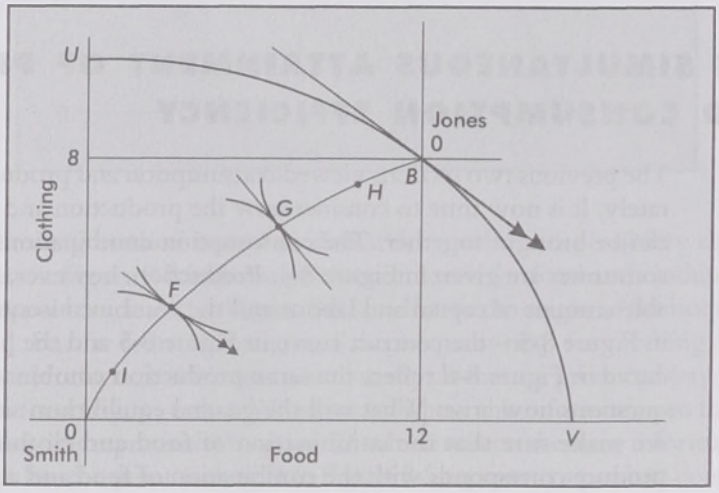
The previous two sections viewed consumption and production efficiency separately. It is now time to consider how the production and consumption sectors can be brought together. The consumption combinations of the model's two consumers are given in Figure 8-4. Production, however, is based on the available amount of capital and labour and the combined isoquant maps as pictured in Figure 8-5 – the contract curve in Figure 8-5 and the production possibility curve in Figure 8-6 reflect the same production combinations. The following questions now arise: What will the general equilibrium situation be? How can we make sure that the combination of food and clothing which producers produce corresponds with the combination of food and clothing which consumers wish to consume?

We have already pointed out how the production possibility curve (Fig 8-6) represents the combinations of food and clothing which the community can produce with the production factors available. It therefore also indicates the maximum attainable combinations of the two goods which are available for consumption (Fig 8-4) in the economy. By combining the production possibility curve in Figure 8-6 with the Edgeworth Box for consumption in Figure 8-4, the production and consumption sectors can be brought together. This is done in Figure 8-7. Point B in Figure 8-7 lies on the production possibility curve, indicating a combination of 12 units of food and 8 units of clothing *produced* in the economy. These 12 units of food and 8 units of clothing obviously also denote the maximum amounts of goods available for *consumption* in the economy. Hence, it stands to reason that the Edgeworth Box for consumption should fit exactly inside the production possibility curve. Note how point B was chosen to correspond with the combination (12 units of food and 8 units of clothes) with which we started. However, any other combination on the production possibility curve could be chosen, which would mean that the Edgeworth Box for consumption would have different dimensions (say, 15 units of food and 6 units of clothing), but would still fit exactly within the production possibility curve. Actually, in theory there is a separate Edgeworth Box for consumption for each production combination on the PPC, of which point B is only one. We pointed out above that each point on a contract curve inside an Edgeworth Box for consumption (eg points F and G in Fig 8-7) represents an efficient allocation of goods between consumers.

Figure 8-7

Simultaneous production and consumption efficiency

At point F, $MRS_{FC} = MRT_{FC}$ (third Pareto condition).



As already explained, at point B in Figure 8-7 the quantity of food and clothing *produced* is equal to what is available to be *consumed*. But that does not necessarily mean that this available *combination* of food and clothing corresponds with what consumers *wish* to consume. For *simultaneous efficiency* in both production and consumption a further condition needs to be met: consumers must be *willing* to substitute one good for the other in consumption at the same rate at which the economy *is able to* transform one good into the other in production (the latter rate being measured by the slope of the PPC). This means that the MRS between food and clothing of both Smith and Jones must be equal to the MRT between food and clothing. Hence, simultaneous efficiency requires that the slope of the indifference curves of both Smith and Jones should be equal to the slope of the PPC, which happens at point F in Figure 8-7. This is known as the *third Pareto condition* for general equilibrium in the economy, which is concerned with the relation between the consumption and production sector. This Pareto condition can more formally be expressed as:

Third Pareto condition

Simultaneous consumption and production efficiency require that the marginal rate of substitution between any two consumer goods for both consumers should be equal to the marginal rate of transformation between these consumer goods during the production process, ie $(MRS_{FC})_{Smith} = (MRS_{FC})_{Jones} = MRT_{FC}$.

A more general expression would read:

$$(MRS_{xy})_a = (MRS_{xy})_b = \ldots\ldots\ldots = (MRS_{xy})_n = MRT_{xy}$$

with the letters after the brackets (a, b, etc) indicating consumers and the letters x and y referring to goods.

The economic implication of the third Pareto condition is that the combination of goods produced in the economy must be optimal from the perspective of both producers and consumers. It is not sufficient that the conditions for economic efficiency in the production and consumption sphere should be met separately. These conditions have also to be met at a point where the mutually interdependent production and consumption decisions conform with each other.

The attentive reader will have noticed how, in a certain sense, the third Pareto condition presupposes the first two conditions. The satisfaction of the third condition automatically guarantees that the first two conditions are met. The third Pareto condition consists of two parts: $(MRS_{xy})_a = (MRS_{xy})_b$ and MRT_{xy}. If the marginal rate of substitution is the same for consumers (as required by the third Pareto condition), the first condition is automatically fulfilled. Also, the marginal rate of transformation reflects the slope of the

PPC, which is derived from the contract curve for production, which meets the second Pareto condition. By implication, therefore, points on the PPC fulfil the second Pareto condition. Hence, when the third Pareto condition is met, the first two conditions are met as well.

All three Pareto conditions are therefore satisfied at a point such as F in Figure 8-7. Point F, however, is by no means unique. There are many such points where all three Pareto conditions are fulfilled. (But a point such as G does not satisfy the third Pareto condition, because the slope of the indifference curves of Smith and Jones is not equal to the slope of the PPC; while $(MRS_{FC})_{Jones} = (MRS_{FC})_{Smith}$ holds, this is not equal to MRT_{FC}.) The next question is: Given that point F in Figure 8-7 is not unique, which point on the contract curve should then be regarded as optimal from the point of view of the community (Smith and Jones) as a whole? The next section will address itself to this question.

A further question is: What would the situation be like if MRT was not equal to the MRS? Since an answer to this question will interrupt the flow of our argument, we will relegate it to Box 8-1.

Box 8-1

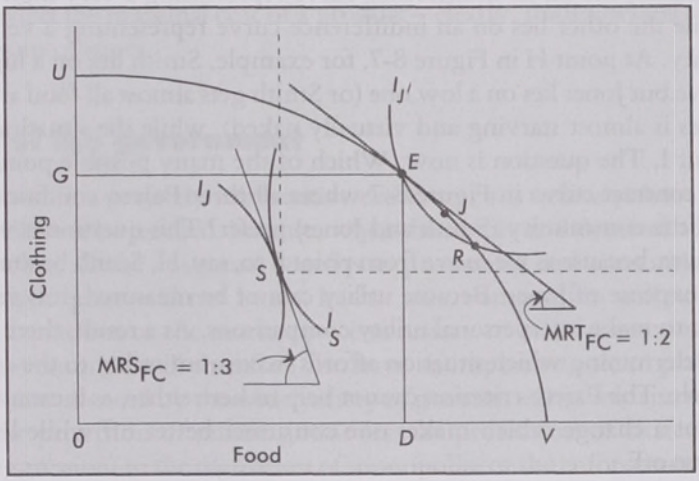
THE EQUALITY OF MRS AND MRT

What is the underlying reason for the optimality rule according to which the MRT and the MRS have to be equal? Assume that the economy finds itself in a situation where the conditions for the MRS and MRT are fulfilled (ie production and consumption efficiency are achieved), but that $MRT_{FC} = 1:2$ (ie 2C/1F) while $MRS_{FC} = 1:3$ (ie 3C/1F). The economy therefore produces on its PPC and the two consumers consume somewhere on the contract curve. Because $MRT_{FC} = 1:2$, this means that to increase the production of food by one unit, the economy (Smith and Jones) needs to offer up two units of clothing – production factors need to be shifted from the clothing to the food producing sector. Assume that this is precisely what happens – the economy produces one additional unit of food but two units less clothing. Let us leave Smith's consumption basket unchanged, but give Jones this 1 additional unit of food produced, for which Jones is prepared to give up 3 units of clothing while remaining equally well off (remember that $MRS_{FC} = 1:3$). What has been achieved? The level of utility (welfare)experienced by both Smith and Jones is the same as before these changes, *but there is now one surplus unit of clothing.* (3C is removed from Jones' basket, but only 2C was necessary to produce the 1 additional unit of food.) By arbitrarily distributing this one unit of clothing over Smith and Jones, both can increase their level of utility (welfare). Hence, the original situation could not have been Pareto optimal. Such an advantageous rearrangement of production and

consumption would not have been possible if the condition MRS = MRT had already been met.

Equality between MRS and MRT

If $MRS_{FC} = MRT_{FC}$, the third Pareto condition for simultaneous production and consumption efficiency is satisfied.



The above discussion can be further illustrated in a diagram. The economy produces at point E on the production possibility curve UV, where $MRT_{FC} = 1:2$. Construct an Edgeworth Box 0DEG and assume that Smith and Jones consume at point S where $MRS_{FC} = 1:3$. (0 and E are the origins for Smith and Jones respectively.) Freeze Smith's consumption at S. Draw Jones' indifference curve in its natural state as shown by the dotted axes running through S. Also draw indifference curve $I_{J'}$ corresponding with I_J. Because Jones' $MRS_{FC} = 1:3$ at S and the $MRT_{FC} = 1:2$ at E, the curve $I_{J'}$ will cut through the PPC from above, as can be seen from the figure. The economy can move its production to a point such as J (on UV), where Jones will find himself on a slightly higher indifference curve than $I_{J'}$, while Smith remains at S.

If the condition concerning the equality between MRS and MRT is fulfilled, Jones' indifference curve $I_{J'}$ will form a tangent to the PPC at E. As a result, it would not be possible to rearrange production and consumption in such a way that the welfare of one person can be improved without making another person worse off – thus increasing the welfare of the community as a whole.

SUNDRY REMARKS ABOUT THE STUDY OF WELFARE ECONOMICS

We mentioned in the previous section that a point such as F on the contract curve in Figure 8-7 is not unique. Hence the distribution of food and clothing between Smith and Jones is not unique either. It is even possible that a point on the contract curve in Figure 8-7 satisfies all three Pareto conditions, but that one consumer lies on an indifference curve representing a very high level of utility while the other lies on an indifference curve representing a very low level of utility. At point H in Figure 8-7, for example, Smith lies on a high indifference curve but Jones lies on a low one (or Smith gets almost all food and clothing but Jones is almost starving and virtually naked), while the situation is reversed at point I. The question is now: Which of the many possible points such as F on the contract curve in Figure 8-7 where all three Pareto conditions are satisfied, will the community (Smith and Jones) prefer? This question is very difficult to answer, because as we move from point F to, say, H, Smith becomes better off at the expense of Jones. Because utility cannot be measured, it is virtually impossible to make interpersonal utility comparisons. As a result, there is no easy way of determining which situation affords maximum utility to the community as a whole. The Pareto criterion cannot help us here either, as it cannot say anything about a change which makes one consumer better off while leaving another worse off.

Welfare economics

The problem as sketched in the previous paragraph falls within the field of study known as *welfare economics*. Welfare economics attempts to judge the relative desirability of economic situations from the point of view of the community as a whole. The central question of welfare economics is which allocation of economic resources yields the maximum welfare (utility) for the community as a whole. It goes without saying that welfare economics is essentially normative, meaning that value judgements are an integral part of any choice between alternative economic scenarios. Even if a model which could make such choices were to be built, it would necessarily contain some kind of welfare criterion according to which alternative situations are weighed up against each other. Undoubtedly such a welfare criterion would then reflect the value judgements of the model builder, be he or she a planner, state body, politician or whoever. Value judgements, unfortunately, cannot be scientifically determined, and there is consequently no guarantee that welfare criteria have an equal concern for the welfare of each individual (or group of individuals) in society.

There are theoretical models which determine which allocation of economic resources gives maximum welfare to a community, but it falls outside the scope of this course to discuss them in greater depth.

WELFARE ECONOMICS IN PRACTICE

It should be obvious that welfare economics is a difficult field of study whose practical applications are rather complicated. Nonetheless, many studies have been conducted to apply welfare principles. Without going into detail, we can mention some of these: a study to determine the welfare cost of monopoly; the welfare cost of extraordinary high medical care; welfare losses due to transactions outside the formal economy; as well as a study about the extinction of the Blue Whale as an example of the inefficiency which arises when prices do not reflect the marginal cost of a product – clearly, studies which cover a wide spectrum of issues.

The role of the government

Even in a perfectly competitive economy, it is unlikely that a Pareto optimum will ever be reached, because, when the supply and demand of a product do not reflect all the costs and benefits in producing and consuming a product, the 'right' price will not be set. In that case, competition will not bring about the adaptations to the market price necessary to achieve maximum welfare. The government will therefore also have an important role to play in the economy – as evidenced by the wide variety of government involvements that exist, from the provision of public goods (eg the protection of citizens against foreign aggression) to the regulation of monopolies or the enforcement of anti-pollution measures. This concerns a field of study which will receive attention in other economics courses.

IMPORTANT CONCEPTS

- Partial equilibrium analysis
- General equilibrium analysis
- Pareto optimality
- Edgeworth Box Diagram
- Contract curve
- Consumption efficiency
- Production efficiency
- Production possibility curve
- Marginal rate of transformation
- Simultaneous efficiency
- Pareto's three conditions
- Welfare economics

QUESTIONS

(1) Explain why, with regard to consumption, points that lie away from the contract curve are regarded as inefficient. (Also use a diagram to illustrate your explanation.) (6)

(2) Explain fully in your own words (without a diagram) what happens if an economy moves from a point that is not on the *contract curve for production* to a point that does in fact lie on the contract curve. (6)

(3) What does a *production possibility curve* represent? Explain the meaning of a point that lies within the curve. What do we know about a combination of goods that is represented by a point that lies outside the curve? (Also use a diagram to illustrate your explanation.) (8)

(4) Explain fully how a general equilibrium can be achieved *simultaneously* in production and exchange, given that factors of production are fully employed. (Also use a diagram to illustrate your explanation.) (15)

(5) Assume that Utopia has a 2 × 2 × 2 economy (ie two consumers, two products and two factors of production). Explain how the *contract curve for the production* of food and clothing in Utopia will be derived. Also explain the difference between efficient and inefficient production. Use an Edgeworth Box Diagram to illustrate your discussion. (15)

(6) Use the *contract curve for production* discussed in question 5 to derive the *production possibility curve* for Utopia. (Explain how you go about this.) Show common points between the two curves clearly. (5)

(7) Suppose that in Utopia it is found that the $MRT_{FC} = 3:1$, while the $MRS_{FC} = 1:1$. Define and discuss each of these concepts briefly and explain why, according to the Pareto criterion, there is room for improving welfare. (5)

(8) (a) *Name* only the three conditions that must be met in order to satisfy the Pareto criterion. (3)

(b) *Explain* in your own words the marginal conditions that must be met in order to satisfy the Pareto criterion. (9)

(9) Is each allocation of resources that satisfies the Pareto criterion also a social welfare optimum? Explain in your own words. (3)

Microeconomics offers a detailed discussion of microeconomic theory for students who wish to gain an intermediate knowledge of the subject, but it is written in such a way that it is accessible to anyone who has little, or no, background in microeconomics.

Prof Roelie Viljoen has been at the Department of Economics at Unisa since 1974. He has lectured microeconomics for more than twenty years and is familiar with the types of problem students encounter. In *Microeconomics* he shares his knowledge with readers and students in a fresh and practical way.

ISBN 1 86888 095 8

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