

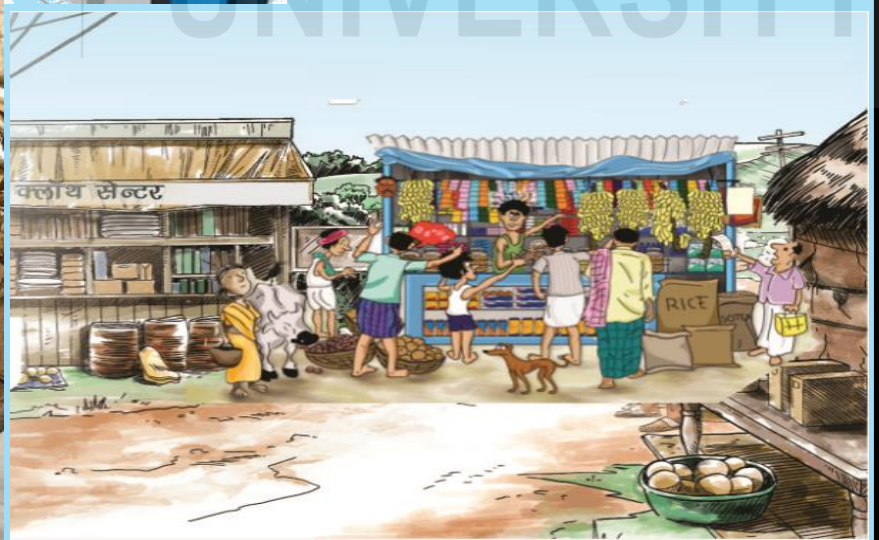


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Indira Gandhi National Open University
School of Social Sciences

BECC-101

**INTRODUCTORY
MICROECONOMICS**





**INTRODUCTORY
MICROECONOMICS**

**School of Social Sciences
Indira Gandhi National Open University**

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INTRODUCTORY MICROECONOMICS

This course is designed to expose the students pursuing BA Hons. Economics Programme to the basic Principles of Microeconomic theory. It aims to provide the conceptual foundation of Microeconomic theory in a manner to enable the students to understand the Intermediate Microeconomics I & II so as to analyse real life situations.

Economics is a live subject and helps the economic agents in their decision making like: Which commodities to produce? How to produce? Which techniques to use? Which factors or resources to use, in which combinations to produce and What quantity of a commodity to produce? How consumers make purchasing decisions and how their choices are affected by changing prices and incomes? How firms decide how many workers to hire and how workers decide where to work and how much work to do? In other words, economics has moved away from financing the activities of state to helping the common man in the street to make many a crucial decisions impinging on their day-to-day life.

We, today incorporate a wide spectrum of activities in the domain of economics. These activities include: (a) consumer's behaviour or choice process; (b) producers' behaviour or how is the production organised and carried on, what is the special role of cost functions? (c) What are the different forms of market organisations; (d) how different individuals co-operate in the process of production to contribute factors owned by them. (e) What are the various types of efficiencies? (f) Under what situations markets fail and how the state can play its role in such situations? The present course on Introductory Micro Economics aims to expose the learners to the issues pertaining to (a) to (f). The course is divided into six blocks.

Introducing the nature of Economics, **Block 1** throws light on the basics of demand and supply and how the demand and supply curves are used to describe market mechanism. The block comprises 3 units. Unit 1 on Introduction to Economics and Economy covers the essential nature of economics and the basic concepts and methodology used in the discipline. Unit 2 deals with the Principles of Demand and Supply, measurement of their elasticities, and determinants. Unit 3 discusses the Market Mechanism by putting the Supply curve and Demand curve together.

Block 2 deals with the theory of consumer behaviour and consists of two units. Unit 4 discusses Cardinal Utility Approach for measurement of utility and how a consumer attains equilibrium with the help of equi-marginal utility. Unit 5 analyse the Consumer Behaviour under Ordinal Approach.

Block 3 covers production function and theory of cost. It consists of three units. Unit 6 throws light on production function with one variable input, Unit 7 deals with the nature of production function with two and more variable inputs. Unit 8 discusses the cost side of production considering different types of costs.

Block 4 throws light on the various forms of market i.e. perfect competition, monopoly, monopolistic competition, and oligopoly. The block comprises 4 units. Unit 9 on Perfect Competition: Firm and Industry Equilibrium provides the characteristics of perfectly competitive market and exposes the learners to equilibrium of Firm and Industry under perfect competition. Unit 10 on Monopoly: Price and Output Decision deals with pricing and output decisions and price discrimination under monopoly condition. The concept of deadweight loss under monopoly has also be discussed in this unit. The equilibrium conditions of monopolistic competition in short-run and long-run period, theory of excess capacity, the comparison of the various market forms have been provided

in Unit 11. Price and Output determination under oligopoly have been covered in Unit 12.

Block 5 discusses the Pricing of the factors of production. It comprises three units. Introducing the Marginal Productivity theory of distribution, Unit 13 provides an overview of how rent and wages are determined. It also provides a bird's eye view on the theories of interest and profit. Unit 14 acquaints the learners of the role of demand and supply mechanisms in determinations of wages under perfectly competitive labour markets and imperfectly competitive labour markets. Unit 15 throws light on features of land as a peculiar factor of production and the various theories of rent.

Block 6 covers the Welfare Market failure and the role of state. This block comprises two units. Unit 16 exposes the learners to the various forms of efficiencies under perfectly competitive market economy and the outcome of departures from the assumptions of perfectly competitive market conditions. Unit 17 highlights the various situations where markets fail and hence the role of state comes into picture.



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BLOCK 4 MARKET STRUCTURE

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BLOCK 4 MARKET STRUCTURE

Block 4 essentially concentrates on output markets i.e. markets for goods and services that firms sell and consumers purchase under the different market structures i.e. perfect competition, various forms of imperfect competition i.e. monopoly, monopolistic competition and oligopoly. The Block comprises four units.

Unit 9 on Perfect Competition: Firm and Industry Equilibrium provides the characteristics of perfectly competitive market and exposes the learners to equilibrium of Firm and Industry under perfect competition. **Unit 10 on Monopoly: Price and Output Decision** deals with pricing and output decisions and price discrimination under monopoly condition. The concept of deadweight loss under monopoly has also be discussed in this unit. The equilibrium conditions of monopolistic competition in short-run and long-run period, theory of excess capacity, the comparison of the various market forms have been provided in **Unit 11**. Price and Output determination under oligopoly have been covered in **Unit 12**.



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UNIT 9 PERFECT COMPETITION: FIRM AND INDUSTRY EQUILIBRIUM

Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Perfect Competition: Characteristics of a Perfectly Competitive Market
- 9.3 The Firm as a Price Taker in Perfectly Competitive Market (PCM)
- 9.4 The Price-Taking Firm's Cost Structure
- 9.5 The Perfectly Competitive Market: Firm in the Short Run and Long Run
 - 9.5.1 Short Run Price and Output
 - 9.5.2 Short Run Abnormal Profit – Market Entry
 - 9.5.3 Short Run Loss
 - 9.5.4 Long Run Price and Output of a PC Firm
 - 9.5.5 Conclusions
- 9.6 Shut Down Point and Break-Even Output for PCM Firm
- 9.7 Supply Curve for a PC Firm and for PC Market
 - 9.7.1 Constant-Cost, Increasing-Cost, and Decreasing-Cost Industries
- 9.8 Let Us Sum Up
- 9.9 References
- 9.10 Answers or Hints to Check Your Progress Exercises

9.0 OBJECTIVES

After reading this unit, you will be able to :

- identify the characteristics a perfectly competitive market and their implications;
- explain the concept of firm as a Price Taker in Perfectly Competitive Market (PCM);
- state the profit-maximisation condition for a perfectly competitive (PC) firm;
- explain the Equilibrium of a perfectly competitive market or a industry;
- talk about the shut Down Point and Break-Even Output for a PC Firm;
- derive a perfectly competitive firm's short-run supply curve from the firm's profit-maximisation problem;

- construct the short-run market supply curve from the short-run supply curves of individual firms;
- perform comparative statics analysis of the short-run equilibrium in a perfectly competitive market; and
- state the conditions for the long-run perfectly competitive equilibrium.

9.1 INTRODUCTION

Market structure refers to arrangements that bring buyers and sellers together. The market for a product may also refer to the whole region where buyers and sellers of that product are spread and there is such free competition that one price for the product prevails in the entire region. Whether a firm can be regarded as competitive depends on several factors such as the number of firms in the industry, degree of rivalry, degree of homogeneity of the product, economies of scale and easiness with which any firm can enter in the market and exit from it. On the basis of these characteristics, especially in terms of degree of competition, a market can be classified as a perfectly competitive market, monopoly, duopoly, oligopoly and monopolistic competition. In this unit, we aim to explore the features of a perfectly competitive market, equilibrium of industry and firms under such a market.

9.2 PERFECT COMPETITION: CHARACTERISTICS OF A PERFECTLY COMPETITIVE MARKET

A perfectly competitive market exhibits the following characteristics:

- 1) The industry is **fragmented**. It consists of large number of buyers and sellers. Each buyer's purchases are so small that they have an imperceptible effect on market price. Each seller's output is so small in comparison to the market demand that it does not affect the market price. In addition, each seller's input purchases are so small that they have a negligible impact on input prices.
- 2) Firms produce **homogeneous** products. i.e., consumers perceive the products to be identical or homogeneous no matter who produces them. Product of Firm A will in no way be differentiated from those of Firm B. This results in price competition.
- 3) There is **perfect knowledge/information** amongst both firms and consumers: Firms will have total knowledge of any improvement in technology and manufacturing processes, while consumers will be fully aware of all firms' prices.
- 4) The industry is characterised by **equal access to resources**. All firms – those currently in the industry, as well as prospective entrants – have access to the same technology and inputs. Firms can hire inputs, such as labour, capital, and materials, as they need them, and they can release them from their employment when they do not need them.
- 5) There are **no barriers to entry**: Nothing hinders firms from entering the market in order to compete with existing producers. Such barriers could be insurmountably high initial (start-up) costs, lack of access to key

technology or raw materials, and legal barriers such as not having necessary patent rights.

Sometimes, economists distinguish perfect competition from pure competition and impose the following two more conditions for a market to be perfectly competitive:

- 1) Perfect mobility of factors of production between the industries
- 2) No transport costs involved in a perfectly competitive market.

However, if one closely looks into the characteristics described earlier, one can easily find that the additional conditions mentioned above are implicit and therefore for the purpose of convenience and to avoid any confusion, pure and perfect completions are used as synonyms to each other.

These characteristics have three implications for how perfectly competitive markets work:

- 1) The first characteristic – *the market is fragmented* – implies that sellers and buyers act as price takers. That is, a firm takes the market price of the products given when making an output decision and a buyer takes the market price as given when making purchase decisions. This characteristic also implies that a firm takes input prices as fixed when making decisions about input quantities.
- 2) The second and third characteristics – *firms produce homogeneous products* and consumers have perfect information about prices – imply a law of one price: Transactions between buyers and sellers occur at a single market price. Because the products of all firms are perceived to be identical and the prices of all sellers are known, a consumer will purchase at the lowest price available in the market. No sales can be made at any higher price. The lowest price demanded by one firm will become the market price – every firm will have to sell at that price only.
- 3) The fourth and fifth characteristics imply that the *industry is characterised by free entry*. That is, if it is profitable for new firms to enter the industry, they will eventually do so. Free entry does not mean that a new firm incurs no cost when it enters the industry, but rather that it has access to the same technology and inputs that existing firms have.

In the real world it is hard to find examples of industries which fit all the criteria of ‘perfect knowledge’ and ‘perfect information’. However, some industries are close to perfectly competitive markets:

- *Foreign exchange markets*. As currency is all homogeneous and traders will have access to many different buyers and sellers and buyers also have choice from which trader to buy the currency. A good information about relative prices is available to the buyers and thus easy to compare prices while buying currency.
- *Agricultural markets*. Normally, there are several farmers selling identical products in the market which has many buyers. At the market, it is easy to compare prices. Therefore, agricultural markets often get close to perfect competition.

- *Internet based markets:* The internet has made many markets closer to perfect competition because the internet has made it very easy to compare prices, quickly and efficiently (perfect information). Owing to the relatively low cost of doing business through internet, it has become easier to enter in the market. For example, selling a good on internet through a service like Amazon or e-kart etc. is close to perfect competition. Equal access to the market and availability of full information about the prices of the products, enable the price of goods to fall in line with the market price making the firms to earn only normal profit in the long run.

Check Your Progress 1

- 1) Describe briefly the characteristics of a perfectly competitive market and their implications?

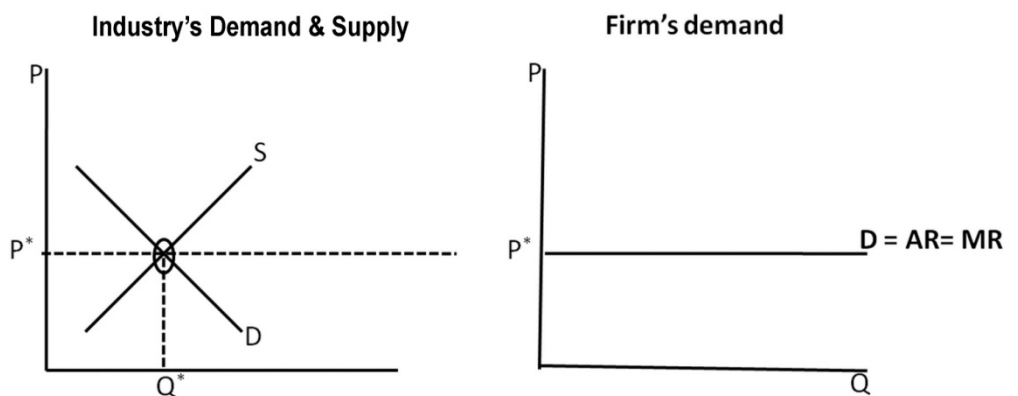
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- 2) Can you imagine in real world the markets akin to a perfectly competitive market, if yes list them with their similarities?

.....

9.3 THE FIRM AS A PRICE TAKER IN PERFECTLY COMPETITIVE MARKET (PCM)

The aggregate demand and supply of industry determine the equilibrium price of the homogeneous product. The firm cannot influence this on its own, and thus simply accepts that it is facing a fixed price. The demand curve for the price taker firm is infinitely elastic, since the market can absorb any amount produced by any one supplier (Fig. 9.1).



A competitive market firm is a price-taker, so demand will be perfectly elastic. The demand curve is also the MR and AR curve.
 $P = D = AR = MR$

Fig. 9.1 : Demand and Revenue for a Perfectly Competitive Market (PCM)

In case for the perfectly competitive market firm, the price will be the same. The horizontal demand curve, is also the average revenue (AR) and marginal revenue curve (MR), i.e. $P = AR = MR$. This can be verified as follows:

Total Revenue (TR) = Price \times Quantity

$$TR = P \cdot Q$$

$$AR = \frac{TR}{Q} = \frac{P \cdot Q}{Q} = P \text{ - which is 'given'}$$

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(P \cdot Q)}{\Delta Q} = \frac{P \cdot \Delta Q}{\Delta Q} = P \quad (\text{Price is given for a PCM firm})$$

Supply curve for the firm. To know about the supply curve of the firm, it would be necessary to look into the profit¹ maximising behaviour of the price taker firm.

Assuming that the firm produces and sells a quantity Q , its economic profit is $\pi = TR(Q) - TC(Q)$, where $TR(Q)$ is the total revenue derived from selling the quantity Q and $TC(Q)$ is the total economic cost of producing the quantity Q . As the firm is a price taker, it perceives that its volume decision has a negligible impact on market price and its goal is to choose a Q to maximise its total profit. To illustrate the firm's problem, suppose that a rose grower anticipates that the market price for fresh-cut roses will be $P = ₹1.00$ per rose. Table 9.1 shows total revenue, total cost, and profits for various output levels and Fig. 9.2(a) graphs these numbers.

Table 9.1: Total Revenue, Cost and Profit for a Price Taking Rose producer Firm

(Units in Thousands and value in ₹)			
Q	TR(Q)	TC(Q)	Profit
0	0	0	0
60	60	95	35
120	120	140	20
180	180	155	25
240	240	170	70
300	300	210	90
360	360	300	60
420	420	460	40

Fig. 9.2(a) shows that profit is maximised at $Q = 300$ (i.e., 300,000 roses per month). It also shows that the graph of total revenue is a straight line with a slope of 1. Thus, as we increase Q , the firm's total revenue goes up at a constant rate equal to the market price, ₹1.00 which is also equal to MR.

¹ A distinction is to be made between economic profit and accounting profit, i.e.

economic profit = sales revenue - economic costs

accounting profit = sales revenue - accounting costs

That is, economic profit is the difference between a firm's sales revenue and the totality of its economic costs, including all relevant opportunity costs, for example, reward or return of the labour put in by the owner of the firm which is treated equivalent to the return expected in his next best alternative use. Therefore, whenever we discuss profit maximisation, we are talking about economic profit maximisation.

Marginal cost (MC), the rate at which cost changes with respect to a change in output, following usual return to scales, is exhibited as U-shaped curve.

Fig. 9.2 shows that for quantities between $Q = 60$ and the profit-maximising quantity $Q = 300$, producing more roses increases profit. Increasing the quantity in this range increases total revenue faster than total cost, i.e. $MR > MC$ or in our case $P > MC$.

When $P > MC$, each time the rose producer increases its output by one rose, its profit goes up by $P - MC$, the difference between the marginal revenue and the marginal cost of that extra rose.

Further, for quantities greater than $Q = 300$, producing fewer roses increases profit. Decreasing quantity in this range decreases total cost faster than it decreases total revenue – that is, marginal revenue is less than marginal cost, or $P < MC$. When $P < MC$, each time the producer reduces its output by one rose, its profit goes up by $MC - P$, the difference between the marginal cost and the marginal revenue of that extra rose.

The producer can increase its profit when either $P > MC$ or $P < MC$, quantities at which these inequalities hold cannot maximise its profit. It must be the case, then, that at the profit-maximising output, $P = MC$, i.e. a price-taking firm maximises its profit when it produces a quantity Q^* at which the marginal cost equals the market price.

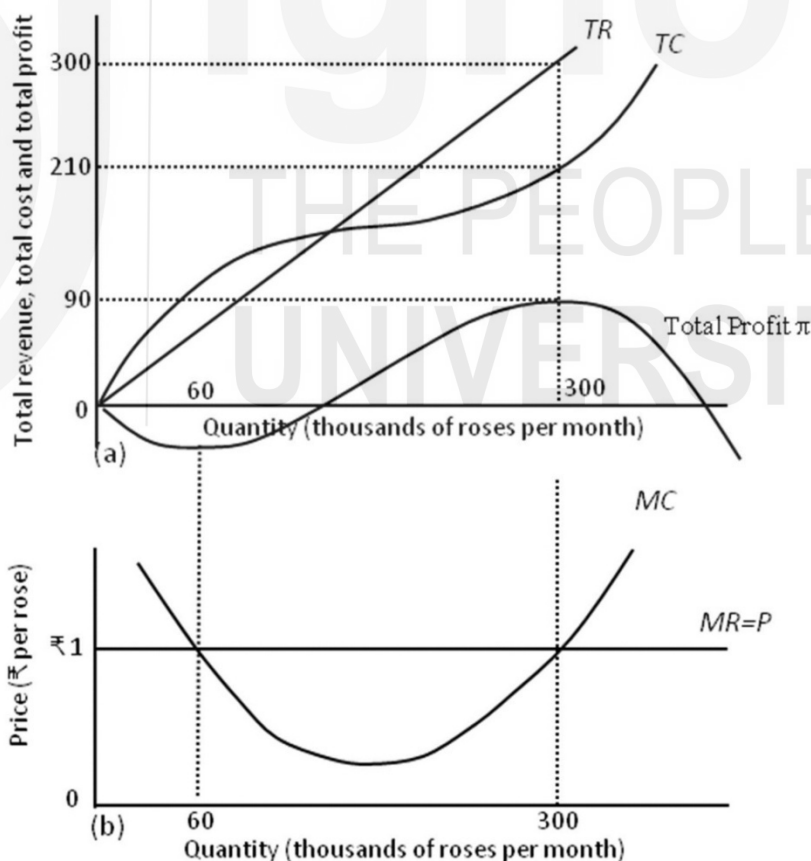


Fig. 9.2

Fig. 9.2 (b) however shows that there are two points ($Q = 60$, and $Q = 300$) at which $MR = MC$. The difference between $Q = 60$ and $Q = 300$ is that at $Q = 300$, the marginal cost curve is rising, while at $Q = 60$ the marginal cost curve is falling. The point at which $Q = 60$ represents the point at which profit is

minimised rather than maximised. This shows that there are two profit-maximisation conditions for a price-taking firm:

- $P = MC$.
- MC must be increasing.

If either of these conditions does not hold, the firm cannot maximise its profit. It would be able to increase profit by either increasing or decreasing its output. **Thus the rising part of the MC curve reflects the firm's supply curve, and horizontal summation of the entire firms' supply curve will be the market's supply curve which is upward slopping.** This concept would be further elaborated in the later part of this Unit. Any change in market demand will also shift the demand curve for the firm which would change the $MC=MR$ point along the MC curve. Fig. 9.3 shows that when market demand increases from D_0 to D_1 and decreases to D_2 , the demand curve (which is also the MR and AR curve) for the firm shifts upwards or downwards, along the upward-sloping MC curve. Any change in MR will change the profit maximising intersection of $MC = MR$, would accordingly change the supply of the firms, whose horizontal summation would indicate the market supply curve.

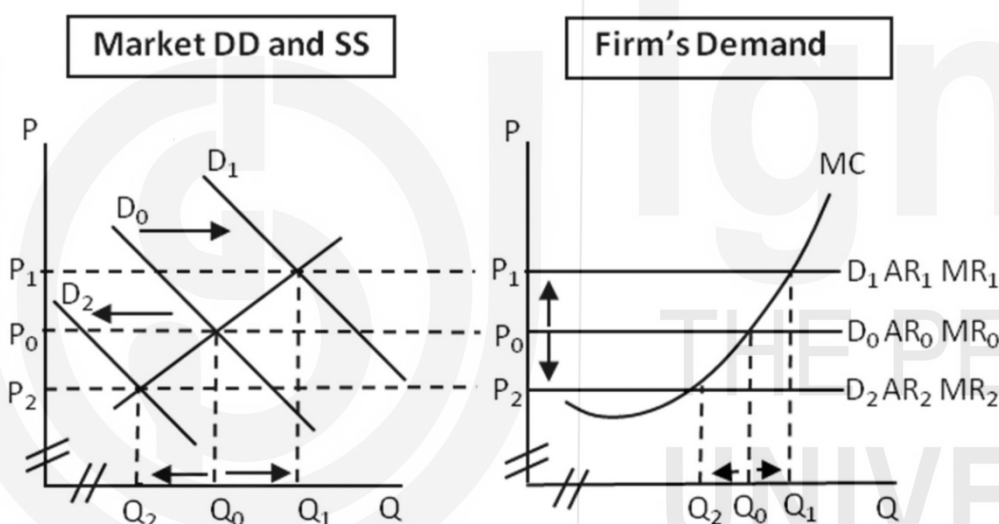


Fig. 9.3: The PCM Firms' Supply Curve

9.4 THE PRICE-TAKING FIRM'S COST STRUCTURE

To understand the response of a price-taking firm in the short-run and also in the long run, we need to explore the cost structure of a typical such firm in the industry. The firm's short-run total cost of producing a quantity of output Q is:

$$STC(Q) = SFC + NSFC + TVC(Q)$$

This equation identifies three categories of costs for this firm.

- TVC (Q) represents total variable costs. These are output-sensitive costs — that is, they go up or down as the firm increases or decreases its output. Total variable costs include materials costs and the costs of certain kinds of labour (e.g., factory labour). Total variable costs are zero if the firm produces zero output and thus are examples of non-sunk costs. If a rose producer, in our example, decides to shut down its rose growing

operations, it would avoid the need to spend money on fertilizer and pesticide.

- SFC represents the firm's sunk fixed costs. A sunk fixed cost is a fixed cost that a firm cannot avoid if it temporarily suspends operations and produces zero output. For this reason, sunk fixed costs are often also called unavoidable costs. For example, suppose that a rose grower has signed a long-term lease (e.g., for five years) to rent land on which to grow roses and that the lease prevents it from subletting the land to anyone else. The lease cost is fixed because it does not vary with the quantity of roses that the firm produces. It is output insensitive. It is also sunk because the firm cannot avoid the rental payments, even by producing zero output.
- NSFC represents the firm's non-sunk fixed costs. A non-sunk fixed cost is a fixed cost that must be incurred if the firm is to produce any output, but it does not have to be incurred if the firm produces no output. Non-sunk fixed costs, as well as variable costs, are also often called avoidable costs. For a rose grower, an example of a non-sunk fixed cost would be the cost of heating the greenhouses. Because greenhouses must be maintained at a constant temperature whether the firm grows 10 or 10,000 roses within the greenhouses, so the cost of heating the greenhouses is fixed (i.e., it is insensitive to the number of rose stems produced). But the heating costs are non-sunk because they can be avoided if the grower chooses to produce no roses in the greenhouses.

The firm's total fixed (or output-insensitive) cost, TFC, is thus given by $TFC = NSFC + SFC$. If $NSFC = 0$, there are no fixed costs that are non-sunk. In that case, $TFC = SFC$.

Check Your Progress 2

- 1) Why a firm is always a price taker in a perfectly competitive market? Give adequate justification for your answer.

.....

.....

.....

- 2) Briefly explain the cost structure of a PC firm and its relevance in determining the price and output of such a firm?

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9.5 THE PERFECTLY COMPETITIVE MARKET: FIRM IN THE SHORT RUN AND LONG RUN

9.5.1 Short Run Price and Output

The perfectly competitive market firm ('PCM firm' henceforth) is basically left with two decisions in the short run to maximise the profit; whether to produce and how much to produce. It is pertinent to note that profit maximisation

output choice also implies cost-minimising input choices, or in short, profit maximisation implies cost minimisation. Assuming that the firm has decided to produce, regarding the second decision, in line with our assumption of profit maximisation, the PC firm will set output at the point where MC equals MR. Being a price-taker, the price is set by market forces (supply and demand) and the firm will have three possible outcomes in the short run, as shown in Fig. 9.4 below:

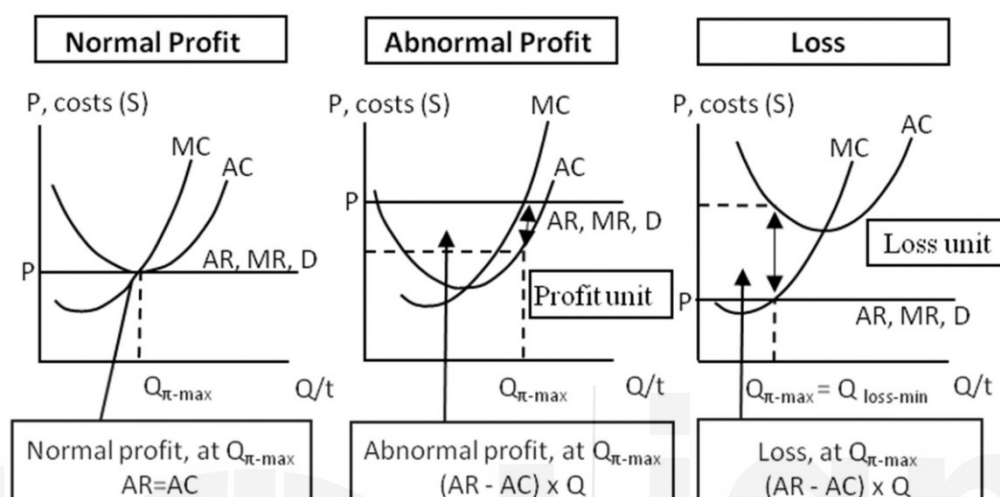


Fig. 9.4: Short run possibilities of a PCM firm

Given that profit is $\pi = TR(Q) - TC(Q)$, which in the unit-cost picture corresponds to $AR - AC$, Fig. 9.4 shows three possibilities:

- *Normal profit:* When the market price equals the AC of the PC firm, the firm will be at break-even, i.e. it will enjoy normal profits. This is shown in the first diagram of Fig 9.4 as the $MR = MC$ point coincides with average costs. As $AR = AC$ there is a normal profit.
- *Abnormal/supernormal profit:* The middle diagram illustrates a situation where the market price (and thus the MR, AR curve) is above the average cost. The firm sets output at $Q_{\pi-\max}$ and earns an abnormal profit.
- *Loss:* Finally, when the price is below any point on the AC-curve, the firm will operate at a loss, as profit maximising output ($Q_{\pi-\max}$ – which is the same as the loss minimising level of output; $Q_{\text{loss-min}}$ in the diagram) results in an AR below AC.

A firm in a perfectly competitive environment can only enjoy abnormal profits in the short run. The same holds for losses, which makes intuitive sense as no firm will be willing/able to uphold long term losses. The market mechanism together with the assumptions will act to create long run equilibrium where the PC firm will earn normal profits only.

9.5.2 Short Run Abnormal Profit – Market Entry

The firm depicted in the Fig. 9.5 on the left has an AC curve where the AC_{\min} point is below the market price, P_0 . The firm sets output at the profit maximisation point of $MC = MR$ and thus has an average revenue which is above average cost. This is the abnormal profit per unit, shown by the double-edged arrow, and these times the quantity shows the total abnormal profit for the PC firm.

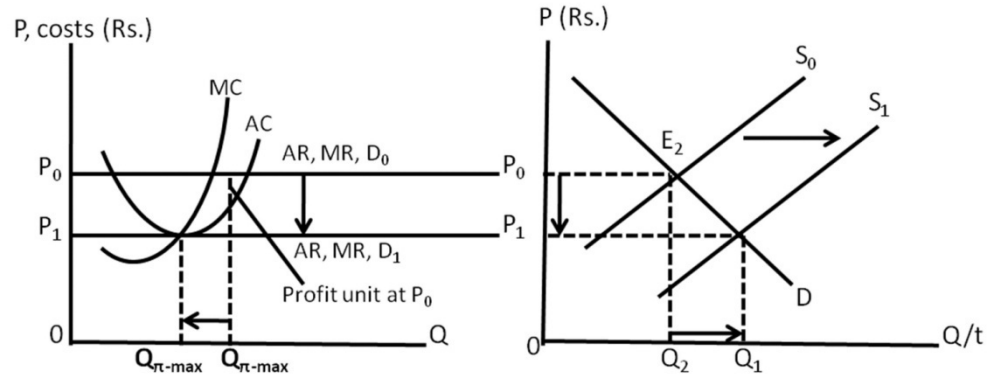


Fig. 9.5: Short run profit in a perfectly competitive market

What then happens, keeping in mind the assumptions of free market entry and perfect knowledge/information, is that new firms will be attracted and of course enter the market. This increases supply from S_0 to S_1 causing the price to fall from P_0 to P_1 . Falling market price will lower AR for the single PC firm, creating a long run equilibrium where once again $AR = AC$. The firm's short run profit is thus eroded in the long run by market entry.

9.5.3 Short Run Loss

Assume that firms which have been attracted to the market in the situation of abnormal profit, increased market output to the extent where the increase in supply lowered the market price to a level where individual firms made losses. This is the situation shown in Fig. 9.6 for a loss-making firm. At a market price of P_0 , the firm's AR is below AC. The firm will still produce at $MC = MR$ ('loss-minimising' point in this case) and will run at a loss, shown by the double-sided arrow. Total loss is the rectangle. As firms begin to exit the market over time – switching to more attractive producer substitutes – the market supply curve will shift to the left.

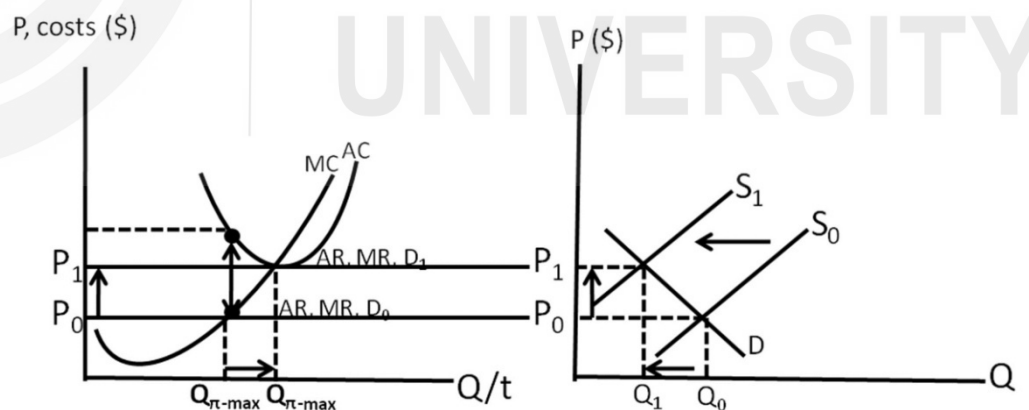


Fig. 9.6: Short Run Loss in a PCM Firm

In the LR, some firms will exit the market and market supply will decrease – shown by the shift from S_0 to S_1 in the market diagram on the right. As the market price rises, the firm's AR rises and when $AR = AC$ once again, there is LR equilibrium and every firm makes normal profits. What the firms can do in the short run? As a PC firm is a price taker, not much can be done to influence the AR side of the coin, so firms are focused on lowering costs. A firm running at a loss will have to find ways to become more efficient (i.e. lower MC) and/or decrease costs in general. One of the most common methods

used to decrease costs is to decrease the amount of labour used in production and to try to use remaining labour more efficiently.

9.5.4 Long Run Price and Output of a PC Firm

A long-run PC firm's equilibrium occurs at a price at which supply equals demand and firms have no incentive to enter or exit the industry. More specifically, a long-run PC equilibrium firm is characterised by a market price P^* , a number of identical firms' n^* , and a quantity of output Q^* per firm that satisfies three conditions:

- Each firm maximises its long-run profit with respect to output and plant size. Given the price P^* , each active firm chooses a level of output that maximises its profit and selects a plant size that minimises the cost of producing that output. This condition implies that a firm's long-run marginal cost equals the market price, or $P^* = MC(Q^*)$.
- Each firm's economic profit is zero. Given the price P^* , a prospective entrant cannot earn positive economic profit by entering this industry. Moreover, an active firm cannot earn negative economic profit by participating in this industry. This condition implies that a firm's long-run average cost equals the market price, or $P^* = AC(Q^*)$.
- Market demand equals market supply. At the price P^* , market demand equals market supply, given the number of firms n^* and individual firm supply decisions Q^* . This implies that $D(P^*) = n^*Q^*$, or equivalently, $n^* = D(P^*)/Q^*$.

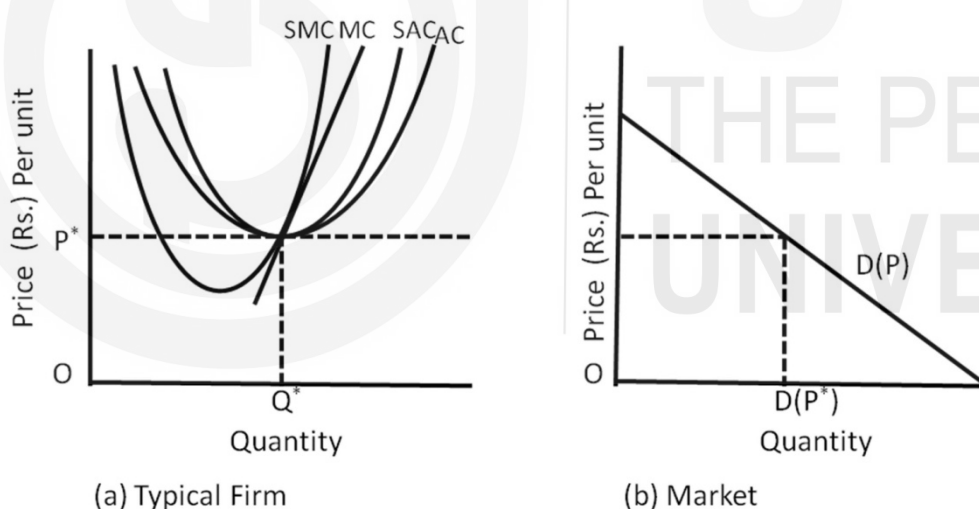


Fig. 9.7: Long-Run Equilibrium in a Perfectly Competitive Market

Fig. 9.7 shows these conditions graphically. Because the equilibrium price simultaneously equals long-run marginal cost and long-run average cost, each firm produces at the bottom of its long-run average cost curve.

9.5.5 Conclusions

The PCM firm's behaviour in determining its output in the short and long run leads to make the following conclusions:

Market Structure

- a) The PC firm can make abnormal profits in the short run, but will make a normal profit in the long run as lack of entry barriers allows new firms to enter the market and increase supply and lower the market price.
- b) The firm cannot run at a loss in the long run either since some firms will leave the market and supply will converge to a long run equilibrium which allows the (surviving) firms a normal profit once again.
- c) The LR equilibrium level of output is thus: $P = AC_{\min} = MC = AR = MR$.

Check Your Progress 3

- 1) State whether following statements are true or false:
 - a) A competitive firm in the long run will produce output up to the point where price equals average variable cost.
 - b) A firm's shutdown point comes where price is less than minimum average cost.
 - c) A firm's supply curve depends only on its marginal cost. Any other cost concept is irrelevant for supply decisions.
 - d) The $P = MC$ rule for competitive industries holds for upward-sloping, horizontal, and downward-sloping MC curves.
 - e) The competitive firm sets price equal to marginal cost.

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- 2) Interpret this dialogue:
 - A: "How can competitive profits be zero in the long run? Who will work for nothing?"
 - B: "It is only excess profits that are wiped out by competition. Managers get paid for their work; owners get a normal return on capital in competitive long-run equilibrium – no more, no less."

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- 3) A firm is operating at a loss. Explain why the firm might stay rather than exit the market.

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- 4) Why can a PC firm only make a normal profit in the long run according to our model?

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9.6 SHUT DOWN POINT AND BREAK-EVEN OUTPUT FOR PC FIRM

When a firm is earning normal profit, output is at the point where $AR = AC$, this is the *break-even point of output*. The shut-down point, the point at which firm is likely to leave the market, is the output level where it is equally costly for the firm to continue producing as it is for the firm to leave the market. If the firm can cover all of the variable costs and at least some of the fixed costs (i.e. non-sunk fixed costs as defined above) then it has an incentive to remain on the market. If the price falls below the AVC then the firm will not cover even the variable costs – and leave the market. Hence, the point where the firm must decide whether to remain on the market or leave is when $AR = AVC$. This is the *shut-down point*.

It will be easier to understand these critical issues clearly in a figure using the actual numbers rather than points A, B, and C etc. Fig. 9.8 attempts to explain these points. Assume that the original demand on the market gives a market price of ₹10, which are the PCM firm's MR and AR . This is the long run equilibrium and also the break-even point, as the firm covers all its costs – even opportunity costs – earning it a normal profit. Assume that for some reason (either increasing supply or decreasing demand) the market price starts to fall and subsequently the firm's AR , MR , D -curve falls to a price level of ₹6. Being a profit maximiser, the firm sets output where $MC = MR$, which is now at 80 units rather than 100. At this output level the firm cannot cover all its costs; ATC at an output of 80 is ₹11. The firm loses ₹5 on each unit produced, giving an overall loss of ₹400 (₹5 × 80 units).

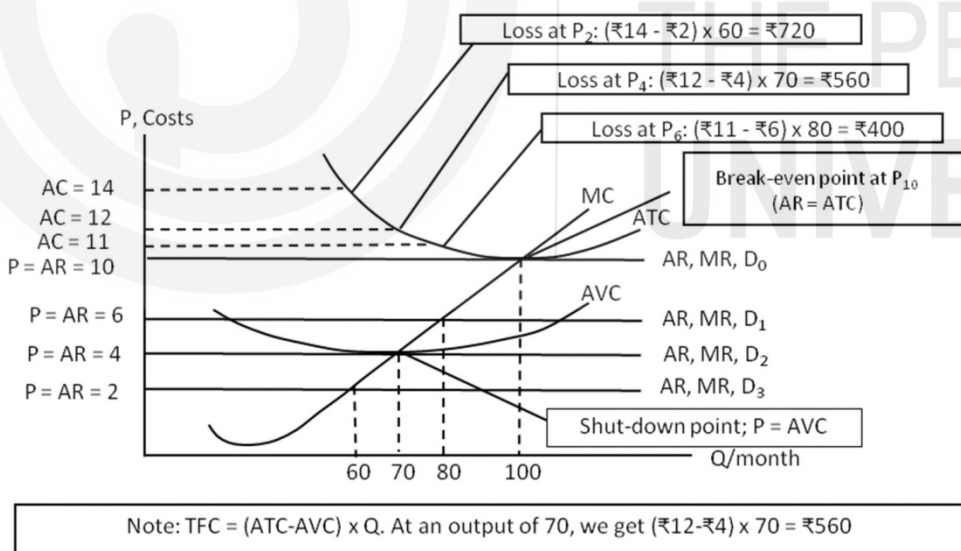


Fig. 9.8: Shut Down and Break-even Price for a PCM Firm

Why doesn't the firm leave the market at a price level of ₹6? Consider the choices facing the firm:

- Stay in the business and make a loss of ₹400
- Leave the business and make a loss of ₹560, which is the total fixed cost (see TFC calculation in Fig. 9.7), i.e. $TFC = (ATC - AVC) \times Q$. At an output of 70, we get $(₹12 - ₹4) \times 70 = ₹560$.

This is not much of a choice, rather a lack of options. The firm will have a strong incentive to stay in the market during the short run, hoping perhaps that either market price will increase or that increased efficiency and/or cost-cutting can lower MC and AC to a normal profit level again.

If, however, the market price falls even further, to ₹4, then the options become:

- a) Stay in the business and make a loss of ₹560
- b) Leave the business and make a loss of ₹560

The firm's TR ($₹4 \times 70 = ₹280$) will be identical to the TVC, which means that there is no contribution towards covering the fixed costs. The firm is making a loss of ₹560 by staying in the business and would make the same loss by leaving it. The point where $P (AR) = AVC$ is therefore the *shut-down point* for the firm. The firm will not produce at a lower price level – just consider the options at a price of ₹2. The firm's TR would be ₹120 ($₹2 \times 60$) and TC would be ₹720 ($₹12 \times 60$) leading to a loss of ₹600. The reason is that at a price (e.g. AR) of ₹2 the firm would not even be covering all its variable costs so total costs would be greater than total fixed costs alone. At any price below AVC the firm will leave the market.

Therefore the important consideration for a PC firm will be: as long as the firm has an AR above AVC, the firm covers variable costs and at least some of the fixed costs (i.e. non-sunk fixed costs) – therefore there is an incentive to stay in the business in the short run. The shut-down point is when $P (AR) = AVC$

9.7 SUPPLY CURVE FOR A PC FIRM AND FOR PC MARKET

The important decision points for a PC firm to stay in the business or leave the market, as derived above, requires revisiting the concept of supply curve of both a PC firm as well as of a perfectly competitive market. The significant modifications to be noted for the supply curve of a PC firm in short and long run are given below:

- a) *The PC firm's supply curve in the short run is thus the portion of the MC curve which is above the AVC curve.*
- b) *The long run supply would be the portion of the MC curve above ATC as no firm could withstand indefinite losses and would ultimately have to leave the market if it did not cover all costs.*

Building on the proposition that firms will supply at any possible level above the average variable cost curve in the short run, the market supply can be derived from this. Fig. 9.9 assumes a market of three firms (it could however be any number), having different marginal and average costs. As the portion of the MC-curve above AVC is relevant, summing the individual firms' output at various prices yields the short run industry/market supply curve; 5,000 units per month at a price of ₹5 up to 25,000 units per month at a price of ₹12.

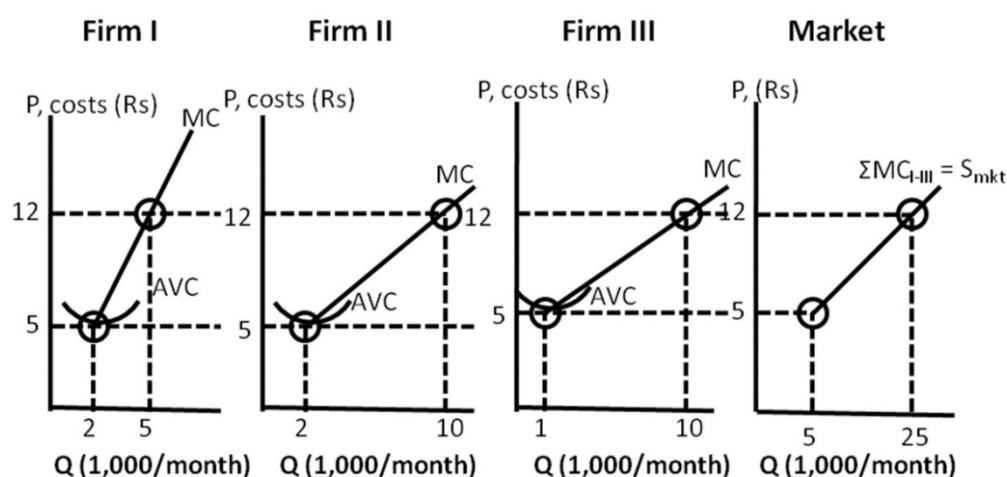


Fig. 9.9: Supply Curve for PCM Firms and Markets ($\sum MC_{PCM \text{ firm}} = \text{Market Supply}$)

The concept of increasing marginal costs coupled to the profit maximisation condition of $MC = MR$ renders each individual firm's supply curve, and their horizontal aggregation is the market supply curve.

9.7.1 Constant-Cost, Increasing-Cost, and Decreasing-Cost Industries

As the market supply curve is derived from PC firms supply curves, it implies that when firms' marginal costs are affected by technology, production improvements, lower costs of labour and raw material etc., the total market supply will also change accordingly.

Theoretically, we may have three situations:

First, when changes in industry output have no effect on input prices, we have a constant-cost industry. In such a case, after all adjustment to a change in demand have taken place, the market price must have returned to the lowest point on the LRAC curve, which is exactly where it was before. So in this case, the LR supply curve must be horizontal (instead of upward-sloping as in the picture above). We call this a *constant-cost industry*. This is most likely to be the case when the industry in question uses only a small portion of inputs, available in the market and usable by all the industries.

Second, if the industry in question has a large impact on the markets for its inputs, then the LR supply curve may slope upward or downward. If the effect of entry into the industry is to bid up the price of inputs, so that a firm's cost curves rise as a result of the entry of new firms, then the market price after adjustment will be higher than it was before. In this case, the LR supply curve must be upward-sloping as in the picture above; this is called an *increasing-cost industry*, which results from external diseconomies.

Third, on the other hand, if entry into the industry creates a greater demand for inputs that allows those inputs to be produced through mass production techniques (i.e., at lower average cost), then the industry can benefit from lower costs of production. In this case, the LR supply curve is downward-sloping. This is called a *decreasing-cost industry*, which results from external economies.

Check Your Progress 4

- 1) Explain why the sum of individual firms' MC curves is the market supply curve.

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- 2) What is the shutdown price when all fixed costs are sunk? What is the shutdown price when all fixed costs are non-sunk?

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- 3) Would a perfectly competitive firm produce if price were less than the minimum level of average variable cost?

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9.8 LET US SUM UP

We have studied in this unit how price-taking firms adjust their production decisions in the light of the market price and how the market price is determined. Since a PC firm is a price taker, in order to earn normal profit even in the long run, they need to adopt the strategies concentrating on enhancing their productivities so that they supply more output at given price with reduced average and marginal costs. The salient features of a perfectly competitive market are summarised below:

Supply Behaviour of the Competitive Firm

- A perfectly competitive firm sells a homogeneous product and is too small to affect the market price. To maximise profits, the competitive firm will choose that output level at which price equals the marginal cost of production, that is, $P = MC$.
- Variable costs need to be taken into consideration in determining a firm's short-run shutdown point. Below the shutdown point, the firm loses more than its fixed costs. It will therefore produce nothing when price falls below the shutdown price.
- In the long run, PC firm will stay in business only if price is at least as high as long-run average costs including some non-sunk fixed costs.

Supply Behaviour of Competitive Industries

- Each firm's rising MC curve is its supply curve; the horizontal summation of all firms in the industry will provide the supply curve of the industry.

- Because firms can adjust production over time, we distinguish two different time periods: (a) short-run equilibrium, when variable factors like labour can change but fixed factors like capital and the number of firms cannot, and (b) long-run equilibrium, when the numbers of firms and plants, and all other conditions, adjust completely to the new demand conditions.
- In the long run, when firms are free to enter and leave the industry and no one firm has any particular advantage of skill or location, competition will eliminate any excess profits earned by existing firms in the industry. So, just as free exit implies that price cannot fall below the zero-profit point; free entry implies that price cannot exceed long-run average cost in long-run equilibrium.
- When an industry can expand its production without pushing up the prices of its factors of production, the resulting long-run supply curve will be horizontal. When an industry uses factors specific and scarce factors, its long-run supply curve will slope upward, e.g. important special cases include relatively or completely inelastic supply which produces economic rent shared between the firm and that factor of production.

Disadvantages of Perfect Competition Generally Mentioned

- No scope for economies of Scale, this is because there are many small firms producing relatively small amounts.
- Industries with high fixed costs would be particularly unsuitable to perfect competition. This is one reason why existence of such a market is highly unlikely in the real world.
- Undifferentiated products lead to a monotonous situation for the consumers as little choice available to them. Differentiated products are very important in industries in FMCGs.
- Lack of supernormal profit may make investment in R&D unlikely. This would be important in an industry such as pharmaceuticals which require significant investment.
- With perfect knowledge there is no incentive to develop new technology because it would be shared with other companies.

Notwithstanding these facts, perfect competition is worth studying for two reasons. *First*, a number of important real-world markets consist of many small firms, each producing nearly identical products, each with approximately equal access to the resources needed to participate in the industry. The theory of perfect competition developed in this unit will help us to understand the determination of prices and the dynamics of entry and exit in these markets. *Second*, the theory of perfect competition forms an important foundation for understanding theory of price determination as many of the key concepts such as the vital roles of marginal revenue and marginal cost in output decisions will apply when we study other market structures such as monopoly, duopoly, monopolistic and oligopolistic competitive markets

9.9 REFERENCES

- 1) Koutsoyiannis, A. (1979), *Modern Micro Economics*, London: Macmillan, p. 67-103
- 2) Sanjay Rode, (2013), *Modern Microeconomics*, First Edition, bookboon.com, First Edition, 2008, bookboon.com,
- 3) Krister Ahlersten, (2008) *Essentials of Microeconomics*, First Edition, bookboon.com, p. 76-87
- 4) David A. Besanko, Ronald R. Braeutigam and Michael J. Gibbs, *Microeconomics*, 4th Edition, John Wiley and Sons, p. 327-376
- 5) Lipsey, RG (1979), *An Introduction to Positive Economics*, English Language Book Society, p. 201-259

9.10 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

- 1) Read Section 9.2 and answer

Check Your Progress 2

- 1) Read Section 9.3 and answer
- 2) Read Section 9.4 and answer

Check Your Progress 3

- 1) a) False b) False c) False d) False e) False
- 3) Read Section 9.5, sub-sections 9.5.1 to 9.5.5 and answer
- 4) Read Section 9.5.4 and answer

Check Your Progress 4

- 1) Read Section 9.7 and answer
- 2) Read Section 9.6 and answer
- 3) No

UNIT 10 MONOPOLY: PRICE AND OUTPUT DECISIONS

Structure

- 10.0 Objectives
- 10.1 Introduction
 - 10.1.1 Meaning of Monopoly
 - 10.1.2 Some Definitions
 - 10.1.3 Characteristics of Monopoly
 - 10.1.4 Causes of Monopoly
- 10.2 Demand and Revenue Curves under Monopoly
 - 10.2.1 Relationship between AR, MR, and Price Elasticity under Monopoly
- 10.3 Equilibrium of the Monopoly Firm: Price and Output Decision
 - 10.3.1 Total Revenue and Total Cost Approach
 - 10.3.2 Marginal Revenue and Marginal Cost Approach
 - 10.3.3 Long Run Equilibrium under Monopoly
- 10.4 Comparison of Monopoly with Perfect Competition
- 10.5 Efficiency and Deadweight Loss under Monopoly
- 10.6 Price Discrimination under Monopoly: Types and Degrees
 - 10.6.1 Types of Price Discrimination
 - 10.6.2 Degrees of Price Discrimination
- 10.7 Pricing in Public Monopoly
 - 10.7.1 Marginal Cost Pricing
 - 10.7.2 Average Cost Pricing
 - 10.7.3 Mark-up Pricing
- 10.8 Let Us Sum Up
- 10.9 References
- 10.10 Answers or Hints to Check Your Progress Exercises

10.0 OBJECTIVES

We have learned in Unit 9 that there are different forms of market. Broadly speaking market can either be perfectly competitive or imperfectly competitive. In Unit 9 we have already discussed price and output decisions of a firm and industry under perfectly competitive market. There are various forms of market under imperfect competition. These include monopoly, oligopoly, and monopolistic competition. Some of them are extreme forms. In this unit we will discuss an extreme form of market, that is monopoly, where, there is only one seller.

After going through this unit, you will be able to:

- state the meaning, causes and characteristics of monopoly;

- explain pricing and output decision under monopoly;
- discuss the concept of deadweight loss under monopoly;
- explain price discrimination under monopoly; and
- illustrate pricing in a public monopoly.

10.1 INTRODUCTION

10.1.1 Meaning of Monopoly

The word monopoly has been derived from the combination of two words i.e., 'Mono' and 'Poly'. Mono refers to a single entity and poly to control. In this way, monopoly refers to a market situation in which there is only one seller of a commodity.

There are no close substitutes for the commodity that monopoly firm produces and there are barriers to entry. The single producer may be in the form of individual owner or a simple partnership or a joint stock company. In other words, under monopoly there is no difference between firm and industry.

Monopolist has full control over the supply of commodity. Having control over the supply of the commodity, it exercises the market power to set the price. Thus, as a single seller/producer monopolist may be a king without a crown. If there is to be an effective monopoly, the cross elasticity of demand between the product of the monopolist and the product of any other seller must be very small.

10.1.2 Definitions

"Pure monopoly is represented by a market situation in which there is a single seller of a product for which there are no substitutes; this single seller is unaffected by and does not affect the prices and outputs of other products sold in the economy." -Bilas

"Monopoly is a market situation in which there is a single seller. There are no close substitutes of the commodity it produces, and there are barriers to entry". -Koutsoyiannis

"Under pure monopoly there is a single seller in the market. The monopolist's demand is market demand. The monopolist is a price-maker. Pure monopoly suggests no substitute situation". -A. J. Braff

"A pure monopoly exists when there is only one producer in the market. There are no dire competitors." -Ferguson

10.1.3 Characteristics of Monopoly

- 1) **Single Seller:** There is only one seller; he can control supply of his product. But he cannot control demand for the product, as there are many buyers.
- 2) **No close Substitutes:** There are no close substitutes for the product. Either they have to buy the product or go without it.
- 3) **Control over price:** The monopolist has control over the supply and thereby on price. Sometimes he may adopt price discrimination. He may

fix different prices for different sets of consumers. A monopolist can either fix the price or quantity of output; but he cannot do both, at the same time.

- 4) **No Entry:** There is no freedom to other producers to enter the market as the monopolist is enjoying monopoly power. Barriers for new firms to enter are strong. There are legal, technological, economic and natural obstacles, which may block the entry of new producers.
- 5) **No difference between Firm and Industry:** Under monopoly, there is no difference between a firm and an industry. As there is only one firm, that single firm constitutes the whole industry.

10.1.4 Causes of Monopoly

- 1) **Natural:** A monopoly may arise on account of some natural causes. Some minerals are available only in certain regions. For example, South Africa has the monopoly of diamonds; nickel in the world is mostly available in Canada and oil in Middle East. This monopoly is caused by natural availability of resources.
- 2) **Technical:** Monopoly power may be enjoyed due to technical reasons. A firm may have control over raw materials, technical knowledge, special know-how, scientific secrets and formula that enable a monopolist to produce a commodity, e.g., Coco Cola.
- 3) **Legal:** Monopoly power is achieved through patent rights, copyrights and trade marks by the producers. This is called legal monopoly.
- 4) **Large Amount of Capital:** The manufacture of some goods requires a large amount of capital or lumpiness of capital. All firms cannot enter the field because they cannot afford to invest such a large amount of capital. This may give rise to monopoly. For example, iron and steel industry, railways, etc.
- 5) **State:** Government will have the sole right of producing and selling some goods. They are State monopolies. For example, in India we have public utilities like electricity, railways, water supply. These public utilities are generally run by the State.

10.2 DEMAND AND REVENUE CURVES UNDER MONOPOLY

It is important to understand the nature of the demand curve facing a monopolist. The demand curve facing an industrial firm under perfect competition, is a horizontal straight line, but the demand curve facing the whole industry under perfect competition is sloping downward.

This is so because the demand is made by all the consumers and the demand curve of total consumers for a product usually slopes downward. The downward-sloping demand curve of the consumers faces the whole competitive industry. An individual firm under perfect competition does not face a downward-sloping demand curve. But in the case of monopoly one firm constitutes the whole industry. Therefore, the entire demand of the consumers for a product faces the monopolist. Since the demand curve of the consumers for a product slopes downward, the monopolist faces a downward sloping demand curve.

Market Structure

A perfectly competitive firm merely adjusts the quantity of output it has to produce, price being a given and constant datum for him. But the monopolist encounters a more complicated problem. He cannot merely adjust quantity at a given price because each quantity change by him will bring about a change in the price at which the product can be sold.

Consider Fig. 10.1. DD is the demand curve facing a monopolist. At price OP the quantity demanded is OM, therefore he would be able to sell OM quantity at price OP. If he wants to sell a greater quantity ON, then he has to price it OL. If he restricts his quantity to OG, the price will rise to OH.

Thus, every quantity change by him entails a change in price at which the product can be sold. The problem faced by a monopolist is to choose a price-quantity combination which is optimum for him, that is, which yields him maximum possible profits.

Demand curve facing the monopolist will be his average revenue curve. Thus, the average revenue curve of the monopolist slopes downward throughout its length. Since average revenue curve slopes downward, marginal revenue curve will lie below it. This follows from usual average-marginal relationship. The implication of marginal revenue curve lying below average revenue curve is that the marginal revenue will be less than the price or average revenue.

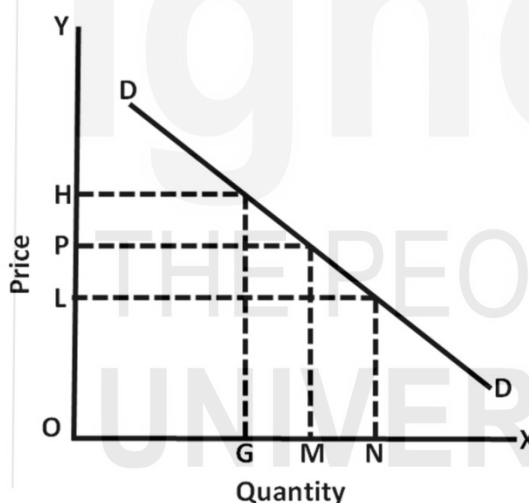


Fig. 10.1: Demand Curve of Monopolist slopes downward

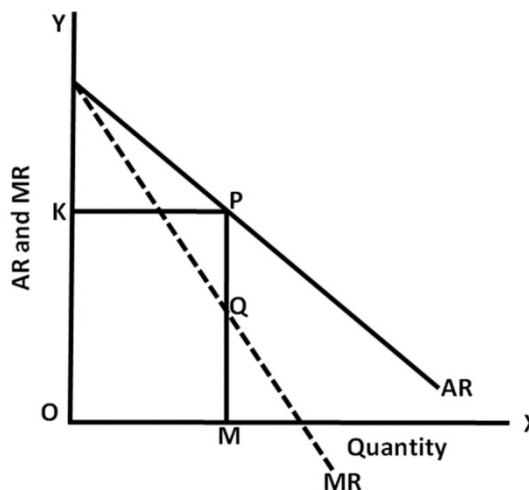


Fig. 10.2: Marginal and Average revenue curves under monopoly

When monopolist sells more, the price of his product falls; marginal revenue therefore must be less than the price. In Fig. 10.2, AR is the average revenue curve of the monopolist and slopes downward. MR is the marginal revenue curve and lies below AR curve. At quantity OM, average revenue (or price) is MP and marginal revenue is MQ which is less than MP. The same can be shown by a numerical example in the Table 10.1 below:

Table 10.1 : Computation of MR for given AR

Price P=AR	Quantity (q)	TR= P*Q	MR= $\Delta TR/\Delta q$
11	0	0	-
10	1	10	10
9	2	18	8
8	3	24	6
7	4	28	4
6	5	30	2
5	6	30	0
4	7	28	-2

10.2.1 Relationship between Average Revenue, Marginal Revenue and Price Elasticity under Monopoly

Average and marginal revenue at a quantity are related to each other through price elasticity of demand and in this connection, we had derived the following formula in:

$$MR = AR \frac{(e-1)}{e}, \text{ where } e \text{ stands for price elasticity}$$

Since, AR is the same thing as price

$$\text{Therefore, } MR = \text{price} \frac{(e-1)}{e}$$

$$\text{or } \text{price} = MR \frac{e}{(e-1)}$$

Since the expression $(e-1)/e$ will be less than unity, MR will be less than price, or price will be greater than MR. The extent to which MR curve lies below AR curve depends upon the value of the fraction $(e-1)/e$.

The monopolist has a clearly distinguished demand curve for his product, which is identical with the consumers' demand curve for the product in question. It is also worth mentioning that, unlike oligopolist or a firm under monopolistic competition, monopolist does not consider the repercussions of the price change by him upon those of other firms.

Monopoly, as defined here, requires that the gap between the monopoly product and those of other firms is so sharp that change — in the price policies of the monopolist will not affect other firms and will therefore not evoke any readjustments of the policies by these firms.

The first thing to understand is that, apart from the special case of constant elasticity where the demand curve is of the form $Q = aP^{-b}$, the elasticity will

vary along different points of the demand curve. *This is true even when the gradient of the demand curve is constant (i.e. the demand curve is linear).* This is a point that sometimes confuses you about elasticity, you think “constant gradient = constant elasticity”...no it doesn't.

Here is an example, this is a simple demand function $Q = 20 - 0.5P$.

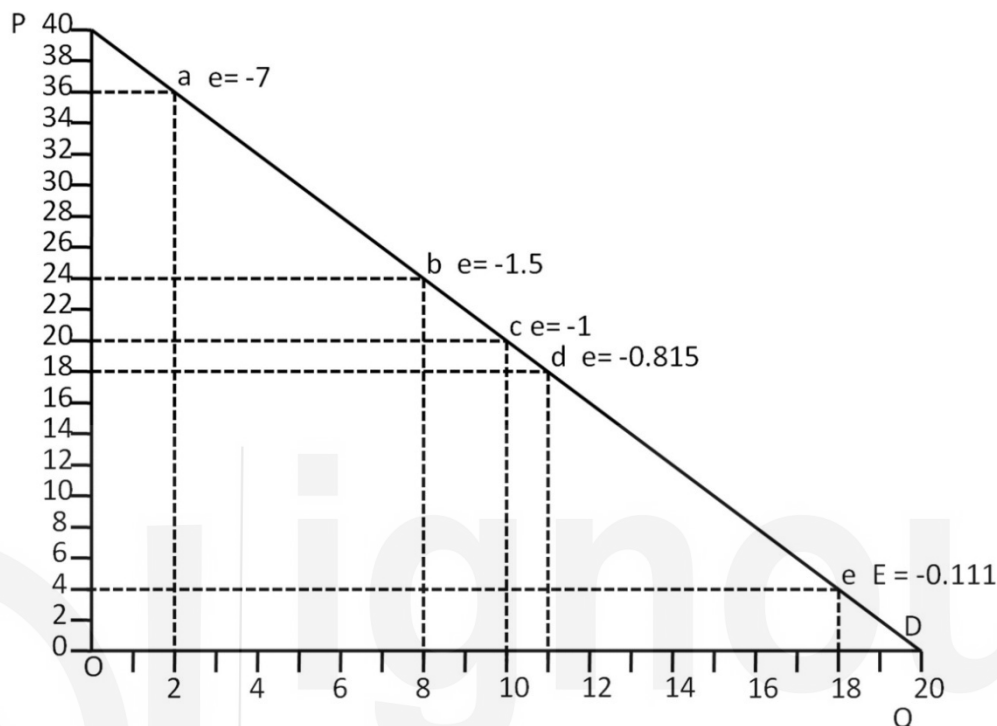


Fig. 10.3

We can calculate the elasticity at different points, a, b, c, d and e.

With this demand function, $\frac{dQ}{dP} = -0.5$, so the elasticity at different points will be $e = \frac{P}{Q} \times -0.5$

So at point a, the elasticity is $36/2 \times -0.5 = -9$

At point b, the elasticity is $24/8 \times -0.5 = -1.5$

At point c, the elasticity is $20/10 \times -0.5 = -1$

At point d, the elasticity is $18/11 \times -0.5 = -0.818$

At point e, the elasticity is $4/18 \times -0.5 = -0.111$

Notice that at point c, the midpoint of the curve, the elasticity is -1 , this is where the curve is **unit elastic**. Above point c, the curve is elastic. It gets more elastic at higher level of price and lower the quantity. At the point where the price is 40 and the quantity is 0, the elasticity will be infinity. Below point c, the curve is inelastic and gets less elastic at lower the price and higher the quantity. At the point where the price is 0 and the quantity is 20, the elasticity will be 0.

We can now think of this situation with marginal revenue. $MR = \frac{d(TR)}{dQ}$ and $TR = PQ$ so $MR = \frac{d(PQ)}{dQ}$.

Here the inverse demand function is $P = 40 - 2Q$ so $PQ = 40Q - 2Q^2$ and $\frac{d(PQ)}{dQ} = 40 - 4Q$. So we can draw the marginal revenue curve $MR = 40 - 4Q$:

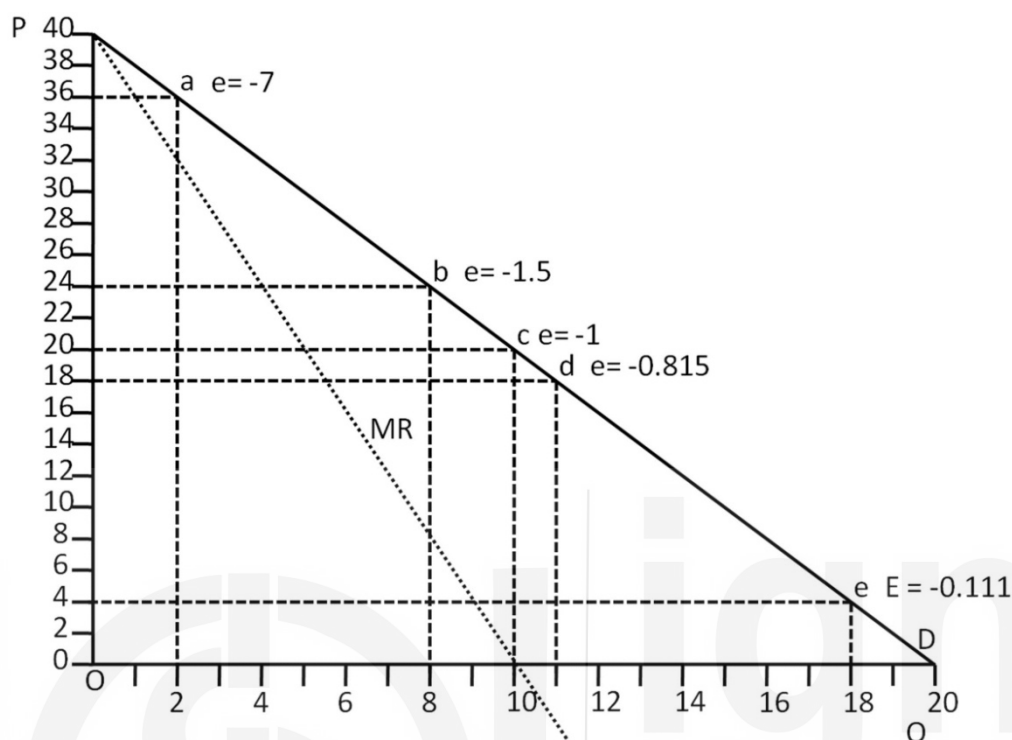


Fig. 10.4

Notice how the **marginal revenue is positive when the demand curve is elastic**, it is zero when the demand curve is unit elastic and it becomes **negative when the demand curve is inelastic**.

This is the answer to the question. Given that the marginal revenue is the amount of revenue gained by selling an extra unit, nobody is going to sell an extra unit if the marginal revenue is negative (i.e. they lose money by selling it).

You can also think of this in an algebraic way. Given that $MR = \frac{d(PQ)}{dQ}$, we can use the product rule to say $\frac{d(PQ)}{dQ} = P \frac{dQ}{dQ} + Q \frac{dP}{dQ}$ so $MR = P + Q \frac{dP}{dQ}$

Now multiply both top and bottom parts of the right hand side of that equation by P so you get $MR = P + PQ \frac{dP}{PdQ}$. We can factorise the P out of this to get $MR = P \left[1 + Q \frac{dP}{PdQ} \right]$ which can be rewritten slightly differently as $MR = P \left[1 + \frac{Q}{P} \frac{dP}{dQ} \right]$.

The right hand side of that equation is the inverse of the elasticity, $\frac{1}{e}$, so $MR = P \left[1 + \frac{1}{e} \right]$. **This is a useful equation to remember.**

Elastic demand is where $e < -1$ and inelastic demand is where $-1 < e < 0$. So now we can think of why a monopolist won't produce in the inelastic part of its demand curve. When demand is inelastic then $-1 < e < 0$ so $\left[1 + \frac{1}{e} \right] < 0$. And

given that the price, P , is positive, it also follows that $P \left[1 + \frac{1}{\epsilon} \right] < 0$. So the marginal revenue will be negative, and no firm will produce an extra unit if it means it loses money.

10.3 EQUILIBRIUM OF THE MONOPOLY FIRM: PRICE AND OUTPUT DECISION

Under monopoly, for the equilibrium and price determination, two different conditions need to be satisfied:

- 1) Marginal revenue must be equal to marginal cost.
- 2) MC must cut MR from below.

However, there are two approaches to determine equilibrium price under monopoly viz.;

- 1) Total Revenue and Total Cost Approach.
- 2) Marginal Revenue and Marginal Cost Approach.

10.3.1 Total Revenue and Total Cost Approach

Monopolist can earn maximum profits when difference between TR and TC is maximum. By fixing different prices, a monopolist tries to find out the level of output where the difference between TR and TC is maximum. The level of output where monopolist earns maximum profits is called the equilibrium situation. This can be explained with the help of Fig. 10.5.

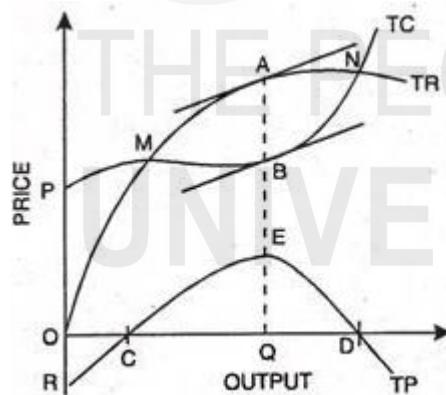


Fig. 10.5

In Fig. 10.5, TC is the total cost curve. TR is the total revenue curve. TR curve starts from the origin. It indicates that at zero level of output, TR will also be zero. TC curve starts from P. It reflects that even if the firm discontinues its production, it will have to suffer the loss of fixed costs.

Total profits of the firm are represented by TP curve. It starts from point R showing that initially firm is faced with negative profits. Now as the firm increases its production, TR also increases. But in the initial stage, the rate of increase in TR is less than that of TC.

Therefore, RC part of TP curve reflects that firm is incurring losses. At point M, total revenue is equal to total cost. It shows that firm is working under no profit, no loss basis. Point M is called the breakeven point. When firm

produces more, beyond point M, TR will be more than TC. TP curve also slopes upward. It shows that firm is earning profit. Now as the TP curve reaches point E then the firm will be earning maximum profits. This amount of output will be termed as equilibrium output.

10.3.2 Marginal Revenue and Marginal Cost Approach

According to marginal revenue and marginal cost approach, a monopolist will be in equilibrium when two conditions are fulfilled i.e., (i) $MC = MR$ and (ii) MC must cut MR from below. The study of equilibrium price according to this analysis can be conducted in two time periods.

- 1) The Short Run
- 2) The Long Run

1) Short Run Equilibrium under Monopoly

Short period refers to that period in which the monopolist has to work with a given existing plant. In other words, the monopolist cannot change the fixed factors like, plant, machinery etc. in the short period. Monopolist can increase his output by changing the variable factors. In this period, the monopolist can enjoy super-normal profits, normal profits and sustain losses.

These three possibilities are described as follows:

Super Normal Profits

If the price determined by the monopolist is more than AC, he will get super normal profits. The monopolist will produce up to the level where $MC=MR$. This limit will indicate equilibrium output. In Fig. 10.6 output is measured on X-axis and price on Y-axis. SAC and SMC are the short run average cost and marginal cost curves respectively while AR and MR are the average revenue and marginal revenue curves respectively.

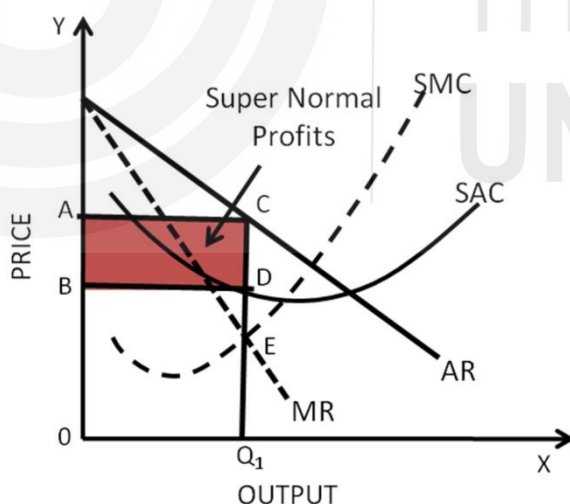


Fig. 10.6

The monopolist is in equilibrium at point E because at point E both the conditions of equilibrium are fulfilled i.e., $MR = MC$ and MC intersects the MR curve from below. At this level of equilibrium the monopolist will produce OQ_1 level of output and sells it at CQ_1 price which is more than average cost DQ_1 by CD per unit. Therefore, in this case total profits of the monopolist will be equal to shaded area $ABDC$.

Normal Profits

A monopolist in the short run would enjoy normal profits when average revenue is just equal to average cost. We know that average cost of production is inclusive of normal profits. This situation can be illustrated with the help of Fig 10.7.

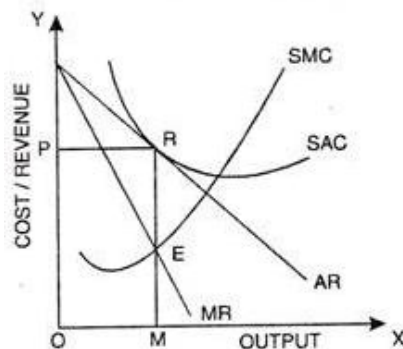


Fig. 10.7

In Fig. 10.7 above the firm is in equilibrium at point E. Here marginal cost is equal to marginal revenue. The firm is producing OM level of output. At OM level of output average cost curve touches the average revenue curve at point P. Therefore, at point 'P' price MR is equal to average cost of the total product. In this way, monopoly firm enjoys the normal profits.

Minimum Losses

In the short run, the monopolist may have to incur losses. This situation occurs if in the short run price falls below the variable cost. In other words, if price falls due to depression and fall in demand, the monopolist will continue to produce as long as price covers the average variable cost. Once the price falls below the average variable cost, monopolist will stop production. Thus, a monopolist in the short run equilibrium may bear the minimum loss, equal to fixed costs. Therefore, equilibrium price will be equal to average variable cost. This situation can also be explained with the help of Fig. 10.8.

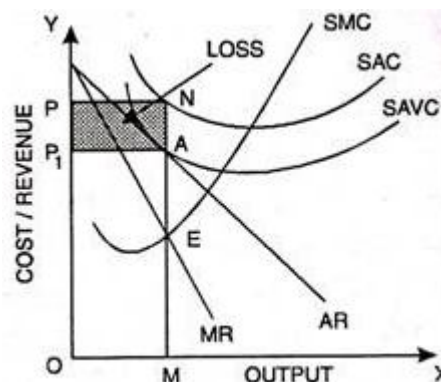


Fig. 10.8

In Fig. 10.8 above monopolist is in equilibrium at point E. At point E marginal cost is equal to marginal revenue and he produces OM level of output. At OM level of output, equilibrium price fixed by the monopolist is OP_1 . At OP_1 price, AVC touches the AR curve at point A.

It signifies that the firm will cover only average variable cost from the prevailing price. At OP_1 price, firm will bear loss of fixed cost i.e., A per unit. The firm will bear the total loss equal to the shaded area PP_1AN . Now if the price falls below OP_1 , the monopolist will stop production. It is so, because, if he continues production, he will have to bear the loss of variable costs along with fixed costs.

Illustration 1: Let the cost of production of monopoly firm be given as : $C = 40 + Q^2$ and demand be $P = 20 - Q$.

Find the profit maximising level of output and price.

Solution: Since cost is given as:

$$C = 40 + Q^2$$

$$MC = \frac{\Delta C}{\Delta Q} = 2Q$$

and

Since demand is given as:

$$P = 20 - Q$$

$$\text{Total Revenue} = P \cdot Q = (20 - Q)Q = 20Q - Q^2$$

$$MR = \frac{\Delta TR}{\Delta Q} = 20 - 2Q$$

and

Profit maximisation occurs where:

$$MR = MC$$

$$20 - 2Q = 2Q$$

$$Q = 5$$

Thus profit maximising level of output is 5 units and profit maximising price is $P = 20 - Q = 20 - 5 = 15$

Illustration 2. Only one firm produces and sells soccer balls in the country of Wiknam, and as the story begins, international trade in soccer balls is prohibited. The following equations describe the monopolist's demand, marginal revenue, total cost, and marginal cost:

$$\text{Demand : } P = 10 - Q$$

$$\text{Marginal Revenue : } MR = 10 - 2Q$$

$$\text{Total Cost : } TC = 3 + Q + 0.5 Q^2$$

$$\text{Marginal Cost : } MC = 1 + Q$$

Where Q is quantity and P is the price.

- (a) How many units does the monopolist produce? At what price are they sold? What is the monopolist's profit?

Solution:

$$P = 10 - Q$$

Market Structure

$$MR = 10 - 2Q$$

$$TC = 3 + Q + 0.5Q^2$$

$$MC = 1 + Q$$

Monopolist will produce where:

$$MR = MC$$

$$10 - 2Q = 1 + Q$$

⇒

$$3Q = 9$$

$$Q = 3$$

Quantity are sold at price given by:

$$P = 10 - Q$$

$$= 10 - 3$$

∴

$$P = \$7$$

Monopolist profit (Rupees) is given by:

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

$$= [7 \times 3] - [3 + 3 + 0.5 \times 3^2]$$

$$= 21 - [6 + \frac{9}{2}] = [21 - \frac{21}{2}] = 10.5$$

$$\text{Profit} = \$10.5$$

10.3.3 Long Run Equilibrium under Monopoly

Long-run is the period in which output can be changed by changing the factors of production. In other words, all variable factors can be changed and monopolist would choose that plant size which is most appropriate for specific level of demand. Here, equilibrium would be attained at that level of output where the long-run marginal cost cuts marginal revenue curve from below. This can be shown with the help of Fig. 10.9.

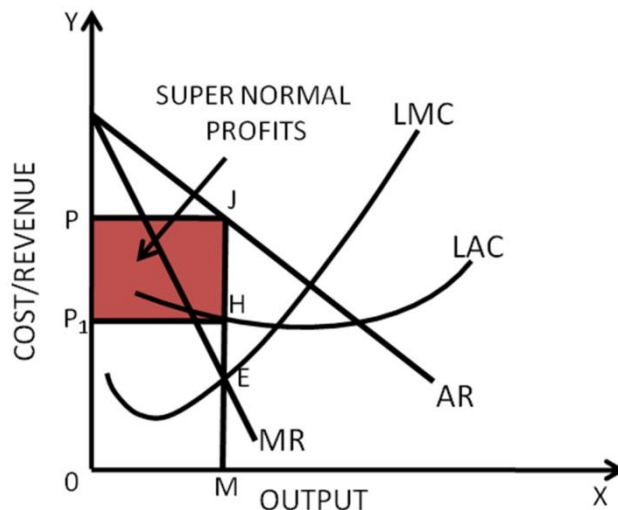


Fig. 10.9

In Fig. 10.9 above monopolist is in equilibrium at OM level of output. At OM level of output marginal revenue is equal to long run marginal cost and the monopolist fixes OP price. HM is the long run average cost. Price OP being more than LAC i.e., HM which fetch the monopolist super normal profits. Accordingly, the monopolist earns $JM - HM = JH$ super normal profit per unit. His total super normal profits will be equal to shaded area $PJHP_1$.

Check Your Progress 1

- 1) How does the monopolist determine his price and output in the short period?

.....

- 2) Based on market research, a film production company in Mumbai obtains the following information about the demand and production costs of its new DVD:

Demand: $P = 1,000 - 10Q$

Total Revenue $TR = P \times Q = 1000Q - 10Q^2$

Marginal Revenue: $MR = 1,000 - 20Q$

Marginal Cost $MC = 100 + 10Q$

Where Q indicates the number of copies sold and P is the price in dollars.

Find the price and quantity that maximises the company's profit.

.....

10.4 COMPARISON OF MONOPOLY WITH PERFECT COMPETITION

Following points make clear difference between both the monopoly and perfect competition:

- 1) **Output and Price**

Under perfect competition, price is equal to average cost which is equal to marginal cost at the equilibrium output. Under monopoly, the price is always greater than marginal cost, it may be less than, equal to or greater than average cost.

- 2) **Equilibrium**

Both under perfect competition and monopoly equilibrium is possible only when $MR = MC$ and MC cuts the MR curve from below.

3) Entry

Under perfect competition, there exists no restrictions on the entry or exit of firms into the industry. Under simple monopoly, there are strong barriers on the entry and exit of firms.

4) Discrimination

Under monopoly, a monopolist can charge different prices from the different groups of buyers. But, in the perfectly competitive market, it is absent by definition. We shall discuss the price discriminations by a monopolist in Sections 10.6 below.

5) Profits

The difference between price and average cost under monopoly results in super-normal profits to the monopolist. Under perfect competition, a firm in the long run enjoys only normal profits.

6) Supply Curve of Firm

Under perfect competition, supply curve can be known. It is so because all firms can sell desired quantity at the prevailing price. Moreover, there is no price discrimination. Under monopoly, supply curve cannot be known. MC curve is not the supply curve of the monopolist.

7) Slope of Demand Curve

Under perfect competition, demand curve is perfectly elastic. It is due to the existence of large number of firms. Price of the product is determined by the industry and each firm has to accept that price. On the other hand, under monopoly, average revenue curve slopes downward. AR and MR curves are separate from each other. Price is determined by the monopolist.

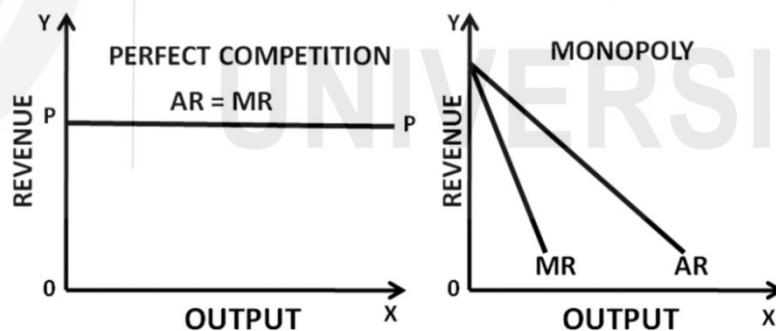


Fig. 10.10

8) Goals of Firms

Under perfect competition and monopoly the firm aims at to maximise its profits. The firm which aims at to maximise its profits is known as rational firm.

9) Comparison of Price

Monopoly price is higher than perfect competition price. In long period, under perfect competition, price is equal to average cost. In monopoly, price is higher as is shown in Fig. 10.11 below. The perfect competition price is OP_1 , whereas monopoly price is OP . In equilibrium, monopoly sells ON output at OP price but a perfectly competitive firm sells higher output ON_1 at lower price OP_1 .

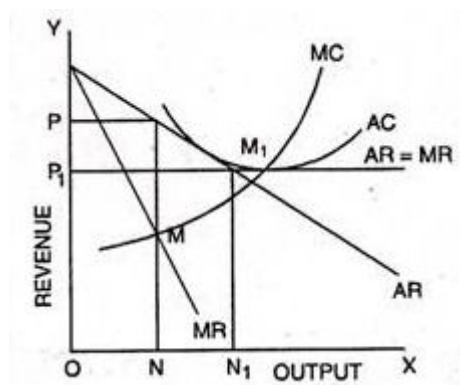


Fig. 10.11

10) Comparison of Output

Perfect competition output is higher than monopoly output. Under perfect competition the firm is in equilibrium at point M_1 where $AR = MR = AC = MC$ are equal. The equilibrium output is ON_1 . On the other hand monopoly firm is in equilibrium at point M where $MC=MR$. The equilibrium output is ON . The monopoly output is lower than perfectly competitive firm output.

Summary of Comparison:

A general comparison between monopoly and perfect competition for easy understanding has been depicted as under:

S. No.	Features	Monopoly	Perfect Competition
1	Description	Extreme market situation, where there is only one seller. He has no competition and so controls supply and price.	A fair, direct competition between buyers and buyers, seller and sellers, and finally between buyers and sellers.
2	Buyers and Sellers	Only one seller and practically all buyers depend on him. Hence he has absolute control over the market.	Large number of buyers and sellers. Hence no sellers or buyers can alter the price in the market.
3	Supply	Supply from only one seller, hence absolute control over the supply.	i) Supply comes from large number of sellers ii) Individual supply is negligible, compared to market supply.
4	Demand	Demand is not perfectly. Demand curve slopes downward.	Demand is perfectly elastic. Demand curve faced by a seller is a horizontal straight line.
5	Product	Homogeneous product.	Homogenous product.
6	Nature of Competition	No competition at all. No price or product competition.	Pure and perfect competition in price.

7	Price	Higher price, higher than all competitive price. $P > MR = MC$	Normal Price $P = MR = MC$
8	Output	Small output fixed by the sole seller.	Large output fixed by $MR = MC$
9	Profit	Excess profit monopoly gain.	Normal profit realised by price competition.
10	Application	Pure Monopoly is rare but elements of monopoly are there in markets.	Quite unreal.

10.5 EFFICIENCY AND DEADWEIGHT LOSS UNDER MONOPOLY

The outcome of a competitive market has a very important property. In equilibrium, all gains from production activities are realised. This means that there is no additional surplus to obtain from further trades between buyers and sellers. In this situation, we say that the allocation of goods and services in the economy is efficient. However, markets sometimes fail to operate properly and not all gains from trade are exhausted. In this case, some buyer surplus, seller surplus, or both are lost. Economists call this a deadweight loss.

The deadweight loss from a monopoly is illustrated in the Fig. 10.12 below. The monopolist produces a quantity such that marginal revenue equals marginal cost. The price is determined by the demand curve at this quantity. A monopoly makes a profit equal to total revenue minus total cost. When the total output is less than socially optimal, there is a deadweight loss, which is indicated in the figure.

Deadweight loss arises in other situations, such as when there are quantity or price restrictions. It also arises when taxes or subsidies are imposed in a market. Tax incidence is the way in which the burden of a tax falls on buyers and sellers — that is, who suffers most of the deadweight loss. In general, the incidence of a tax depends on the elasticities of supply and demand.

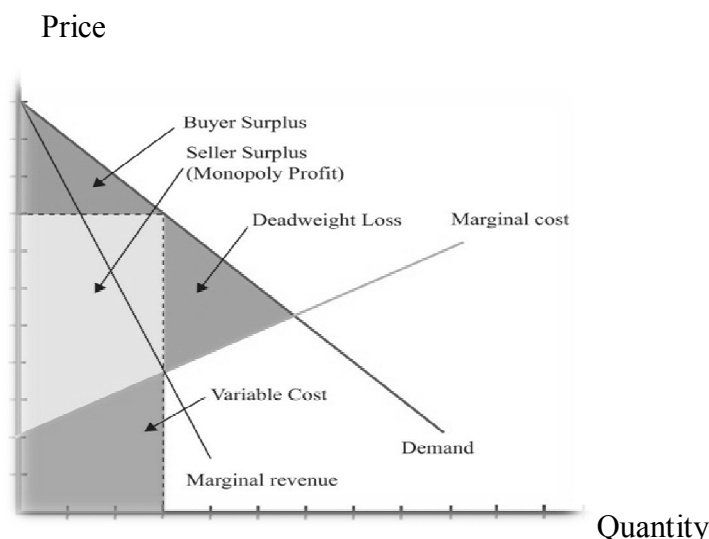


Fig. 10.12

10.6 PRICE DISCRIMINATION UNDER MONOPOLY: TYPES AND DEGREES

In monopoly, there is a single seller of a product called monopolist. The monopolist has control over pricing, demand, and supply decisions, thus, sets prices in a way, so that maximum profit can be earned.

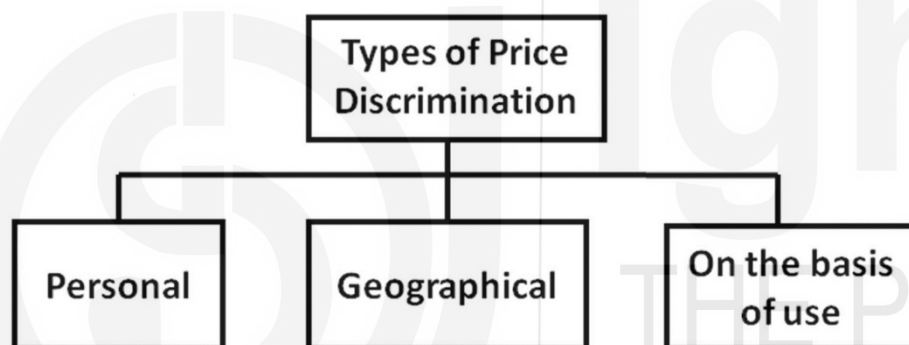
The monopolist often charges different prices from different consumers for the same product. This practice of charging different prices for identical product is called price discrimination.

According to Robinson, “Price discrimination is charging different prices for the same product or same price for the differentiated product.”

10.6.1 Types of Price Discrimination

Price discrimination is a common pricing strategy used by a monopolist having discretionary pricing power. This strategy is practiced by the monopolist to gain market advantage or to capture market position.

There are three types of price discrimination, which are shown below:



i) Personal

Personal price discrimination refers to a situation when different prices are charged from different individuals. The different prices are charged according to the level of income of consumers as well as their willingness to purchase a product. For example, a doctor charges different fees from poor and rich patients.

ii) Geographical

This type of price discrimination occurs when the monopolist charges different prices at different places for the same product. This type of discrimination is possible if those who buy at lower price cannot sell to those being charged a higher price by the firm.

iii) On the basis of use

This kind of price discrimination occurs when different prices are charged according to the use of a product. For instance, an electricity supply board charges lower rates for domestic consumption of electricity and higher rates for commercial consumption. Similar discrimination occurs when buyers are charged different prices at different hours of the day – it is referred to as peak-load pricing.

10.6.2 Degrees of Price Discrimination

i) First-degree Price Discrimination

Refers to a price discrimination in which a monopolist charges the maximum price that each buyer is willing to pay. This is also known as perfect price discrimination as it involves maximum exploitation of consumers. In this price discrimination, consumers fail to enjoy any consumer surplus. First degree is practiced by lawyers and doctors.

ii) Second-degree Price Discrimination

Refers to a price discrimination in which buyers are divided into different groups and different prices are charged from these groups depending upon what they are willing to pay. Railways and airlines practice this type of price discrimination.

iii) Third-degree Price Discrimination

Refers to a price discrimination in which the monopolist divides the entire market into submarkets and different prices are charged in each submarket. Therefore, third-degree price discrimination is also termed as market segmentation.

In this type of price discrimination, the monopolist is required to segment market in a manner, so that products sold in one market cannot be resold in another market. Moreover, he/she should identify the price elasticity of demand of different submarkets. The groups are divided according to age, sex, and location. For instance, railways charge lower fares from senior citizens. Students get discount in cinemas, museums, and historical monuments. We are explaining it with help of Fig. 10.13, which has three segments (a), (b) and (c).

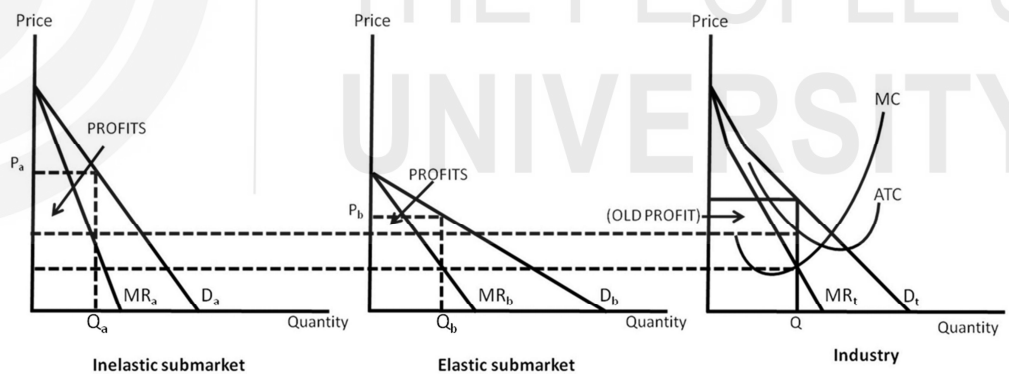


Fig. 10.13

Segments (a) and (b) depict markets with inelastic and elastic demand curves respectively. The segment (c) has horizontal sum of the AR and MR curves of (a) and (b), denoted as AR_t and MR_t . The firm has a single Average Total Cost curve and corresponding Marginal Cost Curve. Inter-section of this MC with MR_t gives us equilibrium output OQ for the firm. It also shows the MR for the firm, which maximises its profits. The firm will like to realise the same MR from each of the units sold in either of those two market segments. So, wherever the extended line EM cuts MR_a and MR_b (points E_a and E_b respectively) will be used to determine equilibrium outputs Q_aO and Q_bO for the two market segments. The prices will be what the consumers are ready to pay for the respective quantities, that is, P_a and P_b .

Note two points: The monopolist offers larger quantities in market with relatively elastic demand curve and smaller in market with inelastic demand. We find that $Q_b > Q_a$. However, the price change in the segment (a) with inelastic demand, P_a is greater than price in segment (b) P_b . So we can say that buyers with inelastic demand will face a double disadvantage at the hands of a monopolist: They end up buying smaller quantities and have to pay higher prices.

Check Your Progress 2

1) What is Price Discrimination?

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.....
.....

2) Explain the degrees of Price Discrimination.

.....
.....
.....

3) How Monopolist firm faces efficiency loss?

.....
.....
.....

4) How is price determination under Monopoly is different from Perfect Competition?

.....
.....
.....

10.7 PRICING IN PUBLIC MONOPOLY

So far we have discussed the behaviour of a private monopolist whose objective is to maximise her profits, given the economic and technical constraints. In this section, we analyse the behaviour of a public monopoly — a firm owned and controlled by the government. The objective of a public monopoly is to provide more output and charge lower price so as to increase the welfare of people. The optimal pricing and output decisions by such an undertaking is not based on profit or sales maximisation principles but on maximisation of welfare.

Average-cost-pricing and marginal-cost-pricing are the two possible options for the determination of output and price by a public utility firm. In fact, these two options can become policy guidelines for the government for price regulation of a private monopoly firm as well.

There is a need to regulate monopoly because monopolists have ability to restrict output and raise prices of their product and this way earn super normal

profits. Such behaviour increases inequalities in the distribution of income and wealth leading to exploitation of the consumers and also causes inefficiency in allocation of resource. A net result of all these actions is reduction of consumer welfare in the society. Therefore, the main objective behind regulation of monopoly is the maximisation of welfare. A monopoly may be regulated either through fixation of a maximum price that a monopolist may charge or appropriate taxation policy. Here, we are concerned with price regulation of monopoly only. The issue involved in average and marginal cost pricing discussed here are useful in fixing of prices in a public utility as well.

10.7.1 Marginal Cost Pricing

As discussed above, a monopolist sets price of its product higher than marginal cost. Monopolist maximise profit at the level of output where $MR=MC$ and charges price according to equilibrium condition. The government may decide to regulate a monopoly by fixing maximum price that equals marginal cost of production. The monopolist will be forced to raise the output higher than the equilibrium level and charges price, which would have prevailed had the market been perfectly competitive. Such a price would ensure efficiency in allocation of resources as well, since it is equal to marginal cost. It also enhances welfare of the consumers, as they get larger output at lower price. The consumer's surplus under regulated monopoly is more than it was in non-regulated monopoly.

It may be noted that given the conditions of demand and cost 'Marginal cost' pricing may still allow a monopolist to earn super normal profits as the price may still be higher than the average cost. This is a case of 'capacity-constrained situation', that is the demand for the product is quite high as compared to the production capacity. But, in a different situation, when there is excess capacity, marginal cost pricing results in direct loss to the firm as its average cost is higher than marginal cost. Thus, the firm will produce marginal cost price output only if it is compensated by the government for the direct loss at this level of production.

10.7.2 Average Cost Pricing

The aim of the public policy is to regulate monopoly in such a manner that is possible to provide maximum output at minimum price. One policy option is to fix price according to the average cost, i.e., at a point where $AR = AC$. This allows the firm to earn normal profit. In case of capacity-constrained situation, average cost pricing leads to higher output and lower price. This means there will be higher level of consumer's surplus compared to marginal cost pricing. However, in excess capacity situation, there shall be a somewhat higher price with average cost pricing but there shall be no direct loss to the producer as $P = AC$. Marginal cost pricing adopted to reach full economic efficiency or maximum social welfare. But in case of excess capacity, where $AC > MC$, marginal cost pricing necessitates state subsidies to induce the monopolist to stay in the market.

10.7.3 Mark-up Pricing

It is observed that in real life, prices are not fixed by marginal analysis, viz., by the use of marginal revenue and marginal cost concepts. An alternative approach is to set the prices in accordance with the average cost principle.

The firm sets a price equal to its average cost which includes some profit margin, that is.

$$P = AVC + GPM$$

where P is the price, AVC is the average variable cost, and GPM is the gross profit margin which include average fixed cost and net profit margin.

The purpose of this note is to show that average cost principle and marginal analysis would give the same long-run profit maximisation solution. The setting of the price on the basis of the average cost principles incorporates as estimation of the elastic of demand in the long run equilibrium. Recall that the necessary condition for profit maximisation is $MC=MR$. It has already been proved that $MR=P(e-1/e)$. Given that $MC > 0$. MR must be positive for profit maximisation. This implies $e > 1$, provided that AVC is constant over the relevant range of output, that is, $AVC=MC$. For equilibrium, $AVC=MR$, that is, $AVC=P(1-1/e)=P\{(e-1)/e\}$. In other words $P = AVC \{e/(e-1)\}$. Given that $e > 1$, we may write $\{e/(e-1)\}=(1+k)$, where $k > 0$. Therefore, $P=AVC(1+k)$, where k is the gross profit margin. For example, if the firm sets a 20 per cent of AVC as its profit margin, we have $(1+k) = [1 + 0.20] = \frac{e}{e-1}$. Thus, the elasticity of demand is 6. Setting a gross profit margin is equivalent to estimating the price elasticity of demand and applying marginalist analysis.

Check Your Progress 3

- 1) How a public monopoly is different from a private monopolist firm?

.....

- 2) How does the public monopoly firm make price and output decisions?

.....

- 3) What do you mean by Mark up pricing?

.....

10.8 LET US SUM UP

Monopoly is a market structure in which there is a single seller with large number of buyers. Assumptions of monopoly are: Single firm, No close substitutes, Barriers to entry, Goal is profit maximisation, Perfect knowledge. In monopoly, market Firm’s demand curve is industry’s demand curve. The demand curve is downward sloping because monopolist is a price maker and not a price taker. The demand curve of monopolist is the AR curve or the price line. According to the marginal principle, equilibrium takes place where: $MR = MC$ and slope of MC should be greater then Slope of MC. In the long-run, the firm will either continue to earn profit or may breakeven. Two market

structures, i.e. Perfect Competition and Monopoly are extreme situations. Monopolist charges higher price and sells lesser output as compared to perfectly competitive firm. Price discrimination is the practice of charging different prices from different consumers for the same good. AC and MC pricing are undertaken by a public monopoly for social or public welfare.

10.9 REFERENCES

- 1) Dr Deepashree (2016), *Introductory Micro Economics*, Mayur Paperbacks, Chapter on Theory of Market structure.

<http://www.economicdiscussion.net>

- 2) Varian, Hal (1999), *Intermediate Microeconomics*, W.W Norton &Co, New York, Chapter 24 & 25, page no. 415-455.

10.10 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

- 1) Read Sub-section 10.3.2 and answer
- 2) $Q = 30$ units
 $P = \text{Rs. } 700$

Check Your Progress 2

- 1) Read Section 10.6 and answer
- 2) Read Sub-section 10.6.2 and answer
- 3) Read Section 10.5 and answer
- 4) Read Section 10.4 and answer

Check Your Progress 3

- 1) Read Section 10.7 and answer
- 2) Read Sub-section 10.7.1 and answer
- 3) Read Sub-section 10.7.2 and answer

UNIT 11 MONOPOLISTIC COMPETITION: PRICE AND OUTPUT DECISIONS

Structure

- 11.0 Objectives
- 11.1 Introduction
- 11.2 Concept and Features of Monopolistic Competition
- 11.3 Demand Curve under Monopolistic Competition
- 11.4 Equilibrium under Monopolistic Competition
 - 11.4.1 Individual Firm's Equilibrium in Short-Run Period
 - 11.4.2 Individual Firm's Equilibrium in Long Run
 - 11.4.3 Group Equilibrium in Monopolistic Competition
 - 11.4.4 Equilibrium with Selling Costs
- 11.5 Perfect Competition, Monopoly and Monopolistic Competition: Comparison
- 11.6 Theory of Excess Capacity under Monopolistic Competition
- 11.7 Let Us Sum Up
- 11.8 References
- 11.9 Answers or Hints to Check Your Progress Exercises

11.0 OBJECTIVES

After studying this unit, you will be able to:

- define the term monopolistic competition;
- explain the demand curve under monopolistic competition;
- state the equilibrium conditions of monopolistic competition;
- make comparison under perfect competition, monopoly and monopolistic competition; and
- explain the theory of excess capacity under monopolistic competition.

11.1 INTRODUCTION

Pure monopoly and perfect competition are two extreme cases of market structure. In reality, there are markets having large number of producers competing with each other in order to sell their product in the market. Thus, there is monopoly on one hand and perfect competition on other hand. Such a mixture of monopoly and perfect competition is called as monopolistic competition, it refers to a market situation in which there are large numbers of

firms which sell closely related but **differentiated products**. Markets of products like soap, toothpaste AC, etc. are examples of monopolistic competition.

11.2 CONCEPT AND FEATURES OF MONOPOLISTIC COMPETITION

Monopolistic competition is a market in which firms can enter freely each producing its own brand or a differentiated product. Thus, a firm under monopolistic competition

- a) Enjoys 'monopoly position' as far as a particular brand is concerned.
- b) Since the various brands are close substitutes, its monopoly position is influenced by the stiff 'competition' from other firms.

Examples of Monopolistic Competition:

- 1) When you walk into a departmental store to buy toothpaste, you will find a number of brands, like Pepsodent, Colgate, Neem, Babool, etc.
 - i) On one hand, the market for toothpaste seems to be full of competition, with thousands of competing brands and freedom of entry;
 - ii) On the other hand, its market seems to be monopolistic, due to uniqueness of each toothpaste and power to charge different price. Such a market for toothpaste is a monopolistic competitive market.
- 2) A firm supplies branded good 'Lux Soap' in the market. There are many other firms in the market which sell similar soaps (not identical) with different brand names like Rexona, Palm Rose, etc., etc. Some times we can find one company manufacturing and selling similar products with several brand names at different prices. Their idea is to place each of their products in 'niches' or slots which capture attention of a different set of consumers. The firm supplying 'Lux Soap' enjoys a monopoly in the sale of its own product. It also faces competition from firms selling similar products. Same is the case with many other firms in the market like plywood manufacturing, jewellery making, wood furniture, book stores, departmental stores, repair services of all kinds, professional services of doctors, technicians, etc. These firms and others which have an element of monopoly power and also face competition over the sale of product or service in the market are called monopolistically competitive firm.

The following are the features or characteristics of monopolistic competition:-

1) Large Number of Sellers

There are large number of sellers producing differentiated products. So, competition among them is very keen. Since number of sellers is large, each seller produces a very small part of market supply. Every firm is limited in its size.

In other words, there are large numbers of firms selling closely related, but not homogeneous products. Each firm acts independently and has a limited share of the market. So, an individual firm has limited control over the market price. Large number of firms leads to competition in the market.

2) **Product Differentiation**

It is one of the most important features of monopolistic competition. In perfect competition, products are homogeneous in nature. On the contrary, here, every producer tries to keep his product dissimilar than his rival's product in order to maintain his separate identity. This boosts up the competition in market and at the same time every firm acquires some monopoly power. Hence, each firm is in a position to exercise some degree of monopoly (in spite of large number of sellers) through product differentiation. Product differentiation refers to differentiating the products on the basis of brand, size, colour, shape, etc. The product of a firm is close, but not perfect substitute for products of other firms. Implication of 'Product differentiation' is that buyers of a product differentiate between the same products produced by different firms. Therefore, they are also willing to pay different prices for the same product produced by different firms. This gives some monopoly power to an individual firm to influence market price of its product. Following points provide insight about the product differentiation:

- a) The product of each individual firm is identified and distinguished from the products of other firms due to product differentiation.
- b) To differentiate the products, firms sell their products with different brand names, like Lux, Dove, Lifebuoy, etc.
- c) The differentiation among different competing products may be based on either 'real' or 'imaginary' differences.
 - i) Real Differences may be due to differences in shape, flavour, colour, packing, after sale service, warranty period, etc.
 - ii) Imaginary Differences mean differences which are not really obvious but buyers are made to believe that such differences exist through selling costs (advertising).
- d) Product differentiation creates a monopoly position for a firm.
- e) Higher degree of product differentiation (i.e. better brand image) makes demand for the product less elastic and enables the firm to charge a price higher than its competitor's products. For example, Pepsodent is costlier than Babool.
- f) Some more examples of Product Differentiation: i) Toothpaste: Pepsodent, Colgate, Neem, Babool, etc., ii) Cycles: Atlas, Hero, Avon, etc., iii) Tea: Brooke Bond, Tata tea, Today tea, etc.

3) **Freedom of Entry and Exit**

This feature leads to stiff competition in market. Free entry into the market enables new firms to come with close substitutes. Free entry or exit maintains normal profit in the market for a longer span of time.

4) **Selling Cost**

It is a unique feature of monopolistic competition. In such type of market, due to product differentiation, every firm has to incur some additional expenditure in the form of selling cost. This cost includes sales promotion expenses, advertisement expenses, salaries of marketing staff, etc.

But on account of homogeneous product in perfect competition and zero competition in monopoly, selling cost does not exist there.

5) Absence of Interdependence

Large numbers of firms are different in their size. Each firm has its own production and marketing policy. So no firm is influenced by other firm. All are independent.

6) Two Dimensional Competition

Monopolistic competition has two types or aspects of competition aspects viz. Price competition i.e. firms compete with each other on the basis of price. Non-price competition i.e. firms compete on the basis of brand, product quality advertisement.

7) Concept of Group

In place of Marshallian concept of industry, Chamberlin introduced the concept of Group under monopolistic competition. An industry means a number of firms producing identical product. A group means a number of firms producing differentiated products which are closely related.

8) Falling Demand Curve

In monopolistic competition, a firm is facing downward sloping demand curve. It means one can sell more at lower price and vice versa.

9) Lack of Perfect Knowledge

Buyers and sellers do not have perfect knowledge about the market conditions. Selling costs create artificial superiority in the minds of the consumers and it becomes very difficult for a consumer to evaluate different products available in the market. As a result, a particular product (although highly priced) is preferred by the consumers even if other less priced products are of same quality.

Check Your Progress 1

- 1) What is monopolistic competition? Explain with few examples.
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- 2) Identify the features that shows the presence of monopolistic competition in market.
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.....
- 3) A market with few entry barriers and with many firms that sell differentiated products is
 - A) purely competitive.
 - B) a monopoly.
 - C) monopolistically competitive.
 - D) oligopolistic.

11.3 DEMAND CURVE UNDER MONOPOLISTIC COMPETITION

Under monopolistic competition, large number of firms selling closely related but differentiated products make the demand curve downward sloping. It implies that a firm can sell more output only by reducing the price of its product.

As seen in Fig. 11.1, output is measured along the X-axis and price and revenue along the Y-axis. At OP price, a seller can sell OQ quantity. Demand rises to OQ_1 , when price is reduced to OP_1 . So, demand curve under monopolistic competition is negatively sloped as more quantity can be sold only at a lower price.

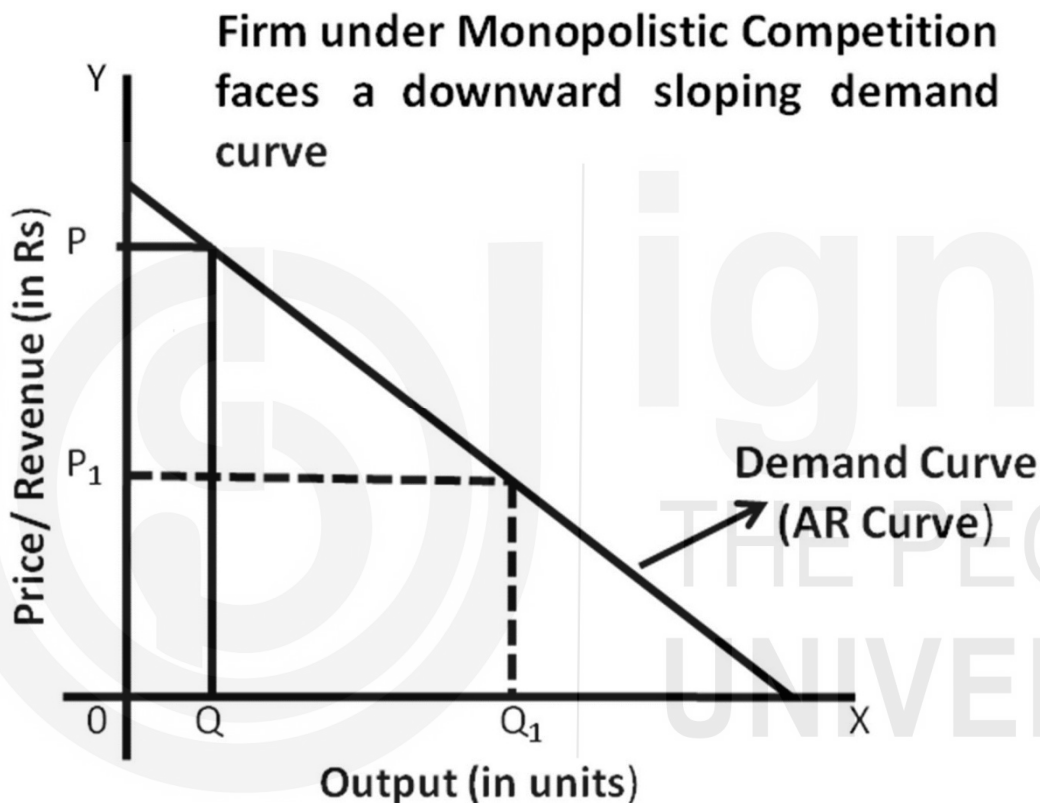


Fig. 11.1

MR < AR under Monopolistic Competition: Like monopoly, MR is also less than AR under monopolistic competition due to negatively sloped demand curve.

Demand Curve: Monopolistic Competition Vs. Monopoly:

At first glance, the demand curve of monopolistic competition looks exactly like the demand curve under monopoly as both faces downward sloping demand curves. However, demand curve under monopolistic competition is more elastic as compared to demand curve under monopoly. This happens because differentiated products under monopolistic competition have close substitutes, whereas there are no close substitutes in case of monopoly.

Let us prove this with the help of Fig. 11.2.

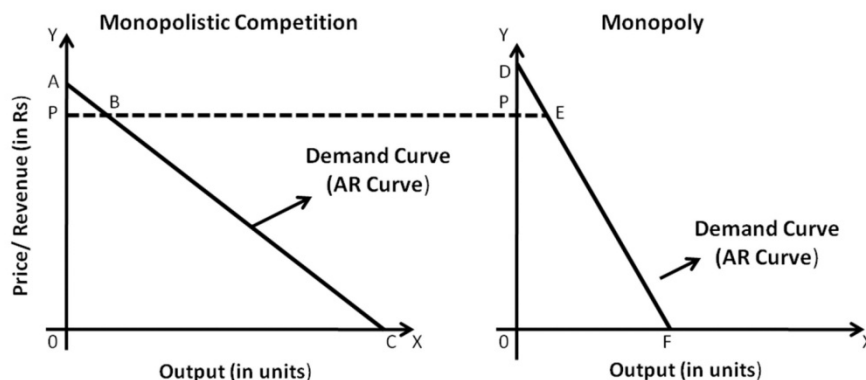


Fig. 11.2

We know, price elasticity of demand (by geometric method) at a point on the demand curve is given by: $E_d = \text{Lower segment of demand curve} / \text{Upper segment of demand curve}$.

At price 'OP', price elasticity of demand under monopolistic competition is BC/AB and under monopoly is EF/DE . Fig. 11.2 reveals that $BC > EF$ and $DE > AB$. So, $BC/AB > EF/DE$.

It means, demand curve in case of monopolistic competition is more elastic as compared to demand curve under monopoly.

11.4 EQUILIBRIUM UNDER MONOPOLISTIC COMPETITION

A firm under monopolistic competition has to face various problems which are absent under perfect competition. Since the market of an individual firm under perfect competition is completely merged with the general one, it can sell any amount of the good at the ruling market price.

But, under monopolistic competition, individual firm's market is isolated to a certain degree from those of its rivals with the result that its sales are limited and depend upon:

- 1) Its price,
- 2) The nature of its product, and
- 3) The advertising outlay it makes.

Thus, the firm under monopolistic competition has to confront a more complicated problem than the perfectly competitive firm. Equilibrium of an individual firm under monopolistic competition involves equilibrium in three respects, that is, in regard to the price, the nature of the product, and the amount of advertising outlay it should make.

Equilibrium of the firm in respect of three variables simultaneously – price, nature of product, selling outlay – is difficult to discuss. Therefore, the method of explaining equilibrium in respect of each of them separately is adopted, keeping the other two variables given and constant.

Moreover, as noted above, the equilibrium under monopolistic competition involves "individual equilibrium" of the firms as well as "group equilibrium". We shall discuss these two types of equilibrium first in respect of price and output and then in respects of product and advertising expenditure adjustments.

11.4.1 Individual Firm's Equilibrium in Short-Run Period

The demand curve for the product of an individual firm, as noted above, is downward sloping. Since the various firms under monopolistic competition produce products which are close substitutes to each other, the position and elasticity of the demand curve for the product of any of them depend upon the availability of the competitive substitutes and their prices.

Therefore, the equilibrium adjustment of an individual firm cannot be defined in isolation from the general field of which it is a part. However, for the sake of simplicity in analysis, conditions regarding the availability of substitute products produced by the rival firms and prices charged for them are held constant while the equilibrium adjustment of an individual firm is considered in isolation.

Since close substitutes for its product are available in the market, the demand curve for the product of an individual firm working under conditions of monopolistic competition is fairly elastic. Thus, although a firm under monopolistic competition has a monopolistic control over its variety of the product but its control is tempered by the fact that there are close substitutes available in the market and that if it sets too high a price for its product, many of its customers will shift to the rival products.

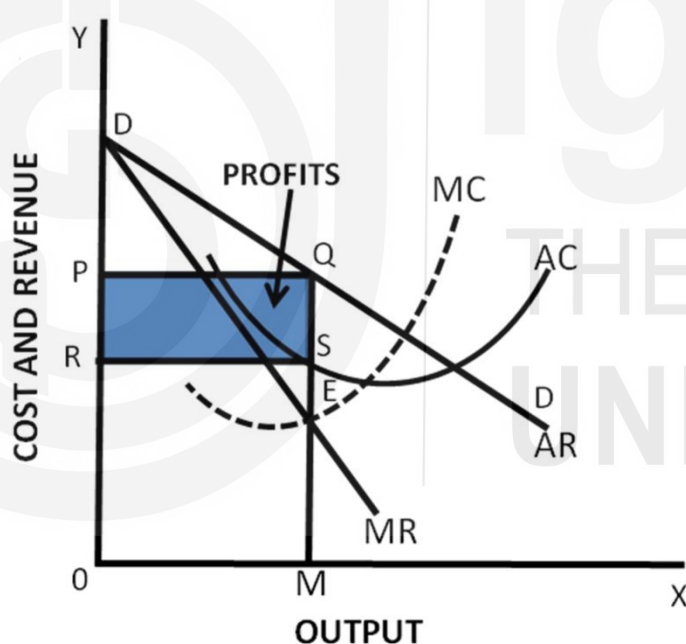


Fig. 11.3

Assuming the conditions with respect to all substitutes such as their nature and prices being constant, the demand curve for the product of a firm will be given. We further suppose that only variables are price and output in respect of which equilibrium adjustment is to be made.

The individual equilibrium under monopolistic competition is graphically shown in Fig. 11.3. DD is the demand curve for the product of an individual firm, the nature and prices of all substitutes being given. This demand curve DD is also the average revenue (AR) curve of the firm.

AC represents the average cost curve of the firm, while MC is the marginal cost curve corresponding to it. It may be recalled that average cost curve first falls due to internal economies and then rises due to internal diseconomies.

Given these demand and cost conditions a firm will adjust its price and output, at the level which gives it maximum total profits. Theory of value under monopolistic competition is also based upon the profit maximisation principle, as is the theory of value under perfect competition.

Thus a firm, in order to maximise profits, will equate marginal cost with marginal revenue. In Fig. 11.3, the firm will fix its level of output at OM, for at OM output marginal cost is equal to marginal revenue. The demand curve DD facing the firm in question indicates that output OM can be sold at price MQ = OP. Therefore, the determined price will evidently be MQ or OP.

In this equilibrium position, by fixing its price at OP and output at OM, the firm is making profits equal to the area RSQP which is maximum. It may be recalled that profits RSQP are in excess of normal profits because the normal profits which represent the minimum profits necessary to secure the entrepreneur's services are included in average cost curve AC. Thus, the area RSQP indicates the amount of supernormal or economic profits made by the firm.

In the short-run, the firm, in equilibrium, may make supernormal profits, as shown in Fig. 11.3 above, but it may make losses too if the demand conditions for its product are not so favourable relative to cost conditions. Fig. 11.4 depicts the case of a firm whose demand or average revenue curve DD for the product lies below the average cost curve, indicating thereby, that no output of the product can be produced at positive profits.

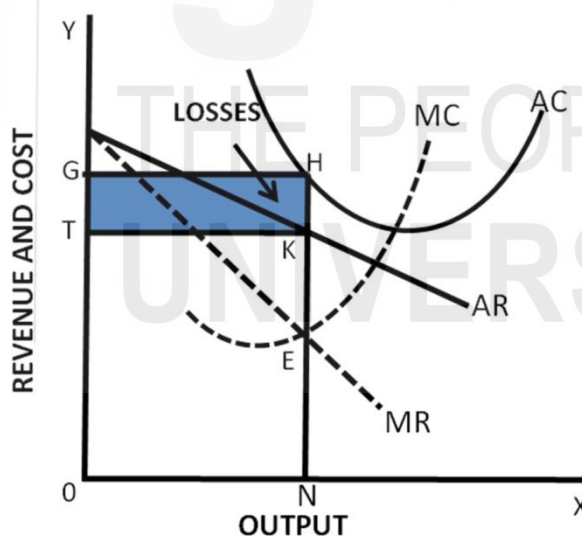


Fig. 11.4

However, the firm is in equilibrium at output ON and setting price NK or OT. By adjusting price at OT and output at ON, it is able to minimise its losses. In such an unfavourable situation, there is no alternative for the firm except to make the best of the bad bargain.

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

It should be carefully noted that in individual equilibrium of the firm in Fig. 11.3 and 11.4, the firm having once adjusted price at OP and (respectively will have no tendency to vary the price any more. If it varies its price upward, the loss due to fall in quantity demanded will be more than possible gain owing to the higher price. If it cuts down its price, the gain due to the increase in quantity demanded will be less than the loss due to the lower price. Hence, price will remain stable at OP and OT in the two cases respectively.

11.4.2 Individual Firm's Equilibrium in Long Run

In the preceding sections, we have discussed that in the short run, firms can earn supernormal profits. However, in the long run, there is a gradual decrease in the profits of the firms. This is because in the long run, several new firms enter the market due to freedom of entry.

When these new firms start production the market supply would increase and the price would fall. This would automatically increase the level of competition in the market. Consequently, AR curve shifts from right to left and supernormal profits are eliminated. The firms will be able to earn normal profits only.

In the long run, the AR curve is more elastic than that of in the short run. This is because of an increase in the number of substitute products in the long-run. The long-run equilibrium of monopolistically competitive firms is achieved when average revenue is equal to average cost. In such a case, the firms receive normal profits.

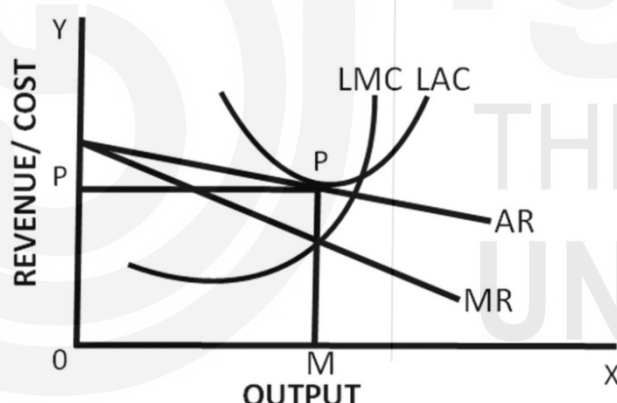


Fig. 11.5: Shows the long-run equilibrium position under monopolistic competition

In Fig. 11.5, P is the point at which AR curve touches the average cost curve (LAC) as a tangent. P is regarded as the equilibrium point at which the price level is MP (which is also equal to OP') and output is OM.

In the present case average cost is equal to average revenue that is MP. Therefore, in long run, the profit is normal. In the short run, equilibrium is attained when marginal revenue is equal to marginal cost. However, in the long run, both the conditions ($MR=MC$ and $AR=AC$) must hold to attain equilibrium.

11.4.3 Group Equilibrium in Monopolistic Competition

The concept of group equilibrium was introduced by Chamberlin. The price-output equilibrium of all firms is known as group equilibrium. Group equilibrium represents the price and output of firms having close substitutes.

However, due to product differentiation, it is difficult to form market demand schedules and supply.

For overcoming the problem Chamberlin gave a concept called product group, which includes products that are technological and economic substitute of each other. Technological substitutes are the products having technical similarity, while economic substitutes are the products that have same prices and fulfill the same want of consumers.

A product group refers to a group in which the demand for each product is highly elastic. Here, the demand for a product changes with the changes in the prices of other products within the group, and, the price and cross elasticity of demand for products forming the group is high.

In an industry, different types of groups exist automatically. In automobile industry makers of cars and trucks are two different product groups.

The main competition would be among those organisations manufacturing similar products (cars or trucks) which are close substitutes of each other. Due to product differentiation, there is a large variation in the demand and cost curves of firms. Their price, output, and profits also differ.

Therefore, to simplify product group analysis, Chamberlin has given two assumptions, which are as follows:

- i) The demand and cost curves of all products in the group are the same or uniform. The uniformity assumption. The preferences of consumers are evenly distributed and the difference in preferences does not lead to variation in cost.
- ii) In monopolistic competition, a large number of sellers are not able to influence each other's decisions. The changes in prices or level of output, of firm would have insignificant influence on its competitors. This is termed as the symmetry assumption.

These two assumptions form the basis for group equilibrium analysis. If an organisation within the group has established a popular brand, it is more likely to earn supernormal profits. However, in the long run, other organisations would strive to emulate the product design and features. In such a case, supernormal profits would vanish. This is a general case of all monopolistically competitive organisations.

On the other hand, if the entire group is earning supernormal profits, then external organisations would get attracted towards the group, until the legal or economic barriers are imposed.

In Fig. 11.6, P is the equilibrium point at which output is OM, price is MP, and average cost is MT. In such a case, marginal cost is equal to marginal revenue. Therefore, firms are earning supernormal profits (P'PTT'). However, these supernormal profits disappear in the long run.

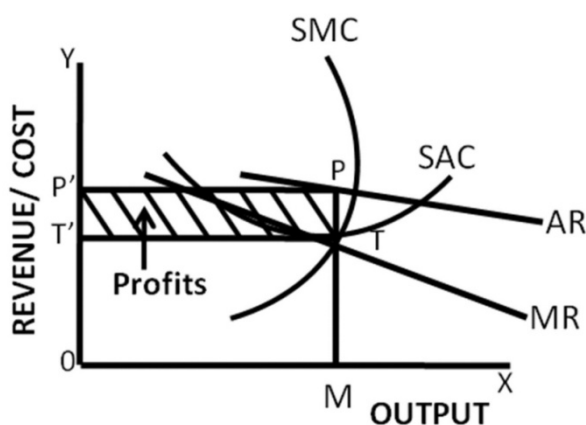


Fig. 11.6: The short-run group equilibrium

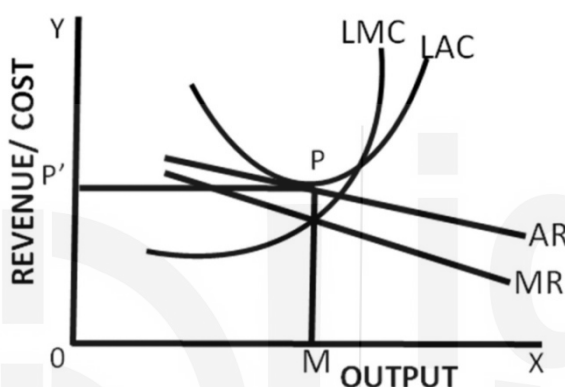


Fig.11.7: The long-run group equilibrium

In Fig. 11.7, it can be seen that the supernormal profits have disappeared. It also depicts that average revenue (AR) is tangent to LAC, which implies that price is equal to average revenue. Marginal revenue gets equal to marginal cost at the output level of OM. This shows that in the long run, all firms in the industry are making normal profits.

11.4.4 Equilibrium with Selling Costs

Selling Costs: Concept

“Selling costs are costs incurred in order to alter the position or shape of the demand curve for the product.” E.H. Chamberlin

Selling costs play the key role in monopolistic competition and oligopoly. Under these market forms, the firms have to compete to promote their sale by spending on advertisements and publicity.

Moreover, producer has not to decide about price and output only. He also keeps in view how to maximise the profit.

Thus, cost on advertisement, publicity and salesmanship add to the cost or supply curve of the product while also contributing to rise in its demand. The Selling costs is a broader concept than the advertisement expenditures. Advertisement expenditures are part of selling costs.

In selling costs we include the salaries of sales persons, incentives to retailers to display the products, besides the advertisements. It was Chamberlin who introduced the analysis of selling costs and distinguished it from the production

costs. The production costs include all those expenses which are spent on the manufacturing of the commodity, its transportation cost of handling, storing and delivering of the commodity to actual customers because these add utilities to a commodity.

On the other hand, all selling costs include expenditures in order to raise demand for a commodity. In short, selling costs are those which are made to ‘create’ the demand for the product. Transport costs should not be included in selling costs; rather these should be included in the production costs. Transport costs actually do not increase the demand; it only helps in meeting the demand of the consumers.

In general, “those costs which are made to adopt the product to the demand are costs of production; those made to adopt the demand to product are costs of selling.”

The concept of selling cost is based on the following two assumptions:

- 1) Buyers do not have any perfect knowledge about the different types of product.
- 2) Buyers’ demand and tastes can be changed.

While production costs include outlays incurred on services engaged in the manufacturing of the product like land, labour and capital etc, the selling costs include all the costs incurred to change the consumer’s preference from one product to another. These raise the demand of a product at any given price.

“Production costs create utilities in order that demands may be satisfied while selling costs create and shift the demand curves themselves.”

Selling costs influence equilibrium price-output adjustment of a firm under monopolistic competition. In the Fig. 11.8 APC is the initial average production cost. AR_1 is the initial average revenue curve or initial demand curve. The initial price is OP and the firm earns profits shown by the first shaded rectangle $PQRS$.

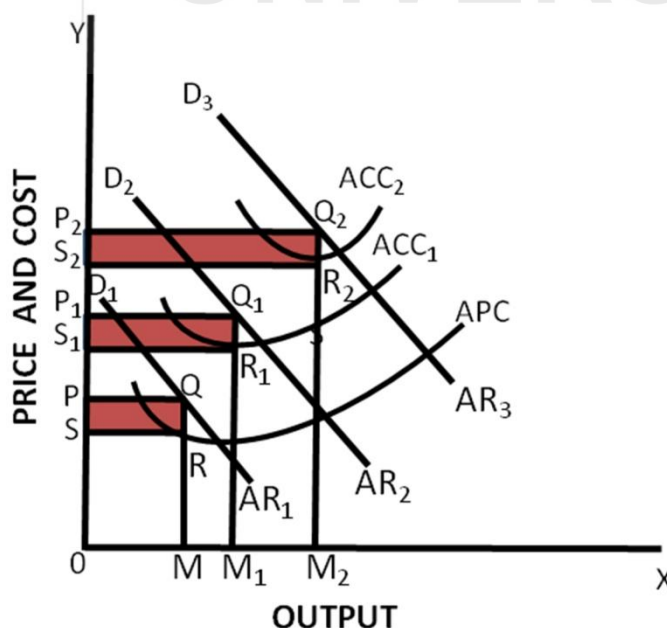


Fig. 11.8: Equilibrium with selling costs

ACC_1 is the average composite costs curve, which includes the average selling cost (ASC). Average selling cost is equal to the vertical distance between APC and ACC_1 . The new demand curve is AR_2 . It is obtained after incurring selling costs or after making advertisements.

It is, obvious, that the demand for the product has increased as a result of selling costs. The profits have also increased as a result of selling costs. The profits after incurring selling costs at OM_1 level of output become equal to the shaded area $P_1Q_1R_1S_1$. Note that these profits are greater than the initial level of profits when no selling cost was incurred, i.e., $P_1 Q_1 R_1 S_1 > PQRS$.

ACC_2 is the average composite cost when more additional selling cost is incurred, as a result of which the demand for the product further increases. The new demand curve is AR_3 which indicates a higher demand for the product. The profits are also greater than before since the shaded area $P_2Q_2R_2S_2 > P_1Q_1R_1S_1$.

It is, thus, obvious that the demand for the product is increasing as a result of the selling costs. Since selling costs are included in the cost of production, therefore price of the product is also increasing as a result of selling costs. Profits are also increasing as a result of higher selling costs and increased demand.

Here, question arises, how long a firm may go on incurring expenditure on selling costs? It will continue to make expenditure on selling costs as long as any addition to the revenue is greater than the addition to the selling costs. The firm will stop incurring expenditure on selling costs when the total profits are at the highest possible level.

This would be the point at which the additional revenue due to advertising expenditure equals the extra expenditure on advertisement. It should, however, be noted clearly that the effects of advertisement on prices and output are uncertain. Advertisement by a firm may be considered successful if the elasticity of demand for its product falls.

Check Your Progress 2

- 1) Will the demand curve for a firm under monopolistic competition be horizontal or downward sloping?

- 2) On which factors equilibrium of individual firm depend under monopolistic condition?

- 3) Construct the diagram showing long run equilibrium of firm in monopolistic competition.

11.5 PERFECT COMPETITION, MONOPOLY, AND MONOPOLISTIC COMPETITION: COMPARISON

The upcoming discussion will help you to make a comparison between perfect competition, monopoly and monopolistic competition.

1) Structural Differences

Under perfect competition, there are innumerable numbers of firms who produce homogeneous goods. Each firm in the market is so small that it cannot exert any influence on price and output. Each firm, thus, behaves as a price-taker.

Under monopolistic competition, there is quite a large number of sellers who sell slightly different products. Product differentiation enables a firm to exercise some power over price and output. This means that sellers behave as **'price-makers'**. However, a monopoly seller has full control over its price-output decision.

There is complete freedom of entry and exit of firms — both in perfect competition and in monopolistic competition. This condition is true during the long period only. In the short run, entry or exit is ruled out in both these market forms. But a monopoly business is characterised by the absence of a rival seller. Entry of new firms is either legally prohibited in monopoly, or may not be financially feasible.

2) Behavioural Differences

A firm behaves as a price-taker under perfect competition, and the demand curve faced by it is a horizontal one. Since price is fixed, AR curve coincides with the MR curve. A monopoly firm, however, faces a negatively sloped demand curve because it can have perceptible influence over price and output. Consequently, MR curve is also negative sloping and lies below the AR curve.

This is also true under monopolistic competition. The only difference between monopoly and monopolistic competition is that the demand curve faced by a monopolistically competitive seller is relatively more elastic.

Since price is fixed for a competitive firm, it has only to undertake output decisions. Further, products sold by competitive firms are perfect substitutes. Because of complete product homogeneity, no firm finds any incentive to spend money on any kind of sales promotional activity.

A monopoly firm also does not find any urgency to spend money on advertisement since there is no rival seller. But a monopolistically competitive seller has to incur some sort of **"selling costs"** just to provide information about its product or rivals' products. In fact, in order to attract more and more customers, additional expenditure on selling cost is a necessity.

In every market, sellers adopt independent price-output policy. But all sellers of all market forms follow one basic principle. The basic behavioural rule is the equality between MC and MR. Under perfect competition, since $AR = MR$, $MC = MR = AR = P$. But, in monopoly and in monopolistic competition, this behavioural rule is slightly altered to $MC = MR < AR = P$, since in these two markets, $AR > MR$.

A monopoly firm or a monopolistically competitive firm produces in that region of its demand curve where the coefficient of elasticity of demand is greater than one. But, under perfect competition, coefficient of elasticity of demand is infinite.

3) Optimum Capacity and Sub-Optimal Capacity of Production

A competitive firm always produces at the minimum point of its AC curve. This means that a firm utilises its plant optimally. Since AR curve is a horizontal one, a competitive firm will always produce at the lowest point of its AC curve. It is then said that perfect competition leads to optimum economic efficiency.

But, under monopoly, or under monopolistic competition, the demand curve is negative sloping. It is due to the nature of this demand curve that a firm fails to operate at the minimum point of its AC curve. It operates somewhere to the left of the lowest point of the AC curve.

The implication of this is that resources are not utilised optimally under imperfect competition. Imperfect competition leads to economic inefficiency. As a result, a higher price for the product is charged and lower output is produced. In this sense, perfect competition is an ideal market where social welfare gets maximised. But social welfare gets reduced in monopoly or in monopolistic competition.

4) Supply Curve

Under perfect competition, MC curve above the shut-down point is the short run supply curve. But, under monopoly, or monopolistic competition, the supply curve remains indeterminate. In other words, in these market forms, MC curve is not the supply curve.

11.6 THEORY OF EXCESS CAPACITY UNDER MONOPOLISTIC COMPETITION

The doctrine of excess (or unutilised) capacity is associated with monopolistic competition in the long-run and is defined as “the difference between ideal (optimum) output and the output actually attained in the long-run.”

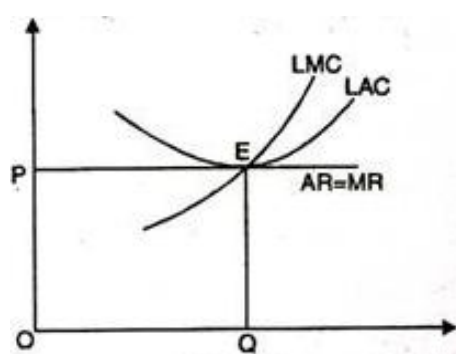


Fig. 11.6

We know that under perfect competition, the demand curve (AR) is tangential to the long-run average cost curve (LAC) at its minimum point and conditions of full equilibrium are fulfilled: $LMC = MR$ and AR (price) = Minimum LAC. This means that in the long-run, the entry of new firms forces the existing firms to make the best use of their resources to produce at the lowest point of average total costs. At point E in Fig. 11.6, abnormal profits will be competed away

because $MR = LMC = AR = LAC$ at its minimum point E and OQ will be the most efficient output which the society will be enjoying. This is the ideal or optimum output which firms produce in the long-run.

Under monopolistic competition, the demand curve facing the individual firm is not horizontal as under perfect competition, but it is downward sloping. A downward sloping demand curve cannot be tangent to the LAC curve at its minimum point.

The double condition of equilibrium $LMC = MR = AR (P) = \text{Minimum LAC}$ will not be fulfilled. The firms will, therefore, producing at less than the optimum level even when they are earning normal profits. No firm will have the incentive to produce the ideal output, since any effort to produce more than the equilibrium output would involve a higher long-run marginal cost than marginal revenue.

Thus each firm under monopolistic competition will be producing at less than the optimum level and work under excess capacity. This is illustrated in Fig. 11.7 where the monopolistic competitive firm's demand curve is d and MR_1 is its corresponding marginal revenue curve. LAC and LMC are the long-run average cost and marginal cost curves.

The firm is in equilibrium at E_1 where the LMC curve cuts the MR_1 curve from below and OQ_1 output is set at the price Q_1A_1 . OQ_1 is the equilibrium output but not the ideal output because d is tangent to the LAC curve at A_1 to the left of the minimum point E. Any effort on the part of the firm to produce beyond OQ_1 will mean losses as beyond the equilibrium point E_1 , $LMC > MR_1$. Thus the firm has negative excess capacity measured by OQ_1 which it cannot utilise working under monopolistic competition.

A comparison of the equilibrium positions under monopolistic competition and perfect competition with the help of Fig. 11.7 reveals that the output of a firm under monopolistic competition is smaller and the price of its product is higher than under perfect competition. The monopolistic competition output OQ_1 is less than the perfectly competitive output OQ , and the monopolistic competitive price Q_1A_1 is higher than the competitive equilibrium price QE . This is because of the existence of excess capacity under monopolistic competition.

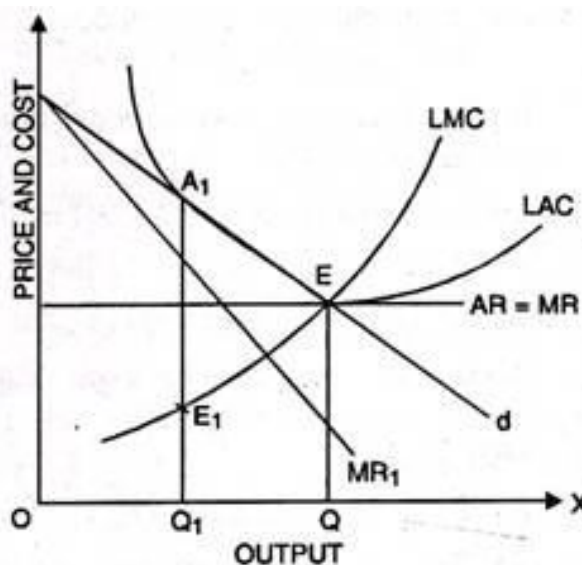


Fig. 11.7

Check Your Progress 3

1) In what respects monopolistic competition is different from other two extreme forms of market structure.

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2) What do you understand by the term ‘excess capacity’?

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11.7 LET US SUM UP

Monopolistic competition is a market structure in which there are many firms selling closely related commodities. Its assumptions are: Large number of buyers and sellers, Differentiated products, Free entry and exit, aim of the firm is profit maximisation. Product differentiation exist which can be real or artificial. Its effect is that the firm has some degree of price-making power.

Under monopolistic competition in the short-run, firm maximises profit where $MR=MC$ and the MC curve intersects MR curve from below. In the long-run, due to free entry and exit of firms, firm earns normal profit. Economic profits are zero.

Excess Capacity Theory states that it is a long-run concept and is the difference between least cost output and profit maximising output. While, under perfect competition, there is no excess capacity and under monopolistic competition, excess capacity always exists.

11.8 REFERENCES

1) Dr Deepashree (2016), *Introductory Micro Economics*, Mayur Paperbacks, Chapter on Theory of Market structure.
<http://www.economicdiscussion.net>

2) Varian, Hal (1999), *Intermediate Microeconomics*, W.W Norton &Co, New York, Chapter 24 & 25, page no. 415-455.

11.9 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

- 1) Read Section 11.1 and answer
- 2) Read Section 11.2 and answer
- 3) (c)

**Market
Structure**

Check Your Progress 2

- 1) Read Section 11.3 and answer
- 2) Read Section 11.4 and answer
- 3) Read Sub-section 11.4.1 and answer

Check Your Progress 3

- 1) Read Section 11.5 and answer
- 2) Read Section 11.6 and answer



UNIT 12 OLIGOPOLY: PRICE AND OUTPUT DECISIONS

Structure

- 12.0 Objectives
- 12.1 Introduction
 - 12.1.1 Definition of Oligopoly
 - 12.1.2 Features of Oligopoly Market
 - 12.1.3 Causes for the Existence of Oligopoly
- 12.2 Price and Output Determination under Oligopoly
 - 12.2.1 Cournot's Model
 - 12.2.2 Stackelberg's Model
 - 12.2.3 Paul Sweezy's Model: Kinked Demand Curve Analysis
 - 12.2.3.1 Why the Kink in the Demand Curve?
 - 12.2.3.2 Analysis of the Kinked Demand Curve Model
- 12.3 Co-operative vs. Non-cooperative Behaviour
 - 12.3.1 Co-operative Behaviour and Prisoner's Dilemma
 - 12.3.2 Types of Co-operative Behaviour
 - 12.3.3 Types of Non-Cooperative Behaviour
- 12.4 Cartel Theory of Oligopoly
- 12.5 Let Us Sum Up
- 12.6 References
- 12.7 Answers or Hints to Check Your Progress Exercises

12.0 OBJECTIVES

After studying this unit, you shall be able to:

- state the meaning and features of oligopoly;
- discuss the causes of existence of oligopoly;
- throw light on different models that explain the oligopoly price and output determination;
- explain the co-operative and non-cooperative behaviour of oligopolistic firms; and
- appreciate cartel theory of oligopolist.

12.1 INTRODUCTION

Oligopoly refers to a market wherein only a few firms account for most or all of total production.

12.1.1 Definition of Oligopoly

Oligopoly refers to the presence of few sellers in the market selling the homogeneous or differentiated products. In other words, the Oligopoly market structure lies between the pure monopoly and monopolistic competition, where few sellers dominate the market and have control over the price of the product.

Under the Oligopoly market, a firm either produces homogeneous or heterogeneous products:

- **Homogeneous Product:** The firms producing the homogeneous products are called as Pure or Perfect Oligopoly. It is found in the case of industrial products such as aluminum, copper, steel, zinc, iron, etc.
- **Heterogeneous Product:** The firms producing the heterogeneous products are called as Imperfect or Differentiated Oligopoly. Such type of Oligopoly is found in the production of consumer goods such as automobiles, soaps, detergents, television, refrigerators, etc.

12.1.2 Features of Oligopoly Market

1) **Few Sellers:** Under the Oligopoly market, the sellers are few, and the customers are many. Few firms dominating the market enjoy a considerable control over the price of the product.

2) **Interdependence:** It is one of the most important features of an Oligopoly market, wherein, the seller has to be cautious with respect to any action taken by the competing firms. Since there are few sellers in the market, if any firm makes a change in the price or promotional scheme, all other firms in the industry have to comply with it to remain in the competition.

Thus, every firm remains alert to the actions of others and plan their counterattack beforehand to escape the turmoil. Hence, there is a complete interdependence among the sellers with respect to their price-output policies.

3) **Advertising:** Under Oligopoly market, every firm advertises their products on a frequent basis with the intention to reach more and more customers and increase their customer base. This advertising makes the competition intense.

If any firm does a lot of advertisement while the other remained silent, then you will observe that his customers are going to the firm which is continuously promoting its product. Thus, in order to be in the race, each firm spends lots of money on advertisement activities.

4) **Competition:** It is genuine that with a few players in the market, there will be an intense competition among the sellers. Any move by one firm will have a considerable impact on its rivals. Thus, every seller keeps an eye over its rivals and be ready with the counterattack.

5) **Entry and Exit Barriers:** The firms can easily exit the industry whenever they want, but has to face certain barriers to enter into it. These barriers could be Government license, Patent, large firm's economies of scale, high capital requirement, complex technology, etc. Also, sometimes the government regulations favour the existing large firms, thereby acting as a barrier for the new entrants.

- 6) **Lack of Uniformity:** There is a lack of uniformity among the firms in terms of their size, some are big, and some are small. Since there are less number of firms, any action taken by one firm has a considerable effect on the other. Thus, every firm must keep a close eye on its counterpart and plan the promotional activities accordingly.

12.1.3 Causes for the Existence of Oligopoly

There are certain reasons which have led to the emergence of oligopoly. These are:

1) Large Investment of Capital

The number of firms in an industry may be small due to the large requirements of capital. No entrepreneur will like to venture into investing large sums in an industry in which addition to output to the existing level may depress prices. Further, the new entrant may also fear of provoking a price-war by the established firms in the industry. This is always true that in the midst of differentiated products, it is difficult to introduce a new product.

2) Control of Indispensable Resources

A few firms may control some indispensable resources which may enable them to secure several advantages in costs over all others. This enables them to operate profitably at a price at which others cannot survive.

3) Legal Restriction and Patents

In public utility sector, the entry of new firms is closely regulated through the grant of certificate by the State. This policy of exclusion of rivals may be due to diseconomies of small scale or of duplication of services. Another factor for the emergence of oligopoly is the patent right which a few firms acquire in matter of some goods. Patents have led to many important industrial monopolies in America and elsewhere.

4) Economies of Scale

Another factor responsible for emergence of oligopoly is the operations at large scale. In some industries, a few firms can meet the entire demand for the product. It is possible that the demand may be satisfied by a large number of firms, but small firms cannot secure the economies of large scale production. In the industries where there is a lot of mechanisation and where economies of large scale are considerable, only a few firms will survive.

The firms attain such a huge size that just a few of them can satisfy the entire demand. For example, automobiles, steel industry, petroleum etc. Oligopolies are also found in local markets. In small towns, a few firms may be sufficient to satisfy the demand, e.g., petrol, banks, building material suppliers etc. The market is small and therefore can be satisfied by a few firms.

5) Superior Entrepreneurs

In some industries there may be some superior entrepreneurs whose costs are lower than inferior rivals. These entrepreneurs under sell and eliminate most of their rivals.

6) Mergers

Many oligopolies have been created by combining two or more independent

firms. The combination of two or more firms into one firm is known a merger. The main motives of mergers include increasing market powers, more resources, economies of scale and market extensions etc.

7) Difficulties of Entry into the Industry

Lastly, oligopoly may come to exist because of difficulties of entry into the industry. One big difficulty in some industries is the large requirements of capital. Businessmen do not like to venture into those industries entry to which, even of one firm, is likely to depress prices to such an extent as to make it unprofitable for all. They may also be afraid of the price war that their entry may provoke from the established firms in the industry. Prospective entrants to an industry are also deterred by the difficulty of marketing new products or new brands in the presence of already well-established, well-entrenched brands.

Check Your Progress 1

1) What is Oligopoly? Explain with few examples.

.....
.....
.....

2) Identify and explain the features that shows the existence of oligopoly in market.

.....
.....
.....

3) A market with many buyers and a few dominant sellers is :

- A) purely competitive
- B) a monopoly
- C) monopolistically competitive
- D) oligopolistic

**12.2 PRICE AND OUTPUT DETERMINATION
UNDER OLIGOPOLY**

Unlike other market forms, price and output under oligopoly is never fixed. Interdependence of firms led uncertainty always exists in the market. In such a situation, it becomes difficult to determine the equilibrium price and output for an oligopolistic firm. An oligopolist cannot assume that its competitors will not change their price and/or output if it changes. Price change by one firm will be followed by other competitors, which will change the demand conditions facing this firm. Therefore, demand curve for any firm is not fixed like other markets. Demand curve for a firm keeps changing as firms change their prices. Therefore, in the absence of a fixed demand (Average Revenue) curve, it is difficult to determine the equilibrium price and output. However, economists have developed some price-output models to explain the behaviour of oligopolistic firms. They are as follows:

- I. Some economists ignore the interdependence among the firms when they explain the oligopoly market. In such case the demand will be known and equilibrium price and output can be determined.
- II. Another approach is based on collusion. Oligopolists can form a group and maximise their joint output and profit. Best example of such collusion is Cartel (it is a situation when oligopolists agree to work together in the international market). One firm is chosen as a leader. The prices determined by the leader are followed by others in such a case.
- III. Third approach assumes that an oligopolist predicts the reaction of its competitors. Problems regarding prices and output determination are solved by such assumptions. Various models based on different assumptions exist in this category. Few of them are: Chamberlin Model, Cournot's Model, and Paul Sweezy Kinked Demand curve Model etc.

12.2.1 Cournot's Model

In 1838, Augustin Cournot introduced a simple model of duopolies that remains the standard model for oligopolistic competition.

This model is based on the following assumptions:

- 1) The two firms produce homogeneous and indistinguishable goods.
- 2) There are no other firms in the market who produce the same or substitute goods.
- 3) No other firms can or will enter the market.
- 4) Collusive behaviour is prohibited. Firms cannot act together to form a cartel.
- 5) There exists one market for the produced goods.

In addition to the assumptions stated above, the Cournot duopoly model relies on the following:

- 1) Each firm chooses a quantity to produce.
- 2) All firms make this choice simultaneously.
- 3) The model is restricted to a one-stage game. Firms choose their quantities only once.
- 4) The cost structures of the firms are public information.

In the Cournot model, the strategic variable is the output quantity. Each firm decides how much of a good to produce. Both firms know the market demand curve, and each firm knows the cost structures of the other firm. The essence of the model is that each firm takes the other firm's choice of output level as fixed and then sets its own production quantities.

Before explaining the model, let us define the reaction curve.

A reaction curve for Firm 1 is a function Q_1 that takes input as the quantity produced by Firm 2 and returns the optimal output for Firm 1 given Firm 2's production decisions. In other words, $Q_1(Q_2)$ is Firm 1's best response to Firm 2's choice of Q_2 . Likewise, $Q_2(Q_1)$ is Firm 2's best response to Firm 1's choice of Q_1 .

Let's assume that the two firms face a single market demand curve as follows:

$$Q = 100 - P$$

where P is the single market price and Q is the total quantity of output in the market. For simplicity's sake, let's assume that both firms face cost structures as follows:

$$MC_1 = 10$$

$$MC_2 = 12$$

Given this market demand curve and cost structure, we want to find the reaction curve for Firm 1. In the Cournot model, we assume Q_2 is fixed and proceed. Firm 1's reaction curve will satisfy its profit maximising condition, $MR = MC$. In order to find Firm 1's marginal revenue, we first determine its total revenue, which can be described as follows:

$$\begin{aligned} \text{Total Revenue} &= PQ_1 = (100 - Q) Q_1 = 100Q_1 - (Q_1 + Q_2) Q_1 \\ &= [100 - (Q_1 + Q_2)] Q_1 = 100Q_1 - Q_1^2 - Q_2Q_1 \\ &= 100Q_1 - Q_1^2 - Q_2 Q_1 \end{aligned}$$

The marginal revenue is simply the first derivative of the total revenue with respect to Q_1 (recall that we assume Q_2 is fixed). The marginal revenue for Firm 1 is thus:

$$MR_1 = 100 - 2Q_1 - Q_2$$

Imposing the profit maximising condition of $MR = MC$, we conclude that Firm 1's reaction curve is:

$$100 - 2Q_1 - Q_2 = 10$$

$$Q_1 = \frac{90}{2} - \frac{Q_2}{2}$$

$$Q_1 = 45 - Q_2/2$$

That is, for every choice of Q_2 , Q_1 is Firm 1's optimal choice of output. We can perform analogous analysis for Firm 2 (which differs only in that its marginal costs are 12 rather than 10) to determine its reaction curve. We find Firm 2's reaction curve to be:

$$Q_2 = 44 - Q_1/2.$$

The solution to the Cournot model lies at the intersection of the two reaction curves. We solve now for Q_1 . Note that we substitute Q_2 for Q_2 because we are looking for a point which lies on Firm 2's reaction curve as well.

$$\begin{aligned} Q_1 &= 45 - Q_2/2 = 45 - (44 - Q_1/2)/2 \\ &= 45 - 22 + Q_1/4 \\ &= 23 + Q_1/4 \\ &\Rightarrow Q_1 = 92/3 \end{aligned}$$

By the same logic, we find:

$$Q_2 = 86/3$$

Note that Q_1 and Q_2 differ due to the difference in marginal costs. In a perfectly competitive market, only firms with the lowest marginal cost would survive. In this case, however, Firm 2 still produces a significant quantity of goods, even though its marginal cost is 20% higher than Firm 1's.

An equilibrium cannot occur at a point not at the intersection of the two reaction curves. If such an equilibrium existed, at least one firm would not be on its reaction curve and would therefore not be playing its optimal strategy. It has incentive to move elsewhere, thus invalidating the equilibrium.

The Cournot equilibrium is a best response made in reaction to a best response and, by definition, is therefore a Nash equilibrium. Unfortunately, the Cournot model does not describe the dynamics behind reaching equilibrium from a non-equilibrium state. If the two firms began out of equilibrium, at least one would have an incentive to move, thus violating our assumption that the quantities chosen are fixed. Rest assured that for the examples we have seen, the firms would tend towards equilibrium. However, we would require more advanced mathematics to adequately model this movement.

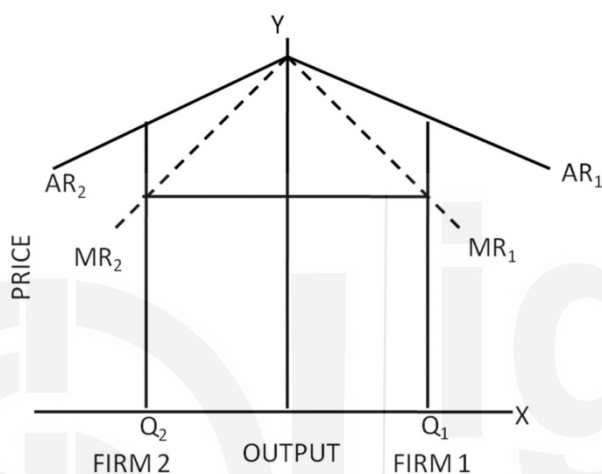


Fig. 12.1

12.2.2 Stackelberg's Model

The Stackelberg duopoly model of duopolies is very similar to the Cournot model. Like the Cournot model, the firms choose the quantities they produce. However, here the firms do not move simultaneously. One firm holds the privilege to choose production quantities before the other. The assumptions underlying the Stackelberg model are as follows:

- 1) Each firm chooses a quantity to produce.
- 2) A firm chooses before the other in an observable manner.
- 3) The model is restricted to a one-stage game. Firms choose their quantities only once.

To illustrate the Stackelberg model, let's take an example. Assume Firm 1 is the first mover with Firm 2 reacting to Firm 1's decision. We assume a market demand curve of:

$$Q = 90 - P$$

Furthermore, we assume all marginal costs are zero, that is:

$$MC = MC_1 = MC_2 = 0$$

We calculate Firm 2's reaction curve in the same way we did for the Cournot Model. Verify that Firm 2's reaction curve is:

$$Q_2 = 45 - Q_1/2$$

To calculate Firm 1's optimal quantity, we look at Firm 1's total revenues.

$$\begin{aligned}\text{Firm 1's Total Revenue} &= P Q_1 = (90 - Q_1 - Q_2) Q_1 \\ &= 90 Q_1 - Q_1^2 - Q_2 Q_1\end{aligned}$$

However, Firm 1 is not forced to assume Firm 2's quantity is fixed. In fact, Firm 1 knows that Firm 2 will act along its reaction curve which varies with Q_1 . Firm 2's quantity very much relies on Firm 1's choice of quantity. Firm 1's Total Revenue can thus be rewritten as a function of Q_1 :

$$R_1 = 90 Q_1 - Q_1^2 - Q_1 (45 - Q_1/2)$$

Marginal revenue for firm 1 is thus:

$$\begin{aligned}MR_1 &= 90 - 2 * Q_1 - 45 + Q_1 \\ &= 45 - Q_1\end{aligned}$$

When we impose the profit maximising condition ($MR = MC$), we find:

$$Q_1 = 45$$

Solving for Q_2 , we find:

$$Q_2 = 22.5$$

In the Cournot model, both firms make their choices simultaneously and have no communication beforehand. In the Stackelberg model, Firm 1 not only announces first, but Firm 2 knows that when Firm 1 announces, Firm 1's actions are credible and fixed. This demonstrates how a slight change in the flow of information can drastically impact the outcome of a market. Note that Firm 1 decided first. Its decision is to meet half of the market demand. The second firm decides to meet half of remaining market demand. Note that firm which decides first will be able to produce and sell larger quantity. It amounts to capturing larger market share. That is why we say that essence of Stackelberg model lies in its **First Movers' Advantage** feature.

Illustration 1:

Two firms have marginal costs of 10. They face a market demand curve of $P = 100 - 4Q$. The government imposes a tax of 10 dollars per unit sold. Determine the Cournot equilibrium quantity.

Assuming that the tax will be paid by the consumer, the effective demand curve becomes $90 - 4Q$.

$$R_1 = (90 - 4Q_1 - 4Q_2).Q_1$$

$$MR_1 = 90 - 8Q_1 - 4Q_2$$

Setting $MR = MC$:

$$Q_1 = 10 - Q_2/2 = \frac{20 - Q_2}{2}$$

By symmetry:

$$Q_1 = Q_2 = \frac{20 - Q_1}{2}$$

Illustration 2 :

Assume three firms face identical marginal costs of 20 with fixed costs of 10. They face a market demand curve of $P = 200 - 2Q$. Find the Cournot equilibrium price and quantity.

$$R_1 = (200 - 2(Q_1 + Q_2 + Q_3))Q_1$$

$$MR_1 = 200 - 4Q_1 - 2Q_2 - 2Q_3$$

Applying $MR = MC$:

$$Q_1 = 45 - Q_2/2 - Q_3/2$$

By symmetry:

$$Q_1 = Q_2 = Q_3 = 22.5$$

12.2.3 Paul Sweezy Model : Kinked Demand Curve Analysis

This model was developed independently by Prof. Paul M. Sweezy on the one hand and Profs. R. C. Hall and C. J. Hitch on the other hand.

The assumptions of this model are:

- i) There are only a few firms in an oligopolistic market.
- ii) The firms are producing close-substitute products.
- iii) The quality of the products remains constant and the firms do not spend on advertising.
- iv) A set of prices of the product has already been determined and these prices prevail in the market at present.
- v) Each firm believes that if it reduces the price of its product, the rival firms would follow suit, but if it increases the price, the rivals would not follow it. They would simply keep their prices unchanged. We shall see presently that, because of this asymmetric pattern of reaction of the rivals, the demand curve of each firm would have a kink at the prevailing price of its product.

12.2.3.1 Why the Kink in the Demand Curve?

In the figure we have drawn two negatively sloped straight line demand curves, viz., dd' and DD' . Of these two curves, dd' is more flat than DD' . Now, when one particular firm in the industry changes the price of its product, all other firms keeping their prices constant, the firm's demand curve will be relatively flatter like dd' , i.e., the magnitude of the change in the demand for its product as its price changes would be relatively larger.

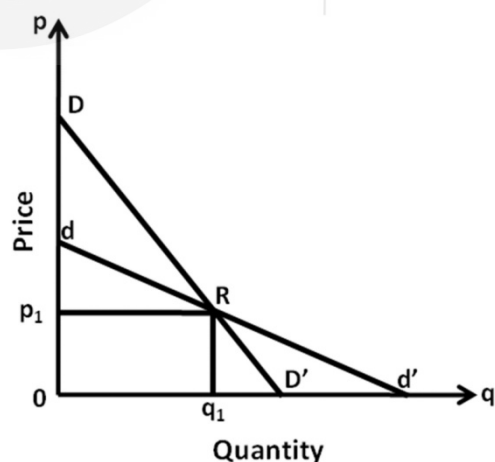


Fig. 12.2

This is because, as the firm reduces or increases the price of its product, the prices of the products of other firms remaining constant, the product of the firm becomes relatively cheaper or dearer, respectively, than those of the other firms. This will make the demand curve flatter for this firm.

On the other hand, if a firm increases its price, the office firms will not follow the suit. So there will be an asymmetry in responses of the rivals.

If one firm reduces price, all others follow the suit – otherwise they run the risk of losing their customers to this firm.

If one raises the price, others do not as they expect to win some customers from this firm. Together, these responses create a kink in demand curve.

Let us suppose that initially the price of the product of the firm is p_1 or Op_1 and the demand for the product is q_1 or Oq_1 . If the firm now increases its price from p_1 , the rival firms would keep their prices unchanged according to assumption (v) of this model.

In this case, the firm's demand would decrease along the segment Rd of the relatively more elastic demand curve dd' . On the other hand, if it goes on decreasing its price from p_1 , its rivals also would be decreasing their prices according to assumption (v). In this case, the quantity demanded of the firm's product will increase along the segment RD' of the relatively steeper demand curve DD' .

Therefore, at the price p_1 , the firm's demand curve would be dRD' . Obviously, because of assumption (v), the segment dR of this demand curve would be more flat or more elastic than the segment RD' (and the segment RD' would be more steep or less elastic than the segment dR).

As a result, there would be a kink at the prevailing price p_1 , or, at the point R on the firm's demand curve dRD' , i.e., the demand curve in this model would be a kinked demand curve.

12.2.3.2 Analysis of the Kinked Demand Curve Model

In the oligopoly model under discussion, the properties of the kinked demand curve as well as its significance are especially discussed. In the first place, as the demand curve or the average revenue (AR) curve of the firm has a kink, its MR curve cannot be obtained as a continuous curve. We may, therefore, begin with the properties of the MR curve of the kinked demand curve with the help of Fig. 12.3.

The kinked demand curve of the firm in Fig. 12.3 is dRD' . There is a kink at the point $R(p_1, q_1)$ on this curve, because the curve consists of a segment dR of the relatively flatter curve dd' and another segment RD' of the relatively steeper curve DD' .

Therefore, in the case of the kinked demand curve dRD' , the firm's MR curve, up to $q = q_1$, would consist of the MR curve dM associated with the dR segment of the kinked demand curve and for $q > q_1$, the MR curve would be the segment NB associated with the segment RD' of the demand curve.

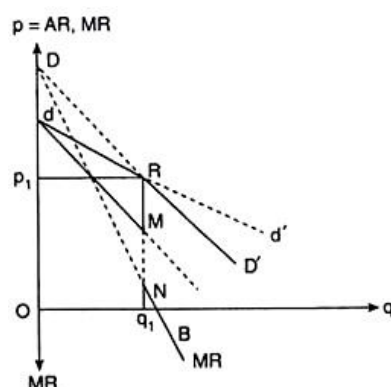


Fig. 12.3

We have obtained above that the firm's MR curve for its kinked demand curve would consist of two parts, viz., the segments dM and NB, and there would be a vertical gap between the points M and N at $q = q_1$.

This implies that as the firm's output goes on increasing up to q_1 , its MR would go on decreasing along the segment dM up to the amount Mq_1 and if the firm's output increases even by an infinitesimally small quantity at $q = q_1$, its MR would fall to Nq_1 , and, thereafter, as q increases, MR would decrease along the segment NB.

In other words, there would be no MR value between Mq_1 and Nq_1 , i.e., the dotted segment MN is the discontinuity in the firm's MR curve. We may also say that at the point R on the dR segment of the kinked demand curve, the firm's MR would be Mq_1 and, at the point R on the RD' segment of the demand curve, MR would be Nq_1 .

We may now easily see that the numerical coefficient of elasticity of demand (e_1) at the point R on the demand curve segment dR is different from the coefficient (e_2) at the point R on the demand curve segment RD', and the larger the difference between e_1 and e_2 , the larger would be the length of the discontinuity of the MR curve at the output q_1 .

As we know, at any point R (p_1, q_1) on the firm's demand curve in Fig.12.4, numerical coefficient (e) of price-elasticity of demand is

$$e = \frac{p_1}{q_1} \times \text{reciprocal of the numerical slope at that point on the demand curve}$$

now, the reciprocal of the numerical slope of the demand curve dRd' at the point R on the segment dR > the reciprocal of the numerical slope of the demand curve at the point R on the segment RD'.

Because, the segment dR is more flat than the segment RD', therefore, we have $e_1 > e_2$

Now, MR (= MR_1 , say) at the point R on the segment dR' is

$$MR_1 = Mq_1 = p_1 \left[1 - \frac{1}{e_1} \right]$$

Also, MR (= MR_2 , say) at point R on the segment RD' is

$$MR_2 = Nq_1 = p_1 \left[1 - \frac{1}{e_2} \right]$$

Therefore, from the above two equations, we obtain

$$e_1 > e_2 \Rightarrow 1 - \frac{1}{e_1} > 1 - \frac{1}{e_2} \Rightarrow p_1 \left[1 - \frac{1}{e_1} \right] > p_1 \left[1 - \frac{1}{e_2} \right]$$

$$\Rightarrow MR_1 (=Mq_1) > MR_2 (=Nq_1)$$

That is, at the point of kink, R, on the demand curve dRD', or at $q = q_1$, we have two different values (e_1 and e_2) of e , and that is why at $q = q_1$, we obtain two different values (MR_1 and MR_2) of MR and two different parts of the MR curve. The vertical gap between the two parts of the MR curve at $q = q_1$ is $Mq_1 - Nq_1 = MN$.

It follows from the above discussion that the larger the difference between e_1 , and e_2 , i.e., the more flat the segment dR would be than the segment RD', i.e., the more prominent the kink would be at the point R, the larger would be the value of MR_1 than that of MR_2 and the larger would be the discontinuity in the MR curve at $q = q_1$.

Second, in the model under discussion, the prices of the products are given initially, and a relation between these prices has been established already. The model does not explain how these prices have been determined.

But there is a good chance that the price of the product of a firm would be consistent with its goal of profit maximisation. For example, in Fig. 12.4, the firm's demand curve is dRD' and the associated MR curve is MR_1 – the discontinuity or the vertical gap between the two parts of the MR_1 curve is MN .

Now, if the marginal cost (MC_1) curve of the firm passes through this gap of MN , then the firm's price-output combination $R(p_1, q_1)$ is consistent with profit maximisation although here, at $q = q_1$, we have $MR (= Mq_1) > MC (= Lq_1)$, and not $MR = MC$.

Here we see that at $q < q_1$ $MR > MC$, making the firm increase its output to reach the profit-maximising point. Now, as q increases and becomes equal to q_1 , then also we have $MR > MC$. But if the firm increases q beyond q_1 , MR becomes less than MC ($MR < MC$), i.e., from the production and sale of the marginal unit of its output, the firm now would incur a loss.

Therefore, it would not produce more than q_1 , and its profit would be maximum at $q = q_1$, in spite of the fact that at $q = q_1$, we have $MR > MC$, and not $MR = MC$.

Third, although the assumption (v) of the model regarding the reaction pattern of the rival firms may explain the kink in the firm's demand curve, it cannot explain how the price of the firm's product, or, for that matter, the prices of the rivals' products are determined.

However, the reaction pattern of the rivals, as given by assumption (v), is able to explain why the prices would not tend to change, i.e., why they would be sticky, once they get determined.

For example, if, in Fig. 12.4, the firm's quantity sold increases from q_1 to q_2 , it would not be inclined to change the assumption regarding the reaction pattern of the rivals, for its conception about the rivals' reactions, is, by no means, dependent on its quantity sold.

Therefore, it would regard the increase in quantity sold, or an increase in the demand for its product, as caused by a rightward shift in its demand curve—it would think that its demand curve has shifted to the right from dRD' to $dR'D''$.

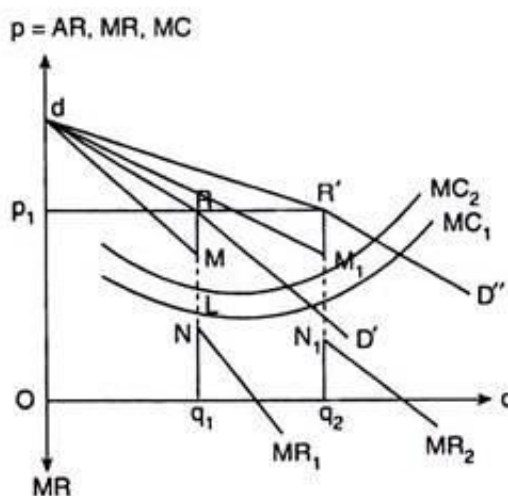


Fig. 12.4

We may note here that although the demand curve has shifted to the right, it has kept the price of its product unchanged, resulting not necessarily in the unfulfilment of its profit maximising goal.

In Fig. 12.4, we have assumed that the two curves, viz., dRD' and $dR'D''$, are iso-elastic, and the MC_1 curve passes also through the discontinuity (M_1N_1) of the MR_2 curve which is the marginal curve for the demand curve $dR'D''$. Therefore, here the firm is able to maximise its profit at the same price $p_1 = R'q_2 = Rq_1$.

Fourth, in the model under discussion, the firm may not have to change the price of its product, even if its cost of production rises. For example, let us suppose that initially the firm's AR and MR curves are dRD' and MR_1 , and the MC curve is the firm's MC curve.

In this case, the firm's profit would be maximised if it sells q_1 of output at the price of p_1 . Now, if the firm's cost position changes resulting in an upward shift in its MC curve from MC_1 to MC_2 , and if the MC_2 curve also, like MC_1 , passes through the discontinuity (MN) of its MR curve, then the firm would not have to change the price of its product in order to earn the maximum profit. It would be able to maximise profit if it, like the previous case, sells of output at the price of p_1 .

If the cost of production rises along with a shift in the demand curve, then also, profit maximisation may not require the firm to change the price of its product. For example, in Fig.12.4, let us suppose that the firm's AR, MR and MC curves are, respectively, dRD' , MR_1 and MC_1 . In this case, the firm's profit-maximising price-output combination would be $R(p_1, q_1)$.

Now, if the firm's MC curve rises to MC_2 along with a rightward shift in its demand curve to $dR'D''$, then also the firm would not be required to change the price of its product if the MC_2 curve passes through both the discontinuities, MN and M_1N_1 , of its dRD' and $dR'D''$ curves.

It would still be able to earn the maximum profit at the price P_1 ; but now its quantity of output produced and sold would be q_2 ; that is, now the firm's price-output combination would be obtained at the point $R'(p_1, q_2)$.

On the basis of the above discussion, we may conclude that in the kinked demand curve model of oligopoly, the firm would not consider it profitable or rational to change the prevailing price of its product because of the assumption (v) relating to the reaction pattern of its rivals.

[This assumption states, that if a particular firm increases the price of its product, its rivals will not increase theirs, but if it reduces the price, they will promptly reduce their prices.] We have seen that, because of these reactions, the demand curve of each oligopolistic firm will be kinked, and the MR curve of this demand curve will have two separate segments, and there will be a vertical gap between them.

However, it is not that the firm's goal of profit maximisation can never be achieved because of the existence of this vertical gap. Even when the firm's demand increases, i.e., its demand curve shifts to the right and/or its MC curve shifts upwards, it is not impossible for it to achieve profit maximisation at the prevailing price.

Therefore, although the kinked demand curve model cannot explain the process

of price determination, it can well explain why the prices are sticky in an oligopolistic market.

Check Your Progress 2

1) Let there be two firms under Cournot's model having market demand curve as $P = 20 - Q$ where Q the total production of the two firms 1 and 2. These firms are assumed to be producing under zero cost of production. Determine:

- i) Reaction curves of the two firms,
- ii) Equilibrium level of output for both the firms
- iii) Equilibrium market price
- iv) Show graphically the Cournot's equilibrium

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2) Let there be two firms which produce output under zero cost of production. The market demand curve is given by $P = 20 - Q$ (Where $Q =$ total output). Calculate output solution for the two firms under Stakelberg's model.

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3) In a duopolist market two firms can produce at a constant average and marginal cost of $AC = MC = 2$. They face the market demand curve $P = 14 - Q$, Where $Q = Q_1 + Q_2$ where Q_1 is the output of Firm 1, Q_2 is the output of Firm 2. In the Cournot's model:

- i) Find action-reaction functions of the two firms.
- ii) Calculate the profit maximising equilibrium price and output.
- iii) What are the profits of the two firms?
- iv) Compare it with competitive equilibrium.

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4) Assume three firms face identical marginal costs of 20 with fixed costs of 10. They face a market demand curve of $P = 200 - 2Q$. Find the Cournot equilibrium price and quantity.

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5) What do you mean by kink in demand curve?

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12.3 CO-OPERATIVE VS. NON-COOPERATIVE BEHAVIOUR

12.3.1 Co-operative Behaviour and Prisoner’s Dilemma

Co-operative behaviour in oligopoly is a situation when firms jointly decide the prices and output and maximise their joint profit. This situation is called collusion. In this situation it becomes profitable for one firm if it defects and undercuts the prices and raises output, as long as others do not do so. Non-cooperative behaviour is a situation when they do not co-operate and decides their prices and output separately and compete with each other. When firms in oligopoly do not co-operate it is called non-cooperative equilibrium or Nash equilibrium (Named after US mathematician John Nash).

In oligopoly, the basic dilemma the firms face is whether to co-operate or to compete. If they co-operate, profit will be maximum and if they do not, profit for all will decrease. Now we will see the behaviour of an oligopolistic firm through an example of game theory. Game theory is the study of decision making in situations where strategic interaction (moves and countermoves) between rival firms occurs. We will assume a case of only two firms in the market, called Duopoly. The case is as follow:

The Oligopolist’s dilemma: to co-operate or to compete.

Table 12.1

		Firm A’s Output			
		One-half Monopoly output		Two-third Monopoly output	
Firm B’s Output	One-half Monopoly output	20	20	15	22
	Two-third Monopoly output	22	15	17	17

The figure above explains the dilemma faced by oligopolists of whether to co-operate or to compete. It is called Payoff Matrix for a two Firm duopoly game. The right side figures on each cell shows the profits of Firm A and left side figures on each cell show the profits of Firm B (in Rs. Crores). It can be explained that if the two firms co-operate and produce one half of market share each will earn Rs. 20 crores of profit. In case of co-operation they can maximise their profits. If Firm A defects and produces two thirds of output and Firm B produces half of monopoly output then Firm A will earn Rs. 22 crores and Firm B Rs. 15 crores. Similarly if Firm B defects and produces two-third and Firm A produces one-half then Firm B will earn Rs. 22 crores and Firm A will earn only Rs. 15 crores. If both decide to compete and produce two-third

of monopoly output each then profits for both will fall to Rs. 17 crores. This type of game, where they reach a non-cooperative solution when they could co-operate, is called Prisoner's Dilemma. Prisoner's Dilemma is shown below:

Table 12.2 : The Prisoner's Dilemma

Mr. Shyam	Mr. Ram		
		Confess	Not confess
	Confess	6	09
	Not confess	9	1

Two prisoners Mr. Ram and Mr. Shyam are arrested for committing a crime and interrogated separately. They are told the following:

- a) If both are claimed to be innocent, they will get a light sentence that is 1 year in jail.
- b) If one confesses and the other does not, then who confesses will be released free and the other will be punished for 9 year in jail, and
- c) If both confess, then both of them will get a punishment of 6 years in jail.

The payoff matrix presented in Table 12.2 shows the dilemma of the prisoners about whether to confess or not to confess. If none of them confess then both will get 1 year of jail, but if Ram confesses and Shyam does not then Ram will be left free and Shyam will get 9 year of imprisonment and the vice-versa. And if both of them confess then both will get 6 years of imprisonment. Not confessing is the best solution in this game (Pareto efficient solution) but this leaves one always in uncertainty. This solution is not a stable solution as one gets an imprisonment of 9 years if he/she does not confess and the other does. Therefore, confession dominates in the mind of both the prisoners. If both of them confess then they end up with 6 years jail for both. This kind of equilibrium is called Nash equilibrium. From both the figures above it is clear that if they co-operate then they will earn the maximum profit than if they compete.

12.3.2 Types of Co-Operative Behaviour

In order to avoid uncertainty arising out of interdependence and to avoid price war and cut throat competition, firms under oligopoly often enter into some agreement about determining uniform price and output. The agreement can be of the following two types.

- **Explicit Collusion:** It is situation when firms under oligopoly do formal (explicit) agreement to determine uniform price and output and maximise their joint profit. Such an agreement at international level is called Cartel, Many such agreements have taken place in the past. The best example of cartel is that of OPEC – Organisation of Petroleum Exporting Countries. Saudi Arabia and other countries after 1973 formed this cartel. An individual firm always has incentive to cheat. Possibility of cheating is larger if number of firms is large. Cheating by a small firm has negligible effect on the market price.
- **Tacit Co-operation:** When firms co-operate without any explicit agreement it is called tacit co-operation. For example in Table 12.1, if

Firm A produces one-half of monopoly output hoping that Firm B will do the same and Firm B does so then they achieve the co-operative equilibrium without any formal agreement.

12.3.3 Types of Non-Cooperative Behaviour

In the absence of formal or informal agreements about co-operation, firms under oligopoly compete with each other. Non-Cooperative or Competitive behaviour under oligopoly can be of following types.

Competition for Market Share: Firms under oligopoly always compete with each other for market share. They use various forms of non-price competition such as advertising, quality products etc. to increase their market share. For example in Delhi major mobile service providers like Airtel, Hutch and Idea compete for increase their mobile connections.

Covert Cheating: In oligopoly, because of huge market share, firms sell their products through contract. Large scale production and distribution is done through contracts. When firms provide secret discounts and rebates to their buyers to increase sales it is called covert cheating.

Contestable Markets and Potential Entry: Theory of contestable markets explains that in the long-run, abnormal profits earned by oligopolists can be eliminated without actual entry. Potential entry can also affect the market as much as an actual entry does. It is possible only when the following two conditions are fulfilled:

- 1) **Entry must be easy to accomplish:** There should not exist any barriers to entry, either natural or firm created.
- 2) **The existing firms must consider potential entry while making price and output decisions:** The existing firms must react when new firms try to enter into the market. They must cut their prices and sacrifice profits (short run) to restrict the new entrants.

Contestable markets always expect potential entry because of huge profits earned by the existing firms in the market. But entry to such markets is too costly. Fixed costs are very high. To develop, design, and sale a new product in such a market involve huge sunk cost. Sunk costs are those costs which cannot be recovered if a firm leaves the market soon. Firms which produce multiple and differentiated products can easily distribute these costs among those many products. For new firms, producing huge number of differentiated products is not easy. Therefore, these costs are very high for a firm which produces single product in the market.

If a new firm can enter and leave the market without any sunk costs of entry, such markets are called perfectly contestable markets. A market can be perfectly contestable, even if, firms have to pay some costs of entry if these costs are recovered when firms leave the market. If the sunk costs are lower, the market will be more contestable and vice-versa.

Sunk costs of entry constitute entry barriers. Higher the sunk costs, larger will be profits earned by the existing firms. If the firms operate in the market without large sunk costs of entry, then they will not earn large profits. As part of strategy, existing firms keep their prices as low as that can only cover the total costs. If they charge high prices and earn abnormal profits, the new firms will enter and may capture the profits. Contestability forces the existing firms to keep the prices low. The threat of entry into a market is as effective as actual entry to limit profiteering by existing firms.

12.4 CARTEL THEORY OF OLIGOPOLY

A cartel is defined as a group of firms that gets together to make output and price decisions. The conditions that give rise to an oligopolistic market are also conducive to the formation of a cartel. In particular, cartels tend to arise in markets where there are few firms and each firm has a significant share of the market. In the U.S., cartels are illegal; however, internationally, there are no restrictions on cartel formation. The Organisation of Petroleum Exporting Countries (OPEC) is perhaps the best known example of an international cartel. OPEC members meet regularly to decide how much oil each member of the cartel will be allowed to produce.

Oligopolistic firms join a cartel to increase their market power. Members of the cartel work together to determine jointly the level of output that each member will produce and/or the price that each member will charge. By working together, the cartel members are able to behave like a monopolist. For example, if each firm in an oligopoly sells an undifferentiated product like oil, the demand curve that each firm faces will be horizontal at the market price. If, however, the oil producing firms form a cartel like OPEC to determine their output and price, they will jointly face a downward sloping market demand curve, just like a monopolist. In fact, the cartel's profit maximising decision is the same as that of a monopolist. The cartel members choose their combined output at the level where their combined marginal revenue equals their combined marginal cost. The cartel price is determined by market demand curve at the level of output chosen by the cartel. The cartel's profits are equal to the area of the rectangular box labelled *abcd* in Fig. 12.5. Note that a cartel, like a monopolist, will choose to produce less output and charge a higher price than would be found in a perfectly competitive market.

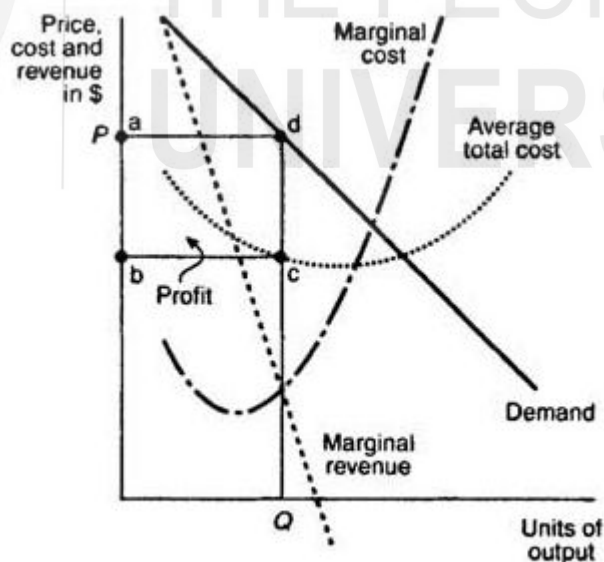


Fig. 12.5

Once established, cartels are difficult to maintain. The problem is that cartel members will be tempted to cheat on their agreement to limit production. By producing more output than it has agreed to produce, a cartel member can increase its share of profits. Hence, there is a built in incentive for each cartel member to cheat. Of course, if all members cheated, the cartel would cease to

earn monopoly profits, and there would no longer be any incentive for firms to remain in the cartel. The cheating problem has plagued the OPEC cartel as well as other cartels and perhaps explains why so few cartels exist.

Check Your Progress 3

1) Explain the prisoner’s Dilemma in oligopoly market.

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2) State the types of Non-cooperative behaviour under oligopoly.

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3) What do you mean by Cartel?

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12.5 LET US SUM UP

Oligopoly is the most prevailing form of markets. It is defined as a market structure in which there are a few sellers of the homogeneous or differentiated products. Oligopoly can be pure or differentiated. Characteristics of Oligopoly are: Few dominant firms, Mutual interdependence, Barriers to entry, Homogeneous or differentiated products. Factors causing oligopoly are: Huge capital investment, Absolute cost advantage to the existing firm, Product differentiation, Economies of large scale production, Mergers.

Price and Output determination in oligopoly is different from other three forms of market structure. Since there are few rival firms and there is mutual interdependence, the price and output policy of a firm will affect the price and quality sold by other firms. There is no general theory under oligopoly. Price and output indeterminateness is an essential feature of oligopoly.

Among models of Non-Collusive Oligopoly, Cournot’s Duopoly Model states that firms attain Nash equilibrium. In equilibrium each firm is doing the best it can given its competitor’s behaviour. It is based on the assumption that each firm is attempting to maximise its total profits assuming that other firm holds its output constant.

Stackelberg’s Duopoly Model is ‘First Mover Advantage’ Model as an alternative explanation of oligopolistic behaviour. In this model, one firm sets its output before other firms do. In this model, neither firm has an opportunity to react. The leader firm produces more output and earns more profit than the other firm. Sweezy’s ‘Kinked demand’ Curve Model explains price rigidity in an oligopoly market by postulating that oligopolist’s will match price decrease but not price increases.

12.6 REFERENCES

- 1) Dr Deepashree (2016), *Introductory Micro Economics*, Mayur Paperbacks, Chapter on Theory of Market structure.

<http://www.economicdiscussion.net>
- 2) Varian, Hal (1999), *Intermediate Microeconomics*, W.W Norton & Co, New York, Chapter 24 & 25, page no. 415-455.

12.7 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

- 1) Read Sub-section 12.1.1 and answer
- 2) Read Sub-section 12.1.2 and answer
- 3) (D)

Check Your Progress 2

- 1)
 - i) Reaction curve for Firm 1: $Q_1 = 10 - \frac{1}{2}Q_2$
Reaction curve for Firm 2: $Q_2 = 10 - \frac{1}{2}Q_1$
 - ii) The equilibrium level of output for both the Firms: $Q = Q_1 + Q_2$
 $= 6.67 + 6.67 = 13.34$
 - iii) Equilibrium market price P is: $P = 6.66$
- 2) Let Firm 1 set its output first (i.e., be a leader) and Firm 2 be a follower which makes its output decision after studying Firm 1's output and assuming that Firm 1's output as fixed. Cournot's reaction curve of Firm 2 will decide Firm 2's profit maximising output.

The calculation of Firm 2's profit maximising output is as follows:

$$MR_2 = MC$$

$$\frac{\Delta R_2}{\Delta Q_2} = 0$$

Or

...(MC is zero is given)

R_2 (total revenue) is calculated as:

$$\begin{aligned} R_2 &= P \cdot Q_2 = (20 - Q) Q_2 \\ &= 20 Q_2 - (Q_1 + Q_2) Q_2 \\ &= 20Q_2 - Q_1Q_2 - Q_2^2 \end{aligned}$$

$$MR_2 = \frac{\Delta R_2}{\Delta Q_2} = 20 - Q_1 - 2Q_2$$

Putting $MR_2 = 0$, and solving for P_2 we get:

$$\begin{aligned} 2Q_2 &= 20 - Q_1 \\ Q_2 &= 10 - \frac{1}{2} Q_1 \end{aligned} \quad (1)$$

This is Firm 2's reaction curve.

The calculation of Firm 1's profit maximising output is as follows:

$$\begin{aligned} MR_1 &= MC \\ R_1 = P \cdot Q_1 &= (20 - Q) Q_1 = [20 - (Q_1 + Q_2)] Q_1 \\ &= 20Q_1 - Q_1^2 - Q_1 Q_2 \end{aligned} \quad (2)$$

It is clear from the above equation that total revenue earned by Firm 1 depends upon output of Firm 2. Firm 2 will choose Q_2 according to its reaction curve $Q_2 = 10 - \frac{1}{2} Q_1$.

Substituting (1) in (2) we get:

$$\begin{aligned} R_1 &= 20 Q_1 - Q_1^2 - Q_1 (10 - \frac{1}{2} Q_1) \\ &= 20Q_1 - Q_1^2 - 10Q_1 + \frac{1}{2} Q_1^2 \\ &= 10Q_1 - \frac{1}{2} Q_1^2 \\ MR_1 = \frac{\Delta R_1}{\Delta Q_1} &= 10 - Q_1 \\ \therefore MR_1 = MC = 0 &\text{ gives } Q_1 = 10 \end{aligned} \quad (3)$$

Substituting (3) in (1), we get:

$$\begin{aligned} Q_2 &= 10 - \frac{1}{2} \cdot 10 \\ Q_2 &= 5 \end{aligned} \quad (4)$$

Thus, under the Stackelberg Model, profit maximum output of Firm 1 is 10 and of Firm 2 is 5. Firm 1 produces twice as much as Firm 2.

3) i) Given that the duopolists faces the following market demand curve:

$$\begin{aligned} P &= 14 - Q \\ \therefore Q &= Q_1 + Q_2 \\ \Rightarrow P &= 14 - (Q_1 + Q_2) \end{aligned}$$

Both the firms have

$$AC = MC = 2$$

Case 1:

Reaction Curve for Firm 1

Total revenue R_1 is given by

$$\begin{aligned} R_1 &= PQ_1 = [14 - (Q_1 + Q_2)] Q_1 \\ \Rightarrow R_1 &= 14Q_1 - Q_1^2 - Q_1 Q_2 \end{aligned}$$

Market Structure

Marginal revenue, MR_1 is just the incremental revenue ΔR_1 resulting from an incremental change in output ΔQ_1 .

$$MR_1 = \frac{\Delta R_1}{\Delta Q_1} = 14 - 2Q_1 - Q_2$$

$$MR_1 = MC \dots \dots \dots \text{in equilibrium}$$

$$\therefore 2 = 14 - 2Q_1 - Q_2$$

$$\Rightarrow Q_1 = \frac{1}{2}(12 - Q_2) \quad \text{Reaction curve of Firm 1}$$

Similarly,

$$\text{Reaction curve for Firm 2 will be: } Q_2 = \frac{1}{2}(12 - Q_1)$$

i) Cournot's Output is:

$$Q_2 = \frac{1}{2} \left[12 - \frac{1}{2}(12 - Q_2) \right]$$

$$Q_2 = \frac{1}{2} \left[12 - 6 + \frac{1}{2} Q_2 \right]$$

$$2Q_2 = \frac{1}{2} - 6 + \frac{1}{2} Q_2$$

$$2Q_2 - \frac{1}{2} Q_2 = 6$$

$$\frac{3Q_2}{2} = 6$$

$$Q_2 = \frac{6 \times 2}{3} = 4$$

and $Q_1 = 4$

Cournot's price is:

$$P = 14 - (Q_1 + Q_2)$$

$$P = 14 - (4 + 4)$$

$$P = 14 - 8$$

$$P = 6$$

ii) Profit of Firm 1 and Firm 2 is:

$$\pi = R_1 - C_1$$

$$= PQ_1 - AC \times Q_1$$

$$= 6 \times 4 - 2 \times 4$$

iii) Comparison of output under perfect competition and Duopoly:

Under Perfect Competition:

$$P = MC$$

$$14 - Q = 2$$

$$Q = 14 - 2$$

$$\therefore Q = 12$$

4) $R_1 = (200 - 2(Q_1 + Q_2 + Q_3))Q_1$
 $MR_1 = 200 - 4Q_1 - 2Q_2 - 2Q_3$

Applying $MR = MC$:

$$Q_1 = 45 - Q_2/2 - Q_3/2$$

By symmetry:

$$Q_1 = Q_2 = Q_3 = 22.5$$

5) Read Sub-section 12.2.3.1 and answer

Check Your Progress 3

- 1) Read Sub-section 12.3.1 and answer
- 2) Read Sub-section 12.3.3 and answer
- 3) Read Section 12.4 and answer



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GLOSSARY

- Average Product** : Total product divided by the number of units of the input used is average product
- Accounting Cost** : Accounting cost refers to actual expenses of the firm plus depreciation charges for capital equipment.
- Allocative Efficiency** : Producing goods and services demanded by consumers at a price that reflect the marginal cost of supply.
- Abnormal Profit** : Profit in excess of normal profit - also known as supernormal profit or monopoly profit. Abnormal profits may be maintained in a monopolistic market in the long run because of barriers to entry.
- Adverse Selection** : When one party to a deal is making suboptimal choice because of asymmetry in information.
- Barter** : Exchange of goods/services against other goods/services.
- Budget Line** : The Budget Line, also called as Budget Constraint shows all the combinations of two commodities that a consumer can afford at given market prices and within the particular income level.
- Comforts** : Goods which are used for increasing our productive capacity and for making our lives more comfortable.
- Consumption** : Using up of Utility of goods in the satisfaction of a want.
- Change in Demand** : Shift of the entire demand of curve.
- Change in Quantity Demanded** : Movement on a demand curve itself caused by a changes in the price of the commodity in question.
- Contraction in Supply** : The decrease in quantity supplied because of a fall in the price of the commodity.
- Curvilinear Supply Curve** : The supply curve which is not a straight line.
- Cardinal Utility** : The **Cardinal Utility** approach is propounded by neo-classical economists, who believe that utility is measurable, and the customer can express his satisfaction in cardinal or quantitative numbers, such as 1, 2, 3 and so on.

Consumer Equilibrium	: The point at which a consumer reaches optimum utility, or satisfaction, from the goods and services purchased, given the constraints of income and prices.
Constant Returns to Scale	: Constant returns to scale implies that when all inputs are increased in a given proportion, output increases in the same proportion.
Complementary Commodity	: It is the commodity whose demand is directly related to the demand of the commodity in question.
Collusive Behaviour	: In collusive oligopoly industry contains few producers wherein producers agree among one another as to pricing of output and allocation of output among themselves. Cartels, such as OPEC, are collusive oligopolies.
Cournot Model	: The Cournot model of oligopoly assumes that rival firms produce a homogenous product, and each attempts to maximise profits by choosing how much to produce. All firms choose output (quantity) simultaneously.
Cartel	: An association of manufacturers or suppliers with the purpose of maintaining prices at a high level and restricting competition.
Common Resources	: These are resources where there are many users but no owner.
Demand	: The amount of goods which the buyers are ready to buy, per period of time, at a given price per unit.
Dependent Variable	: A variable which changes only with the change in the independent variable.
Decrease in Supply	: The decrease in quantity supplied at a given price of the commodity.
Diminishing Returns to Scale	: Diminishing returns to scale refers to the case when output grows proportionally less than input.
Derived Demand	: Refers to demand for factors of production as their demand is derived from the demand for goods and services.
Economic Laws	: Statements of tendencies. They depict the standardised or generalised response of economic units to different forces and stimuli.
Exchange Value	: The price which an item commands in the market.

- Elasticity of Demand** : It quantifies the strength relationship between the quantity demanded of commodity and the price of the commodity or income of the consumer or price of another commodity which is related to the commodity in question.
- Elasticity of Supply** : The responsiveness of quantity supplied to a given percentage change in the price of the commodity.
- Extension in Supply** : The rise in quantity supplied due to a rise in the price of the commodity.
- External Economies** : When a firm enters production, it obtains a number of economies for which the firm's own strategies/policies are not responsible. These are economies external to the firm.
- External Diseconomies** : When the scale of operations is expanded, many such diseconomies accrue that have no particular ill-effect on the firm itself but their burden falls on the other firms. These are known as external diseconomies.
- Explicit cost** : Explicit costs arise from transaction between the firm and other parties in which the former purchases inputs or services for carrying out production.
- Economic Profit** : A firm's revenues less its economic cost.
- Economic Cost** : The economic cost includes the accounting cost and the opportunity cost of the factor of production in its next best alternative use.
- Excess Capacity** : **Excess capacity** is a situation in which actual production is less than what is achievable or optimal for a firm. This often means that the demand for the product is below what the business could potentially supply to the market.
- Economic Rent** : Refers to payment for the use of something which is fixed in supply.
- Externalities** : Externalities occur in an economy when the production or consumption of a specific good impacts a third party that is not directly related to the production or consumption.
- Efficient Allocation of Resources** : That combination of inputs, outputs and distribution of inputs, outputs such that any change in the economy can make someone better off (as measured by indifference curve map) only by making someone worse off (Pareto efficiency).

Flow Variable	: A variable which can be measured only with reference to a period of time.
Free Rider	: It means one person is using the benefits of a good without paying anything for it.
Goods	: Items which have a utility or can be used for the production of other goods or services
Giffen Good	: A commodity in which there is a direct relationship between the price of a commodity and its quantity demanded.
Historical Cost	: Historical cost is the cost that was actually incurred at the time of purchase of an asset.
Inductive Reasoning	: The technique of analysis in which factual information is used to discover the behaviour pattern of different economic units in response to various forces and stimuli.
Inferior Commodity (Good)	: A commodity in which there is an inverse relationship between the income of the consumer and quantity demanded of a commodity.
Income Effect	: It shows the effect of a change in income of the consumer on the quantity demanded of a commodity.
Income Elasticity of Demand	: It is the responsiveness of demand to a given proportional change in the income of the consumer.
Inequalities of Income	: The distribution of income among different income groups of an economy.
Increase in Supply	: The rise in quantity supplied at a given price of the commodity.
Income effect	: A change in the demand of a good or service, induced by a change in the consumers' real income. Any increase or decrease in price correspondingly decreases or increases consumers' real income which, in turn, causes a lower or higher demand for the same or some other good or service.
Isocost Line	: An isocost line represents various combinations of inputs that may be purchased for a given amount of expenditure.
Isoquant	: An isoquant is the of all the combination of two factrors of production that yield the same level of output.
Increasing Returns to Scale	: Increasing returns to scale refer to the case when output grows proportionally more than inputs.

- Internal Economies** : Those economies that accrue to a firm on expansion of its own size are known as internal economies.
- Internal Diseconomies** : When the scale of production is continuously expanded, a point is reached where the increase in production becomes less than proportionate to the increase in the factors of production. As this point, internal diseconomies set in.
- Implicit Cost** : Implicit costs are the costs associated with the use of firm's own resources. Since these resources will bring returns if employed elsewhere, their imputed values constitute the implicit costs.
- Incremental Cost** : An incremental cost is the increase in total costs resulting from an increase in production or other activity.
- Interest** : Refers to payment for the use of capital. Interest is paid for man-made goods which are used for production of goods and services.
- Imperfect Information** : Imperfect information is a situation in which the parties to a transaction have different information, as when the seller of a used car has more information about its quality than the buyer. In other words, a situation when information about the goods and services available to buyers' and sellers are not symmetric.
- Indifference Curve or Utility Frontier** : An indifference curve represents a series of combinations between two different economic goods, between which an individual would be theoretically indifferent regardless of which combination he received.
- Isoquants** : The isoquant curve is a graph that charts all input combinations that produce a specified level of output.
- Imperfect Competition** : Imperfect competition exists whenever a market, hypothetical or real, violates the abstract tenets of neoclassical pure or perfect competition
- Law of Supply** : It shows the direct relationship between the price of a commodity and its quantity supplied, other factors influencing supply (except price of the commodity) remaining constant.
- Law of Diminishing Returns** : As more units of an input are used per unit of time with fixed amounts of another input, the marginal product of the variable input declines after a point.

Linear Homogeneous Production Function	: When output increases in the same proportion in which inputs are increased, the production function is linear homogeneous. For example, if labour and capital are increased λ by times and, as a result, output also increases by λ times, the production function is linear homogeneous.
Long Run	: The time period when all inputs including plant capacity are variable.
Labour Union	: A recognised organisation of workers that seeks protection of their rights.
Merit Goods	: The goods whose consumption is believed to be desirable for the benefit of the society and the consuming individuals.
Macroeconomics	: Branch of economic analysis that focuses on the workings of the whole economy or large sectors of it.
Margin	: The value of the variable under consideration related to the last unit of an item.
Marginal Utility	: The additional or extra satisfaction yielded from consuming one additional unit of a commodity.
Microeconomics	: Branch of economic analysis that focuses on individual economic units or their small groups and micro-variables like individual prices of individual commodities, etc.
Money Exchange	: Sale of goods/services against money.
Monopolist	: A producer who controls the whole supply of a commodity.
Marginal utility	: Marginal utility is the additional satisfaction a consumer gains from consuming one more unit of a good or service. Marginal utility is an important economic concept because economists use it to determine how much of an item a consumer will buy.
Marginal Product	: Marginal product of an input is defined as the change in total output due to a unit change in the amount of an input while quantities of other inputs are held constant.
Marginal Rate of Technical Substitution ($MRTS_{L,K}$)	: Marginal rate of technical substitution of factor L for factor K ($MRTS_{L,K}$) is the quantity of K that is to be reduced on increasing the quantity of L by one unit for keeping the output level unchanged.
Monopoly	: A firm that is the sole seller of a product without close substitutes.

Monopolistic Competition	: There are a large number of firms that produce differentiated products which are close substitutes to each other. In other words, large sellers sell the products that are similar, but not identical and compete with each other on other factors besides price.
MRP	: Marginal revenue product i.e. Marginal revenue times the marginal product of factor.
Marginal Physical Product	: Change in quantity produced as one additional unit of the variable factor keeping all other factors constant.
Marginal Revenue Product	: Marginal physical product multiplied by marginal revenue.
Minimum Wage Act	: Government law which fixes the minimum level of wages payable.
Marginal Rate of Substitution	: The marginal rate of substitution is the amount of a good that a consumer is willing to give up for another good, as long as the new combination of the two goods is equally satisfying. It's used in indifference theory to analyse consumer behaviour.
Marginal Rate of Technical Substitution	: The marginal rate of transformation or technical substitution is the rate at which one good must be sacrificed in order to produce a single extra unit (or marginal unit) of another good, assuming that both goods require the same scarce inputs. The marginal rate of transformation is tied to the production possibilities frontier (PPF), which displays the output potential for two goods using the same resources.
Market Imperfection	: Conditions in market which are not conducive to perfect competition.
Moral Hazard	: Deliberate concealment of some information from the other party.
Market Failure	: It refers to failure of market mechanism to achieve efficient allocation of resources in the economy.
Necessities	: Goods which are used for satisfying basic of existence.
Normative Economics	: That part of economic analysis which is concerned with what ought to be, and the way it can be achieved by changing the existing situation.
Normal Profits	: Normal Profit is an economic condition occurring when the difference between a firm's total revenue and total cost is equal to zero.

Simply, normal profit is the minimum level of profit needed for a company to remain competitive in the market.

Non Collusive Behaviour

: Oligopoly is best defined by the actual conduct (or behaviour) of firms within a market. The concentration ratio measures the extent to which a market or industry is dominated by a few leading firms. When these firms agree to behave in a particular manner it is said to be collusive behaviour of oligopoly market.

Non-exclusion

: It means that we cannot exclude non-payers from consuming it.

Non-rival

: It means that when person consume a good, it will not diminish other person's share.

Ordinal Utility

: The Ordinal Utility approach is based on the fact that the utility of a commodity cannot be measured in absolute quantity. However, it will be possible for a consumer to tell subjectively whether the commodity gives more or less or equal satisfaction when compared to another.

Optimality

: The point where maximum possible output is being achieved given the use of different factors of production.

Oligopoly

A state of limited competition, in which a market is shared by a small number of big producers or sellers.

Optimal Output Mix

: The optimal mix of output is known in economics as the most desirable combination of output attainable with available resources, technology, and social values.

Private Goods

: Goods whose availability can be restricted to selected users. It is divisible in that sense.

Production Possibility Curve

: A graphic representation of the combinations of maximum amounts of goods X and Y which can be produced with the given productive resources of the economy and under certain other simplifying assumptions.

Public Goods

: Goods or services whose availability cannot be restricted to selected users only. The benefits of the goods are indivisible and people cannot be excluded.

Positive Economics

: That part of economic reasoning which covers what is, without going into its desirability or otherwise, and without suggesting ways for changing the existing state of affairs.

- Price Effect** : The impact that a change in its price has on the consumer demand for a product or service in the market. The price effect can also refer to the impact that an event has on something's price. The price effect is a resultant effect of the substitution effect and the income effect.
- Point of Inflexion** : The point where total product stops increasing at an increasing rate and begins increasing at a decreasing rate is called the point of inflexion.
- Production Function** : The technical law which expresses the relationship between factor inputs and output is termed production function.
- Perfectly Competitive Market** : A market is perfectly competitive if it consists of many consumers and firms, none of whom have any appreciable market share, all firms produce identical products, and there are no barriers to entry or exit, and consumers have perfect information about prices.
- Price Discrimination** : When a firm charges different prices to different groups of consumers for an identical good or service, for reasons not associated with costs, it is termed as price discrimination.
- Product Differentiation** : The marketing of generally similar products with minor variations that are used by consumers while making a choice.
- Prisoner's Dilemma** : A situation in which two players each have two options whose outcome depends crucially on the simultaneous choice made by the other, often formulated in terms of two prisoners separately deciding whether to confess to a crime.
- Profits** : Are returns to entrepreneurs for use of their organisation and management skills in the production process, as well as bearing risks.
- Productive Efficiency** : Production efficiency is an economic level at which the economy can no longer produce additional amounts of a good without lowering the production level of another product. This happens when an economy is operating along its production possibility frontier.
- Production Possibility Curve** : A graphical representation of the alternative combinations of the amounts of two goods or services that an economy can produce by transferring resources from one good or service to the other. This curve helps in determining what quantity of a nonessential good or a service an economy can afford to produce without jeopardising the required production of an essential good or service.

Public Goods	: A public good is a product that one individual can consume without reducing its availability to another individual, and from which no one is excluded. Economists refer to public goods as “non-rivalrous” and “non-excludable.”
Price Ratio or Relative Price	: Price of a commodity as it compares to another. The relative price is usually presented as a ratio between the two prices.
Public Interventions	: Actions of the government in the markets for goods, services and factors.
Public Provision	: Direct supply of certain socially desirable services /goods by the government authorities/agencies to the end users.
Price Ceiling	: It occurs when the government puts a legal limit on how high the price of a product can be.
Quasi-Rent	: Return to a factor of production over and above its average cost; it is a short-run concept.
Rectangular Hyperbola	: It is a curve in which every rectangle drawn with one corner on the curve has the same area.
Ridge Lines	: The lines forming the boundaries of the economic region of production are known as the ridge lines.
Replacement Cost	: Replacement cost is the cost that will have to be incurred now to replace that asset (i.e., the replacement cost is the current cost of the new asset of the same type).
Rent	: Refers to payment for the use of land. Land refers to all natural resources available for the purpose of production.
Stock Variable	: A variable which can be measured only with reference to a point of time.
Supply	: The quantity of goods which the sellers are ready to sell, per unit of time, at a given price per unit.
Substitution Effect	: It shows how with a change in the price of a commodity, prices of other commodities remaining unchanged, a consumer substitutes one commodity for the other.
Substitute Commodity	: It is the commodity whose demand is inversely related to the demand of the commodity in question.
Supply Schedule	: A table having two columns, one showing different prices of the commodity and the other showing quantities supplied during a given period at each of these prices.

- Supply Curve** : A curve showing the relationship between price of a commodity and its quantity supplied during a given period, other factors influencing supply remaining unchanged.
- Substitution Effect** : An effect caused by a rise in price that induces a consumer (whose income has remained the same) to buy more of a relatively lower-priced good and less of a higher-priced one.
- Sub-optimality** : It is a point where optimality has not been achieved, i.e. output is less than the possible maximum given the use of the resources.
- Sunk Cost** : Sunk cost is a cost that has already been incurred and can't be recovered.
- Short Run** : The time period when at least one of the inputs (size of the plant) is fixed.
- Supernormal Profit** : A firm earns supernormal profit when its profit is above that required to keep its resources in their present use in the long run i.e. when price > average cost.
- Stackelberg Model** : The Stackelberg leadership model is a strategic game in economics in which the leader firm moves first and then the follower firms move sequentially. ... There are some further constraints upon the sustaining of a Stackelberg equilibrium.
- Technology** : The method employed to produce a commodity or service.
- Total Utility** : The total satisfaction derived from all the units of an item.
- Transfer Earnings** : Minimum payment to be made to a factor of production to retain it in present employment. It refers to the earnings in the next best employment.
- Use Value** : Utility of goods
- Utility** : The want satisfying capacity of goods. It is the service or satisfaction an item yields to the consumer
- VMP** : Value of Marginal Product, i.e. price times the marginal product of factor.
- Wages** : Refers to payment for the use of labour which refers to the human effort made for production of goods and services through technical expertise or manual labour.

SOME USEFUL BOOKS

- 1) Kautsoyiannis, A. (1979), *Modern Micro Economics*, London: Macmillan.
- 2) Lipsey, RG (1979), *An Introduction to Positive Economics*, English Language Book Society.
- 3) Pindyck, Robert S. and Daniel Rubinfeld, and Prem L. Mehta (2006), *Micro Economics*, An imprint of Pearson Education.
- 4) Case, Karl E. and Ray C. Fair (2015), *Principles of Economics*, Pearson Education, New Delhi.
- 5) Stiglitz, J.E. and Carl E. Walsh (2014), *Economics*, viva Books, New Delhi.



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