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M.A. [Economics]

II - Semester

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MICROECONOMICS - II

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SYLLABI-BOOK MAPPING TABLE

Microeconomics - II

Syllabi	Mapping in Book
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BLOCK III: PRICING, BREAK-EVEN ANALYSIS, PROFIT AND GAME THEORY

INTRODUCTION

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Microeconomics is that branch of economics that studies the behaviour of individuals and firms in making decisions regarding the allocation of scarce resources and the interactions among these individuals and firms. In microeconomics, the following theories are dealt with:

Demand theory deals with consumers' behaviour. It answers such questions as: How do the consumers decide whether or not to buy a commodity? How do they decide on the quantity of a commodity to be purchased? When do they stop consuming a commodity? How do the consumers behave when price of the commodity, their income and tastes and fashions, etc., change? At what level of demand, does changing price become inconsequential in terms of total revenue? The knowledge of demand theory can, therefore, be helpful in making the choice of commodities, finding the optimum level of production and in determining the price of the product. Production theory explains the relationship between inputs and output. It also explains under what conditions costs increase or decrease; how total output behaves when units of one factor (input) are increased keeping other factors constant, or when all factors are simultaneously increased; how can output be maximized from a given quantity of resources; and how can the optimum size of output be determined? Production theory, thus, helps in determining the size of the firm, size of the total output and the amount of capital and labour to be employed, given the objective of the firm.

Price theory explains how price is determined under different kinds of market conditions; when price discrimination is desirable, feasible and profitable; and to what extent advertising can be helpful in expanding sales in a competitive market. Thus, price theory can be helpful in determining the price policy of the firm. Price and production theories together, in fact, help in determining the optimum size of the firm. Profit making is the most common objective of all business undertakings. But, making a satisfactory profit is not always guaranteed because a firm has to carry out its activities under conditions of uncertainty with regard to: (*i*) demand for the product, (*ii*) input prices in the factor market, (*iii*) nature and degree of competition in the product market, and (*iv*) price behaviour under changing conditions in the product market, etc. Therefore, an element of risk is always there even if the most efficient techniques are used for predicting the future and even if business activities are meticulously planned. The firms are, therefore, supposed to safeguard their interest and avert or minimize the possibilities of risk. Profit theory guides firms in the measurement and management of profit, in making allowances for the risk premium, in calculating the pure return on capital and pure profit and also for future profit planning.

This book, *Microeconomics II*, is divided into fourteen units that follow the self-instruction mode with each unit beginning with an Introduction to the unit, followed by an outline of the Objectives. The detailed content is then presented in a simple but structured manner interspersed with Check Your Progress Questions to test the student's understanding of the topic. A Summary along with a list of Key Words and a set of Self-Assessment Questions and Exercises is also provided at the end of each unit for recapitulation.

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BLOCK - I
THEORIES OF DEMAND, FIRM, RENT AND DISTRIBUTION

UNIT 1 DEMAND ANALYSIS

Structure

1.0 INTRODUCTION

Utility is a psychological phenomenon. It is a feeling of satisfaction, pleasure or happiness. Is utility measurable quantitatively? Measurability of utility has been a contentious issue. The classical economists, viz., Jeremy Bentham, Leon Walrus, Carl Menger, etc. and the neo-classical economist, notably Alfred Marshall, believed that utility is cardinally or quantitatively measurable like height, weight, length, temperature and air pressure. This belief resulted in the *Cardinal Utility* concept. On the other hand, the modern economists, most notably J. R. Hicks and R. G. D. Allen, however, hold the view that utility is not quantitatively measurable—it is not measurable in absolute terms. Utility can be expressed only ordinally comparatively or in terms of 'less than' or 'more than'. It is, therefore, possible to list the goods and services in order of their preferability or desirability. This is known as the *ordinal* concept of utility.

In this unit, you will learn about the theories of ordinal utilities describing consumer demand.

1.1 OBJECTIVES

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

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- Discuss the difference between cardinal and ordinal utilty
- Explain the characteristics of goods approach
- Describe Bernoulli's risk aversion
- Examine N-M hypothesis
- Explain the Friedman-Savage consumer utility theory
- Discuss Markowitz hypotheses
- Explain indirect utility functions (duality theory)

1.2 UTILITY AND DEMAND ANALYSIS

Let us look into the origin of the two concepts of utility and their use in the analysis of demand.

(i) **Cardinal measurement of utility:** Some early psychological experiments on an individual's responses to various stimuli led classical and neo-classical economists to believe that utility is measurable and cardinally quantifiable. This belief gave rise to the concept of cardinal utility. It implies that utility can be assigned a cardinal number like 1, 2 and 3. The neo-classical economists, especially Marshall, devised a method of measuring utility. According to Marshall, utility of a commodity for a person equals the amount of money he/she is willing to pay for a unit of the commodity. In other words, price one is prepared to pay for a unit of a commodity equals the utility he expects to derive from the commodity. They formulated the theory of consumption on the assumption that utility is cardinally measurable. They coined and used a term 'util' meaning 'units of utility'. In their economic analysis, they assumed: (*i*) that one 'util' equals one unit of money, and (*ii*) that utility of money remains constant.

It has, however, been realized over time that *absolute* or cardinal measurement of utility is not possible. Difficulties in measuring utility have proved to be insurmountable. Neither economists nor scientists have succeeded in devising a technique or an instrument for measuring the feeling of satisfaction, i.e., the utility. Numerous factors affect the state of consumer's mood, which are impossible to determine and quantify. *Utility is, therefore, immeasurable in cardinal terms*.

(ii) **Ordinal measurement of utility:** The modern economists have discarded the concept of *cardinal utility* and have instead employed the concept of *ordinal utility* for analysing consumer behaviour. The concept of *ordinal utility* is based on the fact that it may not be possible for consumers to

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express the utility of a commodity in numerical terms, but it is always possible for them to tell introspectively whether a commodity is more or less or equally useful as compared to another. For example, a consumer may not be able to tell that a bottle of Pepsi gives 5 utils and a glass of fruit juice gives 10 utils. But he or she can always tell whether a glass of fruit juice gives more or less utility than a bottle of Pepsi. This assumption forms the basis of the ordinal theory of consumer behaviour.

To sum up, the neo-classical economists maintained that cardinal measurement of utility is practically possible and is meaningful in consumer analysis. The modern economists, on the other hand, maintain that utility being a psychological phenomenon is inherently immeasurable quantitatively. They also maintain that the concept of ordinal utility is a feasible concept and it meets the conceptual requirement of analysing the consumer behaviour. However, both the concepts of utility are used in analysing consumer behaviour.

Two Approaches to Consumer Demand Analysis

Based on cardinal and ordinal concepts of utility, there are two approaches to the analysis of consumer behaviour.

(i) **Cardinal utility approach,** attributed to Alfred Marshall and his followers, is also called the neo-classical approach or Marshallian approach.

(ii) **Ordinal utility approach**, pioneered by J. R. Hicks, a Nobel laureate and R. G. D. Allen, is also called Hicks-Allen approach or the indifference curve analysis.

The two approaches are not in conflict with one another. In fact, they represent two levels of sophistication in the analysis of consumer behaviour. Both the approaches are important for managerial decisions depending on the level of sophistication required.

It is important to note in this regard that in spite of tremendous developments in consumption theory based on ordinal utility, the neo-classical demand theory based on cardinal utility has retained its appeal and applicability to the analysis of market behaviour. Besides, the study of neo-classical demand theory serves as a foundation for understanding the advanced theories of consumer behaviour. The study of neo-classical theory of demand is of particular importance and contributes a great deal in managerial decisions.

1.2.1 Characteristics of Goods Approach (Lancaster)

This theory was developed by Kelvin Lancaster in 1961. As per this approach, the utility that the consumers derive is not from the contents of the basket of goods but actually the characteristics of those goods. The characteristics of goods approach is useful since it allows the study of change in the consumer's preference in case of additional goods being added to the basket. This would have been difficult in the normal scenario, since then it would demand a study of the consumer's

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preference from the beginning. In this approach, there is a use of 'shadow prices' which are basically prices for the attributes of the goods rather than the goods themselves with the association of utility to the characteristics of the goods. One type of goods whose existence and working in the economy is justified through the characteristics of goods approach are the luxury goods, whose change in prices (surprice) does not affect its position on the indifference curve as opposed to the regular indifference map where for 'cheaper' good in relation to quantity would have satisfied the customer more.

1.2.2 Axioms of Neumann-Morgenstern (N-M) Utility

Before we learn about the actual working of the N-M hypothesis. Let's learn some of the basics. A major contribution to the utility theory was made by a famous mathematician, John von Neumann, and a well-known economist Oskar Morgenstern in their famous book *Theory of Games and Economic Behaviour.* Their theory is also known as Modern Utility Theory and Neumann-Morgenstern Hypothesis (N-M hypothesis). It is important to note that N-M hypothesis is concerned with the measurement of utility concept, particularly of money, rather than explaining the utility maximizing behaviour of the consumer. In other words, the prime objective of N-M hypothesis is to provide a measure (or an index) of utility and to show that marginal utility of money decreases.

To appreciate the contribution of *modern utility theory,* we need to look at its point of deviation from the *cardinal* and *ordinal utility* theories of consumer behaviour. Recall that the cardinal utility assumes measurability of utility in terms of constant utility of money. The ordinal utility theory considers cardinal measurement of utility neither possible nor necessary in consumer analysis, and relies on ordinal concept of utility. An important aspect of these theories is that they presume all consumer choices to be made under *certain* and *riskless* conditions. That is, these theories ignore the possibility of *uncertainty and risk* involved in consumer's alternative choices. Neumann and Morgenstern have gone, without disputing the ordinal utility approach, one step forward to suggest a measure of utility where risk is involved in choice-making.

In this section, we will briefly describe the basic idea of N-M hypothesis, its approach towards construction of utility index, and also look into its drawbacks.

Characteristics of N-M Utility Index

The N-M hypothesis suggests that if an individual behaves consistently, it is possible to construct his 'utility index' and express his preferences numerically. For example, consider an individual who makes a choice between: (i) witnessing a test cricket-match (M) being played in the city, and (ii) going around for sight-seeing (S). Suppose his preference is given as $M > S$. Let us now introduce the element of uncertainty in his choice for, under N-M hypothesis, the consumer is required to make choice under the conditions of uncertainty. In order to introduce uncertainty

(or a risk element), let us suppose that the cricket-match (M) is likely to be interrupted by rainfall. Therefore, if the individual goes to witness the match he may either enjoy a good cricket (M_g) or a bad cricket (M_b) due to interruptions by rainfall. Assuming certain probability rates of rainfall, individual's preferences for the alternative probability rates may be hypothetically ranked as follows.

(i) If probability of clear weather is rated at 80 per cent (or 0.8) the individual expects to enjoy a good cricket (M_g) and he prefers M_g to S.

(ii) If probability of clear weather is 60 per cent (or 0.6) and of rainfall 40 per cent (or 0.4), the individual becomes indifferent between the alternatives, M and S.

Given the first set of probability rates and ranking of individual's preferences, his preferences may be arranged, assuming consistency in his behaviour, as follows.

$$M_g > S > M_b$$

This ordering of his preferences follows the utility expected from these alternatives. Consider now (the second) situation in which probabilities of their clear weather and rainfall are rated as 60:40 (or 0.6:0.4). Under these probability rates, the individual is indifferent between M and S. It means that the composite *expected utility* (U_e) of M_g and M_b is the same as that of S.

The *expected utility,* under the conditions of uncertainty, is obtained by multiplying the riskless utility (U) of an event by its probability rate (P). Thus, individual's equation of *indifference* may be expressed as:

$$U(S) = P \cdot U(M_g) + (1 - P) \cdot U(M_b)$$

As we have assumed above, the probability (P) of M_g is 0.6 and probability of M_b is $1 - P = 1 - 0.6 = 0.4$. Now if the individual is somehow in a position to obtain the information regarding the utilities which he can assign to M_g and M_b, he is able to assign a numerical value to $U(S)$. Let us assume that the values M_g at 50 utils and M_b at 25 utils, i.e., $U(M_g) = 50$ and $U(M_b) = 25$. By substituting these values in the above equation, we get:

$$U(S) = 0.6(50) + 0.4(25)$$

$$U(S) = 30 + 10 = 40$$

Thus, the individual assigns 40 utils to S. This illustrates the N-M measure of utility index. Having computed the utility index of S, individual's preferences may be ranked as $M_g > S > M_b$ and may be numerically expressed as:

$$50 > 40 > 25.$$

Assumptions

The construction of N-M utility index is based on three basic assumptions.

1. **Transitivity:** The N-M hypothesis, like indifference curve and revealed preference theories, assumes transitivity in consumer's preferences. That is, if he prefers A to B and B to C, then he prefers A to C.

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2. **Consistency:** Consistency in consumer's behaviour implies that if a consumer prefers *A* to *B*, *A* having a probability *P* and *B* having a probability $1 - P$, then he will not prefer *B* to *A* under the same probabilities.
3. **Continuity of preferences:** The consumer has a 'system of preferences that is all-embracing and complete.' His preferences have continuity in the sense that if he prefers event *A* to *B* when probability of *A* equals 1 (i.e., $P(A) = 1$) and if he prefers *B* to *A* when $P(A) = 0$, there lies a probability between 1 and 0, at which he is indifferent between events *A* and *B*.

Appraisal of N-M Utility Index

The N-M utility index is only a theoretical or conceptual measure of utility. It provides a basis for indexing the expected utility levels under uncertain conditions. It does not measure the *intensity of introspective satisfaction or pleasure* nor is it the purpose of N-M measure of 'cardinal' utility.

It is also worth noting that N-M cardinal utility is not identical with neo-classical cardinal utility. While cardinal utility, in the neo-classical sense, means actual, absolute measurement of strength of feeling, the word 'cardinal' has been used in N-M measure of utility entirely in the 'operational' sense.

The N-M measure of utility serves a useful purpose by providing a basis for rational thinking and prediction, particularly where uncertainty and risk are involved, in spite of the fact that there is an arbitrariness in the method of computing utility index.

Check Your Progress

1. Mention one use of the characteristics of goods approach.
2. State the prime objective of the N-M hypothesis.

1.3 CONSUMER'S CHOICE INVOLVING RISK

In this section, you will study the N-M hypothesis, Friedman-Savage, Markowitz hypothesis and indirect utility function.

1.3.1 Bernoulli's Idea

Based on the behaviour that people project towards risk, it is possible to place them under one of the three distinct categories. The category under which they will be placed will depend on the respective Bernoulli utility functions that they display with their behaviours.

Let us use the example of tossing a coin to explain this. Assume that on heads the amount won is ` 10 and on tails the amount won is ` 20. Hence, the gamble's expected value will be:

$$(0.5 \times 10) + (0.5 \times 20) = \$15.$$

A person who is risk-averse

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When an individual's utility of the gamble's expected value is higher than the expected utility from the gamble itself, the individual is considered to be risk-averse. This is a more precise definition of Bernoulli's idea.

A person's risk-averse behaviour can be captured in the concave Bernoulli utility function, like a logarithmic function. In the case of the gamble of coin toss as given above, a person who is risk averse and whose Bernoulli utility function was:

$$u(w) = \log(w) \text{ ; (w representing the outcome)}$$

might have an expected utility over the gamble of:

$$0.5 \times \log(10) + 0.5 \times \log(20) = 1.15,$$

And the utility expected of the value will be:

$$\log (15) = 1.176$$

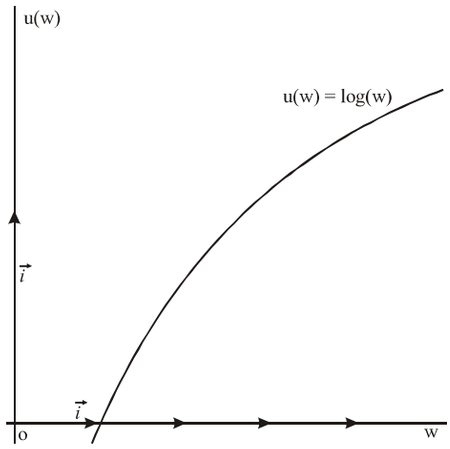

Fig. 1.1 *Bernoulli Utility Function*

A person who is risk loving

When an individual's utility of the gamble's expected value is lower than the expected utility from the gamble itself, they are categorised as being risk-loving. Nevertheless, it is important to note that, this is not how normally gambling behaviour works, for example in a casino. If this definition is to be accepted, then a truly risk-loving person should be ready to put all his assets at stake for just one roll of dice.

Risk-loving behaviour is captured in the convex Bernoulli utility function. For example, an exponential function. In case of the gamble given above, a risk-loving person with the Bernoulli utility function as:

$$u(w) = w^2$$

would display an expected utility for the gamble as being:

$$0.5 \times 10^2 + 0.5 \times 20^2 = 250,$$

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When the utility of the gamble's expected value is:

$$15^2 = 225$$

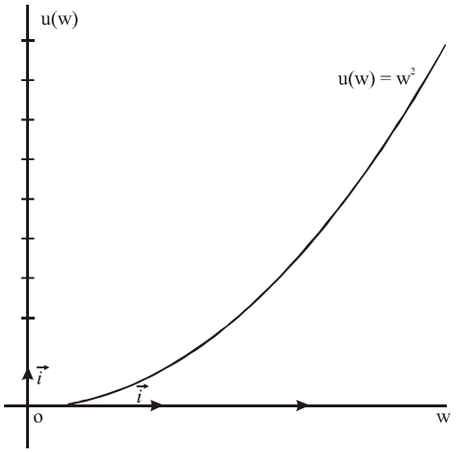

Fig. 1.2 *Convex Bernoulli Utility Function*

A person who is risk neutral

When an individual's utility of the gamble's expected value is exactly equal to the expected utility from the gamble itself, they are categorised as being risk-neutral. In practice, the best example of risk-neutrality are the majority of the financial institutions that adopt this method in making investments.

A linear Bernoulli function is used to capture risk-neutral behaviour. In the case of the gamble that has been discussed above, a risk-neutral person with Bernoulli utility function as:

$$u(w) = 2w$$

would have an expected utility over the gamble of:

$$(0.5 \times 2 \times 10) + (0.5 \times 2 \times 20) = 30,$$

While the utility of the expected value of the gamble is:

$$2 \times 15 = 30$$

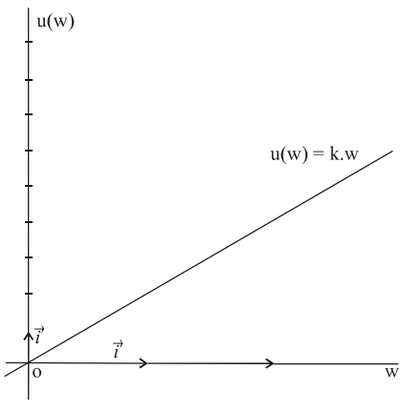

Fig. 1.3 *Linear Bernoulli Function*

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If we take the example of insurance, while the buyers of insurance display behaviour that is risk-averse, the insurance company itself shows a behaviour of being risk-neutral. The insurance company is earning its profit with the received premiums' value being greater than the value of the loss that the company expects.

Any gambling 'g' will have the *certainty equivalent* which is an amount of money, say 'Q', which will certainly accrue and will provide the consumer the exact same utility as would be provided by the gamble itself.

A gamble's *risk premium* is the difference of the gamble's expected value and the gamble's certainty equivalent.

From the above, it can be said that a person who is risk averse will have certainty equivalent lower than the gamble's expected value, and the person's risk premium will be positive. This means that a person who is risk averse will require some added incentive to actually participate in the gambling risk.

There is a zero risk premium for a person who is risk neutral and the person's certainty equivalent is exactly the same as the gamble's expected value. On the other hand, a person who is risk loving has a risk premium in the negative. This is due to the need to accept the expected value for extra incentives, not due to the risky gamble, and the person will have a higher certainty equivalent than the gamble's expected value.

Elasticity of Marginal Utility and Risk Aversion

The money income of an individual is representative of the market basket of goods that can be purchased by him. The assumption that will be made is that the individual is aware of the existing probabilities of gaining or making money income in various situations and the pay-offs/outcomes will be measured not in rupees but as provided utility.

As has been seen above, individuals have their own attitudes towards risk. Mostly, individuals opt for situations that are less risky, and that which will have less variability as far as rewards/outcomes are concerned. We could say that mostly individuals aim at keeping their risks at a minimum and these persons are referred to as risk averse or risk averters. People who like to take risks are referred to as risk lovers or risk seekers. There are persons who are referred to as risk neutral also as they are the ones who have an attitude of indifference towards risk.

People have different attitude towards risk based on whether the marginal utility of money increases, diminishes or remains constant.

A person who is risk averse will have diminishing marginal utility with increase in money. In the case of a risk seeker, there is increase in marginal utility of money with increase in money. For a risk neutral person, marginal utility of money remains constant with increase in the amount of money.

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Risk Averter

Let us look at money income as a single composite commodity to consider risk attitude in the light of marginal utility. The money income of an individual is representative of the basket of goods that he can purchase from the market. We are going with the assumption that the individual is well aware of the probabilities of gaining/making money income in various situations and that the pay-offs or outcomes will be measured in the utility provided rather than in terms of rupees.

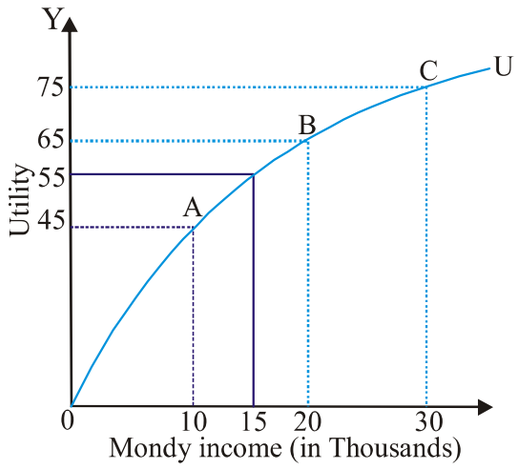

Fig. 1.4 *Money Income and Utility*

In the figure given above, the X axis represents the money income and the Y axis represents utility while the curve OU has been drawn to represent the utility function of money income of a risk-averse individual. Here, OL is the slope of total utility function and with the increase in the individual's money income, this slope is seen to decrease.

As there is an increase in the individual's money income from ` 10,000 to ` 20,000, there is an increase in his total utility by twenty units as it escalates from 45 units to 65. When there is a rise in money income from ` 20,000 to ` 30,000, the individual's total utility increases from 65 units to 75 units which is an increase of just 10 units.

In the above graph, the concave utility function shows the marginal utility of money of the individual decreasing with a decrease in his money income, showing that the individual is risk averse.

Consider that at this point the individual is in a job that provides him with ` 15,000 fixed monthly salary. Since this has no uncertainty as far as income from the job is concerned, there is no risk present. If the individual decides to move to a job of a salesperson whose income is dependent on commission, it will involve risk since the income will not be certain. In case he is successful in his sales job, he

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might make an income much higher than he is currently making and if he is not that good he might earn just about the same as he is earning in his current job. Let us consider that in the new job that he is considering to take lies a 50-50 probability of getting either ` 30,000 or ` 10,000 (implying that the probability for each is 0.5). Therefore, in case of uncertainty, there is no way for the individual to know what the actual utility is of performing a specific action. Since there are probabilities of alternative outcomes, it is possible to calculate the expected utility. Whether or not the new risky job will be taken up by the individual can be known through comparison of the utility that is expected from the new risky job against the utility from the job the individual is currently holding. In the above graph, the OU, the utility function curve, shows that the money income of ` 15,000 in certainty is 55. In the new risky job, in case the individual is successful and has an income of ` 30,000, the utility gained from ` 30,000 is 75. In case he fails at the new risky job and just gains ` 10,000 as income his utility will be 45.

While the utility function of money income shows the individual to be risk-averse, but as the risky job's expected utility appears greater than the present job's utility with a certain income, the individual will opt for the risky job.

Now, consider that in the new risky job, the individual succeeds and earns an income of ` 30,000, which is twice as the assured income from the present job. If failure at the new job on the part of the individual will decrease the income to zero, then the expected utility of the risky job is given by:

$$E(U) = 0.5\ U(0) + 0.5\ U(30{,}000)$$

$$= 0 + 0.5 \times 75$$

$$= 37.5$$

Hence, the new jobs expected utility is lower than the utility of 55 which the individual gains from the current job which is providing him ` 15,000 as a fixed assured income.

Even in the risky job the income that can be expected is ` 15,000:

$$[E(x) = 0.5 \times 0 + 0.5 \times 30{,}000 = 15000]$$

In the graph given above, the choice of a risk-averse individual is being represented and for him there is a fall in marginal utility of money with increase in money. We are now in a position to provide a precise definition of a risk-averse individual.

A risk lover or risk-preferred person is an individual who likes to opt for an outcome that is risky but comes with the same expected income as a certain income. For an individual who is risk-loving, there is an increase in the marginal utility of

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income with increase in his money income. This is represented by the convex total utility function curve OU in the graph given below.

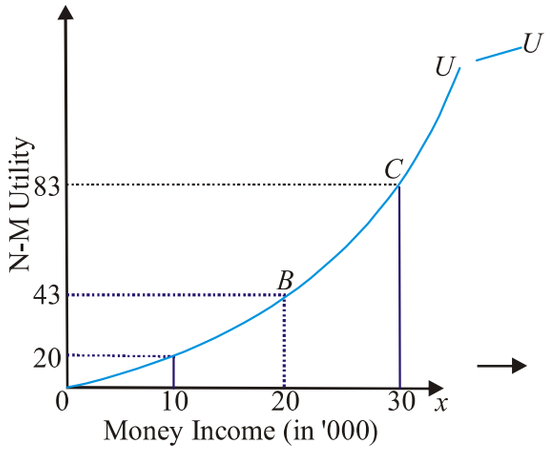

Fig. 1.5 *Convex Total Utility Function*

Consider that this individual who is risk-loving is holding a job that earns him ` 20,000 as a certain income. The above graph depicts that 43 units is the utility of ` 20,000 for the individual. In case the individual is offered a risky job with ` 30,000 as income if he proves to be extremely efficient and just ` 10,000 if he is extremely inefficient with equal probability of 0.5 in both the jobs, then the new jobs expected utility will be:

$$E(U) = 0.5\ U(10{,}000) + 0.5\ U(30{,}000)$$

As depicted in the graph above, ` 20 is the utility of ` 10,000 for this individual and for ` 30,000 it is 83. Hence,

$$E(U) = 0.5(20) + 0.5(83)$$
$$= 10 + 41.5$$
$$= 51.5$$

With 51.5 being the new risky job's expected utility which is more than the present job's utility of 43, the new job will be preferred by the risk-loving individual despite the fact that the expected income in the new risky job is also ` 20,000 as:

$$(0.5 \times 10{,}000) + 0.5\ (30{,}000) = \text{` } 20{,}000).$$

Risk-loving individuals are the ones who gamble, purchase lotteries, take part in criminal activities, and commit big frauds, even at the risk of punishment if caught.

A person will be considered to be risk neutral, if he is indifferent either towards a certain given income or an uncertain income with the same expected value. A person is risk neutral if his money income's marginal utility remains constant with increase in his money income. The graph given below represents a risk neutral individual's total utility function.

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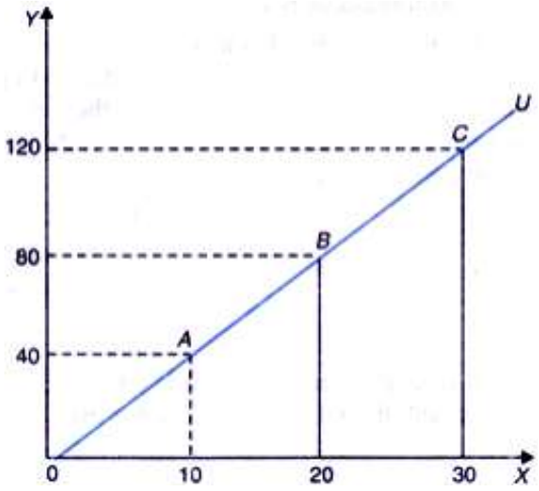

Fig. 1.6 *Risk Neutral Individual's Total Utility Function*

The graph in the figure above shows that the utility of a certain income of ` 20,000 is 80. With the new risky job and rise in income on being a successful salesman to ` 30,000, the utility goes up to 120 units.

Then again in case the individual is unsuccessful at the new risky job as a salesman, the income falls to ` 10,000 and its utility slips to 40 units. The assumption is that increase in income or decrease in income is equally possible at the new risky job.

The expected utility of the new risky job is:

$$E(U) = 0.5\ U(10,000) + 0.5\ U(30,000)$$
$$= 0.5\ (40) + 0.5\ (120)$$
$$= 20 + 60$$
$$= 80$$

Risk Aversion and Fair Bets

According to Bernoulli's hypothesis, an individual whose marginal utility of money declines will not be willing to accept a fair gamble. A fair gamble or game is that where the gamble's expected value of income is equal to the same amount of income with certainty. An individual refusing a fair bet will be considered to be risk-averse. This individual will give preference to a 'given income with certainty to a risky gamble with the same expected value of income'.

The commonest attitude found towards risk is of risk aversion. It is because of this attitude that many people take insurance for all kinds of risks like accident, theft, illness, to name a few. The risk-averse individuals are the ones who would rather be in occupations or jobs that get them stable income rather than those that have uncertain income.

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1.3.2 Neumann-Morgenstern Hypothesis

The Neumann-Morgenstern method of measuring expected utility can be used to explain the risk-averse attitude. For an individual who is risk averse, as his income increases, his marginal utility of income diminishes.

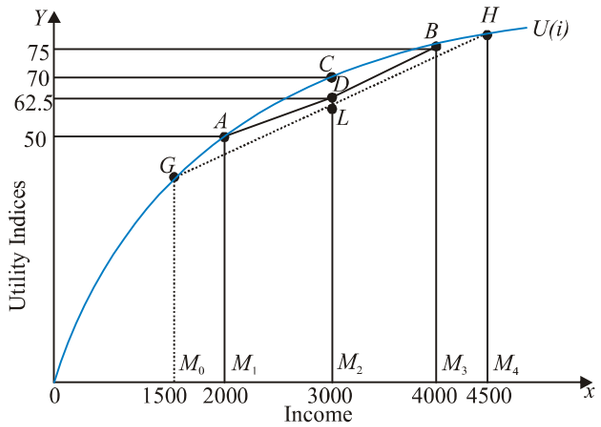

Fig. 1.7 *Neumann-Morgenstern Utility Function Curve*

The graph in the figure given above shows the Neumann-Morgenstern utility function curve *U (I).* The utility curve begins at the origin and continues on a positive slope showing that the individual has preference for more income in comparison to less income.

Additionally, a conclave utility curve implies that an individual's marginal utility of income diminishes with increase in his income. The utility curve in the above graph depicts the risk-averse attitude.

Neumann-Morgenstern Concave Utility Curve of a Risk-Averter

Assume that the current income of an individual is ` 3,000. The individual is offered a fair gamble where there is a 50-50 chance of losing/winning ` 1,000 which places the probability of winning at 0.5 or 1/2. In case he wins the game, his income will go up to ` 4,000 and on losing it will go down to ` 2,000.

In such an uncertain situation, the individual's expected money value of income is:

$$E(V) = 1/2 \times 4000 + 1/2 \times 2000 = ` 3000$$

If the gamble is not accepted by the individual, his income will remain ` 3,000 with certainty. Even 'though the expected value of his uncertain income prospect is equal to his income with certainty, a risk averter will not accept the gamble'. The reason being that he will act according to the expected utility of his income in the uncertain situation.

According to the above graph, the utility obtained from ` 4,000 is 75 and just 50 from ` 2,000.

The uncertain prospects expected utility is:

$$E(U) = 1/2\ (75) + 1/2\ (50)$$
$$= 37.5 + 25 = 62.5$$

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The individual's rejection of the gamble is based on his diminishing marginal utility of money income. He perceives the utility gained from ` 1,000 to be lower than the loss he would incur on ` 1000 on losing the gamble.

Therefore, if money income's marginal utility diminishes, an individual will stay away from fair gambles. An individual of this type is known as a risk averter as he would rather go for an income with certainty than for a gamble that provides the same expected value.

Here is an example to explain the above situation.

Consider that the individual has a certain income of ` 3,000 and is offered 2 fair gambles.

- A 50:50 chance to lose or win ` 1000
- A 50:50 chance to lose or win ` 1,500

In the second case, the even chance to lose or win the expected value of income will be:

$$1/2(1500) + 1/2\ (4500) = `.\ 3000$$

In the above figure on the utility curve *U (I),* a straight line segment *GH* is drawn to join *G* (corresponding to income of ` 1500) and *H* (corresponding to income of ` 4500).

GH, the straight-line segment shows the expected utility from the expected money value of ` 3,000 from the second gamble which is:

M₂L

Which is less than M₂D of the first gamble.

Hence, the first gamble is preferred by the individual as it has lower variability of outcome compared to the second gamble.

In the case where there is certainty of income, there is no risk, as there exists no variability of outcome.

1.3.3 Friedman-Savage Hypothesis

It can be possible that a person is risk averse in some segments while he is risk loving in others and can also change his attitude towards risk in any segment. It is argued by Friedman and Savage that an individual can be at the same time risk averse and risk loving for different choices and for different segments of wealth. Therefore, effectively, we cannot consider it to be irrational when an individual purchases insurance to cover some varieties of risk on a day and them is seen

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gambling on the same day. They proposed that all individuals are capable of irrational behaviour when they are faced with choices that are risky under some situations.

It is also possible to make a distinction between an individual's reaction to absolute changes in wealth and to proportional changes in wealth, where the former measures an absolute risk aversion and the latter measures a relative risk aversion.

The implication of a decreasing absolute risk aversion depends on the amount of wealth an individual is ready to risk which will increase with increase in wealth. Similarly, the implication of a decreasing relative risk aversion depends on the proportion an individual will be ready to risk which will rise with rise in wealth. In case of constant absolute risk aversion, the amount of wealth which the individual will put to risk will stay constant with increase in wealth, while the proportion of wealth will remain the same with constant relative risk aversion. Individuals will be ready to put increasing smaller amounts of wealth at risk as they grow wealthier, with increasing absolute risk aversion, and decreasing proportions of wealth with increasing relative risk aversion.

Using the Arrow-Pratt measure, we can write the relative risk aversion measure in the following manner:

Arrow-Pratt relative risk aversion = $-W\,U''(W)/U'(W)$

where,

W = Level of wealth

$U'(W)$ = First derivative of utility to wealth, measuring how utility changes as wealth changes

$U''(W)$ = Second derivative of utility to wealth, measuring how the change in utility itself changes as wealth changes

We can use the log utility function to illustrate the concept:

$U = \log(W)$

$U' = 1/W$

$U'' = 1/W^2$

Absolute risk aversion coefficient = $U''/U' = W$

Relative risk aversion coefficient = 1

Therefore, the log utility function shows a decreasing absolute risk aversion in which an individual will be willing to invest more money in risky assets as their wealth increases. It also shows a constant relative risk aversion in which an individual will be willing to invest the same percentage of wealth in risky assets even when their wealth increases.

Majority of the risk and return models, are in practice based around certain specific assumptions regarding relative and absolute risk aversion, and also if they decrease, increase or remain constant with increase in wealth.

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1.3.4 Markowitz Hypotheses

We can say that this is an improvement over Friedman-Savage hypothesis. Professor Markowitz was of the opinion that Friedman-Savage's argument that the rich and the poor are averse to taking risks except in the presence of favourable odds was not what happened in reality. This made the analysis of these groups faulty for initially the marginal utility of income was being linked to the absolute level of income. Markowitz addition was that the marginal utility of income be linked to the changes in the present level of income.

Thereby, Markowitz proposed the theory that small rise in the income increases the marginal utility of income and large rise in income leads to diminishing marginal utility of income. This is to say that people gamble more when their income is increasing by a small margin, to better their position and become over-cautious and avoid gambling when increases in income is large even in conditions of safe bets.

Similarly, small decrease in the income leads to rise in marginal utility of income and large losses in income results in diminishing marginal utility. In layman terms, people are quick to insure against small losses and not take risk when there is small decrease in income but still indulge in gambling where large losses in income is observed to better their position.

1.3.5 Indirect Utility Functions (Duality Theory)

This utility theory proposes that the consumer's maximum attainable utility is linked by the vector of price of goods and the amount of income. This utility function is called indirect because unlike the conventional utility theory the consumer's preference here is not linked solely to the goods consumed but is affected by the price of goods and the amount of income. The way this function is arrived at is a two step process and hence the name the duality theory.

So, indirect utility function is defined as vectors of price of goods and the amount of income. Thus, the first step solves the utility maximization problem by arriving at the bundle of most of affordable group through the quantities of goods consumed and then calculating the utility that the consumer derives from that bundle.

Check Your Progress

3. What does the Bernoulli utility function show?
4. What does the marginal utility of a risk averse person look like in case there is increase in money?
5. What is a fair gamble?

1.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. The characteristics of goods approach is useful since it allows the study of change in the consumer's preference in case of additional goods being added to the basket.
2. The prime objective of the N-M hypothesis is to provide a measure (or an index) of utility and to show that marginal utility of money decreases.
3. Based on the behaviour that people project towards risk, it is possible to place them under one of the three distinct categories. The category under which they will be placed will depend on the respective Bernoulli utility functions that they display with their behaviours.
4. A person who is risk averse will have diminishing marginal utility with increase in money.
5. A fair gamble or game is that where the gamble's expected value of income is equal to the same of income with certainty.

1.5 SUMMARY

- Some early psychological experiments on an individual's responses to various stimuli led classical and neo-classical economists to believe that utility is measurable and cardinally quantifiable. This belief gave rise to the concept of cardinal utility. It implies that utility can be assigned a cardinal number like 1, 2 and 3.
- It has, however, been realized over time that *absolute* or cardinal measurement of utility is not possible. Difficulties in measuring utility have proved to be insurmountable.
- The modern economists have discarded the concept of *cardinal utility* and have instead employed the concept of *ordinal utility* for analysing consumer behaviour. The concept of *ordinal utility* is based on the fact that it may not be possible for consumers to express the utility of a commodity in numerical terms, but it is always possible for them to tell introspectively whether a commodity is more or less or equally useful as compared to another.
- Based on cardinal and ordinal concepts of utility, there are two approaches to the analysis of consumer behaviour.
  (i) Cardinal utility approach, attributed to Alfred Marshall and his followers, is also called the neo-classical approach or Marshallian approach.

(ii) Ordinal utility approach, pioneered by J. R. Hicks, a Nobel laureate and R. G. D. Allen, is also called Hicks-Allen approach or the indifference curve analysis.

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- A major contribution to the utility theory was made by a famous mathematician, John von Neumann, and a well-known economist Oskar Morgenstern in their famous book *Theory of Games and Economic Behaviour*. Their theory is also known as Modern Utility Theory and Neumann-Morgenstern Hypothesis (N-M hypothesis).
- The N-M hypothesis suggests that if an individual behaves consistently, it is possible to construct his 'utility index' and express his preferences numerically.
- Based on the behaviour that people project towards risk, it is possible to place them under one of the three distinct categories. The category under which they will be placed will depend on the respective Bernoulli utility functions that they display with their behaviours.
- When an individual's utility of the gamble's expected value is higher than the expected utility from the gamble itself, the individual is considered to be risk-averse. This is a more precise definition of Bernoulli's idea.
- When an individual's utility of the gamble's expected value is lower than the expected utility from the gamble itself, they are categorised as being risk-loving.
- When an individual's utility of the gamble's expected value is exactly equal to the expected utility from the gamble itself, they are categorised as being risk-neutral.
- According to Bernoulli's hypothesis, an individual whose marginal utility of money declines will not be willing to accept a fair gamble. A fair gamble or game is that where the gamble's expected value of income is equal to the same amount of income with certainty. An individual refusing a fair bet will be considered to be risk-averse.
- The Neumann-Morgenstern method of measuring expected utility can be used to explain the risk-averse attitude. For an individual who is risk averse, as his income increases, his marginal utility of income diminishes.
- It can be possible that a person is risk averse in some segments while he is risk loving in others and can also change his attitude towards risk in any segment. It is argued by Friedman and Savage that an individual can be at the same time risk averse and risk loving for different choices and for different segments of wealth.
- Professor Markowitz was of the opinion that Friedman-Savage's argument that the rich and the poor are averse to taking risks except in the presence of favourable odds was not what happened in reality.

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- Markowitz addition was that the marginal utility of income be linked to the changes in the present level of income.
- Indirect utility theory proposes that the consumer's maximum attainable utility is linked by the vector of price of goods and the amount of income. This utility function is called indirect because unlike the conventional utility theory the consumer's preference here is not linked solely to the goods consumed but is affected by the price of goods and the amount of income. The way this function is arrived at is a two step process and hence the name the duality theory.

1.6 KEY WORDS

- **Utility:** It is a psychological feeling of satisfaction, pleasure or happiness.
- **Cardinal Utility:** It implies that utility can be assigned a cardinal number.
- **Ordinal Utility:** It is based on the fact that it may not be possible for consumers to express the utility of a commodity in numerical terms, but it is always possible for them to tell introspectively whether a commodity is more or less or equally useful as compared to another.

1.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on cardinal and ordinal approach.
2. Why is utility immeasurable in cardinal terms?
3. What is Lancaster's Characteristics of Goods Approach?
4. Briefly explain the Markovitz hypotheses.
5. Write a short note on indirect utility function.

Long Answer Questions

1. Explain the characteristics of N-M utility index and its assumptions.
2. Discuss Bernoulli's risk aversion hypothesis.
3. Examine N-M hypotheses and Friedman-Savage improvement.

1.8 FURTHER READINGS

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NOTES

UNIT 2 THEORIES OF THE FIRM

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Structure

2.0 INTRODUCTION

In the previous unit, you learnt about demand analysis. This unit will discuss those alternative theories of firm which have gained considerable ground in economic literature and have a greater relevance to business decision making on empirical grounds. The theories of this category include:

(i) Baumol's theory of sales revenue maximization

(ii) Marris's theory of maximization of firm's growth rate

(iii) Williamson's theory of maximization of managerial utility function

This unit will deal with the basic elements of these alternative theories of firm. The objective here is to make the readers aware of the recent developments in the theory of the firm rather than dealing with the alternative theories at length.

2.1 OBJECTIVES

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

- Discuss the traditional theory of a firm
- Explain Baumol's theory of sales revenue maximization
- Evaluate Williamson's model of managerial utility maximization
- Analyse the differences between managerial and entrepreneurial firm
- Explain Marris' model of managerial enterprise
- Describe the limit pricing theory with special reference to Bain's model of limit pricing

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2.2 TRADITIONAL THEORY OF FIRM AND ITS CRITICAL EVALUATION

Although the conventional theory of firm still holds its ground firmly, several *alternative theories of firm* were proposed during the early 1960s by economists, notably by Simon, Baumol, Marris, Williamson, Berle and Means, Galbraith, and Cyert and March. These economists have questioned the validity of the *profit maximization hypothesis* and the relevance of the conventional theory to modern business, mainly on empirical grounds.

Another major drawback of the conventional theory is that it does not recognize the dichotomy between the ownership and management and its role in setting the goal for the firm. Berle and Means were first to point out in 1932, the separation of management from ownership. The proponents of the recent theories of firm argue that the dichotomy between the ownership and management and the shift in decision-making powers from the owners (of the firm) to its managers give the latter an opportunity to exercise their discretion in setting the goals for the firm, especially in case of large business corporations. The managers of large business corporations set the goals for the firm which in their judgment are feasible and desirable for the firm's survival and growth. Based on this argument, some economists formulated their own hypotheses and studied extensively the objectives, motivations and behaviour of firms afresh and developed their own theory of firm. As a result, there are now a number of *alternative theories of firm* postulating different objectives of business firms. The alternative theories of the business firms are sometimes classified under the following categories.

- Managerial theories of firm
- Growth maximization theories of firm
- Maximization of managerial utility theories
- Behavioural theories of firm

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Conventional vs Alternative Theories of Firm

A question that may be asked is: Do the alternative theories replace the conventional theory of a firm? Or to what extent do the alternative theories really offer an alternative and more appropriate explanation to firms' behaviour? There are no simple answers to these questions. One thing is clear that the conventional theory of firm based on profit maximization hypothesis is not the only theory applicable to a multitude of firms—large and small, owner-managed and manager-managed, single-product and multi-product, local and multinational, private and public undertakings, and alternative theories do provide alternative explanations to the firm's behaviour.

As regards the validity and plausibility of the alternative theories, this issue can be examined on both theoretical and empirical grounds. The theoretical plausibility of a theory depends on its power to predict. There is a general consensus that the conventional theory has greater explanatory and predictive power than the alternative theories of firm. As regards the empirical validity, the empirical evidence in support of the alternative theories is not unambiguous. In fact, the multitude of alternative theories is in itself an evidence against them. On the contrary, the empirical evidence against the conventional theory is not clear and strong. Hance, it can be said that the alternative theories of firm are still in a state of testable hypotheses and they do not offer a replacement to the conventional theory of firm.

Check Your Progress

1. Name the economists who proposed the alternative theories of firm during the early 1960s.
2. How can the alternative theories of the business firms be classified?

2.3 BAUMOL'S REVENUE MAXIMIZATION MODEL

Baumols's theory of sales maximization is one of the most important alternative theories of firm's behaviour. The basic premise of Baumol's theory is that *sales maximization,* rather than *profit maximization,* is the plausible goal of the business firms. He argues that there is no reason to believe that all firms seek to maximize their profits. Business firms, in fact, pursue a number of incompatible objectives and it is not easy to single out one as the most common objective pursued by the firms. However, from his experience as a consultant to many big business houses, Baumol finds that most managers seek to maximize sales revenue rather than profits. He argues that, in modern business, management is separated from ownership, and managers enjoy the discretion to pursue goals other than profit maximization. Their discretion eventually falls in favour of sales maximization.

According to Baumol, business managers pursue the goal of sales maximization for the following reasons.

First, financial institutions consider sales as an index of performance of the firm and are willing to finance the firm with growing sales.

Second, while profit figures are available only annually at the end of the final accounting year, sales figures can be obtained easily and more frequently to assess the performance of the management. Maximization of sales is more satisfying for the managers than the maximization of profits that go into the pockets of the shareholders.

Third, salaries and slack earnings of the top managers are linked more closely to sales than to profit. Therefore, managers aim at maximizing sales revenue.

Fourth, the routine personnel problems are more easily handled with growing sales. Higher payments may be offered to employees if sales figures indicate better performance. Profits are generally known after a year. To rely on profit figures means, therefore, a longer waiting period for both the employees and the management for resolving labour problems.

Fifth, where profit maximization is the goal and it rises in one period to an unusually high level, this becomes the standard profit target for the shareholders that managers find very difficult to maintain in the long run. Therefore, managers tend to aim at sales maximization rather than profit maximization.

Finally sales growing at a rate higher than the rate of market expansion indicate growing market share, a greater competitive strength and better bargaining power of a firm in a collusive oligopoly. In a competitive market, therefore, sales maximization is found to be a more reasonable target.

To formulate his theory of sales maximization, Baumol has developed two basic models: (i) static model and (ii) dynamic model—each with and without advertising. His static models with and without advertising are discussed next.

2.3.1 Baumol's Model without Advertising

Baumol assumes cost and revenue curves to be given as in conventional theory of pricing. Suppose that the total cost (*TC*) and the total revenue (*TR*) curves are given as in Figure 2.1. The total profit curve, *TP*, is obtained by plotting the difference between the *TR* and *TC* curves. Profits are zero where *TR* = *TC*.

Given the *TR* and *TC* curves, there is a unique level of output at which total sales revenue is maximum. The total sales revenue is maximum at the highest point of the *TR* curve. At this point, slope of the *TR* curve (i.e., $MR = \partial TR/\partial Q$) is equal to zero. The highest point on the *TR* curve can be obtained easily by drawing a line parallel to the horizontal axis and tangent to the *TR* curve. The point *H* on the *TR* curve in Figure 2.1 represents the total maximum sales revenue. A line drawn from point *H* to output axis shows that sales revenue is maximized at output OQ_3. It implies that a sales revenue maximizing firm will produce output OQ_3 and its price equals HQ_3/OQ_3.

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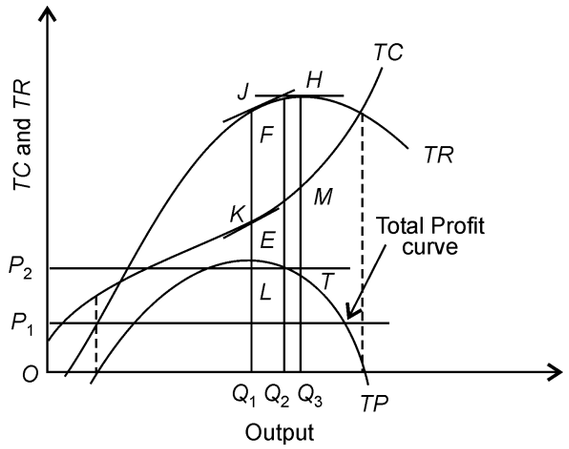

Fig. 2.1 *Sales Revenue Maximization*

Profit Constraint and Revenue Maximization

At output OQ_3, the firm maximizes its total revenue. At this output, the firm makes a total profit equal to $HQ_3 - MQ_3 = HM$. Since total *TP* curve gives the measure of total profit at different levels of output, profit $HM = TQ_3$. If this profit is enough or more than enough to satisfy the stockholders, the firm will produce output OQ_3 and charge a price = HQ/OQ_3. But, if profit at output OQ_3 is not enough to satisfy the stockholders, then the firm's output must be changed to a level at which it makes a satisfactory profit, say OQ_2, which yields a profit $LQ_2 > TQ_3$.

Thus, there are two types of probable equilibrium: one, in which the profit constraint does not provide an effective barrier to sales maximization, and second, in which profit constraint does provide an effective barrier to sales maximization. In the second type of equilibrium, the firm will produce an output that yields a satisfactory or target profit. It may be any output between OQ_1 and OQ_2. For example, if minimum required profit is OP_1, then the firm will stick to its sales maximization goal and produce output OQ_3 which yields a profit much greater than the required minimum. Since actual profit (TQ_3) is much greater than the minimum required, the minimum profit constraint is not operative.

However, if required minimum profit level is OP_2, OQ_3 will not yield sufficient profit to meet the profit target. The firm will, therefore, produce an output which yields the required minimum level of profit OP_2 (= LQ_2). Given the profit target OP_2, the firm will produce OQ_2 where its profit is just sufficient to meet requirement of minimum profit. As can be seen in Figure 2.1, output (OQ_2) is less than the sales maximization output OQ_3. Evidently, the profit maximization output, OQ_1 is less than the sales maximization output OQ_2 (with profit constraint).

2.3.2 Baumol's Model with Advertising

We have shown above how price and output are determined in a static single period model without advertising. In an oligopolistic market structure, however,

price and output are subject to non-price competition. Baumol considers in his model with *advertising* as the typical form of *non-price competition* and suggests that the various forms of non-price competition may be analysed on similar lines.

In his analysis of advertising, Baumol makes the following assumptions.

- Firm's objective is to maximize sales, subject to a minimum profit constraint.
- Advertising causes a shift in the demand curve and hence the total sales revenue (*TR*) rises with an increase in advertisement expenditure (*A*) i.e., $\partial TR/\partial A > 0$.
- Price remains constant — a simplifying assumption.
- Production costs are independent of advertising. This is rather an unrealistic assumption since increase in sales may put output at a different cost structure.

Baumol's model with advertising is presented in Figure 2.2. The *TR* and *TC* are measured on the *Y*-axis and total advertisement outlay on the *X*-axis. The *TR* curve is drawn on the assumption that advertising increases total sales in the same manner as price reduction.

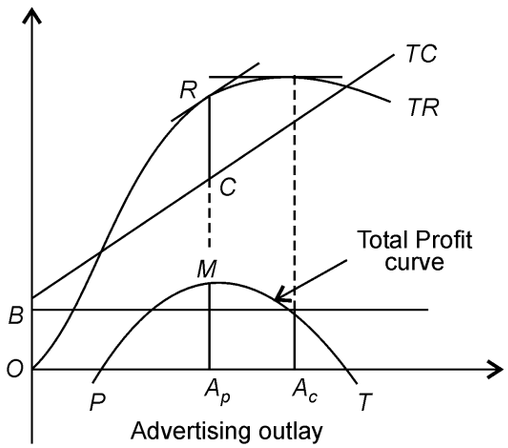

Fig. 2.2 *Sales Revenue Maximisation*

The *TC* curve includes both production and advertisement costs. The total profit curve is drawn by subtracting *TC* from *TR*. The profit so estimated is shown by the curve *PT*. As shown in Figure 2.2 profit maximizing advertisement expenditure is OA_p which maximizes profit at MA_p. Note that $MA_p = RC$. Assuming that minimum profit required is *OB*, the sales maximizing advertisement outlay would be OA_c. This implies that a firm increases its advertisement outlay until it reaches the target profit level which is lower than the maximum profit. This also means that sales maximizers advertise not less but more than the profit maximizers.

2.3.3 Criticism of Baumol's Model

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Although Baumol's sales maximization model is found to be theoretically sound and empirically practicable, economists have pointed out the following shortcomings in his model.

First, it has been argued that in the long-run, Baumol's sales maximization hypothesis and the conventional hypothesis would yield identical results, because the *minimum required* level of profits would coincide with the *normal* level of profits.

Second, Baumol's theory does not distinguish between firm's equilibrium and industry equilibrium. Nor does it establish industry's equilibrium when all the firms are sales maximizers.

Third, it does not clearly bring out the implications of interdependence of the firm's price and output decisions. Thus, Baumol's theory ignores not only actual competition between the firms but also the threat of potential competition in an oligopolistic market.

Fourth, Baumol's claim that his solution is preferable to the solutions offered by the conventional theory, from a social welfare point of view, is not necessarily valid.

Check Your Progress

3. What is the basic premise of Baumol's theory?
4. Name the two basic models formulated by Baumol for his theory of sales maximization.
5. Give one reason for the criticism received by the Baumol's model.

2.4 WILLIAMSON'S MODEL OF MANAGERIAL DISCRETION

Williamson's model of maximization of managerial utility function is a culmination of the managerial utility models. A. A. Berle and G. C. Means were the first business economists to point out, in 1932, that management is separated from ownership in the large multi-product business corporations and this influences the role of business managers in setting the goals of the large corporations. They argued that owners (the shareholders) look for high dividends and, therefore, they might be interested in profit maximization. But, for lack of corporate democracy, the owners have little or no role to play in policy decisions.

On the other hand, managers have different motives, desires and aspirations which they seek to maximize rather than maximizing profit. Besides, since corporate managers can generate the necessary capital internally by means of retained earnings and they do not need to venture into the capital market for debt capital, their

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decisions and actions are not subject to scrutiny. The managers, therefore, feel free to pursue their own interest in the corporate firms.

J. K. Galbraith developed Berle-Means hypothesis further and examined the issue extensively which is known as the Berle-Means-Galbriath hypothesis. It claims (i) that manager-controlled firms have lower profits than owner-controlled firms and (ii) that professional managers have no interest in maximizing profits. While some empirical studies support these claims, some others do not. The issue remains controversial.

However, Williamson made further improvements in the Berle-Means hypothesis. We discuss Williamson's hypothesis in some detail.

Williamson's model of maximization of managerial utility function is regarded as another important contribution to the managerial theory of firms' behaviour. Williamson argues that:

- Management is divorced from ownership
- Managers enjoy discretionary powers to set the goals of the firm they manage
- Managers maximize their own utility function rather than maximizing profit

Williamson's *managerial utility function* includes both quantifiable and unquantifiable variables. *Quantifiable variables* are also called *pecuniary variables* which include managers' salary, slack earnings and perks, and *unquantifiable variables* include power, prestige, job security, status, professional excellence and discretionary powers to spend money.

Williamson's model of managerial utility function (U_m) can be expressed as follows.

Maximize $$U_m = f(S, M, I_D) \quad ...(2.1)$$

subject to a minimum profit

where S = staff salary (management and administration), M = managerial monetary emoluments (including perks, etc.), and I_D = discretionary investment.

In Eq. (2.1), S, M and I_D are important decision variables in the managerial utility function and, therefore, need some elaboration. The variable S includes all payments to managerial and administrative staff on account of salary. It increases with expansion and promotion of the supporting staff for the top managers. It reflects the power, prestige, status and professional success of the management. Also, it enhances the market value of the managers. Variable M includes managers' gross emoluments which comprises salary and slack earnings in the form of luxurious residence, office, car, travel grants and entertainment. Variable I_D refers to the investment that managers make on their own discretion in addition to routine investment meant for the operation of the business to make a certain minimum profit. I_D reflects manager's powers, a sense of fulfillment and satisfaction.

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Assumptions: Williamson makes the following assumptions in his model of managerial utility maximization.

(*i*) Demand function: $Q = f(P, S, e)$

where Q = output, P = price, S = staff expenses, and e = environmental factors causing an upward shift in the demand curve;

(*ii*) Cost function: $C = f(Q)$ where $dC/dQ > 0$;

(*iii*) Profit measures:

(*a*) Actual profit = $P = R - C - S$

where R = revenue, C = cost of production, and S = staff salary,

(*b*) Reported profit = $\Pi_R = \Pi - M$

where M = managerial emoluments,

(*c*) Minimum profit = $\Pi_0 = \Pi_R - T$

where T = tax and $(\Pi_0 + T) \leq \Pi_R$, and

(*d*) Discretionary profit = $\Pi_D = \Pi = \Pi_0 - T$

2.4.1 Simple Version of Williamson's Model

Given the assumptions and the parameters, we present here only the simple version of Williamson's model. The simple version of the model assumes that 'managerial emoluments' equal zero, i.e., $M = 0$. With this assumption, the managerial utility function (2.1) can be written as:

Maximize $U_m = f(S, I_D)$ ...(2.2)

Subject to $\Pi > \Pi_0 + T$

The term I_D in Eq. (2.2) is defined as $\Pi - (\Pi_0 + T)$. That is,

$$I_D = \Pi - \Pi_0 - T \quad ...(2.3)$$

Equation (2.3) implies that managers set aside a part of *actual profit* (Π) as owners' 'minimum profit' (Π_0) and a part for tax payment (T). The balance of the actual profit is available to the managers for the purpose of 'discretionary investment' (I_D).

Note that I_D in Eq. (2.3) is the same as *discretionary profit* (Π_D) given in (*d*) above. It means that:

$$I_D = \Pi_D$$

By substitution, the managerial utility function (2.2) can be rewritten as:

Maximize $U_m = f(S, \Pi_D)$ ...(2.4)

where $\Pi_D = \Pi - \Pi_0 - T$

Equation (2.4) gives the final form of the managerial utility function in the simple version of the model. It must, however, be noted here that there is substitutability between S and Π_D. That is, given the actual profit (Π), S can be increased only by reducing Π_D, and *vice versa*. Therefore, in their attempt to maximize their utility function (2.4), the managers find an *optimum* combination

of S and Π_D. This is the point of firm's equilibrium. The firm's point of equilibrium is shown below graphically.

2.4.2 Firm's Equilibrium: Graphical Presentation

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Williamson's simple model of firm's equilibrium is presented graphically in Figure 2.3. To begin with, let us recall that there is *substitutability* between S and Π_D. This implies that managers can attain a certain level of utility (U) from the various combinations of S and Π_D. This possibility can be shown by an indifference curve as depicted by U_1 in Figure 2.3. The indifference curve U_1 presents the various combinations of S and Π_D that yield the same level of managerial satisfaction. By the same logic, an indifference map can be constructed assuming different levels of actual profits (Π) and the associated level of managerial utility, as shown by the indifference curves U_2, U_3 and U_4 in Figure 2.3. The higher the indifference curve, the higher the level of managerial satisfaction at different levels of actual profit.

The problem now is how to find the optimum point on the indifference map. This task is accomplished by finding the relationship between S and $\boldsymbol{\Pi}_D$ and the total actual profit ($\boldsymbol{\Pi}$). We know that $\boldsymbol{\Pi} = TR - TC$ and $TR = P \times Q$. Therefore, by assuming usual demand and cost functions, we can imagine that Π increases over some level of output and then it begins to decline. This behaviour of actual profit ($\boldsymbol{\Pi}$) is shown by the curve marked $\boldsymbol{\Pi}$ in Figure 2.3. By combining manager's indifference map and the profit function, one can obtain the optimum combination of S and $\boldsymbol{\Pi}_D$, i.e., the point of firm's equilibrium. The equilibrium of the firm lies at the point at which the highest indifference curve is tangent to the $\boldsymbol{\Pi}$-curve. As shown in the figure, point E is the point of firm's equilibrium. Point E denotes a situation in which managerial utility function (U_m) is maximized subject to a minimum profit of EM.

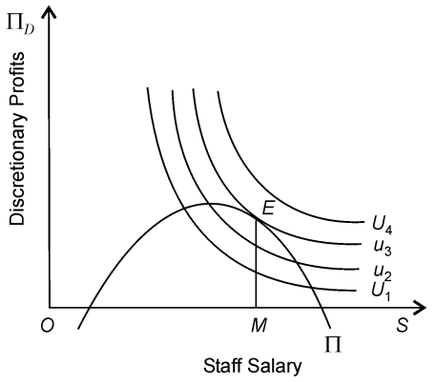

Fig. 2.3 *Equilibrium of the Firm: Willamson's Model*

Criticism: Williamson's model, like other models of this category, suffers from certain weaknesses of its own. This model does not deal satisfactorily with the problem of interdependence of firms under oligopolistic competition. Williamson's model is said to hold only where rivalry is not strong. In the case of strong rivalry, profit maximization hypothesis has been found to be more appropriate.

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Check Your Progress

6. Name the first business economists to point out, in 1932, that management is separated from ownership in the large multi-product business corporations.
7. Why is the Williamson's model of managerial discretion criticized?

2.5 MANAGERIAL FIRM vs ENTREPRENEURIAL FIRM

A thin line exists between a manager and an entrepreneur. An entrepreneur is often asked to perform his duties like a manager whereas a manager is always asked to perform his duties like an entrepreneur. A manager is advised to have the opportunism and drive like that of an entrepreneur whereas an entrepreneur is advised to discipline himself in a methodical manner similar to that of a manager (Heller, 2006). In the management literature, the two terms are sometimes used synonymously as both are associated with leadership. There are few researchers who have tried to merge both the terms in their findings of leadership and entrepreneurship (Gupta et al., 2004; Tarabishy et al., 2005), while there are others who have found connections between the concepts of leadership and entrepreneurship (for instance, Cogliser and Brigham, 2004; Vecchio, 2003). However, management and leadership are not necessarily corresponding, but they may be interconnected (Davidson and Griffin, 2000).

There are many differences between a manager and an entrepreneur: while a manager is appointed by a higher authority, an entrepreneur emerges out of the people. While managers have colleagues, entrepreneurs have helpers to assist them. Managers usually depend on their positional powers whereas entrepreneurs use their natural inherent powers like charisma, wisdom, cleverness and intuition. Mangers usually influence others on the basis of their authority whereas entrepreneurs influence others beyond formal authority.

Structuring on irrational decision-making models from behavioural decision theory, Busenitz and Barney (1997) proclaim that entrepreneurs are more vulnerable to decision-making prejudices and heuristics in comparison to managers. Thus, 'entrepreneurs are the people who notice opportunities and take risk and responsibility for mobilising the resources necessary to produce new and improved goods and services' (Jones and George, 2007, p. 42). Whereas, managers are more often responsible to make use of human resources and administering work to accomplish organizational goals effectually and proficiently (Jones and George, 2007). However, Griffin and Davidson (2000) are of the view that when performing of roles and duties are concerned, the differences between the duties and roles are more often that of degrees rather than of kind. Organizations require both

managers and entrepreneurs or leaders as far as the lifecycle theory of organizational leadership is concerned (Baliga and Hunt, 1987). Furthermore, to achieve the best out of the two skill sets, both should supplement each other and their ability and talent should overlap (Davidson and Griffin, 2000). Therefore, when an organization is being set-up or is laying its foundation, entrepreneurial leadership is very important in fashioning a goal or idea that helps the organization in taking its first steps. Managerial or entrepreneurial leadership becomes significant in the collectivity and formalization stages in order to speed up growth of the organization. A heavy emphasis on entrepreneurial leadership is needed again at the amplification of the structural stage.

2.5.1 Entrepreneurial Firms

The term 'entrepreneur' is often used interchangeably with 'entrepreneurship'. But conceptually it typically means *to undertake*. It owes its origin to Western societies. But even in the West, the meaning has undergone changes from time to time. In the early sixteenth century they were different. An entrepreneur is a creator whereas entrepreneurship is the creation. Entrepreneurship is the tendency of a person to organize his own business and run it profitably, exploiting the qualities of leadership, decision making, managerial calibre, etc. Entrepreneurship is a role played by or the task performed by an entrepreneur. The central task of the entrepreneur is to take moderate risks and invest money to earn profits by exploiting an opportunity.

The word 'entrepreneurship' was used to refer to army leaders. In the eighteenth century, it represented a dealer who bought and sold goods at uncertain prices. In 1961, Schumpeter used the term 'innovator' for entrepreneur. Entrepreneurship is recognized all over the world in countries such as USA, Germany, and Japan and in developing countries like India.

Hans Schollhammer provides a classification of entrepreneurial firms describing them to be of five types. These are described as follows:

- **Administrative entrepreneurship:** In the administrative model, the firm moves beyond formal R&D projects to encourage greater innovation through a philosophy of corporate support to innovators by systematically providing resources for making new ideas commercial realities. An entrepreneurial team led by a champion is supported by contributions from all departments in implementation of these projects.
- **Opportunistic entrepreneurship:** Champions are given the freedom to pursue opportunities both for the organization and through external markets by the loosening of formal structural ties. For instance, Quad/Graphics Inc., the company that prints *Newsweek*, when printing technology began to change rapidly with computers, challenged its engineers to design state-of-the-art equipment for printing. Quad/Graphics then created a separate subsidiary, QuadTech, and gave its engineers executive control and the autonomy to sell technology openly to anyone.

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- **Acquisitive entrepreneurship:** It is when corporate managers search for external opportunities, such as other firms and entrepreneurial start-ups that can enhance profits. This may be through mergers, acquisitions, joint ventures and licensing agreements. Rather than developing ideas internally, firms actively court other firms that have proprietary knowledge or promising products.
- **Imitative entrepreneurship:** Imitative entrepreneurship uses the ideas of other firms and then applies weight or corporate muscle to control markets. The Japanese, for example, during their initial period of growth, copied American products and produced them at lower costs, and exported them to American markets. Imitation shakes out less efficient producers and more capable firms who are able to provide consumers with value for their products or services take the initiative.
- **Incubative entrepreneurship:** The 'incubative' process is necessary for new ideas to be developed for commercialization. Project teams are created and are expected to put an innovation through its paces, and if warranted to push the implementation. The teams are often established as semi-autonomous new venture development units that often have seed capital, access to corporate resources, freedom of independent action, and responsibility for implementation from inception to commercialization. Corporate endeavour is to support these ideas so that they are successful. This process is reflective of risk-oriented entrepreneurship.

Each of these types has a different strategy and a distinct role for the innovator. Each classification implies a supportive environment that benefits not only the corporation, but also the innovative manager. This is easier to accomplish in small companies than in large ones, in part, because large companies have greater geographic differences and bureaucracies. Intrapreneurs embody the same characteristics as the entrepreneur—conviction, passion and drive.

Characteristics of a successful entrepreneurial firm

The National Business Incubation Association (NBIA) has identified the following characteristics of a successful entrepreneurial firm:

- An effective management team that works cooperatively and consists of members selected to provide a range of knowledge and skills
- Sound financing, the earlier the better; funding is directly related to a firm's success, and in some cases can be the deciding factor between a business venture's success and failure
- Principals who make business decisions based on a clear understanding of the market and the competition, rather than their own enchantment with their product or service

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- Principals who keep on top of best business practices by surrounding themselves with knowledgeable people, remaining open to advice and ideas and being willing and ready to make changes based on new information
- A well-researched business plan that provides clear direction and focus
- Principals who are good money managers and remain in control of the venture's books
- Entrepreneurs who are passionate about their ventures and communicate that excitement to potential investors, customers and mentors

2.5.2 Cyert-March Model of Firms

The behavioural model of Cyert and March is an extension and modified version of Simon's 'satisficing behaviour' model of corporate firms. The Cyert-March model can be appreciated better in contrast to other alternative theories of firm. Traditional theory of firm assumes 'profit maximization' as the sole goal of business firms. Managerial utility models emphasize the role of the dichotomy between the ownership and the management in setting business goals and claim that managers maximize their utility function. They argue that managers use their discretion to set goals for themselves different from profit maximization. They set such goals for themselves as maximization of sales revenue, maximization of firm's growth rate, maximization of manager's own utility function, and so on.

In contrast, Cyert and March look at large multiproduct corporations not as an ordinary firm, but as a *coalition of different but related interest groups including owners, managers, workers, input suppliers, customers, bankers, and tax authorities.* All these groups have their own interest in the corporations and their interests are often in conflict with one another.

- Owners (the stockholders) are interested in maximum profit possible;
- managers aim at high salary, power and perks;
- workers are interested in high pay packets, bonus, safe working conditions, insurance and other facilities;
- customers are interested in high quality goods and lower prices;
- input suppliers are interested in continuity and growth in demand for their supplies at higher prices;
- bankers expect and want their loans and advances to be secure and repaid on time; and
- tax authorities expect honest and regular tax payments.

Obviously there is a conflict—more or less—between the interests of the different interest groups. One of the important managerial tasks is the goal formation for the firm reconciling these conflicting interests. Let us now look at the aspiration levels of different interest groups and the process of goal formation.

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Aspiration Levels and Process of Goal Formulation

Goal formulation by reconciling conflicting interests is a complicated task. Cyert and March argue that managers have a crucial task in formulating a goal for the firm that reconciles the conflicting and competing interests of the different interest groups so as to ensure a smooth functioning of the corporation. In reconciling conflicting and competing interests, managers look at the factors that determine the demands of the various interest groups from the corporation. The demands of the various interest groups are determined largely by their 'aspiration levels', past performance of the firm, and information available to the interest groups. For example, managers' demand for a higher salary depends on the level of their aspirations, and their aspirations depend on their experience about the achievements of their aspirations. In a dynamic society, business environment and conditions continue to change. Environmental changes alter the achievements and, therefore, the level of their aspirations and their demands. That is, in a dynamic society—aspirations, achievements and goals of the corporations keep changing continuously.

Setting goals: The satisficing behaviour

Now the question arises: How are the goals set? The goals of large multiproduct corporations are set by the top management. Since interest groups are many and their aspirations and expectations are many and competing, a single goal cannot be set as it will not satisfy all concerned. Therefore, the top management sets a set of diversified goals. As mentioned already, according to Cyert and March, the top management sets the following five main goals:

(i) Production goal

(ii) Inventory goal

(iii) Sales goal

(iv) Market share

(v) Profit goal

These goals are determined through a process of continuous bargaining between the coalition groups. The top management attempts in the process of bargaining to bring about a reconciliation between the conflicting goals. However, so long as the firm is able to achieve the above goals, top management finds it helpful in reconciling the 'aspirations' of the interest groups. How the achievement of these goals satisfies the different coalition groups is described here briefly.

- Production goal aims at continuity in production irrespective of any seasonal variability of demand. This goal is achieved by preventing (*a*) underutilization of capacity in one period and its overutilization in another period and (*b*) lay-off of labour in one period and 'rush recruitment' in another. This helps in preventing undue variation in the cost of production and the problem of labour unrest and dissatisfaction. As a result, owners, managers and workers are satisfied.

- Inventory goal aims at maintaining a balanced inventory of both raw materials and finished goods. A balanced inventory of inputs and raw materials ensures continuity of production and supply of goods to the customers and also keeps the suppliers of inputs satisfied.
- Sales and market share goals aim at promotion and enhancing the market share of the firm. Sales are promoted through competitive advertising and a pricing strategy. Sales promotion and increase in market shares keep top management and owners satisfied.
- Profit goal is so determined that it satisfies the owners (the shareholders), the bankers and other financiers of the firm. Besides, the profit goal aims at making adequate financial provision for future projects.

However, setting the goals is an extremely complicated and difficult task. What the top management aims at, in practice, is to achieve an overall satisfactory performance. This, they call the firms' 'satisficing behaviour'. This is, according to Simon, *a bounded rational behaviour*. The practical methods of the 'satisficing behaviour' are to bring a reconciliation between the conflicting and competing aspirations. The methods that are generally used include:

- Budget allocation and delegation of authority
- Regular payment of dues to related interest groups
- Allocation of funds for R&D as 'side payment'
- 'Slack payments' to deserving groups
- Allocation of priorities to demand from different groups and meeting them in the same sequence
- Decentralization of decision-making powers at different levels of managerial functions

Shortcomings of the Cyert-March Model

The behavioural model of Cyert and March has been criticized on the following grounds.

(i) It provides only a simulation of managerial technique rather than providing a behavioural model.

(ii) It does not analyze and reveal how a firm reaches its equilibrium level in its 'satisficing behaviour'.

(iii) More importantly, it does not deal with the interdependence in the case of oligopolist firms.

(iv) This model has no predictive power whatsoever.

(v) At its best, it presents managerial behaviour rather than economic behaviour of the firms.

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Check Your Progress

8. State two differences between a manager and an entrepreneur.
9. List two characteristics of entrepreneurial firms as identified by National Business Incubation Association (NBIA).

2.6 MARRIS' MODEL OF MANAGERIAL ENTERPRISE

Robin Marris' theory of firm assumes that the goal that managers of a corporate firm set for themselves is to maximize the firm's *balanced growth rate* subject to managerial and financial constraints. To prove his point of view, he developed a model of firm's growth rate maximization. Marris defines firm's growth rate (G_r) as:

$$G_r = G_D = G_c \quad ...(2.5)$$

where G_D = growth rate of demand for firm's product and

G_c = growth rate of capital supply to the firm.

Equation (2.5) implies that a firm achieves a *balanced growth rate* when the *growth rate* of demand for its product equals the growth rate of capital supply to the firm. In maximizing firm's growth rate, managers are faced with two constraints: (*i*) managerial constraints and (*ii*) financial constraints.

Managerial constraints arise due to: (*a*) limits to managers' ability to manage and to achieve optimum efficiency and (*b*) managers' own job security. ***Financial constraints*** arise due to conflict between managers' own utility function which they attempt to maximize and owners' utility function. Marris defines managerial utility (U_m) and owners' utility (U_o) functions as follows.

Manager's utility function: $U_m = f$(salary, power, status, job security)

Owners utility function: $U_o = f$ (profit, capital, output, market share, public reputation)

Apparently, there is a divergence and, to some extent, a conflict between the manager's and owner's utility functions. However, Marris argues that the divergence between U_o and U_m is not so wide as it is made out in managerial theories of firm. He claims that the two utility functions converge into one variable, i.e., *a steady growth in the size of the firm*, however defined. Nevertheless, Marris defines steady growth rate of the firm for managers and owners in terms of two different variables—for managers in terms of G_d, i.e., growth in demand for firm's product, and for owners in terms of G_c, i.e., the growth of firm's capital (G_c). Thus, he redefines manager's and owner's utility functions as follows.

$$U_m = f(G_d) \quad ...(2.6)$$

and $$U_o = f(G_c) \quad ...(2.7)$$

According to Marris, managers try to maximize utility functions (2.6) and (2.7) in such a way that $G_d = G_c$. This is what Marris calls the *'balanced growth rate'*. The firm reaches its equilibrium when *'balanced growth rate'* is achieved. This is what Eq. (2.5) implies. The manager's objective is to maximize *balanced growth rate* (G_r) such that $G_d = G_c$. Thus, the firm is in equilibrium where:

$$G_{r(\max)} = G_d = G_c \quad ...(2.8)$$

Marris redefines G_d and G_c in Eq. (2.8) in operational terms as given below:

$$G_d = f(d, k) \quad ...(2.9)$$

where d = diversification of product, and k = success rate of new products,

and $$G_c = \bar{r}\,(\mathrm{P}) \quad ...(2.10)$$

where $\bar{r}$ = financial security ratio assumed to be a constant proportion of profit (Π).

In Marris's model, $\bar{r}$ is assumed to be determined subjectively by the managers. To elaborate on his theory, Marris has developed an elaborate model. We now turn to another aspect of Marris' theory of firm, i.e., the manager's financial policy.

2.6.1 Financial Policy for Balanced Growth

In their effort to strike a balance between their own and the owner's utility functions, managers adopt a *prudent financial policy*. In formulating a prudent financial policy, managers use the following three critical ratios.

(i) $\text{Debt ratio or Leverage } (r_1) = \dfrac{\text{Value of debts}}{\text{Total assets}}$

(ii) $\text{Liquidity ratio } (r_2) = \dfrac{\text{Liquid assets}}{\text{Total assets}}$

(iii) $\text{Profit retention ratio } (r_3) = \dfrac{\text{Retained profits}}{\text{Total profit}}$

Managers keep ***debt ratio*** (r_1) within a manageable limit by avoiding high debt liabilities including interest and debt repayment. The reason for this strategy is that a high debt ratio might lead to bankruptcy or insolvency and a low debt ratio means relying heavily on own resources which imposes a limit on capital growth. Likewise, high and low ***liquidity ratios*** (r_2) are avoided. The reason is a *high liquidity ratio* invites the risk of takeover by the dominant group of owners who could use the liquidity for their other ventures. *Low liquidity ratio* is avoided because it implies low financial leverage and low ability to meet payment obligations which often leads to loss of prestige and sometimes even to insolvency.

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The ***retention ratio*** is maintained at a level which prevents the change of top management (i.e., job security aspect) and keeps share prices reasonably high. *Low retention ratio* is avoided because it means high distribution of profits which may attract takeover by raiders. *High retention ratio* is avoided because it involves the risk of replacement of the top management.

In brief, a prudent financial policy is devised by constructing 'a financial security ratio' $\bar{r}$, which is a weighted average of the three *financial ratios*.

2.6.2 Shortcomings of Marris Theory

Marris's theory is regarded as an important contribution to the theory of firm in so far as it introduces financial ratios as decision variables in determining the firm's goal. Besides, his theory provides a reconciliation between the conflicting utility functions of the managers and owners. However, Marris's theory has its own shortcomings.

One, Marris assumes cost structure and price to be given. Therefore, he assumes implicitly that profit is given too. This assumption is not realistic. If fact, price determination has been the major point of contention in the theory of firms whereas Marris ignores this aspect completely. This is one of the serious drawbacks of his theory.

Two, most industries are oligopolistic and hence firms' business decisions are interdependent. Marris's theory does not account for this interdependence in firms' decisions. This implies that product differentiation by rival firms goes unnoticed or is ignored in the firm's decision-making. His theory has, therefore, a limited applicability.

Three, in an oligopolistic industry, if all the firms seek simultaneously to maximize their growth rate, it imposes a serious limitation on the growth in demand for firms' product and the supply of capital. Marris's theory does not account for this factor.

Check Your Progress

10. What are the two constraints faced by managers in maximizing a firm's growth rate?
11. Why do managers adopt a prudent financial policy?

2.7 LIMIT PRICING THEORY

Limit price can be defined as the maximum price that existing firms charge with the objective of limiting the number of firms and preventing the entry of new firms to the industry. *Limit pricing* is a practice of charging a price lower than the profit maximising one. The objective behind this practice is to prevent the entry of new firms to the industry. Limit pricing is thus an entry-preventing-pricing policy.

Over time, many economists have developed the limit pricing models. Bain was the first to formulate limit pricing theory in 1949. Later Sylos-Labini (1957), Franco Modigliani (1958), Pashigian (1968), and J. N. Bhagwati (1970) formulated their own theories of limit pricing. In this section, we will briefly describe only Bain's model of limit pricing—the most famous model.

2.7.1 Bain's Model of Limit Pricing

Bain has attempted, in his model, to explain why oligopoly firms maintain their prices over a long period of time at a level which is lower than the price that would maximize their profits. This price lies somewhere between the long-run competitive price (i.e., $P = LAC$) and monopoly price (determined where $MR = MC$). He calls the price so determined as *limit price*, i.e., the highest price which the established firms believe they can charge without inducing entry of new firms. We present here the simplest form of his model.

In his model, Bain assumes: (a) that long-run *AR*, *MR* and *LAC* curves are determinate and known; (b) that existing firms are in effective collusions; (c) that there exists a *limit-price* of which existing firms are aware; and (d) that existing firms seek to maximize their *long-run* profits.

The model which Bain has developed on the basis of these assumptions is presented in Figure 2.4.

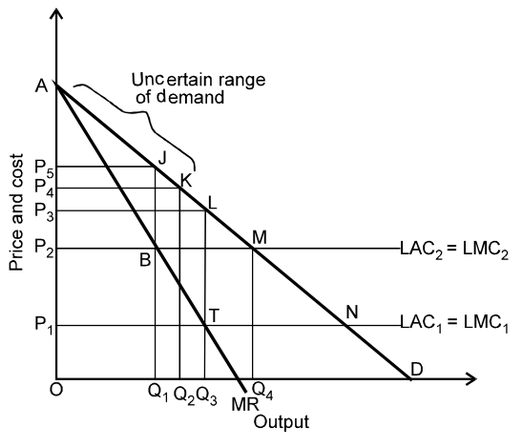

Fig. 2.4 *Determination of Limit Price*

The long-run average and marginal revenue conditions are given by *AD* and *A-MR* curves, respectively, and long-run average and marginal cost conditions are given by the horizontal line $LAC_2 = LMC_2$. Given the revenue and cost conditions, profit-maximizing monopoly price is OP_5 (= JQ_1) which is given by intersection of *MR* and LMC_2 at point *B*. Since LMC_2 and *AD* intersect at point *M*, competitive price is OP_2. Thus, the existing firms have monopoly price OP_5 at point *J* on the demand curve and competitive price OP_2 determined by point *M*. The limit price lies between these two prices. By assumption, existing firms can

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estimate the limit-price. They will therefore determine the limit price a little below the monopoly price, say at OP_4 at point K on the demand curve. Limit price OP_4 prevents the entry of new firms and existing firms maximize their long-run profits. Any price above OP_4 makes profit uncertain because it will attract new firms whose behaviour is uncertain. Therefore, *AK* part of the demand curve is the *uncertain range* of demand curve.

In case firms are able to decrease their cost of production and their $LAC_2 = MC_2$ shift downward to $LAC_1 = MC_1$, competitive price will be OP_1 and monopoly price will be OP_3 as determined by point T where $LAC_1 = MC_1$ intersects the MR curve. In that case, the limit price will be determined somewhere between OP_1 and OP_3. For example, limit price may be determined at $OP_2 = MQ_4$. This explains how limit price is determined. We will discuss Bain's limit pricing theory in detail in Unit 8.

Check Your Progress

12. Define limit price theory.
13. What does Bain try to explain about oligopy in his model?

2.8 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Although the conventional theory of firm still holds its ground firmly, several alternative theories of firm were proposed during the early 1960s by economists, notably by Simon, Baumol, Marris, Williamson, Berle and Means, Galbraith, and Cyert and March.
2. The alternative theories of the business firms are sometimes classified under the following categories:
   - Managerial theories of firm
   - Growth maximization theories of firm
   - Maximization of managerial utility theories
   - Behavioural theories of firm
3. The basic premise of Baumol's theory is that sales maximization, rather than profit maximization, is the plausible goal of the business firms.
4. To formulate his theory of sales maximization, Baumol has developed two basic models: (i) static model and (ii) dynamic model—each with and without advertising.
5. One criticism of Baumol's theory is that it does not distinguish between firm's equilibrium and industry equilibrium. Nor does it establish industry's equilibrium when all the firms are sales maximizers.

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6. A. A. Berle and G. C. Means were the first business economists to point out, in 1932, that management is separated from ownership in the large multi-product business corporations and this influences the role of business managers in setting the goals of the large corporations.
7. Williamson's model does not deal satisfactorily with the problem of interdependence of firms under oligopolistic competition. Williamson's model is said to hold only where rivalry is not strong. In the case of strong rivalry, profit maximization hypothesis has been found to be more appropriate.
8. There are many differences between a manager and an entrepreneur: while a manager is appointed by a higher authority, an entrepreneur emerges out of the people. While managers have colleagues, entrepreneurs have helpers to assist them.
9. The National Business Incubation Association (NBIA) has identified the following characteristics of a successful entrepreneurial firm:
   - An effective management team that works cooperatively and consists of members selected to provide a range of knowledge and skills
   - Sound financing, the earlier the better; funding is directly related to a firm's success, and in some cases can be the deciding factor between a business venture's success and failure
10. In maximizing firm's growth rate, managers are faced with two constraints:
    (i) managerial constraints and (ii) financial constraints.
11. In their effort to strike a balance between their own and the owner's utility functions, managers adopt a prudent financial policy.
12. Limit price can be defined as the maximum price that existing firms charge with the objective of limiting the number of firms and preventing the entry of new firms to the industry.
13. Bain has attempted, in his model, to explain why oligopoly firms maintain their prices over a long period of time at a level which is lower than the price that would maximize their profits.

2.9 SUMMARY

- Although the conventional theory of firm still holds its ground firmly, several alternative theories of firm were proposed during the early 1960s by economists, notably by Simon, Baumol, Marris, Williamson, Berle and Means, Galbraith, and Cyert and March.
- Another major drawback of the conventional theory is that it does not recognize the dichotomy between the ownership and management and its role in setting the goal for the firm.

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- The alternative theories of the business firms are sometimes classified under the following categories:
  - Managerial theories of firm
  - Growth maximization theories of firm
  - Maximization of managerial utility theories
  - Behavioural theories of firm
- One thing is clear that the conventional theory of firm based on profit maximization hypothesis is not the only theory applicable to a multitude of firms—large and small, owner-managed and manager-managed, single-product and multi-product, local and multinational, private and public undertakings, and alternative theories do provide alternative explanations to the firm's behaviour.
- There is a general consensus that the conventional theory has greater explanatory and predictive power than the alternative theories of firm. As regards the empirical validity, the empirical evidence in support of the alternative theories is not unambiguous.
- Baumols's theory of sales maximization is one of the most important alternative theories of firm's behaviour. The basic premise of Baumol's theory is that sales maximization, rather than profit maximization, is the plausible goal of the business firms.
- To formulate his theory of sales maximization, Baumol has developed two basic models: (*i*) Static Model and (*ii*) Dynamic Model—each with and without advertising.
- There are two types of probable equilibrium: one in which the profit constraint does not provide an effective barrier to sales maximization, and second in which profit constraint does provide an effective barrier to sales maximization.
- In an oligopolistic market structure, however, price and output are subject to non-price competition. Baumol considers in his model with advertising as the typical form of non-price competition and suggests that the various forms of non-price competition may be analysed on similar lines.
- Baumol's theory does not distinguish between firm's equilibrium and industry equilibrium. Nor does it establish industry's equilibrium when all the firms are sales maximizers.
- Williamson's model of maximization of managerial utility function is a culmination of the managerial utility models. A. A. Berle and G. C. Means were the first business economists to point out, in 1932, that management is separated from ownership in the large multi-product business corporations and this influences the role of business managers in setting the goals of the large corporations.

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- Williamson's model does not deal satisfactorily with the problem of interdependence of firms under oligopolistic competition. Williamson's model is said to hold only where rivalry is not strong. In the case of strong rivalry, profit maximization hypothesis has been found to be more appropriate.
- A thin line exists between a manager and an entrepreneur. An entrepreneur is often asked to perform his duties like a manager whereas a manager is always asked to perform his duties like an entrepreneur.
- There are many differences between a manager and an entrepreneur: while a manager is appointed by a higher authority, an entrepreneur emerges out of the people. While managers have colleagues, entrepreneurs have helpers to assist them.
- Structuring on irrational decision-making models from behavioural decision theory, Busenitz and Barney (1997) proclaim that entrepreneurs are more vulnerable to decision-making prejudices and heuristics in comparison to managers.
- The term 'entrepreneur' is often used interchangeably with 'entrepreneurship'. But conceptually it typically means to undertake. It owes its origin to Western societies.
- In the administrative model, the firm moves beyond formal R&D projects to encourage greater innovation through a philosophy of corporate support to innovators by systematically providing resources for making new ideas commercial realities.
- The behavioural model of Cyert and March is an extension and modified version of Simon's 'satisficing behaviour' model of corporate firms. The Cyert-March model can be appreciated better in contrast to other alternative theories of firm.
- Goal formulation by reconciling conflicting interests is a complicated task. Cyert and March argue that managers have a crucial task in formulating a goal for the firm that reconciles the conflicting and competing interests of the different interest groups so as to ensure a smooth functioning of the corporation.
- Robin Marris's theory of firm assumes that the goal that managers of a corporate firm set for themselves is to maximize the firm's balanced growth rate subject to managerial and financial constraints.
- In maximizing firm's growth rate, managers are faced with two constraints: (*i*) managerial constraints and (*ii*) financial constraints.
- In their effort to strike a balance between their own and the owner's utility functions, managers adopt a prudent financial policy.

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- Marris's theory is regarded as an important contribution to the theory of firm in so far as it introduces financial ratios as decision variables in determining the firm's goal. Besides, his theory provides a reconciliation between the conflicting utility functions of the managers and owners.
- Limit price can be defined as the maximum price that existing firms charge with the objective of limiting the number of firms and preventing the entry of new firms to the industry. Limit pricing is a practice of charging a price lower than the profit maximising one.
- Bain has attempted, in his model, to explain why oligopoly firms maintain their prices over a long period of time at a level which is lower than the price that would maximize their profits.

2.10 KEY WORDS

- **Entrepreneurship:** Entrepreneurship is the tendency of a person to organize his own business and run it profitably, exploiting the qualities of leadership, decision making, managerial calibre, etc.
- **Limit price:** It can be defined as the maximum price that existing firms charge with the objective of limiting the number of firms and preventing the entry of new firms to the industry.
- **Limit pricing:** It is a practice of charging a price lower than the profit maximising one.

2.11 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What lies at the foundation of the alternative theories of business firms? Do the alternative theories really offer an alternative explanation to firms' behaviour?
2. What was the conventional theory of a firm based on?
3. According to Baumol, why do business managers pursue the goal of sales maximization?
4. In what way is Baumol's theory superior to the conventional theory based on profit maximization hypothesis?
5. Does Baumol's model offer a more appropriate explanation to price and output determination than the conventional theory?
6. How does Williamson's model of managerial utility maximization explain the equilibrium of the firm?

7. How does Marris define the balanced growth of the firm? How do managers arrive at the balanced growth? What kind of financial policy do the managers adopt to secure their stake in the firm?
8. Write a short note on limit pricing theory.

Long Answer Questions

1. Discuss the traditional theory of firm.
2. Explain Baumol's theory of sales revenue maximization.
3. Assess Baumol's model of price and output determination with and without advertisement.
4. Evaluate Williamson's model of managerial utility maximization.
5. Critically analyse the differences between managerial and entrepreneurial firm.
6. Explain Marris' model of managerial enterprise.
7. Describe the limit pricing theory with special reference to Bain's model of limit pricing.

2.12 FURTHER READINGS

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UNIT 3 THEORIES OF RENT AND PROFIT

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Structure

3.0 INTRODUCTION

Rent in layman terms, is understood at the price paid for renting a property or land. But this term has different usage in economics. There have been different theories regarding the concept of rent and as per the classical theory of rent (propounded by Ricardo), rent is the price paid for the indestructible and original value of the land by the tenant to the landlord. In the modern theory of rent, the term has been expanded to include all the factors of production which do not have a perfectly elastic supply. In this unit, you will be introduced to the concept of rent and the Ricardian theory of rent.

You will also learn about the theories of profit. And just like the theories of rent, the theories of profit define the difference concepts of profit. The unit will also discuss the dynamic and innovation theories of profit.

3.1 OBJECTIVES

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

- Discuss the concept of rent and the Ricardian theory of rent
- Explain profit as a dynamic surplus
- Describe the concept of innovation and profit

3.2 CONCEPT OF RENT: RICARDIAN THEORY OF RENT

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The Ricardian theory of rent is the earliest known rent theory and is generally known as the classical theory of rent. The point of distinction between Ricardian and modern theories of rent is that while Ricardo considered rent as 'surplus produce' attributable solely to land as a factor of production, modern economists consider rent as 'economic surplus' which accrues as well to all other factors in fixed supply in the short-run.

Antecedents of Rent Theory

Ricardian theory of rent has an interesting antecedent. In the early 19th century, food prices in Britain had considerably increased partly due to Napoleonic War and partly due to increase in population and the consequent increase in demand for food. This caused a great deal of anxiety to the British Government. So both House of Lords and the House of Commons appointed a Committees to find the cause of rise in food price. The Committees reported that 'food prices were high because rents were high'. The contemporary economists, namely, West, Torrens, Malthus and Ricardo reacted to this suggestion and offered, separately, an alternative explanation to the problem. In their opinion, food prices were high not because rents were high, rather, rents were high because food prices were high. According to them, food prices had gone up due to Napoleonic War and increase in population causing increase in demand for food. Scarcity of food led to increase in food prices which, in turn, increased profitability of cultivation. This resulted in increase in demand for land, which caused rise in rents. Ricardo, who was said to be a new bourgeoisie, added that the landed aristocracy (the landlords) was thriving on the misfortune of the rest of the society and causing misery to the tenant farmers. For holding this view, Ricardo was criticised as being anti-landed aristocracy. However, Ricardo's theory of rent emerged out of his effort to establish his argument.

Ricardian Theory of Rent

Ricardo defined rent as "that portion of the produce of earth which is paid to the landlord for the use of the *original* and indestructible powers of soil". Ricardo considered payment of rent as an indication of niggardliness of nature. This was contrary to the opinion of French economists, known as 'Physiocrats' who considered rent as the result of bounty of nature. By niggardliness of nature, Ricardo meant 'fixed supply' of land and its limited productivity. Land as a factor of production proves scarce with the growth of population. Growth of population forces extension of cultivation to inferior lands. According to Ricardo, rent arises due to differential in surplus accruing to the cultivators resulting from the differences in fertility of soil of different grades of land. In simple words, rent arise because of difference in surplus produce of land of different productivity.

Ricardian theory of rent is based on the principle of demand and supply. If, in a country, the fixed supply of land exceeds the total demand for land, no rent

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will be paid, like nothing is paid for the use of air. In Ricardo's words, '...if all lands had the same properties, if it were unlimited in quantity, and uniform in quality, no charge could be made for its use, unless where it possessed peculiar advantages of situation.' Rent is chargeable '...because land is not unlimited in quantity and uniform in quality, and because [due to increase in population], land of an inferior quality, or less advantageously situated, is called into cultivation...'

Ricardo has shown that *rent arises in both extensive and intensive cultivation of land.* Let us first explain the rent on **extensive cultivation.** When land is cultivated extensively, rent on superior land equals the excess of its produce over that of the inferior land. Suppose there are three grades of land—*A, B* and *C* and if an equal amount of capital and labour is used to cultivate the same area of each grade of land, and the respective yields are 100, 80 and 70 quintals of wheat. If, in a country, the supply of *A* grade land is greater than what must be cultivated to meet the food requirement of the existing population, no rent is payable till the demand for land exceeds the supply of *A* grade land. When population increases, demand for land increases, beyond grade *A* land, the land of grade *B* will be brought under cultivation. But, compared to the yields from land *A*, (i.e., 100 quintals), land *B* yields only 80 quintals of wheat, even if the same quantities of capital and labour are used. This difference in the yields from lands of grade *A* and *B*, gives rise to rent on land of grade *A*. The rent on land *A* equals 100 – 80 = 20 quintals of wheat. Similarly, when population increases further, land of grade C is also brought under cultivation, which yields only 70 quintals of wheat. This gives rise to rent on land *B* and raises rent on land *A*. According to Ricardian theory, rent on land of different grade is worked out by the following formula.

Rent = yield from a land *less* yield from the lowest grade of land.

For example, the rent on land of grade *A* and *B* can be worked out as follows.

Rent on land *A* = 100 – 70 = 30 quintals of wheat

Rent on land *B* = 90 – 70 = 20 quintals of wheat

If the value of capital and labour used in cultivation equals the value of 70 quintals of wheat, the land of grade *C* will not bear any rent. Land *C* is therefore called 'marginal land' or 'no-rent land'.

In case of **intensive cultivation,** Ricardo observes that it often happens that before land *B* is brought under cultivation, more of capital can be employed to increase productivity of land *A*. But, it is quite likely that doubling the capital on land *A*, the produce is not doubled. It may yield only 95 quintals instead of 100 quintals, which is greater than the produce of land *B*. The cultivators would therefore intensify cultivation of land *A*, instead of employing their capital on land *B* or on any inferior land. In this case, the rent on land *A* would be 5 quintals = 100 – 95 quintals. Thus, in case of intensive cultivation, capital and labour will not be employed on land *B* till the yields from subsequent units of factors used on land *A* are greater than that of land *B*. As more and more units of capital and labour are employed on

land *A*, the yield from the successive units of capital and labour decreases. This has two repercussions: *one*, rent on land *A* increases and *two*, the inferior land, i.e., land *B*, is brought under cultivation. It shows that the Ricardian concept of rent is based on the *law of diminishing return*.

Critical Evaluation

Ricardian theory has been criticised on the following grounds.

First, Ricardo's concept of rent is based on the assumption that powers of soil are 'original and indestructible', which can hardly be accepted. Fertility can be created through techniques of soil conservation and land reclamation and can be destroyed through the continuous use of the soil. Destruction of 'power of soil' has become particularly easy due to growth of atomic energy.

Second, Ricardo's idea that rent is peculiar to land as a factor of production has been questioned by the modern economists. The differential surplus as rent acrues also to other factors—labour, capital and entrepreneurship—as well as to land.

Third, Ricardo assumed only one use of land, i.e., growing corn, and hence, there is no transfer earning. So all that is paid in the name of rent becomes economic rent. There are, however, alternative uses of land. There are, therefore, transfer earnings, and the total rent cannot be economic rent.

Finally, Ricardo considered land supply to be fixed because he considered land of the economy as a whole. For an individual cultivator, however, the supply of land has an elasticity greater than zero. This alters the concept of rent envisaged by Ricardo.

3.2.1 Quasi-Rent: The Short-Term Rent on Fixed Factors

The *quasi-rent*, a concept used by Marshall, refers to the short-term earnings of factors which are in fixed supply in the short run. To explain the concept of quasi-rent, let us make a distinction between the short run and the long run. In the long run, all inputs are variable in large quantities as their supply is elastic. In the short run, however, the supply of certain inputs is fixed. For example, the supply of plant and machinery in the short run is inelastic.

In the short run, variable factors can be transferred to their alternative uses if they are paid an amount less than their transfer earning (or opportunity cost). Therefore, if variable factors are to be retained in their current use in the short run, they must be paid equal to their transfer earning. Otherwise, variable factors shall be transferred to their alternative uses. On the contrary, the fixed factors cannot be transferred to their alternative uses in the short run. Therefore, in the short run, fixed factors are paid what is left after the variable factors are paid their opportunity cost. That is, fixed factors are paid, in the short run, the *residual* of the total revenue. This residual payment to a factor fixed in the short run is called quasi-rent. The quasi-rent may thus be defined as *TR—TVC*.

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The determination of quasi-rent is illustrated in Fig. 3.1. Suppose, given the *AVC, AC* and *MC* curves, price is *OP,* and the firm is in equilibrium at point *E.*

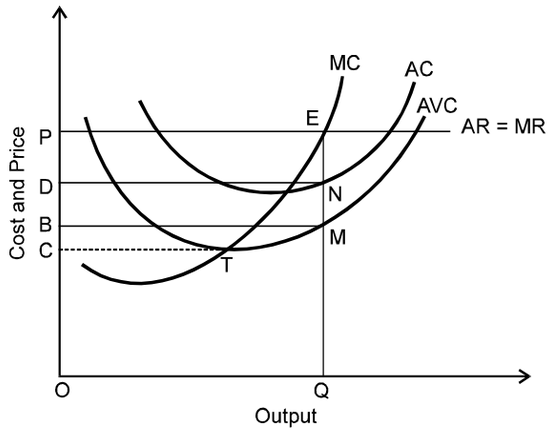

Fig. 3.1: *Determination of Quasi-Rent*

At equilibrium, 'firms' total revenue is

$OP \times OQ = \quad OPEQ$

and $\quad TVC = OB \times OQ = OBMQ$

The firm must pay a total sum of *OBMQ* to retain the variable factors. Under perfectly competitive conditions, this sum equals their transfer earnings the earning that a factor expects from its second best use. The quasi-rent may be obtained as

Quasi-Rent = $OPEQ - OBMQ = PBME$

The quasi-rent will always be a non-negative quantity. For example, so long as price is greater than *OC,* the quasi-rent will be greater than zero. When price is *OC,* total revenue (*TR*) equals total variable cost (*TVC*), i.e.,

$TR = OC \times CT$ and $TVC = OC \times CT$

Since $\quad TR - TVC = 0,$ quasi-rent = 0. When price falls below *OC,* there will be no production. There is therefore no question of quasi-rent.

The quasi-rent can be divided into two components: (i) opportunity cost; and (ii) economic profits. We have seen that when prices is *OP,* quasi-rent is represented by the area *PBME*. Of this, the area *DPEN* represents the difference between the *TR* and *TC* (= $OQ \times OD$). Therefore, the area *DPEN* represents the total pure or economic profits. The area *BDNM* represents the *total fixed cost, TFC* = $(AC - AVC)\ OQ = (OD - OB)\ OQ$. The fixed factors would have earned the same amount in another firm of the same industry, under competitive conditions. Therefore, the area *BDNM* is the *opportunity cost* of fixed factors. Thus

Quasi-rent = *TFC* + Economic Profit

Factor Price, Transfer Earning and Economic Rent

The equilibrium price of a factor service can be divided into two components:

(i) *Transfer Earning;* and

(ii) *Economic Rent*

Transfer earning or what is also known as *opportunity cost,* may be defined as *the amount that a factor must earn to remain in its present occupation.* Or, transfer earning is the amount that a factor expects to earn if transferred to its second best use. For example, suppose a doctor earns ` 10,000 per month from his private practice. The alternative available to him is to serve in a hospital as an employee where he expects to earn ` 8,000 per month. Thus, doctor's transfer earning is ` 8,000 per month. He must earn a minimum of ` 8,000 per month to remain in his private practice. So long as he earns ` 8,000 per month from his private practice, he has no incentive to join a hospital as an employee.

Economic rent is the excess of actual earning of a factor over its transfer earning. *Economic rent* may thus be defined as factor's actual earning minus its transfer earning. Consider the factor supply curve, S_f in Fig. 3.2, which has less positive slope. It implies that more and more units of factor shall be supplied to an industry if factor payments increase, and, conversely, less and less units will be supplied to the industry if factor payments decrease. That is, when factor payment decreases, factors are transferred to their alternative uses. For example, given the demand curve D_f, the market factor price is determined at OP_3, where equilibrium supply of factor is OM. Note that, given the supply curve, S_f, all but one of OM units (i.e., $OM - 1$) of factor are willing to remain in this industry at factor prices lower than OP_3. That is, minimum payments that must be made to all but the last factor unit, in order to prevent transfer of factors to alternative uses, is less than the equilibrium price OP_3.

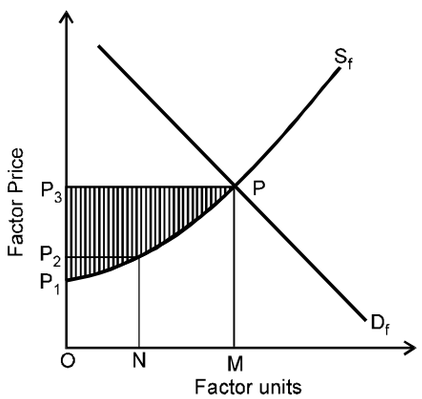

Fig. 3.2: *Economic Rent*

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In other words, the transfer earning of all factor units, *excepting the last one,* is less than their actual earning. For example, the *transfer earning* of *ON*th unit of the factors is only OP_2, whereas the actual earning, i.e., the market factor price, is OP_3. Thus, economic rent earned by the *ON*th unit is $OP_3 - OP_2 = P_2O_3$. The same exercise may be performed for all the *OM* factor units, and economic rent computed. The shaded area, $P_1 P P_3$, represents the *total economic rent of OM* units. Note that the *OM*th unit, i.e., the last unit, of the factor does not earn economic rent because its actual earning equals its transfer earning. The total transfer earning is shown by the area below the shaded area.

Note that the terms 'economic rent' means differently from the term 'rent' in common parlance. In its common usage, the term 'rent' means the *actual* payment to the landlord, much of which is transfer earning. But, when an economist speaks of 'rent' he means 'economic rent', i.e., the excess of payment over transfer earning.

Elasticity of Factor Supply and Economic Rent

The existence of economic rent depends on the elasticity of factor supply. Economic rent may be zero or equal to transfer earning depending on whether factor supply is perfectly elastic or perfectly inelastic. These are the two limiting cases of economic rent.

When factor supply is perfectly elastic, economic rent is zero. Perfectly elastic factor supply (i.e., $e_s = \infty$) means that an individual factor-owner can supply his factor as much as he wishes, and an individual firm or industry can buy as many units of the factor as it wants to, *at a given price.* In such a case, *the whole price paid to the factor*, i.e., its actual earning, equals its transfer earning. There is no excess payment over the transfer earning. Hence economic rent is zero.

Factor supply is perfectly inelastic, economic rent equals actual earning. If factor supply is fixed and factor has only one use, the factor owners would have to put their factors on the market for whatever they can earn. Even if factor owners are not satisfied with what the market offers, they cannot transfer their factors to other uses, since there is none. Therefore, in such cases *transfer earning* is zero. Thus, the whole factor price is *economic rent.*

Check Your Progress

1. What was the difference between the definition of rent by Ricardo and the physiocrats?
2. Why does rent arise as per Ricardo?
3. State the two components in which quasi rent can be divided?

3.3 PROFIT AS A DYNAMIC SURPLUS AND INNOVATION AND PROFIT

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The meaning and source of 'profit' have always been a centre of controversy. "The word 'profit' has different meanings to businessmen, accountants, tax collectors, workers and economists..." For example, 'profit to a layman means all incomes that go to the capitalist class'. To an accountant, profit means the excess of revenue over all paid-out costs including both manufacturing and overhead expenses. For all accounting purposes, businessmen also use accountants' definition of profit. But, on the question as to whether a businessman should stay in his present business or move to another, his concept of profit differs from the one used in accountancy. The term 'profit' in the accounting sense does not include the **opportunity cost**— the earning that a businessman foregoes to earn a given profit in his present occupation. But a businessman does consider his *opportunity cost* in his calculation of his satisfactory profit that must be large enough to cover his opportunity cost. All such costs are termed as 'opportunity costs'. Essentially, it includes all the expected incomes which he might earn from the second best alternative use of his *own resources*—labour and capital.

Concept of Pure Profit. Economists' concept of profit is of '**pure profit**'. It is also called '**economic profit**' or '**just profit**'. The word 'profit' in this unit means 'pure profit'. 'Pure profit' is a return over and above opportunity cost, i.e., the payment that would be "necessary to draw forth the factors of production from their most remunerative alternative employment." Pure profit may thus be defined as "a residual left over after all contractual costs have been met, including the transfer costs of management, insurable risks, depreciation, and payments to shareholders sufficient to maintain investment at its current level." In other words, *pure profit* equals *net profit* less opportunity costs of management, insurable risk, depreciation of capital, necessary minimum payments to shareholders than can prevent them from withdrawing their capital from its current use. The pure profit, so defined, may not be necessarily positive for a single firm in a single year; rather there may be negative profit (i.e., loss). What is important is the return over time. In the long-run, in a competitive system, however, pure profit is presumed to be equal to zero. That is, pure profit is non-existent in the long-run. "To discover whether such profit exists, take the revenue for the firm and deduct the costs of all factors of production other than capital. Then deduct the pure return on capital and any risk premium necessary to compensate the owner of capital for the risks associated with its use in this firm and industry. Anything that remains is pure profit."

An important question regarding 'pure profit' is 'to whom does it belong and in what form?' It is common knowledge that pure profit belongs to the entrepreneur, the owner of the firm. But the question arises: how does it accrue to the entrepreneur? For, if an entrepreneur is treated as a separate factor of

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production, pure profit must equal the value of its marginal product. But marginal value of product cannot be logically equated to pure profit, because as concluded above, pure profit is a 'residual'. In fact, this problem has been the source of controversy which led to various profit theories. We now turn to discuss the various theories of profit.

Theories of Profit

In this section, we will discussed some important theories of profit. Profit theories reveal, in fact, only the source of profit, not the determination of profit rate.

3.3.1 Walker's Theory of Profit: Profit as Rent of Ability

One of the most widely known theories advanced to explain the nature of profit was formulated by F.A. Walker. According to him, profit is rent of the exceptional abilities that an entrepreneur may possess over the least entrepreneur. Just as rent on land is the difference between the yields of the least fertile and super lands, pure profit is the difference between the receipts of the least efficient entrepreneur and that of those with greater efficiency or managerial ability.

Assumptions. In formulating his profit theory, Walker visualised a state of perfect competition in which all firms (or entrepreneurs) are presumed to possess equal managerial ability or entrepreneurship. There being no barrier to prevent the entry of new firms to the industry, the number of firms would increase until the remuneration of each was just enough to keep them in the industry. Each firm would then receive only the wages of management which, in Walker's view, formed no part of (pure) profit. He regarded wages of management as ordinary wages. Thus, under perfectly competitive conditions, there would be no pure profits and all firms would be no-profit firms.

However, when one departs from the realm of perfect competition, one finds, in almost every economic activity, some firms making only a bare living while other firms in the same industry are making pure profits. Walker regarded profits of profit-making firms arising from what a more efficient firm is able to produce over and above what the least efficient firm i.e., able to produce with same amount of capital and labour. Walker attributed this surplus wholly to the greater efficiency of a firm, which distinguishes it from the least efficient ones.

Thus, to Walker, profit is reward for exceptional business ability over and above the ordinary ability required for management of the organisation which could be rewarded by a wage or salary. Just as rent is a reward for a higher productivity of land, so is the profit reward for superior managerial ability of an entrepreneur.

A natural corollary of this view is that profit did not enter the cost of production as is the case with rent. Therefore, according to Walker, profit does not enter the price determination. The logic that Walker gives for his argument runs as follows. Market price is determined by the cost of production of that portion of supply which is produced by the least efficient firms. Prices so determined

make allowance for only wages of management not the surplus that accrues to the firms with greater efficiency.

3.3.2 Clark's Theory of Profit: Profit as Reward for Dynamic Entrepreneurship

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The dynamic theory of profit is associated with the name of J.B. Clark, which he propounded in 1900. According to Clark, profits accrue in a dynamic world, not in a static world.

The Static World. As visualised by Clark, a static world is one in which there exists absolute freedom of competition; but population and capital are stationary; there are no inventions; production process does not change; and the goods continue to remain homogeneous. Besides, in a static state there is perfect mobility of factors of production but there is no motion because marginal products of labour and capital are equal in all groups of industries. Also, in a static state, there is no uncertainty and hence, no risk. Whatever risks might arise due to natural calamities are covered by insurance.

No Profit in Static Society. To show how profits were eliminated in a static state, Clark draws a distinction between the work of an entrepreneur and that of a manager of business. He believed that the task of a manager could be described as labour which can be paid for by wage. In a static state, profit would not arise because competition would not permit any business manager to earn more than his actual wages which would be equal to marginal value his product. Therefore, there would be no surplus available which could be called as profit.

The Dynamic World. In contrast to static word, dynamic world is one in which the factors that remain constant in a static world undergo the process of change. Clark indicated certain generic changes that mark the transition of a society from a static to a dynamic state. Briefly speaking, generic changes include

(a) increase in population;

(b) increase in capital;

(c) improvement in production techniques;

(d) changes in forms of business organisation; and

(e) multiplication of consumer's wants.

Profit as Reward for Dynamic Enterprise. In Clark's view, the major functions of an entrepreneur in a dynamic society are related to these changes, i.e., to take the advantage of generic changes, promote their business, expand their sales, and reduce their cost of production. The typical changes that emerge out of this special effort of some entrepreneur are inventions and improvement in the methods of production. Such changes lead to increase in production given the costs or reduction in costs given the output, which results in emergence of profits to the initial inventors.

Profits in Dynamic World are not There for Ever. With the passage of time, profits resulting from the inventions and improvements in production methods disappear. What happens, in fact, is that competition forces other entrepreneurs to imitate or innovate the new technology. This leads to rise in demand for labour and capital. Consequently, wages and interest rise and cost of production increases. On the other hand, with larger employment of labour and capital, production increases leading to fall in product prices. The ultimate result is that profits disappear. In Clark's own words, "profit is an elusive sum which entrepreneurs grasp but cannot hold. It slips through their figures and bestows itself on all members of the society."

Profits Disappear to Reappears. This however should not mean that, in a dynamic society, profits arise only once and disappear never to emerge again. In fact, under dynamic conditions, the generic changes continue to take place: it is a continuous process. The process of dynamic change gives entrepreneurs opportunities time and again to adjust their business to the changing conditions, make inventions and improve production methods, with a view to make pure profit. In fact, emergence and disappearance of profits is a continuous process.

On the question of risk involved in making inventions and improving production methods, Clark was of the view that profit docs not arise due to risk. If risk is there, it affects capitalists because risk-income accrues to them. Profit, on the other hand, is the result of entrepreneurial functions under dynamic conditions. Therefore, profit does not result from risk-bearings.

To sum up, according to J.B. Clark, profit is a reward for coordinating managerial functions of entrepreneurs under dynamic conditions. It is a reward for dynamism. It is not a reward for risk bearing. Pure profit, according to him, is a residue that remains after interest and wages are paid. That is, the difference between the gross receipts and payments for wages and interest represents profit.

Criticism of Clark's Theory

Clark's theory, though impressive, has failed to win unqualified acceptance and has been criticised on the following grounds.

First, to some economists the division of firm's earning between the wage of management and profits is not acceptable. It has been contended, for instance, that even the routine conduct of a business calls for a prudent judgement and administrative ability just as these qualities are calls for in the exploitation of a new invention or in any other manifestation of economic change. Clark's definition was therefore a matter of phraseology and no clear line could be drawn to show the functions which give wages of management and those which were remunerated by profits.

Secondly, even if it is accepted that profits are accounted for by the coordinating functions of entrepreneur, it poses special difficulties in explaining the profits in the practical world. For instance, profits of companies are mainly paid to

the shareholders. But these shareholders exercise no coordinating functions. One may say, for the sake of argument, that shareholders receive only a fair interest on their investment and that the profit is what remains after paying this 'interest'. Still, this sum after deducting the 'interest' paid to shareholders would continue to be their property, because they are the owners of retained earnings. Thus, Clark's theory fails to explain the profits in practice.

Thirdly, the basic tenet of Clark's theory is that profits result from change in business conditions and are reward for dynamism and Clark's entrepreneur is the pioneer of this change. But in practice, one finds that profit exists under different conditions. There are many profitable business concerns engaged in forms of activity in which dynamic stage is long since past and in which no change takes place. In many lines of activity business has settled down to almost routine conditions and yet profits continue to be made despite competition.

Fourthly, it has been argued by F.H. Knight that all changes would not give rise to profits. Certain changes are predictable and others are not. So far as predictable changes are concerned they pose no managerial problems or uncertainty. Therefore, such changes cannot give rise to profit. Only the unpredictable changes would require the use of managerial talent and, hence, give rise to uncertainty. Clark's theory thus misses an important element of uncertainty and risk and their relation to profit.

3.3.3 Hawley's Risk Theory of Profit: Profit as Reward for Risk-Bearing

The risk theory of profit was propounded by F.B. Hawley in 1893. Hawley regarded risk-taking as the inevitable accompaniment of dynamic production. and those who take risk have a sound claim to a separate reward, known as profit. Thus, according to Hawley, profit is simply the price paid by society for assuming business risks. In his opinion, businessmen would not assume risk without expecting an adequate compensation in excess of acturial value. That is, the entrepreneur would always look for a return in excess of the expected losses. The reason why Hawley maintains that profit is over and above the acturial risk is that the assumption of risk is irksome; it gives rise to trouble, anxiety and disutilities of various kinds, which gives a claim to reward for all these pains in excess of acturial value of risk. Profit, according to Hawley, consists of two parts: *one*, represents compensation for acturial or average loss incidental to the various classes of risks necessarily assumed by the entrepreneur; and *second* the remaining part represents, an inducement to suffer the problems of being exposed to the risk.

Hawley recognises that the coordination which Clark spoke of was important, but he believes that profit is attendant upon profit only when coordination happens to be an incident of ownership; and that profit arises from ownership only so long as ownership involves risk. Thus, risk has to be assumed to qualify for profit. If an entrepreneur shifts his risks by insuring against them, he would cease

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to be an entrepreneur and would not receive any profit. It is only from the uninsured risks that profits arise, and until the uncertainty ends with the sale of entrepreneur's products, the amount of the reward cannot be determined. Profit, therefore, is a residue. Hawley's theory is also called as a **residual theory of profit.**

Hawley was conscious that his theory did not offer a full explanation of all the gains arising from business activities. In monopoly undertakings, for example, many a time profit could not be attributed to the risks which were undertaken: profits in monopoly firms arise from the very fact of not undertaking the risks. Thus, monopoly gains fall outside his theory. To meet this flaw he placed monopoly gains in a distinct, separate category of business gains which might arise to other factors also. According to his view, monopoly gains could occur also to labour, landlords, capital suppliers. But since their respective incomes—wages, rent and interest—do not arise from the operation of productive forces, these are merely economic gains.

Criticism of Hawley's Theory

Perhaps no other theory of profit has attracted so much attention and generated so much discussion as Risk Theory of Profit. It ranks today as one of the most widely accepted theories of profits. Nevertheless, Hawley's risk theory of profit has been criticised on the following grounds.

First, in his reaction to risk theory of profit, Clark remarked that the profit visualised by Hawley was nothing but an interest on capital. Risk, in Clark's view, was risk of loss of capital. Therefore, the reward for assuming risk (of loss of capital) was interest: it is not profit.

Secondly, it has also been argued that Hawley stressed only the risk in terms of loss of capital: he did not give due consideration to the fact that risks arise also in the use of factors of production other than capital.

Thirdly, Hawley's theory of profit concentrates only on risk-bearing element, and ignores other entrepreneurial functions, viz., organisation and coordination, which also lead to emergence of profit.

Fourthly, Hawley fails to make a distinction between predictable and unpredictable risks. While predictable (or foreseeble) risks are insurable, unpredictable (or unforeseeable) risk are not. Since predictable risks can be insured, such risks do not give rise to profit because the risk is shifted on to the insurer. As Knight put it, it is in fact the uninsurable risk, which is uncertain and gives rise to profit. Thus, in his view, profit is a reward for uncertainty bearing rather than a reward for risk-bearing.

Fifthly, Carver observed that profits are reward for avoiding risk and not for bearing risk, because only those entrepreneurs who are able to avoid risk make profits.

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Finally, if profits were the reward for risk bearing, then the greater the risk undertaken, the greater the profits. But, there is no empirical support to this inference which can be drawn from Hawley's theory.

3.3.4 Knight's Theory of Profit: Profit as a Return to Uncertainty Bearing

Frank H. Knight treated profit as a residual return to uncertainty bearing—not to risk bearing. Obviously, Knight made a distinction between **risk** and **uncertainty**. He divided risks into calculable and non-calculable risks. Calculable risks are those whose probability of occurrence can be statistically calculated on the basis of available data, e.g., risks due to fire, theft, accidents, etc. Such risks are insurable. There remains, however, an area of risks in which probability of risk occurrences cannot be calculated. For instance, there may be a certain element of cost which may not be accurately calculated; and the strategies of the competitors may not be accurately guessed. The risk element of such incalculable events are not insurable. The area of incalculable risks is thus marked by 'uncertainty'. It is in this area of uncertainty that decision becomes a peculiar responsibility of an entrepreneur. If his decisions are proved right by the subsequent events, the entrepreneur makes profit, and *vice versa*. Obviously, profit arises from the decisions taken and implemented under the conditions of uncertainty, as visualised by Knight. The profits may arise as a result of (a) decisions concerning the state of market; (b) decisions which result in increasing the degree of monopoly; (c) decisions with respect to holding stocks that give rise to windfall gains when prices increase; and (d) decisions taken to introduce new techniques or innovations that give rise to profit.

Criticism of Knight's Theory of Profit

Several objections have been raised against Knight's theory of profit too.

First, it has been contended that Knight's uncertainty theory lacks scientific precision. Uncertainty is a difficult concept to handle. Tausig, for instance, has shown that though certain risks are in the area of uncertainly, many are not. For example, suppose that a person is betting in a horse race. If he has the knowledge of age, training, rearing, etc., of different horses and their jockeys, he would be operating in the region of *risk.* And, if he does not have the knowledge about the horses and jockeys participating in the race, he would be regarded as operating in the area of *uncertainty.* But, if he has some knowledge about the horses and/or jockeys, it will be difficult to decide whether the person is operating in the area of risk or in the area of uncertainty.

Secondly, by considering profit as a reward exclusively for uncertainty bearing, Knight has implicitly accorded it (uncertainty bearing) the status of a factor of production, whereas it is simply an element of real cost as distinguished from

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money cost. Therefore, uncertainty bearing cannot be accepted as a factor of production, and hence the sole cause of profit.

Thirdly, Knight's attempt to explain profits only by 'uncertainty' makes his theory unconvincing if one examines it in the light of real experience of the business world. If his theory is accepted, it would mean the greater the degree of uncertainty, the greater the profits, and *vice versa*. But there are enterprises, e.g., agriculture, which are known for their high uncertainty and low returns.

3.3.5 Schumpeter's Innovation Theory of Profit: Profit as Reward for Innovations

The Innovation Theory of Profit was developed by Joseph A. Schumpeter. Throughout his life as an economist, he was preoccupied with the study of economic evaluation and development in capitalist system. He was of the opinion that issues like interest, profit, trade cycles and many others were only incidental to a distinct process of economic development: and certain principles which could explain this process would also explain these economic variables. His theory of profit is thus embedded in his theory of economic development.

The Stationary Equilibrium: The Starting Point. To explain the phenomenon of economic development (and therefore of profit) Schumpeter starts from the state of stationary equilibrium which is characterised by full equilibrium in all the spheres. He assumes a closed, commercially organised, capitalist economy in which private property, division of labour and free competition prevail, along with constant population level. Everybody sells all his produce and insofar as be himself consumes, he is his own customer. The productive services may also be included in the same category of marketable things which are sold. But anyone who wants to purchase these goods or productive services must also have his own products or services to offer. Thus all goods and services are exchanged for one another. "Hence it follows that somewhere in the economic system a demand is, so to say, ready awaiting every supply, and nowhere in the system are there commodities without complements..." It, therefore, follows that sellers of all the commodities appear as buyers to acquire the goods. This maintains their consumption and also productive capacity in the next period at the existing level. As a result, there emerges, "an unchanging economic process which flows on at constant rates in time and merely reproduces itself."

Profit as the Reward for Innovations. Under these conditions of stationary equilibrium, total receipts from the business are exactly equal to the total outlay: there is no profit. Profit can be made by introducing innovations in manufacturing and methods of supplying the goods. Innovations include:

(i) introduction of a new good or a new quality of good;

(ii) introduction of a new method of production;

(iii) creating or finding a new market;

(iv) finding new sources of raw material; and

(v) organising the industry in a different manner.

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When an entrepreneur introduces an innovation, there will be a surplus over cost provided following conditions are fulfilled.

1. When a new supply comes forth as a result of innovation, the price of commodity should not fall to such an extent that it eliminates all the gains from the larger product.
2. The cost per unit of output with new technique should be less than that of older method.
3. The increase in demand for the productive services due to innovation should not lead to such a rise in remuneration to the productive services that it pushes per unit cost of the commodity beyond the expected revenue per unit.

If these conditions are fulfilled, the surplus realised will *ipso facto* become a net profit.

Profits Disappear Due to Imitation. The profits resulting from innovations exist only temporarily. This is so because when an entrepreneur introduces an innovation, others are likely to imitate it for its profitability. First a few and then many follow the lead, and produce the commodity in the same manner. This causes a keen competition for the productive services to be employed with the new techniques. Their supply remaining the same, their remuneration tends to increase. As a result, cost of production increases. On the other hand, with other firms adopting the innovations, supply of goods and services increases resulting in fall in their prices. Thus, on the one hand, cost per unit of output goes up and, on the other, revenue per unit decreases. Ultimately, a time comes when the difference between cost and receipt disappears. So the profit disappears. In the process, however, the economy reaches higher level of stationary equilibrium.

It is however quite likely that profits exist in spite of the process of profits being wiped out. Such profits are in the nature of *quasi-rent* arising due to some special characteristics of productive services. Furthermore, where profits arise due to factors like patents, trusts, cartels, etc., such profits would be in the nature of monopoly revenue rather than entrepreneurial profits.

It may be inferred from the above that **profit is the child as well as victim of economic development.** Economic development consists of increase in national output. When innovations occur the national output increases because the same output can be produced at lower costs, or what is the same thing, with the same amount of resources greater output can be produced. But producing at lower cost or producing more output with the same total cost results in profits. Thus, economic development gives birth to profits. But, when other producers also adopt the

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technique introduced by the innovator, the total national output increases, i.e., economic development catches pace. The widespread use of innovation, however, results in wiping out of profits, as was explained earlier. Hence, economic development itself is responsible for the disappearance of profits.

Criticism of Innovation Theory of Profit

The major criticism against Schumpeter's innovation theory of profit is that he ignores the risk and uncertainty, the two major sources of profit as shown in the traditional theories of profits. Although in his book *Capitalism, Socialism and Democracy,* he admits that innovations are made by the risk-taking entrepreneurs, he ignores uncertainty altogether. Besides, it has also been argued that innovation is not the only function of the entrepreneurs. As delineated in the dynamic theory of profit, entrepreneur's functions include organisational and coordinational activities also in response to the changing conditions and needs of the society.

Does Profit Enter the Cost of Production?

From the above description of profit theories, one is tempted to infer that profits do not enter the cost of production. In fact, whether profits enter the cost of production or not depend on the concept of profit under reference. Generally two different concepts of profits are used in economic literature, viz., *normal profit* and *pure profit.* Before we answer the question, let us look into these concepts of profit.

We have already described the meaning of pure profit, in the beginning of this chapter. We describe here briefly the meaning of 'normal profit'. Normal profit is the minimum rate of return that a firm must earn to remain in the industry. In other words, normal profit equals the *transfer earning.* Normal profit is also referred to as the wages of management. Marshall calls it the supply price of average business ability. The concept of normal profit is related to the concept of long run. It refers to the long-term earning of the entrepreneurs under competitive conditions. Under competitive conditions, in the long-run, the earnings of all the entrepreneurs of an industry tends to equalise. Besides, the concept of normal profit is also related to the state of equilibrium in which there is no risk or uncertainty involved, nor is there any tendency of firms to enter or to leave the industry. That is, in a static equilibrium all firms earn only normal profit, or what Knight calls, the wages of management.

Let us now return to the question whether profits enter the cost of production. When reference is made to normal profit, undoubtedly, it enters the cost of production, in the same way as rent, interest and wages. For, normal profit is treated simply as the wages of management. But, when reference is made to pure profit, it does not enter the cost of production. Pure profit is rather a surplus over and above the cost of production.

Check Your Progress

4. According to whom does profit accrue in a dynamic world, not in a static world?
5. Which type of economy does Schumpeter assume in his innovation theory?
6. State the major criticism against Schumpeter's innovation theory of profit.

3.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Ricardo considered payment of rent as an indication of niggardliness of nature. This was contrary to the opinion of French economists, known as 'Physiocrats' who considered rent as the result of bounty of nature.
2. As per Ricardo, rent arises because of difference in surplus produce of land of different productivity.
3. Quasi rent can be divided into two components: opportunity costs and economic profits.
4. According to J B Clark, profit accrues in a dynamic world, not in a static world.
5. Schumpeter in his Innovation theory assumes a closed, commercially organise, capitalist economy in which private property, division of labour and free competition prevail, along with constant population level.
6. The major criticism against Schumpeter's innovation theory of profit is that he ignores the risk and uncertainty, the two major sources of profit as shown in the traditional theories of profit.

3.5 SUMMARY

- The Ricardian theory of rent is the earliest known rent theory and is generally known as the classical theory of rent. The point of distinction between Ricardian and modern theories of rent is that while Ricardo considered rent as 'surplus produce' attributable solely to land as a factor of production, modern economists consider rent as 'economic surplus' which accrues as well to all other factors in fixed supply in the short-run.
- Ricardo defined rent as "that portion of the produce of earth which is paid to the landlord for the use of the *original* and indestructible powers of soil". Ricardo considered payment of rent as an indication of niggardliness of nature. This was contrary to the opinion of French economists, known as 'Physiocrats' who considered rent as the result of bounty of nature.

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- Ricardian theory of rent is based on the principle of demand and supply. If, in a country, the fixed supply of land exceeds the total demand for land, no rent will be paid, like nothing is paid for the use of air.
- The *quasi-rent*, a concept used by Marshall, refers to the short-term earnings of factors which are in fixed supply in the short run. To explain the concept of quasi-rent, let us make a distinction between the short run and the long run. In the long run, all inputs are variable in large quantities as their supply is elastic. In the short run, however, the supply of certain inputs is fixed. For example, the supply of plant and machinery in the short run is inelastic.
- The equilibrium price of a factor service can be divided into two components:
  (i) Transfer Earning; and
  (ii) Economic Rent
- Transfer earning or what is also known as opportunity cost, may be defined as the amount that a factor must earn to remain in its present occupation.
- Economic rent is the excess of actual earning of a factor over its transfer earning. Economic rent may thus be defined as factor's actual earning minus its transfer earning. Consider the factor supply curve, S_f in Fig. 3.2, which has less positive slope.
- The meaning and source of 'profit' have always been a centre of controversy. "The word 'profit' has different meanings to businessmen, accountants, tax collectors, workers and economists..."
- Economists' concept of profit is of 'pure profit'. It is also called 'economic profit' or 'just profit'. The word 'profit' in this unit means 'pure profit'. 'Pure profit' is a return over and above opportunity cost, i.e., the payment that would be "necessary to draw forth the factors of production from their most remunerative alternative employment."
- One of the most widely known theories advanced to explain the nature of profit was formulated by F.A. Walker. According to him, profit is rent of the exceptional abilities that an entrepreneur may possess over the least entrepreneur. Just as rent on land is the difference between the yields of the least fertile and super lands, pure profit is the difference between the receipts of the least efficient entrepreneur and that of those with greater efficiency or managerial ability.
- The dynamic theory of profit is associated with the name of J.B. Clark, which he propounded in 1900. According to Clark, profits accrue in a dynamic world, not in a static world.
- The risk theory of profit was propounded by F.B. Hawley in 1893. Hawley regarded risk-taking as the inevitable accompaniment of dynamic production. and those who take risk have a sound claim to a separate reward, known

as profit. Thus, according to Hawley, profit is simply the price paid by society for assuming business risks.

- Frank H. Knight treated profit as a residual return to uncertainty bearing—not to risk bearing. Obviously, Knight made a distinction between risk and uncertainty. He divided risks into calculable and non-calculable risks.
- Under these conditions of stationary equilibrium, total receipts from the business are exactly equal to the total outlay: there is no profit. Profit can be made by introducing innovations in manufacturing and methods of supplying the goods.

3.6 KEY WORDS

- **Rent:** As per Ricardo, it is 'that portion of the produce of earth which is paid to the landlord for the original and indestructible powers of the soil.'
- **Quasi Rent:** As per Marshall, it refers to the short-term earnings of factors which are in fixed supply in the short run.
- **Economic Rent:** It is the excess of actual earning of a factor over its transfer earning.
- **Pure Profit:** It is the return over and above opportunity cost.

3.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the antecedents of Rent theory.
2. Briefly discuss Marshallian theory of quasi rent.
3. What is Hawley's theory of profit?
4. What are static and dynamic economy?
5. List the criticism against Knight's theory of profit.
6. Write a short note on Walker's theory of profit.

Long Answer Questions

1. Discuss the Ricardian theory of rent along with the criticisms against it.
2. Explain 'Profit as a dynamic surplus' through Clark's theory along with its drawbacks.
3. Describe Schumpeter's innovation theory of profit. List the criticism against it.

3.8 FURTHER READINGS

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UNIT 4 NEO-CLASSICAL APPROACH

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Structure

4.0 INTRODUCTION

There are four factors of production in economics: land, capital, labour and enterprise. The theories dealing with the determination of price of the different factors of production is known as the theory of factor price determination. This theory is extremely crucial to the entrepreneur because it is him who pays the rent, interest, wage and profit for taking the benefit of these factors in the production. In this unit, you will learn about the neo-classical approach to the factor price determination. This is the marginal productivity theory. Now it is crucial to remember with neo-classical theory is that the factor prices and quantities are determined simultaneously with the demand and supply factors. You will also learn the product exhaustion theory which comes from the adding up problem related to the theory and the concept of technical progress and factor shares.

4.1 OBJECTIVES

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

- Discuss the marginal productivity theory
- Describe the product exhaustion theorem
- Explain the concept of technical progress and factor shares

4.2 MARGINAL PRODUCTIVITY THEORY

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The neo-classical approach to factor price determination is based on marginal productivity theory of factor. Marginal productivity theory is regarded as the general micro-theory of factor price determination. It provides an analytical framework for the analysis of determination of factor prices. The origin of marginal productivity concept can be traced into the writings of economic thinkers of the nineteenth century. The earliest hint of the concepts of 'marginal product' and its use in the determination of 'natural wage' appeared in Von Thunen's *Der Isolierte Staat* (1826). Later, the concept also appeared, in Samnel Mountifont Longfield's *Lectures on Political Economy* (1834) and in Henry George's *Progress and Poverty* (1879). It was, in fact, John Bates Clark who had developed the *marginal productivity theory* as an analytical tool of analysing wage determination.

According to Clark, the **marginal productivity principle** is a complete theory of wages, which could be well applied to other factors of production also. Although many theorists, including Marshall and Hicks, have objected to the marginal productivity theory being regarded as theory of wages or as theory of distribution, it is regarded as a sound theory of factor price determination.

Strictly speaking, marginal productivity theory offers only a theory of demand for a factor of production. The marginal productivity theory provides an analytical framework for deriving the demand for a factor which is widely used in modern economic analysis. The factor demand curve, derived on the basis of its marginal productivity, combined with factor supply curve, gives the factor price determination. The derivation of factor demand curve is explained below with reference to labour.

Marginal Productivity and Factor Demand

Demand for a factor is a derived demand. It is derived on the basis of the marginal productivity of a factor. Firms demand factors of production—land, labour, capital—-because they are productive. Factors are demanded not merely because they are productive but also because the resulting product has a market value. Thus, demand for a factor of production depends on the existence of demand for the goods and services that a factor of production can create. The derivation of factor demand has been explained with reference to labour demand.

Demand for a Single Factor: Labour

The demand for a variable factor depends on the value of its marginal productivity. Therefore, we shall first derive the *value of marginal productivity* (*VMP*) curve of labour. The VMP_L for labour is drawn from the marginal productivity curve (MP_L). The MP_L curve is shown in Figure 4.1. The curve MP_L shows diminishing returns to the variable factor—labour. If we multiply the MP_L at each level of employment a *constant* price *Px*, we get the *value of marginal physical product curve*, as shown by the curve $VMPL = MPL.P_x$. It is this curve which is the basis

of demand curve for labour. The derivation of labour demand curve is illustrated in the following section.

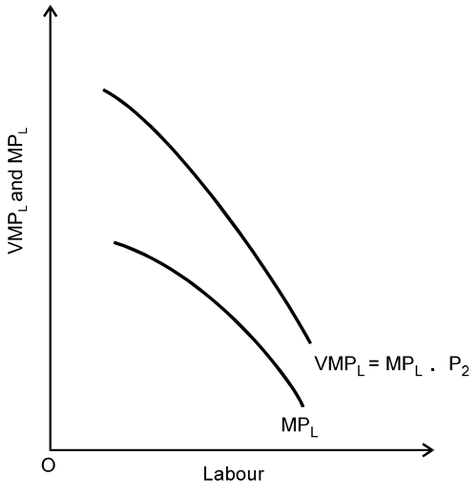

Fig. 4.1 *MP_L and VMP_L Curves*

Derivation of a Firm's Labour

A firm's demand curve for labour is derived on the basis of the VMP_L curve on the following assumptions for the sake of simplicity in the analysis.

(i) Firm's objective is to maximise profit and profit condition is MR=MC=*w*.

(ii) The firm uses a single variable factor, labour and the price of labour, wages (*w*), is constant.

(iii) The firm produces a single commodity whose price is constant at P_x.

Given the assumptions and the VMP_L curve, we can now derive the firm's demand curve for labour. As assumed above, a profit maximising firm produces a quantity of output at which its *MR=MC=w*. This profit-maximisation rule can be interpreted as *a profit-maximising firm increases its output upto the point at which the marginal cost of available factor (labour) employed equals* the *value of its product.* In other words, a profit-maximising firm employs a factor till the marginal cost of the variable factor (labour) equals the value of the marginal product of the factor (i.e., VMP_L).

The short-run equilibrium of the profit-maximising firm is illustrated in Figure 4.2. The VMP_L curve shows the value of marginal product of labour, the only variable factor. The S*L* lines present the labour supply curves for an individual firm [assumption (b)], at the constant wage rates. The VMP_L curve and SL_3 line intersect each other at point E_3, where $VMP_L = W_3$. The profit-maximising firm will, therefore, employ only OL_1 units of labour. By employing OL_1 units of labour, the firm maximises its profit. Given these conditions, any additional employment of labour will make $W_3 > VMP_L$. Hence, the total profit will decrease by $W_3 - VMP_L$. Similarly, if one unit less of labour is employed, VMP_L will be greater

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than $W3$ and the total profit is reduced by $VMP_L - W_3$. Thus, given the VMP_L and SL_3, the profit maximising firm will demand only OL_1 units of labour.

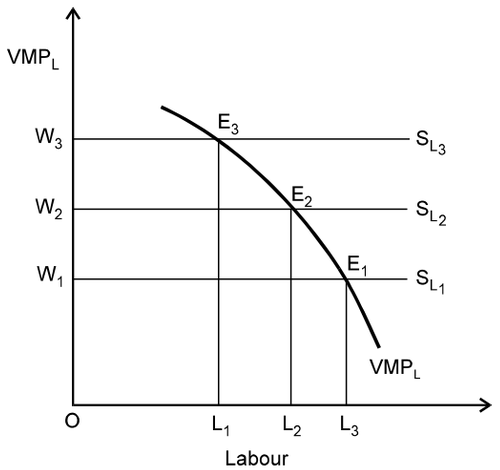

Fig. 4.2 *MP_L and VMP_L Curves*

The above analysis can be extended to derive the firm's demand curve for labour. If wage rate falls to OW_2 firm's equilibrium point shifts from point E_3 to E_2 increasing the demand for labour from OL_1 to OL_2. Similarly, when wage rate falls further to OW_1, firm's equilibrium shifts downward to E_1 causing an increase in the demand for labour to OL_3. To summarise, when wage rate is OW_3, demand for labour OL_1; when wage rate falls to OW_2, demand for labour increases to OL_2; and when wage rate falls further to OW_1, labour demand increases to OL_3. Obviously, as wage rate falls, demand for labour increases. This relationship between the wage rate and labour demand gives a usual downward sloping demand curve for labour, which is, by definition, the same as VMP_L curve. It may now be concluded that *individual demand* curve for a single variable factor (e.g., labour) is given by its value of marginal product curve (VMP_L) or its marginal revenue product curve (MRP_L).

When all the firms of an industry are using a single variable factor, industry's demand for labour is a horizontal summation of the individual demand curve.

Factor Price Determination in Perfect Market

We have derived above the market demand curve for labour, as shown by curve D_2 in Figure 4.3. The labour supply curve is shown through the curve S_L. The labour supply curve (S_L) shows that labour supply increases in wage rate. The tools may now be applied to illustrate the factor price (wage) determination in perfectly competitive markets. Figure 4.3 shows the determination of wage in a competitive market. As shown in the figure, the demand curve for and supply curve of labour intersect each other at point *P*, where demand for and supply of labour are equal at *OL*, and wage-rate is determined at *OW*. This wage rate will remain stable in a competitive market so long as demand supply conditions do not change.

This final analysis of factor price determination gives a brief analysis of marginal productivity theory of factor price determination with reference to labour. But it applies to other factors also.

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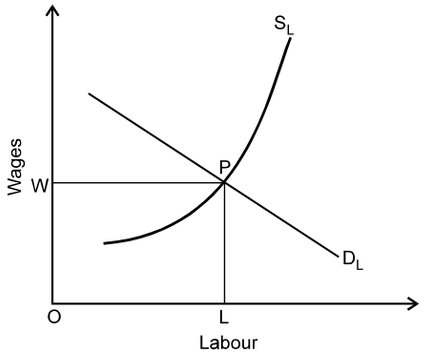

Fig. 4.3 *Determination of Wages in a Perfectly Competitive Market*

Check Your Progress

1. Who developed the marginal productivity theory?
2. How does one get the value of marginal physical product curve?

4.3 PRODUCT EXHAUTION THEOREM

The ultimate aim of the distribution theory is to explain how the share of factors of production in total output is determined.

According to the marginal productivity theory, the share of each factor in national income is determined by the marginal productivity of a factor and the number of units of the factor employed, i.e., national income = $VMP_L \cdot L + VMP_L \cdot K$. However, there has been a controversy on as to how is the share of each factor in the national income determined. The controversy is known as 'adding-up controversy'. This controversy is discussed first to focus on the nature of the problem. This is followed by Euler's theorem of distribution and then 'relative factor share'.

Adding-up Controversy and Solution

When the marginal productivity theory first gained acceptance by the end of the 19th century, a controversy arose whether distribution of national income among the various factors of production according to their marginal productivity was morally justifiable. In the course of the debate, another question came up, i.e., whether the sum of total labour income and of capital income equals the total product.

In other words, the controversy was, if each factor is paid the value of its marginal product (*VMP*), does this mean that the entire output is exhausted and nothing is left that falls into the hands of exploiting capitalists? Some economists attempted to show that, if each factor is paid its *VMP*, the distribution of income

under free enterprise or capitalist system must be equitable. Precisely, they attempted to demonstrate that

$$Q = (MP_l)L + (MP_k)K \quad ...(4.1)$$

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In terms of value, national income is equal to $P \cdot Q$, and:

$$P \cdot Q = (MP_l \cdot P)\ L + (MP_k \cdot P)\ K \quad ...(4.2)$$

where P is the average price of the products.

Since, $MP_l \cdot P = VMP_l$ and $MP_k \cdot K = VMP_k$

$$P \cdot Q = VMP_l + VMP_k \quad ...(4.3)$$

It is, thus, proved that national income in distributed between the factors of production according to their marginal productivity.

Euler's Product Exhaustion Theorem

One of the earlier proofs to the distribution of national income according to marginal productivity of production factors was provided by the Swiss mathematician, Leonard Euler (1701–83), which is known as *Euler Theorem. Euler Theorem* demonstrates that if production function is homogeneous of degree one (which exhibits constant returns to scale), then

$$Q = \frac{\partial Q}{\partial L} \cdot L + \frac{\partial Q}{\partial K} \cdot K \quad ...(4.4)$$

Since $\partial Q/\partial L = MP_l$ and $\partial Q/\partial K = MP_k$, Eq. (4.4) takes the form of Eq. (4.1), i.e.,

$$Q = MP_l \cdot L + MP_k \cdot K$$

This may be proved as follows.

A production function, $Q = f(L, K)$, is homo-geneous of degree v if

$$f(\lambda L, \lambda K) = \lambda^v \cdot f(L, K) \quad ...(4.5)$$

By differentiating Eq. (4.5) with respect to λ, we get

$$L \cdot \frac{df}{dL} + K \cdot \frac{df}{dK} = \nu \cdot \lambda \nu^{-1}\ f(L,\ K)$$

When return to scale is constant, $\nu = 1$, and then Eq. (4.5) may be written as

$$Q = L\ (MP_l) + K\ (MP_k) = f\ (L, K)$$

Thus, $Q = MP_l \cdot L + MP_k \cdot K$

Multiplying MP by the price of product, P, we get

$$P \cdot Q = (MP_l \cdot P)\ L + (MP_k \cdot P)\ K$$
$$= VMP_l \cdot L + VMP_k \cdot K$$

If $VMP_l = w$ and $VMP_k = r$, then

$$P \cdot Q = w \cdot L + r \cdot K$$

It is thus, proved that if each factor is paid a sum equal to its *VMP*, the total value of product is exhausted. This is Euler's product exhaustion theorem.

Clark-Wicksteed-Walras Product Exhaustion Theorem

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Euler's product exhaustion theorem assumes a homogeneous production function, i.e., constant returns to scale. Clark, Wicksteed and Walras have, however, shown that the assumption of homogeneous production function is not necessary for the product exhaustion theorem. It holds for all types of production functions. That is, according to Clark-Wicksteed-Walras theorem, if each factor is paid its *VMP*, then the total factor payments will exhaust the value of total output. A graphical proof of Clark-Wicksteed Walras theorem of product exhaustion is given in Figure 4.4.

Let us assume (i) an economy consists of n identical firms, (ii) each firm employs the same number of homogeneous labour, (iii) the marginal physical product of labour is given by the curve *MPL* in Figure 2.4, and (iv) each firm employs *OL* number of workers. The total output of each firm will then be represented by the area *OMBL*. Suppose also that each labour is paid a real wage of $OQ = BL$ and that the total wages equal the area *OQBL*. That is, the share of labour in total output *OMBL* is *OQBL*. The residual ($OMBL - OQBL = QMB$) goes to land as *rent*. The rent so computed is merely a residual. But, Clark and others proved that *QMB* is not merely a residual: it is also the marginal physical product of land. By proving this, they had established the product exhaustion theorem. Note that, given n firms, the total output of the industry is $n \times OMBL$. Now suppose that the number of firms increases to $n + 1$, the number of workers remaining the same, i.e., $n \times OL$. The new firm gets its labour supply from the old firms. Suppose that $n \times OL$ workers are so distributed between $n + 1$ farms that each farm again has the same number of workers, say OL'. Note that number of workers employed by each firm decreases from *OL* to OL' so that

$$(n + 1)\, QL' = n \cdot OL$$

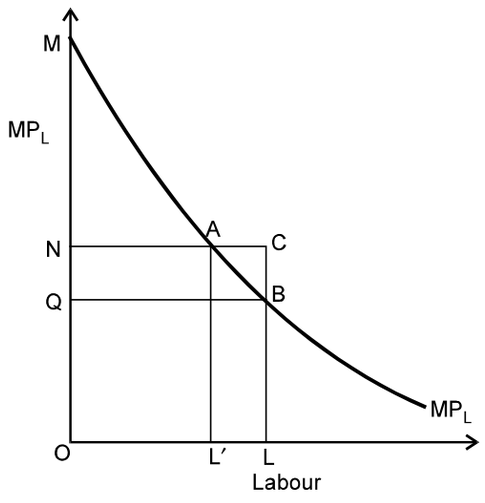

Fig. 4.4 *Product Exhaustion Theorem*

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When each firm employs OL' workers, output per firm is $OMAL'$, and the total output of the industry is

$$(n + 1) \cdot OMAL' = n \cdot OMAL' + OMAL' \quad ...(4.6)$$

The initial output of the industry with n firms can be written as

$$n \cdot OMBL = n \cdot OMAL' + n \cdot L'ABL \quad ...(4.7)$$

The difference between Eqs. (4.6) and (4.7) is the marginal product of land (MP_{LD}) That is,

$$MP_{LD} = (n \cdot OMAL' + OMAL') - (n \cdot OMAL' + n \cdot L'ABL)$$
$$= OMAL' - n \cdot L'ABL \quad ...(4.8)$$

As can be seen from Figure 4.1,

$$OMAL' = NMA + ONAL' \quad ...(4.9)$$

and $$L'ABL = L'ACL - ABC \quad ...(4.10)$$

By substituting Eqs. (4.9) and (4.10) in Eq. (4.8), we get

$$MP_{LD} = NMA + ONAL' - n(L'ACL - ABC)$$
$$= NMA + ONAL' - n \cdot L'ACL + n \cdot ABC \quad ...(4.11)$$

Since $n \cdot L'ACL = ONAL'$, by substitution, we can write Eq. (4.11) as

$$MP_{LD} = NMA + ONAL' - ONAL' + n \cdot ABC \quad ...(4.12)$$
$$= NMA + n \cdot ABC$$

Consider the last term, $n \cdot ABC$. As $n \to \infty$, the share of each firm in the given supply of labour tends to be zero. Therefore the last term $n \cdot ABC \to 0$. Consequently,

$$MP_{LD} = NMA = \text{rent of land}$$

It is the same residual, for all firms with OL' number of workers, calculated earlier as rent. Thus, Clark-Wicksteed-Walras theorem is proved.

4.3.1 Relative Factor Shares and Income Distribution

Now we will discuss how a *change* in relative factor prices affect the relative factor shares and income distribution. When relative factor prices change, one factor becomes relatively cheaper and the other becomes relatively costlier. This impels the profit maximizing firms to substitute the cheaper factor for the costlier one. As a result, factor ratio changes. For example, suppose there are only two variable factors, labour (L) and capital (K) and factor ratio is given as K/L. This factor ratio changes, at margin when one factor is substituted for another. When factor ratio changes, relative factor-share changes.

Elasticity of factor substitution and relative factor shares

The extent to which relative **factor shares** in income are affected by the change in relative factor prices depends on the *elasticity of factor substitution*. The concept of the elasticity of factor substitution was developed by J.R. Hicks. It is regarded

as the foundation of the modern neo-classical theory of distribution and relative factor shares. Ferguson remarks that the concept of *elasticity of substitution* lies at the heart of the neoclassical theory of distribution. The *elasticity of substitution* (σ) is defined as

$$\sigma = \frac{\partial(K/L)/(K/L)}{\partial(MRTS)/(MRTS)}$$

Recall that, in a perfectly competitive input market, a firm is in equilibrium when it chooses a labour-capital combination at which *MRTS* is equal to the ratio of factor prices (w/r). That is, under perfectly competitive conditions, a firm is in equilibrium when

$$MRTS_{l,k} = \frac{w}{r} \qquad ...(4.13)$$

where w = price of labour (wage rate) and r = price of capital (interest). Thus, in a prefectly competitive factor market, the firm's equilibrium condition given in Eq. (4.13), may also be written as

$$\sigma = \frac{\partial(K/L)/(K/L)}{\partial(w/r)/(w/r)} \qquad ...(4.14)$$

The elasticity of substitution (i.e., the value of σ) is always positive, though in some cases, $\sigma = 0$. Thus, *the value of* σ *ranges from zero to infinity.* The value of σ yields useful information regarding the degree of substitutability between the factors. If $\sigma = 0$, it means that substitution between factors, say labour and capital, is impossible; the two factors can be used only in a fixed proportion; and that isoquant is *L*-shaped.

The positive range of s may be classified and interpreted as follows:

$\sigma < 1$: **Inelastic substitutability:** The degree of substitutability between the two factors is very low.

$\sigma = 1$: **Unit elasticity of substitution:** The two factors can be proportionately substituted for one another (see properties of Cobb-Douglas production function).

$\sigma > 1$: **Highly elastic substitutability:** One factor can substitute another to a large extent.

$\sigma = \infty$: **Perfect substitutability:** One factor can substitute another to any extent.

Let us now examine the relationship between the value of σ and the relative shares of factors in the total output. Consider a two-factor model in which the total income $P \cdot Q$ is the sum of labour-share ($w \cdot L$) and capital-share ($r \cdot K$). That is,

$$P \cdot Q = w \cdot L + r \cdot K \qquad ...(4.15)$$

The relative share of *labour* in the total value of output is then given by

$$\frac{w \cdot L}{P \cdot Q}$$

Similarly, the relative share of *capital* in the total value of the output is given by

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$$\frac{r \cdot K}{P \cdot Q}$$

Thus, the *ratio* of relative share of L and K

$$= \frac{wL}{PQ} + \frac{rK}{PQ}$$

$$= \frac{wL}{rK} \quad ...(4.16)$$

$$= \frac{w/\ r}{K/\ L} \quad ...(4.17)$$

Eq. (4.17) can be used to show the effect of change in relative factor price (w/r) on the relative shares of L and K in the value of total output.

Suppose w/r increases by 10 per cent, i.e., labour becomes costlier by 10 per cent. This will lead to a substitution of capital (the relatively cheaper factor) for the labour (the relatively costlier factor). The extent of substitution depends on the value of σ (i.e., the elasticity of substitution). Suppose $\sigma = 0.5$, i.e., the elasticity of substitution is less than one. Then a 10 per cent increase in w/r will result in a 5 per cent increase in the capital-labour ratio (K/L). This will alter the relative shares of K and L.

The new relative shares can be obtained as

$$\left(\frac{wL}{rK}\right)^{*} = \frac{(w/\ r)(1+0.10)}{(K/\ L)(1+0.05)}$$

$$= \frac{1.10}{1.05} \cdot \frac{(w/\ r)}{(K/\ L)}$$

where * denotes the new relative factor share.

Obviously,

$$\left(\frac{wL}{rK}\right)^{*} > \left(\frac{wL}{rK}\right)$$

That is, new relative factor-share ratio is greater than the initial ratio. One may show by the same reasoning that if $\sigma > 1$, and other things remain the same, then

$$\left(\frac{wL}{rK}\right)^{*} < \left(\frac{wL}{rK}\right)$$

There is a two-way causation in the change in relative factor shares caused by a change in relative factor prices. Changes in the relative supply position of factors and changes the relative factor prices which, in turn, changes the factor-ratios depending on the value of σ. This leads to a change in the relative shares of the factors in the total output.

It is clear that the concept of elasticity of substitution plays a very important role in neo-classical theory of income distribution.

4.3.2 Technical Progress and Factor Shares

NOTES

We have so far analysed factor price determination and relative factor shares on the basis of a tacit assumption that production function is given and technology of production remains unchanged over the reference period. In the real world, however, technological progress does take place. Technological progress means a given quantity of output can be produced with less quantity of inputs or a given quantity of inputs can produce a greater quantity of output. This means a downward shift in the production function (the isoquant) towards the point of origin (*O*).

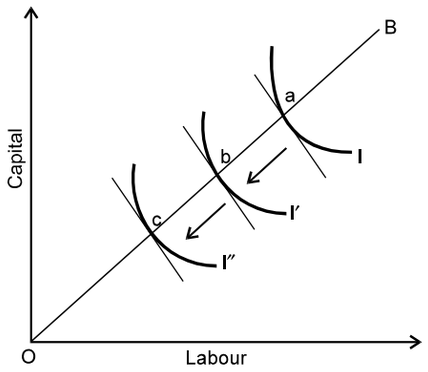

Fig. 4.5 *Technological Progress-Neutral*

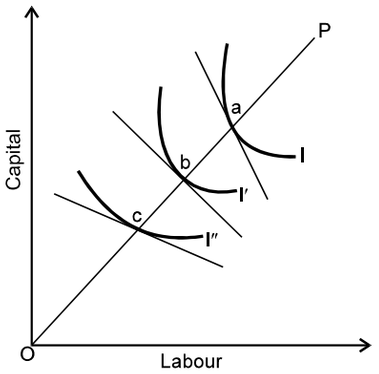

Fig. 4.6 *Capital Deepening Technological Progress*

Technological progress is graphically shown in Figure 4.5. A given level of output is shown by isoquants *I*, *I′* and *I″*. That is, all three isoquants, *I*, *I′*, *I″* represent the same level of output.

The downward (or leftward) shift in the isoquant from the position of *I* to *I′* and from *I′* to *I″* means that a given level of output can be produced with decreasing quantities of labour and capital represented by points *a, b* and *c*. This is possible only with technological progress. The movement from *a* towards *c* shows technological progress. The slope of the ray, *OP*, shows the constant capital-labour ratio.

According to J. R. Hicks, technological progress may be classified as neutral, capital-deepening and labour-deepening. Technological progress is *neutral* if, at constant *K/L*, the marginal rate of technical substitution of capital for labour i.e., $MRTS_{l,k}$) remains constant. The neutral technological progress is illustrated in Figure 2.5. At each equilibrium point, $MRTS_{l,k} = w/r$. When technological progress is neutral, both *K/L* and *w/r* remain unchaged. It follows that relative factor share remains unchanged when technological progress is neutral.

Capital-deepening technological progress is illustrated in Figure 4.6. Technological progress is capital-deepening when, at a constant capital/labour

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ratio (K/L), $MRTS_{l,k}$ declines. It implies that, at constant K/L, MP_k increases relative to MP_l. Therefore, at equilibrium w/r declines, as r increases relative to w, because $w = VMP_l$. Consequently, the relative factor share changes in favour of K. That is, share of capital in the total output increases while that of labour decreases.

Technological progress is labour-deepening when, at a given K/L, the $MRTS_{l,k}$ increases. Labour-deepening technological progress is illustrated in Figure 4.7. It can be shown, following the above reasoning, that under labour-deepening technological progress, the share of labour in the total output increases while that of capital increases.

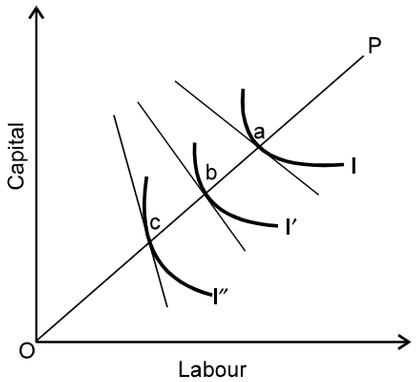

Fig. 4.7 *Labour Deepening Technological Progress*

Check Your Progress

3. Briefly state the adding up controversy.
4. What is the assumption of Euler's product exhaustion theorem?
5. What are the ways in which technical progress can be classified as per J R Hicks?

4.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. It was John Bates Clark who had developed the marginal productivity theory as an analytical tool for analysing wage determination.
2. If we multiply the marginal productivity curve (MPl) at each level of employment a constant price Px, we get the value of marginal physical product curve.
3. The adding up controversy was that if each factor is paid the value of its marginal product, does this mean that the entire output is exhausted and nothing is left that falls into the hands of the exploiting capitalists?
4. Euler's product exhaustion theorem assumes a homogenous production function, i.e., constant returns to scale.

5. According to J R Hicks, technological progress may be classified as neutral, capital-deepening, and labour-deepening.

4.5 SUMMARY

NOTES

- The neo-classical approach to factor price determination is based on marginal productivity theory of factor. Marginal productivity theory is regarded as the general micro-theory of factor price determination. It provides an analytical framework for the analysis of determination of factor prices.
- According to Clark, the **marginal productivity principle** is a complete theory of wages, which could be well applied to other factors of production also. Although many theorists, including Marshall and Hicks, have objected to the marginal productivity theory being regarded as theory of wages or as theory of distribution, it is regarded as a sound theory of factor price determination.
- According to the marginal productivity theory, the share of each factor in national income is determined by the marginal productivity of a factor and the number of units of the factor employed, i.e., national income = $VMP_L \cdot L + VMP_L \cdot K$. However, there has been a controversy on as to how is the share of each factor in the national income determined. The controversy is known as 'adding-up controversy'. This controversy is discussed first to focus on the nature of the problem. This is followed by Euler's theorem of distribution and then 'relative factor share'.
- One of the earlier proofs to the distribution of national income according to marginal productivity of production factors was provided by the Swiss mathematician, Leonard Euler (1701–83), which is known as *Euler Theorem.*
- Euler's product exhaustion theorem assumes a homogeneous production function, i.e., constant returns to scale. Clark, Wicksteed and Walras have, however, shown that the assumption of homogeneous production function is not necessary for the product exhaustion theorem.
- When relative factor prices change, one factor becomes relatively cheaper and the other becomes relatively costlier. This impels the profit maximizing firms to substitute the cheaper factor for the costlier one. As a result, factor ratio changes.
- In the real world, however, technological progress does take place. Technological progress means a given quantity of output can be produced with less quantity of inputs or a given quantity of inputs can produce a greater quantity of output. This means a downward shift in the production function (the isoquant) towards the point of origin (O).

NOTES

4.6 KEY WORDS

- **Marginal Productivity Theory:** It is a theory which provides an analytical framework for the analysis of determination of factor prices.
- **Technological Progress:** In factor price determination, it means that a given quantity of output can be produced with less quantity of inputs.

4.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the origins of the marginal productivity theory.
2. Briefly explain factor price determination in perfect market.
3. What was Clark-Wicksteed-Walrus product exhaustion theorem?

Long Answer Questions

1. Explain the marginal productivity theory and demand with the help of figures.
2. Describe the adding up controversy and product exhaustion theorem.
3. Discuss how a change in relative factor prices affect the relative factor shares and income distribution.
4. Examine the effect of technical progress on factor price determination.

4.8 FURTHER READINGS

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UNIT 5 THEORIES OF DISTRIBUTION

NOTES

Structure

5.0 INTRODUCTION

In the previous unit, you were introduced to the neo-classical approach to factor price determination. In this unit, we move towards a different and broader topic of discussion: the theory of distribution. The theory of distribution, as the name suggests, deals with the distribution of national income amongst the factor of production including land, labour and capital. This necessitates the understanding of factor prices. Three important questions become a part of this discussion: how the national income is divided, how the factor price is determined and what proportion goes to each factor of production. This area of study is very vast, in this unit, we will restrict ourselves to the study of theory of distribution only in imperfect market and factor shares. Further, you will study the macro theories of distribution.

5.1 OBJECTIVES

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

- Discuss the concept of theory of distribution under imperfect product and factor markets
- Explain the macro theories of distribution: Ricardian, Marxian and Kalecki

5.2 THEORIES OF DISTRIBUTION UNDER IMPERFECT PRODUCT AND FACTOR MARKETS

In this section, we discuss wage determination in a market setting in which there is monopoly in the commodity market and monopsony in the labour market. When there is a single buyer of labour, there exists **monopsony** in the labour

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market. Thus, in the present model, the monopolist is also a monopsonist in the factor market. It may be **noted** here that the analysis of determination of factor-price and employment under the conditions of monopoly in the commodity-market and monopsony in the factor market is relevant also for monopolistic competition and oligopoly in the commodity-market, and monopsony and oligopsony in the factor market.

Factor price and employment determination in the market setting described above is discussed under two different assumptions: (i) that only a single variable factor (labour) is used; and (ii) that more than one variable factor is used. Before we analyse the factor price and employment determination, let us explain the **concept of marginal cost of factor input** which is used in the analysis of factor price determination.

Marginal Cost of a Variable Factor

Factor price and employment under product monopoly and factor monopsony are determined by intersection of labour demand curve and the marginal-cost-of-labour or *MW* curve. The monopsonist's demand curve for labour is given by the MRP_L curve. Let us now explain the **concept of marginal cost of variable factor**.

A monopsonist in labour market faces a positively sloping labour supply curve, i.e., more labour is supplied at increasing wage rate. Due to positive slope of the labour supply curve, there is a divergence between the average and marginal costs of labour. The monopsonist must therefore consider his **marginal cost of labour**, i.e., marginal wage (*MW*) to decide on the units of labour to be employed. The marginal cost of labour may be computed as shown in Table 5.1

Table 5.1 *Total and Marginal Cost of Labour*

Units of Labour	*Average cost of labour (AW) (₹)*	*Total expenditure on labour (TW) (₹)*	*Marginal* cost *of labour (MW) = ΔTW)(₹)*
1	5	5	–
2	6	12	7
3	7	21	9
4	8	32	11
5	9	45	13
6	10	60	15
7	11	77	17

It can be observed from the table that marginal cost of labour is greater than the average wage rate at all levels of employment. Figures in the 2nd and 4th columns when graphed, as in Figure 5.1, give the normal labour supply curve (*AW*) and marginal cost of labour (*MW*) curve. The *AW* curve shows the labour supply for the monopsonist and *MW* curve shows its marginal cost at different levels of labour employment.

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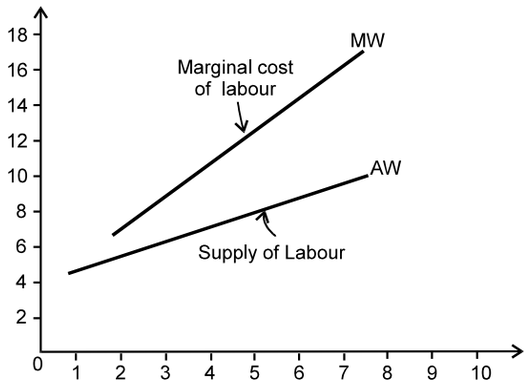

Fig. 5.1 *Marginal Cost of Labour*

Wages and Employment Under Monopsony

Having derived the *AW* and *MW* curves, we can now explain wage and employment determination under monopsony. As already mentioned, wage rate and employment under monopsony are determined by the intersection of monopsonist's demand curve for labour and marginal cost curve of labour. When a monopsonist uses only one variable factor (labour), MRP_L curve is its demand curve for labour and *MW* curve is its labour supply curve which is the same as marginal cost curve of labour, as shown in Figure 5.2.

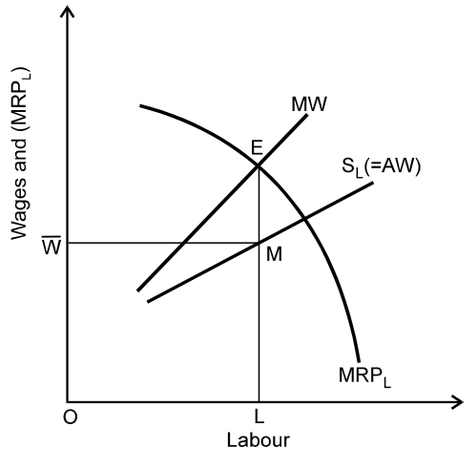

Fig. 5.2 *Wages and Employment Determination under Monopsony*

The determination of wage rate and employment under monopsony with a single variable factor (labour) is illustrated in Figure 2.10. The MRP_L curve represents monopsonist's demand curve for labour and *MW* curve represents its marginal cost. A monopsonist employs labour up to the point at which the marginal revenue product of labour (MRP_L) equals its marginal cost of labour (*MW*), i.e., where $MRP_L = MW$. In Figure 5.2, the MRP_L and *MW* curves intersect each other at point *E* at which $MRP_L = MW$. The monopsonist firm is therefore in equilibrium at point *E* where it employs *OL* units of labour. Thus,

OL is the equilibrium level of labour employment. Given the labour supply curve (*AW*), the equilibrium wage rate (corresponding to the equilibrium level of employment (*OL*) is $O\overline{W}$ (= *ML*).

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Monopsonist Exploitation of Labour

Determination of wage rate and monopsonistic exploitation of labour are both analysed simultaneously in this section. Recall that monopolistic exploitation results from the fact that commodity demand curve for a monopolist firm has a negative slope, and hence, its *MR* < *P*. The profit maximising monopolist firm must pay for a factor service according to their *MRP* (= *MPP*. *MR*) which is less than their *VMP* (= *MP*.*P*). The level of monopolistic exploitation equals the difference between *VMP* and *MRP*. **Monopsonistic exploitation** arises for reasons similar to monopolistic competition. But monopsonistic exploitation is greater than the monopolistic exploitation. A monopsonist pays a price to a factor which is less than not only its *VMP* but also less than its *MRP*. This gives rise to the *monopsonistic exploitation* which results from the monopsonistic power of the firm. The extent of monopsonistic exploitation of labour may be measured by comparing the wage rate in perfectly competitive and labour markets with the wage rate under monopolistic product market and monopsonistic product labour market conditions. A comparative analysis of the two wage rates is presented in Figure 5.3.

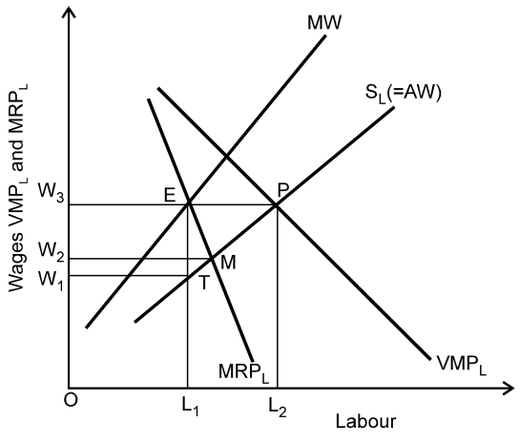

Fig. 5.3 *Monopsonistic and Monopolistic Exploitation of Labour*

When both product and labour markets are perfectly competitive, the curve VMP_L represents the industry or market *demand curve* for labour, and the curve S_L (= *AW*) represents the market *supply of labour*. Labour demand and supply curves intersect at point *P* determining the wage rate at OW_3—which equals VMP_L, i.e., $w = VMP_L$.

Now, let commodity market be monopolistic while labour market remains perfectly competitive. The market demand curve for labour now is MRP_L curve which is the sum of individual demand curves of the monopolists. The MRP_L curve intersects the labour supply curves, S_L at point *M,* determining wage rate

at OW_2. Thus, labour market reaches a new equilibrium point (M) where wage rate is determined at OW_2. Note that monopoly wage rate, OW_2, is less than the competitive wage rate, OW_3. The difference between OW_3 and OW_2, (i.e., $OW_3 - OW_2 = W_2W_3$) is the **monopolistic exploitation** of labour. Besides, when there is monopoly in the commodity market, employment of labour decreases from OL_2 to OL_1. Thus, the effect of monopolistic exploitation is a lower level of employment at a lower wage rate.

Let us now introduce monopsony in the labour market while commodity market remains monopolised. This is the category of market organisation with which we are mainly concerned in this section. The monopsonist must employ labour until $MRP_L = MW$, the marginal cost of labour. As Figure 5.3 shows, MRP_L and MW curves intersect at point E which determines the equilibrium level of employment at OL_1. The ordinate EL_1 intersects the labour supply curve S_L at point T, which determines the equilibrium wage rate for the monopsonist at OW_1. Thus, the wage rate under monopsony in labour market goes further below the competitive wage rate. The difference between the competitive wage rate, OW_3, and the monopsony wage rate, OW_1 measures the **monopsonistic exploitation** of labour. That is, $OW_3 - OW_1 = W_1W_3$ is the monopsonistic exploitation.

Monopsonistic exploitation W_1W_3 may be split into two parts W_2W_3 and W_1W_2. The exploitation W_2W_3 is attributable to monopoly power in the commodity market. This part of factor exploitation is not unique to the monopsonist. But remaining part, W_1W_2, is unique to the monopsonist. Thus, the main feature of the monopsonistic exploitation is that each factor is paid a price less than even its *MRP*.

Check Your Progress

1. What type of labour supply curve does a monopsonist labour market face?
2. How is the extent of monopsonistic exploitation of labour measured?

5.3 MACRO THEORIES OF DISTRIBUTION: RICARDIAN, MARXIAN, KALECKI

Income distribution (as per the economics concept) is how a nation's total GDP is dispersed amongst its population. David Ricardo opined that the principle issue of political economy was the laws governing the distribution of income. He was a successful broker who developed a theoretical model popularly known as 'corn laws'. The corn laws imposed tariffs on the import of agricultural products, which led to an increase in their prices, domestically. Then there emerged a struggle between the interest of landlords and manufacturing concerns over economic policy and control of parliament.

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The significance of David Ricardo's model is that it was one of the initial models used in economics, intended at the amplification that how income is distributed or dispersed in society.

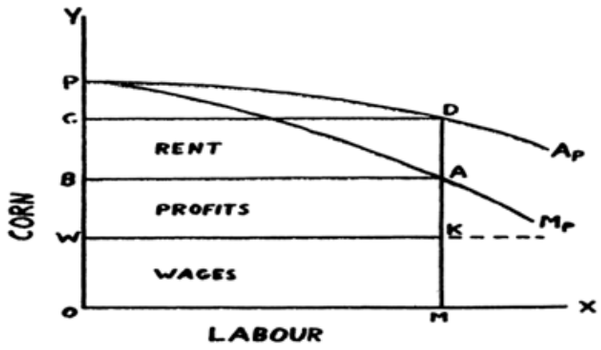
The Ricardian model is based upon certain assumptions. These assumptions are as under:

1. There is only one industry, i.e., agriculture
2. There is only one good, i.e., grain
3. There are three kinds of people in the economy, i.e., capitalists, workers and landlords
   - **(i) Capitalists:** The capitalist start their process of economic growth with saving and investment. The reward for it is in the form of profits (P). The profits are obtained after making payment of wages and rents out of gross revenues. The capital can be divided into fixed capital and working capital. Machine is an example of fixed capital and wage fund (WF) is an example of working capital in Ricardo's model of income distribution.
   - **(ii) Workers:** The workers get wages (w) as a reward of their work. They represent the labour force of the economy.
   - **(iii) Landlords:** They provide land to allow production (y) to take place in the economy and the in return they get rent (R) as a reward.
4. The principle of margin applies to labour. The marginal product of labour along with average product of land is decreasing.
5. Says' law is applicable which says that supply creates its own demand. It further elaborates that whatever is saved is invested.
6. Agriculture is labour intensive and manufacturing is capital intensive.
7. Land is fixed and differs in fertility.
8. Law of diminishing returns is prevailing which affects labour and land. Labour is considered as a variable factor of production and land is considered as fixed factor of production.

Table 5.2 *Increases in Output (in plots of land of decreasing quality*

No. of workers (each with one shovel)	A	B	C	D	E	F
1	50	45	40	35	30	25
2	45	40	35	30	25	20
3	40	35	30	25	20	15
4	35	30	25	20	15	10
5	30	25	20	15	10	5
6	25	20	15	10	5	0

9. Principle of economic surplus is prevailing which says that the profits are determined on the basis of surplus production.



As explained in the diagram, the y-axis measures the quantities of 'corn' which is the output of all agricultural land and x-axis measures the amount of labour employed on agriculture land. At a given state of knowledge and natural environment, the P-AP curve represents the product per unit of labour and curve P-MP represents the marginal product of the labour. These two curves are the result of assumption of diminishing returns. The corn-output is determined at a place where the quantity of labouris given, for any given working force, OM total output is represented by the rectangle OCDM. The rent is determined through the difference in product of labouron 'marginal' land and product on average land, or the difference between average and marginal labour productivity which is dependent upon the elasticity of P-AP curve.

Implication of the Theory

In the short run, the corn laws result in raising the price of agricultural product. It leads to cultivation of marginal or less fertile land to earn profits. It raises the demand for more fertile land and leads to increased rents because of competitive bids. The increased rent paid to landlords cause reduced profits and percentage profit per unit of wage. The lesser the profits the lesser is the savings which reduces the investment or accumulation of capital. And as per Say's law, lesser investment causes slow economic growth. Therefore, the policy recommendation is in favour of a **laissez faire** economy. And it suggests corn laws to be eliminated. Therefore, by redistribution of income to capitalists can push the economic growth.

Ricardo believed there was a coincidence in the interest of capitalists and interest of society, and contradiction in the interest of landlords and interest of society. In the long run, the growth in population causes use of marginal land and increased rents for and reduced profits which disappear gradually. At this stationary state of the economy, there is no accumulation of profits and capitalism ceases. Ricardo is pessimistic of the long run and says that economy can do better in the short run.

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Therefore, Ricardo concluded that there is no benefit of worrying about long-term growth of an economy. It is just a waste of time. And instead of worrying about the steady state of economy, the more important issue to be considered is how to distribute the output among different classes of the society. He was of the opinion that ultimately there will be no increase in the total output of an economy. Therefore, it is more important to find out ways on how to share limited output of the economy. It is to be shared among different sectors rather than considering more on the methods of making economy richer. The following quotation of Ricardo gives a glimpse of his theory.

'Political economy, you think, is an enquiry into the nature and causes of wealth. I think it should rather be called an enquiry into the laws which determine the division of produce of industry amongst the classes that concur in its formation. No law can be laid down respecting quantity, but a tolerably correct one can be laid down respecting proportions. Every day I am more satisfied that the former enquiry is vain and delusive, and the latter the only true object of the science.'

(David Ricardo, 'Letter to T. R. Malthus',October 9, 1820,in *Collected Works,* Vol. VIII: p.278-9).

Marxian Theory of Distribution

The Marxian theory of distribution is an adoption of 'surplus theory' given by Ricardo. The distinction between Marxian theory and Ricardian theory can be made on the following basis:

1. Karl Marx has not given attention to the law of diminishing returns, therefore, no logical difference is made between rent and profits,
2. Marx has considered the 'cost of production', i.e., supply price of labouras fixed which is not in terms of 'corn' but of commodities in general.

Marx has said that the share of profit in output is determined by the surplus per unit of product available after considering the supply price of labour. Or it can also be calculated by determining the surplus of production to the consumption mandatory for production.

The Marxian theory can also be distinguished from the Ricardian theory on other aspects. One of these distinctions is on the basis of reasons for wages being tied to the continuation level. Marx has made sure of it through the truth that at any one time the supply of labour is likely to surpass the demand for labour. The subsistence of an unemployed fringe i.e., 'reserve army', thwarts the wages from expanding above the minimum that must be paid to facilitate the labourers to carry out the work. Marx further assumed that development of capitalist enterprise takes place at the operating cost of pre-capitalist or handicraft units than are engrossed in the capitalist sector, owing to the dissimilarity in productivity per head between the two sectors. As long as the expansion of capitalist enterprise is at the cost of a reduction of pre-capitalist enterprise, the increase in the supply of wage labour will tend to run in advance of the rise in the demand for wage labour.

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But sooner or later, the rise in demand for labour resulted as accumulation by capitalist enterprise will sprint ahead of enlarged supply. It leads to scarcity in labour force and rise in wages and gradually the profits fade away and the capitalist face the 'crises.' The 'crisis' itself further slows down the accumulation of capital which further cause decline in demand for labour which recreates 'reserve army' due to increase in the 'organic composition of capital'. Other important distinction between Marxian and Ricardian theories is made on the basis of 'motivation of accumulation of capital'. Ricardo has called it to be the greed for higher profits which motivates the accumulation of capital. This is a voluntary act of the capitalists and continues as long as higher rate of profits are available in comparison to compensation paid to the capital. But Marx, has a belief that the accumulation of capital is not because of the lure for higher profits by the capitalist but the motivation is the competition among the capitalists themselves.

Marx has explained it with the existence of economies of large scale of production. As larger the scale of production, more is the efficiency of the business, therefore, each capitalist is bound to have a large size of the business through the re-investment of accumulated capital so that he does not fall behind the struggle amongst the capitalists.

At a later stage, as soon as production process started expanding and moved into the hands of more victorious enterprises, separating the competitive requirement from accumulation, i.e. the stage of '**monopoly capitalism**', according to the Marxian scheme room for economic crises is created, not on account of an undue boost in the demand for labour subsequent to accumulation but on account of an lack of valuable demand, i.e., the collapse of markets consequential to the inability of the capitalists either to spend or to invest the full amount of profits (which Marx addressed as the problem of 'realizing surplus value')

One more idea taken by Marx from Ricardo was the idea of declining rate of profits with the progressive accumulation of capital, which is generally taken by the classical economists. But Marx has clearly eliminated the assumption of Ricardo of diminishing returns on which whole logical analysis of the Ricardo is based. Marx did not find any strong reason to believe in this assumption. His own clarification is based on the assumption of increase in the ratio of fixed to circulating capital (in Marxian terminology, '**constant**' **to** '**variable**' **capital**) with the progress of capitalism; but as numerous authors have pointed out, the law of the declining rate of profit cannot actually be derived from the laws of the 'increasing organic composition' of capital.

As Marx presupposes, that the supply price of labour vestiges unaffected in terms of commodities when the organic composition of capital, and consequently output per head, increases, there is no other basis to presume that an enhanced '**organic composition**'will yield a lesser rate of profit than a superior rate. For even if output per man, the 'surplus value' per man (the surplus of output per man over the costs of reproduction of labour) will essentially augment more rapidly than output per man and may as a consequence secure a mounting rate of profit

even if there is falling productivity to consecutive additions to fixed capital per unit of labor. Although, a number of predictions made by Marx such as the growing concentration of production in the hands of big enterprises was confirmed precisely.

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Kalecki's Theory

Income distribution plays an important task in Michal Kalecki's theory of effective demand. According to Kalecki, output and employment depend on capitalist spending, and on the share of profits in national income. Kalecki's theory of income distribution is closely attached with his theory of price determination, and the latter is associated with his vision that recent capitalism is distinguished by market imperfections, equally on the labour market and on the product market. By centering on these imperfections, Kalecki obtained two vital dissimilarities between perfect and imperfect competition. The primary difference is that in perfect competition, for any particular firm production is not restricted by demand, nevertheless by costs and prices. Because individual firms facade a horizontal demand curve, they are cost inhibited, in that by vaguely lowering their price they can put up for sale whatsoever quantity they desire as long as marginal cost is under the market price. On the contrary, in the case of imperfect competition firms are demand-constrained, as they would freely produce extra if only they could put up for sale at the existing or a somewhat lower price; but they cannot, since their supply has an impact on the price. As a result, while alteration in the level of aggregate demand origin price deviation when competition is ideal, it requires also, or only, a quantity deviation when competition is imperfect.

The next disparity is that firms in perfect competition function essentially in the growing element of their marginal cost curves. In contrast, the theory of imperfect competition forecast surplus ability as a long-term characteristic. An imperative feature of this proposal is that firms can now function in the stable part of their marginal constant cost curves. Collectively, both propositions indicate, primary, that prices stay comparatively stable in the face of deviation in demand. Conversely, as regards income distribution, author implies that when demand changes this need not engross a change in income shares, providing the degree of market imperfection does not vary. This guided Kalecki to hypothesize that the allocation of income is determined by the price/unit cost ratio, or degree/amount of monopoly, a word summarizing a diversity of oligopolistic and monopolistic factors.

It is worth highlighting that Kalecki's model does not entail price inflexibility. In a state of perfect competition, price rigidity arises normally as an estimate to partial price adjustment. On the contrary, in imperfect competition prices are understood to adjust as quickly as necessary; producers supply whatsoever is demanded at the price which they have put in their greatest interests.This comment can assist understanding the essential difference made by Kalecki between price whose changes, in perfect competitive market, are mainly determined by altering in the costs of productions and those prices whose changes, in imperfect competitive market, are dogged mainly by changes in demand, illuminating

particularly this difference is not based on disparity on pace of price modification but on disparity in industrial structure and in costs condition.

Kalecki in 1954 posited, generally speaking, changes in the prices of finished goods are 'cost-determined', while changes in the prices of raw materials, inclusive of primary foodstuffs, are 'demand-determined'.

With his hypothesis of income distribution, Kalecki further developed his hypothesis of efficient demand. He had previously revealed that, for a specified distribution of income between profits and wages, changes in profits would carry about alteration in the similar route of output and employment. At the moment, he added that for an agreed level of capitalist expensesand consequently for a known level of profits, income redistribution amid workers and capitalists, will aggravate an alteration in aggregate demand and by means of it in the level of output and employment. The fundamental cause is the diverse inclination to consume between workers and capitalists.

There is a well-built complementarily among income distribution and income determination, which establish appearance in the thought that even although the profit share depends on the degree of monopoly, the profit level stays exclusively determined by the level of capitalist expenses. This proposal is critical. On the one side, it highlights that difference in the degree of monopoly influence output and employment merely by moving effective demand through workers' expenditure. On the other hand, it demonstrates that if wages drop (climb), profits will not get high (go down) since they are totally determined by capitalist investment and expenditure, which are doubtful to change either in the present period or in the subsequent just because wages (or the wage share) altered. However, Kalecki's crucial intention on the reasons of unemployment under capitalism does not necessitate this theory of income distribution. Nevertheless, the later should be taken into account as it is practical under contemporary capitalism, even as it completes and strengthens Kalecki's theory of effective demand. Lastly, Kalecki's theory of income distribution permits defining a novel examination of the wages-employment association, first in reviewing the association between real wages and output by centering on defects on the product markets, and next in reviewing the association among money wages and employment by centering on both limitations on the labourand product market.

Kalecki's theory of income distribution

To seize the general idea of Kalecki's theory of income distribution, let us take the case of a vertically integrated industry. To make the study simpler, we suppose that all workers are productive workers and that the productivity of labour is known and are stable. Furthermore, we describe gross profits as the distinction between the total value of production and total prime costs, which are completely made up of wages in this simplify case. It can be simply seen that income distribution in an industry is entirely determined by the ability of firms to repair their prices in relative to prime unit costs. Precisely, the higher (lower) the price/unit-costs ratio,

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the higher (lower) the share of profits in respect to gross value added will be. The perception following the previous analysis is the subsequent.

Let us presume that in the industry under consideration the wage rate and productivity per worker are known. Then, if firms lift up prices, the price-cost ratio, and the unit profit margin will go up. However, now workers will be capable to purchase a lesser share of the output (or the value added) of the industry than earlier, whereas capitalists will be capable to purchase a higher share of the value added. Income distribution will vary, adjacent to wages and in support of profits. Additionally, we may believe that in any known industry, the senior the monopolistic control of firms on the market, the higher their ability to fix high prices (in relation to their costs). As a result, the superior the monopolistic power of firms, and the superior the relative share of profits in income in the industry have a tendency to be. This is perhaps the rationale why Kalecki named 'degree of monopoly' the price-cost ratio of the industry. Certainly, the later is expected to be prejudiced by the strength of the monopolization existing in the industry. But the 'degree of monopoly' is a diverse and extremely exact term in Kalecki's theory, as it submits exclusively to the price-cost ratio, and is definite by numerous factors. One, but only one of these factors is the strength of the monopolization of the market.

Check Your Progress

3. What was the more important issue to be considered as per Ricardo as against the long-term growth of the economy?
4. How is the share of profit determined as per Marx?

5.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. A monopsonist in a labour market faces a positively sloping labour supply curve, i.e., more labour is supplied at increasing wage rate.
2. The extent of monopsonistic exploitation of labour may be measured by comparing the wage rate in perfectly competitive and labour labour markets with wage rate under monopolistic product market and monopsonistic product labour conditions.
3. As per Ricardo, there is no benefit of worrying about the long-term growth of the economy. It is just a waste of time. The more important issue to be considered is how to distribute the output among different classes of the society.
4. Marx has stated that the share of profit in output is determined by the surplus per unit of product available after considering the supply price of labour.

5.5 SUMMARY

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- When there is a single buyer of labour, there exists monopsony in the labour market. Thus, in the present model, the monopolist is also a monopsonist in the factor market. It may be noted here that the analysis of determination of factor-price and employment under the conditions of monopoly in the commodity-market and monopsony in the factor market is relevant also for monopolistic competition and oligopoly in the commodity-market, and monopsony and oligopsony in the factor market.
- Factor price and employment determination in the market setting described above is discussed under two different assumptions: (i) that only a single variable factor (labour) is used; and (ii) that more than one variable factor is used. Before we analyse the factor price and employment determination, let us explain the concept of marginal cost of factor input which is used in the analysis of factor price determination.
- Factor price and employment under product monopoly and factor monopsony are determined by intersection of labour demand curve and the marginal-cost-of-labour or *MW* curve. The monopsonist's demand curve for labour is given by the MRP_L curve.
- A monopsonist in labour market faces a positively sloping labour supply curve, i.e., more labour is supplied at increasing wage rate. Due to positive slope of the labour supply curve, there is a divergence between the average and marginal costs of labour. The monopsonist must therefore consider his marginal cost of labour, i.e., marginal wage (*MW*) to decide on the units of labour to be employed.
- Monopsonistic exploitation arises for reasons similar to monopolistic competition. But monopsonistic exploitation is greater than the monopolistic exploitation. A monopsonist pays a price to a factor which is less than not only its *VMP* but also less than its *MRP*. This gives rise to the monopsonistic exploitation which results from the monopsonistic power of the firm.
- Income distribution (as per the economics concept) is how a nation's total GDP is dispersed amongst its population. David Ricardo opined that the principle issue of political economy was the laws governing the distribution of income. He was a successful broker who developed a theoretical model popularly known as 'corn laws'.
- The significance of David Ricardo's model is that it was one of the initial models used in economics, intended at the amplification that how income is distributed or dispersed in society.
- The Marxian theory of distribution is an adoption of 'surplus theory' given by Ricardo.

NOTES

- The Marxian theory can also be distinguished from the Ricardian theory on other aspects. One of these distinctions is on the basis of reasons for wages being tied to the continuation level. Marx has made sure of it through the truth that at any one time the supply of labour is likely to surpass the demand for labour.
- Income distribution plays an important task in Michal Kalecki's theory of effective demand. According to Kalecki, output and employment depend on capitalist spending, and on the share of profits in national income. Kalecki's theory of income distribution is closely attached with his theory of price determination, and the latter is associated with his vision that recent capitalism is distinguished by market imperfections, equally on the labour market and on the product market. By centering on these imperfections, Kalecki obtained two vital dissimilarities between perfect and imperfect competition.

5.6 KEY WORDS

- **Monopsony:** It refers to a market situation in which there is only one buyer.
- **Income Distribution:** It is how a national's total GDP is dispersed amongst its population.

5.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Briefly explain wages and employment under monopsony.
2. State the assumptions of the Ricardian model of distribution.
3. What were the two dissimilarities between perfect and imperfect competition as per Kalecki?

Long Answer Questions

1. Discuss the theories of distribution under imperfect product and factor markets.
2. Compare and contrast the Ricardian and Marxian theory of distribution.
3. Explain Kalecki's theory of distribution.

5.8 FURTHER READINGS

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UNIT 6 THEORIES OF DEMAND

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Structure

6.0 INTRODUCTION

In this unit, we take a deeper look at the theory of demand but from different perspectives. Up till now, you must be familiar with the cardinal approach to understanding consumer demand. In this unit, the ordinal approach to demand will be discussed which was propounded by Hicks. You will also learn about Slutsky's theorem. Lastly, you will be introduced to the concepts of risk and uncertainty and how it affects the consumer's choice.

6.1 OBJECTIVES

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

- Discuss Slutsky's theorem
- Explain the revision of demand theory by Hicks
- Describe consumer's choice involving risk and uncertainty

6.2 SLUTSKY'S THEOREM

Expenditure maximization and utility minimization are dual problems. Formally,

$$x\,(p, Y) = h\,(p, v\,(p, Y))$$

The bundle of goods that solves the utility maximization problem (Marshallian) with prices p and income Y also solves the expenditure minimization problem (Hicksian) with prices p and utility target $v\,(p, Y)$.

$$h\,(p, \underline{u}) = x\,(p, e\,(p, \underline{u}))$$

The bundle of goods that solve the expenditure minimization problem (Hicksian) with prices p and utility target $\underline{u}$ also solves the utility maximization problem (Marshallian) with prices p and income $e(p, \underline{u})$.

This duality allows us to derive the Slutsky equation, which relates changes in the Marshallian demand to changes in Hicksian demand.

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Slutsky Decomposition Equation

The change in demand due to price can be decomposed into a substitution effect and an income effect.

$$\underbrace{\frac{\partial x_j}{\partial p_j}}_{\text{Demand response to price changes}} = \underbrace{\frac{\partial h_j}{\partial p_j}}_{\text{Substitution effect}} \underbrace{- x_j \frac{\partial x_j}{\partial Y}}_{\text{Income effect}}$$

Proof.

1. Start from duality equation (2) for good j

$$x_j(\mathrm{p}, e(\mathrm{p}, \underline{u})) = h_j(\mathrm{p}, \underline{u})$$

2. Differentiate with respect to p_j

$$\frac{\partial x_j(\mathrm{p}, e(\mathrm{p}, \underline{u}))}{\partial p_j} + \frac{\partial x_j(\mathrm{p}, e(\mathrm{p}, \underline{u}))}{\partial Y} \cdot \left[\frac{\partial e(\mathrm{p}, \underline{u})}{\partial p_j}\right] = \frac{\partial h_j(\mathrm{p}, \underline{u})}{\partial p_j}$$

3. Substitute in the following identities

$$\frac{\partial e(\mathrm{p}, \underline{u})}{\partial p_j} = h_j(\mathrm{p}, \underline{u}) \quad \text{(from Shephard's lemma)}$$

$$\mathrm{Y} = e(\mathrm{p}, \underline{u}) \quad \text{(Budget Constraint: income = expenditure)}$$

$$h_j(\mathrm{p}, \underline{u}) = x_j(\mathrm{p}, Y) \quad \text{(from duality)}$$

leading to

$$\frac{\partial x_j(\mathrm{p}, Y)}{\partial p_j} + \frac{\partial x_j(\mathrm{p}, Y)}{\partial Y} \cdot x_j(\mathrm{p}, Y) = \frac{\partial h_j(\mathrm{p}, \underline{u})}{\partial p_j}$$

4. Rearrange to obtain the result

Consider the substitution effect. This is exactly the definition of the Hicksian demand curve, which gives us the effect on demand of price changes, after we have negated any effects on overall utility. The negative slope of the Hicksian demand curve tells us that this term is always negative.

Consider the income effect. Intuitively, the first order effect on our budget when pj rises by a dollar is that we are xj dollars poorer. We scale this response by $\frac{\partial x_j}{\partial Y}$ which tells us how sensitive demand for good j is to changes in wealth.

A normal good is one where $\frac{\partial x_j}{\partial Y} > 0$. This effect reinforces the substitution effect.

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On the other hand, an inferior good is one where $\frac{\partial x_j}{\partial Y} < 0$. The income effect would then counteract the substitution effect.

The following is a useful schematic that shows how the utility maximization problem (UMP) and expenditure minimization problem (EMP) are connected.

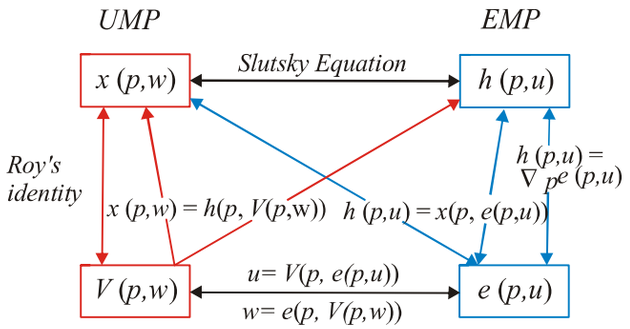

Fig. 6.1 *Connection between UMP and EMP*

6.3 REVISION OF DEMAND THEORY BY HICKS

Unlike Marshall, modern economists—Hicks in particular—have used the ordinal utility concept to analyse consumer's behaviour. This is called ordinal utility approach. Hicks has used a different tool of analysis called indifference curve or equal utility curve to analyse consumer behaviour. In this section, we will first explain the indifference curve and then explain consumer's behaviour through the indifference curve technique. Let us first look at the assumptions of the ordinal utility approach.

Assumptions of Ordinal Utility Approach

The assumptions of ordinal utility approach are as follows:

1. **Rationality**: As under cardinal utility approach, under ordinal utility approach also, the consumer is assumed to be a rational being. Rationality means that a consumer aims at maximizing his total satisfaction given his income and prices of the goods and services. To maximize his/her total utility, he/she spends his/her first rupee on the commodity which yields maximum utility.
2. **Ordinal utility**: Indifference curve analysis assumes that utility is only ordinally expressible. That is, the consumer can only reveal the order of his preference for different goods or basket of goods.
3. **Transitivity and consistency of choice**: Consumer's choices are assumed to be transitive. *Transitivity* of choice means that if a consumer prefers *A*

to *B* and *B* to *C*, then he prefers *A* to *C*. Or, if he treats *A* = *B* and *B* = *C*, then he treats *A* = *C*. *Consistency* of choice means that if he prefers *A* to *B* in one period, he will not prefer *B* to *A* in another period or even treat them as equal.

4. **Non satiety**: It is also assumed that the consumer has not reached the point of saturation in case of any commodity. This implies that the consumer is not over supplied with goods in question. Therefore, a consumer always prefers a larger quantity of all the goods.
5. **Diminishing marginal rate of substitution**: The marginal rate of substitution is the rate at which a consumer is willing to substitute one commodity (*X*) for another (*Y*) so that his total satisfaction remains the same. This rate is given as $\Delta Y/\Delta X$. The ordinal utility approach assumes that $\Delta Y/\Delta X$ goes on decreasing when a consumer continues to substitute *X* for *Y*.

Meaning and Nature of Indifference Curve

An indifference curve may be defined as the locus of points, each representing a different combination of two substitute goods, which yield the same utility or level of satisfaction to the consumer. Therefore, he is indifferent between any two combinations of goods when it comes to making a choice between them. Such a situation arises because he consumes a large number of goods and services and often finds that one commodity can be substituted for another. It gives him an opportunity to substitute one commodity for another, if need arises and to make various combinations of two substitutable goods which give him the same level of satisfaction. If a consumer is faced with such combinations, he would be indifferent between the combinations. When such combinations are plotted graphically, it produces a curve called *indifference curve*. An indifference curve is also called *isoutility curve* or *equal utility curve*.

For example, let us suppose that a consumer makes five combinations *a*, *b*, *c*, *d* and *e* of two substitute commodities, *X* and *Y*, as presented in Table 6.1. All these combinations yield the same level of satisfaction indicated by *U*.

Table 6.1 *Indifference Schedule of Commodities X and Y*

Combination		*Units of Commodity Y*	+	*Units of Commodity X*	=	*Total Utility*
a	=	25	+	3	=	*U*
b	=	15	+	6	=	*U*
c	=	8	+	10	=	*U*
d	=	4	+	17	=	*U*
e	=	2	+	30	=	*U*

Table 6.1 is an indifference schedule—a schedule of various combinations of two goods, between which a consumer is indifferent. The last column of the

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table shows an undefined utility (*U*) derived from each combination of *X* and *Y*. The combinations *a*, *b*, *c*, *d* and *e* given in Table 6.1 are plotted and joined by a smooth curve (as shown in Figure 6.2). The resulting curve is known as an *indifference curve*. On this curve, one can locate many other points showing different combinations of *X* and *Y* which yield the same level of satisfaction. Therefore, the consumer is indifferent between the combinations which may be located on the indifference curve.

Indifference map: We have drawn a single indifference curve in Figure 6.2 on the basis of the indifference schedule given in Table 6.1. The combinations of the two commodities, *X* and *Y*, given in the indifference schedule or those indicated by the indifference curve are by no means the only combinations of the two commodities. The consumer may make many other combinations with less of one or both of the goods—each combination yielding the same level of satisfaction but less than the level of satisfaction indicated by the indifference curve *IC* in Figure 6.2. As such, an indifference curve below the one given in Figure 6.2 can be drawn, say, through points *f*, *g* and *h*. Similarly, the consumer may make many other combinations with more of one or both the goods—each combination yielding the same satisfac-tion but greater than the satisfaction indicated by *IC*. Thus, another indifference curve can be drawn above *IC*, say, through points *j*, *k* and *l* as shown in Figure 6.2. This exercise may be repeated as many times as one wants, each time generating a new indifference curve.

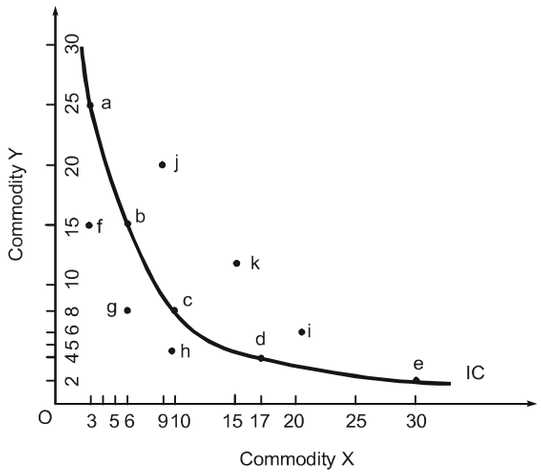

Fig. 6.2 *Indifference Curve*

In fact, the space between *X* and *Y* axes is known as the *indifference plane* or *commodity space*. This plane is full of finite points and each point on the plane indicates a different combination of goods *X* and *Y*. Intuitively, it is always possible to locate any two or more points indicating different combinations of goods *X* and *Y* yielding the same satisfaction. It is thus possible to draw a number of indifference curves IC_1, IC_2, IC_3 and IC_4 drawn in this manner make the

indifference map. It is important to note here that utility represented by each upper *IC* is higher than that on the lower ones. For example, the utility represented by IC_2 is greater than utility represented by IC_1. In terms of utility, $IC_1 < IC_2 < IC_3 < IC_4$.

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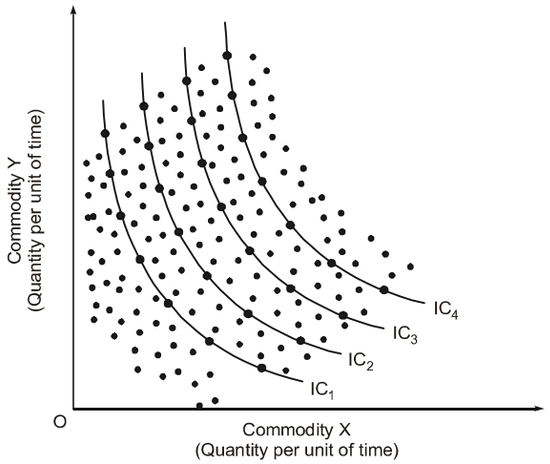

Fig. 6.3 *The Indifference Map*

Marginal Rate of Substitution (MRS)

An indifference curve is formed by substituting one good for another. The *MRS* is the rate at which one commodity can be substituted for another, the level of satisfaction remaining the same. The *MRS* between two commodities *X* and *Y*, may be defined as the quantity of *X* which is required to replace one unit of *Y* or quantity of *Y* required to replace one unit of *X*, in the combination of the two goods so that the total utility remains the same. This implies that the utility of *X* (or *Y*) given up is equal to the utility of additional units of *Y* (or *X*). The *MRS* is expressed as $\Delta Y/\Delta X$, moving down the curve.

Diminishing *MRS:* The basic postulate of ordinal utility theory is that $MRS_{y,x}$ (or $MRS_{x,y}$) decreases. It means that the quantity of a commodity that a consumer is willing to sacrifice for an additional unit of another goes on decreasing when he goes on substituting one commodity for another. The diminishing $MRS_{x,y}$ obtained from different combinations of *X* and *Y* given in Table 6.1 are given in Table 6.2.

Table 6.2 *The Diminishing MRS between Commodities X and Y*

Indifference Points	*Combinations Y + X*	*Change in Y (– ΔY)*	*Change in X (ΔX)*	$MRS_{y,x}$ *(ΔY/ΔX)*
a	25 + 3	–	–	–
b	15 + 6	– 10	3	– 3.33
c	8 + 10	– 7	4	– 1.75
d	4 + 17	– 4	7	– 0.60
e	2 + 30	– 2	13	– 0.15

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As Table 6.2 shows, when the consumer moves from point *a* to *b* on his indifference curve (Figure 6.2) he gives up 10 units of commodity *Y* and gets only 3 units of commodity *X*, so that:

$$MRS_{y,x} = \frac{-\Delta Y}{\Delta X} = \frac{-10}{3} = -3.33$$

As he moves down from point *b* to *c*, he gives up 7 units of *Y* for 4 units of *X*, giving

$$MRS_{y,x} = \frac{-\Delta Y}{\Delta X} = \frac{7}{4} = -1.75$$

The $MRS_{y,x}$ goes on decreasing as the consumer moves further down along the indifference curve, from point *c* through points *d* and *e*. *The diminishing marginal rate of substitution causes the indifference curves to be convex to the origin*.

Why does the *MRS* diminish?

(i) Diminishing subjective marginal utility: The *MRS* decreases along the *IC* curve because, in most cases, no two goods are perfect substitutes for one another. In case any two goods are perfect substitutes, the indifference curve will be a straight line with a negative slope and constant *MRS*. Since most goods are not perfect substitutes, the subjective value attached to the additional quantity (i.e., subjective MU) of a commodity decreases fast in relation to the other commodity whose total quantity is decreasing. Therefore, when the quantity of one commodity (*X*) increases and that of the other (*Y*) decreases, the subjective *MU* of *Y* increases and that of *X* decreases. Therefore, the consumer becomes increasingly *unwilling* to sacrifice more units of *Y* for one unit of *X*. But, if he is required to sacrifice additional units of *Y*, he will demand increasing units of *X* to maintain the level of his satisfaction. That is the reason why *MRS* decreases.

(ii) Decreasing ability to sacrifice a good: When combination of two goods at a point on indifference curve is such that it includes a large quantity of one commodity (*Y*) and a small quantity of the other commodity (*X*), then consumer's *capacity* to sacrifice *Y* is greater than to sacrifice *X*. Therefore, he can sacrifice a larger quantity of *Y* in favour of a smaller quantity of *X*. For example, at combination *a* (see the indifference schedule, Table 6.1), the quantity of *Y* (25 units) is much larger than that of *X* (3 units). That is why the consumer is willing to sacrifice 10 units of *Y* for 3 unit of *X*. This is an observed behavioural rule that the consumer's willingness and capacity to sacrifice a commodity is greater when its stock is greater and it is lower when the stock of a commodity is smaller. Besides, as mentioned above, the *MRS* decreases also because of the law of the diminishing *MU*. The *MU* of a commodity available in larger quantity is lower than that of a

commodity available on smaller quantity. Therefore, the consumer has to sacrifice a large quantity of *Y* for a small quantity of *X* in order to maintain total utility at the same level. These are the reasons why *MRS* between the two substitute goods decreases all along the indifference curve.

Properties of Indifference Curves

Indifference curves drawn for two normal substitute goods have the following four basic properties:

- Indifference curves have a negative slope
- Indifference curves are convex to the origin
- Indifference curves do not intersect nor are they tangent to one another
- Upper indifference curves indicate a higher level of satisfaction

These properties of indifference curves, in fact, reveal the consumer's behaviour, his choices and preferences. They are, therefore, very important in the modern theory of consumer behaviour. Let us now look into their implications.

1. **Indifference curves have a negative slope:** In the words of Hicks, 'so long as each commodity has a positive marginal utility, the indifference curve must slope downward to the right', as shown in Figure 6.4.

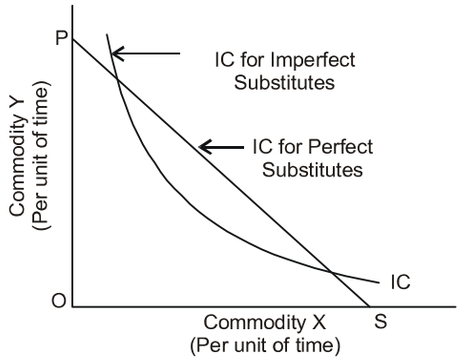

Fig. 6.4 *Normal Indifference Curves*

Figure 6.4 shows two *IC* curves:

(*i*) A curvilinear *IC*

(*ii*) A straight line *IC* as shown by the line *PS*

The curvilinear *IC* represents *IC* for two imperfect substitute goods whereas straight line *PS* represents *IC* for two perfect substitute goods. In both the cases, the *IC* has a downward or a negative slope. The negative slope of an indifference curve implies: (*a*) that the two commodities can be substituted for each other; and (*b*) that if the quantity of one commodity decreases, quantity of the other commodity must increase so that the consumer stays at the same level of satisfaction. If quantity of the other commodity does not increase simultaneously, the bundle of commodities will decrease as a result

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of decrease in the quantity of one commodity. And, a smaller bundle of goods is bound to yield a lower level of satisfaction.

2. **Indifference curves are convex to origin:** Indifference curves are not only negatively sloped, but are also *convex to the origin*. The *convexity of the indifference curves* implies two properties:
   (*i*) The two commodities are imperfect substitutes for one another
   (*ii*) The marginal rate of substitution (*MRS*) between the two goods decreases as a consumer moves along an indifference curve.

   The *MRS* decreases because of an observed fact that if a consumer substitutes one commodity (*X*) for another (*Y*), his willingness to sacrifice more units of *Y* for one additional unit of *X* decreases, as quantity of *Y* decreases. There are two reasons for this: (*i*) no two commodities are perfect substitutes for one another, and (*ii*) *MU* of a commodity increases as its quantity decreases and *vice versa*, and, therefore, more and more units of the other commodity are needed to keep the total utility constant.

3. **Indifference curves can neither intersect nor be tangent with one another:** If two indifference curves intersect or are tangent with one another, it reflects two rather impossible conclusions: (*i*) that two equal combinations of two goods yield two different levels of satisfaction, and (*ii*) that two different combinations—one being larger than the other—yield the same level of satisfaction. Such conditions are impossible if the consumer's subjective valuation of a commodity is greater than zero. Besides, if two indifference curves intersect, it would mean negation of *consistency* or *transitivity* assumption in consumer's preferences.

   Let us now see what happens when two indifference curves, IC_1 and IC_2, intersect each other at point *A* (Figure 6.5). Point *A* falls on both the indifference curves, IC_1 and IC_2. It means that the same basket of goods (*OM* of *X* + *AM* of *Y*) yields different levels of utility below and above point *A* on the same indifference curve.

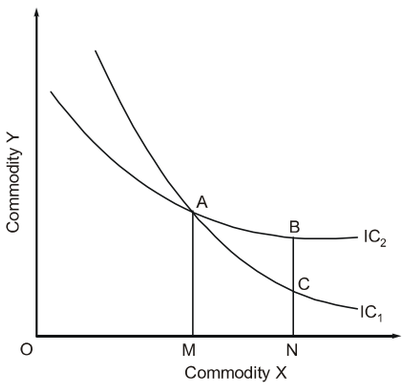

Fig. 6.5 *Intersecting indifference Curves*

The inconsistency that two different baskets of *X* and *Y* yield the same level of utility can be proved as follows. Consider two other points—point *B* on indifference curve IC_2 and point *C* on indifference curve IC_1 both being on a vertical line.

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Points *A*, *B* and *C* represent three different combinations of commodities *X* and *Y*, yielding the same utility. Let us call these combinations as *A*, *B* and *C*, respectively. Note that combination *A* is common to both the indifference curves. The intersection of the two IC_S implies that in terms of utility,

$$A = B$$

and $$A = C$$

$$\therefore \quad B = C$$

But if *B* = *C*, it would mean that in terms of utility,

ON of *X* + *BN* of *Y* = *ON* of *X* + *CN* of *Y*

Since '*ON* of *X*' is common to both the sides, it would mean that

BN of *Y* = *CN* of *Y*

But as Figure 6.5 shows, *BN* > *CN*. Therefore, combinations *B* and *C* cannot be equal in terms of satisfaction. The intersection, therefore, violates the *transitivity rule* which is a logical necessity in indifference curve analysis. The same reasoning is applicable when two indifference curves are tangent with each other.

4. **Upper indifference curves represent a higher level of satisfaction than the lower ones:** An indifference curve placed above and to the right of another represents a higher level of satisfaction than the lower one. In Figure 6.6, indifference curve IC_2 is placed above the curve IC_1. It represents, therefore, a higher level of satisfaction. The reason is that an upper indifference curve contains all along its length a larger quantity of one or both the goods than the lower indifference curve. And a larger quantity of a commodity is supposed to yield a greater satisfaction than the smaller quantity of it, provided *MU* > 0.

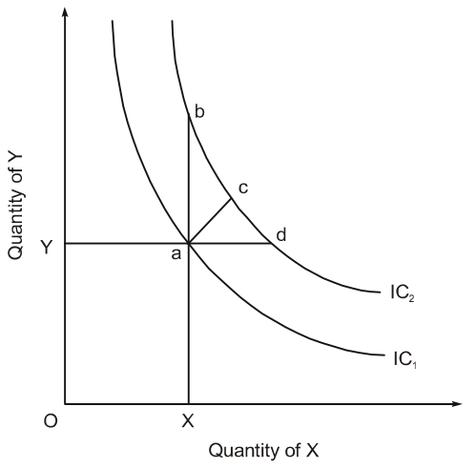

Fig. 6.6 *Comparison between Lower and Upper Indifference Curves*

For example, consider the indifference curves IC_1 and IC_2 in Figure 6.6. Let us begin at point *a*. The vertical movement from point *a* on the lower indifference curve IC_1, to point *b* on the upper indifference curve IC_2, means an increase in the quantity of *Y* by *ab*, the quantity of *X* remaining the same (*OX*). Similarly, a

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horizontal movement from point *a* to *d* means a greater quantity (*ad*) of commodity *X*, quantity of *Y* remaining the same (*OY*). The diagonal movement, i.e., from *a* to *c*, means a larger quantity of both *X* and *Y*. Unless the utility of additional quantities of *X* and *Y* are equal to zero, these additional quantities will yield additional utility. Therefore, the level of satisfaction indicated by the upper indifference curve (IC_2) would always be greater than that indicated by the lower indifference curve (IC_1).

Check Your Progress

1. How is Slutsky's decomposition equation derived?
2. What is transitivity of choice?
3. Mention some other names for an indifference curve.

6.4 CONSUMER'S CHOICE INVOLVING RISK AND UNCERTAINTY

The concept of risk and uncertainty can be better explained and understood in contrast to the concept of certainty. Therefore, let us first have a closer look at the concept of certainty and then proceed to explain the concepts of risk and uncertainty. *Certainty* is the state of perfect knowledge about the market conditions. In the state of certainty, there is only one rate of return on the investment and that rate is known to the investors. That is, in the state of certainty, the investors are fully aware of the outcome of their investment decisions. For example, if you deposit your savings in 'fixed deposit' bearing 10 per cent interest, you know for certain that the return on your investment in time deposit is 10 per cent, and *FDR* can be converted into cash any day. Or, if you buy government bonds or treasury bills, etc. bearing an interest of 11 per cent, you know for sure that the return on your investment is 11 per cent per annum, your principal remaining safe. In either case, you are sure that there is little or no possibility of the bank or the government defaulting on interest payment or on refunding the money. This is called the *state of certainty*.

However, there is a vast area of investment avenues in which the outcome of investment decisions is not precisely known. The investors do not know precisely or cannot predict accurately the possible return on their investment. Some examples will make the point clear. Suppose a firm invests in R&D to innovate a new product and spends money on its production and sale. The success of the product in a competitive market and the return on investment in R&D and in production and sale of the product can hardly be predicted accurately. There is, therefore, an element of uncertainty. Consider another example. Suppose a company doubles its expenditure on advertisement of its product with a view to increasing its sales. Whether sales will definitely increase proportionately can hardly be forecast with

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a high degree of certainty, for it depends on a number of unpredictable conditions. Consider yet another example. Maruti Udyog Limited (*MUL*) decided in July 2014 to invest money in financing the sale of its own cars with a view to preventing the downslide in its sales which it had experienced over the past two years. However, the managers of *MUL* could hardly claim the knowledge of or predict the outcome of this decision accurately. Hence, this decision involves risk and uncertainty. In real life situations, in fact, a large number of business decisions are taken under the conditions of risk and uncertainty, i.e., the lack of precise knowledge about the outcome of the business decisions. Let us now look into the precise meaning of the terms risk and uncertainty in business decisions.

Meaning of Risk

In common parlance, risk means a low probability of an expected outcome. From business decision-making point of view, risk refers to a situation in which a business decision is expected to yield more than one outcome and the probability of each outcome is known to the decision makers or it can be reliably estimated. For example, if a company doubles its advertisement expenditure, there are four probable outcomes: (*i*) its sales may more-than-double, (*ii*) they may just double, (*iii*) increase in sales may be less than double and (*iv*) sales do not increase at all. The company has the knowledge of these probabilities or has estimated the probabilities of the four outcomes on the basis of its past experience as: (*i*) more-than double: — 20 per cent (or 0.2), (*ii*) almost double — 40 per cent (or 0.4), (*iii*) less-than double — 50 per cent (or 0.5) and (*iv*) no increase — 10 per cent (or 0.1). It means that there is 80 per cent risk in expecting more-than-doubling of sales, and 60 per cent risk in expecting doubling of sale, and so on.

There are two approaches to estimating probabilities of outcomes of a business decision, viz., (*i*) *a priori approach*, i.e., the approach based on deductive logic or intuition and (*ii*) *posteriori approach*, i.e., estimating the probability statistically on the basis of the past data. In case of *a priori probability*, we know that when a coin is tossed, the probabilities of 'head' or 'tail' are 50:50, and when a dice is thrown, each side has 1/6 chance to be on the top. The *posteriori* assumes that the probability of an event in the past will hold in future also. The probability of outcomes of a decision can be estimated statistically by way of 'standard deviation' and 'coefficient of variation'.

Meaning of Uncertainty

Uncertainty refers to a situation in which there are more than one outcome of a business decision and the probability of no outcome is not known nor can it be meaningfully estimated. The unpredictability of outcome may be due to the lack of reliable market information, inadequate past experience, and high volatility of the market conditions. For example, if an Indian firm, highly concerned with population burden on the country, invents an irreversible sterility drug, the outcome regarding its success is completely unpredictable. Consider the case of insurance companies.

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It is possible for them to predict fairly accurately the probability of death rate of insured people, accident rate of cars and other automobiles, rate of buildings catching fire, and so on, but it is not possible to predict the death of a particular insured individual, a particular car meeting an accident or a particular house catching fire, etc.

The long-term investment decisions involve a great deal of uncertainty with unpredictable outcomes. But, in reality, investment decisions involving uncertainty have to be taken on the basis of whatever information can be collected, generated and 'guesstimated'. For the purpose of decision-making, uncertainty is classified as:

- Complete ignorance
- Partial ignorance

In case of *complete ignorance*, investment decisions are taken by the investor using their own judgement or using any of the rational criteria. What criterion he chooses depends on his attitude towards risk. The investor's attitude towards risk may be that of:

- A risk averter
- A risk neutral
- A risk seeker or risk lover

In simple words, a risk averter avoids investment in high-risk business. A risk-neutral investor takes the best possible decision on the basis of his judgement, understanding of the situation and his past experience. He does his best and leaves the rest to the market. A risk lover is one who goes by the dictum that 'the higher the risk, the higher the gain'. Unlike other categories of investors, he prefers investment in risky business with high expected gains.

In case of *partial ignorance*, on the other hand, there is some knowledge about the future market conditions; some information can be obtained from the experts in the field, and some probability estimates can be made. The available information may be incomplete and unreliable. Under this condition, the decision-makers use their subjective judgement to assign an *a priori probability* to the outcome or the pay-off of each possible action such that *the sum of such probability distribution is always equal to one*. This is called *subjective probability distribution*. The investment decisions are taken in this case on the basis of the *subjective probability distribution*.

Check Your Progress

4. Define certainty.
5. What are the ways by which probability of outcomes of a decision are estimated?

6.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. The change in demand due to price can be decomposed into a substitution effect and an income effect. This is how Slutsky's decomposition equation is derived.
2. Transitivity of choice means that if a consumer prefers A to B and B to C, then he prefers A to C.
3. Some other names for an indifference curve are isoutility curve or equal utility curve.
4. Certainty is the state of perfect knowledge about the market conditions.
5. The ways by which probability of outcomes of a decision are estimated are standard deviation and coefficient of variation.

6.6 SUMMARY

- Expenditure maximization and utility minimization are dual problems. Formally,

$$x\,(\mathrm{p},\, Y) = h\,(\mathrm{p},\, v\,(\mathrm{p}, Y))$$

  The bundle of goods that solves the utility maximization problem (Marshallian) with prices p and income Y also solves the expenditure minimization problem (Hicksian) with prices p and utility target $v\,(p, Y)$.

$$h\,(\mathrm{p},\, \underline{u}) = x\,(\mathrm{p},\, e\,(\mathrm{p},\, \underline{u}))$$

  The bundle of goods that solve the expenditure minimization problem (Hicksian) with prices p and utility target $\underline{u}$ also solves the utility maximization problem (Marshallian) with prices p and income $e\,(p, \underline{u})$.
- This duality allows us to derive the Slutsky equation, which relates changes in the Marshallian demand to changes in Hicksian demand.
- The change in demand due to price can be decomposed into a substitution effect and an income effect.
- Unlike Marshall, modern economists—Hicks in particular—have used the ordinal utility concept to analyse consumer's behaviour. This is called ordinal utility approach. Hicks has used a different tool of analysis called indifference curve or equal utility curve to analyse consumer behaviour. In this section, we will first explain the indifference curve and then explain consumer's behaviour through the indifference curve technique.
- An indifference curve may be defined as the locus of points, each representing a different combination of two substitute goods, which yield the same utility or level of satisfaction to the consumer.

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- An indifference curve is formed by substituting one good for another. The *MRS* is the rate at which one commodity can be substituted for another, the level of satisfaction remaining the same. The *MRS* between two commodities *X* and *Y*, may be defined as the quantity of *X* which is required to replace one unit of *Y* or quantity of *Y* required to replace one unit of *X*, in the combination of the two goods so that the total utility remains the same. This implies that the utility of *X* (or *Y*) given up is equal to the utility of additional units of *Y* (or *X*). The *MRS* is expressed as $\Delta Y/\Delta X$, moving down the curve.
- Indifference curves drawn for two normal substitute goods have the following four basic properties:
  - o Indifference curves have a negative slope
  - o Indifference curves are convex to the origin
  - o Indifference curves do not intersect nor are they tangent to one another
  - o Upper indifference curves indicate a higher level of satisfaction
- The concept of risk and uncertainty can be better explained and understood in contrast to the concept of certainty. Therefore, let us first have a closer look at the concept of certainty and then proceed to explain the concepts of risk and uncertainty. Certainty is the state of perfect knowledge about the market conditions. In the state of certainty, there is only one rate of return on the investment and that rate is known to the investors.
- In common parlance, risk means a low probability of an expected outcome. From business decision-making point of view, risk refers to a situation in which a business decision is expected to yield more than one outcome and the probability of each outcome is known to the decision makers or it can be reliably estimated.
- Uncertainty refers to a situation in which there are more than one outcome of a business decision and the probability of no outcome is not known nor can it be meaningfully estimated. The unpredictability of outcome may be due to the lack of reliable market information, inadequate past experience, and high volatility of the market conditions.

6.7 KEY WORDS

- **Indifference Curve:** It may be defined as the locu of points, each representing a different combination of two substitute goods, which yield the same utility or level of satisfaction to the consumer.
- **Marginal Rate of Substitution:** It is the quantity of X which is required to replace one unit of Y.
- **Risk:** In business decision-making, risk refers to a situation in which a business decision is expected to yield more than one outcome and the

probability of each outcome is known to the decision maker or can be reliably estimated.

- **Uncertainty:** It refers to a situation in which there are more than one outcome of a business decision and the probability of no outcome is not known nor can it be meaningfully estimated.

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6.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on Slutsky's theorem.
2. State the assumptions of the ordinal utility approach.
3. Briefly explain the concept of certainty.

Long Answer Questions

1. Examine in detail Hick's theory of demand.
2. Discuss the implications of the modern theory of consumer behaviour.
3. Describe the concept of uncertainty and risk.

6.9 FURTHER READINGS

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BLOCK - II

MARKET THEORIES

UNIT 7 MARKET THEORIES OF FIRM-I

Structure

7.0 INTRODUCTION

Duopoly refers to a market situation in which only two sellers of the product are present in the market. There have been many different theories of duopoly including both classical and modern. The duopoly can be said to the special case of oligopoly or a limiting case of oligopoly in which there is a necessity of two sellers for the product for it to be called in a duopoly. In this unit, you will learn about some of the major duopoly models including that of Cournot, Edgeworth, Chamberlain and Bertrand.

7.1 OBJECTIVES

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

- Discuss Cournot's model of duopoly
- Explain Bertrand's model of duopoly
- Recall Edgeworth's theory of duopoly
- Describe Chamberlain's duopoly theory

7.2 THE DUOPOLY MODELS OF COURNOT

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Augustine Cournot, a French economist, was the first to develop a formal oligopoly model in 1838. He formulated his oligopoly theory in the form of a *duopoly model* which can be extended to oligopoly model. To illustrate his model, Cournot made the following assumptions.

(*a*) There are two firms, each owning an artesian mineral water well

(*b*) Both the firms operate their wells at zero marginal cost

(*c*) Both of them face a demand curve with constant negative slope

(*d*) Each seller acts on the assumption that his competitor will not react to his decision to change his *output*—Cournot's behavioural assumption

On the basis of this model, Cournot has concluded that each seller ultimately supplies one-third of the market and both the firms charge the same price. And, one-third of the market remains unsupplied.

Cournot's duopoly model is presented in Figure 7.1. The demand curve for mineral water is given by the *AR* curve and firm's *MR* by the *MR* curve. To begin with, let us suppose that there are only two sellers *A* and *B*, but initially, *A* is the only seller of mineral water in the market. By assumption, his $MC = 0$. Following the profit maximizing rule, he sells quantity *OQ* where his $MC = 0 = MR$, at price OP_2. His total profit is OP_2PQ.

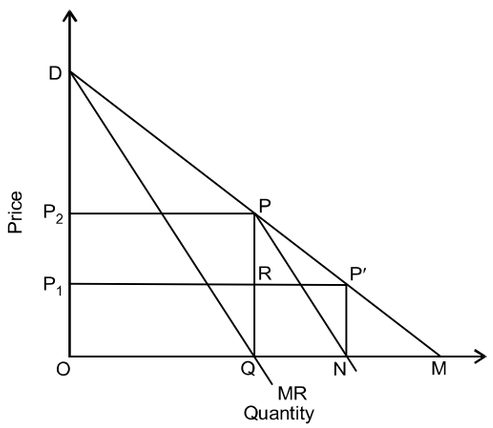

Fig. 7.1 *Price and Output Determination under Duopoly: Cournot's Model*

Now let *B* enter the market. He finds that the market open to him is *QM* which is *half* of the total market. That is, he can sell his product in the remaining half of the market. *B* assumes that *A* will not change his *output* because he is making maximum profit. Specificially, *B* assumes that *A* will continue to sell *OQ* at prices OP_2, Thus, the market available to *B* is *QM* and the relevant part of the demand curve is *PM*. Given his demand curve *PM*, his *MR* curve is given by the curve *PN* which bisects *QM* at point *N* where $QN = NM$. In order to maximize his

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revenue, *B* sells *QN* at price OP_1. His total revenue is maximum at *QRP′N* which equals his total profit. Note that *B* supplies only *QN* = 1/4 = (1/2)/2 of the market.

Let us now see how *A's* profit is affected by the entry of *B*. With the entry of *B*, price falls to OP_1. Therefore, *A*′s expected profit falls to OP_1RQ. Faced with this situation, *A* assumes, in turn, that *B* will not change his output *QN* and price OP_1 as he is making maximum profit. Since *QN* = 1/4th of the market, *A* assumes that he has 3/4 (= 1 – 1/4) of the market available to him. To maximize his profit, *A* supplies 1/2 of the unsupplied market (3/4), i.e., 3/8 of the market. It is noteworthy that *A*′s market share has fallen from 1/2 to 3/8.

Now it is *B*′s turn to react. Following Cournot's assumption, *B* assumes that *A* will continue to supply only 3/8 of the market and the market open to him equals 1 – 3/8 = 5/8. To maximise his profit under the new conditions, *B* supplies 1/2 × 5/8 = 5/16 of the market. It is now for *A* to reappraise the situation and adjust his price and output accordingly.

This process of action and reaction continues in successive periods. In the process, *A* continues to lose his market share and *B* continues to gain. Eventually, a situation is reached when their market share equals 1/3 each. Any further attempt to adjust output produces the same result. The firms, therefore, reach their equilibrium where each one supplies one-third of the market and both charge the same price.

The actions and reactions and equilibrium of the sellers *A* and B, according to Cournot's model, are presented in Table 7.1.

Table 7.1 *Determination of Market Share*

Period	*Seller A*		*Seller B*
I	$\frac{1}{2}(1)=\frac{1}{2}$	→	$\frac{1}{2}\left(\frac{1}{2}\right)=\frac{1}{4}$
II	$\frac{1}{2}\left(1-\frac{1}{4}\right)=\frac{3}{8}$	→	$\frac{1}{2}\left(1-\frac{3}{8}\right)=\frac{5}{16}$
III	$\frac{1}{2}\left(1-\frac{5}{16}\right)=\frac{11}{32}$	→	$\frac{1}{2}\left(1-\frac{11}{32}\right)=\frac{21}{64}$
IV	$\frac{1}{2}\left(1-\frac{21}{64}\right)=\frac{43}{128}$	→	$\frac{1}{2}\left(1-\frac{43}{128}\right)=\frac{85}{256}$
…	…		…
…	…		…
N	$\frac{1}{2}\left(1-\frac{1}{3}\right)=\frac{1}{3}$	←	$\frac{1}{2}\left(1-\frac{1}{3}\right)=\frac{1}{3}$

Note: Arrows show the direction of actions and reactions of sellers *A* and *B*.

Cournot's equilibrium solution is stable. For, given the action and reaction, it is not possible for any of the two sellers to increase their market share as shown in the last row of the table.

Cournot's model of duopoly can be extended to a general oligopoly model. For example, if there are three sellers in the industry, each one of them will be in

equilibrium when each firm supplies 1/4 of the market. The three sellers together supply 3/4 of the total market, 1/4 of the market remaining unsupplied. Similarly, when there are four firms each one of them supply 1/5th of the market and 1/5th of the market remains unsupplied. The formula for determining the share of each seller in an oligopolistic market is: $Q \div (n + 1)$ where Q = market size, and n = number of sellers.

Algebraic solution of duopoly: Cournot's model can also be presented algebraically. Let us suppose that the market demand function is given by linear function as

$$Q = 90 - P \qquad ...(7.1)$$

As noted above, under zero cost condition, profit is maximum where $MC = MR = 0$ and when $MR = 0$, the profit maximizing output is 1/2 (Q).

Let us suppose that when A is the only seller in the market, his profit-maximising output is Q_A which is determined by the profit maximising rule under zero cost condition. $A's$ market share can be written as

$$Q_A = 1/2\ (90 - P) \qquad ...(7.2)$$

When seller B enters the market, his profit maximising output is determined as follows.

$$Q_B = 1/2\ [(1/2(90 - P)] \qquad ...(7.3)$$

Thus, the respective shares of sellers A and B are fixed at Q_A and Q_B. The division of market output may be expressed as

$$Q = Q_A + Q_B = 90 - P \qquad ...(7.4)$$

The demand function for A may now be expressed as

$$Q_A = (90 - Q_B) - P \qquad ...(7.5)$$

and for B as

$$Q_B = (90 - Q_A) - P \qquad ...(7.6)$$

Given the demand function (7.5), the market open to A (at $P = 0$) is $90 - Q_B$. The profit maximising output for A will be

$$Q_A = \frac{90 - Q_B}{2} \qquad ...(7.7)$$

and for B, it will be

$$Q_B = \frac{90 - Q_A}{2} \qquad ...(7.8)$$

The equations (7.7) and (7.8) represent the reaction functions of sellers A and B, respectively. For example, consider equation (7.7). The profit maximising output of A depends on the value of Q_B, i.e., the output which B is assumed to produce. If B chooses to produce 30 units (i.e., $Q_B = 30$), then $A's$ profit maximizing output = $[(90 - 30)1/2] = 30$. If B chooses to produce 60 units, $A's$ profit maximizing

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output = (90 – 60) 1/2 = 15. Thus, equation (7.8) is *A*′s reaction function. It can similarly be shown that equation (7.8) is *B*′s reaction function.

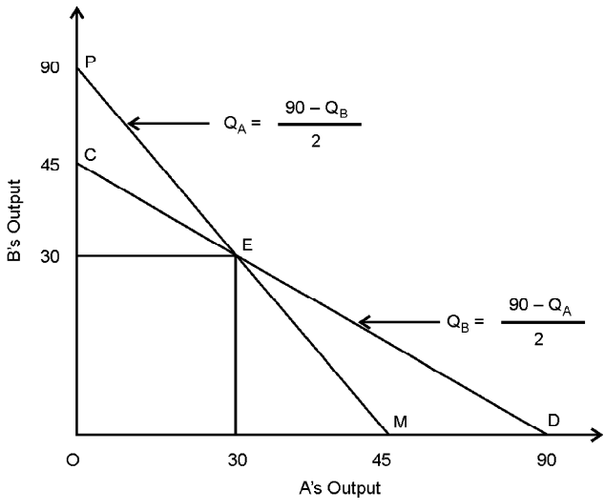

Fig. 7.2 *Reaction Functions and Equilibrium: Cournot's Model*

The reaction functions of *A* and *B* are graphed in Figure 7.2. The reaction function *PM* shows how *A* will react on the assumptions that *B* will not react to changes in his output once *B's* output is fixed. The reaction function *CD* shows a similar reaction of *B*. The two reaction functions intersect at point *E*. It means that the assumptions of *A* and *B* coincide at point *E* and here ends their action and reaction. Point *E* is, therefore, the point of stable equilibrium. At this point, each seller sells only 30 units.

The same result can be obtained by equating the two reaction equations (7.7) and (7.8). The market slope of *A* and *B* can be obtained by equating *A*′s and *B*′s reaction functions (7.7) and (7.8), respectively. That is, market equilibrium lies where

$$\frac{90 - Q_B}{2} = \frac{90 - Q_A}{2}$$

Since, $Q_B = (90 - Q_A)/2$, by substitution, we get first term as

$$Q_A = \frac{90 - (90 - Q_A)/2}{2}$$

$$Q_A = 30$$

Thus, both the sellers are in equilibrium at their respective output of 30. The maket output will be 60 units. Given the market demand curve, market price will be $P = 90 - Q = 90 - 60 =$ Rs 30.

As mentioned above, the dupoly model can be extended to oligopoly market.

Criticism of Cournot's model: As we have seen above, Cournot's model is logically sound and yields a stable equilibrium solution. His model has, however, been criticized on the following grounds.

First, Cournot's behavioural assumption, specifically assumption (*d*) above, is said to be naive as it implies that firms continue to make wrong calculations about the behaviour of the rival firms even though their calculations are proved wrong. For example, each seller continues to assume that his rival will no change his output even though he finds frequently that his rival does change his output.

Second, Cournot assumed zero cost of production, which is not realistic. However, even if this assumption is ignored, Cournot's results are not affected.

Check Your Progress

1. When did Cournot develop his duopoly model?
2. At which point do firms reach equilibrium in Cournot's duopoly model?

7.3 BERTRAND' MODEL

Betrand, a French mathematician, criticised Cournot's model and developed his own model of duopoly in 1883. Bertrand's model differs from Cournot's model in respect of its behavioural assumption. While under Cournot's model, each seller assumes his rival's output to remain constant, under Bertrand's model each seller determines his price on the assumption that his rival's price, rather than his output, remains constant.

Bertrand's model concentrates on price-competition. His analytical tools are reaction functions of the duopolists. Reaction functions of the duopolists are derived on the basis of isoprofit curves. An isoprofit curve, for a given level of profit, is drawn on the basis of various combinations of prices charged by rival firms. Assuming two firms *A* and *B*, the two axis of the plane on which isoprofit curves are drawn measure one each the prices of the two firms. Isoprofit curves of the two firms are convex to their respective price axis, as shown in Figures 7.3 and 7.4. Isoprofit curves of firm *A* are convex to its price-axis P_A (Figure 9.3) and those of firm *B* are convex to P_B (Figure 7.4).

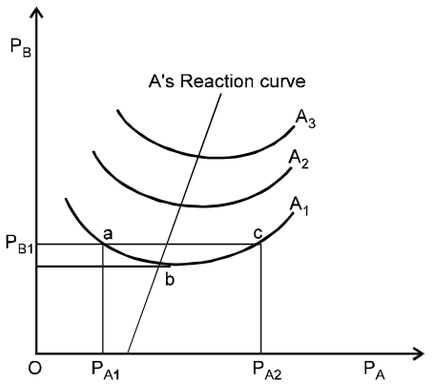

Fig. 7.3 *A's Reaction Curve*

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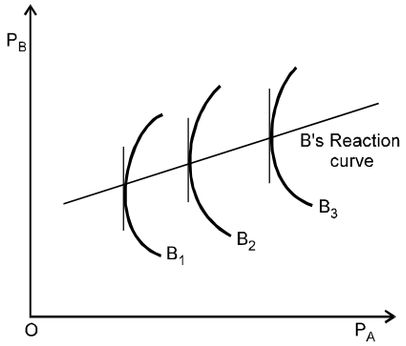

Fig. 7.4 *B's Reaction Curve*

To explain the implication of an isoprofit curve, consider curve *A* in Figure 7.3. It shows that *A* can earn a given profit from the various combinations of its own and its rival's price. For example, price combinations at points *a, b* and *c* on isoprofit curve *A*1, yield the same level of profit. If firm *B* fixes its price P_{B1}, firm *A* has two alternative prices, P_{A1} and P_{A2}, to make the same level of profits. When *B* reduces its price, *A* may either raise its price or reduce it. *A* will reduce its price when he is at point *c* and raise its price when he is at point *a*. But there is a limit to which this price adjustment is possible. This point is given by point *b*. So there is a unique price for *A* to maximize its profits. This unique price lies at the lowest point of the isoprofit curve. The same analysis applies to all other isoprofit curves. If we join the lowest points of the isoprofit curves A_1, A_2 and A_3, we get *A*'s reaction curve. Note that *A*'s reaction curve has a rightward slant. This is so because, isoprofit curve tend to shift rightward when *A* gains market from its rival *B*.

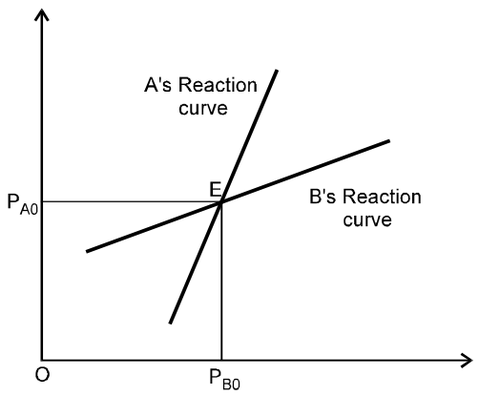

Fig. 7.5 *Duopoly Equilibrium: Bertand's Model*

Following the same process, *B*'s reaction curve may be drawn as shown in Figure 7.4. The equilibrium of duopolists suggested by Bertrand's model may be obtained by putting together the reaction curves of the firms *A* and *B* as shown in Figure 7.5. The reaction curves of *A* and *B* intersect at point *E* where their expectations materialise. Point *E* is therefore equilibrium point. This equilibrium is

stable. For, if anyone of the firms deviates from the equilibrium point, it will generate a series of actions and reactions between the firms which will lead them back to point *E*.

Criticism

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Bertrand's model has however been criticised on the same grounds as Cournot's model. Bertrand's implicit behavioural assumption that firms never learn from their past experience is naive. Furthermore, if cost is assumed to be zero, price will fluctuate between zero and the upper limit of the price, instead of stabilizing at a point.

7.4 EDGEWORTH'S MODEL

The English economist F.Y. Edgeworth presented another model of duopoly in 1897. Edgeworth also shows a price war between two competitors, who lower their prices to a level where each firm's sales are equal to its maximum output. Neither firm now has any incentive to make further price reductions, because it could not produce the additional quantity that would be demanded. Then, Edgeworth reasoned, one of the firms will raise its price to the monopoly level; the firm does this because it believes that it has half of the total market all to itself. The other firm promptly follows suit. Almost at once, another price war breaks out. The Edgeworth model, therefore, works with a perpetual oscillation of prices. First they go down in a series of price reductions; then they jump back up to the starting point.

From the above three models we have explained a market situation of duopoly.

7.4.1 Chamberlain's Theory of Duopoly

As per Chamberlain, there in an interdependence of firms in the oligopoly and the firms learn from their past mistakes. Further, the assumptions of his model resemble the traditional model in which there is homogenous product, identical prices, no entry of new firm in the market and the firms have full knowledge with regards to demand.

Unlike Cournot, as per Chamberlain, the firms will already be aware of the effect of changes in prices and output of other firm, therefore, there will not be a price war, rather the equilibrium will be stable with monopoly price and output. He also suggests that there is no need for collusion in this case. The firms will not settle at a lower equilibrium price and output and therefore will charge a monopoly price.

The problems with this theory is that even though Chamberlain's theory is more realistic than the rest, it relies on the monopoly solution which is harder to achieve in reality in the absence of collusion. Further, non-entry of new firms is far from reality of generally opened oligopoly market which puts a question on the stable equilibrium solution.

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Check Your Progress

3. What is the basic difference between Bertrand and Cournot's duopoly models?
4. With which type of prices does the Edgeworth's theory od duopoly works?

7.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Cournot developed his duopoly model in the year 1838.
2. In Cournot's duopoly model, the firms reach their equilibrium where each one supplies one-third of the market and both charge the same price.
3. Bertrand's model differs from Cournot's model in respect of its behavioural assumption.
4. Edgeworth**'s** theory of duopoly works with a perpetual oscillation of prices. First they go down in a series of price reductions, then they jump back to the starting point.

7.6 SUMMARY

- Augustine Cournot, a French economist, was the first to develop a formal oligopoly model in 1838. He formulated his oligopoly theory in the form of a *duopoly model* which can be extended to oligopoly model.
- On the basis of his model, Cournot concluded that each seller ultimately supplies one-third of the market and both the firms charge the same price. And, one-third of the market remains unsupplied.
- Betrand, a French mathematician, criticised Cournot's model and developed his own model of duopoly in 1883. Bertrand's model differs from Cournot's model in respect of its behavioural assumption. While under Cournot's model, each seller assumes his rival's output to remain constant, under Bertrand's model each seller determines his price on the assumption that his rival's price, rather than his output, remains constant.
- Bertrand's model concentrates on price-competition. His analytical tools are reaction functions of the duopolists. Reaction functions of the duopolists are derived on the basis of isoprofit curves.

7.7 KEY WORDS

- **Oligopoly:** A market situation in which there is only few sellers, selling homogeneous or differentiated products.

- **Isoprofit Curves:** For a given level of profit, it is drawn on the basis of various combinations of prices charged by rival firms.
- **Monopoly:** It is a market situation in which there is only one seller, selling a unique product and there are restrictions on entry of new firms.

7.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What were the assumptions made by Cournot in his duopoly model?
2. How can Cournot's duopoly model be extended to oligopoly?
3. What is the criticism against Bertrand's model of duopoly?
4. Write a short note on duopoly models by Edgeworth and Chamberlain.

Long Answer Questions

1. Explain Cournot's duopoly model in detail.
2. Describe Bertrand's model of duopoly and its difference from Cournot's model.

7.9 FURTHER READINGS

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UNIT 8 MARKET THEORIES OF FIRM-II

NOTES

Structure

8.0 INTRODUCTION

In the previous unit, you were introduced to specific theories related to duopolies. In this unit, you will learn about the major theories pertaining to oligopolies. As learnt earlier, oligopolies are the market structure which is characterised by the presence of few sellers, selling homogeneous or differentiated products. The theories related to oligopoly which will be discussed in this unit, include Kinked demand curve theory, Stackleberg's solutions, Collution theories, price leadership and Bain's limit price theory.

8.1 OBJECTIVES

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

- Discuss the concept of kinked demand curve theory
- Explain the Stackleberg's solutions
- Describe Collution theories
- Examine price leadership and Bain's limit price theory

8.2 KINKED DEMAND CURVE

The origin of kinked-demand curve can be traced into Chamberlin's theory of monopolistic competition. Later, Hall and Hitch used kinked-demand curve to explain rigidity of prices in oligopolistic market. But, neither Chamberlin nor Hall

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and Hitch used kinked-demand curve as a tool of analysis in their respective theories. It was Paul M. Sweezy who used the kinked-demand curve in his model of price stability in oligopolistic market. Sweezy's Model is described below.

The kinked-demand curve model developed by Paul M. Sweezy has features common to most oligopoly pricing models. This is the best known model to explain, relatively more satisfactorily, the behaviour of the oligopolistic firms. It must, however, be noted at the outset that *kinked-demand curve analysis does not deal with price and output determination. Rather, it seeks to establish that once a price-quantity combination is determined, an oligopoly firm does not find it profitable to change its price even when there is a considerable change in the cost of production and change in demand for the product.*

The logic behind the proposition that price once determined remains stable runs as follows. An oligopoly firm believes that if it reduces the price of its product, the rival firms would follow and neutralise the expected gain from price reduction. But, if it raises the price, the firms would either maintain their prices or even go for price-cutting, so that the price-raising firm loses a part of its market to the rival firms. This behaviour is true of all the firms. The oligopoly firms would, therefore, find it more desirable to maintain the prevailing price and output. This is the basic theme of Sweezy's theoretical model. This model is explained and illustrated below.

In order to analyse the effects of possible reactions of the rival firms on the demand for the product of the firm initiating the change in price, let us make the following assumptions.

(*i*) There are four oligopoly firm—*A*, *B*, *C* and *D*

(*ii*) Market demand curve is given by *dd*′ in Figure 8.1

(*iii*) All the firms are in equilibrium at point *P*

Let us suppose that firm *A* takes lead in changing its price and examine the effect of various kinds of reactions of the rival firms on demand for *A*'s product.

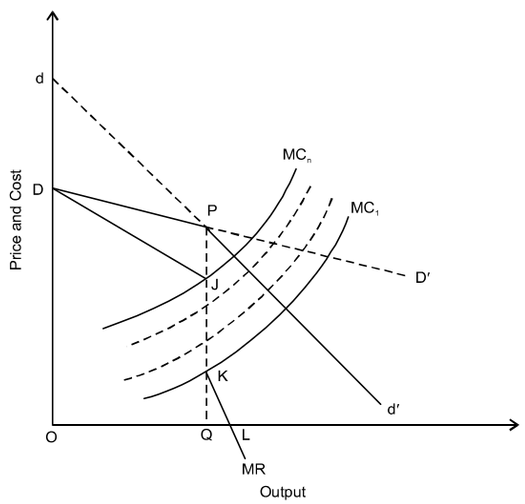

Fig. 8.1 *Kinked-Demand Curve Analysis*

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Reaction (*i*) When firm *A* increases or decreases its price, the rival firms follow the suit. Then firm *A* finds itself moving along the demand curve *dd*′. It does not gain nor does it lose.

Reaction (*ii*) When the rival firms do not react to price changes made by the firm *A*, its demand curve becomes highly elastic as shown by the curve *DD*′ in Figure 8.1. To explain it further, when firm *A* raises its price and rival firms do not follow, firm *A* loses a part of its market to the rival firms and moves along *PD* part of the demand curve. But, when firm *A* cuts its price and rival firms do not follow, then it captures a part of the rival's market share and finds itself moving along the *PD*′ part of the demand curve. This is what firm *A* would like to achieve. Note that *PD*′ part of demand curve is more elastic than *Pd*′.

Reaction (*iii*) When firm *A* raises its price and rival firms do not follow, then firm *A* loses a part of its market share to the rival firms. Then the relevant demand curve for firm *A* is *DP*. But, when firm *A* decreases its price, rival firms react by cutting down their own prices by an equal amount or even more. This is a more realistic reaction. This counter move by the rival firms prevents firm *A* from taking any advantage of price cut. Therefore, the relevant segment of demand curve for firm *A* (below point *P*) is *Pd*′. If the two relevant segments of the two demand curves are put together, the demand curve for *A*'s product takes the form of the curve *DPd*′. Note that this demand curve has a ***kink*** at point *P*. It is, therefore, called ***a kinked-demand curve.***

Let us now derive *MR* curve. We know that given the demand function as $D = a - bP$, marginal revenue (*MR*) function is given as $MR = a - 2bP$. The derivation of the *MR* curve on the basis of this *MR* function is shown in Figure 8.1 under the condition of kinked demand (or *AR*) curve. The segment *DJ* of the *MR* curve corresponds to *DP* segment of the demand curve and *KL* segment of *MR* curve corresponds to *Pd*′ segment of the demand curve. By joining the two segments of the *MR* curves, we get the full *MR* curve as *DJKL*.

Let us suppose that the marginal cost curve is given as MC_1 which intersects *MR* at point *K*. Point *K* satisfies the necessary condition for profit maximization (*MR* = *MC*). Therefore, oligopoly firms are in equilibrium at output *OQ* and they are making maximum profit. Now, if marginal cost curve shifts upwards to MC_n or to any level between points *J* and *K*, their profit would not be affected because profit maximization condition remains undistributed. Therefore, they have no motivation for increasing or decreasing their price. It is always beneficial for them to stick to the price *PQ* and output *OQ*. Thus, both price and output are *stable*. The oligopoly firms would think of changing their price and output only if *MC* rises beyond point *J*. The same analysis applies to decrease in *MC* below point *K*. The firms would not cut their prices down unless *MC* decreases below point *K* (Figure 8.1).

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Criticism of Sweezy's Model

As mentioned earlier, Sweezy's model is considered to be the best known model that explains relatively more satisfactorily, the behaviour of the firms in oligopoly. On the face it, it appears to be logically sound and realistic. However, economists have criticized his model on both theoretical and empirical grounds as follows.

1. Sweezy's model does not explain price determination: The basic function of price theory is to explain price and output determination in a particular kind of market. Sweezy's model, however, does not explain price and output determination. His model only assumes the price to be given at a point of time. It explains only why price once determined tends to be sticky even if there are changes in cost conditions to a certain extent. Sweezy's model is, therefore, regarded as an *ex-post rationalization* rather than *ex-ante* explanation of market equilibrium.

2. This model does not determine the point of kink: This is a criticism related to non-determination of price. The kinked demand curve anlaysis explains why 'kink' appears on the demand curve. It does not explain how and at what level of price and output, the point of kink is determined. George Stigler doubts even the existence of the kinked-demand curve. Stigler's view is supported by Julian Simon. This makes the model a purely hypothetical one, not as realistic as it appears on the face of it. However, Cohen and Cyert argue that kink in the demand curve and price rigidity may exist for a short period, for lack of inter-firm information, especially when new and unknown rivals enter the market. They are of the opinion that kink is clearly not a stable long-run equilibrium.

3. Price rigidity is not supported by empirical facts: Sweezy's claim of price rigidity in oligopoly does not stand the test of empirical verification. Empirical facts reveal a surprising lack of price stability in oligopoly markets. Empiricially, monopoly prices have been found to be more stable than oligopoly prices. Economists' opinion is, however, divided on the issue of price rigidity in oligopoly. While Stigler has questioned price rigidity in oligopoly market, Liebhafsky finds considerable evidence of price rigidity in oligopolistic industries of the US.

4. Sweezy's conclusion conflicts with marginal productivity theory: In Sweezy's model, *MC* curve can shift up and down (say, between finite points *J* and *K* in Figure 8.1), while *MR* remains the same. This argument is in conflict with *marginal productivity theory* of factor pricing as this means that factor prices do not necessarily equal the marginal revenue productivity.

8.3 STACKLEBERG'S SOLUTIONS

Stackelberg, a German economist, developed, his leadership model of duopoly in 1930. His model is an extension of Cournot's model. Stackelberg assumes that one of the duopolists (say *A*) is sophisticated enough to play the role of a leader and the other (say *B*) acts as a follower. The leading duopolist *A* recognizes that

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his rival firm *B* has a definite reaction function which *A* uses into his own profit function and maximizes his profits.

Suppose market demand function is $Q = 90 - P$ and *B*'s reaction function is given as in Equation (8.1), i.e.,

$$Q_B = \frac{90 - Q_A}{2} \quad \ldots(8.1)$$

Now, let *A* incorporate *B*'s reaction function into the market function and formulate his own demand function as

$$Q_A = 90 - Q_B - P \quad \ldots(8.2)$$

Since $Q_B = (90 - Q_A)/2$, Equation (8.2) may be written as

$$Q_A = 90 - \frac{90 - Q_A}{2} - P$$

or $$Q_A = 45 + \frac{Q_A}{2} - P$$

or $$2_{QA} = 90 + Q_A - 2P \quad \ldots(8.3)$$

$$Q_A = 90 - 2P$$

Thus, by knowing *B*'s reaction function, *A* is able to determine his own demand function. Following the profit-maximization rule, *A* will fix his output at 45 units

(= 90/2), i.e., half of the total demand at zero price.

Now, if seller *A* produces 45 units and seller *B* sticks to his own reaction function, he will produce

$$Q_B = \frac{90 - 45}{2} = 22.5 \text{ units} \quad \ldots(8.4)$$

Thus, the industry output will be

$$45 + 22.5 = 67.5.$$

The problem with Stackelberg's model is that it does not decide as to which of the firms will act as leader (or follower). If each firm assumes itself to be the leader and the other to be the follower then Stackelberg's model will be indeterminate with unstable equilibrium.

Check Your Progress

1. The origin of kinked demand curve theory can be traced to which theory?
2. Why is Sweezy's model called ex-post rationalization rather than ex-ante explanation of market equilibrium?
3. Whose leadership model is considered to be an extension of Cournot's model?

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8.4 COLLUSIONS (CARTELS AND MERGERS)

The oligopoly models discussed in the previous unit are based on the *assumption* that the oligopoly firms act *independently;* they are in competition with one another; and there is *no collusion* between the firms. The oligopoly models of this category are called *non-collusive models.* In reality, however, oligopoly firms are found to have some kind of collusion or agreement—open or secret, explicit or implicit, written or unwritten, and legal or illegal—with one another for at least ***three major reasons. First,*** collusion eliminates or reduces the degree of competition between the firms and gives them some monopolistic powers in their price and output decisions. ***Second,*** collusion reduces the degree of uncertainty surrounding the oligopoly firms and ensures profit maximisation. ***Third,*** collusion creates some kind of barriers to the entry of new firms.

The models that deal with the collusive oligopolies are called ***collusive oligopoly models.*** Collusion between firms may take many forms depending on their relative strength and objective of collusion, and on whether collusion is legal or illegal. There are, however, two major forms of collusion between the oligopoly firms: (*i*) cartel, i.e., firms' association, and (*ii*) price leadership agreements.

Accordingly, the collusive oligopoly models that economists have developed to explain the price determination under oligopoly can be classified as:

(i) Cartel models

(*ii*) Price leadership models

In this section, we will discuss these two types of oligopoly models.

8.4.1 Cartel Models: Collusive Models

Oligopoly cartels: A form of collusion: A *cartel* is a formal organisation of the oligopoly firms in an industry. A general purpose of cartels is to centralise certain managerial decisions and functions of individual firms in the industry, with a view to promoting common benefits. Cartels may be in the form of *open* or *secret collusion.* Whether open or secret, cartel agreements are *explicit* and formal in the sense that agreements are enforceable on the member firms not observing the cartel rules or dishonouring the agreements. Cartels are, therefore, regarded as ***the perfect form of collusion.*** Cartels and cartel type agreements between the firms in manufacturing and trade are illegal in most countries. Yet, cartels in the broader sense of the term exist in the form of trade associations, professional organisations and the like.

A cartel performs a variety of services for its members. The two services of central importance are (*i*) fixing price for joint profit maximization; and (*ii*) market-sharing between its members. Let us now discuss price and output determination under the cartel system.

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(i) Joint profit maximization model

Let us suppose that a group of firms producing a homogeneous commodity forms a cartel aiming at joint profit maximization. The firms appoint a central management board with powers to decide (*i*) the total quantity to be produced; (*ii*) the price at which it must be sold; and (*iii*) the share of each firm in the total output. The cartel board is provided with cost figures of individual firms. Besides, it is supposed to obtain the necessary data required to formulate the market demand (*AR*) curve. The cartel board calculates the marginal cost (*MC*) and marginal revenue (*MR*) for the industry. In a sense, the cartel board holds the position of a multiplant monopoly. It determines the price and output for each firm in the manner a multiplant monopoly determines the price and output for each of its plants.

The model of price and output determination for each firm is presented in Figure 8.2. It is assumed for the sake of convenience that there are only two firms, *A* and *B*, in the cartel. Their respective cost curves are given in the first two panels of Figure 8.2. In the third panel, *AR* and *MR* curves represent the revenue conditions of the *industry.* The *MC* curve is the summation of *mc* curves of the individual firms. The *MC* and *MR* curves intersect at point *C* determining the industry output at *OQ*. Given the industry output, the market price is determined at *PQ*.

Now, under the cartel system, the industry output *OQ* has to be so allocated between firms *A* and *B* that their individual *MC* = *MR*. The share of each firm in the industry output, *OQ*, can be obtained by drawing a line from point *C* and parallel to X-axis through mc_2 and mc_1. The points of intersection c_1 and c_2 determine the profit maximizing output for firms *A* and *B*, respectively. Thus, the share of firms *A* and *B*, is determined at OQ_A and OQ_B, respectively, where $OQ_A + OQ_B = OQ$. At these outputs, they maximize their respective profits.

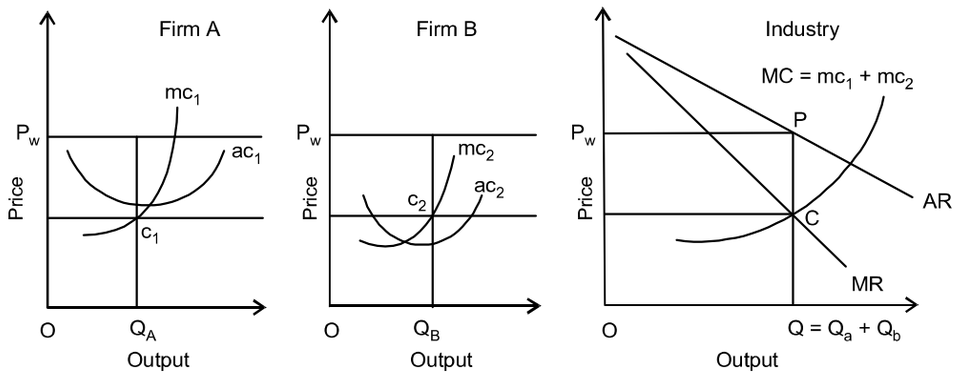

Fig. 8.2 *Price and Output Determination Under Cartel*

Problems in joint profit maximization: Although the above solution to joint profit maximization by cartel looks theoretically sound, William Fellner gives the following reasons why profits may not be maxmized jointly.

First, it is difficult to estimate market demand curve 'accurately since each firm thinks that the demand of its own product is more elastic than the market demand curve because its product is a perfect substitute for the product of other firms.

Second, an accurate estimation of industry's *MC* curve is highly improbable for lack of adequate and correct cost data. If industry's *MC* is incorrectly estimated, industry output can be only incorrectly determined. Hence joint profit maximization is doubtful.

Third, cartel negotiations take a long time. During the period of negotiation, the composition of the industry and its cost structure may change. This may render demand and cost estimates irrelevant, even if they are correct. Besides, if the number of firms increases beyond 20 or so, cartel formation becomes difficult, or even if it is formed, it breaks down soon.

Fourth, there are 'chiselers' who have a strong temptation to give secret or undeclared concessions to their customers. This tendency in the cartel members reduces the prospect of joint profit maximisation.

Fifth, if cartel price, like monopoly price, is very high, it may invite government attention and interference. For the fear of government interference, members may not charge the cartel price.

Sixth, another reason for not charging the cartel price is the fear of entry of new firms. A high cartel price which yields monopoly profit may attract new firms to the industry. To prevent the entry of new firms, some firms may decide on their own not to charge the cartel price.

Lastly, yet another reason for not charging the cartel price is the desire to build a public image or good reputation. Some firms may, to this end, decide to charge only a fair price and realise only a fair profit.

(ii) Cartel and Market-Sharing

The market-sharing cartels are more common because this kind of collusion permits a considerable degree of freedom in respect of style and design of the product, advertising and other selling activities. There are two main methods of market allocations: (*a*) non-price competition agreement, and (*b*) quota system.

(a) Non-price competition agreement: The non-price competition agreements are usually associated with loose cartels. Under this kind of arrangement between firms, a uniform price is fixed and each firm is allowed to sell as much as it can at the cartel price. The only requirement is that firms are not allowed to reduce the price below the cartel price.

The cartel price is, however, a bargain price. While low-cost firms press for a low price, the high-cost firms press for a higher price. But the cartel price is so fixed by mutual consent that all member firms are able to make a reasonable profits. However, firms are allowed to compete with one another in the market on

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a non-price basis. That is, they are allowed to change the style of their product, innovate new designs and to promote their sales without reducing their price below the level of cartel price.

Whether this arrangement works or breaks down depends on the cost conditions of the individual firms. If some firms expect to increase their profits by violating the price agreements, they will indulge in cheating by charging a lower price. This may lead to a price-war and the cartel may break down.

(b) Quota system: The second method of market-sharing is *quota system*. Under this system, the cartel fixes a quota of market-share for each firm. There is no uniform principle by which quota is fixed. In practice, however, the main considerations are (*i*) bargaining ability of a firm and its relative importance in the industry, (*ii*) the relative sales or market share of the firm in pre-cartel period, and (*iii*) production capacity of the firm. The choice of the base period depends on the bargaining ability of the firm.

Fixation of quota is a difficult problem. Nevertheless, some theoretical guidelines for market sharing are suggested as follows. A reasonable criterion for ideal market-sharing can be to share the total market between the cartel members in such proportions that the industry's marginal cost equals the marginal cost of individual firms. This criterion is illustrated in Figure 8.3 assuming an oligopoly industry consisting of only two firms, *A* and *B*. The profit maximizing output of the industry is *OQ*. The industry output *OQ* is so shared between the two firms *A* and *B* that their individual *MC* equals industry's *MC*. As shown in Figure 8.3, at output OQ_A, *MC* of firm *A* equals industry's marginal cost, *MC*, and at output OQ_B, *MC* of firm *B* equals industry's *MC*. Thus, under quota system, the quota for firms *A* and *B* may be fixed as OQ_A and OQ_B, respectively. Given the quota allocation, the firm may set different prices for their product depending on the position and elasticity of their individual demand curves. This criterion is identical to the one adopted by a multiplant monopolist in the short-run, to allocate the total output between the plants.

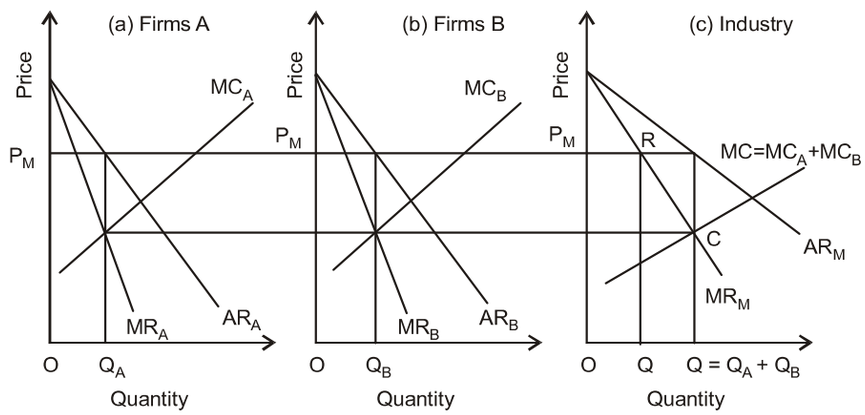

Fig. 8.3 *Quota Allocation under Cartel Agreements*

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Another reasonable criterion for market-sharing under quota system is *equal market-share for equal firms*. This criterion is applicable where all firms have *identical* cost and revenue curves. This criterion also leads to a monopoly solution. It resembles Chamberlin's duopoly model.

To illustrate equal market sharing through quota allocation, let us assume that there are only two firms, *A* and *B*. Their *AR*, *MR* and *MC* curves are presented in Figure 8.3 (a) and 8.3 (b). The market revenue and cost curves, which are obtained by summing the individual revenue and cost curves, respectively, are presented in panel (c) of the figure. The industry output is determined at *OQ*. The share of each firm, which maximises their profits, is so determined that $OQ = OQ_A + OQ_B$, Given the identical cost and revenue conditions, $OQ_A = OQ_B$. That is, market is divided equally between firms *A* and *B*. This result can be obtained also by drawing an ordinate from the point where price line (P_M) intersects the MR_M, i.e., from point *R*. The market output *OQ* is divided equally between firms *A* and *B*.

It may be noted at the end that cartels do not necessarily create the conditions for price stability in an oligopolistic market. Most cartels are loose. Cartel agreements are generally not binding on the members. Cartels do not prevent the possibility of entry of new firms. On the contrary, by ensuring monopoly profits, cartels create conditions which attract new firms to the industry. Besides, 'chiselers' and 'free-riders' create conditions for instability in price and output.

8.4.2 Price Leadership

Price leadership is an imperfect form of collusion between oligopoly firms. Price leadership is an informal position given to or attained by a firm in an oligopolistic setting to lead other firms in pricing. This leadership may emerge spontaneously due to technical reasons or out of tacit or explicit agreements between the firms to assign leadership role to one of them.

The *spontaneous price leadership* may be the result of such technical factors as size, efficiency, economies of scale or firm's ability factors. The most typical case of price leadership is the leading role played by the dominant firm of the industry. The dominant firm takes lead in changing the price and the smaller ones follow. Sometimes price leadership is *barometric*. In the barometric price leadership, one of the firms, not necessarily dominant one, takes lead in announcing change in price, particularly when such a change is due but is not brought into effect due to uncertainty in the market.

The price leadership is possible under the conditions of both *product homogeneity* and *product differentiation*. There may, however, be price differentials on account of product differentiation. Price differentials may also exist on account of cost differentials.

Another important aspect of price leadership is that it often serves as a means to price discipline and price stabilisation. Achievement of this objective

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establishes an effective price leadership. Such a price leadership can, however, exist effectively only under the following conditions.

(*i*) Number of firms is small

(*ii*) Entry to the industry is restricted

(*iii*) Products are, by and large, homogeneous

(*iv*) Demand for industry is inelastic or has a very low elasticity

(*v*) Firms have almost similar cost curves

There are three common types of price leaderships: (*i*) Price leadership by a low-cost or most efficient firm; (*ii*) Price leadership by a dominant firm; and (*iii*) Barometric price leadership. Let us discuss price and output determination under the three kinds of price leaderships.

(i) Price leadership by a low-cost firm

The price and output decisions under price leadership of a low-cost firm is illustrated in Figure 8.4. Suppose all the firms face identical revenue curves as shown by *AR* and *MR* curves. But the largest firm or the low-cost firm, has its cost curves as shown by AC_1 and MC_1 whereas all the rival firms, smaller in size, have their cost curves as shown by AC_2 and MC_2. The largest firm has greater economies of scale and, therefore, its cost of production is lower than that of other firms. Given the cost and revenue conditions, the low-cost firm would find it most profitable to produce and sell OQ_2 and fix its price at OP_2 (= LQ_2), Since at this level of output, its *MC* = *MR*, its profit is maximum. On the other hand, the high-cost firms would be in a position to maximise their profit at price OP_3 and quantity OQ_1. But, if they charge a higher price, OP_3, they would lose their customers to the low-cost firm. The high-cost firms are, therefore, forced to accept the price OP_2 and recognise the price leadership of the low-cost firm.

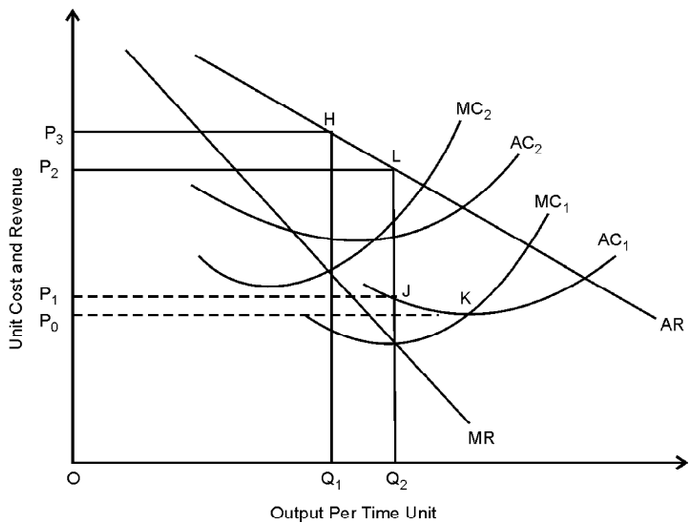

Fig. 8.4 *Price Leadership by a Low-Cost Firm*

Note that the low-cost firm can eliminate the high-cost firms and become a monopolist by cutting the price down to OP_1 (= JQ_2). The low-cost firm can sell its entire output OQ_2 at price OP_1 and make only normal profit. If necessary, it can cut its price further down to OP_0 and still make normal profits. It will, however, not do so as it would avoid falling under anti-monopoly laws.

(ii) Price leadership by a dominant firm

Price leadership by a dominant firm is more common than by a low-cost firm. In the analysis of price leadership by a dominant firm, it is assumed that there exists a large size firm in the industry, which supplies a large proportion of the total market. The dominance of the large firm is indicated by the fact that it could possibly eliminate all its rival firms by price-cutting. In that case, the large firm gains the status of a monopoly which may invite legal problems. The dominant firm, therefore, compromises with the existence of small rival firms in the market. It uses its dominance to set its price so as to maximise its profit. The smaller firms recognise their weak position and behave like a firm in a perfectly competitive market, i.e., smaller firms accept the price set by the dominant firm.

The price leadership and market sharing between the dominant firm and the rival small firms as a group is illustrated in Figure 8.5. Suppose that the market demand curve is given by DD_M and the supply curve of the small firms together is given by the curve S_s in panel (a) of the figure. The problem confronting the dominant firm is to determine its price and output that will maximise its profit, leaving the rest of the market to be jointly supplied by the small firms. To solve this problem, the dominant firm finds its demand curve by deducting the quantity supplied jointly by the small firms at different prices from the corresponding market demand. The dominant firm considers the residual of the market share as the demand for its own product. Thus, at a given price the market share of the dominant firm equals the market demand *less* the share of small firms.

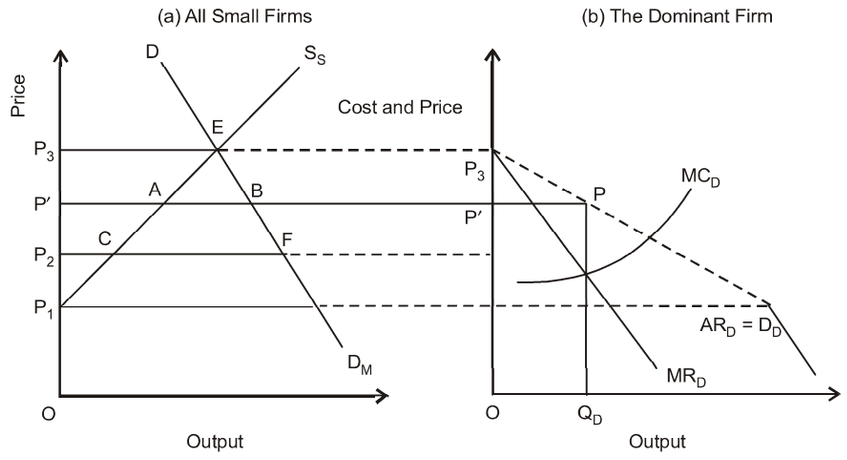

Fig. 8.5 *Price Leadership by a Dominant Firm*

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For example, when market price is set at OP_3, the total supply by the smaller firms is P_3E which equals the market demand. Therefore, at price OP_3, the market left for the dominant firm is zero. When price falls to OP_2, the demand for dominant firm's product is $CF = P_2F - P_2C$. Following this process, the market-share of the dominant firm at other prices can be easily obtained.

Note that the gap between demand curve DD_M and supply curve P_1S_s below point *E* in Figure 8.5 (a) measures the demand for the dominant firm.

The information so derived and plotted graphically gives P_3D_D as the demand curve for the dominant firm [Figure 8.5 (b)]. Since the relation *between AR* and *MR* is known, the *MR* curve for the dominant firm can be dervied as MR_D [Figure 8.5 (b)]. If *MC* curve of the dominant firm is assumed to be given as MC_D, its profit maximising output will be OQ_D and price PQ_D.

Once the dominant firm sets its price at $PQ_D = OP'$, the small firms have to accept this price, and then their joint market demnad curve is the horizontal straight line *P′B* [in Figure 8.5 (a)], because they can sell at this price as much as they can produce. But, in order to maximise their joint profits, small firms will produce only *P′A*. For small firms, therefore, profit maximizing joint output is *P′A*.

Criticial appraisal: The dominant-firm price-leadership model, as presented above, yields a stable solution to the problem of oligopoly pricing and output determination, only if the small firms faithfully follow the leader. That is, small firms produce the right quantity and charge the price set by the dominant firm. Besides, the model requires that the dominant firm should be both large and a low-cost firm. For, if a firm does not enjoy the advantage of large size and, consequent upon it, the advantage of low-cost, it cannot act as a price leader.

In practice, however, one finds many cases of price leadership by a firm which is neither large nor is a low-cost firm. But such cases are found mostly under recessionary conditions when a relatively smaller firm reduces its price, to survive in the market.

Furthermore, if a leading firm loses its cost advantages, it also loses its leadership. Such cases are frequent in the real business world. Leadership also changes following the innovation of products and techniques of production by the small firms.

Besides, where there are many large firms of equal size and have some cost advantage, price leadership by any firm or group of firms becomes less probable, particularly when the number of small firms is smaller than that of larger firms. Under such conditions, another kind of price leadership, i.e., barometric leadership, emerges.

Lastly, it is assumed that the entry of new firms is prevented either by low-cost of the existing firms or by initial high cost of new firms. In practice, however, many firms having the capacity to diversify their products enter the industry with relatively initial low-cost.

For these reasons, dominant-firm leadership model is not considered to be a very realistic one.

(iii) Barometric price leadership

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Another form of price leadership is *barometric price leadership*. In this form of price leadership, a firm initiates well publicised changes in price which are generally followed by the rival firms. This kind of price leadership comes from a firm whose activities are taken as the barometer for the industry—it may not necessarily come from the largest firm of the industry. The barometric firm is supposed to have a better knowledge of the prevailing market conditions and has an ability to predict the market conditions more precisely than any of its competitors. These qualities of the barometric firm should have been established and recognized over time by the rival firms. The firm having the qualifications of price leadership, is regarded as a barometer, which reflects the changes in business conditions and environment of the industry. The price changes announced by the barometric firm serve as a barometer of changes in demand and supply conditions in the market.

The barometric leadership evolves for various reasons. The major ones are the following.

First, the rivalry betweeen the large firms may lead to cut-throat competition to the disadvantage of all the firms. On the other hand, rivalry between the larger firms may make them unacceptable as a leader. So a firm which has better predictive ability emerges as the price leader.

Second, most firms in the industry may have neither the capacity nor the desire to make continuous calculations of cost, demand and supply conditions. Therefore, they find it advantageous to accept the price changes made by a firm which has a proven ability to make reasonably good forecasts.

Third, Kaplan *et. al.*, observe that barometric price leadership often develops as a reaction to a long economic warfare in which all the firms are losers.

Check Your Progress

4. Mention the two major forms of collusion between the oligopoly firms.
5. List two major functions of cartels.
6. What is barometric price leadership?
7. Price leadership by which kind of firm is more common?

8.5 BAIN'S LIMIT PRICING THEORY

In the traditional monopoly and oligopoly theories, existing firms do worry about the potential entry of new firms and their behaviour and reaction. In the models of perfect competition and monopolistic competition, the effect of actual entry of

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new firms on price and output of the existing firms is studied. But the traditional oligopoly models of Cournot, Bertrand Edgeworth and Chamberlin are closed models because they do not provide for the entry of new firms. The number of firms in these oligopoly models is assumed to be constant; only the reactions of the existing firms to the moves of rival firms are explained. Recently, it has been argued by economists such as Bain, Sylos–Labini, Andrews, Modigliani, J. Bhagwati that price output decisions of the existing firms in oligopolistic markets are affected not only by the actual entry but also by the potential entry of firms.

An important issue that has been raised by these economists is that oligopolistic firms do not maximize short-run profits but seek to maximize profits over the long run. J.S. Bain put forward the **theory of limit pricing**, which in essence implies that firms do not maximize short-run profits, because of the fear that the abnormal profit in the short run will induce the entry of new firms which will greatly reduce the profit in the long run. We have discussed Bain's theory in Unit 2 already. Let us briefly recapitulate.

Bain's theory of limit pricing relates to the case of collusive oligopoly, which exists when the firms in an oligopolistic market charge the same prices for their products. This in affect makes the firms act like in a monopoly but in the process leads to division of any profits that are earned by these firms.

Limit price is the highest price which the existing firms believe they can charge without attracting entry of new firm. In other words, limit price is the entry-preventing price.

Bain has given three models to explain his theory of limit pricing. This model is based on following assumption:

(1) Each industry has a minimum size of plant and economies of scale are fully realized.

(2) The long run average cost curve (LAC) is the same for all firms.

(3) In the long run, price cannot remain lower than the LAC and the flat part of the LAC curve determines the long run competitive price.

(4) Both established firms and new entrants know the market demand curve.

(5) All firms produce very similar products and have equal market share.

(6) Each firm equally shares the market demand curve.

According to Bain, firms determine price at a level below short-run profit maximizing monopoly price and above the long run average cost which equals pure competition price. This price is rightly called limit price because the existing firms believe that they can charge it without attracting entry.

To explain the equilibrium of the firm, Bain uses individual LAC and DD curves and aggregate LAC and the aggregate demand curve DD to derive competitive output and price. This is shown in Figure 8.6.

In this figure, O_q is the minimum optimal output produced by the firm OP_c is the competitive price and QC is the competitive output. According to Bain, the limit price is determined by the following:

(a) The costs of the potential entrants

(b) Price elasticity of demand for the industry product

(c) The size of the market or magnitude of DD

(d) The number of established firms in the industry

(e) The long-run average cost

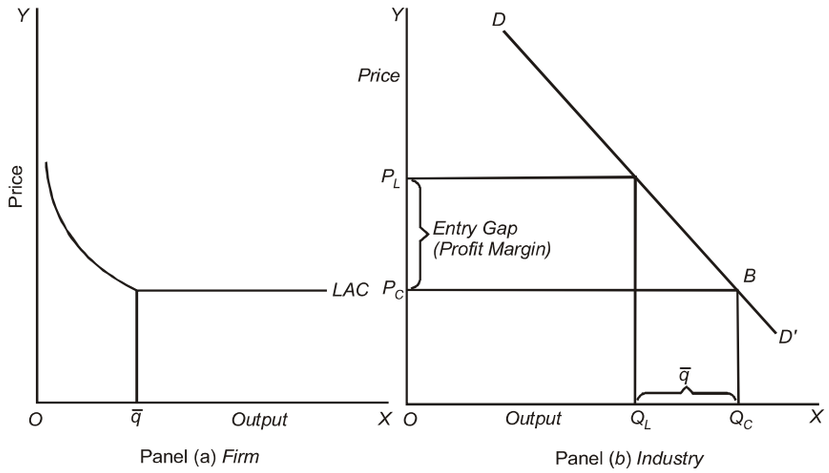

Fig. 8.6 *Modigliani's Model of Limit Pricing*

Figure 8.7 illustrates the essential features of limit-pricing theory. *DD'* is the market demand curve facing the collusive oligopoly and *MR* is the revenue curve. Suppose LAC_{EF} is the long-run average cost of the existing established collusive oligopolists. As this curve is constant, *LMC* will be equal to it. If the collusive oligopoly wishes to maximize short-run profit, it will set the price corresponding to the intersection of LAC_{EF} (which is equal to LMC_{EF}) with the marginal revenue curve *MR*.

It will be seen from Figure 8.7 that this short-run profit maximizing price is equal to P_m (which is the monopoly price because we are considering the case of collusive oligopoly). But this short-run profit maximizing price P_m is greater than the long-run average cost LAC_{PE} of the potential entrants. Consequently, the price P_m will attract entry of new firms in the industry. With the entry of new firms, the established firms would lose a part of the market demand which would cause a shift in their demand curve to the left. Thus, firms face uncertainty about the level of precise demand for their product as a result of the entry of new firms in the industry.

Now, if they set price P_L, they will sell quantity Q_2 of the product. The established collusive oligopolists will still earn profits as price P_L is greater than long-run average cost LAC_{EF}. However, it will not be in the interest of potential

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rivals to enter the industry as the price P_L equals their average cost of production. If they enter, the supply will increase and, given the market demand curve, the price of the product will fall below their average cost. Thus, post-entry price will be less than the average cost of the potential entrants. If the potential firms enter the industry, they will suffer losses which, therefore, prevent them to enter at price P_L. Therefore, price P_L is known as the *limit price* as it is the price which the established firms can charge without inducing entry. It should be noted that at the limit price P_L, the established firms, unlike potential entrants, are making profit but profit margin per unit C_1P_L or C_1C_2 is lower as compared to the case if they charge monopoly price.

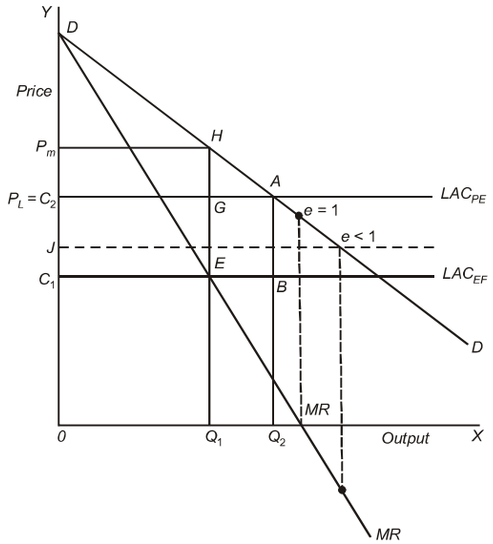

Fig. 8.7 *Limit Pricing Model*

Barriers to Entry and Limit Price

In his later works, Bain explained why oligopolists set prices above the perfectly competitive price. The existing firms will set the price at a level which will not attract the potential entrance. The limit price, that is, the entry preventing price is expressed symbolically as follows:

$$PL = PC = (I+E)$$

where, PL = limit price

PC = competitive price

E = premium

Bain has emphasized the following barriers to entry listed as follows:

(1) Established firms enjoy cost advantage because of which new firms cannot complete with existing firms.

(2) New firms cannot provide the product that has already earned goodwill.

(3) Minimum criteria required for efficient/optimum production of a new firm include:

(a) Large initial capital requirement

(b) Economies of scale

An important aspect of Bain's limit pricing theory is that some firms keep price where demand elasticity is less than 1, if they think it is in their best interest to adopt entry prevention strategy to promote maximization of profit in the long run.

Another interesting feature of this theory is that if the market demand and costs are such that monopoly price is less than limit price ($P_M < P_L$), the firm will charge the monopoly price to maximize its short-run profits, because this will also serve to prevent entry and ensure maximizing profit.

It follows from the above, that Bain was able to explain why oligopolists charge price below the short-run profit maximizing price. He explained that this was due to threat of potential entry of new firms and they wished to prevent entry of potential firms as this ensures maximum long-run profits.

Check Your Progress

8. State Bain's theory of limit pricing.
9. List the factors which determine the limit price as per Bain.

8.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The origin of kinked demand curve theory can be traced to Chamberlain's theory of monopolistic competition.
2. Sweezy's model is called ex-post rationalization rather than ex-ante explanation of market equilibrium because it does not explain price and output determination. His model only assumes the price to be given at a point of time.
3. Stackelberg's leadership model of duopoly is considered to be an extension of Cournot's duopoly model.
4. The following are the two major forms of collusion between the oligopoly firms: (i) cartel , and (ii) price leadership agreements.
5. The two major functions of cartels are: (i) fixing price for joint maximization, and (ii) market-sharing between its members.
6. In barometric price leadership, one of the firms, not necessarily dominant one, takes lead in announcing change in price, particularly when such a change is due but is not brought into effect due to uncertainty in the market.

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7. Price leadership by the dominant firm is more common than a low-cost firm.
8. Bain's theory of limit pricing implies that firms do not maximize short-run profits, because of the fear that the abnormal profit in the short run will induce the entry of new firms which will greatly reduce the profit in the long run.
9. The following are the factors which determine the limit price as per Bain: cost of the potential entrants, price elasticity of demand for the industry product, size of the market, number of established firms in the industry and long-run average cost.

8.7 SUMMARY

- The origin of kinked-demand curve can be traced into Chamberlin's theory of monopolistic competition. Later, Hall and Hitch used kinked-demand curve to explain rigidity of prices in oligopolistic market. But, neither Chamberlin nor Hall and Hitch used kinked-demand curve as a tool of analysis in their respective theories. It was Paul M. Sweezy who used the kinked-demand curve in his model of price stability in oligopolistic market.
- An oligopoly firm believes that if it reduces the price of its product, the rival firms would follow and neutralise the expected gain from price reduction. But, if it raises the price, the firms would either maintain their prices or even go for price-cutting, so that the price-raising firm loses a part of its market to the rival firms. This behaviour is true of all the firms. The oligopoly firms would, therefore, find it more desirable to maintain the prevailing price and output. This is the basic theme of Sweezy's theoretical model.
- Stackelberg, a German economist, developed, his leadership model of duopoly in 1930. His model is an extension of Cournot's model. Stackelberg assumes that one of the duopolists (say *A*) is sophisticated enough to play the role of a leader and the other (say *B*) acts as a follower. The leading duopolist *A* recognizes that his rival firm *B* has a definite reaction function which *A* uses into his own profit function and maximizes his profits.
- The oligopoly models discussed in the previous unit are based on the assumption that the oligopoly firms act independently; they are in competition with one another; and there is no collusion between the firms. The oligopoly models of this category are called non-collusive models. In reality, however, oligopoly firms are found to have some kind of collusion or agreement—open or secret, explicit or implicit, written or unwritten, and legal or illegal—with one another for at least three major reasons.

- Accordingly, the collusive oligopoly models that economists have developed to explain the price determination under oligopoly can be classified as:
  (i) Cartel models
  (*ii*) Price leadership models
- A cartel performs a variety of services for its members. The two services of central importance are (*i*) fixing price for joint profit maximization; and (*ii*) market-sharing between its members.
- Price leadership is an imperfect form of collusion between oligopoly firms. Price leadership is an informal position given to or attained by a firm in an oligopolistic setting to lead other firms in pricing. This leadership may emerge spontaneously due to technical reasons or out of tacit or explicit agreements between the firms to assign leadership role to one of them.
- There are three common types of price leaderships: (*i*) Price leadership by a low-cost or most efficient firm; (*ii*) Price leadership by a dominant firm; and (*iii*) Barometric price leadership. Let us discuss price and output determination under the three kinds of price leaderships.
- The traditional oligopoly models of Cournot, Bertrand Edgeworth and Chamberlin are closed models because they do not provide for the entry of new firms. The number of firms in these oligopoly models is assumed to be constant; only the reactions of the existing firms to the moves of rival firms are explained. Recently, it has been argued by economists such as Bain, Sylos–Labini, Andrews, Modigliani, J. Bhagwati that price output decisions of the existing firms in oligopolistic markets are affected not only by the actual entry but also by the potential entry of firms.
- Bain put forward the theory of limit pricing, which in essence implies that firms do not maximize short-run profits, because of the fear that the abnormal profit in the short run will induce the entry of new firms which will greatly reduce the profit in the long run.

8.8 KEY WORDS

- **Cartel:** It is a formal organization of the oligopoly firms in an industry.
- **Price Leadership:** It is an informal position given to or attained by a firm in an oligopolistic setting to lead other firms in pricing.
- **Limit Price:** It refers to the highest price which the existing firms believe they can charge without attracting entry of a new firm.

NOTES

8.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What is Stackelberg's solutions? What is the problem with the solution?
2. State the reasons why oligopoly firms have collusion.
3. What are the methods of market allocations?
4. Write a short note on barriers to entry and limit price as suggested by Bain.

Long Answer Questions

1. Discuss Sweezy's model of kinked demand curve for oligopolies.
2. Explain joint maximization and its problems in oligopoly industry.
3. Describe the three common types of price leaderships.
4. Examine theory of limit price by Bain.

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BLOCK - III
PRICING, BREAK-EVEN ANALYSIS, PROFIT AND GAME THEORY

NOTES

UNIT 9 PRICING

Structure

9.0 INTRODUCTION

As you would have observed up till now, there are lot of factors which affect the revenues of a business establishment. But one of the most important factors which has a bearing on the businesses' turnover is the method of pricing. In this unit, you will learn about the different methods of pricing, and their determination. This will include a discussion on types of pricing like: cost plus pricing, going rate pricing, limit pricing, and two major concepts of market skimming and penetration pricing.

9.1 OBJECTIVES

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

- Discuss cost plus pricing
- Explain going rate pricing
- Describe limit pricing
- Discuss the concepts of market skimming and penetration pricing

9.2 METHODS OF PRICING

In this section, you will learn about three important concepts of pricing: cost plus going rate and unit pricing.

NOTES

9.2.1 Cost Plus Pricing

Cost-plus pricing is also known as **'mark-up pricing', 'average cost pricing'** or **'full cost pricing'**. The cost-plus pricing is the most common method of pricing used by the manufacturing firms. The general practice under this method is to add a 'fair' percentage of profit margin to the average variable cost (*AVC*). The formula for setting the price is given as

$$P = AVC + AVC\ (m) \qquad \ldots(9.1)$$

where *AVC* = average variable cost, and *m* = mark-up percentage, and *AVC*(*m*) = gross profit margin (*GPM*).

The mark-up percentage (*m*) is fixed so as to cover average fixed cost (*AFC*) and a net profit margin (*NPM*). Thus,

$$AVC\ (m) = AFC + NPM \qquad \ldots(9.2)$$

The procedure for arriving at *AVC* and price fixation may be summarized as follows.

The **first step** in price fixation is to estimate the average variable cost. For this, the firm has to ascertain the volume of its output for a given period of time, usually one accounting or fiscal year. To ascertain the output, the firm uses figures of its 'planned' or 'budgeted' output or takes into account its normal level of production. If the firm is in a position to compute its optimum level of output or the capacity output, the same is used as *standard output* in computing the average cost.

The **next step** is to compute the total variable cost (*TVC*) of the 'standard output.' The *TVC* includes direct cost, *i.e.*, the cost of labour and raw material, and other variable costs. These costs added together give the *total variable cost*. The 'Average Variable Cost' (*AVC*) is then obtained by dividing the total variable cost (*TVC*) by the 'standard output' (*Q*), *i.e.*,

$$AVC = \frac{TVC}{Q}$$

After *AVC* is obtained, a 'mark-up' of some percentage of *AVC* is added to it as profit margin and the price is fixed. While determining the mark-up, firms always take into account 'what the market will bear' and the competition in the market.

Cost-Plus Pricing and Marginal Rule Pricing

The cost-plus pricing method appears to be a 'rule of thumb' totally different from the marginalist rule of pricing. Fritz Machlup has, however, shown that mark-up pricing is not incompatible with the marginalist rule of pricing. Rather, it is very much compatible with marginalist rule of pricing. According to Machlup, when we look into the logic of mark-up pricing, it appears quite similar to the marginalist rule of pricing. We have earlier noted that profit is maximum at the level of output where *MC = MR*. We have also noted that the mark-up pricing method is given by

$$P = AVC + AVC\ (m)$$

or $$P = AVC\ (1 + m) \quad \ldots(9.3)$$

Let us now show that the mark-up pricing ultimately converges to the marginalist rule of pricing at least under constant cost conditions.

NOTES

Recall that profit is maximum where

$$MC = MR$$

and $$MR = P\left(1 - \frac{1}{e}\right) \quad \ldots(9.4)$$

or $$MR = P\left(\frac{e-1}{e}\right) \quad \ldots(9.5)$$

By substituting Eq. (9.5) in Eq. (9.4), we may restate the necessary condition of profit maximization as

$$MC = P\left(\frac{e-1}{e}\right) \quad \ldots(9.6)$$

If *MC* is constant, then *MC* = *AVC*. By substituting *AVC* for *MC*, Eq. (9.6) may be rewritten as,

$$AVC = P\left(\frac{e-1}{e}\right) \quad \ldots(9.7)$$

By rearranging the terms in Eq. (9.7), we get

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

or $$P = AVC\ \left(\frac{e}{e-1}\right) \quad ...(9.8)$$

Now, consider Eq. (9.6). If $MC > 0$, then $P\left(\frac{e-1}{e}\right)$ must be greater than 0.

For $P\left(\frac{e-1}{e}\right)$ to be greater than 0, e must be greater than 1. This implies that profit can be maximised only when $e > 1$. The logic to this conclusion can be provided as follows.

Given the Eq. 9.5 and Eq. 9.6, if $e = 1$, $MR = 0$, and if $e < 1$, $MR < 0$. It means that if $MR < 0$ and $MC > 0$, or in other words, when $MR \neq MC$, then the rule of profit maximization breaks down. Thus, profit can be maximized only if $e > 1$, and $MC > 0$.

Now if $e > 1$, then the term $e/(e - 1)$ will always be greater than 1 by an amount, say m. Then

$$\frac{e}{e-1} = (1 + m) \quad ...(9.9)$$

By substituting term $(1 + m)$ in Eq. (9.9) for $e/(e - 1)$ in Eq. (9.7), we get

$$P = AVC\ (1 + m) \qquad \ldots(9.10)$$

where m denotes the mark-up rate.

NOTES

Note that Eq. (9.10) is exactly the same as Eq. (9.3). This means that the mark-up rule of pricing converges into the marginalist rule of pricing. In other words, it is proved that the mark-up pricing method leads to the marginalist rule of pricing. However, m in Eq. (9.3) and in (9.9) need not the same.

Limitations of Mark-up Pricing Rule. The cost-plus pricing has certain limitations, which should be borne in mind while using this method for price fixation.

First, cost-plus pricing assumes that a firm's resources are optimally allocated and the standard cost of production is comparable with the average of the industry. In reality, however, it may not be so and cost estimates based on these assumptions may be an overestimate or an underestimate. Under these conditions pricing may not be commensurate with the objective of the firm.

Second, in cost-plus pricing, generally, historical cost rather than current cost data are used. This may lead to under-pricing under increasing cost conditions and to over-pricing under decreasing cost conditions, which may go against the firm's objective.

Third, if variable cost fluctuates frequently and significantly, cost-plus pricing may not be an appropriate method of pricing.

Finally, it is also alleged that cost-plus pricing ignores the demand side of the market and is solely based on supply conditions. This is, however, not true, because the firm determines the mark-up on the basis of 'what the market can bear' and it does take into account the elasticity aspect of the demand for the product, as shown above.

9.2.2 Going Rate Pricing

Many producers enter the market often with a new brand of a commodity for which a number of substitutes are available. For example, the cold drinks like Coke and Spot, were quite popular in the market when new brands of cold drinks like Limca, Thums Up, Double Seven, Mirinda, Pepsi, Teem, Campa, etc., were introduced in the market over time. So has been the case with many consumer goods. Many other models of motor cars appeared in the market despite the popularity of Maruti cars. A new entrant to the market faces the problem of pricing his product because of strong competition with established products. This problem of pricing of a new brand is known as *pricing in relation to the established products*.

In pricing a product in relation to its well established substitutes, generally three types of pricing strategies are adopted, viz., (*i*) pricing below the ongoing price, (*ii*) pricing at par with the prevailing market price, and (*iii*) pricing above the

existing market price. Let us now see which of these strategies are adopted under what conditions.

NOTES

Pricing Below the Market Price

Pricing below the prevailing market price of the substitutes is generally preferred under two conditions. **First,** if a firm wants to expand its product-mix with a view to utilizing its unused capacity in the face of tough competition with the established brands, the strategy of pricing below the market price is generally adopted. This strategy gives the new brand an opportunity to gain popularity and establish itself. For this, however, a high cross-elasticity of demand between the substitute brands is necessary. This strategy may, however, not work if existing brands have earned a strong brand loyalty of the consumers. If so, the price incentive from the new producers must, therefore, overweigh the brand loyalty of the consumers of the established products, and must also be high enough to attract new consumers. This strategy is similar to the *penetrating pricing*. **Second,** this technique has been found to be more successful in the case of innovative products. When the innovative product gains popularity, the price may be gradually raised to the level of market price.

Pricing at Market Price

Pricing at par with the market price of the existing brands is considered to be the most reasonable pricing strategy for a product which is being sold in a strongly competitive market. In such a market, keeping the price below the market price is not of much avail because the product can be sold in any quantity at the existing market rate. This strategy is also adopted when the seller is not a 'price leader'. It is rather a 'price-taker' in an oligopolistic market. This is, in fact, a very common pricing strategy—rather the most common practice.

Pricing Above the Existing Market Price

This strategy is adopted when a seller intends to achieve a prestigious position among the sellers in the market. This is a more common practice in case of products considered to be a commodity of conspicuous consumption or prestige goods or deemed to be of much superior quality. Consumers of such goods prefer shopping in a gorgeous shop of a posh locality of the city. This is known as the 'Veblen Effect'. Sellers of such goods rely on their customers' high propensity to consume a prestigious commodity. After the seller achieves the distinction of selling high quality goods, though at a high price, they may sell even the ordinary goods at a price much higher than the market price. This practice is common among sellers of readymade garments.

Besides, a firm may sets a high price for its product if it pursues the 'skimming price strategy'. This pricing strategy is more suitable for innovative products when the firm can be sure of the distinctiveness of its product. The demand for the commodity must have a low cross-elasticity in respect of competing goods.

NOTES

9.2.3 Limit Pricing

As you have learnt before, unit price can be defined as the maximum price that existing firms charge with the objective of limiting the number of firms and preventing the entry of new firms to the industry. *Limit pricing* is a practice of charging a price lower than the profit maximising one. The objective behind this practice is to prevent the entry of new firms to the industry. Limit pricing is thus an entry-preventing-pricing policy.

Over time, many economists have developed the limit pricing models. Bain was the first to formulate limit pricing theory in 1949. Later Sylos-Labini (1957), Franco Modigliani (1958), Pashigian (1968), and J. N. Bhagwati (1970) formulated their own theories of limit pricing. In this section, we will briefly describe only Bain's model of limit pricing—the most famous model.

Bain's Model of Limit Pricing

Bear in mind, this has been discussed in the previous unit and the idea is recapitulated here. Bain attempted, in his model, to explain why oligopoly firms maintain their prices over a long period of time at a level which is lower than the price that would maximize their profits. This price lies somewhere between the long-run competitive price (i.e., $P = LAC$) and monopoly price (determined where $MR = MC$). He calls the price so determined as *limit price,* i.e., the highest price which the established firms believe they can charge without inducing entry of new firms. We present here the simplest form of his model.

In his model, Bain assumes: (a) that long-run *AR*, *MR* and *LAC* curves are determinate and known; (b) that existing firms are in effective collusions; (c) that there exists a *limit-price* of which existing firms are aware; and (d) that existing firms seek to maximize their *long-run* profits.

The model which Bain has developed on the basis of these assumptions is presented in Figure 9.1.

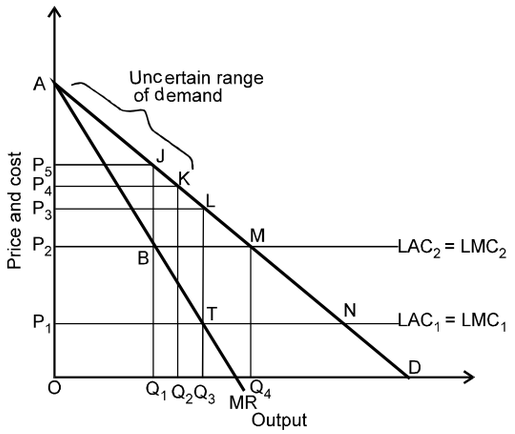

Fig. 9.1 *Determination of Limit Price*

NOTES

The long-run average and marginal revenue conditions are given by *AD* and *A-MR* curves, respectively, and long-run average and marginal cost conditions are given by the horizontal line $LAC_2 = LMC_2$. Given the revenue and cost conditions, profit-maximizing monopoly price is OP_5 (= JQ_1) which is given by intersection of *MR* and LMC_2 at point *B*. Since LMC_2 and *AD* intersect at point *M*, competitive price is OP_2. Thus, the existing firms have monopoly price OP_5 at point *J* on the demand curve and competitive price OP_2 determined by point *M*. The limit price lies between these two prices. By assumption, existing firms can estimate the limit-price. They will therefore determine the limit price a little below the monopoly price, say at OP_4 at point *K* on the demand curve. Limit price OP_4 prevents the entry of new firms and existing firms maximize their long-run profits. Any price above OP_4 makes profit uncertain because it will attract new firms whose behaviour is uncertain. Therefore, *AK* part of the demand curve is the *uncertain range* of demand curve.

In case firms are able to decrease their cost of production and their $LAC_2 = MC_2$ shift downward to $LAC_1 = MC_1$, competitive price will be OP_1 and monopoly price will be OP_3 as determined by point *T* where $LAC_1 = MC_1$ intersects the *MR* curve. In that case, the limit price will be determined somewhere between OP_1 and OP_3. For example, limit price may be determined at $OP_2 = MQ_4$. This explains how limit price is determined.

Check Your Progress

1. Mention some of the other names for cost plus pricing.
2. What is the problem of pricing of a new brand known as?

9.3 MARKET SKIMMING AND PENETRATION PRICING

A new product may be either a new brand name added to the existing ones or an altogether new product. Pricing a new brand for which there are many substitutes available in the market is not as big a problem as pricing a new product for which close substitutes are not available. For, in case of the *new brand*, market provides adequate information regarding cost, demand, and availability of market, etc. Pricing in this case depends on the nature of the market. However, problems arise in pricing a *new product* without close substitutes because, for lack of information, there is some degree of uncertainty.

Thus, pricing policy in respect of a new product depends on whether or not close substitutes are available. Depending on whether or not close substitutes are available, generally two kinds of pricing strategies are suggested in pricing a new product, viz., (*i*) skimming price policy, and (*ii*) penetration price policy.

NOTES

(i) **Skimming price policy:** The *skimming price policy* is adopted where close substitutes of a new product are not available. This pricing strategy is intended to skim the cream off the market, i.e., consumer's surplus, by setting a high initial price, three or four times the ex-factory price, and a subsequent lowering of prices in a series of reduction, especially in case of consumer durables. The initial high price would generally be accompanied by heavy sales promoting expenditure. This policy succeeds for the following reasons.

First, in the initial stage of the introduction of the product, demand is relatively inelastic because of consumers' desire for distinctiveness by the consumption of a new product.

Second, cross-elasticity is usually very low for lack of a close substitute.

Third, step-by-step price-cuts help *skimming consumers'* surplus available at the lower segments of demand curve.

Fourth, high initial prices are helpful in recovering the development costs.

The *post-skimming strategy* includes the decisions regarding the time and size of price reduction. The appropriate occasion for price reduction is the time of *saturation* of the total sales or when strong competition is apprehended. As regards the rate of price reduction, when the product is on its way to losing its distinctiveness, the price-cut has to be appropriately larger. But, if the product has retained its exclusiveness, a series of small and gradual price reductions would be more appropriate.

(ii) **Penetration price policy:** In contrast to skimming price policy, the penetration price policy involves a reverse strategy. This pricing policy is adopted generally in the case of new products for which substitutes are available. This policy requires fixing a lower initial price designed to penetrate the market as quickly as possible and is intended to maximize the profits in the long-run. Therefore, the firms pursuing the penetration price policy set a low price of the product in the initial stage. As the product catches the market, price is gradually raised up. The success of penetration price policy requires the existence of the following conditions.

First, the short-run demand for the product should have an *elasticity greater than unity.* It helps in capturing the market at lower prices.

Secondly, *economies of large-scale production* should be available to the firm with the increase in sales. Otherwise, increase in production would result in increase in costs which might reduce the competitiveness of the price.

Thirdly, the *potential market* for the product ought to be fairly large and have a good deal of future prospects.

Fourthly, the product should have *a high cross-elasticity* in relation to rival products for the initial lower price to be effective.

NOTES

Finally, the product, by nature should be such that it can be easily accepted and adopted by the consumers.

The choice between the two strategic price policies depends on (*i*) the rate of market growth; (*ii*) the rate of erosion of distinctiveness; and (*iii*) the cost-structure of the producers. If the rate of market growth is slow for such reasons as lack of information, slow growth of purchasing power, consumers' hesitation, etc., penetration price policy would be unsuitable. The reason is a low price will not mean a large sale. If the pioneer product is likely to lose its distinctiveness at a faster rate, skimming price policy would be unsuitable. Penetration pricing policy has to be followed when lead time, i.e., the period of distinctiveness, is fairly long. If cost-structure shows a decreasing trend over time, penetration price policy would be more suitable, since it enables the producer to reduce his cost and prevents potential competitors from entering the market in the short-run.

Check Your Progress

3. When is the skimming price strategy adopted?
4. What type of price is set by the firms pursuing the penetration price policy in the initial stage?

9.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Some of the other names for cost plus pricing are mark-up pricing, average cost pricing and full cost pricing.
2. The problem of pricing of a new brand known as pricing in relation to the established products.
3. The skimming price strategy is adopted where close substitutes of a new product are not available.
4. The firms pursuing the penetration price policy sets a low price for the product in the initial stage.

NOTES

9.5 SUMMARY

- Cost-plus pricing is also known as 'mark-up pricing', 'average cost pricing' or 'full cost pricing'. The cost-plus pricing is the most common method of pricing used by the manufacturing firms. The general practice under this method is to add a 'fair' percentage of profit margin to the average variable cost (*AVC*).
- The cost-plus pricing method appears to be a 'rule of thumb' totally different from the marginalist rule of pricing. Fritz Machlup has, however, shown that mark-up pricing is not incompatible with the marginalist rule of pricing. Rather, it is very much compatible with marginalist rule of pricing.
- A new entrant to the market faces the problem of pricing his product because of strong competition with established products. This problem of pricing of a new brand is known as *pricing in relation to the established products*.
- In pricing a product in relation to its well established substitutes, generally three types of pricing strategies are adopted, viz., (*i*) pricing below the ongoing price, (*ii*) pricing at par with the prevailing market price, and (*iii*) pricing above the existing market price.
- As you have learnt before, unit price can be defined as the maximum price that existing firms charge with the objective of limiting the number of firms and preventing the entry of new firms to the industry. *Limit pricing* is a practice of charging a price lower than the profit maximising one. The objective behind this practice is to prevent the entry of new firms to the industry. Limit pricing is thus an entry-preventing-pricing policy.
- A new product may be either a new brand name added to the existing ones or an altogether new product. Pricing a new brand for which there are many substitutes available in the market is not as big a problem as pricing a new product for which close substitutes are not available.
- The *skimming price policy* is adopted where close substitutes of a new product are not available. This pricing strategy is intended to skim the cream off the market, i.e., consumer's surplus, by setting a high initial price, three or four times the ex-factory price, and a subsequent lowering of prices in a series of reduction, especially in case of consumer durables.
- In contrast to skimming price policy, the penetration price policy involves a reverse strategy. This pricing policy is adopted generally in the case of new products for which substitutes are available. This policy requires fixing a lower initial price designed to penetrate the market as quickly as possible and is intended to maximize the profits in the long-run. Therefore, the firms pursuing the penetration price policy set a low price of the product in the initial stage.

9.6 KEY WORDS

- **Cost Plus Pricing:** It is the method of pricing in which a 'fair' percentage of profit margin is added to the average variable cost.
- **Skimming Policy:** It is pricing policy intended to skim the cream off the market, i.e., consumer's surplus by setting a high initial price, three or four times the ex-factory price.

NOTES

9.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the limitations of mark up pricing?
2. Briefly explain the concept of limit pricing.

Long Answer Questions

1. Describe the concept of mark up pricing and its relation to marginal rule pricing.
2. Explain the types of pricing strategies adopted in relation to pricing a product vis a vis its well established substitutes.
3. Discuss the concepts of skimming pricing and penetration pricing.

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UNIT 10 BREAK-EVEN ANALYSIS

NOTES

Structure

10.0 INTRODUCTION

You have learnt about the methods of pricing in the previous unit. In this unit, we will turn towards another important decision which is to be considered by a businessman. This is the break-even analysis. It tells the firm the price at which it needs to sell its goods in order to cover its cost of production. It is the point at which the value of sale and production is equal, i.e., when the company breaks even. In this unit, you will learn about the meaning, assumptions and determination of break-even point for a company. You will also learn about its limitations.

10.1 OBJECTIVES

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

- Discuss the meaning and assumptions of break-even analysis
- Explain the determination of break-even point
- Describe the uses and limitations of break-even analysis

10.2 MEANING, ASSUMPTIONS AND DETERMINATION OF BREAK-EVEN POINT

In traditional theory of firm, the basic objective of the firm is to maximize profit. Maximum profit does not necessarily coincide with the minimum cost, as far as the traditional theory of firm is concerned. Besides, profit is maximum at a specific level of output which is difficult to know before hand. Even if it is known, it cannot be achieved at the outset of production. In real life, firms begin their activity even at a loss, in anticipation of profit in the future. However, the firms can plan their production better if they know the level of production where cost and revenue break-even, i.e., the profitable and non-profitable range of production. Break-

even analysis or what is also known as *profit contribution analysis* is an important analytical technique used to study the relationship between the total costs, total revenue and total profits and losses over the whole range of stipulated output. The break-even analysis is a technique of having a preview of profit prospects and a tool of profit planning. It integrates the cost and revenue estimates to ascertain the profits and losses associated with different levels of output.

The relationship between cost and output and between price and output may be linear or non-linear in nature. We shall discuss the break-even analysis under both linear and non-linear revenue conditions.

Break-Even Analysis: Linear Cost and Revenue Function

To illustrate the break-even analysis under linear cost and revenue conditions, let us assume a linear cost function and a linear revenue function are given as follows.

$$\text{Cost function: } TC = 100 + 10Q \quad \ldots(10.1)$$

$$\text{Revenue function: } TR = 15Q \quad \ldots(10.2)$$

The cost function given Eq. (10.1) implies that the firm's total fixed cost is given at ` 100 and its variable cost varies at a constant rate of ` 10 per unit in response to increase in output. The revenue function given in Eq. (10.2) implies that the price for the firm's product is given in the market at ` 15 per unit of sale.

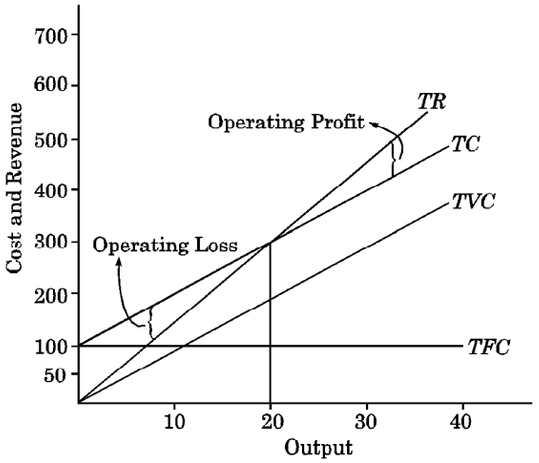

Fig. 10.1 *Break-even Analysis: Linear Functions*

What firm needs to do to carry out a break-even analysis of its business operations is to make a chart of its total fixed cost (*TFC*), total variable cost (*TVC*), total cost (*TC*) and the total revenue (*TR*), and graph them to find the break-even point. The process of break-even analysis is illustrated graphically in Fig. 10.1. The line *TFC* shows the total fixed cost at ` 100 for a certain level of output, and the line *TVC* shows the variable cost rising with a slope ($\Delta Q/\Delta TVC$) = 1/10. The line *TC* has been obtained by plotting the *TC* function. It can be obtained also by a vertical summation of *TFC* and *TVC* at various levels of output.

NOTES

The line TR shows the total revenue (*TR*) obtained as $Q \cdot P$. The line *TR* intersects the line *TC* at point *B*, where output is equal to 20 units. The point *B* shows that at $Q = 20$, firm's total cost equals its total revenue. That is, at $Q = 20$, *TC* breaks even with *TR*. Point *B* is, therefore, the break-even point and $Q = 20$ is the break-even level of output. Below this level of output, *TC* exceeds *TR*. The vertical difference between *TC* and *TR*, (i.e., *TC*–*TR*) is known as operating loss. Beyond $Q = 20$, $TR > TC$, and *TR*–*TC* is known as operating profit. It may thus be inferred that a firm producing a commodity under cost and revenue conditions mentioned above must produce at least 20 units to make its total cost and total revenue break-even.

The break-even output can also be calculated algebraically. We know that at break-even point,

$$TR = TC$$

That is, in terms of *TR* and *TC* functions,

$$15Q = 100 + 10Q$$

$$5Q = 100$$

$$Q = 20$$

Thus, 20 is the break-even output. Given the *TR* and *TC* functions, production beyond 20 units will yield increasing profits, at least in the short-run.

Algebra of Break-Even Analysis. The break-even analysis can also be presented algebraically. At break-even volume,

$$TR = TC$$

and that $TR = (P \times Q)$ and $TC = TFC + TVC$. In break-even analysis *TVC* is defined as $TVC = AVC \times Q$. Thus,

$$TC = TFC + AVC \times Q$$

Now, break-even quantity (Q_B) can be obtained as follows:

$$TR = TC$$

$$Q_B \times P = TFC + AVC \times Q_B \qquad \ldots(10.3)$$

where Q_B = break-even volume.

Rearranging Eq. (10.4), we get

$$Q_B \times P - AVC \times Q_B = TFC$$

$$Q_B(P - AVC) = TFC$$

$$Q_B = TFC/P - AVC \qquad \ldots (10.4)$$

If *TFC*, *AVC* and *P* are known, Q_B can be obtained straightaway from Eq. (10.4).

The break-even analysis is based on the assumption that cost and revenue functions are linear. Under the condition of linear cost and revenue functions, *TC*

and *TR* are straight lines and intersect each other at only one point (as shown in Fig. 10.1) dividing the whole range of output into two parts—profitable and non-profitable. It may give the impression that the whole output beyond the break-even level is profitable. In real life, however, it may not be true due to changing price and cost conditions. In reality, the cost and revenue functions may be non-linear. Non-linearity arises because *AVC* and price vary with variation in the output. As a result, the total cost (*TC*) may increase at increasing rates while the total revenue (*TR*) increases at decreasing rates. Therefore, at some stage of output, *TC* may exceed *TR*. Thus, there might be two break-even points (as shown in Fig. 10.2) instead of one. This limits the profitable range of output and determines the lower and upper limits of profitable output. The analyst should, therefore, pre-test and verify the validity of cost and revenue functions rather than assuming straightaway the linearity conditions.

Break-Even Analysis: Non-Linear Cost and Revenue Functions

Let us now examine the break-even analysis under non-linear cost and revenue functions. The break-even analysis is presented in Fig. 10.2. As shown in the figure, the *TFC* line shows the fixed cost at *OF* and the vertical distance between *TC* and *TFC* measures the total variable cost (*TVC*). The curve *TR* shows the total sale proceeds or the total revenue (*TR*) at different levels of output and price. The vertical distance between the *TR* and *TC* measures the profit or loss for various levels of output.

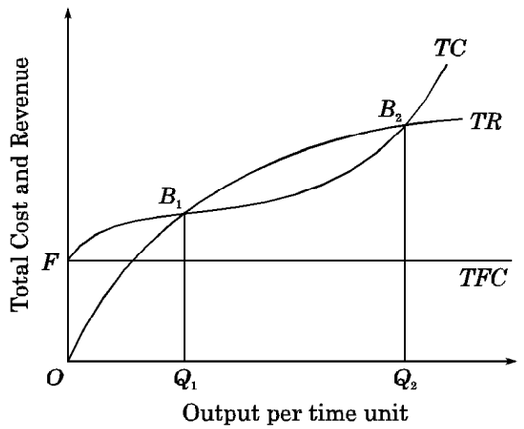

Fig. 10.2 *Break-even Analysis: Non-Linear Functions*

As shown in Fig. 10.2, *TR* and *TC* curves intersect each other at two points, B_1 and B_2, where *TR* = *TC*. These are the lower and upper break-even points. For the whole range of output between OQ_1 (corresponding to the break-even point, B_1) and OQ_2 (corresponding to the break-even point B_2), *TR* > *TC*. It implies that a firm producing more than OQ_1 and less than OQ_2 will make profits. In other words, the profitable range of output lies between OQ_1 and OQ_2 units of output. Producing less or more then these limits will result in losses.

NOTES

Contribution Analysis

Contribution analysis is the analysis of incremental revenue and incremental cost of a business decision or business activity. Break-even charts can also be used for measuring the contribution made by the business activity towards covering the fixed costs. For this purpose, variable costs are plotted below the fixed costs as shown in Fig. 10.3. Fixed costs are a constant addition to the variable costs. In that case, the total cost line will run parallel to the variable cost line.

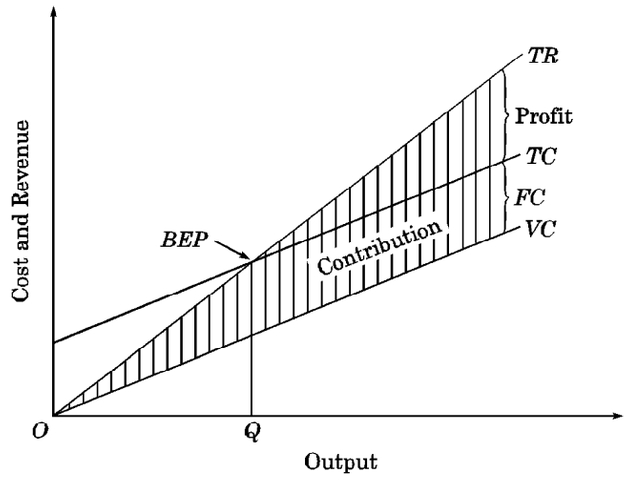

Fig. 10.3 *Contribution Analysis*

The 'contribution is the difference between total revenue and variable costs' arising out of a business decision. At the break-even level of output *OQ* in Fig. 10.3, contribution equals fixed costs. Below the output *OQ*, the total contribution is less than the fixed cost. This amounts to loss. Beyond output *OQ*, contribution exceeds fixed cost. The difference is a contribution towards profits resulting from a business decision.

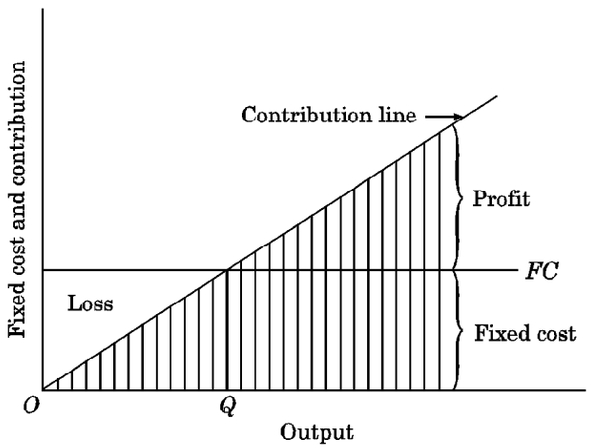

Fig. 10.4 *Profit Contribution Analysis*

Sometimes, contribution over the time period under review is plotted in order to indicate the commitment that the management has made for fixed expenditure, and to find the level of output of which it will be recovered and profit will begin to emerge. This kind of contribution analysis is graphically presented in Fig. 10.4. At output *OQ*, contribution equals fixed cost. Beyond output *OQ*, contribution includes net profit.

Profit Volume Ratio

The profit volume (*PV*) ratio is another handy tool used to find the *BEP* for sales, specially for the multi-product firms. The formula for *PV* ratio is given below.

$$PV \text{ Ratio} = \frac{S - V}{S} \times 100$$

where S = Selling price, and V = Variable costs (average).

For instance, if selling price (S) = ` 5 and variable cost ($V$) = ` 4 per unit, then,

$$PV \text{ Ratio} = \frac{5 - 4}{5} \times 100 = 20 \text{ per cent}$$

The break-even point (*BEP*) in sales value is calculated after dividing the fixed expenses by *PV* ratio as follows.

$$BEP \text{ (Sale value)} = \frac{\text{Fixed Expenses}}{PV \text{ Ratio}}$$

For instance, given the selling price at ` 5 per unit, average variable expenses at ` 3 per unit and fixed expenses (F) of ` 4,000 per month, *BEP* (sale value) is calculated as follows.

$$BEP \text{ (Sale Value)} = \frac{\text{Fixed Expenses}}{PV \text{ Ratio}} \text{ or } \frac{F}{(S - V)/S} \times 100$$

We can calculate break-even sale volume by using the contribution per unit of sale by the following formula.

$$BEP \text{ (Sale Value)} = \frac{\text{Fixed Expenses}}{\text{Contribution per unit}}$$

$$BEP = \frac{4000}{(5 - 3)} = \frac{4000}{2} = 2{,}000 \text{ units}$$

The *PV* ratio is not only helpful in finding the break-even point but it can also be used for making a choice of the product.

If there is no time constraint, the choice should always be for a product which assures a higher *PV* ratio. Otherwise, *PV* ratio per time unit is taken as the basis of choice. For instance, suppose two products *A* and *B* involve the following variable cost and selling price.

NOTES

Products	A	B
Selling price unit (`)	2	2.5
Variable cost per unit (`)	1	1.5
Machine hour per unit	2	1.0

$$PV \text{ ratio for } A = \frac{\text{Selling Price} - \text{Variable cost}}{\text{Selling price}} \times 100$$

$$= \frac{2-1}{2} \times 100 = 50 \text{ per cent}$$

Therefore, for each machine hour, *PV* Ratio = 50/2 = 25 per cent

$$PV \text{ ratio for } B = \frac{2.5 - 1.5}{2.5} \times 100 = 40 \text{ per cent}$$

Therefore, for each machine hour, *PV* Ratio = 40 per cent.

In this case, product *B* is preferable to product *A*.

Margin of Safety

The margin of safety represents the difference between the sales at break-even point and the total actual sales. Three measures of the margin of safety are as follows:

(*i*) Margin of safety = $\frac{\text{Profit} \times \text{Sales}}{PV \text{ ratio}}$

(*ii*) Margin of safety = $\frac{\text{Profit}}{PV \text{ ratio}}$

(*iii*) Margin of safety = $\frac{S_a - S_b}{S_a} \times 100$

where S_a = actual sales and S_b = Sales at *BEP*.

The safety margin can be worked out by using formula (*iii*) as follows. Suppose *TR* and *TC* functions are given, respectively, as:

$$TR = 10Q$$

$$TC = 50 + 5Q$$

and $$S_a = 20$$

Given the *TR* and *TC* functions, S_b can be obtained as shown below. At break-even point, *TR* = *TC*.

By substituting S_b for *Q* in *TR* and *TC* functions, we get

$$TR = 10S_b$$

and $$TC = 50 + 5S_b$$

Thus, at break-even point,

$$10S_b = 50 + 5S_b$$
$$10S_b - 5S_b = 50$$
$$5S_b = 50$$
$$S_b = 10$$

By substituting S_a and S_b in formula (*iii*), we get

$$\text{Margin of safety} = \frac{20 - 10}{20} \times 100$$
$$= 50 \text{ per cent}$$

Margin of safety can be increased by increasing selling price provided the sales are not seriously affected. This can happen only when demand for the product is inelastic.

It can also be increased by increasing production and sales up to the capacity of the plant, if necessary, even by reducing selling price provided the demand is elastic. The other modes include reduction in fixed expenses, reduction in variable expenses or having a product mix with greater share of the one which assures greater contribution per unit or which has a higher *PV* ratio.

Profit-Volume Analysis Charts. The general break-even and contribution break-even charts have already been discussed above in Fig. 10.1 through 10.4. There can be a number of such charts or graphs showing existing and proposed situations with variation in sales price, fixed and variable cost and, consequently, variable contributions to fixed costs, profits, etc. One of such charts is the cash break-even chart.

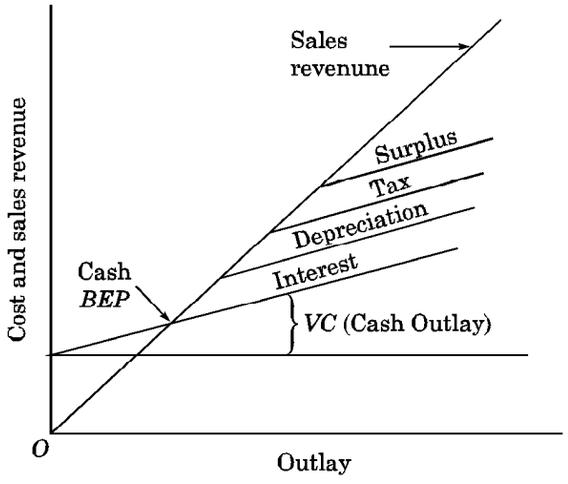

Fig. 10.5 *Cash Break-even Analysis*

A cash break-even chart can be prepared by taking cash inflow from sales and cash outlay on fixed and variable costs. The distribution of the total contribution may also be shown from the angle of incidence as shown in Fig. 10.5.

NOTES

Another variation of the break-even chart is called profit-volume analysis chart or graph. In this chart, the horizontal axis represents the sales volume and the vertical axis shows profit or loss. The profit line is graphed by computing the profit or loss consisting of the difference between sales revenue and the total cost at each volume. The point where the profit line intersects the horizontal axis is the break-even point. This has been shown in Fig. 10.6.

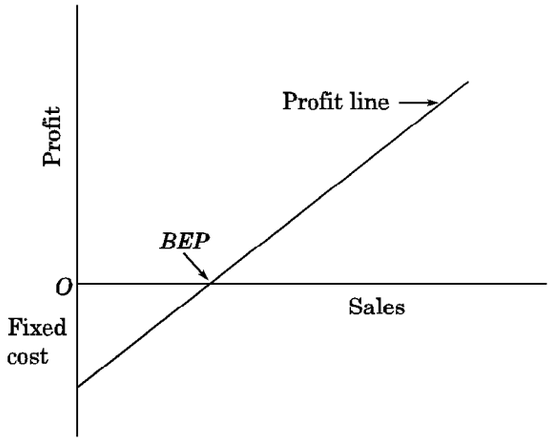

Fig. 10.6 *Profit Volume Analysis*

It may be noticed that break-even charts are good for displaying information. The same information is available from simple calculations.

10.2.1 Uses of Break-Even Analysis

Let us now discuss the uses of break-even analysis.

Uses

- Sales volume can be determined to earn a given amount of return on capital.
- Profit can be forecast if estimates of revenue and cost are available.
- Effect of change in the volume of sales, sale price, cost of production can be appraised.
- Choice of products or processes can be made from the alternatives available. Product-mix can also be determined.
- Impact of increase or decrease in fixed and variable costs can be highlighted.
- Effect of high fixed costs and low variable costs to the total cost can be studied.
- Valid interfirm comparisons of profitability can be made.
- Cash break-even chart helps proper planning of cash requirements.
- It emphasizes the importance of capacity utilization for achieving economies.
- Further help is provided by margin of safety and angle of incidence.

NOTES

Limitations

We have discussed that the break-even analysis is based on linear assumptions. The linearity assumption can be removed by pre-testing the cost and revenue functions and by using, if necessary, the non-linearity conditions. Nevertheless, the break-even analysis as such has certain other limitations. First, the break-even analysis can be applied only to a single product system. Under the condition of multiple products and joint operations, the break-even analysis can be applied only if product-wise cost can be ascertained which is, of course, extremely difficult. Second, break-even analysis cannot be applied usefully where cost and price data cannot be ascertained beforehand and where historical data are not relevant for estimating future costs and prices.

Despite these limitations, the break-even analysis may serve a useful purpose in production planning if relevant data can be easily obtained.

Check Your Progress

1. What is another name for break-even analysis?
2. State the formula for calculating break-even point.
3. How is a cash break-even chart prepared?

10.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Break even analysis is also known as profit contribution analysis.
2. The break-even point in sales value is calculated after diving the fixed expenses by PV ratio.
3. A cash break-even chart is prepared by taking cash inflow from sales and ash outlay on fixed and variable costs. The distribution of the total contribution may also be shown from the angle of incidence.

10.4 SUMMARY

- In traditional theory of firm, the basic objective of the firm is the firm is to maximize profit. In real life, firms begin their activity even at a loss, in anticipation of profit in the future.
- Break even analysis integrates the cost and revenue estimates to ascertain the profits and losses associated with different levels of output.
- The relationship between cost and output between price and output may be linear or non-linear in nature. And so is the analysis of break-even point.

NOTES

- Contribution analysis is the analysis of incremental revenue and incremental cost of a business decision or business activity.
- The profit volume ratio is another handy tool used to find the BEP for sales, specially for the multi-product firms. The PV ratio is not only helpful in finding the break-even point but it can be used for making a choice of the product.
- The margin of safety represents the difference between the sales at break-even point and the total actual sales.
- The limitations of break-even analysis include: linearity problem, its limited application only to single product system, etc.

10.5 KEY WORDS

- **Break-Even Analysis:** It is a technique of having a preview of profit prospects and a tool of profit planning.
- **Contribution Analysis:** It is the analysis of incremental revenue and incremental cost of a business decision or business activity.
- **Margin of Safety:** It represents the difference between the sales at break-even point and the total actual sales.

10.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Give an algebraic representation of break-even analysis.
2. Write a short note on break-even analysis of non-linear cost and revenue functions.
3. Briefly explain the concept of margin of safety.
4. Explain how a profit volume analysis chart is made.
5. What are the uses and limitations of break-even analysis?

Long Answer Questions

1. Explain the break-even analysis with linear cost and revenue function.
2. Discuss the concept of contribution analysis and profit volume analysis.

10.7 FURTHER READINGS

NOTES

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UNIT 11 PROFIT MAXIMIZATION

NOTES

Structure

11.0 INTRODUCTION

The conventional economic theory assumes profit maximization as the only objective of business firms—profit measured as TR–TC. Profit maximization as the objective of business firms has a long history in economic literature. It forms the basis of conventional price theory. Profit maximization is regarded as the most reasonable and analytically the most 'productive' business objective. The strength of this assumption lies in the fact that this assumption 'has never been unambiguously disproved'.

Besides, profit maximization assumption has a greater predictive power. It helps in predicting the behaviour of business firms in the real world and also the behaviour of price and output under different market conditions. No other hypothesis explains and predicts the behaviour of firms better than the profit maximization assumption. Nevertheless, the profit maximization has been questioned strongly by some modern economists. This created a controversy on objectives of business firms.

In this unit, you will learn about the concept of profit maximization, profit functions and its properties along with marginal revenue.

11.1 OBJECTIVES

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

- Discuss the concept and controversy of profit maximization
- Explain profit functions and its properties
- Describe the profit and its relation to marginal revenue and supply curve

11.2 PROFIT FUNCTIONS AND ITS PROPERTIES

NOTES

Profit maximization is the short run and long run process by which the firm makes decisions regarding price and output level resulting in largest profit.

The profit function is crucial for businesses to determine the quantity and prices at which goods must be sold so as to ensure that profit is earned. Two primary functions make up the profit function. These are revenue and cost functions. So if R(x) is the revenue function and C(x) is the cost function then the profit function P(x) is:

$$P(x)= R(x)- C(x)$$

11.2.1 Marginal Revenue and Profit Maximization

Generally, a firm produces to the point that their marginal cost is equal to its marginal revenue. The logic behind this principle is that the maximum point of TR is at the point where marginal revenue is equal to marginal profit. This is so because the firms continue producing till the point where the marginal profit becomes zero, which is when it equals the marginal revenue minus marginal cost.

The formulae to be remembered is this:

Firms must produce until MR= MC, when MR>MC and stop producing when MR<MC since it is making loss on additional units produced.

11.2.2 Supply Function by Price Taking Firm

A firm's profit is the revenue minus cost. Taking price as given, the function which reflects the firm's decision to maximize its profit by affecting its supply function is called the supply function by the price taking firm.

Short run Supply by Price-taking Firm

In the short run, the costs which prevail are fixed cost and so as to not cross a loss greater than the fixed cost, the firms need to take a decision of whether producing no supply is a better off situation. This is in the case that its supply yield leads a greater loss than the fixed cost. This is to say that the firm must not produce in case the price is less than the AVC of the firm.

11.3 CONTROVERSY ON PROFIT MAXIMIZATION

The conventional theory of firm assumes profit maximization as the sole objective of the business firms. Some modern economists, however, refute the profit maximization assumption because, in their opinion, it is practically non-achievable. Their own findings reveal that business firms, especially big corporations, pursue several other objectives, rather than profit maximization. However, some modern economists have strongly defended the profit maximization objective. This has created a controversy on the profit maximization objective of the business firms. In

this section, we discuss briefly the arguments against and for profit maximization objective.

Arguments against Profit-Maximization Objective

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(*i*) The ***first argument*** against the profit maximization objective is based on the dichotomy between the *ownership* and *management* of business firms. It is argued that, in modern times, due to rapid growth of large business corporations, management of business firms has got separated from the ownership. The separation of management from ownership gives managers an opportunity and also the discretion to set firm's goals other than profit maximization. The researches conducted by the economists reveal that, in practice, business managers pursue such objectives as

(*a*) *maximization of sales revenue,*

(*b*) *maximization of the value of the firm, i.e., the net worth of the firm,*

(*c*) *maximization of managerial utility function,* (*d*) *maximization of firm's growth rate*, (*e*) *making a target profit,* (*f*) *retaining and increasing market share,* and so on.

(*ii*) Another argument against profit maximization objective is that traditional theory of firm assumes managers to have full and perfect knowledge of market conditions and of the possible future development in business environment of firm. The firm is thus supposed to be fully aware of its demand and cost conditions in both short and long runs. Briefly speaking under profit maximization objective, a complete certainty about the market conditions is assumed. Some modern economists question the validity of this assumption. They argue that the firms do not possess the perfect knowledge of their costs, revenue and future business environment. They operate in the world of uncertainty. Most price and output decisions are based on *probabilities*.

Besides, it is further argued that the equi-marginal principle of profit maximization, i.e., equalizing *MC* and *MR*, has been claimed to be ignored in the decision-making process of the firms. Empirical studies of the pricing behaviour of the firms have shown that the marginal rule of pricing does not stand the test of empirical verification. Hall and Hitch have found, in their study of pricing practices of 38 UK firms, that the firms do not pursue the objective of profit maximization and that they do not use the marginal principle of equalizing *MR* and *MC* in their price and output decisions. According to them, most firms aim at long-run profit maximization. In the short-run, they set the price of their product on the basis of *average cost principle*, so as to cover AC = AVC + AFC (where *AC* = Average cost, *AVC* = Average variable cost, *AFC* = Average fixed cost) and a normal margin of profit (usually 10 per cent).

NOTES

In a similar study, Gordon has found (*i*) that there is a marked deviation in the real business conditions from the assumptions of the traditional theory, and (*ii*) that pricing practices were notably different from the marginal theory of pricing. Gordon has concluded that the real business world is much more complex than the one postulated by the theorists. Because of the extreme complexity of the real business world and ever-changing conditions, the past experience of the business firms is of little use in forecasting demand, price and costs. The firms are not aware of their *MR* and *MC*. The *average-cost-principle* of pricing is widely used by the firms. Findings of many other studies of the pricing practices lend support to the view that there is little link between pricing theory and pricing practices.

The Defence of Profit Maximization

The arguments against profit-maximization objectives have been strongly rejected by other economists. They argued strongly that pricing theory does have relevance to the actual pricing policy of the business firms. A section of economists has strongly defended the profit maximization objective and 'marginal principle' of pricing and output decisions. The empirical and theoretical support put forward by them in defence of the profit maximization objective and marginal rule of pricing may be summed as follows:

In two empirical studies of 110 'excellently managed companies', J.S. Earley has concluded that the firms do apply the marginal rules in their pricing and output decisions.

Fritz Maclup has argued in abstract theoretical terms that empirical studies by Hall and Hitch and by Lester do not provide conclusive evidence against the marginal rule and that these studies have their own weaknesses. He argues further that there has been a misunderstanding regarding the purpose of traditional theory of value. The traditional theory seeks to explain market mechanism, resource allocation through price mechanism and has a predictive value, rather than dealing with pricing practices of individual firms. The relevance of marginal rules in actual pricing system of firms could not be established for lack of communication between the businessmen and the researchers as they use different terminology. Researchers use technical terms like *MR*, *MC* and elasticities which are often abstract for businessmen. Besides, businessmen, even if they do understand economic concepts, would not admit that they are making *abnormal profits* on the basis of marginal rules of pricing. They would instead talk of a 'fair profit'. Also, Maclup is of the opinion that the practices of setting *price* equal to *average variable cost* plus a *profit margin* is not incompatible with the marginal rule of pricing and that the assumptions of traditional theory are plausible.

While the controversy on profit maximization objective remains unresolved, the conventional theorists, the marginalists, continue to defend the profit maximization objective.

NOTES

Other Arguments in Defence of Profit Maximization Hypothesis

The conventional economic theorists defend **the profit** maximization hypothesis on the following grounds also.

1. **Profit is indispensable for firm's survival.** The survival of all the profit-oriented firms in the long run depends on their ability to make a *reasonable* profit depending on the business conditions and the level of competition. What profit is reasonable may be a matter of opinion. But, making profit is a necessary condition for the survival of the firm. Once the firms begin to make profit, they try to maximize it.
2. ***Achieving other objectives depends on firm's ability to make profit.*** Many other objectives of business firms have been cited in economic literature, e.g., maximization of managerial utility function, maximization of long-run growth, maximization of sales revenue, satisfying all the concerned parties, increasing and retaining market share, etc. The achievement of such alternative objectives depends wholly or at least partly on the primary objective of making profit.
3. ***Evidence against profit maximization objective is not conclusive.*** Profit maximization is a time-honoured objective of business firms. Although this objective has been questioned by many researchers, some economists have argued that the evidence against it is not conclusive or unambiguous.
4. ***Profit maximization objective has a greater predicting power.*** Compared to other business objectives, profit maximization objective has been found to provide a much more powerful basis for predicting certain aspects of firms' behaviour. As Friedman has argued, the validity of the profit maximization objective cannot be judged by *a priori* logic or by asking business executives, as some economists have done. In his opinion, ultimate test of its validity lies in its ability to predict the business behaviour and the business trends.
5. ***Profit is a more reliable measure of a firm's efficiency.*** Though not perfect, profit is the most quick and reliable measure of the efficiency of a firm. It is also the source of internal finance. Profit as a source of internal finance assumes a much greater significance when financial market is highly volatile. The recent trend shows a growing dependence on the internal finance in the industrially advanced countries. In fact, *in developed countries, internal sources of finance contribute more than three-fourths of the total finance.*
6. ***Finally,*** according to Milton Friedman, whatever one may say about firms' motivations, if one judges their motivations by their managerial acts, profit maximization appears to be **a more valid business objective.**

NOTES

11.3.1 Reasonable Profit and Standard Profit

As noted above, objectives of business firms can be various. There is no unanimity among the economists and researchers on the objectives of business firms. One thing is, however, certain that the survival of a firm depends on the profit it can make. So whatever the goal of the firm-—–sales revenue maximization, maximization of firm's growth, maximization of the value of the firm, maximization of managers' utility function, long-run survival, market share, or entry-prevention—it has to make a profit. The firms, therefore, adopt a more practical approach. Maximization of profit in technical sense of the term may not be practicable, but making a profit has to be the objective of the firms. The firms may differ on 'how much profit' but they do set a profit target for themselves. Some firms set their objective of a 'standard profit', some a 'target profit' and some a 'reasonable profit'. A 'reasonable profit' is the most common objective.

Let us now look into the policy questions related to setting standard or criteria for a reasonable profit. The important policy questions are:

(*i*) Why do modern corporations aim at a "reasonable profit" rather than maximizing profit?

(*ii*) What are the criteria for a reasonable profit?

(*iii*) How is the "reasonable profit" determined?

Let us now briefly examine the policy implications of these questions.

Reasons for Aiming at "Reasonable Profits"

For a variety of reasons, modern corporations aim at making *a reasonable profit* rather than maximizing the profit. Joel Dean has listed the following reasons.

1. **Preventing entry of competitors:** Profit maximization under imperfect market conditions generally leads to a high 'pure profit' which is bound to attract competitors, particularly in case of a weak monopoly. The firms, therefore, adopt a pricing and a profit policy that assure them a reasonable profit and, at the same time, keep potential competitors away.
2. **Projecting a favourable public image:** It becomes often necessary for large corporations to project and maintain a good public image. The reason is, if public opinion turns against the firm, its sales begin to fall. Also, if profits are high, government officials start raising their eyebrows on profit figures. So most firms set prices lower than those conforming to the maximum profit but high enough to ensure a "reasonable profit".
3. **Restraining trade union demands:** High profits make trade unions feel that they have a share in the high profit and therefore they raise demands for wage-hike. Hiking wage under pressure may lead to wage-price spiral and frustrate the firm's objective of maximizing profit. Therefore, profit restrain is sometimes used as a measure to prevent trade union activities.

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4. **Maintaining customer goodwill:** Customer's goodwill plays a significant role in maintaining and promoting demand for the product of a firm. Customer's goodwill depends largely on the quality of the product and its 'fair price'. What consumers view as fair price may not be commensurate with profit maximization. Firms aiming at better profit prospects in the long-run, sacrifice their short-run profit maximization objective in favour of a "reasonable profit".
5. **Other factors:** Some other factors that put restraint on profit maximization include
   (*a*) managerial utility function being preferable to profits maximization for executives,
   (*b*) congenial relation between executive levels within the firm, (*c*) maintaining internal control over management by restricting firm's size and profit, and (*d*) forestalling the anti-trust suits.

Standards of Reasonable Profits

When firms voluntarily exercise restraint on profit maximization and choose to make only a 'reasonable profit', the questions that arise are:

(*i*) what form of profit standards should be used, and

(*ii*) how should reasonable profits be determined?

(i) **Forms of Profit Standard:** Profit standards may be determined in terms of: (*a*) aggregate money terms—total net profit, (*b*) percentage of sales, or (*c*) percentage return on investment. These standards may be determined with respect to the whole product line or for each product separately. Of all the forms of profit standards, the total net profit of the enterprise is more common than other standards. But when purpose is to discourage the potential competitors, then a target rate of return on investment is the appropriate profit standard, provided competitors' cost curves are similar. The profit standard in terms of 'ratio to sales is an eccentric standard' because this ratio varies widely from firm to firm, even if they all have the 'same return on capital invested'.

(ii) **Setting the Profit Standard:** The following are the important criteria that are taken into account while setting the standards for a 'reasonable profit'.

(a) ***Capital-attracting standard:*** An important criterion used in setting standard profit is that it must be high enough to attract external (debt and equity) capital. For example, if a firm's stocks are being sold in the market at five times their current earnings, it is necessary that the firm earns a profit at the rate of 20 per cent of the booked investment.

There are however certain problems associated with this criterion: (*i*) capital structure of the firm (i.e., the proportions of bonds, equity and preference shares) affects the cost of capital and thereby the rate of

profit, and (*ii*) whether profit standard has to be based on current or long-run average cost of capital as it varies widely from company to company and may at times prove treacherous.

(b) ***'Plough-back' standard:*** In case a company intends to rely on its own sources for financing its growth, then the most relevant standard is the aggregate profit that provides for an adequate 'plough-back' for financing a desired growth of the company without resorting to the capital market. This standard of profit is used especially by those firms for whom maintaining liquidity and avoiding debt are main considerations in profit policy.

(c) ***Normal earnings standard.*** Another important criterion for setting standard of reasonable profit is the 'normal' earnings of firms of an industry over a normal period. Company's own normal earnings over a period of time often serve as a valid criterion of reasonable profit, provided it succeeds in (*i*) attracting external capital, (*ii*) discouraging growth of competition, and (*iii*) keeping stockholders satisfied. When average of 'normal' earnings of a group of firms is used, then only comparable firms and normal periods are chosen.

However, none of these standards of profits is perfect. A standard is, therefore, chosen after giving due consideration to the prevailing market conditions and public attitudes. In fact, different standards are used for different purposes because no single criterion satisfies all conditions and all the people concerned.

Profit as a Measure of managerial control

An important managerial aspect of profit is that it is used in measuring and controlling performance of the executives of the large business undertakings. Researches have revealed that business executives of middle and high ranks often deviate from profit objective and try to maximize their own utility functions. They think in terms of job security, personal ambitions for promotions, larger perks, etc., which often conflict with firms' profit-making objective. Keith Powlson has pointed out three common deviationist tendencies:

(*i*) more energy is spent in expanding sales volume and product lines than in raising profitability;

(*ii*) subordinates spend too much time and money doing jobs to perfection regardless of its cost and usefulness; and

(*iii*) executives cater more to the needs of job security in the absence of any reward for imaginative ventures.

In order to control these deviationist tendencies and orienting managerial functions towards the profit objective, the top management uses 'managerial decentralization and control-by-profit techniques'. These techniques have distinct advantage for a big business corporation. Managerial decentralization is achieved

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by changing over from functional division of business activities (e.g., production branch, sales division, purchase department, etc.) to a system of product-wise division. Managerial responsibilities are then fixed in terms of profit. Managers enjoy autonomy in their operations under the general policy framework. They are allotted a certain amount of money to spend and a profit target to be achieved by the particular division. Profit is then the measure of executive performance, not the sales or quality. This kind of reorganization of management helps in assessing profit-performance of various product lines in a multi-product organization. It serves as a useful guide in reorganization of the product lines.

The use of this technique, however, raises many interesting technical issues that complicate its application. These issues centre around the method of measuring divisional profits and profit standards to be set. The two important problems that arise are: (*i*) should profit goals be set in terms of total net profit for the divisions or should they be confined to their share in the total net profit? and (*ii*) how should divisional profits be determined when there is a long ladder of vertical integration?

In respect to question (*i*), the most appropriate profit standard of divisional performance is revenue minus current expenses. In allocating different costs, however, some arbitrariness is bound to be there. However, where a long vertical integration is involved, relative profitability of a division can be fixed in terms of a lower 'transfer price' compared to the market price. But, control measures are not all that simple to apply. It is difficult to set a general formula. It has to be settled differently under varying conditions.

Conclusion

Although profit maximization continues to remain the standard business objective in economic analysis, there is no reason to believe that profit maximization is the only objective that firms pursue. Modern corporations, in fact, pursue multiple objectives. Through their study of business firms, the economists have postulated a number of alternative objectives pursued by them. The main factor behind the multiplicity of the objectives, particularly in case of large corporations, is the dichotomy between the management and the ownership.

Moreover, profit maximization hypothesis is a time-tested one. It is more easy to handle. The empirical evidence against this hypothesis is not conclusive and unambiguous. Nor are the alternative hypotheses strong enough to replace this hypothesis. More importantly, profit maximization hypothesis has a greater explanatory and predictive power than any of the alternative hypotheses. Therefore, it still forms the basis of firms' behaviour. In the subsequent chapters, we will use this hypothesis to explain the price and output decisions of the business firms.

Check Your Progress

1. Why has the controversy of profit maximization as a firm's sole objective arisen?
2. What is referred to a firm's profit?
3. As per the marginal revenue concept, when must firms stop producing so as to stop incurring losses?
4. List the terms in which profit standards may be determined.

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11.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Modern economists believe that profit maximization is practically non-achievable. As per them, firms, especially big corporations pursue several other objectives rather than profit maximization.
2. A firm's profit is its revenue minus cost.
3. Firms must stop producing when MR<MC since it is making loss on additional units produced.
4. Profit standards may be determined in terms of (a) aggregate money terms, (b) percentage of sales, (c) percentage return on investment.

11.5 SUMMARY

- A firm produces to the point that their marginal cost is equal to its marginal revenue. The logic behind this principle is that the maximum point of TR is at the point where marginal revenue is equal to marginal profit. This is so because the firms continue producing till the point where the marginal profit becomes zero, which is when it equals the marginal revenue minus marginal cost.
- Firms must produce until MR= MC, when MR>MC and stop producing when MR<MC since it is making loss on additional units produced.
- In the short run, the costs which prevail are fixed cost and so as to not cross a loss greater than the fixed cost, the firms need to take a decision of whether producing no supply is a better off situation. This is in the case that its supply yield leads a greater loss than the fixed cost. This is to say that the firm must not produce in case the price is less than the AVC of the firm.

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- The profit function is crucial for businesses to determine the quantity and prices at which goods must be sold so as to ensure that profit is earned. Two primary functions make up the profit function.
- The conventional theory of firm assumes profit maximization as the sole objective of the business firms. Some modern economists, however, refute the profit maximization assumption because, in their opinion, it is practically non-achievable. Their own findings reveal that business firms, especially big corporations, pursue several other objectives, rather than profit maximization. However, some modern economists have strongly defended the profit maximization objective. This has created a controversy on the profit maximization objective of the business firms.
- The arguments against profit-maximization objectives have been strongly rejected by other economists. They argued strongly that pricing theory does have relevance to the actual pricing policy of the business firms. A section of economists has strongly defended the profit maximization objective and 'marginal principle' of pricing and output decisions.
- While the controversy on profit maximization objective remains unresolved, the conventional theorists, the marginalists, continue to defend the profit maximization objective.
- There is no unanimity among the economists and researchers on the objectives of business firms. One thing is, however, certain that the survival of a firm depends on the profit it can make. So whatever the goal of the firm-—sales revenue maximization, maximization of firm's growth, maximization of the value of the firm, maximization of managers' utility function, long-run survival, market share, or entry-prevention—it has to make a profit. The firms, therefore, adopt a more practical approach. Maximization of profit in technical sense of the term may not be practicable, but making a profit has to be the objective of the firms.
- none of these standards of profits is perfect. A standard is, therefore, chosen after giving due consideration to the prevailing market conditions and public attitudes. In fact, different standards are used for different purposes because no single criterion satisfies all conditions and all the people concerned.
- An important managerial aspect of profit is that it is used in measuring and controlling performance of the executives of the large business undertakings. Researches have revealed that business executives of middle and high ranks often deviate from profit objective and try to maximize their own utility functions. They think in terms of job security, personal ambitions for promotions, larger perks, etc., which often conflict with firms' profit-making objective.

11.6 KEY WORDS

- **Marginal Revenue:** It refers to the revenue generated by the sale of one additional unit of product.
- **Marginal Cost:** It is cost incurred in the production of an additional unit.
- **Price Taking Firm:** A firm is called price taking when it cannot affect changes in the market price through the quantity of unit it produces.

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11.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the arguments against profit maximization?
2. Write a short note marginal revenue and its relation to profit maximization.
3. Briefly the connection between profit maximization and short run supply of price taking firms.

Long Answer Questions

1. Discuss the defence of profit maximization, in detail.
2. Describe the concept of reasonable profits.
3. Explain profit as a measure of managerial control.

11.8 FURTHER READINGS

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UNIT 12 GAME THEORY

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Structure

12.0 INTRODUCTION

In the previous units, we have discussed the theories of price and output determination under various models offered by the economists under different conditions of oligopoly market structure, including cartel models of joint profit maximization and collusive models of price leadership. The traditional theories of oligopoly, as discussed in the preceding unit, have not been found theoretically strong enough to explain realistically the interdependence of oligopolistic markets and strategic actions, reactions and counteractions of the oligopoly firms. While traditional theories were evaluated and their deficiencies were pointed out, other academicians – including mathematicians and economists – were making efforts to find reasonable explanation to strategic behaviour of oligopoly firms. They have made significant contributions to explain the strategic behaviour of the oligopoly firms.

In this unit, you will learn about the basic concepts of the game theory, the dominant strategy and wash equilibrium.

12.1 OBJECTIVES

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

- Discuss the concept of game theory
- Explain the dominant strategy
- Describe the Nash equilibrium
- Recall the concepts of repeated and sequential games

12.2 GAME THEORY AND STRATEGIC BEHAVIOUR OF OLIGOPOLY FIRMS

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The first most important contribution to the field of strategic behavour of the oligopoly firms was made by a mathematician John von Neumann and an economist Oskar Morgenstern in 1944. Their contribution was in the form of ***game theory.*** The game theory brings out the strategy used by the oligopoly firms to determine the best possible action to maximize their predetermined objective. Although many other economists have contributed to game theory, Martin Shubik is regarded as the 'most prominent proponent of the game theory approach'. A more recent and in-depth work on the game theory and its application of economics and management problems can be found in the work of Prajit K. Dutta.

In this section, we discuss the ***game theory approach*** to explain the strategic actions and reactions of oligopoly firms.

12.2.1 Basics of Game Theory

Before we proceed to discuss the game theory, it is helpful to understand the meaning and purpose of the game theory and some basic terms and tools used in the analysis and application of game theory.

1. **The Game Theory:** In all kinds of games there are two teams. In all games, the objective of the players of each team is to win the game. To win the game, players make their play-strategy and take action in anticipation of possible reactions of the opposite team and plan their own counter action. This concept of strategic play has been applied by von Neumann and Morgenstern to strategic play of oligopoly firms. As a player, each firm formulates its strategic play and estimates its effects on its objective, called ***pay-off.*** The pay-off may be *positive, negative* or *zero-sum* for a firm taking strategic action. Accordingly, if a strategic action taken by a firm may yield some gains to the firm and counteraction by the rival firm neutralises the gain, it is a ***zero-sum game.*** If both the firms—action-taking firm and rival firms—gain from the strategic action taken by a firm, it is a ***positive-sum game.*** And, if both the firms, action-taking firm and rival firms, make losses from the strategic action taken by a firm, it is a ***negative-sum game.***
2. **Interdependence:** The game theory has been formulated on the basis of a realistic assumption of *interdependence* of oligopoly firms. It implies that decision-making of the firms under oligopoly is *interdependent.* That is, while taking a business decision – be it price determination, advertising, introduction of a new product or brand, setting-up a new production unit, or any other issue – oligopoly firms take into account the possible action and reaction of the rival firms. This kind of behaviour of the oligopoly firms shows their *interdependence.*

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3. **Strategy.** The term 'strategy' means the course of action to be taken by the oligopoly firms with the purpose of gaining most from an action under the condition of unknown reaction of the rival firms. For example, suppose there are two firms – *A* and *B*. Firm *A* plans to cut down the price of its product. But Firm *A* is not sure of the possible reaction of the rival Firm *B*. There are two possible reactions of the rival Firm *B*: (*i*) it may cut down its own price, and (*ii*) it may not cut down the price. The price cutting firm *A* will assess its gain and losses under these conditions and chose the best option. This is the strategy of the price cutting firm.
4. **Pay-off Matrix.** The 'pay-off matrix' is tabular recording of gains and losses of a firm taking an action under different kinds of anticipated reactions of the rival firms. Recall the above example of two firms, *A* and *B*. Firm A estimates its gains and losses in terms of increase in the sales of its product under the following conditions:
   (*i*) Estimated increase in its sales when Firm *A* does not reduce its price;
   (*ii*) Estimated increase in its sales when Firm *A* reduces its price and Firm *B* does not react;
   (*iii*) Estimated increase in its sales when Firm *A* reduces its price and Firms *B* also cuts down the price of its product; and
   (*iv*) Estimated change in its sales when Firm *A* does not cut down its price but Firm *B* does cut down its price.

   When all these estimates are recorded in a cross-sectional tabular form, it produces a *pay-off matrix.*
5. **Dominant Strategy:** As noted above, *strategy* means the course of action planned by an oligopoly firm with the purpose of gaining most from its action. The pay-off of the strategy may be high or it may be low depending on the counteraction taken by the rival firm. A strategic action that yields the best outcome whatever the reaction of the rival firms is called ***dominant strategy.*** In the context of game theory, *dominant strategy* can be defined as *the strategy that gives the best payoff no matter what counteraction is taken by the rival firm.*

Having looked at the 'basics' of the game theory, we proceed now to discuss the game theory and its application to business decision-making. In game theory, the decision-making problem of the oligopoly firms is best exemplified by, what game theorists call, the *prisoners' dilemma.* We begin our discussion with the concept of *prisoners' dilemma* – an example of dilemma faced by the oligopoly firms in decision-making.

12.2.2 Prisoners' Dilemma: The Problem of Oligopoly Firms

The nature of the decision-making problems faced by the oligopoly firms is exemplified in game theory by *prisoner's dilemma.* To illustrate *prisoners'*

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dilemma, let us suppose that two persons, *A* and *B*, are partners in illegal activities. They are arrested under the suspicion of being involved in cricket match-fixing. They are lodged in separate jails with no possibility of communication between themselves. They are interrogated by CBI officials under the following conditions disclosed to each of them in isolation.

1. If you confess your involvement in match fixing, you will get a 5-year imprisonment.
2. If you deny your involvement and your partner denies too, you will be set free for lack of evidence.
3. If you confess and your partner does not confess and you turn approver, then you get 2-year imprisonment and the other person will get 10-year imprisonment.

Given these conditions, each suspect has two options open to him: (*i*) to confess or (*ii*) not to confess. Now, both *A* and *B* face a dilemma on how to decide whether or not to confess. While taking a decision, both have a common objective, i.e., to minimize the period of imprisonment. Given this objective, the option is quite simple that both of them deny their involvement in match-fixing. But, there is no certainty that if one denies his involvement, the other will also deny—the other one may confess and turn approver. With this uncertainty, the dilemma in making a choice still remains. For example, if *A* denies his involvement, and *B* confesses and turns approver (settles for a 2-year imprisonment), then *A* gets a 10-year jail term. So is the case with *B*. If they both confess, then they get a 5-year jail term each. Then what to do? That is the dilemma. The nature of their problem of decision-making is illustrated in Table 12.1 in the form of a 'pay-off matrix'. The pay-off matrix shows the pay-offs of their different options in terms of the number of years in jail.

Table 12.1 *Prisoners' Dilemma: The Pay-off Matrix*

		B's Options			
		Confess		*Deny*	
A's Options	Confess	*A* 5	*B* 5	*A* 2	*B* 10
	Deny	*A* 10	*B* 2	*A* 0	*B* 0

Given the conditions, it is quite likely that both the suspects may opt for 'confession', because neither *A* knows what *B* will do, nor *B* knows what *A* will do. When they both confess, each one gets a 5-year jail term. This is the second best option. For his decision to confess, *A* might formulate his strategy in the following manner. He is supposed to reason out the case in this way: It I confess (though I am innocent), I will get a maximum of 5 years' imprisonment. But, if I deny (which I must) and *B* confesses and turns approver then I will get 10 years' imprisonment. That will be the worst scenario. It is quite likely that suspect *B* also

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reasons out their case in the same manner, even if he too is innocent. If they both confess, they would get jail-term for 5 years and would avoid 10 years' imprisonment, the maximum possible jail sentence under the law. This is the best they could achieve under the given conditions.

Relevance of Prisoners' Dilemma to Oligopoly

The prisoners' dilemma illustrates the nature of problems oligopoly firms are confronted with in the formulation of their business strategy with respect to such problems as strategic advertising, price cutting or cheating the cartel if there is one. Look at the nature of problems an oligopoly firm is confronted with when it plans to increase its *advertisement* expenditure (ad-expenditure for short). The basic issue is whether or not to increase the ad-expenditure. If the answer is 'do not increase', then the following questions arise. Will the rival firms increase ad-expenditure or will they not? If they do, what will be the consequences for the firm under consideration? And, if the answer is 'increase', then the following questions arise. What will be the reaction of the rival firms? Will they increase or will they not increase their ad-expenditure? What will be the pay-off if they do not and what if they do? If the rival firms do increase their advertising, what will be the pay-off to the firm? Will the firm be a net gainer or a net loser? The firm planning to increase ad-spending will have to find the answer to these queries under the conditions of uncertainty. To find a reasonable answer, the firm will have to anticipate actions, reactions and counter-actions by the rival firms and chalk out its own strategy. It is in case of such problems that the case of prisoners' dilemma becomes an illustrative example.

12.2.3 Application of Game Theory to Oligopolistic Strategy

Let us now apply the game theory to our example of 'whether or not to increase ad-expenditure', assuming that there are only two firms, *A* and *B*, i.e., the case of a duopoly. We know that in all games, the players have to anticipate the moves of the opposite player(s) and formulate their own strategy to counter them. To apply the game theory to the case of 'whether or not to increase ad-expenditure', the firm needs to know or anticipate the following two kinds of reactions of the rival firm and their pay-offs.

(*i*) The counter moves by the rival firm in response to increase in ad-expenditure by this firm, and

(*ii*) The *pay-offs* of this strategy under two conditions:

(*a*) when the rival firm does not react, and

(*b*) the rival firm does make a counter move by increasing its ad-expenditure.

In order to find solution to its problem, the firm anticipates the possible reactions of the rival firms and estimates their posible outcomes. The firm will then take decision on the best possible strategy for playing the game and achieving its

objective of, say, increasing sales and capturing a larger share of the market. The best possible strategy in game theory is called the 'dominant strategy'. A *dominant strategy is one that gives optimum pay-off, no matter what the opponent does*. Thus, the basic objective of applying the game theory is to arrive at the dominant strategy.

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Suppose that the possible outcomes of the ad-game under the alternative moves are given in the pay-off matrix presented in Table 12.2.

***Table 12.2** Pay-off Matrix of the Ad-Game*

(Increase in sales in million `)

		B's Options			
		Increase Ad		*Don't increase*	
A's Strategy	Increase Ad	*A* 20	*B* 10	*A* 30	*B* 0
	Don't increase	*A* 10	*B* 15	*A* 15	*B* 5

As the matrix shows, if Firm *A* decides to increase its ad-expenditure, and Firm *B* counters *A*'s move by increasing its own ad-expenditure, *A*'s sales go up by `20 million and those of Firm *B* by `10 million. And, if Firm *A* increases its advertisement and *B* does not, then *A*'s sales increase by `30 million and there are no sales gain for Firm *B*. One can similarly find the pay-offs of the stategy 'Don't increase' in case of both firms. As shown in Table 12.2, if Firm *A* does not increase its Ad-spending and Firm *B* does increase its Ad-spending, then *A*'s sales increases by `10 million and of *B* by `15 million.

Given the pay-off matrix, the question arises: What strategy should Firm *A* choose to optimize its gain from extra ad-expenditure, irrespective of counter-action by the rival Firm *B*. It is clear from the pay-off matrix that Firm *A* will choose the strategy of increasing the ad-expenditure because, no matter what Firm *B* does, its sales increase by at least `20 million. This is, therefore, the ***dominant strategy*** for Firm *A*. A better situation could be that when Firm *A* increases its expenditure on advertisement, Firm *B* does not. In that case, sales of Firm *A* could increase by `30 million and sales of Firm *B* do not increase. But there is a greater possibility that Firm *B* will go for counter-advertising in anticiption of losing a part of its market to Firm *A* in future. Therefore, a strategy based on the assumption that Firm *B* will not increase its ad-expenditure involves a great deal of uncertainty. Under these conditions, the first option gives the dominant strategy for Firm *A*.

12.2.4 Nash Equilibrium

In the preceding section, we have used a very simple example to illustrate the application of game theory to an oligopolistic market setting, with the following simplifying assumptions.

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(*i*) The strategy formulation is a one-time affair,

(*ii*) Only one firm initiates the competitive warfare and other firms only react to action taken by one firm, and

(*iii*) The there exists a *dominant strategy*—a strategy which gives an optimum solution.

The real-life situation is, however, much more complex. There is a continuous one-to-one and tit-for-tat kind of warfare. Actions, reactions and counter-actions are regular phenomena. Under these conditions, a *dominant strategy* is often non-existent. To analyze this kind of situation, John Nash, an American mathematician, developed a technique, which is known by his name as *Nash equilibrium*. ***Nash equilibrium technique*** seeks to establish that each firm does the best it can, given the strategy of its competitors and a *Nash equilibrium is one in which none of the players can improve their pay-off given the strategy of the other players.* In case of our example, Nash equilibrium can be defined as one in which none of the firms can increase its pay-off (sales) given the strategy of the rival firm.

The Nash equilibrium can be illustrated by making some modifications in the pay-off matrix given in Table 12.2. Now we assume that action and counter-action between Firms *A* and *B* is a regular phenomenon and the pay-off matrix that appears finally is given in Table 12.3. The only change in the modified pay-off matrix is that if neither Firm *A* nor Firm *B* increases its ad-expenditure, then pay-offs change from (15, 5) to (25, 5).

Table 12.3 *Nash Equilibrium: Pay-off Matrix of the Ad-Game*

(Increase in sales in million `)

		B's Options			
		Increase AD		Dont't increase	
A's Strategy	Increase Ad	*A* 20	*B* 10	*A* 30	*B* 0
	Don't increase	*A* 10	*B* 15	*A* 25	*B* 5

It can be seen from the pay-off matrix (Table 12.3) that Firm *A* no longer has a *dominant strategy*. Its optimum decision depends now on what Firm *B* does. If Firm *B* increases its ad-expenditure, Firm *A* has no option but to increase its advertisement expenditure. And, if Firm *A* reinforces its advertisement expenditure, Firm *B* will have to follow suit. On the other hand, if Firm *B* does not increase its ad-expenditure, Firm *A* does the best by increasing its ad-expenditure. Under these conditions, the conclusion that both the firms arrive at is to increase ad-expenditure if the other firm does so, and 'don't increase', if the competitor 'does not increase'. In the ultimate analysis, however, both the firms will decide to increase the ad-expenditure. The reason is that if none of the firms increases its ad-outlay, Firm *A* gains more in terms of increase in its sales (`25 million) and the

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gain of Firm *B* is much less (` 5 million only). And, if Firm *B* increases advertisement expenditure, its sales increase by ` 10 million. Therefore, Firm *B* would do best to increase its ad-expenditure. In that case, Firm *A* will have no option but to do likewise. Thus, the *final conclusion* that emerges is that both the firms will go for advertisement war. In that case, each firm finds that it is doing the best given what the rival firm is doing. This is the Nash equilibrium.

However, there are situations in which there can be more than one Nash equilibrium. For example, if we change the pay-off in the south-east corner from (25, 5) to (22, 8); each firm may find it worthless to wage advertisement war and may settle for 'don't increase' situation. Thus, there are two possible Nash equilibria.

Concluding Remarks

What we have presented here is an elementary introduction to the game theory. It can be used to find equilibrium solution to the problems of oligopolistic market setting under different assumptions regarding the behaviour of the oligopoly firms and market conditions. However, despite its merit of revealing the nature and pattern of oligopolistic warfare, game theory often fails to provide a determinate solution.

12.2.5 Repeated and Sequential Games

Sequential games are a type of strategic game theory in which the decision of the firms and the respective outcomes affects the course which the game takes. The decision strategies are represented here in the form of decision tree. Each decision tree gets a sub-node depending on the entry of the firms. The decisions then in a way affect the functioning of the game theory in the market.

Repeated games are slightly at higher stakes than sequential games, since here the decisions are taken keeping in mind the past actions of the firm. It is called a super game of sorts since it plays out over an extended period of time. Since it is pretty complicated, it is represented through an extensive form. It brings into play strategic incentives, The question of cooperation is also brought in. The firm must use this cooperation factor with consideration that if his/her firm does hold the end of the bargain, the rival firm may follow suit and deny previously promised deals. Since the playing field is huge, the firms taken into consideration the overall behaviour and past actions of the firm before taking any decision.

Check Your Progress

1. Who developed the game theory?
2. What is the zero-sum game?
3. State the basic objective of applying game theory.

12.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. The game theory was developed by a mathematician John von Neumann and an economist Oskar Morgenstern in 1944.
2. If the strategic action taken by a firm may yield some gains to the firm and counteraction by the rival firm neutralizes the gain, it is a zero-sum game.
3. The basic objective of applying game theory is to arrive at the dominant strategy.

12.4 SUMMARY

- The traditional theories of oligopoly have not been found strong enough to explain realistically the interdependence of oligopolistic markets and strategic actions, reactions, and counteractions of oligopoly firms.
- The game theory brings out the strategy used by the oligopoly firms to determine the best possible action to maximize their pre-determined objective.
- The concept of strategic play has been applied by von Neumann and Morgenstern to strategic play of oligopoly firms. As a player, each firm formulates its strategic play and estimates its effects on its objective called pay-off.
- A strategic action that yields the best outcome whatever the reaction of the rival firms is called dominant strategy.
- The nature of the decision-making problems faced by the oligopoly firms is exemplified in game theory by prisoner's dilemma.
- The prisoners' dilemma illustrates the nature of problems oligopoly firms are confronted with in the formulation of their business strategy with respect to such problems as strategic advertising, price cutting or cheating the cartel if there is one.
- A Nash equilibrium is one in which none of the players can improve their pay-off given the strategy of the other players.

12.5 KEY WORDS

- **Game Theory:** It is the strategy used by the oligopoly firms to determine the best possible action to maximize their predetermined objective.

- **Dominant Strategy:** It refers to the strategic action that yields the best outcome whatever the reaction of the rival firms.
- **Nash Equilibrium:** It refers to the technique in which none of the firms can increase its pay-off given the strategy of the rival firm.

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12.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Who were the major proponents of the game theory?
2. What are the different pay-offs in the game theory?
3. Write a short notes on the pay-off matrix and dominant strategy in game theory.
4. What are repeated strategies and sequential games?

Long Answer Questions

1. Describe the concept of prisoner's dilemma.
2. Explain the Nash equilibrium in detail.

12.7 FURTHER READINGS

Dwivedi, D. N. 2002. *Managerial Economics*, 6th Edition. New Delhi: Vikas Publishing House.

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BLOCK - IV

THEORIES OF WELFARE

NOTES

UNIT 13 THEORIES OF WELFARE ECONOMICS-I

Structure

13.0 INTRODUCTION

As regards the origin of welfare economics, it is very difficult to point out the period in the history of economic thoughts which marks the beginning of welfare economics. Nor is it reasonable to associate the emergence of welfare economics with any particular economist, because E. J. Mishan points out that 'welfare economics does not appear at any time to have wholly engaged the labours of any one economist'. Some believe that Pigou's *Wealth and Welfare* and his later work *Economics of Welfare* mark the emergence of welfare economics as a separate branch of economics. But Hla Myint has pointed out, in his *Theories of Welfare Economics*, that the classical economist had a great deal to say on a subject which could reasonably be brought within the compass of welfare economics. Many textbooks, however, commence discussion on welfare economics with Pareto. In this unit, you will learn the basic of welfare economics.

13.1 OBJECTIVES

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

- Explain the meaning and nature of welfare economics

- Describe the Pareto optimal conditions
- Discuss the Paretian welfare criterion
- Examine the social welfare function
- Describe the compensation principle

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13.2 MEANING AND NATURE OF WELFARE ECONOMICS

Welfare economics is the study of economic welfare of the members of a society as a group. In the words of Oscar Lange, 'Welfare economics is concerned with the conditions which determine the total economic welfare of a community.' Reder defines 'welfare economics' as that 'branch of economics science that attempts to establish and apply the criteria of propriety to economic policies.' In his survey of welfare economics, Mishan defines 'theoretical welfare economics' as 'that branch of study which endeavours to formulate propositions by which we may rank on the scale of better and worse, alternative economic situations open to society'. The function of welfare economics is to evaluate the alternative economic situations and determine whether one economic situation yields greater economic welfare than others. Welfare economics may also be defined as that branch of economic science which evaluates alternative economic situations (i.e., alternative patterns of resource allocations) from the viewpoint of economic well-being of the society as a whole.

Nature of Welfare Economics

Economists hold different views on the question *whether welfare economics is a positive (pure) or normative (applied) science.* Although welfare economics has been closely associated with positive economics from the inception of economic thinking, 'at one point in economic thought, it was felt that welfare economics was unscientific; that it was normative and was hence a branch of ethics. . . .' (M. W. Reder, *Studies in the Theory of Welfare Economics*). It was also argued that welfare economics is concerned with 'what ought to be' and, hence, it is 'normative' in character. This view, however, has not been universally held. Pigou, for example, was concerned, in his *Economics of Welfare*, with the causes of economic welfare and did not make any policy recommendation. Pigou's *Economics of Welfare* is, therefore, a positive study.

A widely held view on this issue is that *welfare economics is both a positive and a normative science.* Positive economics is primarily concerned with understanding, explaining and predicting the working of the economic system. Welfare economics is a positive science insofar as it attempts to explain and predict the outcome of the functioning of the economic system. Welfare propositions 'may be subjected to test in the same way as those of positive economics,' though testing welfare propositions is much more difficult than the propositions of general

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positive economics. The information gained through positive analysis is useful in devising appropriate policy measures to maximize the welfare of the society. The task of normative economics is to determine 'what ought to be'. Welfare economics is a normative science in that it provides guidelines for policy formulations to maximize social welfare. Maximization of economic welfare presumes a welfare function which consists essentially of value judgements. Given the welfare function, welfare economics, as a normative science, provides guidelines for appropriate policy measures.

13.3 PARETIAN WELFARE CRITERION

It was Vilfred Pareto, an Italian economist, who broke away from the cardinal utility tradition and gave a new orientation to welfare economics. He rejected cardinal utility concept and additive utility function on the ground of their limitations. With the rejection of cardinal utility thesis, the attempts to quantify the social welfare ended, at least temporarily, perhaps because welfare is not an observable quantity like a market price or an item of personal consumption.

Pareto introduced a new concept, i.e., the concept of *social optimum*. This concept is central to Paretian welfare economics. The basic idea behind this concept is that while it is not possible to add up utilities of individuals to arrive at the total social welfare, it is possible to determine whether social welfare is optimum. Conceptually, social welfare is said to be *optimum* when nobody can be made better-off without making somebody worse-off. In the words of Boulding, 'A social optimum is defined as a situation in which nobody can move to a position which he prefer without moving somebody else to a position which is less preferred.'

The basic point in regard to the concept of social optimum which need to be noted is that social optimum does not define (or determine) a quantity or magnitude of welfare. It is rather associated with the question whether the magnitude of social welfare from a given economic situation can be or cannot be increased by changing the economic situation. The test of increase in social welfare is that at least one person should be made better-off without making anybody else worse-off.

However, it is difficult to conceive economic policies which can improve the welfare of an individual without injuring another. To overcome this problem, the economists, viz., Kaldor, Hicks and Scitovsky, have evolved the **compensation principle**. This principle states that the person who benefits from an economic policy or reorganization must be able to compensate the person who becomes worse-off due to this policy and yet remain better-off.

Modern welfare economics does not attempt to quantify the total social welfare. It concerns itself with only the indicators of change in welfare. It analyses whether total welfare increases or decreases when there is a change in economic situation. This approach is based on the premise that while cardinal measurement of utility is not possible, expression of utility in ordinal sense is possible and it is an

adequate guide to change in the welfare of an individual. It is this principle on which the modern welfare criteria are based.

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Pareto's Welfare Economics

Pareto's *Manual of Political Economy* (1906) represents a decisive watershed in the history of subjective welfare economics. Pareto broke away from the traditional utilitarian economics. He rejected the hypothesis based on cardinal utility and also the additive utility function, and arrived at his welfare conclusions which do not require any interpersonal comparison whatever. Some have, therefore, called Pareto's welfare economics as new welfare economics.

Pareto Optimum

Pareto optimum is also called as Pareto efficiency, Pareto unanimity rule, Pareto criteria, and Social optimum. Pareto optimum is defined as a position from which it is not possible to improve welfare of any one by any reallocation of factors or of goods and services without impairing the welfare of someone else. In other words, a Paretian optimum position is attained when it is not possible, through any reallocation of resources or reorganization of economy, to make anyone better-off in the sense of putting him on a higher indifference curve without making someone worse-off in the sense of making him go down on a lower indifference curve on the scale of his preference. From the concept of Pareto optimum, is derived *Pareto Criterion* of welfare. According to Pareto criterion, any change that makes at least one person better-off without making someone else worse-off definitely causes an improvement in social welfare. Conversely, any change that makes at least one person worse-off and no one better-off causes decrease in social welfare.

Criticism of Pareto Optimality

The Paretian concept of 'social optimum' is definitely an improvement over cardinal utility approach, in that it is, as is claimed, free from the problems of additive utility function and interpersonal comparison of utility. The concept has however been criticized on the following grounds.

First, Pareto's optimum does not define a unique optimum economic situation. As Winch has pointed out, 'There are three aspects of optimum performance of an economic system, associated respectively with the three basic functions—the transformation function, the utility function and the welfare function. The unique optimum economic situation requires perfect performance in all the three respects, but the term Paretian Optimum has come to mean the simultaneous fulfillment of the first two functions regardless of the third.' There are therefore an infinite number of Paretian optima that satisfy the optimality conditions. The Paretian optimum, however, does not determine the *optimum optimorum*—the best of the best. In fact, each Paretian optimum (as defined above) is sub-optimum. It is, therefore, quite likely that an optimum situation which corresponds to a bad distribution of income may be worse than a sub-optimum position corresponding to a good

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distribution of income. That is, a situation in which Pareto optimality conditions are fulfilled may well be inferior to a number of other situations in which they are not fulfilled.

Second, it follows from the above that Pareto optimum does not guarantee the maximization of social welfare. Any point on production possibility curve, given the factor prices and technology, may satisfy Paretian efficiency in production. But, as we will show later, all points do not represent the maximum social welfare. Thus, Pereto optimum, as it is defined, offers only necessary but, not sufficient condition of welfare maximization.

Third, Pareto optimum raises the question of payment of compensation because it is difficult to imagine an economic change that benefits at least one person without harming another. If interpersonal comparisons are rejected, then we cannot say whether gains of the person who benefit from the change is greater than or equal to or less than the loss of the person who suffers from the change. It may thus be said that Pareto optimum does not offer a measure to evaluate the change that makes some persons better-off and some others worse-off.

Check Your Progress

1. State the function of welfare economics.
2. Who gave the concept of Pareto optimality?
3. Which idea is central to the concept of Paretian welfare economics?

13.4 PARETO OPTIMAL CONDITIONS

Having described the concept by Pareto optimum and its weaknesses, we discuss, in this section, the first order conditions that must be satisfied to attain the maximum social welfare in accordance with Pareto optimality. Hicks calls these conditions marginal conditions of maximum welfare. The marginal conditions of Pareto optimality or Pareto efficiency have been set out by Hicks, Lerner and Lange.

The marginal conditions of maximum welfare have been derived directly from the definition of maximum welfare. As mentioned above, maximum social welfare is achieved when it is impossible to make any one better-off, by reallocating resources, without making someone else worse-off. Achieving maximum social welfare in this sense is possible only when allocation of productive factors between the various commodities, allocation of commodities between the consumers, and allocation of productive factors between the different firms are all optimum. Pareto optimality is, therefore, also called as *allocative efficiency*.

First order conditions: We now turn to explain the *marginal conditions* or the *first order conditions* of Pareto optimality in welfare maximization under the following categories:

- **Pareto optimality in exchange,** i.e., optimum allocation of products among the consumers
- **Pareto optimality in production,** i.e., optimum allocation of input and output among the firms
- **General optimality of production and exchange,** i.e., simultaneous fulfillment of production and exchange optimality conditions
- **Other optimality conditions** of welfare maximization

Assumption of Paretian Model

Before we explain the marginal conditions of welfare maximization, let us set out the necessary assumptions which are usually made for the fulfilment of marginal conditions.

1. We assume a model of two commodities (*X* and *Y*), two consumers (*A* and *B*), two inputs (capital, *K* and labour, *L*) and two firms (F_1 and F_2), respectively.
2. Consumers maximize their respective utility functions which are independent of each other.
3. Inputs, *K* and *L*, are homogeneous, perfectly divisible, and available in fixed quantities which are exogenously determined. Both inputs are used in the production function of both the goods.
4. Production functions for both goods are given.
5. There is perfect competition in both product and factors markets.

1. Pareto optimality condition of exchange

Pareto optimality in exchange is achieved when allocation of commodities among the consumers is such that it is not possible to increase the satisfaction of any person without reducing the satisfaction of someone else. The marginal condition that must be fulfilled to achieve Pareto optimality (or efficiency) in exchange requires that marginal rate of substitution between any two products must be the same for every consumer of both the products. This marginality condition, with reference to two-commodity and two-consumer model, may be expressed as:

$$MRS^{A}_{x,y} = MRS^{B}_{x,y}$$

It means that the ratio of the marginal utilities of any two products must be the same for every consumer. In a situation in which this condition is not fulfilled, it will always be possible to increase the total welfare by transferring some units of a good from a person who derives a lower utility to the person who derives a greater utility.

The Pareto optimum allocation of goods among the consumers is illustrated by using Edgeworth box diagram, as presented in Figure 13.1 assuming that there

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are only two consumers, *A* and *B*, and only two commodities *X* and *Y*. In Figure 13.1, O_A is the point of origin for consumer *A* and point O_B for consumer *B*. The length of the horizontal axis of the diagram, $O_AM = O_BN$ represents the total quantity of commodity *X* available to consumers *A* and *B*, and the length of the vertical axis, $O_AN = O_BM$ shows the total quantity of commodity *Y*. Indifference curves A_1 to A_5 represent *A*'s scale of preference and B_1 to B_5 represent *B*'s scale of preference. The Edgeworth contract curve *CC'*, represents the points on indifference map that satisfy the Pareto optimality condition of exchange. Every point on the *CC'* curve satisfies the marginality condition, that is,

$$MRS^A_{x,y} = MRS^B_{x,y}$$

Distribution of goods, *X* and *Y*, between consumers *A* and *B* represented by any other point is inefficient. Therefore, movement towards a point on contract curve improves the satisfaction level of either both the consumers or of at least one consumer without affecting the satisfaction of the other. For example, suppose both the consumers are at point *J*. Movement along the curve *JK* increases the satisfaction of *A* as he moves to an upper indifference curve from A_2 to A_3 while *B* remains on the same indifference curve, B_3. Similarly, movement from point *J* towards *L* increases the satisfaction of *B*, without affecting *A*'s satisfaction. Any point in the shaded area, say *H*, indicates the increase in the satisfaction of both, *A* and *B*, as both move onto their upper indifference curves. Thus, movement towards the contract curve from any other point shows the improvement in the total welfare. Since contract curve is formed by joining the points of tangency of indifference curves of consumers *A* and *B*, and at each point of tangency marginal rates of substitution ($MRS_{x,y}$) between the two goods, *X* and *Y*, is the same for both the consumers, each point on the contract curve satisfies the Pareto optimality condition of exchange.

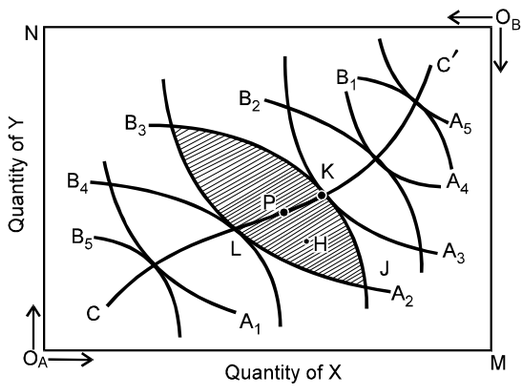

Fig. 13.1 *Edgeworth Box Diagram: Efficiency in Exchange*

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The following inferences can be drawn from the information contained in Figure 13.1.

1. Since there are infinite points on the contract curve *CC'* that satisfy the optimality condition, there are infinite Pareto optima.
2. It is not possible to conclude that every Pareto optimum solution indicates greater social welfare than that indicated by every non-optimal point. For example, we cannot compare optimal point *K* with non-optimal point *H* because while *A* will prefer optimal point *K*, *B* will prefer a non-optimal point, *H*. Thus without an explicit interpersonal comparison of utilities it will not be possible to judge which of the two points (*K* or *H*) is socially optimal.
3. An upward movement on the contract curve makes *A* better off and *B* worse off. Similarly, a downward movement makes *B* better off and makes *A* worse off. Therefore, it cannot be said that every point on the *CC'* curve represents optimum optimorum.

2. Pareto optimality in production: Optimum allocation of productive factors

The second marginal condition of Pareto optimality is related to optimal allocation of factors (*L* and *K*) between the products (*X* and *Y*). Pareto optimality in factor allocation requires that factors are so allocated between goods *X* and *Y* that it is not possible to increase the output of any commodity by reallocating the factors, without causing decrease in the production of another. The marginal condition that must be fulfilled to achieve Pareto optimality in resource allocation is that marginal rate of technical substitution (*MRTS*) between *L* and *K* is the same for both the goods, *X* and Y_2, produced by F_1 and F_2. Technically, optimum allocation of inputs between *X* and *Y* requires that:

$$MRTS^{X}_{L,K} = MRTS^{Y}_{L,K}$$

Pareto optimality in the allocation of factors between the two products and also between the two firms has been presented in Edgeworth box diagram given in Figure 13.2. The analysis is analogous to one developed to present the marginal condition of optimum allocation of goods between the consumers.

In Figure 13.2, horizontal axis measures the total amount of labour ($O_x W$) and vertical axis represents the total quantity of capital ($Q_x M$) available for production of commodities *X* and *Y*. Isoquant map for commodity *X* is given by X_1, X_2, X_3, X_4 and X_5 with origin O_x. And isoquant map of commodity *Y*, with origin at O_y is inverted and superimposed on the isoquant map of *X*. Isoquants for *Y* are given by Y_1, Y_2, Y_3, Y_4 and Y_5. The curve joining the two points of origin, O_x and O_y is obtained by connecting tangential points of isoquants for *X* and *Y*. This curve, called **contract curve of production**, is the locus of tangency points of the isoquants of the two firms F_1 and F_2 both producing goods *X* and *Y*. At each point of tangency, the *MRTS* for both goods is the same, that is,

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$$MRTS^{X}_{L,K} = MRTS^{Y}_{L,K}$$

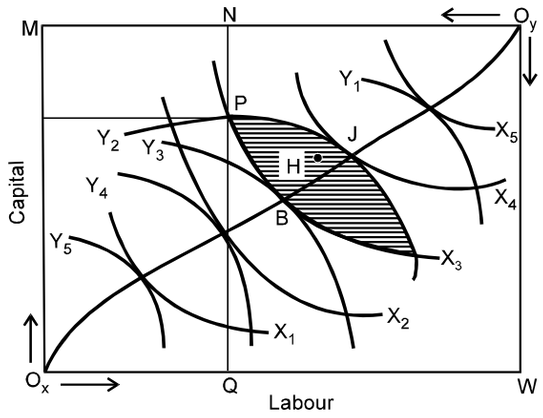

Fig. 13.2 *Edgeworth Box of Production*

Therefore, only those points which lie on the contract curve of production represent the Pareto optimality or Pareto efficiency in production. Any other point that satisfies the above condition is inefficient. For example, let us consider point *P*, where O_xQ (= *MN*) of labour is allocated to the production of *X* and *QW* (= O_yN) of labour to the production of *Y*. And, *PQ* of capital is allocated to *X* while *PN* of capital goes to the production of *Y*. Note that isoquant X_3 and Y_2 intersect at point *P*. Therefore, $MRTS^{X}_{L,K} = MRTS^{Y}_{L,K}$. Yet Point *P* marks Pareto inefficient allocation of *L* and *K* between *X* and *Y*. For, any movement towards the contract curve, through the shaded area will improve the efficiency in resource allocation for both the goods. For example, factor allocation represented by point *H* will increase the production of both, *X* and *Y*, as both products move onto higher isoquants.

Movements along the ridge lines of the shaded area improves the output of one of the commodities without reducing the production of the other. Therefore, any point on the ridge lines indicates a more efficient allocation of *L* and *K*, than point *P*. For Example, movement along *PJ* indicates reallocation of factors which leads to increase in the production of *X* without reducing production of *Y*. Similarly, movement along *PB* increases production of *Y* without affecting output of *X*. But, once a point on contract curve is reached, it will not be possible to increase the production of any commodity without reducing of the other. Thus, each point on the contract curve Q_xO_y represents optimal allocation of *K* and *L* between *X* and *X* in Paretian sense.

Again, Pareto optimality condition of production does not offer a unique solution. It can be seen in Figure 13.2 that there are infinite points on the contract curve of production that satisfy the marginal condition of Pareto optimality. But a reasoning analogous to one applied to the optimality condition in Figure 13.1, it is not possible to say which point on the production contract curve represents optimum optimorum.

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Optimal allocation of resources between firms

Another condition that must be satisfied for Pareto optimality of production is optimum degree of specialisation of firms. That is, each firm produces *X* and *Y* in such quantities that it is not possible, by reallocation of output among firms, to increase the output of any of these goods without reducing the output of the other. A necessary condition that must be fulfilled is that marginal rates of transformation (*MRT*) between *X* and *Y* must be the same for all firms producing them both. This is however not a sufficient condition. Sufficient condition requires that the equality of *MRT* be found at the point of tangency of *MRT* curves—not at the points of intersection. If this condition is not fulfilled it will always be possible to increase the total social product by reallocating goods between firms.

For example, if firm F_1 can produce one additional unit of *X* at the cost of 3 units of *Y*, and firm F_2 can produce 2 units of *Y* at the cost of one unit of *X*, then *MRT* for F_1 is $1X = 3Y$, and for F_2, it is $2Y = 1X$. It means that if F_1 produces one unit less of *X* and F_2 produces one additional unit of *X*, then production of *Y* can be increased by one unit, without reducing the production of *X*.

This point can be represented graphically as follows. Suppose that the marginal rates of transformation (*MRT*) curves of firms F_1 and F_2 for products *X* and *Y* are, respectively, given as *CD* and *EF* in Figure 13.3(a) and (b). If we invert the panel (b) shifting its origin O_{F2} to north-east corner, the position that emerges will be as shown in Figure 13.4. The *MRT* curves *CD* and *EF* intersect each other at two points, P_1 and P_2.

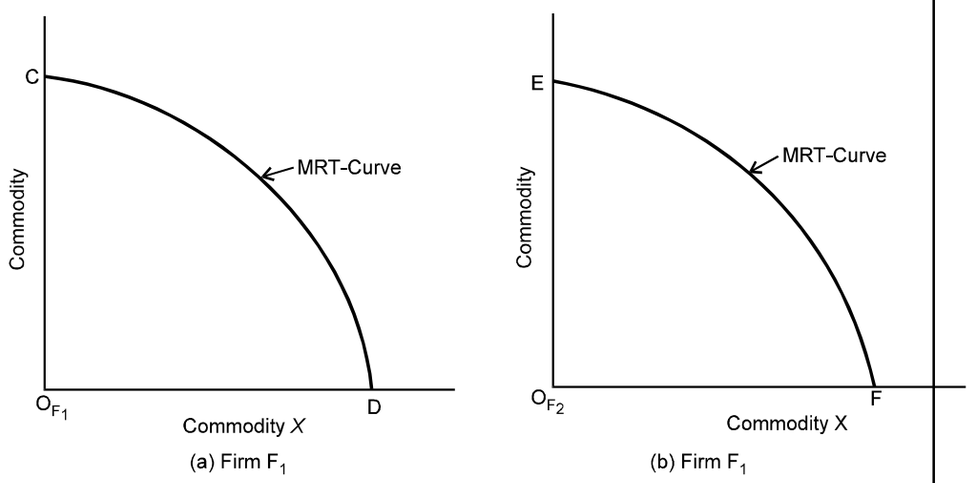

Fig. 13.3 *Marginal Rate of Transformation Curves*

At both points P_1 and P_2, the *MRT* of firm F_1 equals *MRT* of firm F_2. But none of these points optimizes the output of the two firms. Nor does it maximize the output of *X* and *Y*. For example, if two firms settle at point P_2, firm F_1 will produce MP_2 of *X* and QP_2 of *Y*, and firm F_2 will produce NP_2 of *X* and RP_2 of *Y*.

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By adding the output of each commodity produced by each firm, we can obtain the total output of *X* and *Y*.

$$\text{Total output of } X = MP_2 + NP_2 = MN$$
$$\text{Total output of } Y = QP_2 + RP_2 = RQ$$

Thus, if the two firms settle at point P_2, the maximum total output of *X* will be *MN* and that of *Y* will be *RQ*. It may be noted from Figure 13.4 that total output of *X* and *Y* will not change if firms settle at point P_1, though output mix of each firm will change.

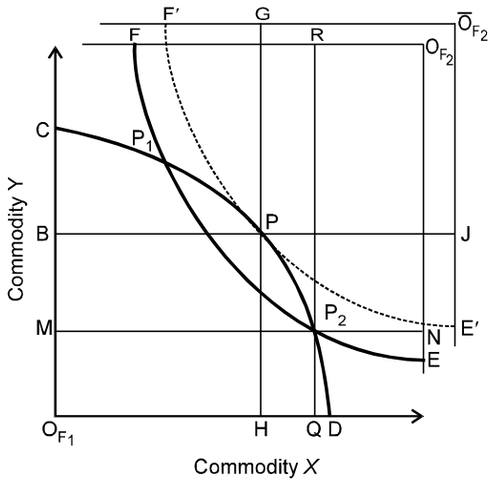

Fig. 13.4 *Optimum Degree of Specialisation*

It may, however, be observed from Figure 13.4 that if the firms move from point P_2 towards P_1 (or from point P_1 towards P_2) along their respective *MRT* curves, production of both *X* and *Y* will increase to a certain level and then decreases. The maximum output of *X* and *Y* can be obtained by shifting the inverted panel (b) further north-eastward until *MRT* curve *EF* is tangent to *MRT* curve *CD*, while its origin shifts to $\bar{O}_{F_2}$. As shown in Figure 13.4, *MRT* curves, *CD* and *EF* are tangent with each other at point *P*. This point satisfies both necessary and sufficient conditions of Pareto optimality of specializations between firms for output mix. At point *P*, firm F_1 produces *PH* of *Y* and *PB* of *X* and firm F_2 produces *PJ* of *X* and *GP* of *Y*. Thus,

Total output of $X = BP + PJ = BJ$, and $BJ > MN$ Total output of $Y = PH + PG = GH$, and $GH > RQ$

The output *GH* of *X* and *BJ* of *Y*, is maximum that can be produced given the factors. Also, the output-mix at the two firms is optimum.

3. General optimality of production and exchange

The third necessary condition that must be fulfilled to optimize the social welfare in the Paretian scheme is that the bundle of factors used and goods produced in the

economy be so organized that greater satisfaction of one person is impossible without loss for another. For this, it is necessary that optimality conditions of both production and exchange must be fulfilled simultaneously and at the same level of output of various goods. In other words, the optimum output-mix must match with the optimum demand mix. This is called, the 'Top Level' optimality condition of welfare maximization.

The fulfilment of the top level Pareto optimality condition requires (for our 2 × 2 × 2 model) that the *MRT* between the two products (*X* and *Y*) must be equal to the *MRS* between the two products for the two consumers (*A* and *B*). That is,

$$MRT_{x,y} = MRS^{A}_{x,y} = MRS^{B}_{x,y}$$

The fulfilment of this condition is graphically illustrated in Figure 13.5. The curve *TT'* is the production possibility (or product transformation) curve. The slope of curve *TT'* gives the *MRT*. The indifference curves of consumer *A* are given by A_1, A_2, A_3, ... and those of consumer *B* are given by B_3, B_4, ... (for details see Figure 13.1). Curve *CC'* is the contract curve of exchange. The product transformation curve *TT'* is intersected by the contract curve of exchange *CC'*, at point *P*. We know that at each point on *CC'* curve:

$$MRS^{A}_{x,y} = MRS^{B}_{x,y}$$

The product transformation curve *TT'* shows the *MRT*, the rate at which one commodity can be transformed into the other, given the technology. Although *MRT* is different at different points of the transformation curve *TT'*, it is equal to *MRS* at point *P*. Point *P* satisfies therefore the third Pareto optimality condition of welfare maximization.

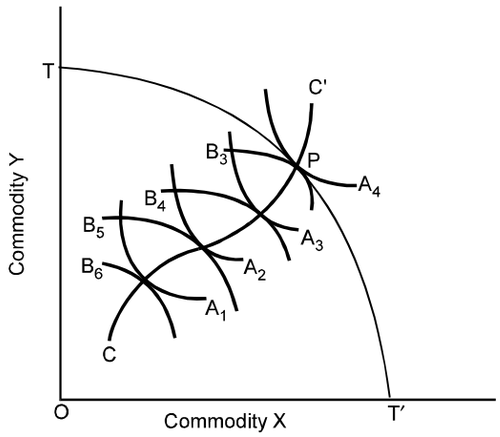

Fig. 13.5 *General Optimality of Production and Exchange*

We may now summarise the basic marginal conditions of Pareto optimality.

1. The marginal rate of substitution (*MRS*) between any pair of goods must be the same for all consumers.

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2. The marginal rate of technical substitution (*MRTS*) between any pair of factors must be equal for all commodities and all firms.
3. The marginal rate of transformation (*MRT*) between any pair of goods must be equal to the marginal rates of substitution for any pair of goods.

4. Other conditions of Pareto optimality

In addition to the three optimality conditions explained above, the following marginal condition must also be simultaneously satisfied for social welfare to be maximum.

First, the owner of a factor is always in a position to use it for personal satisfaction or to rent it out for income, or use it partly for personal use and for earning income. If it is rented out, the reward that is paid to the owner for renting the marginal unit of a factor must be equal to the value of the marginal physical product of the factor unit. This is what Pareto calls the optimum allocation of *factor-units time.*

Second, the marginal rate of substitution between resource control at any pair of moments (t_i and t_j) is the same for every pair of individuals or firms including pairs in which one member is a firm and the other is an individual. This condition relates to optimum control of resources through time by individuals and firms. This is *inter-temporal condition* of maximum welfare.

Third, Boulding has pointed out two other conditions relating to time-preference which have not been explicitly stated in the literature: (i) that owner rates of *time preference* for any one individual for two commodities must be the same; and (ii) that the rate of *time preference* for an individual must be equal to the rate of *time substitution* in production (the marginal own-rate of return) for every commodity.

Total Conditions' of Pareto Optimality

Even if first order conditions are satisfied, it does not ensure the maximization of social welfare. There is another 'set of conditions', what Hicks calls 'total conditions' that must be satisfied in order that social welfare is maximized. The 'total conditions' may be stated as 'it must be impossible to increase welfare by producing a product not otherwise produced (or produced by only one firm); or by using a factor not otherwise used (or used by only one firm)'.

Thus, in order that social welfare is maximum, all the conditions first order, second order, and total conditions—must be simultaneously satisfied. But this maximum will not be unique. The reason is that it presupposes a given distribution of income which is not determined by the optimality conditions of welfare maximization. If income distribution (presumed to the given) changes, it will cause a change in welfare maximizing output and factor allocation.

Pareto Optimality under Perfect Competition

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A necessary condition for Pareto optimality is the existence of perfect competition in both product and factor markets. In this section, we will show how perfect competition leads to Pareto optimality in exchange or consumption and production.

(i) **Efficiency in exchange under perfect competition:** Pareto optimality of exchange requires that marginal rate of substitution between any two goods must be the same for all individuals consuming them both, i.e.,

$$MRS^{A}_{x,y} = MRS^{B}_{x,y}$$

Every utility maximizing consumer attains his equilibrium (or the level of maximum satisfaction) where:

$$MRS_{x,y} = \frac{P_x}{P_y}$$

where P_x, P_y are prices of commodities, X and Y, respectively.

We know that under perfect competition, P_x and P_y are given for all the consumers. Therefore,

$$MRS^{A}_{x,y} = MRS^{B}_{x,y} = P_x/P_y$$

Under perfect competition, this condition holds for any pair of goods for all the consumers consuming them both. Perfect competition, therefore, ensures optimality in exchange.

(ii) **Efficiency in production under perfect competition:** Pareto efficiency (or optimality) in production requires that *MRTS* between any two factors must be the same for all commodities for whose production both these factors are used. With reference to two-products, X and Y, and two factors, L and K, in our model, this condition may be expressed as:

$$MRTS^{X}_{l,k} = MRTS^{Y}_{l,k}$$

Profit maximizing firms are in equilibrium, with respect to a product (say X), where:

$$MRTS^{X}_{l,k} = \frac{P_l}{P_k} = \frac{w}{r}$$

where $P_l = w$ = wages, and $P_k = r$ = rate of interest.

When factor market is perfectly competitive, P_l and P_k are the same for all the firms using L and K. Therefore,

$$MRTS^{X}_{l,k} = MRTS^{Y}_{l,k} = P_l/P_k$$

Thus, perfect competition ensures also the optimality of production, i.e., the first order condition of maximum welfare.

(iii) **Efficiency in production and exchange under prefect competition:** The third condition of Pareto optimality requires that *MRS* must be equal to *MRT* for all products. We have already shown that:

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$$MRS_{x,y} = \frac{P_x}{P_y}$$

Under perfect competition, a profit maximising firm sets its optimum combination of output where:

$$MRT_{x,y} = \frac{\Delta Y}{\Delta X} = \frac{MC_x}{MC_y}$$

Since in a perfectly competitive market, $MC_x = P_x$ and $MC_y = P_y$, therefore,

$$MRT_{x,y} = \frac{MC_x}{MC_y} = \frac{P_x}{P_y}$$

Since $MRS_{x,y} = \frac{P_x}{P_y}$,

therefore, $MRS_{x,y} = \frac{P_x}{P_y} = MRT_{x,y}$

It is then proved that, under perfect competition, all the three Pareto optimality conditions of welfare maximization are satisfied. It is thus established that perfect competition ensures the maximization of social welfare provided second order conditions are simultaneously satisfied.

Some Exception

We have concluded above that perfect competition is a necessary condition for attainment of Pareto optimality in exchange and production. There are, however, certain cases in which perfect competition is neither a necessary or a sufficient condition for maximising welfare in the Paretian sense. Besides, there are certain other factors which cause non-optimisation of welfare measures even if first order conditions are satisfied under perfect competition. Some important cases of these categories are given below.

1. **Pareto optimality in exchange may not be attained under perfect competition if one or more consumers are satiated.** A consumer is said to be satiated or has reached the maximum possible level of his satisfaction when his $MU = O$ for all goods that he consumes. If a consumer is satiated, goods may be diverted from him, without reducing his total satisfaction, to those whose $MU > O$. This results in increase in the total satisfaction of the society. Therefore, one additional condition of Pareto optimality under perfect competition is that no consumer is satiated.
2. **Corner solution prevents Pareto optimality.** In some cases, under perfect competition, Pareto optimality may be represented by a corner solution, as shown by point *C* in Figure 13.6. In such cases, marginality condition is not satisfied. Yet in an optimum solution, such a solution represents minimum rather than maximum welfare. In such cases, thus, perfect competition offers

a solution which represent only minimum welfare, because only commodity *Y* will be produced and consumed.

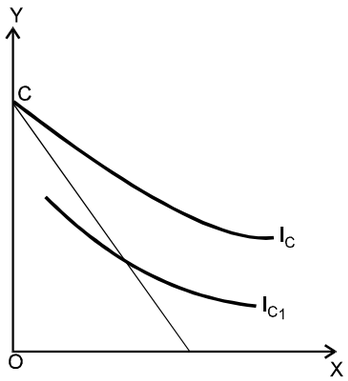

Fig. 13.6 *Corner Solution of Pareto-Optimality*

13.4.1 Externalities and Pareto Optimality

The foregoing conclusion that perfect competition leads to Pareto optimality is based upon the assumption that there are no externalities in consumption and production. This assumption implies:

- That production function of each producer is independent of others
- Utility function of each individual is independent of others

If independence of production and utility functions is not assumed, activity of an individual (firm or consumer) will affect the activities of others (firms or consumers). Such effects are known as ***externalities***. If externalities are present, Pareto optimality may not be attained even under the conditions of perfect competition.

In this section, we will explain externalities of various kinds and how they affect the realization of Pareto optimality under perfect competition.

Meaning of externalities

The term *externalities* refers to the external economies and diseconomies. ***External economies*** are the gains that arise from the activities of an economic unit and accrues to other members of the society for which they cannot be charged through the market price system. Similarly, ***external diseconomies*** are the costs that are imposed on the members of the society by the activities of others for which market system does not provide a compensation to those who suffer. External economies and diseconomies arise in both production and consumption. Let us now examine the effects of external economies and diseconomies in production and consumption on welfare maximization.

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Externalities in Production

Externalities in production consist of both external economies and external diseconomies. External economies and diseconomies are discussed below.

External economies in production

To understand the external economies in production, consider the following examples:

1. When an irrigation facility is extended to non-irrigated areas, productivity of land increases and land values go up. The land owners who gain are not required to bear the cost of irrigation programmes.
2. When new production units of an industry are set up, the demand for inputs increases. This increase in demand for inputs might give an opportunity to the input suppliers to expand their production. The expansion of production might reduce the cost of input production due to economies of scale. As a result, the input-prices for all the users of inputs decrease. This is an external gain to the input users.
3. The education and training programmes of the government increases the supply of skilled labour to the industrial units. But industrial units do not bear the cost of education and training. A part of this gain to the industrial units may percolate down to the consumers in terms of lower price.
4. Construction of roads and railways reduces the cost of transportation in terms of both money and time. The advantage accrues to the industrial units which do not bear the cost of road and railway construction.
5. Afforestation schemes increase rainfalls and oxygen gas in the air; reduce air-pollution; and maintain ecological balance, which benefits the citizens in general and farmers in particular. But none of them bears the cost of afforestation.

The external economies in production create a divergence between private and social gains. The divergence between the private and social costs results in non-optimization of production. The case of non-optimization due to externality in production is shown in Figure 13.7. Recall that under perfect competition, a firm producing a commodity (say, *X*) is in equilibrium when its:

$$MC_x = P_x = PB$$

where *PB* is private benefit.

As shown in Figure 13.7, the firms produce *OQ* which maximizes their profits. In the absence of economies in production, the price and output will be Pareto optimum.

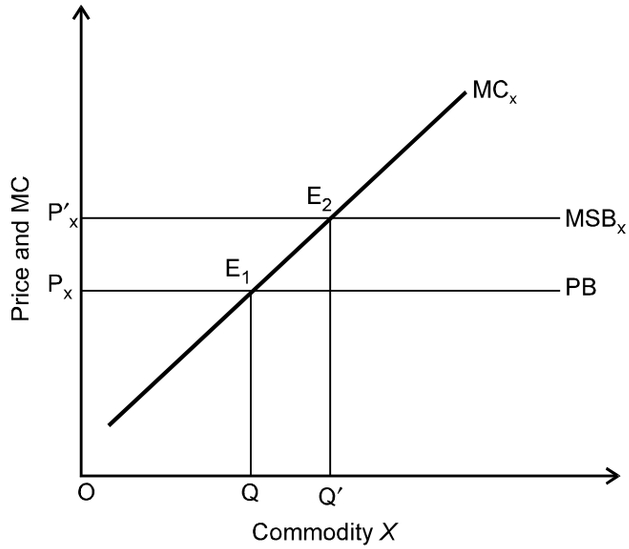

Fig. 13.7 *Private and Social Benefits and Optimum Output*

In reality, however, external economies do exist which result in social benefits. The price, P_x, which consumers pay equals only their private benefits (*PB*) i.e., $PB_x = P_x$, which does not include their social gains. If, by some means, social benefits of external economies are measured and added to P_x, the marginal social benefit (MSB_x) will exceed P_x. The MSB_x will then rise to P'_x. There is thus a divergence between private and social benefits. The difference between P_x and P'_x (or between PB_x and MSB_x) measures the divergence.

Let us suppose that when social benefits of external economies are added to P_x, it rises to MSB_x (Figure 13.7). In that case, equilibrium point E_1 shifts to E_2 and profit maximising output increases to OQ' which is greater than OQ. Thus, Pareto optimum (OQ) is less than the socially optimum output (OQ') when external economies are accounted for in social pricing. That is, exclusion of social benefits (*SB*), when $SB > O$ output OQ means under-production. It may, therefore, be concluded that, in the presence of external economies in production, Pareto optimality may not be realized even under perfect competition.

External diseconomies in production

The famous examples of diseconomies of industrial production are the following:

- Air-pollution caused by factory smoke and fumes of transport vehicles cause health hazards to the public
- Water-pollution caused by discharge of industrial refuse and waste create health hazards for human, animal (particularly fishes) and plant lives
- Concentration of industries in an area creates industrial slums which breed various kinds of diseases and crimes

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Due to health hazards caused by production, medical expenses of the inhabitants of the area go up. This is an external cost to the society resulting from the external diseconomies of production. All such costs incurred by the society, individually or collectively, to prevent the ill-effects of production of a commodity are included in the external social cost (*ESC*). The external cost is not included in the private cost of production. The social cost (*SC*) of a product can be measured as:

$$SC = PC + EC$$

where *PC* = private cost and *EC* = external cost.

There is, obviously, a divergence between private cost and social cost. That is, $SC > PC$, if $EC > O$. By definition, therefore, marginal social cost (*MSC*) exceeds the marginal private cost, *MC*. That is, in production of commodity, say *X*,

$$MSC_x > MC_x$$

Because of the divergence between private and social costs, Pareto-optimality cannot be said to conform to social optimum. This point is illustrated in Figure 13.8. Given the MC_x curve and price OP_x, the Pareto optimal output will be OX_1, determined by equilibrium point E_1 because at this level of output:

$$MC_x = P_x = MR_x$$

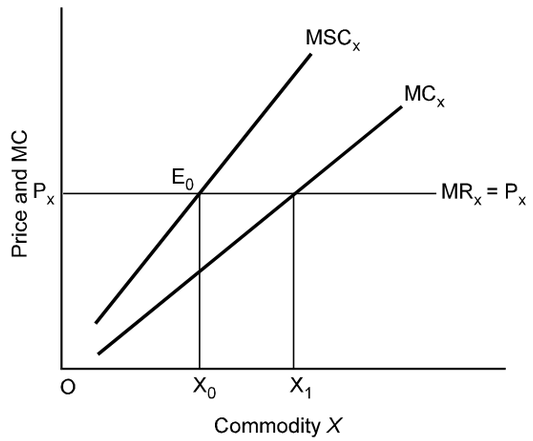

Fig. 13.8 *Divergence between Private and Social Costs and Optimum Output*

If it were possible to measure the marginal external cost (MEC_x) and firms were made to pay for the full social costs, their MC_x curve will shift to MSC_x curve. Note that the vertical distance between MC_x and MSC_x measures the external cost of production of commodity *X*. Given the MSC_x and P_x, a profit maximizing firm will find its equilibrium at point E_0 and produce OX_0 of *X*. Obviously, if external costs are included, the Pareto optimal output will decrease from OX_1 to OX_0. It implies that exclusion of external costs (when $EC > O$) leads to over production which is socially non-optional.

However, in case social benefits and social costs of production cancel out, the Pareto optimality can be realized under perfect competition. The equality of social costs and benefits is however not certain.

Externalities in Consumption

Like externalities in production, externalities in consumption prevent the realization of Pareto optimality in consumption. Externalities in consumption arise due to *interdependence of utility functions*. We explain below how external economies and diseconomies in consumption affect optimality under competitive conditions.

(a) **External economies in consumption:** When a housewife replaces her traditional charcoal-stove with a gas-stove, her neighbours benefit because air-pollution caused by smoke is reduced. When a household buys a TV set, its neighbours benefit when the TV owner allows them to watch TV programmes. Similarly, if a person plants trees around his house or decorates his courtyard with flowerpots, his neighbours benefit from the oxygen produced by the trees and also from the beautiful greenery around. A well-maintained car improves the safety of the people on the road and reduces air-pollution. Expenditure on education by some people gives others benefit of an educated society.

All such external benefits imply that utility functions of some individuals are dependent on the consumption of others. Interdependence of utility functions violates one of the marginal conditions of Pareto optimality, i.e., *MRS* between any pair of goods must be the same for all consumers. Since utility of one consumer increases because of increase in the consumption of another consumer, it is always possible to redistribute the goods and increase total social utility.

(b) **External diseconomies in consumption.** Analogous to diseconomies in production, there are diseconomies in consumption too. Diseconomies in consumption arises where increase in the consumption of a commodity by an individual decreases the total utility of others. For example, (i) smoking cigarette in a bus, railway compartment, theatre or restaurant causes disutility to non-smokers; (ii) playing TV and music system loudly causes disutility to neighbours; and (iii) Veblen and snob effects also cause diseconomies in consumption. Such diseconomies of consumption imply interdependence of utility functions, since utility of a commodity for a consumer depends on the consumption of that commodity by others.

How interdependence of utility functions affects Pareto optimality is shown graphically in Figure 13.9(a) and (b) assuming (i) that there are only two consumers, *A* and *B*, of two commodities *X* and *Y*; (ii) that indifference maps of *A* and *B* are given as in Figure 13.9(a) and (b), respectively, (iii) that utility level of *A* is not affected by *B*'s consumption; and (iv) that utility level of *B* is affected by *A*'s consumption of *X*, but not of *Y*.

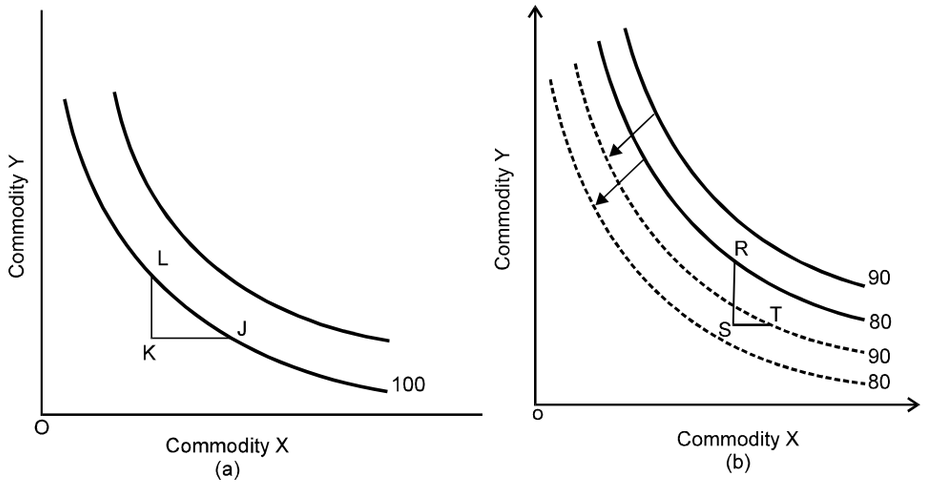

Fig. 13.9 *Interdependence of Utility Functions and Pareto-Optimality*

To begin the analysis, let us assume that *A* and *B* are at points *J* and *R* on their respective indifference maps and $MRS^{A}_{x,y} = MRS^{B}_{x,y}$. Given this condition, let the commodities *X* and *Y* so redistribute between *A* and *B* that consumer *A* moves to point *L* and his consumption of commodity *X* decreases by *JK*. Since *A* remains on the same indifference curve his total utility remains unchanged.

But since *B*'s utility is dependent also on *A*'s consumption of *X* (which has decreased), his indifference map shifts downward due to fall in consumption of *X* by consumer *A*. The downward shifts is denoted by the dotted indifference curves [Figure 13.9(b)]. Let us suppose that consumer *B* moves from point *R* on old indifference curve 80 to point *T* on the new indifference curve 90. Thus, his index of total satisfaction increases from 80 to 90. As a result of this shift, the total satisfaction index increases from 180 (= *A*'s 100 + *B*'s 80) to 190 (= *A*'s 100 + *B*'s 90), despite the fact that at new equilibrium of *A* and *B*, $MRS^{A}_{x,y} = MRS^{B}_{x,y}$. It may thus be concluded that when externalities exist, equality of *MRS* between any pair of goods for any two consumers does not ensure realization of Pareto optimality. For, utility level of one consumer (*B*) can be increased without reducing utility level of the other consumer (*A*).

Externalities of Public Goods

We have shown above why Pareto optimality cannot be ensured if there are externalities in the production and consumption of private goods. Here, we discuss optimality conditions in respect of public goods and externalities that arise due to collective consumption of such goods.

For our purpose here, a pure public good is one to which *exclusion principle* of market cannot be applied. Recall the characteristics of pure public good as mentioned earlier: (i) nobody can be excluded from its consumption, nor can consumers be forced to pay for their benefit; (ii) its consumption is collective and

all consumers are supplied with it jointly; (iii) satisfaction level of no consumer is reduced by the consumption of others; (iv) its supply to existing consumers is not reduced if number of consumers increases; (v) no individual can appropriate a public good for his personal use; and (vi) its $MC = O$ (though not infinitely) because its opportunity cost is zero.

The standard examples of public goods are (a) radio and TV transmission; (b) improved sanitary system of a town; (c) air-pollution control programmes; (d) road safety-measures; (e) tree-plantation on the road sides, and green-belts of a city. Some of these goods may however turn to be a non-public goods beyond a certain number of consumers.

Given the characteristics of public goods, the Pareto optimality conditions are not valid to this category of goods. Public goods, therefore, require formulation of **new rules**. The rule for optimum output of public goods is that the sum of its marginal benefits must equal its marginal cost. The marginal benefit of an individual from a public goods, *X*, can be measured in terms of money that the individual is willing to pay for his benefit. According to Baumol, the marginal benefit of the individual has to be measured in terms of his marginal rate of substitution between *X* and money (*m*). Thus, the marginal benefit of an individual from *X*,

$$= \frac{MU_x}{MU_m} = MRS_{x,m}$$

The sum of marginal benefits of *n* individuals from commodity *X* is expressed as:

$$\frac{MU^1_x}{MU^1_m} + \frac{MU^2_x}{MU^2_m} + \cdots + \frac{MU^n_x}{MU^n_m}$$

The optimum output condition for the public good (*X*) is then:

$$\frac{MU^1_x}{MU^1_m} + \frac{MU^2_x}{MU^2_m} + \cdots + \frac{MU^n_x}{MU^n_x} = MC_x$$

In an economy, however, a public good exists along with many private goods. Under this condition, a Pareto optimum can be realized only by equating the *MRT* between the public goods and the private goods with the sum of *MRS* between the same pair of goods for all the individuals. That is, Pareto optimality in case of a public good, *X*, and a private good *Y* is realized when:

$$MRT_{x,y} = MRS_{x,y}$$

There are however problems in discovering individual utility functions. The knowledge of individual utility function is necessary to obtain the sum of *MRS* of all the individuals.

Indivisibilities and Pareto Optimality

One of the assumptions of Pareto optimality conditions is that commodities and inputs are perfectly divisible. In reality, however, it is not unusual to come across

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indivisibility of production processes. If indivisibilities are introduced, perfect competition may not lead to optimal allocation of resources.

Suppose there are two types of technology: one used by small-scale firms and the other used by large-scale firms. The large-scale firms enjoy the economies of scale and, therefore, have lower average cost of production than the small-scale firm. If the technology used by large-scale firms is indivisible, then perfect competition does not lead to optimum allocation of resources; nor does it lead to maximization of welfare. Suppose a large number of firms are in competitive equilibrium and *MRT* = *MRS* for all firms and consumers. Assume also that production process is indivisible and that economies of scale that accrue to the large firms are not available to the small firms. On the other hand, a few large firms can produce goods more efficiently. That is, large firms that enjoy the economies of scale can produce large output by using the same quantity of inputs. It means that if all inputs are used only by a small number of large firms, production possibility curve will shift upward. It may thus be concluded that if indivisibilities exist, production by small firms will be inoptimal, even if marginal conditions are satisfied under perfectly competitive conditions.

Check Your Progress

4. What is another name for Pareto optimality?
5. Which type of competition exists in the product and factor market under Paretian model?
6. What are externalities?

13.5 SOCIAL WELFARE FUNCTION: VALUE JUDGEMENTS

It should be understood that attempts to device value-free welfare criteria have not yielded satisfactory results. It is not possible to evaluate a change which makes some persons better-off and some worse-off without making some implicit value judgement about the deservingness of an individual or a group. Recognizing the inevitability of value judgement, Bergson suggested that the only way out to resolve this problem is to formulate a set of explicit **value judgments** which enable the analyst to evaluate the situation. The value judgements may be set up by the analyst himself, government authorities, legislators, social reformers, or an individual or a group of the society.

Bergson suggested that value judgements may be explicitly formulated in the form of a social welfare function. A social welfare function is an indifference map which ranks different combinations of individual utilities according to a set of explicit value judgements about the distribution of income. It is analogous to the utility function of a consumer. More precisely, a social welfare function is an ordinal

index of welfare of the society and is a function of the utility levels of all individual members.

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It may be expressed as

$$W = f(u_1, u_2, ..., u_n)$$

where W denotes social welfare and u_1, is utility index of the ith individual.

Assuming a simple economy of two persons, A and B, the social welfare function may be written as:

$$W = F(U_A, U_B)$$

This function may be represented by a set of social indifference curves, as shown in Figure 13.10. Each social indifference curve in the utility space (such as $W_1, W_2 ..., W_n$) is the locus of combination of utilities of individuals A and B, which yields the same level of social welfare. The social welfare function as mapped in Figure 13.13 permits as analyst to judge unambiguously whether a proposed policy change is or is not an improvement in welfare. For example, a change from P to R or M improves social welfare since these points are on higher social indifference curves. But a change from P to Q does not improve social welfare as Q lies on the same social indifference curve.

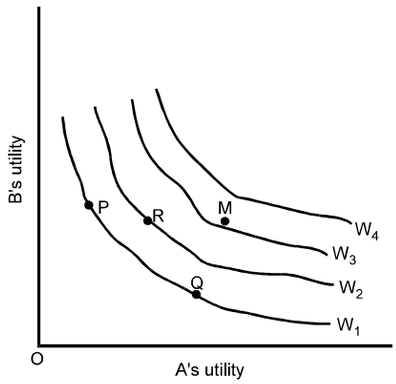

Fig. 13.10 *Bergson's Social Welfare Function*

Limitations of Bergson's Criterion

Although Bergson's criterion has been well received by economists, it has its own weaknesses.

First, Bergson's criterion requires explicit value judgements. Value judgements of different categories of judges are bound to be different. Economists' value judgement may be different from those of the legislators, electorates or a Commission assigned with the task of policy making. Bergson does not offer a solution to resolve such differences in value judgement.

Second, there is no easy method of constructing social welfare function. Bergson's criterion does not come out with necessary instructions for drafting welfare judgements which are required in the formulation of welfare function. It

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implies that the most difficult problem of this criterion remains unsolved. As Mishan has pointed out, 'Although the social welfare function had received continual mention since Bergson's 1938 formulation, no instruction in the drafting of this grandiose design had been hazarded.' In simple words, although usefulness of social welfare function is widely recognized, no attempt has been made to provide guidelines for constructing a reasonable social welfare function.

Third, construction of social welfare function on the basis of ordinal preferences of the individuals leads to contradictions if majority rule is applied. If majority votes for a non-essential commodity, the essential ones may not be adequately produced.

13.6 COMPENSATION PRINCIPLE

According to Pareto criterion social welfare increases if any reorganization or reallocation of resources makes at least one individual better off without making any other individual worse off. However, it is difficult to imagine an economic change or implementation of a policy measure that does not affect any individual adversely. In reality, most economic changes make some people better off at the cost of some others. Pareto criterion does not evaluate such economic changes. Some economists, viz., Kaldor, Hicks and Scitovsky, have however devised compensation criteria that attempt to overcome the limitations of the Paretian criteria for maximization of social welfare. This has come to be called as *New Welfare Economis*. In this section, we explain the *compensation criteria* proposed by Kaldor, Hicks, and Scitovsky.

Kaldor-Hicks' Compensation Criterion

Although Kaldor and Hicks proposed their compensation criterion in separate articles in 1939. Their criteria are very much alike. Their criteria are, therefore, jointly referred to as Kaldor-Hicks criterion. A minor difference between their criteria is that Kaldor evaluates compensation from gainers' point of view while Hicks does it from losers' angle. According to Kaldor, if an economic change makes some people gain and some others lose, and gainers are able to compensate the losers and yet are better off than they were before the change, then the change increases social welfare. According to Hicks, if an economic change makes some people gain and some others lose, and losers are not able to bribe the gainers to prevent them from voting for the change, then the change is socially desirable. Both criteria are essentially the same.

The Kaldor-Hicks criterion may be stated as follows. If gainers of a proposed economic change (or reallocation of resources) evaluate their gains at G and losers evaluate their losses at L, and if $G > L$, then gainers would be able to compensate the losers and yet retain a net gain. The proposed change is, therefore, socially desirable as it increases the social welfare.

The Kaldor-Hicks compensation criterion is graphically illustrated in Figure 13.11. Vertical axis measures *B*'s utility and the horizontal axis measures *A*'s utility. The curve *UP* is the utility possiblity curve obtained by graphing combination of utilities of *A* and *B* represented by the consumption contract curve in Edgeworth box diagram of exchange. The curve *UP* shows the various combinations of utility received by *A* and *B*, in the utility space, when the economy is in general equilibrium. At each point on *UP* curve,

$$MRS^{A}_{x,y} = MRS^{B}_{x,y}$$

Given the utility possibility curve, curve *UP*, let *WD* represent the alternative utility combinations after an economic change is introduced.

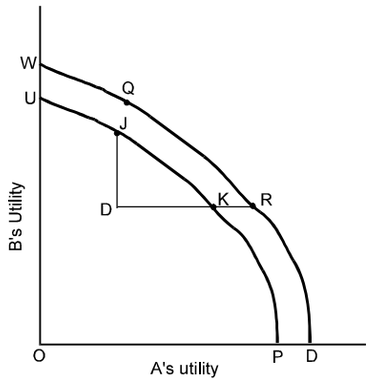

Fig. 13.11 *Utility Possibility Curves and Kaldor-Hicks Criterion*

Now, consider first the utility possibility curve *UP*. All points on this curve (e.g., points *J* and *K*) represent the alternative distributions of total utility with the existing distribution of resources. A change from *J* to *K* implies that *A* (the gainer) can compensate *B* (the loser) without retaining any net gain, since *A*'s gain equals *B*'s loss. Pareto optimality condition can evaluate this change. But a movement from *J* to *R*, after an economic change is introduced, would make A better off and *B* worse off. This change cannot be evaluated by Pareto criterion. On the Kaldor-Hicks criterion, however, movement from *J* to *R* is an improvement in welfare, because *A* can compensate *B* for his loss and yet be better off than his position at *J*.

The movement from *X* point *J* to point *R* makes *B* to lose *JD* utility and *A* to gain *DR* utility. Note that *DR* = *DK* + *KR* and *DK* is just sufficient to compensate *B* for his loss of utility. After compensating *B* for his loss of utility, *A* retains *KR* utility. Thus, *A* is better off. This kind of resource reallocation increases total social welfare. The Kaldor-Hicks criterion applies also to movement from point *K* to *Q*.

Whether compensation is paid or not paid, in Kaldor's opinion, is a matter of political or ethical decision. In the welfare criterion, compensation is simply a measure of loser's loss. In formulating his criterion for judging the social desirability of an economic change, Kaldor merely suggests that the gainers must potentially be able to compensate the losers and yet retain some gains to themselves. Kaldor-

Hicks criterion is thus considered to be a potentially superior criterion and an improvement in Pareto welfare criteria.

Criticism

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The fundamental problem in compensation criterion is that it refers to only potential rather than the actual compensation. But there is a world of difference between a potential and an actual compensation. If losers are actually compensated for their loss, then there is no problem. It satisfied the Pareto criterion, i.e., at least one person is better off and no person is worse off. But, if the potential compensation is not actually paid, it would imply that the prevailing distribution of income measures the relative strength of feelings of gainers and losers. It follows that the individual preference pattern is also known. This means 'interpersonal comparison of utility'. But this is an issue that is unresolved. The Kaldor-Hicks criterion, therefore, does not provide a test free from value judgement.

Second, another problem with Kaldor-Hicks criterion is that it uses money value of gains and losses in evaluating the economic efficiency of a change. This results in a serious shortcoming in compensation criterion as it ignores the real value of gains and losses. If gainers are highly rich, the real value of their monetary gain (even if it far exceeds the losses of losers) may be insignificant compared to the real loss to the poor (even if monetary loss is much less than gainers monetary gain).

Finally, Scitovsky pointed out a contradiction in Kaldor-Hicks criterion. The contradiction is illustrated in Figure 13.12. Suppose a proposed economic change not only affects the utility of each individual (i.e., of *A* and *B*) but also simultaneously shifts the utility possibility curve (*UP*) to the place of *WD*, as shown in Figure 13.12. That is, a change from *J* to *K* not only changes utilities of *A* and *B*, but also shifts the utility possibility curve from *UP* to *WD*. Note that *WD* intersects *UP*. There is no reason why it should not. To demonstrate the contradiction, let us begin by considering point *J* which represents a combination of utilities of *A* and *B*.

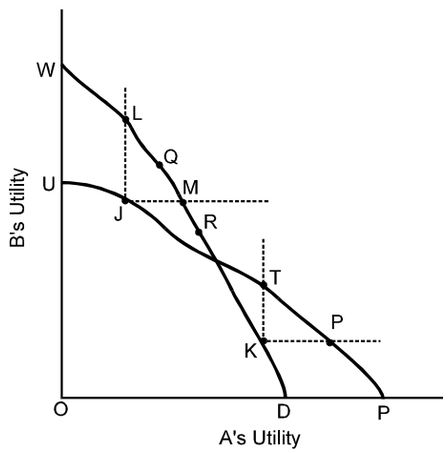

Fig. 13.12 *Contradiction in Kaldor-Hicks Criterion*

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Any policy change that makes *A* and *B* to move to point *L* or *M* or to any point like *Q* between *L* and *M*, satisfies Pareto criterion. However, Pareto criterion cannot evaluate a situation that results due to a move from point *J* to *R*, because, in this case, *A* gains at the cost of *B*. This situation can, however, be evaluated on the basis of Kaldor-Hicks criterion, simply by asking *A* how much he would like to pay to have the change and by asking *B* how much he would pay to prevent the change. Suppose *A* puts his amount M_a and *B* puts M_b. If $M_a > M_b$, the policy change makes an improvement in welfare. In the same way, a move from *J* to *K* satisfied the Kaldor-Hicks criterion. But the same argument cannot be applied to the change from point *K* back to *J*. The reason is that in the change from *J* to *K*, *K* is a superior point as it is on a higher utility probability curve. But a change from *K* to *J*, makes *J* a superior point and *K* an inferior point. Thus, Kaldor-Hicks criterion is self-contradictory.

Scitovsky's Double-Criterion

As already mentioned, Scitovsky pointed out a contradiction in Kaldor-Hicks criterion. He then proposed his *double-criterion.* His criterion may be stated as follows. A change in economic situation of individual would increase welfare only if: (a) the change improves welfare on Kaldor-Hicks criterion; and (b) those who lose from the change are not capable of bribing those who gain for voting against the change, i.e., reversal of change does not improve the welfare. Obviously Scitovsky's criterion is rather stringent.

Scitovsky's criterion is based on the premise of Kaldor-Hicks criterion. Rather, one of his double-criterion is Kaldor-Hicks criterion itself. Therefore, most criticism against Kaldor-Hicks criterion is applied to Scitovsky's double-criterion. In addition, there are only a few changes in real life that would meet the Scitovsky double-criterion. In fact, if the double-criterion is to be satisfied for an increase in welfare, the general welfare should not be affected by change in expenditure pattern and in income distribution.

Little's Criterion

The Little criterion was developed by Ian M. D. Little in his paper 'A Critique of Welfare Economics', 1949, and it establishes an advance step for *compensation principle* theory. Little disapproves the separation between efficiency and distribution and he demands as in *Scitovsky's criterion*, for the *Kaldor's* and *Hicks'* criteria to hold. Furthermore, this criterion also requires that the income distribution is not degraded by the change of states.

This criterion, however, brings some precincts, as a result of its contained value judgement. The criterion will be met, if by a change of states the positively affected individual (winner) is poorer than the negatively affected individual (loser). As an example, let's analyse the following graph, where we consider the *utility* of two individuals (A on the x-axis and B on the y-axis), which we will compare using the utility possibility frontier of two different moments.

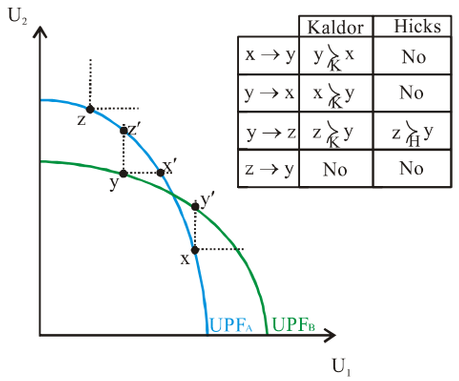

Fig. 13.13 *Little's Criterion*

Kaldor's criterion is met when going from X to Y, Y to X or Y to Z, but not when going from Z to Y. However, Hicks' criterion is only met when going from Y to Z. Therefore, when comparing state Y to Z, winners can compensate the loss of the losers, but losers cannot compensate the other part in order to avoid the change. This is the only case in our example where the Scitovsky criterion is met, making Z preferred to Y. However, Little's criterion is only met if individual B is poorer than individual A.

Check Your Progress

7. What is the social welfare function analogous to?
8. State the minor difference between Kaldor and Hicks formulation of the compensation criterion.
9. State the fundamental criticism against compensation criterion.

13.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The function of welfare economics is to evaluate the alternative economic situations and determine whether one economic situation yields greater economic welfare than others.
2. It was Vilfred Pareto, an Italian economist, who gave the concept of Pareto optimality.
3. The concept of social optimum is central to the concept of Paretian welfare economics.
4. Another name **f**or Pareto optimality is allocative efficiency.
5. There is perfect competition in both product and factor market under Paretian model.

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6. If independence of production and utility functions is not assumed, activity of an individual firm will affect the activities of others, such effects are known as externalities.
7. The social welfare function is analogous to the utility function of a consumer.
8. The minor difference between the Kaldor and Hicks formulation of compensation criterion is that Kaldor evaluates compensation from gainer's point of view while Hicks does it from loser's angle.
9. The fundamental problem in compensation criterion is that it refers to only potential rather than the actual compensation.

13.8 SUMMARY

- Welfare economics is the study of economic welfare of the members of a social group. Economists hold different views on the question whether welfare economics is positive or normative science.
- It was Vilfred Pareto, an Italian economist who broke away from the cardinal utility tradition and gave a new orientation to welfare economics.
- Pareto introduced the concept of social optimum, This concept is central to Pareto welfare economics. Conceptually, social welfare is said to be optimum when nobody can be made better-off without making somebody worse-off.
- Pareto optimum is the defined as the position from which it is not possible to improve welfare of any one by any relocation of factors or of goods and services without impairing the welfare of someone else.
- Attempts to device value-free welfare criteria have not yielded satisfactory results. Recognizing the inevitability of value judgement, Bergson suggested that the only way out to resolve this problem is to formulate a set of explicit value judgements which enable analysts to evaluate the situation.
- A social welfare function is an indifference map which ranks different combinations of individual utilities according to a set of explicit value judgements about the distribution of income.
- The Kaldor-Hicks' compensation criterion can be stated as follows. If gainers of a proposed economic change evaluate their gains at G and losers evaluate their loses at L, and if G>L, then gains would be would be able to compensate the losers and yet retain a net gain

13.9 KEY WORDS

- **Welfare Economics:** It is the study of economic welfare of the members of a social group.

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- **Social Optimum:** It refers to the concept that while it is not possible to add up utilities of individuals to arrive at the total social welfare, it is possible to determine whether social welfare is optimum.
- **Pareto Optimum:** It is defined as a position from which it is not possible to improve welfare of any one by any relocation of factors or of goods and services without impairing the welfare of someone else.
- **Social Welfare Function:** It is an indifference map which ranks different combinations of individual utilities according to a set of explicit value judgements about the distribution of income.

13.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the nature of welfare economics.
2. What is the criticism against Pareto optimality?
3. List the assumptions of the Paretian model.
4. Briefly explain indivisibilities and Pareto optimality.
5. Write short notes on Scitovsky's double criterion and Little's criterion.

Long Answer Questions

1. Discuss the first order conditions of Pareto optimality.
2. Describe the Pareto optimality under perfect competition. Mention the execeptions.
3. Examine the concept of externalities and Pareto optimality.
4. Explain the social welfare function and discuss its criticism.
5. Discuss Kaldor and Hicks' compensation criterion with its criticism.

13.11 FURTHER READINGS

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UNIT 14 THEORIES OF WELFARE ECONOMICS-II

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Structure

14.0 INTRODUCTION

In the last unit, you learnt some of the major theories of welfare economics. The discussion focussed on the deeper understanding of the Pareto welfare criterion and improvements on it. In this unit, we continue the discussion on theories of welfare economics and you will study three more important theories: theory of the second best, Arrow's impossibility theorem and Rawl's theory of justice.

14.1 OBJECTIVES

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

- Discuss the concept of theory of second best
- Explain Arrow's impossibility theorem
- Describe Rawl's theory of justice

14.2 THEORY OF SECOND BEST

The Pareto criterion and the marginal conditions of Pareto-optimality lead to maximum social welfare but all marginal conditions of Pareto optimality can not be fulfilled due to the existence of monopoly and imperfections in markets.

Prof. Richard Lipsey and Prof. Kelvin Lancaster in their Theory of Second Best described that it is impossible to meet all conditions of Pareto efficiency and consequently maximum social welfare situation is unattainable. In their theory of second best, they assert that the second best solution will not lead to increase in social welfare. Let us take a concrete example. Suppose monopoly exists in a

mining market. Mining leads to waste being dumped in the river and there is nothing that can be done about the pollution. However, the government is able to break the monopoly. Increasing competition would increase production in this market which is likely to increase pollution associated with production. This may actually make the situation worse off than before. That is, the second best solution is not desirable.

The second best theorem is complicated and difficult. Therefore, we would present the argument with the help of graphic representation. Consider Figure 14.1 where production possibility frontier PP' has been drawn on which all points are Pareto efficient. According to Lipsey and Lancaster, it is sometimes better to move inside the production possibility curve to achieve a higher level of social welfare in case all marginal conditions are not satisfied. To demonstrate this, social welfare curves (community indifference curves) have also been drawn in Figure 14.1. These social welfare curves represent combinations of two products X and Y which yield the same level of welfare to the society.

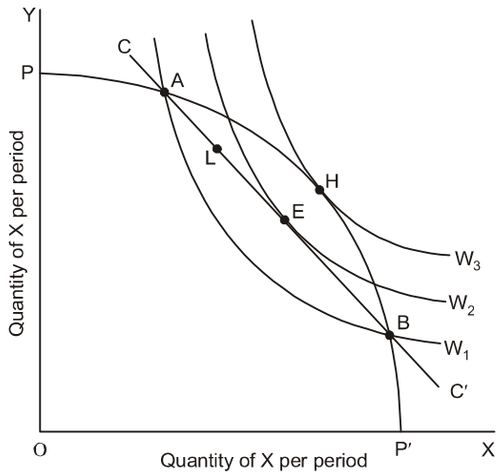

Fig. 14.1 *Theory of Second Best*

Further, higher level of a social welfare curve means that there is higher level of social welfare. In Figure 14.1, point H is tangent to the curve PP' which shows the maximum social welfare point satisfying all the marginal conditions of Pareto-optimality. Now, suppose due to the existence of monopoly in the markets, the socially best point is unattainable. Further, due to the existence of monopolies only combinations lying on the line CC are attainable. We also assume that the economy is at point L at present on the attainable line CC. Now, if Pareto optimality is to be achieved we can move from point L which is inside the production possibility curve to point A or B on the production possibility curve PP'. These points are also on the attainable line CC'. However, moving to point A or B on the production possibility curve would put us on a lower social welfare curve W_1. If instead from point L, we move to the point E which is inside the production possibility curve PP', we find that though it is Pareto inefficient yet it yields a higher level of welfare

as indicated by social welfare curve W_2. Thus, the Theory of Second Best asserts that when one of the marginal conditions for Pareto-optimality is not satisfied, it is better to violate other marginal conditions of Pareto optimality to achieve maximum possible social welfare.

14.3 ARROW'S IMPOSSIBILITY THEOREM

Kenneth Arrow while commenting on social choice theory has shown that it is impossible to make social choices on the basis of individual values. Arrow has specially demonstrated through his general Impossibility Theorem that when the choice is between more than two alternatives then the individual's voting/expression/ preferences would lead to inconsistent results as no valid social choice can be made by majority rule.

According to Arrow's theorem, 'if we exclude the possibility of interpersonal comparisons of utility then the only method of passing from individual tastes to social preferences which will be satisfactory and which will be defined for a wide range of sets of individual ordering are either imposed or dictatorial.'

The democratic procedure for reaching a social choice or group decision is to know the preferences of individuals through free voting. But Arrow has demonstrated through his Impossibility Theorem that consistent social choices cannot be made without violating the consistency condition. The social choice on the basis of majority rule may be inconsistent even if individual preferences are consistent. Arrow first considers a case of two alternative social states and proves that social choice through a majority rule yields a social choice which can satisfy all the five conditions in this case. But when there are more than two alternatives, majority rule fails to yield a social choice. Thus, in case of more than two alternatives, social choice based on individual preferences cannot be made.

Let us illustrate the proof of the Impossibility Theorem with the help of Table 14.1. In this table, three individuals A, B and C who constitute the society have been shown to have voted for three alternative social states X, Y and Z, by writing 3 against the most preferred alternative, 2 for the next preferred alternative and 1 for the least preferred alternative. A glance at the table will reveal that individual A prefers X to Y, Y to Z, and therefore X to Z. Individual B prefers Y to Z, Z to X and therefore Y to X. Individual C prefers Z to X, X to Y and therefore Z to Y. It is clear that two individuals A and B prefer Y to Z and two individuals A and C prefer Z to X. Thus, the majority (two of the three individuals) prefers X to Y and also Y to Z and therefore Z to X.

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Table 14.1 *Ranking of Alternatives by Individuals and Social Choice*

	Alternative Social States		
	X	Y	Z
A	3	2	1
B	1	3	2
C	2	1	3

But majority also prefers Z to X. Thus, we see that majority rule leads to inconsistent social choices because on one hand, X has been preferred to Z by the majority and on the other hand, Z has also been preferred to X by the majority which is quite contradictory and inconsistent. Therefore, Prof. Arrow says that it is impossible to obtain a social choice based on individual preference, without violating at least one of the value judgments as expressed in the five conditions, when there are more than two alternatives. This is in essence his Impossibility Theorem.

14.4 RAWL'S THEORY OF JUSTICE

At the beginning of *Political Liberalism*, John Rawls (1993: 4) provokes: '*How is it possible for there to exist over time a just and stable society of free and equal citizens, who remain profoundly divided by reasonable religious, philosophical, and moral doctrines?*' In further terms, how can we imagine regarding justice for a society noticeable by (reasonable) value pluralism – by profound disagreements among individual preferences regarding how society should be prearranged? Classical utilitarianism strives to evade this problem by sacrificing a free idea of distributive impartiality. It cares for individual value as the final good and identifies the right social understanding as the one that make the most of an aggregate of individual utility. Rawls' theory of justice constructs on the social agreement custom to present an option to utilitarianism. His 'political conception' of justice relaxes on basic values he recognizes as contained in democratic societies. Rawls disagrees that they propose a base for building principles of justice which can be acknowledged by the members of such societies. Rawls' understanding of the social contract permits him to address questions of justice openly, not via social welfare as in utilitarianism, and certainly singles out fairness – not utmost welfare or efficiency – as 'the first virtue of social institutions'.

Rawls' theory of justice has been extremely prominent in philosophy and beyond. It has, from the beginning, fascinated much attention from economists. An essential cause for this attention lies, merely, in the inspiring account that Rawls provides in his articles and books. There are, nevertheless, also a number of motives

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explicit to economic theory. First, in the outcome of Arrow's useless result, welfare economists and social choice theorists resisted with the problem of how to contain deliberations of justice in their academic frameworks. Rawls' theory of justice as equality offered wish for all those economists not satisfied with the prevalence of the principle of efficiency and not prepared to give up on justice. Second, in *A Theory of Justice*, Rawls attempted to justify the principles of justice as integrity by reference to individual normal choice. This endeavor involved a lot of disapproval from economists and was ultimately discarded by Rawls in support of an account that strains the distinctions between being rational and being reasonable. Even if this event has shaped some misunderstanding, Rawls normally strived to build his theory of justice available to economists and several of his thoughts have had an enduring effect on economic hypothesizing.

Rawls' gave presentation of justice as fairness in his 1971 book *A Theory of Justice* as well as to views he put forward in later articles and books (particularly in *Political Liberalism* and in *Justice as Fairness: A Restatement*). Rawls has revised some of his vision over time and offer an account that is in line with the changed explanation of justice as fairness.

Role of Justice

Justice is the primary and desirable quality of social organizations, as fact is of systems of thought. A theory, though, well-designed and inexpensive must be discarded or amended if it is untrue; similarly laws and institutions not subject to how well-organized and well-arranged must be transformed or eliminated if they are unjust. Each person has a holiness created on justice that even the wellbeing of society as entire cannot supersede. For this motive justice rejects that the failure of freedom for some is made correct by a larger good shared by others. It does not allow that the surrenders forced on a few are compensated by the superior sum of advantages liked by numerous. Consequently, in a just society, the freedoms of equal citizenship are taken as established; the rights protected by justice are not questioned to political agreement or to the calculus of societal wellbeing. The merely thing that allows us to agree in an incorrect theory is the lack of a superior one; analogously, unfairness is acceptable only when it is essential to shun an even superior injustice. Being first qualities of human activities, truth and justice are uncompromising. These suggestions seem to articulate our innate assurance of the dominance of justice. No doubt they are articulated too powerfully. Following diagram shows the two basic principles of theory of justice.

Main Idea of the Theory of Justice

The guiding idea for the theory of justice is that the principles of justice for the essential organization of society are the aim of the novel agreement. They are the principles that gratis and normal persons worried to further their own interests would recognize in an original position of parity as defining the elementary terms of their relationship. These principles are to control all supplementary agreements; they identify the kinds of social assistance that can be gone through and forms of government that can be recognized. This mode of concerning the principles of justice shall call like justice as fairness. Thus, we are to visualize that those who connect in social assistance desire together, in one combined act, the principles which are to allocate vital rights and duties and to establish the dissection of social benefits. Men are to choose in advance how they are to control their claims beside one another and what is to be the groundwork agreement of their society.

Just as each person must choose by normal indication what comprises his good, that is, the system of ends which it is normal for him to follow, so a group of persons must choose one time and for all what is to calculate amongst them as fair and unfair. The alternative which rational men would build in this imaginary condition of equal liberty, pretentious for the present that this alternative problem has an answer, concludes the principles of justice.

This unique position is not a reflection of a real chronological state of associations, much less an ancient condition of civilization. It is understood as a simply theoretical condition characterized so as to guide to a certain notion of justice? Among the necessary features of this condition is that no one recognizes his place in civilization, his class position or social position, nor does anybody know his chance in the allocation of natural assets and abilities, his astuteness, potency, and the like. The principles of justice are selected following a veil of unawareness. This guarantees that no one is fortunate or underprivileged in the alternative of principles by the result of natural possibility or the eventuality of social conditions. While all are likewise located and no one is capable to devise principles to support his exacting situation, the principles of justice are the consequence of a reasonable agreement. For given the conditions of the innovative place, the balance of everyone's relation to each other, this original state is fair among individuals as moral persons, that is, as normal beings with their own tops and able of a sense of justice.

Check Your Progress

1. Who proposed the theory of second best?
2. What is the democratic procedure for reaching a social choice or group decision?
3. State the perspective of classical utilitarianism about individual value.

14.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The theory of second best was proposed by Prof. Richard Lipsey and Prof. Kevin Lancaster.
2. The democratic procedure for reaching a social choice or group decision is to know the preferences of individuals through free voting.
3. Classical utilitarianism cares for individual value as the final good and identifies the right social understanding as the one that make the most of an aggregate of individual utility.

14.6 SUMMARY

- Pareto criterion and the marginal conditions of Preto-optimality lead to maximum social welfare but all marginal conditions of Pareto optimality can not be fulfilled due to the existence of monopoly and imperfections in markets.
- Prof. Richard Lipsey and Prof. Kelvin Lancaster in their Theory of Second Best described that it is impossible to meet all the conditions of Pareto efficiency and consequently maximum social welfare situation is unattainable.
- The theory of second best asserts that when one of the marginal conditions of Pareto optimality is not satisfied, it is better to violate other marginal conditions of Pareto optimality to achieve maximum possible social welfare.
- Kenneth Arrow while commenting on social choice theory has shown that it is impossible to make social choices on the basis of individual values. Arrow has specially demonstrated through his general Impossibility theory that when the choice is between more than two alternatives then the individual's voting/ expression/preferences would lead to inconsistent results as no valid social choice can be made by majority rule.
- The guiding idea for the theory of justice is that the principles of justice for the essential organization of society are the aim of the novel agreement.

14.8 KEY WORDS

- **Theory of Second Best:** It is the theory which suggest that the second best solution will not lead to increase in social welfare.
- **Arrow's Impossibility Theorem:** It says that when the choice is between more than two alternatives then the individual's voting/expression/preferences would lead to inconsistent results as no valid social choice can be made by majority rule.
- **Classical Utilitarianism:** It is moral philosophy as per which the sole moral obligation is to maximize utility (or happiness).

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14.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What is the problem of Pareto optimality as brought out by the theory of second best?
2. Explain Arrow's impossibility theorem.
3. Why has Rawl's theory of justice been extremely popular in philosophy and beyond?

Long Answer Questions

1. Explain the theory of second best.
2. Describe Rawl's idea of social justice in detail.

14.10 FURTHER READINGS

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