ਜਗਤ ਗੁਰੂ ਨਾਨਕ ਦੇਵ
ਪੰਜਾਬ ਸਟੇਟ ਓਪਨ ਯੂਨੀਵਰਸਿਟੀ
ਪਟਿਆਲਾ

The Motto of Our University

(SEWA)

SKILL ENHANCEMENT

EMPLOYABILITY

WISDOM

ACCESSIBILITY

JAGAT GURU NANAK DEV
PUNJAB STATE OPEN UNIVERSITY, PATIALA

(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)

MASTER OF ARTS (ECONOMICS)

MAEC24301T- MICRO ECONOMICS -II

SEMESTER – III

Head Quarter: C/28, The Lower Mall, Patiala-147001
Website: www.psou.ac.in

The Study Material has been prepared exclusively under the guidance of Jagat Guru Nanak Dev Punjab State Open University, Patiala, as per the syllabi prepared by Committee of Experts and approved by the Academic Council.

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PREFACE

Jagat Guru Nanak Dev Punjab State Open University, Patiala was established in December 2019 by Act 19 of the Legislature of State of Punjab. It is the first and only Open University of the State, entrusted with the responsibility of making higher education accessible to all, especially to those sections of society who do not have the means, time or opportunity to pursue regular education.

In keeping with the nature of an Open University, this University provides a flexible education system to suit every need. The time given to complete a programme is double the duration of a regular mode programme. Well-designed study material has been prepared in consultation with experts in their respective fields.

The University offers programmes which have been designed to provide relevant, skill-based and employability-enhancing education. The study material provided in this booklet is self-instructional, with self-assessment exercises, and recommendations for further readings. The syllabus has been divided in sections, and provided as units for simplification.

The University has a network of 110 Learner Support Centres/Study Centres, to enable students to make use of reading facilities, and for curriculum-based counselling and practicals. We, at the University, welcome you to be a part of this institution of knowledge.

Dean Academic Affairs

MASTER OF ARTS (ECONOMICS)

MAEC24301T- MICRO ECONOMICS –II

SEMESTER – III

MAX. MARKS:100

EXTERNAL:70

INTERNAL:30

OBJECTIVE: **PASS:40%**

CREDITS:6

This course introduces the basic principles of public expenditure and revenue. It acquaints the students with the needs and effects of public debt and deficit financing and how a fiscal policy works under the conditions of deflation and inflation.

INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER:

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions each from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any 10 questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

INSTRUCTIONS FOR THE CANDIDATES:

Candidates are required to attempt any two questions each from the sections A, and B of the question paper, and any ten short answer questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

SECTION A

UNIT-1-Factor Pricing: Competitive Factor Markets: Demand for and Supply of Inputs, Equilibrium in a Competitive Market.

UNIT 2- Factor Pricing Under Imperfect Competition: Monopoly Power and Factor Pricing, Monopolistic Power in Product Markets and Factor Markets, Bilateral Monopoly. **UNIT 3-** General Equilibrium: Absolute versus Relative Prices, Perfectly Competitive Price and General Equilibrium Models, Edgeworth Box.

UNIT 4- Welfare Economics: Arrow Impossibility Theorem, Pareto Improvement and Efficiency, Pareto Optimality Condition.

SECTION B

UNIT 5- Social Welfare Function, Kaldor-Hicks-Samuelson Criterion, Rawl's Theory of SocialJustice.

UNIT 6- Asymmetric Information: Asymmetric information, Moral hazard problem, adverse selection, principal-agent problem, theory of lemon, implications of asymmetric information, market signalling, efficiency wage model, information and insurance.

UNIT 7- Market Failure and Public Goods: Reasons for market failure – public goods, market imperfections, externality, Theory of public goods – provision and pricing, government intervention, second-best solution, free riding, rent-seeking and regulation. Externalities.

UNIT 8- Capital Budgeting: Introduction, Prerequisites, Investment decisions under certainty (pay-back period method, Net present value method and IRR criterion

Suggested Reading:

- Katar. Singh, Rural Development: Principles, Policies and Management, SAGE
- Publications India Pvt Ltd. Publication year: 2009.
- A.R. Desai (Ed). Introduction of Rural Sociology in India.

- K.R. Gupta, Rural Development in India, Atlantic Publishers and Distributors (P) Ltd.
- M. Soundarapandian, Rural Entrepreneurship: Growth and Potentials, Kanishka Publisher.
- C.B. Mammoria, Indian Social Problems, Kitab Mahal Publisher.

MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT 1: FACTOR PRICING AND COMPETITIVE FACTOR MARKETS

Structure

1.0 OBJECTIVES

After studying this, the learner will be able to:

- Determine a factor market.
- Explain how factor prices are determined.
- Describe how we are using various combinations of inputs with respect to least cost combinations.
- Explain how the value of marginal product determines the demand for a factor of production.

- Describe to how forces of demand and supply determine the price of factor of production in factor market.

1.1 INTRODUCTION

Subject matter of economics concerned with the study of Economics activities. Production is a kind of economics activities. Production is that activity in which factors of production (land, labour, capital and entrepreneur) are used for output. Proper allocation of resources is a subject of study of Micro economics. Micro economics covers the study of theory of production, production function, price determination and factor pricing or distribution. In economics we are always discuss different types of market structures to determine the price of products and price of inputs. In factor market, we understand the factor pricing to maximize economic profit and to achieve the equilibrium level. Factor of production can be defined as inputs used for producing goods or services with the aim to make economic profit. In economics, there are four main factors of production like land, labour, capital and enterprise. In order to produce goods and services, we need these factors of production. Price paid to these factors for their services is called Factor price. The theory of factor pricing deals with the price determination of different factors of production. The factor market is a market where factors of production are bought and sold. The determination of factor prices is always assumed to be similar to the product market. This is because in both cases the prices are determined with the help of demand and supply forces. The demand for factors of production is similar to the demand for products. But in the supply side, there are two main differences on factor of production and product firstly, in product market, the supply of a product is determined by its marginal cost. On the other hand, in the factor market, it is not possible to determine the supply of factors on the basis of marginal cost. Secondly, the supply of factors of production cannot be easily adjusted as in the case of products.

1.2 CONCEPT OF FACTOR PRICING

A large number of goods and services are produced in every economy every year. In order to produce these goods and services, we need these factors of production like land, labor, capital and entrepreneur. Price paid to these factors for their services is called factor pricing e.g. wages to labor, interest to capital, rent to land, and profit to the entrepreneur. Theory of factor pricing concerned with the determination of prices of different factor of production. They are two aspects of price of each factor: (1) price aspect (2) income aspect. In the factor market also prices of factors of production are determined by the interaction of demand and supply forces. Factor market allocates factors of production, including land, labor and capital and

distributes income to the owners of productive resources, such as wage; rent etc. Nature of demand and supply of factor of production in the factor market is entirely different from the nature of demand and supply in the commodity market. Such as the demand for the factors of production is joint demand or derived demand, while demand for products is direct demand. Because a product cannot be produced using a single factor of production. On the other hand, the supply of products is closely related to the cost of production, whereas there is no cost of production for factors. Therefore, the factor pricing is separated from product pricing.

1.3 COMPETITIVE FACTOR MARKET

A competitive factor market involves a large number of sellers and buyers of a factor of production, such as labor. Each firm is a price taker. There is no single seller or buyer can affect the price of a factor. Assume the structure of both the product and factor markets are perfectly competitive. The price is set at the market level through the interaction of supply and demand. Factor demand curve under a competitive factor market will be different from that under monopolistic market. Because of this feature factor, factor demand is also called derived demand. In a competitive factor market, marginal revenue productivity (MRP) or value of marginal product curve of a factor constitutes its demand curve. This is because of a firm's demand for a factor depends upon its marginal revenue productivity. The purpose is to maximize revenue and gains from production using factors of production. Marginal revenue product is the additional revenue resulting from the sale of output created by the use of one additional unit of an input. A factor market is a market in which companies by the factors of production need to produce their goods and services, also called input market. Factors are demanded because they can produce goods and services. The demand for a factor depends upon their marginal productivity. The demand for the factors service is derived demand, which is derived from the demand for the product that it helps to produce. Derived demand is dependent on the demand for related goods or services. For example, the demand for raw material is directly related to the demand for the final product under perfect competition in the factor market. The downward-sloping past of the marginal revenue productivity curve of the factor is the demand curve for that factor. The factors of production are jointly demanded. Because one can never think of demand for labor alone, or for capital alone, or land alone to produce goods and services. It is a difficult task to estimate the contribution of a single factor in total production because of its interdependence on productivity. To estimate the contribution of the different factors of production in the process of production, the concept of

marginal productivity is used, where the marginal productivity of each factor of production is calculated, such as marginal physical product (MPP), value of marginal product (VMP) and marginal revenue product (MRP)

1.4 MARGINAL PHYSICAL PRODUCT (MPP)

MPP of a factor of production (like labour) is the additional output produced when an extra unit of that factor of production (worker) is added, other factors of production remaining constant.

$$MPP = TPP_n - TPP_{n-1} \text{ or } \frac{\Delta TP}{\Delta L}$$

1.5 Marginal Revenue Product

Marginal revenue product can be defined as the addition to total revenue resulting from the employment of one more unit of a factor of production, all other things being constant.

$$MPP = TrP_n - TRP_{n-1} \text{ or } \frac{\Delta TRP}{\Delta L}$$

$$\text{or } MRP = MPP \times MR$$

1.6 Value of Marginal Physical Product

When the price of a product is multiplied by the marginal physical product of a factor of production. One can derive value of the marginal product

$$VMP = MPP \times AR$$

Under the condition of perfect competition, when AR is fixed for a firm, AR = MR. accordingly, there is no difference between the value of marginal physical product and marginal revenue product.

Value of MPP = MRP or

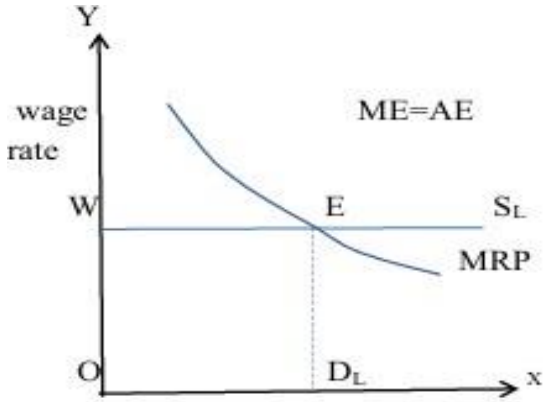
$MPP \times AR = MPP \times MR$

1.7 SUPPLY FOR INPUT/LABOUR IN COMPETITIVE FACTOR MARKET

Supply curve is defined as the amount of labour, measured in person-hours, offered for wire during a given time period with a given population.
In a competitive factor market, a firm faces a perfectly elastic supply curve for inputs because it is a wage taker and cannot influence the input price, which is determined by the market wage. This means the firm purchases any quantity of the input at the prevailing market price. The market supply curve is the sum of the supply curves of individual firms and is positively sloped at a given wage rate. The slop of the market supply curve from left to right, if shows an increase in supply of labour as wages rise. We understand the concept of supply input with

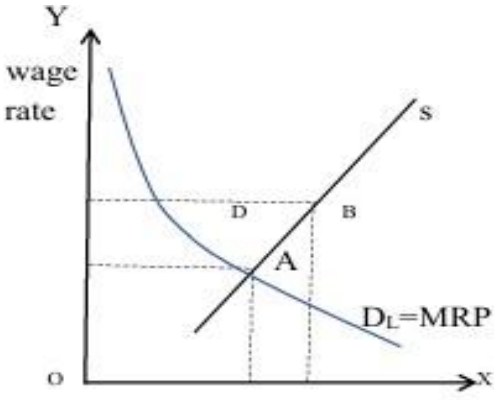
the help of the supply of labour.

We know in a competitive factor market a firm faces perfectly elastic supply curve for that input/labor. Firm is a wage taker so wage rates is fixed for the entire firm. Firm hired their labor on that fixed wage rate



Supply of labour

fig . number 1



demand and supply of labour

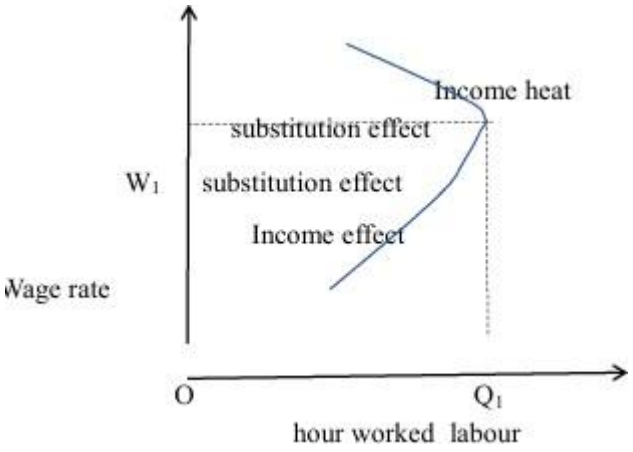
In a competitive factor market, a firm can buy any number of the labor without affecting the fixed wage rate. In fig. 1-point E shows that wages are equal to marginal revenue productivity of labour. In the competitive case, the condition for profit maximization is that the price of the input be equal to marginal expenditure. (ME=W). When the factor market is competitive the average expenditure and marginal expenditure curves are identical horizontal lines. Average expenditure curve is a supply curve the price per unit that a firm pay for a good. Marginal expenditure curve is a curve describing the additions cost of purchasing one additional unit of a good.

Market supply curve is an upward sloping curve showing the positive reaction between wage rate and labour. Market supply curve is the summation of the individual supply curve with a specific market. In combination with market demand, the market supply curve is requisite for determining the market equilibrium wage rate and number of labour.

1.8 BACKWARD BENDING SUPPLY CURVE

A backwards-bending supply curve is a graphical device showing a situation in which, as real wages increase beyond a certain level. The increase in real wages will lead to both income and substitution effects. We know that the substitution effect states that a higher wage makes work more attractive than leisure. Therefore, in response to higher wages, supply increases because work gives more remuneration. Higher wages will substitute leisure for paid wages.

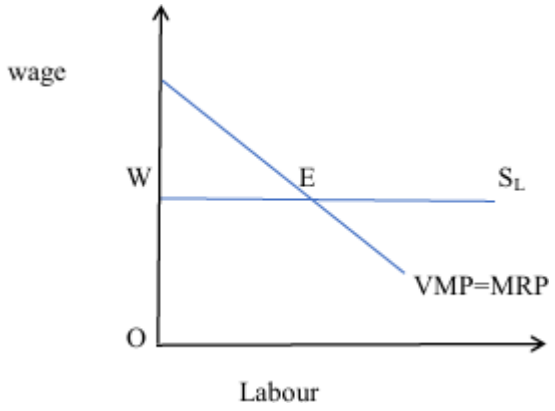
This will lead to a decrease in the labour supply and so less labour-time being offered for sale.



Backwards-bending supply curve occurs when an even higher wage. Actually attracts people to work less and consume more leisure or unpaid time. There are two effects related to determining the supply of labour

1.9 DEMAND FOR INPUT/LABOUR

In a competitive factor market in which the producer is a price taker, the buyer's demand for an input is given by the marginal revenue product curve. So the factor demand curve is also known as the marginal revenue product curve. Like other demand curves, the factor demand curve is generally negatively sloped. There is an inverse relation between the demand for a factor and the factor price. Factor demand is a derived demand. This is a demand for an input that depends on both the firm's level of output and the cost of inputs. As figure below, a firm hires labour up to the point at which the value of marginal product equals the wage rate. If the value of the marginal product of labour exceeds the wage rate, a firm can increase its profit by employing one more worker. A firm demand for labour curve is also known value of the marginal product curve.

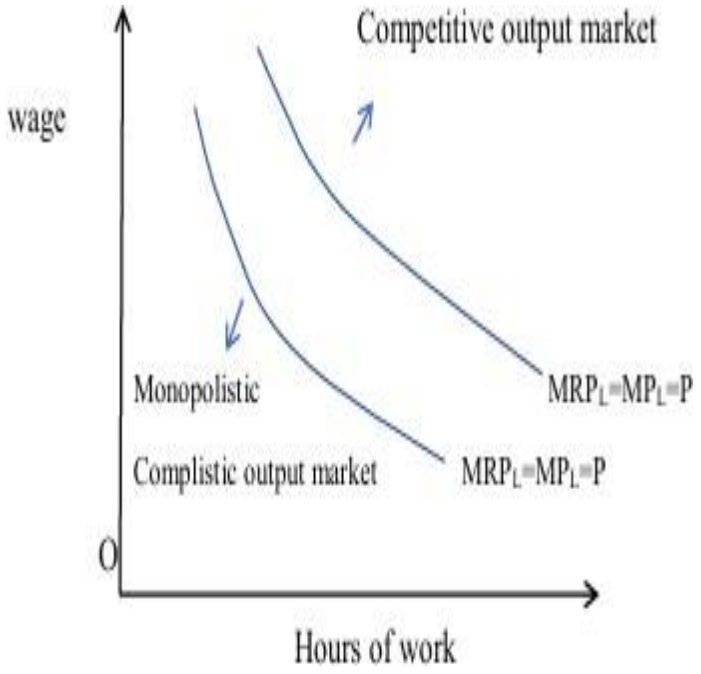


From the above figure we can see that the demand for labour curve is the same as the value of marginal product curve and the demand for labour curve slopes downward. Because the value of the marginal product of labor is the marginal revenue product, is the additional revenue resulting from the sale of output created by the use of one additional unit of an input

$$MRP_L = (MR)\ (MP_L)$$

In a competitive factor market, a firm sells all its output at the market price. So the marginal revenue product of labour is equal to the marginal product of labour or the price of the product.

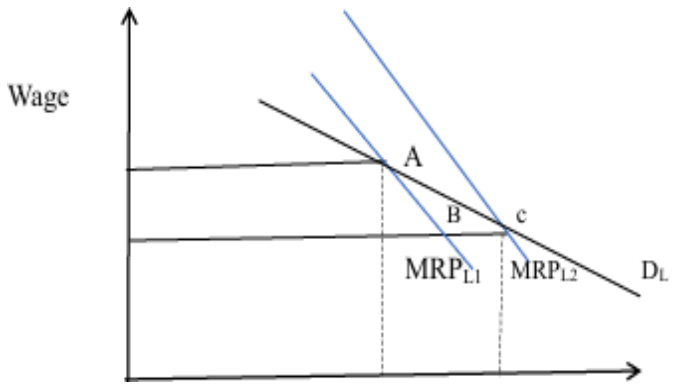
$$MRP_L = MP = (P)$$



In a competitive factor market, the producer is a price taker. The buyers' demand for an input is given by the marginal revenue product curve. The MRP curve falls because the marginal product of labor falls as hours of work increase.

1.10 Demand for a Factor Input when Several Inputs Are Variable-

Here we assume that both labour and capital are variable inputs. When the wage rate falls, the marginal product of capital rises, encouraging the firm to rent more machinery and hire more labor. As a result, the MRP curve shifts from MRP_{L1} to $MRP_{L2,}$ generating a new point C on the firm demand for labor curve.



Thus A and C are demand for labor curve but B is not joining A and C we get labour demand curve under competitive factor market when several inputs are variable. Labour demand curve will be relatively elastic when several inputs are variable.

1.11 INDUSTRY DEMAND CURVE FOR LABOUR

Industry labour demand curve is derived from firm labour demand curve. Hence industry demand curve for labour will be horizontal sum of firm labour demand curve. But when wage rate, wage price of the product also falls (due to shortage of demand).

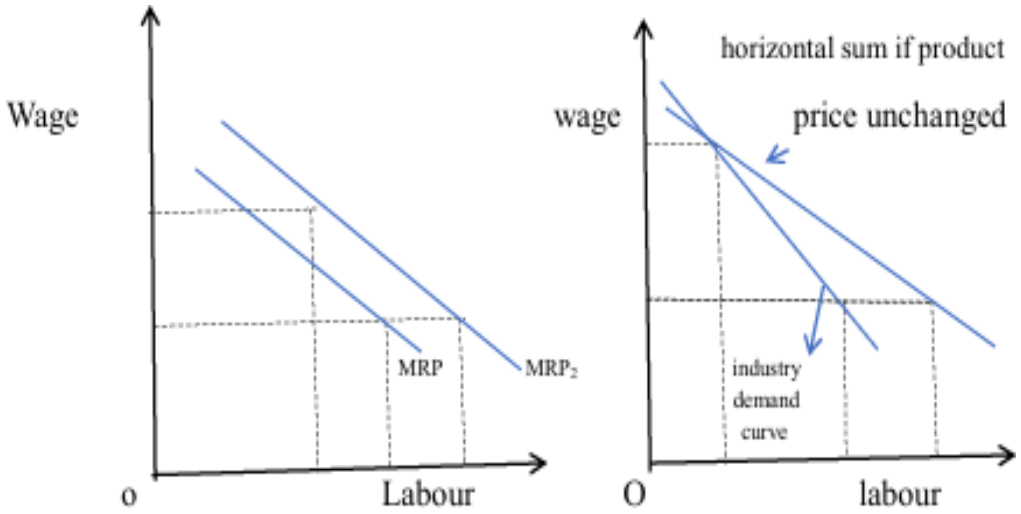
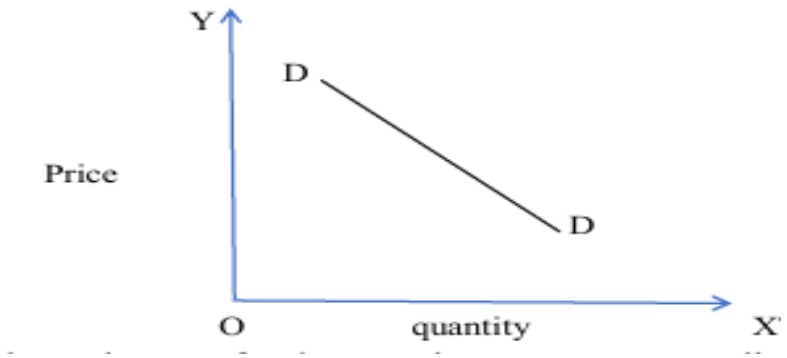


Fig show industry demand curve with variable product price is much more inelastic compared to industry demand curve under fixed product price

1.12 MARKET DEMAND CURVE

The market demand curve gives the quantity demanded by everyone in the market for given price. The market demand curve is downward sloping because as price increase, the quantity demanded decreases.



To determine the market demand curve of a given good, you were to sum the entire individual demand curve for the good in the market.

1.13 EQUILIBRIUM IN A COMPETITIVE FACTOR MARKET

A competitive factor market is in equilibrium when the price of the inputs equates the quantity demanded to the quantity supplied. The equilibrium wage Wc is given by the intersection of the demand for labour and the supply of labor curve (point A)

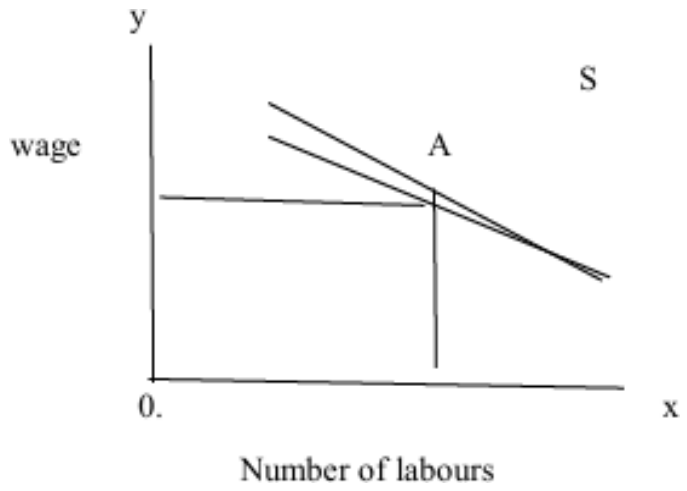


Figure show at point A, the equilibrium wage rate is W and the equilibrium quantity supplied is Lc. in competitive market wage are equal to the marginal product of labour. Wages are in equilibrium when the downward sloping labour demand curve crosses the upward sloping labour Supply Curve.

1.14 SUMMARY

Factor market is the market where sale and purchase of factors of production like land, labour and capital takes place. In factor market, we understand the factor pricing to maximize economic profit and to achieve equilibrium level. Nature of demand and supply of factor of production in the factor market is entirely different from the nature of demand and supply in the commodity market, such as the demand for the factor of production is joint demand or derived demand, while demand for product is direct demand, because a product cannot be produced using a single factor of production. There are four factors of production in an economy namely land, labour, capital and entrepreneur. These factors of production are required in the production of goods and services. According to the modern theory, the price of a factor of production is determined of a point where the demand and supply curve of the factor intersect each other. This point is known as equilibrium point, where demand of a factor is equal to its supply**.**

1.15 GLOSSARY

1) **Factor pricing** - In order to produce goods and services we need factors of production. Price paid to these factors for their services is called factor pricing.
2) **Marginal Revenue Product** - MRP can be defined as the addition to total revenue resulting from employment of one more unit of a factor of production, all other things being constant.
3) **Value of Marginal Physical Product**. When price of a product is multiplied with the marginal physical of a factor production, one can derive value of marginal product.
4) **Derived demand** - The demand for the factor service is derived demand which is derived from the demand for the product that it helps to produce.
5) **Competitive factor market** - where price is set at the market level through the intersection of supply and demand. Each firm is a price taker.
6) **Backward Bending Supply Curve** - A backward bending supply curve is a graphical device showing a situation in which as real wages increases beyond a certain level.
7) **Production** - Production means a manufacturing or creating a product or goods from raw material.

1.16 QUESTIONS FOR PRACTICE

A. Short Answer Questions

Q.1 What is factor pricing?
Q.2 What is the meaning of competition factor market?
Q.3 What is the meaning of derived demand?
Q.4 Shortly explain backward Bending supply curve?
Q.5 Explain how wage rate determined?
Q.6 What is Marginal Revenue Product?
Q.7 Briefly explain the value of Marginal Physical Product?
Q.8 Explain how a firm achieves equilibrium in competitive factor market?
Q.9 Is demand for capital a derived demand?
Q.10 Briefly explain four factors of production?

B. Long Answer Questions

Q.1 What is factor pricing? How is the equilibrium determined in factor market?
Q.2 What do you mean by competitive factor market? How does it explain the process of determination of factor price?

MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT 2: ACTOR PRICING UNDER IMPERFECT COMPETITION

STRUCTURE

2.0 OBJECTIVES

After studying this unit, learner should be able to:

- Monopolistic power in product market
- Role of Price elasticity of demand

- Monopolistic power in the product market and labour market
- Wage determination and equilibrium of a monopolist firm with a single variable factor
- Equilibrium of a Monopolist with Several Variable Factors
- Bilateral Monopoly

2.1 INTRODUCTION

In this chapter, we will explain the determination of the price of a factor when there is imperfect competition in the product as well as the factor market. Hence, the determination of wage rate at labour will be explained in the following cases:

1. Firstly, it is assumed that there is monopolistic power (imperfect competition) in the product market and perfect competition in the factor market.
2. Secondly, it is assumed that there is monopolistic power in the product market but monopsonistic power in the labour market.
3. Thirdly, we take a bilateral monopoly where the firm has monopsonistic power but supply is controlled by trade unions.

One important point worth noting is that there is a difference between MRP and VMP in case of imperfect competition in the product market. We will take up therefore cases one by one.

2.2 MONOPOLISTIC POWER IN PRODUCT MARKET

In this case, it is assumed that firm uses labour as a single variable factor operating in perfectly competitive market. The wage rate is given and supply of labour to the individual firm is perfectly elastic. Since the firm has monopoly power in the product market, hence demand for the product of the firm is downward sloping and marginal revenue would be smaller than the price at all levels of output. Hence the demand for factor of production is determined by marginal revenue product (MRP) of factor and not by the value of marginal product (VMPL). Price would be equal to MRP but it would be less than the value of marginal product. Marginal revenue product curve is defined by multiplying the MPPL times the marginal revenue of selling of the commodity produced.

$MRP_L = MPP_L . MR_X$.

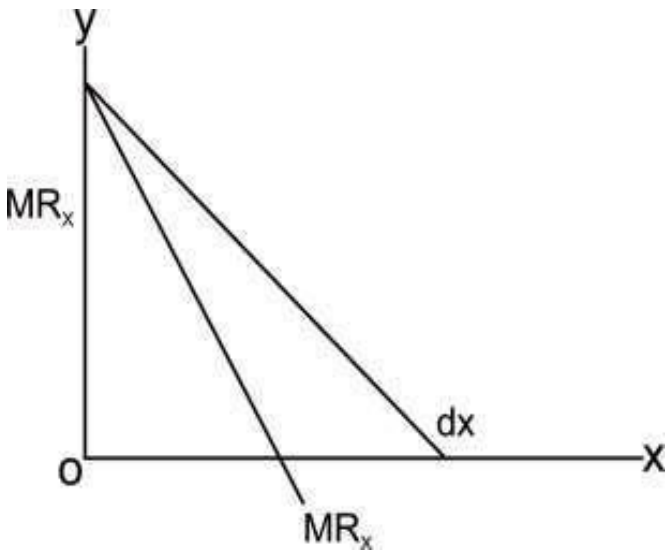


Figure 1: Imperfect product market

In Figure 2, the value of marginal product curve lies above the MRPL curve at all levels of employment. This is due to the fact that Px>MRx at all levels of output and employment. Both the VMPL and MRPL have a negative slope because their components (MPPL, Px, MRx) decline as output expands and hence the price of the product falls.

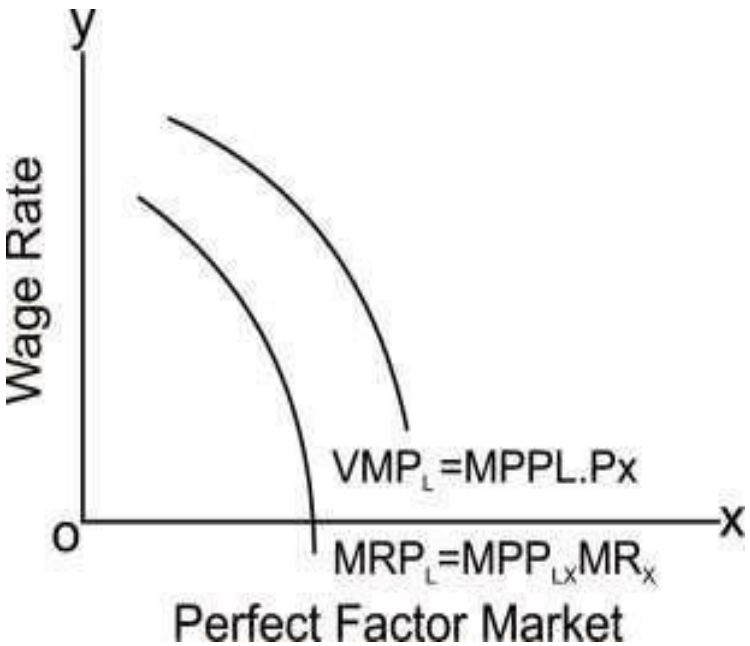


Figure 2: Perfect factor market

The firm is said to be in equilibrium in the factor market when labour is employed by firm

up to the point where the marginal revenue product of labour is equal to its marginal cost. In other words, where MRP = MC and MRP curve cuts the MC curve from the above.

But in this case, as it is assumed that there is perfect competition in the factor market so, wage rate will not be affected and thus, marginal labour cost curve will be horizontal straight line parallel to OX axis. So, the firm is in equilibrium when it maximizes profit at the point where MRP = MFC = wage rate. Firm has monopoly in the product market so it would have control over the price of the product. AR curve will slope downward and MR curve would lie below it. This is the reason that MRP labour will not be equal to VMP.

Since MR is less than the price of the product under monopoly so, MRP would be less than VMP of labour.

Symbolically,

MRP = MPP×MR

VMP = MPP × Px

Since MR < Price under Imperfect Competition So, MRP < VMP

The firm is in equilibrium Where W = MRP

So, W = MRP < VMP.

So, it is concluded that under conditions of monopoly in the product market (assuming perfect competition in factor market) the labour will get wage rate less than the value of its marginal product.

2.2.1 Determination of wage rate

The determination of wage rate is explained in Figure 3.

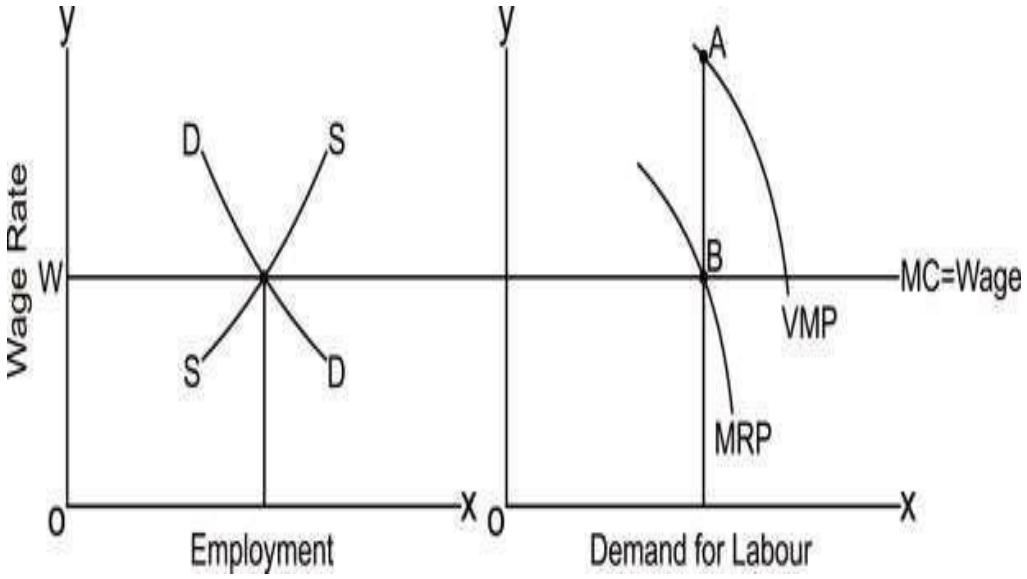


Figure 3: Wage determination with monopoly in product market

It is seen that DD is demand for labour and SS is supply of labour. The intersection of DD curve and SS curve determines the level of wages equal to OW. Since equilibrium shows imperfect competition in the product market VMP is higher than MRP and it lies above the MRP curve. The firm is in equilibrium at point B where wage rate and marginal revenue product of labour is equal. The firm employs OL units of labour. Since the wage is equal to MRP (BL) but less than VMP (AL). Therefore, labour gets (AB) less than the value of marginal Product.

2.2.2 Role of Price elasticity of demand

Now the question arises how much wage rate is less than the value of marginal product of labour? It depends upon the price elasticity of demand for the product produced by the firm. If demand for the product is inelastic, there would be greater divergence between W and VMP. It is shown as under:

$$W = MRP_L$$

$$W = MR.\ MPP_L \ldots\ldots\ldots\ldots (eq.\ 1)$$

$$MR = AR\ [1 - \frac{1}{E}]$$

Substituting MR value in eq. 1, we get;

$$W = AR\left[1 - \frac{1}{E}\right] MPPL$$

Since, VMP = MPP × Px

Or VMP = MPP × AR

So, $W = \left[1 - \frac{1}{E}\right] VMPL$

Under Perfect Competition,

$$\frac{1}{E} = 0$$

So, $1 - \frac{1}{E} = 1 - 0 = 1$

Therefore, W = 1× VMPL = VMPL

When there is Monopoly in product market, price elasticity of demand is less than infinite.

This means, $1 - \frac{1}{E} < 1$

As, $W = \left[1 - \frac{1}{E}\right] VMPL$

So, W < VMPL

It proves that lower the elasticity of demand greater would be the difference between wage rate (W) and value of marginal product of labour (VMPL).

2.3 MONOPOLISTIC POWER IN THE PRODUCT MARKET AND LABOUR MARKET

Monopsonist means a single buyer which can exist either in product market or a factor market. Monopsony in the factor market indicates a situation when there is single buyer of a specific factor of production. It is a very common practice when individual buyers of factors have monopsony power. For example, V.S. automobile companies have monopsony power as buyers of parts and components. For example, G.M. and ford buys large quantities of brakes, tires and can negotiate lower prices than smaller purchases might pay. Similarly, IBM has monopsony power in the market for disk drives because it

purchases so many drives for its computers. Monopsony in the labour market comes into existence when various employers of labour in an area form collusion. So far as recruitment

of labour is concerned Monopsony power can arise in different ways. It can be the specialized nature of firm business or it can be a business location when firm is the only major employer with in an area.

In the factor market, a monopsonist faces an upward slopping supply curve of the factor. Accordingly, monopsonist can affect the price of the factor by varying the level of its employment. As supply curve of labour is upward sloping, it implies that higher the supply of labour, higher will be the wages. As higher wages are given to more labourers, the addition made to total factor cost by employing an additional worker will be greater than wage rate. It is due to this fact that marginal factor cost of labour will lie above the supply curve of labour. It is shown in Figure 4.

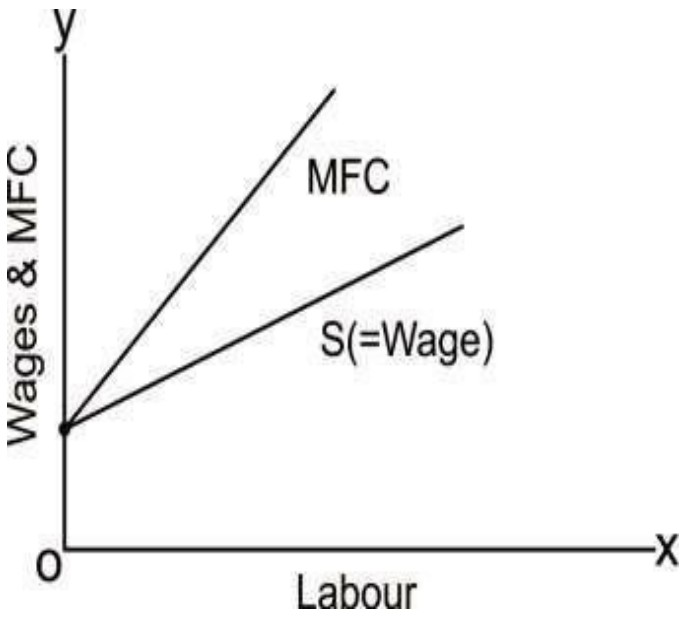


Figure 4: Wages and marginal factor cost

The price of a factor is lowered by restricting its demand. Therefore, the supply curve of a factor or average cost (AC) curve (i.e. wage curve) to the monopsonist will be rising upward to the right. In the real world, monopsony exists in labour market when a large single employer confronts a large no. of workers who are non-unionized and lack geographical mobility. If there is mobility, they would have shifted to industries where the wages are higher, and then it won't be the authority of a single employer to have a determining influence on the wage rate paid to laborers.

2.4 WAGE DETERMINATION AND EQUILIBRIUM OF A MONOPSONIST FIRM WITH SINGLE VARIABLE FACTOR

In this case, the demand for labour by the individual firm is the same as in case 1.

MRP is considered as demand for labour by a monopolistic firm. When there is monopoly in the product market, the marginal revenue product curve will differ from the value of marginal product curve. The MRP curve will be below the VMP, as marginal revenue is less than average revenue when there is a monopoly in the product market. The supply of labour for an individual firm is not perfectly elastic because the firm is large. As firm is a monopsonist in a buyer's market so the supply of labour has a positive slope. In other words, as the monopsonist employs more labour, wage rate tends to rise.

The supply of labour shows the average cost or price that the monopsonist must pay at different levels of employment. The total cost of a monopsonist is calculated by multiplying the price of the input by the level of employment. As the supply curve of labour slopes upward, the marginal cost curve lies above it.

Monopsonist is in equilibrium where the marginal revenue product equals the marginal cost of labour. The marginal cost is the change in the total cost on a factor arising from hiring an additional unit of the factor. Figure 5 shows that equilibrium of the monopsonist is at point E.

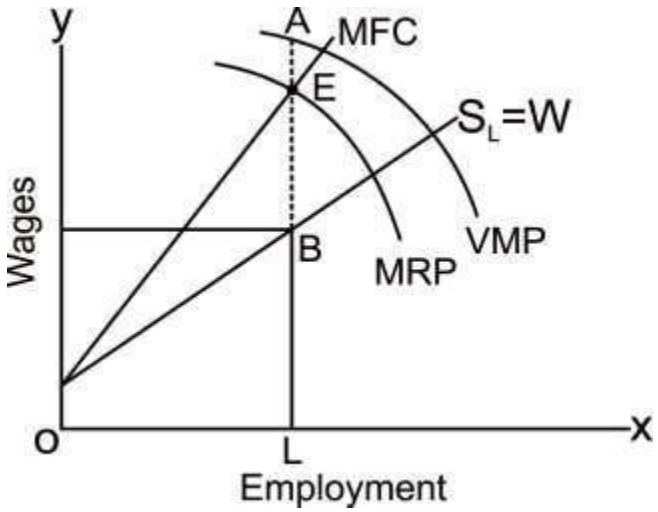


Figure 5: Wage determination under monopoly

The wage rate determined is OW and labour employed in OL. This wage rate BL (OW) is

not only less than the marginal revenue product (LE) but also less than VMP (LA). The difference EB between marginal revenue product LE and wages LB is due to the existence of monopsony in the labour market and hence it is called monopsonist exploitation. The difference AE between VMP (LA) and MRP(LE) is due to existence of monopoly in the product market. The worker gets AE amount less than VMP due to existence of monopoly and hence it is called monopolistic exploitation. To conclude, under monopsony monopoly market situation, the labour is subject to double exploitation. Due to monopoly, he gets. Less than VMP and due to monopsony, he gets less than his MRP.

2.5 EQUILIBRIUM OF A MONOPSONIST WITH SEVERAL VARIABLE FACTORS

As we have studied earlier, if the input markets are perfectly competitive, the firm minimizes its cost by using that factor combination at which

MPPL = W and MPPK = R

As, MPPL = MPPK

W = R

But if the factor markets are monopsonist, then changes in the number of factors employed causes changes in the prices of factors. As W and R are not given, the monopsonist looks at the marginal cost of these factors. He will use that input combination at which the ratio of MPP to MC is equal for all variable inputs. The least-cost combination is obtained when the marginal rate of technical substitution (MRISLK) equals the marginal cost of the input ratio. If we assume that there are two inputs, labour and capital then the equilibrium condition of the monopsonist is stated as:

$$\text{MRTS}_{LK} = \frac{\text{MPPL}}{\text{MPPK}} = \frac{\text{MC}_L}{\text{MC}_K}$$

$$\text{Or } \frac{\text{MPPL}}{\text{MPPK}} = \frac{\text{MC}_L}{\text{MC}_K}$$

2.6 BILATERAL MONOPOLY

In this case, it is assumed that the firms are organized in a single body which acts like a monopsonist while the labour is organized in a labour union which acts like a monopolist.

Both the participants on supply side as well as demand side have their monopolies. In general, this is the case when a single seller (monopolist) faces a single buyer (Monopsonist). For example, a single uranium mining company and uranium miner's union in a small town is an example of bilateral monopoly.

Since Bilateral monopoly will exist in the labour market when both the employer and the trade union exert their monopoly power for fixing wages. In this case, there arises a conflict of interests between the union and the employer. Both parties will use their bargaining powers and try to achieve respective objectives.

While the objective or the employer is profit maximization, the union may choose any of the several possible objectives in keeping with its ideology. Of the several hypotheses as to the goals of Union, the following three are the more common ones.

2.6.1 Objectives of Bilateral Monopoly

- The Union acting as a sole agent for the sale of services of its members may strive to secure an optimum wage and thus maximize the member's income.
- Alternatively, the union may seek to maximize its membership. It could under this hypothesis, be assumed that at each wage rate the union can negotiate, a particular number of person, own allegiance to the union. The higher the wage rate, larger its membership. In this way, a special kind of supply curve the membership function, can be imagined on the basis of which the union may gain with employer.
- Another possible kind of behavior of the union may be to seek an optimum combination of wages and employment. There would be a family of indifference curves representing different combinations of wages and employment, open to the union. And through collective bargaining the union could strive to achieve the optimum combination on as high an indifference curve as possible.

2.6.2 Wage determination under Bilateral Monopoly

Analysis of wage determination under bilateral monopoly theoretically does not lead to a particular wage rate. Rather it brings out two limits. The upper limit given by trade unions and lower limit set by employer. It is within this range that wage would be fixed. Whether it is nearer to the upper limit or lower limit depends upon the relative strength of the union

and employer. Ultimately, wage determination within this range is indeterminate as it may be set at any level within the range between two limits. The range of wage within which a particular wage rate will be settled is explained with the help of figure 6.

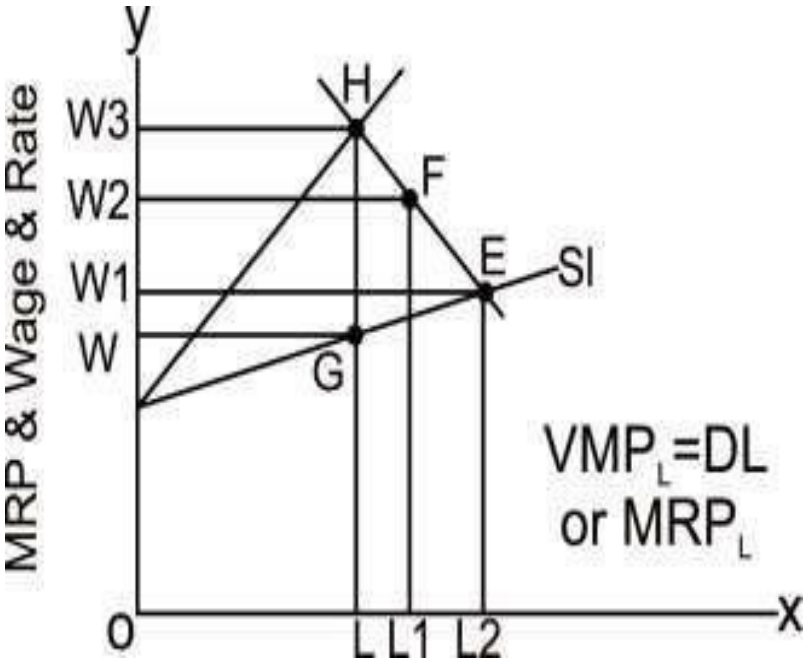


Figure 6: Wage determination under monopoly

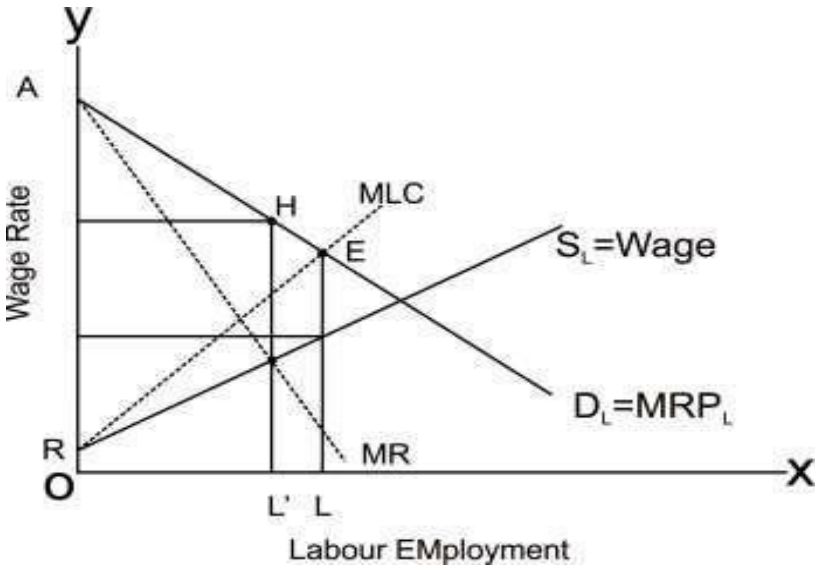
The employer would maximize his profits where marginal labour cost (MLC) equals marginal revenue product (MRPL) of labour as will be seen from Fig.6. To achieve this, he will wish to set the wage rate equal to W0 and employ L0 number of workers. Thus, W0 is the minimum limit below which the wage rate cannot fall.

On the other hand, if the union seeks to maximize wage rate without creating unemployment, it will demand wage rate W3, at which, given to which given demand curve for labour DL, OL0 amount of labour is employed. Thus, W3 sets the upper limit to which the wage rate can be raised. If the union sets a higher wage rate than W3, the employment will fall be below L0 and thus create unemployment for some workers. Which particular wage rate will be ultimately settled between the two parties depends on their relative bargaining strengths.

2.6.3 Sophisticated Bilateral Monopoly Model of Wage Fixation

A more sophisticated bilateral monopoly model of wage fixation is presented in Figure 7.

In this Figure, marginal revenue curve which is marginal to the labour demand curve



(DL=MRPL) has also been drawn shows how much additional income or revenue the union will obtain when more labour is hired. As demand curve for labour is sloping downward, marginal revenue curve lies below it. Now, the employer who is monopsonist, if left free, would wish to set wage rate W0 and employ OL amount of labour at which his marginal

Figure 7: Wage determination under Bilateral monopoly

labour cost (MLC) equals marginal revenue product (MRPL). On the other hand, if the labour union aims at maximizing net revenue or economic rent (i.e. revenue over and above opportunity costs of labour) it will press for wage rate equal to W4 at which OL' quantity of labour will be employed.

Thus, W4 is the upper limit of the wage rate sought by the union whereas W0 is the lower limit. At which wage rate and employment, settlement will be reached between the two parties depends on their bargaining powers and strategies. If the union can make a strong threat to strike, it might succeed in achieving a wage closer to W4. On the other hand, if the employer makes a credible threat to declare lockout or hire non-union labour, it might secure a wage rate closer to W0. The result is indeterminate.

2.7 SUMMARY

Factor pricing under imperfect competition involves deviations from perfect competition outcomes due to market power. Monopoly in product market:

MRP < VMP

Wage = MRP

Monopsony in factor market:

MFC > Wage

Wage < MRP < VMP

Labour faces double exploitation

Bilateral Monopoly: Wage rate is indeterminate, settled through collective bargaining. Greater inelasticity in product demand widens gap between wage and VMP. Equilibrium depends on marginal productivity and bargaining strength in each case.

2.8 QUESTIONS FOR PRACTICE

A. Short Answer Type Questions

1 Write a note on Bilateral Monopoly

2 Explain the Sophisticated Bilateral Monopoly Model of Wage Fixation

3 Role of Price elasticity of demand

B. Long answer Type questions

1 Explain the Wage determination and equilibrium of a monopsonist firm with single variable factor

2 Describe in detail the Monopolistic power in the product market.

3 Explain the Equilibrium of a Monopsonist with Several Variable Factors

2.9 SUGGESTED READINGS

- Ahuja, H.L. (2019). Advanced Economic Theory. S. Chand Publications
- Mankiw, Gregory N (2012). Principles of Economics 3rd Edition.
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MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT 3: GENERAL EQUILIBRIUM ANALYSIS

STRUCTURE

3.0 OBJECTIVE

After reading this unit, learners will be able to know about:

- General Equilibrium Model
- Variables for the General Equilibrium Solution

- Static properties of a General Equilibrium state
- Optimality Properties
- Efficient distribution of the commodities produced between the two consumers
- Efficient combination of products (simultaneous equilibrium of production and consumption

3.1 INTRODUCTION

The French economist Leon Walras formally proposed the idea of general equilibrium analysis in the late 1800s. The question of whether each decision-maker's independent behaviour results in a situation where everyone reaches equilibrium is addressed by general equilibrium theory.

A general equilibrium is reached when all markets and decision-making units are in simultaneous equilibrium. There is general equilibrium if all markets are cleared at a positive price, every firm maximizes profit, and every consumer maximizes satisfaction. General equilibrium analysis is the study of how this state may, if ever, be reached—that is, how prices are set consistently across all markets to avoid excess supply or demand—while also making sure that each economic unit accomplishes its own goals. Because people and markets are interdependent, a consistent set of pricing must be secured by simultaneously determining equilibrium for all product and factor markets as well as for all market participants. When a model of simultaneous equations with millions of equations and millions of unknowns is solved, general equilibrium results. The unknowns are the prices of all factors and all commodities and the quantities purchased and sold (of factors and commodities) by each consumer and each producer. The equations of the system are derived from the maximising behaviour of consumers and producers, and are of two types: behavioural equations describing the demand and supply functions in all markets by all individuals, and clearing-the-market equations.

In theory, if the number of independent equations in a simultaneous-equation system equals the number of unknowns in the system, then the system has a solution.

Thus, General equilibrium analysis examines how supply and demand interact in all markets of an economy at once, rather than in isolation (as done in partial equilibrium analysis). It determines how prices and quantities are set when all markets clear

simultaneously.

3.2 GENERAL EQUILIBRIUM MODEL

The 2 x 2 x 2 general equilibrium model in a simple economy is defined as a model comprising of two factors of production, two commodities (each produced by a firm) and two consumers.

In the perfectly competitive market system, since with free competition it has been proved that a general equilibrium solution exists (given some additional assumptions about the form of the production and demand functions).

3.2.1 THE ASSUMPTIONS OF THE MODEL

1. Factors of Production: The model uses labour (L) and capital (K) as two factors of production which are exogeneous in nature. They are homogeneous and perfectly divisible.
2. Production Structure: It is assumed that X and Y are the two commodities that is produced with given technology. The production function of each commodity is given by isoquant maps. Isoquants are downward sloping smooth convex curves showing that slope of isoquant (MRTS) tends to diminish as we move along the curve. Both the goods exhibit constant returns to scale and assumes that there are no external economies or diseconomies of scale.
3. Consumer and Preferences: A and B are two consumers in the economy and their preferences are shown by indifference curves. Indifference curves are downward sloping convex curves showing that as we move along the curves, their slope (MRS) tends to diminish. Also, it is assumed that consumer choices are sovereign and independent. This means that consumer choices are not dependent on other's utility and other factors like advertisements etc.
4. Objective: The consumer aims to maximize satisfaction subjected to income constraint while firms aim to maximize profits subjected to technology constraint of production function.
5. Factors of Production: Consumers owns factors of production and all the factors of production are fully employed.

6. Perfect competition: Product market and factor market are perfectly competitive. Consumers and firms pursue their goals faced by the same set of prices (Px, Py, w, r).

When the four markets (two commodity markets and two factor markets) are cleared at a set of equilibrium prices (P x Py, w, r) and every participating economic agent (two businesses and two consumers) is concurrently in equilibrium, a general equilibrium is attained in this model.

3.2.2 Variables for the General Equilibrium Solution:

The following variables must be determined in order to find the general equilibrium solution:

- The total quantities of the two commodities X and Y, which will be produced by firms and bought by the consumers.
- The allocation of the given K and L to the production of each commodity (Kx, Ky, Lx, Ly} ·
- The quantities of X and Y which will be bought by the two consumers (X_A, X_B, Y_A, Y_B) ·
- The prices of commodities (P x and P y} and of the factors of production (wage w, and rental of capital r).
- The distribution of factor ownership between the two consumers (K_A, K_B, L_A, L_B).
- The quantities of factors multiplied by their prices define the income distribution between A and B, and hence their budget constraint.

3.2.3 Static Properties of a General Equilibrium State

A general equilibrium solution obtained by a free competitive market mechanism has three static properties:

a) Efficient allocation of resources among firms (equilibrium of production).

b) Efficient distribution of the commodities produced between the two consumers (equilibrium of consumption.

c) Efficient combination of products (simultaneous equilibrium of production and consumption).

These properties are called marginal conditions of Pareto optimality or Pareto efficiency. A situation is defined as Pareto optimal (or efficient) if it is impossible to make anyone better-off without making someone worse-off.

3.3 OPTIMALITY PROPERTIES

3.3.1 Equilibrium of production (efficiency in factor substitution):

Equilibrium of production requires the determination of the efficient distribution of the available productive factors among the existing firms (efficiency in factor substitution).

We know that the firm is in equilibrium if it chooses the factor combination (for producing the optimum level of output) which minimises its cost.

Thus, the condition for the firm to be in equilibrium is:

Slope of isoquant = Slope of Iso-cost

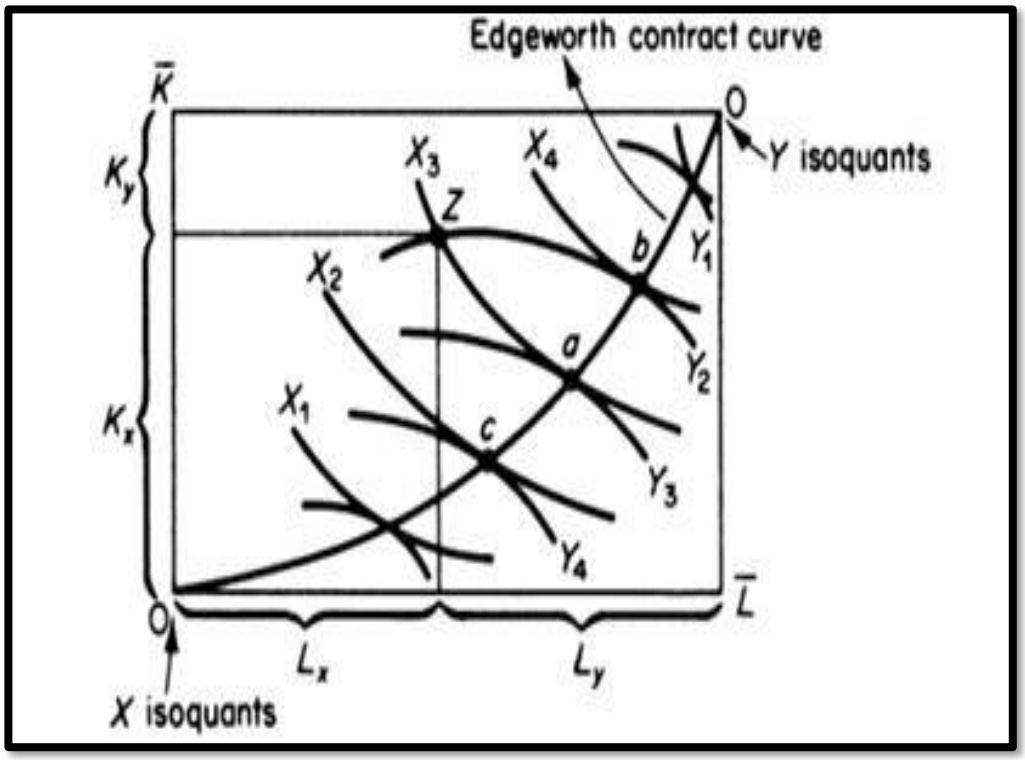
or

$$\mathbf{MRTS}_{L,K} = \mathbf{w/r}$$

where w and r are the factor prices prevailing in the market and M R TS is the marginal rate of technical substitution between the factors.

The Edgeworth box of production can be used to determine the combined equilibrium of production of the two firms in our basic model.

Figure 1: Equilibrium of production



In figure 1, K and L are measured on the axes. The isoquants of commodity X are plotted with origin the south-west comer and the isoquants of Y are plotted with origin the north-east comer. The locus of points of tangency of the X and Y isoquants is called the Edgeworth contract curve of production. This curve is of particular importance because it includes the efficient allocations of K and L between the firms. Each point of the Edgeworth box shows a specific allocation of K and L in the production of commodities X and Y. Such an allocation defines six variables: the amounts of Y and X produced and the amounts of capital and labour allocated to the production of Y and X.

For example, point Z shows that:

X_3 is the quantity produced of commodity X

Y_2 is the quantity produced of commodity Y

K_x is the amount of capital allocated to the production of X_3

K_y is the amount of capital allocated to the production of Y_2

L_x is the amount of labour allocated to the production of X_3

Ly is the amount of labour allocated to the production of Y_2

However, not all points of the Edgeworth box represent efficient allocations of the available resources. Given that K and L are limited in supply, their use should produce the greatest possible output. An allocation of inputs is efficient if the produced combination of X and Y is such that it is impossible to increase the production of one commodity without decreasing the quantity of the other.

From the figure 1, we see that efficient production takes place on the Edgeworth contract curve. It is impossible to move to a point off this curve without reducing the quantity of at least one commodity. Point Z is a point of inefficient production, since a reallocation of K and L between the two commodities (or firms) such as to reach any point from a to b leads to a greater production of one or both commodities. Since the Edgeworth contract curve of production is the locus of tangencies of the X and Y isoquants, at each one of its points the slopes of the isoquants are equal:

Slope of X isoquant = Slope of Y isoquant or

$MRTS_{L,K}$ for X = $MRTS_{L,K}$ for Y

In our simple general equilibrium model the firms, being profit maximisers in competitive markets, will be in equilibrium only if they produce somewhere on the Edgeworth contract curve. The general equilibrium of production occurs at a point where the $MRTS_{L,K}$ is the same for all the firms, that is, at a point which satisfies the Pareto optimality criterion of efficiency in factor substitution: the general equilibrium of production is a Pareto-efficient allocation of resources. The production equilibrium is not unique, since it may occur at any point along the Edgeworth contract curve: there is an infinite number of possible Pareto-optimal production equilibria.

To conclude, with perfect competition, general equilibrium of production will occur at a point on the contract where $MRTS_{L,K}$ is equal to the ratio of the market factor prices w/r

i.e., $$MRTS^{x}_{LK} = MRTS^{y}_{LK} = \frac{w}{r}$$

If the factor prices are given, from the Edgeworth box of production we can determine the

amounts of X and Y which maximize the profits of firms. However, in a general equilibrium, these quantities must be equal to those which consumers want to buy in order to maximize their utility. Consumers decide their purchases on the basis of the prices of commodities, P_X and P_Y. Thus, in order to bring together the production side of the system with the demand side, we must define the equilibrium of the firms in the product space, using as a tool the production possibility curve of the economy.

This is derived from the Edgeworth contract curve of production, by mapping its points on a graph on whose axes we measure the quantities of the final commodities X and Y.

From each point of the Edgeworth contract curve of production we can see the maximum obtainable quantity of one commodity, given the quantity of the other.

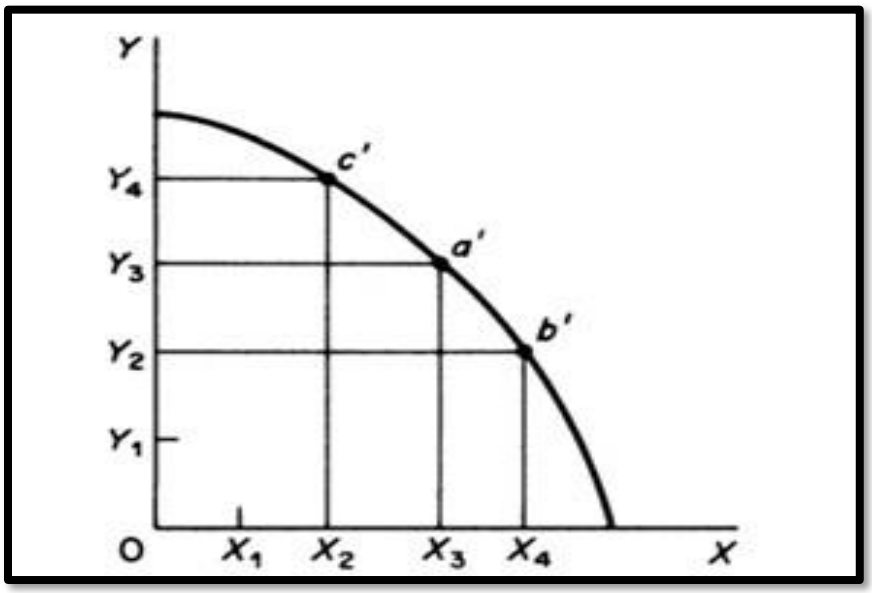
For example, point a in figure 2 shows that, given the quantity of X is X_3 the maximum quantity of Y that can be produced (with the given factors K and L) is Y_3

The X_3 and Y_3 combination is presented by point a' in figure 2.

Similarly, point b of the Edgeworth contract curve of production shows that, given X_4, the maximum amount of Y that the economy can produce is Y_2

Point b' in figure 2 is the mapping of b from the factor space to the production space.

Figure 2: Production Possibility curve



The production possibility curve of an economy is the locus of all Pareto-efficient outputs, given the resource endowment (K and L) and the state of technology is constant. This curve shows the maximum quantity of a good obtainable, given the quantity of the other good. At any point on the curve all factors are optimally (efficiently) employed. Any point inside the curve is technically inefficient, implying unemployed resources. Any point above the curve is unattainable, unless additional resources or a new technology or both are found. The production possibility curve is also called the product transformation curve because it shows how a commodity is 'transformed' into another, by transferring some factors from the production of one commodity to the other.

The negative of the slope of the production possibility curve is called the marginal rate of (product) transformation, $MRPT_{X,Y}$ which shows the amount of Y that must be sacrificed in order to obtain an additional unit of X. The economic meaning of the transformation curve is the rate at which a commodity can be transformed into another. This means;

$MRPT_{X,Y} = -dY/dX$ or

$MRPT_{X,Y} = -dY/dX = MC_x / MC_y$

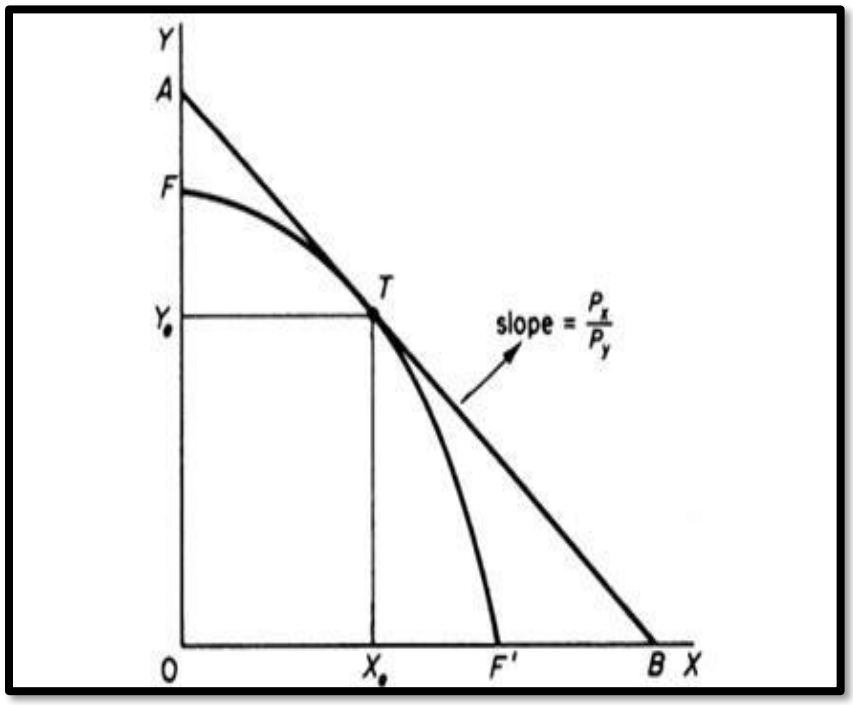
In perfect competition the profit-maximising producer equates the price of the commodity produced to the long-run marginal cost of production:

$MC_x = P_x$ and $MC_y = P_y$

Therefore, the slope of the production possibility curve is also equal to the ratio of the prices at which X and Y will be supplied by perfectly competitive industries:

$MRPT_{X,Y} = MC_x / MC_y = P_x / P_y$

Figure 3: General equilibrium of Production with perfect competition



Thus, the general equilibrium product-mix from the point of view of firms is given by point T. The two firms are in equilibrium producing the levels of output Ye and Xe.

3.3.2 Efficient distribution of the commodities produced between the two consumers (equilibrium of consumption): Optimality Property 11

We know that the consumer maximises his utility by equating the marginal rate of substitution of the two commodities (slope of his indifference curves) to the price ratio of the commodities.

Thus the condition for consumer equilibrium is

$$\mathbf{MRS_{X,Y} = P_x/P_y}$$

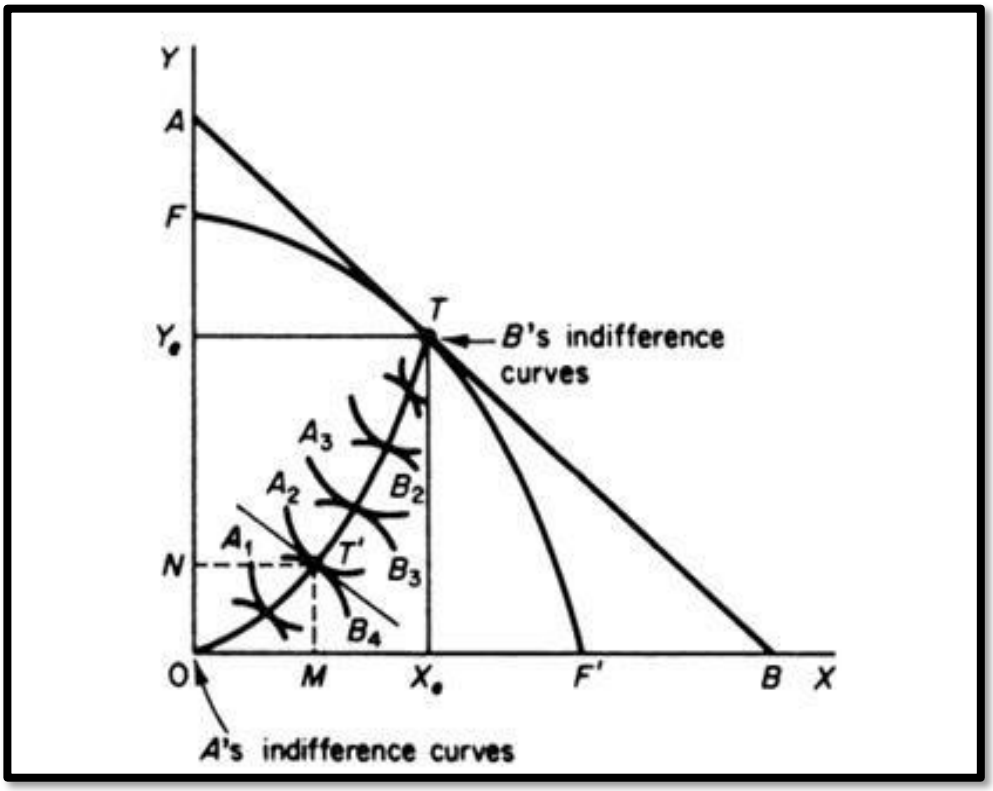
Since both consumers in perfectly competitive markets are faced with the same prices the condition for joint or general equilibrium of both consumers is

$$\mathbf{MRS_{X,Y} \text{ for } A = MRS_{X,Y} \text{ for } B = P_x/P_y}$$

This general equilibrium of consumption for the product mix Y_e, X_e is shown in the figure 4 given below. We construct an Edgeworth box for consumption with the precise dimensions by dropping Y_e and X_e from point T (on the product transformation curve) lines

parallel to the commodity axes. We next plot the indifference curves of consumer A with origin the south-west comer, and the indifference curves of B with origin the north-east comer.

Figure 4: Equilibrium of Consumption



Any point in the Edgeworth consumption box shows six variables: the total quantities Y_e and X_e and a particular distribution of these quantities between the two consumers. However, not all distributions are efficient in the Pareto sense.

A Pareto efficient distribution of commodities is one such that it is impossible to increase the utility of one consumer without reducing the utility of the other.

From figure 4, it is seen that only points of tangency of the indifference curves of the two consumers represent Pareto-efficient distributions. The locus of these points is called the Edge worth contract curve of consumption. It should be clear that at each point of this curve the following equilibrium condition is satisfied:

$MRS_{X,Y}$ for A = $MRS_{X,Y}$ for B

3.3.3 Efficient combination of products (simultaneous equilibrium of production and consumption). Optimal property 111

The general equilibrium of the system as a whole requires the fulfillment of a third condition, namely that the marginal rate of product transformation (slope of the PPC) be equal to the marginal rate of substitution of the two commodities between the consumers i.e.,

$MRPT_{X,Y}$ = $MRS_{X,Y}$ for A = $MRS_{X,Y}$ for B

In the perfect competition the above condition is satisfied as,

$MRPT_{X,Y}$ = Px/Py and ,
$MRS_{X,Y}$ for A = $MRS_{X,Y}$ for B = Px/Py
so, $MRPT_{X,Y}$ = $MRS_{X,Y}$ for A = $MRS_{X,Y}$ for B

This is the third condition of Pareto efficiency. It refers to the efficiency of product substitution (or optimal composition of output). Since the MRPT shows the rate at which a good can be transformed into another in production, and the MRS shows the rate at which the consumers are willing to exchange one good for another, the system is not in equilibrium unless the two ratios are equal. Only then the production sectors' plans are consistent with the household sectors' plans, and the two are in equilibrium.

3.4 SUMMARY

In summary, with perfect competition (and no discontinuities and with constant returns to scale) the simple two-factor, two-commodity, two-consumer system has a general equilibrium solution, in which three Pareto-efficiency conditions are satisfied:

- The MRS between the two goods is equal for both consumers. This efficiency in distribution implies optimal allocation of the goods among consumers.
- The MRTS between the two factors is equal for all firms. This efficiency in factor substitution implies optimal allocation of the factors among the two firms.
- The MRS and the MRPT are equal for the two goods. This efficiency in product mix implies optimal composition of output in the economy and thus optimal allocation of resources.

3.5 QUESTIONS FOR PRACTICE

A. Short Answer Type Questions

Q1 Explain the Static property of General Equilibrium.

Q2 Write down the variables which must be determined in order to find the general equilibrium solution.

Q3 What do you mean by Pareto Optimality? Name the various optimality properties.

B. **Long answer Type questions**

Q1 Describe the basic structure of a general equilibrium model.

Q2 What is a general equilibrium model? How does it differ from a partial equilibrium model?

Q3 Explain the third optimality property of the General equilibrium

Q4 Describe the Equilibrium of production, i.e. efficiency in factor substitution)

Q5 Explain the Equilibrium of Consumption, i.e Efficient distribution of the commodities produced between the two consumers.

3.6 SUGGESTED READINGS

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MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT 4: WELFARE ECONOMICS

STRUCTURE

4.0 OBJECTIVES

After reading this unit, learners will be able to know about:

- Criteria of Social Welfare
- Arrow's Theorem
- Pareto Optimum
- Conditions of Pareto Optimum
- Perfect Competition: the welfare ideal

4.1 INTRODUCTION

The concept of Welfare Economics is associated with various economists like Alfred marshal, Vilfred Pareto and AC Pigou. Welfare economics is a subfield of economics known as welfare economics is concerned with the financial security and general well-being of people in society. It looks at how market mechanisms, resource distribution, and economic policies affect social welfare in an effort to identify the most effective and fair solutions for society as a whole.

4.2 DEFINING WELFARE ECONOMICS

Welfare Economics has come to occupy the status of a specialized branch of economic theory which is concerned with the search for criteria which may serve as the basis for formulating policies to maximize social welfare. This is only a rough and ready definition of welfare economics. Other definitions are also possible, "At one end the spectrum of possible definitions", observes M.J. Farrell." One might treat welfare economics as an exercise in denying the most general policy recommendations from a minimum of value Judgement, eschewing empirical fact' and (so far as possible) positive economic analysis" of M.J. Farrell, Readings in Welfare Economics p. vii.

However, this definition is rather too general and if followed will make the subject non-scientific study in so far as the practitioner of welfare economics eschews, an enjoined by this definition empirical facts and positive economic analysis. Such a definition of welfare economics will turn the subject into purely normative study which may prove to be frustrating as well as sterile. There is no doubt that welfare economics essentially a normative study, basically concerned as it is with policy recommendations, but It must be

studied scientifically.

Therefore, it is more worthwhile to define it as a branch of economic analysis which is "concerned with making policy recommendations applicable in the world of economic affairs" and derived on the basis of minimum of value judgements and a rigorous positive and empirical analysis.

Of the three definitions considered above, the first of these has been virtue of simplicity without losing sight of the essential character of the specialized study that welfare economics is to have a general idea of the nature of subject. which is essentially what is working definition of subject should provide we may focus on the following characteristics of welfare economics as a distinct branch of economic theory first it is concerned with policy recommendations In that context it is a normative study, second, policy recommendations with which it is concerned is not pure and simple value judgements like the statement 'Honesty is the best policy' : it rather seeks to discover through positive analysis the objective criteria with reference to which comparative welfare effects of alternative policy may be judged and thus the optimum or the best policy is recommended ; third (which follows from the second), it is a scientific or, at any rate, it attempt to a scientific theory of economic policy aiming at the maximization of social welfare, Fourth, in so far as it is essentially a normative study, it cannot avoid making some minimum number of value judgement.

The last point is important to remember because, as we shall see later on, the founders of the so-called new welfare economics claims that their brand of welfare economics steers clear of value judgements while the fact is that their value judgements are implicit rather than explicit; that is their value judgements are concealed within their analysis rather than openly stated.

4.3 SOCIAL WELFARE

If welfare economics is concerned with search for scientific criticism or principles which might serve as the basis for recommendations policies so as to maximize social welfare, it is pertinent to ask what we mean by the term 'social welfare'. The term 'social welfare', as used in welfare, economics has a specific meaning like any other scientific term. In the first place, 'welfare' itself has a specific meaning. It is Interpreted in subjective terms and refers

to the level of satisfaction which is assumed' to be identical with or, at least proportionate with the feeling of well-being. Thus, increase or decrease In the level of satisfaction part past leaders to Increase or decrease in welfare.

Secondly, the concept of 'welfare' in economics is used in the sense of economic welfare as distinguished from general Welfare. As defined by Pigou, economic welfare is that part of general welfare 'that can be brought directly into relation with the measuring rod of money. "In other words, it refers to the amount of satisfaction derived from the consumption of exchangeable goods. Some economists have not found the Pigovian distinction between economic welfare and general welfare to be well-founded. Dr. Little, for example, has argued, in his Critique of WeIfare Economics, "that the word 'economic' qualifies not well-being, but the causes of well-being." It has been contended that it is not possible to distinguish between economic welfare and general welfare in as much as welfare refers to a. state of mind and it is not possible to distinguish one state of mind (or feeling of well-being) from another state of mind.

According to Prof. Robbins, "the concept of welfare embraces many states of mind, some of a merely sensual, some of more 'spiritual' nature; and for some purposes, it may be interesting to sort them out into different classes."

But the class 'economic' will not be one of them. On this view, there are no economic states of mind. There are economic factors involved in the achievement of states of mind. But the states of mind themselves are not economic.

We feel that Prof. Robbins is stretching the point too far. It is true that welfare of individual depends on the availability of both, economic goods and non-economic goods (which may include on the one hand, the so called free goods and one of which, such as water unpolluted air, sunlight or quiet atmosphere, can become scarce in relation to demand and enter in the category of economic of goods on the other hand, they may include the so- called spiritual goods such as personal liberty. But it will be realized by most, if not all, people that economic policies in practice have to be analyzed and stated in terms of economic factors, for, as was said above, welfare economics is "concerned with making policy recommendations applicable in the world of affairs.

Moreover, if spiritual states of mind and welfare associated with those of mind need not be

"any less dependent on economic factors" as Robbins maintains it, we may include, by definition, all such welfare in the category or economic welfare.

Nor do we feel that Dr. Little has made any point of substance by emphasizing that "the word 'economic' qualifies not well-being, but the causes of well-being". In fact, it does both, for economic welfare is defined as that of general welfare which is a function of economic goods available. It is all a matter of definition. No definition is perfect from all points of view. A definition which is suitable and appropriate in the context of a particular purpose of analysis may not be appropriate in the context of some other purpose. In the context of the main purpose of the established body of welfare analysis, the definition of economic welfare as given by Pigou, we feel, is appropriate. The distinction made by him between general welfare and social welfare and social welfare is meaningful.

Thus, 'welfare' in the economic welfare, even when not preceded by the adjective 'economic' is taken to mean 'economic welfare', which is that part of general welfare which is function of the quantities of economic goods and refers to the level of satisfaction derived from the consumption of those quantities of economic goods. However, it should be noted that to define welfare as economic welfare in the sense explained above is not to recommend that the attainment of economic welfare should be the sole or even the most important objective to be pursued by individuals and the state.

Pigou himself had warned us against such a misinterpretation when he observed in his paper, "Some Aspects of Welfare Economics", (American Economic Review, June, 1951) that "Nobody supposes that economic welfare is coincident with the whole of welfare or that the State ought to pursue it relentlessly in that regard or other goods-liberty, for instance, the amenities of the family, spiritual needs and so on".

Having fixed the meaning of the world 'welfare' as used in welfare economics, we have not to specify the meaning of the term, 'social welfare'. No doubt, it refers to the economic welfare of a society as a whole. We should not lose sight of the fact that modern welfare economics is rooted in the utility school economics and its doctrine of consumer's sovereignty. Social welfare, therefore, refers to sum total of the satisfactions enjoyed by all the individual making up a given society.

4.3.1 Criteria of social Welfare:

Various economists have suggested different criterions of social welfare in order to define welfare economics. These criterions are as follows:

1. **Growth of GNP as a Criteria of Welfare:**

   This criterion was introduced by Adam Smith. As per this approach, growth of GNP implies social welfare. This is because higher GNP means economic growth which implies increased employment, increased consumption level and thus, higher social welfare of the society. To him, economic growth meant bringing W closer to W* where $W<W^*$.

2. **Bentham's Criteria:**

   This criterion was introduced by Jerry Bentham. He argued that welfare is improved when 'the greatest good (is secured) for the greatest number'. As per this criteria, total welfare is the sum of the utilities of individuals of the society.

   Let us take an example to explain this. Suppose there are three individuals A, B, and C in the society and $W = U_A + U_B + U_C$.

   As per Bentham, $\Delta W > 0$ if $(\Delta U_A + \Delta U_B + \Delta U_C) > 0$.

   This implies that two individuals are better-off while the third is worse-off after the change has taken place, but the sum of the increases in utilities of A and B is greater than the decrease in the utility of C.

3. **A Cardinality Criterion:**

   This criterion uses law of diminishing marginal utility approach to explain the criteria of welfare. Cardinal economists argued that in order to increase the social welfare of the economy, income should be equally distributed to all members of the society.

4. **Pareto Optimality Criterion:**

   This criterion was given by Vilfred Pareto and he measured economic efficiency as the measure of social welfare. According to this criterion any change that makes at least one individual better-off and no one worse-off is an improvement in social welfare. Conversely, a change that makes no one better-off and at least one worse-off is a decrease in social welfare. In other words, a situation in which it is

impossible to make anyone better-off without making someone worse-off is said to be Pareto-optimal or Pareto-efficient.

For the attainment of a Pareto-efficient situation in an economy three marginal conditions must be satisfied:

(a) Efficiency of distribution of commodities among consumers (efficiency in exchange);

(b) Efficiency of the allocation of factors among firms (efficiency of production);

(c) Efficiency in the allocation of factors among commodities (efficiency in the product-mix, or composition of output).

5. The Kaldor- Hicks Compensation Criteria:

In the 1930s, economists Nicholas Kaldor and John Hicks expanded on the idea of Pareto efficiency to create the Kaldor-Hicks Compensation Criteria, a crucial welfare economics premise. Kaldor-Hicks loosens the stringent criterion that a change in economic welfare constitute an improvement if at least one person benefits without making anyone else worse off, in contrast to Pareto efficiency. Assume that a proposed economic change would benefit some people (the "gainers") while harming others (the "losers"). Asking the winners how much they would be willing to pay to see the change come to pass and the losers how much they would pay to stop it would be a good way to assess this shift. A change is deemed to improve social welfare if the total amount that the gainers are willing to offer is more than the amount that the losers would pay to avoid the change because the 'gainers' could compensate the 'losers' and still have some 'net gain'. Thus, the Kaldor-Hicks 'compensation criterion' states that a change constitutes an improvement in social welfare if those who benefit from it could compensate those who are hurt, and still be left with some 'net gain'.

6. The Bergson Criteria: The Social Welfare Function

This criterion was given by A. Bergson and he suggested social welfare function as the measure of welfare economics. He argued that social welfare function is similar to indifference curves. Each curve is the locus of combination of utilities of A and B which yields same level of social welfare. Higher the curve, Higher will be the social welfare.

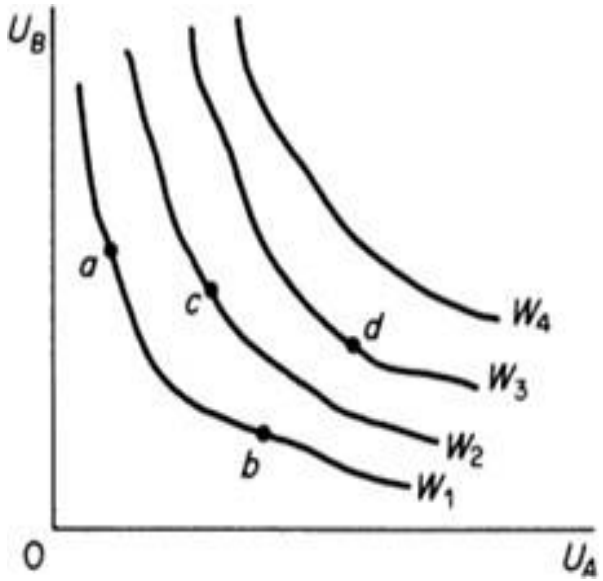


Figure 1: Social Welfare contours

Let us explain this criterion with the help of the above figure 1. Suppose there are two individuals A and B in the society whose Utility is expressed as U_A and U_B. W1, W2, W3, W4 are the social welfare contours showing W4>W3>W2>W1. This implies higher the curve, higher is the social welfare. Points a and b lies on the same curve W1 implying that both gives same level of social welfare to the individuals while, point c and d represents different levels of social welfare as they are on different curves. Point d represents the highest level of social welfare to the society.

4.4 ARROW IMPOSSIBILITY THEOREM

In the new welfare economics, the stress is on social welfare and not on individual welfare. With democratic administration, it is always the prime concern of the governments to examine the possibilities of increasing social welfare. The problems arise at this stage because social welfare function is much more complex than the individual welfare function. It has normally been argued that an individual's welfare can be made objective through his choice but this choice-criteria cannot be generalized to social welfare as it is very hard to think of a social choice in the same fashion as we do an individual. Society is composed of individuals whose choices may not be uniform. The problem then, is how to make social decisions consistent with social preferences.

Kenneth Arrow made significant contributions in the field of social choice theory by offering a clear and systematic analysis of the challenges involved in formulating social decisions that remain consistent with individual preferences. One proposed solution to this problem is to construct a social welfare function based on the majority voting principle, wherein alternatives are ranked according to the preferences of the majority, and this ranking is treated as the collective social preference. However, Arrow demonstrated through rigorous analysis that it is impossible to make collective decisions fully consistent with individual preferences solely through majority voting. This important proposition is now famously known as Arrow's Impossibility Theorem.

Economist Kenneth J. Arrow formally established what is now known as the Arrow Impossibility Theorem, also referred to as Arrow's General Possibility Theorem, in his influential 1951 work Social Choice and Individual Values. This theorem is regarded as a landmark result in the field of social choice theory. It addresses the fundamental problem of how to aggregate individual preferences into a fair, consistent, and logically sound collective decision. Arrow's theorem highlights the inherent difficulties and limitations of designing a social decision-making process that satisfies a set of reasonable fairness conditions when dealing with three or more alternatives.

Let us approach this theorem by taking following axioms:

4.4.1 Unrestricted Domain

To explain this theorem, let us take three persons X, Y, Z and three outcomes A, B and C.

The preference patterns of these three individuals are given as:

X: A>B>C

Y: B>C>A

Z: C>B>A

As per this theorem, there will always be pair wise comparisons and in this case pairs are (A, B), (B, C) and (C, A). This will give us nine possibilities such as:

A>B , B> A, A>C

A<B, C>B, C>A

A i B, B i C, C i A

4.4.2 Independence of Irrelevant alternatives:

In the pair wise comparison of (A, B) C option is treated as irrelevant. When there is change in the comparison patterns of (B, C) and (A, C) it does not affect (A, B).

Paretian Condition: (P) If for X: A > B and Y: A i B, then A>B. It implies that A > B is the group choice so that the welfare of X is increased without any harm to Y.

4.4.3 non-dictatorship:

If for X: A > B, Y: B > A and Z: B > A, but in the group choice somehow X manages to fix A > B, then X is termed as a dictator. If it does not occur, then there is none dictatorship.

4.4.4 Transitivity:

For any individual or group if X > Y and Y > Z implies X > Z then transitivity condition gets fulfilled. Arrow has proved that it is not possible to fulfill all the above axioms simultaneously. At least one of the axioms get violated. Therefore, it is not possible to derive Rational Collective Choice. This is known as Arrow's Impossibility Theorem. According to Arrow no Social Welfare Function (SWF) exists which satisfies the four conditions, U, P, 1 and D, and can produce a transitive preference ordering over social states.

4.5 Proof of Arrow's Theorem

The proof of the theorem (which is the one given by Sen (1970) is described below for three persons X, Y and Z and three alternative choices A, B and C.

1) Let X: A > B > C,

Y: B > A,

Z: B > C.

To fix the comparison in the group choice between (A, B) there is difficulty since for individuals the comparison between (A, B) differs for revealing their preference. This leads to indecisiveness in the group choice. Suppose somehow in the group choice A > B appears. Then X is termed as decisive for fixing this pair in the group choice.

∴X is Decisive: A > B as such B > C (Paretian condition)

It implies that A >C (Transitivity relation)

2) X: B > A > C

Y: C > A

Z: B > C

∴ X is Decisive A > C B > A (Paretian condition)

It implies that B > C (Transitivity)

3) X: B> C >A

Y: C >B

Z: C > A

∴ X is Decisive B > C

C > A (Paretian condition)

It implies that B > A (Transitivity)

4) A: C > B > A

Y: A > B

Z: C > B

∴ X is Decisive B > A C > B (Paretian condition)

It implies that C > A (Transitivity)

5) X: C > A > B

Y: A > C

Z: A > B

∴ X is Decisive C > A and A > B (Paretian condition)

It implies that C > B (Transitivity)

6) X: A >C > B

Y: B > C

Z: A > C

∴ X is Decisive C > B A > C (Paretian condition)

It implies that A > B (Transitivity)

The above formulation proves that if individual X is decisive on any pair, it follows that he is also decisive on all other pairs based on unrestricted domain. In other words, X becomes the dictator. It violates the non-dictatorship axiom. It follows that when one individual is decisive on any single pair he maintains his decisiveness on all other pairs making him a dictator. At this stage we have to prove that for same pair there exists an almost decisive pair containing just one individual

Suppose,

X: A > B > C

Y: B > C > A

Z: C > A > B

In this example there cannot exist a group choice following the majority rule based on pair wise comparison and transitivity relation.

Majority supports A > B and B > C => A > C but according to majority C > A.

It is a contradiction.

So if A > B > C appears in the group choice X is decisive on A > C.

Similarly, if B > C > A appears in the group choice Y is decisive on B > A.

For C > A > B appearing as the group choice.

Z is decisive on C > B.

It proves that at least an individual is decisive on any single pair and therefore for all pairs and becomes a dictator. This proves that all the axioms of rational collective choice are not fulfilled hence there is impossibility in deriving the rational collective choice, which is transitive and follows all axioms.

4.6 INTRODUCTION TO PARETO OPTIMUM

To objective of Pareto was to discover the conditions under which the welfare of society would be optimized (maximized). He had started with certain basic assumptions. One of these assumptions was that the individual alone is the sole judge of his welfare which had the corrollary that social welfare was to be treated simply as the arithmetical summation of individual welfares. Secondly, utility (which, by definition, was conterminous in the welfare) was assumed to be ordinals, which implied that it was not additive. Since utility is subjective and the individual is the sole judge of its magnitude, the utilities of any two individuals could not be compared. In short, Pareto had rejected the possibility of making interpersonal comparisons of utility on only scientific objective basis that is, without introducing some sort of ethical consideration.

It should be obvious that on the basis of the assumption of impossibility on interpersonal comparisons of utility, it is not possible to determine whether social welfare in consequence of a Policy has increased or decreased or remained unchanged, if the policy results in some change in distribution so that some individuals become better off while some others become worse off. Consequently, Pareto assumed t h e distribution to be given and constant and then proceeded to define the situation of optimum social welfare.

"Given certain rules of distribution", observed he, "we can investigate that position, following these rule, will give the greatest possible wellbeing to individuals of the collectivity.... We are led to define as a position of maximum ophelimity one where it is impossible to make a small change of any sort such that the ophelimities of all the individuals, except those that remain constant, are either all increase or all diminished." This is Pareto's definition of a position optimum social welfare. Such a position is referred to as Pareto optimum in the literature on welfare economics. It can be more directly and simply defined as position in which it is not possible to make any individual member of the society better off without making, at the same time, some other individual or individual worse off.

4.6.1 CONDITIONS OF PARETO OPTIMUM

On the static assumptions of given and constant ordinal Utility functions individuals (which, in other words. implies given and constant tastes of the individuals) as well as given and constant production functions. Pareto arrived at the following seven conditions which must be fulfilled in order to attain a position of welfare optimum as defined above.

1) Optimum Allocation of Goods

The first of these conditions is known as the condition of **optimum allocation of goods**. It states that the marginal, rate of substitution, between any pair of goods must be the same for any pair of consumers possessing those goods. This condition can be illustrated with the help of an Edgeworthian box diagram on the simplifying assumptions that the society consists of only two individuals, and produces only two goods.

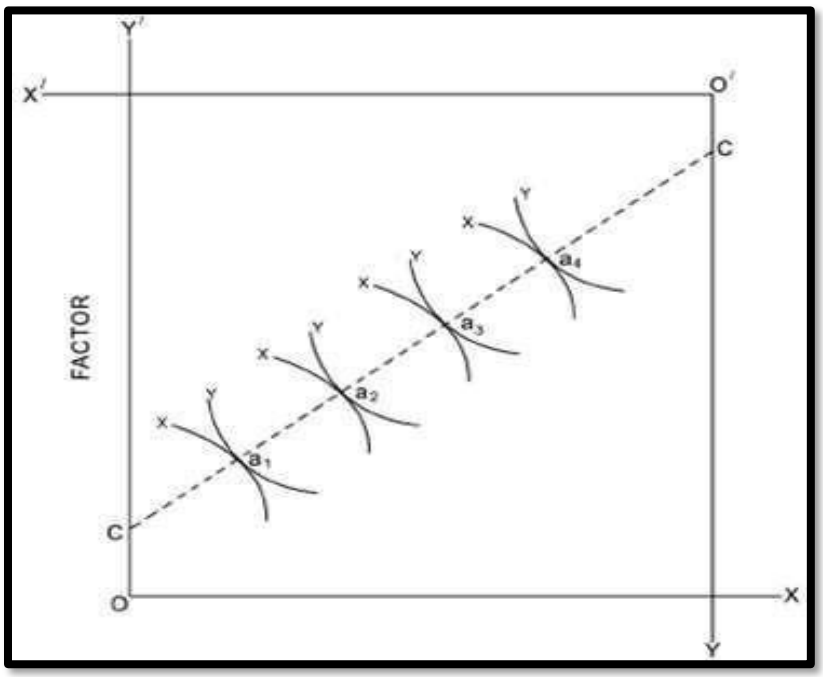


Fig. 2

In Fig. 2 the quantities of good X are represented along the horizontal axis, one of which originates at O and goes eastward then second originates at o and goes westward. The former measures, let us suppose, the quantities of X possessed by

the individual A, while the later measures the quantities of X possessed by the other individual B. The vertical axes, one starting at O' and going northward and the other starting at o and going southward, measure the quantities of the good Y for the individual A and B respectively.

The indifference curves which are convex to the origin O reflect the utility function on the preference scale of A, while the difference curves convex to the Origin O' represent the utility function or preference scale of B. The marginal rate of substitution between the given pair of goods on a given point on an indifference curve equals the slope of the indifference curve on that given point. Therefore, it is. obvious that the marginal rate of substitution between the given pair of goods, X and Y, will be the same for the given two individuals, A and B, at a point where the indifference curves of the two individuals are tangent to each other, for at the point of tangency between them, their slopes will be the same showing the same marginal rate of substitution between X and Y for both the individuals. But the condition can be satisfied at infinite number of points like a1 a2 and a3 in our Fig.2. At each one of these points, the said condition of optimum allocation of goods will thus be satisfied and hence each one of them will represent a welfare optimum in the Paretian sense.

Which one of them will be the optimum (that is the best of the optima) cannot be determined, for each such point is associated with a given distribution of goods between the two individuals. Change from any one such optimum to another optimum will make one of to individuals better off, taking him on the one of his higher in difference curves, but It will also make the other individual worse of pushing him on to a lower indifference curve. A movement from a_1 to a_2 for example, will make A, in our example, better off while, at the same time, it will make B worse off. Since interpersonal comparisons utility are ruled out, it is not possible to compare the gain of A with the loss of B in order to determine the net effect to the change on the total social welfare position.

A line which joins all the points of tangency between the indifference curves of a given pair of individuals is known as the Edgeworthian contract curve

like the dotted curve CC' in our Fig. 2. Each point so such a line represents a Pareto optimum. Which of these is the best cannot be decided without introducing some value judgement with regard to the desirable distribution

2) Optimum Production of Goods

The second condition necessary for Pareto optimum is the condition of the optimum production of goods. The production of goods will be maximum possible under the given technology, when the goods are produced in such quantities and proportions that the marginal rate of transformation between any pair of goods if the same for any pair of producers, producing those goods.

It can be demonstrated that the total production of goods will be less when this condition is not satisfied and it can be increased by introducing a change which helps in fulfilling this condition.

Fig. 3(a) Fig. 3(b)

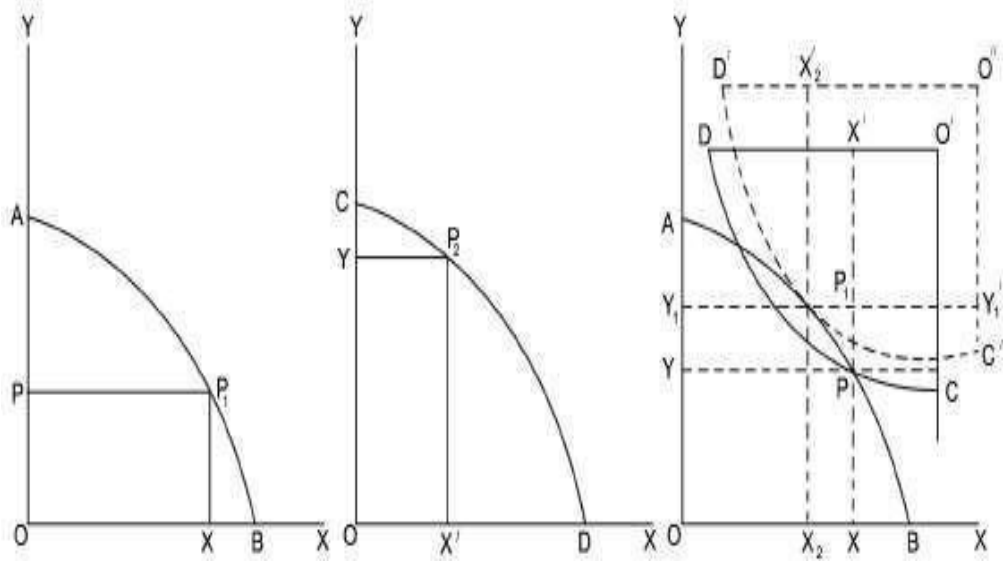


Fig. 3(c)

Fig. 3

We shall make the simplifying that there are only goods, X and Y, to be produced and there are only two producers. AB is the transformation curie (which is also known as the production possibility curve or plainly as the production frontier) of the first producer given in Fig. 3(a) and CD is the transformation curve of the

second producer in our Fig. 3(b). The horizontal axis in these figures expresses the quantities of the good X. The vertical axis denotes the quantities of the other goods Y. The curve AB traces all those combinations of X and Y which our first producer can produce with the help of his given productive resources when they are employed in the best possible manner, that is, most efficiently, under the given technology. If the resources are inefficiently employed, he will not be producing on the transformation curve AR but somewhere under it.

The slope of transformation curve indicates the margin the transformation between the given pair of goods which is nothing but the marginal cost of producing one goods in terms of the other goods. In other words, the slope of transformation curve at any given point on it indicates both the marginal rate of transformation between the given pair of goods (MRTxy) and the ratio between their marginal cost (MCX/MCY). Similarly, the curve CD in Fig. 3 (c) describes all the combinations of goods X and Y which can be produced by the second producer by employing his given resource efficiently under the given technology.

Let us suppose that the first producer is operating at P1 on his transformation curve AB producing thus, OX of X and OY of Y, and the second producer is operating at P2 on has transformation curve CD, producing thus, OX' of X and OY' of Y. It can be seen that the slopes of AB and CD at P1 and P2 respectively are not the same. Hence, this situation will not be an optimum situation, for MRTxy will not be the same for both the producers. It we rotate the diagram of Fig. 3(b) through 80° and superimpose it on fig. 3(a) in such a manner that the point P2 falls on P1 falls we shall have a diagram like the one in Fig.3(c) but without the dotted axes originating at O" and the dotted transformation curve C'D'.

In this diagram the points P1 and P2 of Figs. 3(a) and 3(b) respectively coincide at P which shows that, when the two producers are operating at P1 and P2 on their respective transformation curves, which are cutting each other P showing thus different slopes and therefore divergent marginal rate of transformation, the total output of X is YY' and the total output of Y is XX'. Now, if the diagram of the

second producer (O'CD) in Fig 3(c) slide back in the north east direction such that the transformation curve CD becomes tangent to the transformation curve AB at some point, the diagram of second producer will take the dotted position O" C'D', as shown in fig. 3(c), the transformation curve CD taking the position C'D' and becoming tangent to AB at P1.

Since at P1 the transformation curves of both producers are tangent to each other their slopes at P1 are equal which implies that if both operate at P1, the MRTxy (marginal rate of transformation between X and Y) will be the same for both. In this position, the total output X is Y1 Y1, which is greater than the earlier YY, and the total output of Y is x1, x1 which is greater than the earlier xx'. Thus, the total output of both the goods is increased, though the total productive resources employed as well as technology remain the same. The position P1 in fig. 3(c) thus denotes the Optimum position with regard to the value of total production.

Let us, then, repeat the condition necessary for the optimum total production of all goods: The marginal rate of transformation between any pair of goods must be same for any pair of producing those goods.

3) Optimum Product mix

The third necessary condition or Pareto optimality is the condition of optimum product mix or optimum direction of production. It states that the society's marginal rate of transformation between any pair of goods must equal the marginal rate of substitution between that pair of goods for any consumers who consume both those goods.

This can be explained with the help of Fig. 4. AB is the transformation curve of the society, while. I, II… are the indifference curves of an individual. The two goods are X and Y assumed along the horizontal and the vertical axis respectively. Whether the society chooses to produce the combination P1 or P2, its total cost in terms of real resources is the same.

In fact, transformation curve can be referred to as an iso-cast, curve also where cost refers to real cost. But if either P1 or P2 is chosen, the consumer will remain

on a lower indifferent curve I. But if P is chosen, the consumer moves on to a higher level of satisfaction and welfare without any additional cost to society. It can be seen that under' the given conditions with regard to the available productive resources and technology which define the production frontier AB, the consumer cannot be moved on to an indifference curve higher than indifference curve II, because under the given, constrains, the society is unable to produce such a combination of x and Y. Any other feasible combination than P will be on an indifference curve lower than II. Hence P is the optimum combination in which the given pair of goods X and Y can be produced. At P. the slope of the transformation curve and the slope of the Indifference curve II are equal which implies, that at MRPTxy = MRSxy.

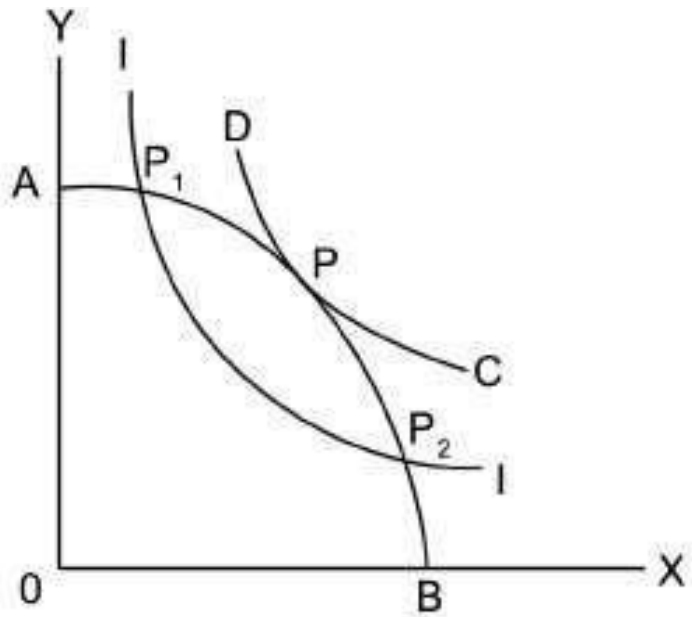


Fig. 4

The condition further implies that social welfare will be optimised, if the various goods are produced in such combination that the marginal rate of transformation between any pair of good is the same for all producer producing those goods (condition ii); the marginal rate of substitution between that pair of goods is the same for all the consumers consuming those goods (condition i); and the two rates (i.e. MRPT and MRS) are also themselves equal (condition iii).

4) Optimum Utilization of Factors

Factors will be optimally, if the marginal rate of transformation of any factor into any product is the same for any pair of producers employing that factor and producing that product. This is known as the condition of technological optimum or of optimum utilization of factor of production which when fulfilled and other things remaining the same maximizes production and thus optimizes social welfare.

This condition is explained with the help of Fig. 5, assuming OY two producers employing a given factor to produce a given product. OF = O'F' is the given quantity of the given factor available to the society as a whole which, in this example, is composed of only two producers. The curve OA represents the production functions of produce. A whose factor quantities employed are shown along OF and whose total output of the given product is shown along O'F', for the second producer B, factor quantities are measured along O'F, and output is measured along "OF', and his production functions is represented by the curve Q'B', to start with. The production functions are concave towards the factor-axis indicating diminishing returns.

Let us suppose that the society is initially operating at P1, employing that the producer A is employing OQ quantity of the given factor, while B is employing the rest (OF = O'R') of it. Under this allocation, A produces QP1 output and B produces RP1 output so that the aggregate output of the society is QR. It can be seen that at P1 the slopes of the two production functions (OA and O'B), which show the marginal rate of transformation of factor in the given product, which is only a different term for the more common 'marginal productivity of a factor, are not equal. It can be shown that this is not an optimum position in as much as the total output can be increased by reallocation of the-factor-between the two producers. At P1, the two product curves are cutting each other.

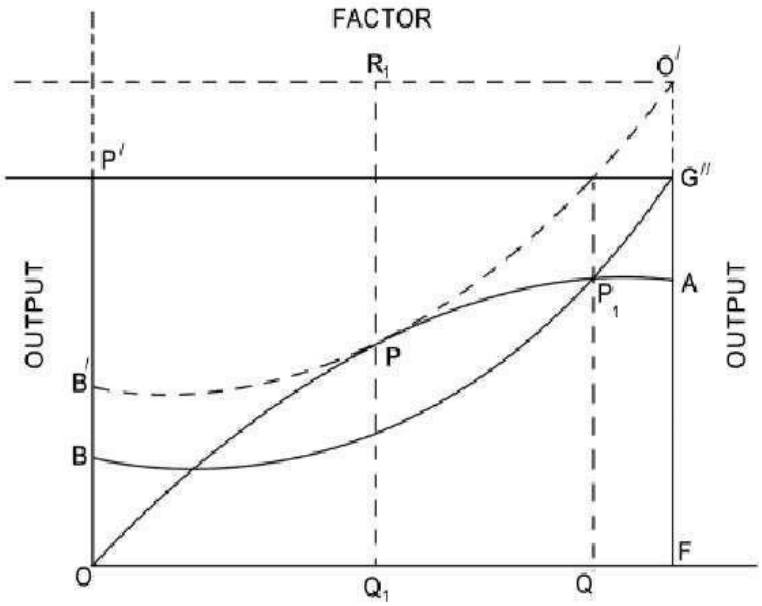


Fig. 5

Now slide the product curve O'B, along with its axes vertically upward such that O'B, takes the position O'B, becoming tangent to A's product curve OA at P. At P1' then, the slopes of the two product curves will be equal showing; the same marginal rate of transformation of the given product for both the producers, that is, the same marginal productivity of the factor for both. Now A employs OQ1 quantity of the factor, while B employs the rest (=Q_1 F= G" R_1) of it, and resultantly the total output increases from the previous QR to Q1Rl. The total output cannot be increased, beyond Q1R1 by any other allocation of the factor. Hence the position P_1 where the marginal rate of transformation of the factor into the product is the same for both the producers is the optimum position.

5) Optimum Factor Allocation

In actually factors of production are employed, in combination. Social welfare will be maximized, if they are employed such propositions in all firms that each firm produces the maximum possible output. The necessary condition for it is that the marginal rate of technical substitution between any pair of factors must be the same for any pair of producers employing those factors and producing that product. This condition will be satisfied for a two-producer, two factor and

one-commodity case at the point of tangency between the iso-producer, curves of the two producers in an Edgeworthian box diagram like our Fig. 2. Here, too, more than one optimum is possible.

6) Optimum Factor Supply

Even when the stocks of factors of production are given their supply can be varied by the owners by deciding to keep a more or less quantity of them for their own direct use. This point can be properly explained with reference to labour and leisure. When the workers decide to have leisure, the supply of labour is decreased, even though the number of workers remain the same. The condition, necessary for this optimum (in the case of labour) is that each worker's marginal rate of substitution between leisure and product (i.e. real income on reward) received as reward for labour must equal that marginal rate of transformation between work and product for the society. In more familiar language this implies the equality between the marginal product of a factor and its reward (price).

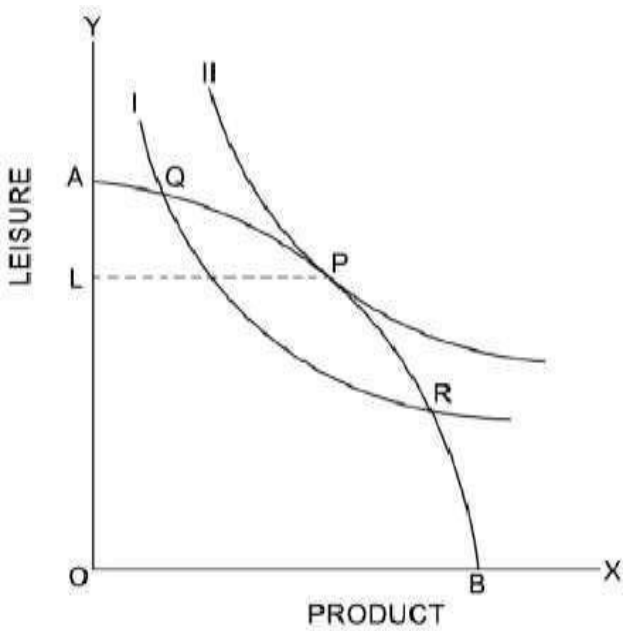


Fig. 6

In Fig 6, OA is the maximum amount of leisure available, any, per week. If a worker decides to have the whole of his time in leisure, his supply of labour (at A) will be zero. As he reduces leisure his supply of labour increases. Hence supply of labour will be measured in Fig 6. AB is the product curves of labour for the society

as a whole. I, II are the indifference curve of the worker the slope of an indifference curve showing his marginal rate of substitution between leisure and product. P is the optimum position which gives the maximum possible output of labour consistent with the maximum possible satisfaction of the labourer. The optimum supply of labour is AL. A greater supply of labour will no doubt, increase the society's output, but it will push the worker to a, lower indifference curve.

7) Inter-temporal Optimum Allocation of Assets

Strictly speaking, inter-temporal allocation lies outside the scope of the static Paretian welfare economics. However, supposing that there is no risk and uncertainty (which is a static way of treating the element of time). What is the best way of allocating the given assets between say, present and future, or alternatively, between present income (consumption and future income savings? The condition for this optimum is that the marginal rate of substitution between assets promising payment of any two moments of line must be the same for any part of individuals.

In fact, this condition is relevant to borrowing and lending in the absence of risk and uncertainty assuming the borrower to be a producer, it would imply that the rate of interest at which an individual is willing to supply given amount of savings (capital) must be equal to the marginal productivity of capital the producer borrowings these savings (capital).

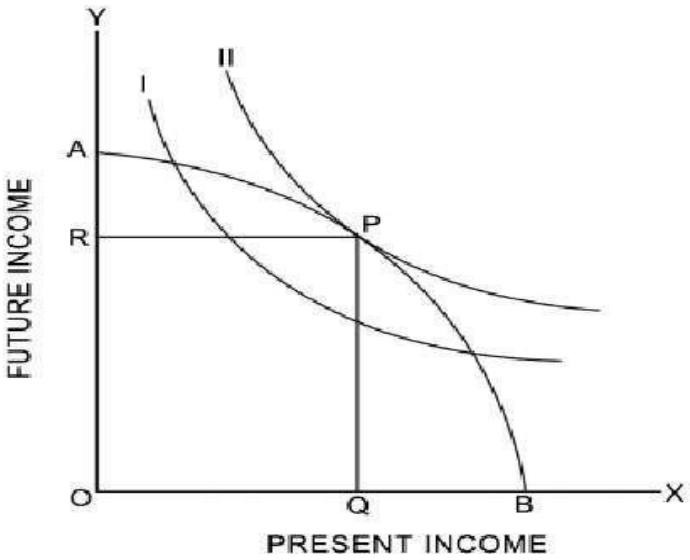


Fig. 7

We can explain the condition with the help of Fig. 7.

Let the present income be represented along the horizontal axis and the future income along the vertical axis. If the whole of the present income is consumed, the future income is zero. But if we reduce the consumption of present income we move from B towards. If only OQ is consumed, BQ is the amount of savings which, when lent and invested by the borrower producers, produce a future income equal to OR. AB is, in fact, a type of transformation curve showing how present income, when saved and invested, is transformed into future income, I, II are the indifference curves of the lender showing his preference scale with respect to present income and future income. The slope of such a curve indicates the individual's rate of time preference. In this case P is the optimum position giving the maximum future income consistent with the preferences of the lender (saver). At P the slop of the transformation curve AB equals the slope of the indifference curve.

Therefore, this condition can also be stated as that the marginal rate of substitution between present income and future income (or the marginal rate of the time preference or any lender (saver) must equal the marginal technical rate transformation of present income and future income. In other words, the marginal rate of time preferences of those who save must equal the marginal productivity of capital to the producers.

4.7 PERFECT COMPETITION: THE WELFARE IDEAL

The conditions necessary for the attainment of the Pareto, optimum; would be automatically met under perfect competition through the market mechanism the assumption that consumers seek to maximize their satisfaction and producers seek to maximize their profits. For every consumer as well as producer, the prices of goods and factors of production are given parameters which none of them can individually influence.

Hence, all consumers seek to equalize their Individuals marginal rate of substitution between any given pair of goods with the given price ratio of those goods. Since the price ratio is the same for all consumers, their MRS' would also be the same.

Similarly, all the producers seek to maximize their profits under perfect competition not by influencing the prices of the goods they produce and / or the factors which they employ, but by producing goods in such quantities and proportions and employing factors in such quantities and proportion as would equalize for each producer

1) the marginal rate of transformation between any pair of good with the price ratio of those goods,

2) the marginal rate of transformation of factor into a given product with the ratio between the price of the factor and the price of the product

3) the marginal rate of technical substitution between any pair of factors with the price ratio of those factors.

Since the price ratio are the same for all, the said transformation rates will also be same for all producers. Thus, perfect competition is said to have welfare-optimizing characteristics and is presented as the welfare ideal, implying that a free-market economy is the ideal economy.

4.8 SUMMARY

This chapter explains the welfare dimension. All aspects of the social welfare have been explained. Various criteria to measure social welfare has been discussed. Pareto Optimum with its conditions is explained with the help of diagrams in detail. Arrow Impossibility Theorem is described with all axioms. In the end, welfare ideal, i.e. Perfect competition is discussed.

4.9 QUESTIONS FOR PRACTICE

A. Short Answer Type Questions

Q1. Why perfect competition is called as the welfare ideal?

Q2. Optimum Utilization of factors.

Q3. Explain axiom of Transitivity.

B. Long Answer Type Questions

Q1. What do you mean by Social Welfare? Explain the various criteria to measure it.

Q2. What do you mean by Pareto Optimum? Explain its various conditions.

Q3. Explain in detail the Arrow Impossibility Theorem.

4.10 SUGGESTED READINGS

- Salvatore Diminick (2003). Micro Economics: Theory & Application, 4th Edition.
- Ahuja, H L (2020). Advanced Economic Theory S Chand Publications.
- Koutsoyannis, A (1977). Modern Micro Economics. McMillan Press. London.

MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT 5- SOCIAL WELFARE FUNCTION, KALDOR-HICKS-SAMUELSON CRITERION, RAWL'S THEORY OF SOCIAL JUSTICE

Structure

5.0 Learning Objectives

After reading this unit, learner will be able to know about:

- Define the concept of social welfare and explain why it is important in economics.
- Identify the main components of social welfare, such as healthcare, education, housing, and income.
- Describe the role of welfare economics in evaluating how policies affect people's well-being.
- Explain the Kaldor-Hicks compensation criterion and how it is used in cost-benefit analysis.
- Summarize Rawls' theory of justice, including the veil of ignorance and the two principles of justice.
- Illustrate how the Bergson-Samuelson social welfare function combines individual utilities.
- Compare the strengths and limitations of Kaldor-Hicks, Rawls, and Bergson-Samuelson approaches.
- Apply welfare theories to real-life examples.

5.1 INTRODUCTION

Social welfare refers to the overall well-being and quality of life of people in a society. It includes not only income and wealth but also access to basic needs like healthcare, education, housing, employment, and equal opportunities. A society with high social welfare is one where people lead healthy, safe, and fulfilling lives, and where basic rights and fairness are protected for everyone.

In economics, social welfare is about understanding how various economic policies and systems impact people's lives. Economists aim to find out whether a specific policy or decision improves people's living standards or makes them worse off. For example, does raising taxes help reduce poverty? Does building a new road benefit the entire society or just a few people? Welfare economics is a branch of economics that is dedicated to assessing alternative economic states, arrangements, or public policies by examining their impact on society's overall well-being. Its main purpose is to put forward methods for enhancing the welfare of society as a whole.

Measuring social welfare can be challenging because people have different needs and preferences. What benefits one person might harm another person. Measuring social welfare relies on adopting certain ethical standards and making interpersonal comparisons, both of which

require subjective value judgments. Since it is nearly impossible to make objective comparisons or rank individuals by their deservingness or worth, welfare economics faces inherent limitations in aggregating individual utilities. That's why economists have proposed several different criteria to evaluate and compare social welfare, like the Kaldor-Hicks compensation test, Rawls' theory of justice, and the social welfare function, to study and improve social welfare in a fair and effective way.

Old welfare economics focused on utilitarian measures and efficiency. Its main proponents were Bentham, Pigou and Pareto, but their ideology relied on cardinal utility and other restrictive criteria. To address this limitation, new welfare economics, led by Hicks, Kaldor, Samuelson, Arrow, and Sen, moved toward ordinal utility, compensation tests, social welfare functions, and capabilities, addressing both efficiency and equity. Together, these contributions transformed welfare economics into a richer, multidimensional field, guiding modern policy on poverty reduction, inequality, taxation, and human development.

This essay provides a comprehensive discussion on three major theoretical frameworks in the field of welfare economics. It begins with the Kaldor-Hicks compensation criterion, which broadened the assessment of welfare-improving changes beyond the strict confines of Pareto efficiency by introducing the idea of potential compensation for those made worse off. The discussion then turns to Rawls' theory of justice, which redefined distributive justice with an emphasis on fairness, equal basic rights, and the well-being of the least advantaged. The essay concludes with Bergson-Samuelson social welfare function, a foundational tool for aggregating individual utilities and identifying the "point of bliss", where social welfare reaches its maximum given economic constraints.

5.2 THE KALDOR-HICKS COMPENSATION CRITERION

Kaldor and Hicks introduced tests to evaluate welfare improvements, and addressed policy changes with uncertain welfare impacts by proposing that if those who gain from a change can adequately compensate those who lose, the change is considered beneficial; otherwise, it is not. This concept, known as the compensation principle, was established in 1939 and is widely used in cost-benefit analysis, where the aggregate benefits of a project are compared to aggregate costs.

While early welfare economics counted on the Pareto criterion, which considered a change an improvement if at least one individual becomes better off without making anyone else worse off. It proved too restrictive in practice as very few policy reforms or market adjustments leave everyone unharmed. On the other hand, Kaldor-Hicks compensation criterion allows for a more flexible evaluation of economic changes, by focusing on net gains and it views any policy change as welfare improvement even if some individuals are worse off, as long as the overall benefits outweigh the losses. Thus all Pareto-optimal points are Kaldor-Hicks optimal too but not all Kaldor-Hicks outcomes are Pareto optimal.

Kaldor formulated the original test, while Hicks developed the reverse test, together providing a framework for welfare evaluation. Their work aims to clarify the ambiguities inherent in Pareto optimality analysis.

5.2.1 Assumptions:

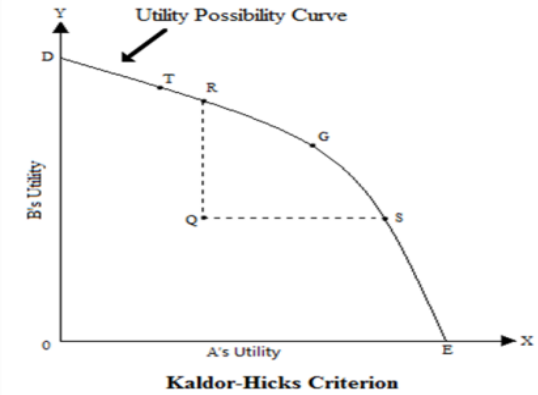
1. Technology is given.
2. No externalities in production and consumption.
3. There is ordinal measurement of utility.
4. Satisfaction derived by different persons are independent of each other.
5. There is constancy of tastes of individuals.

5.2.2 Compensation Criteria:

1. **Kaldor's view:** Kaldor gave his view from gainers point of view. If gainers can compensate losers and still are better off, then social welfare increases. He stated that a change which does not fulfil the Pareto criteria, should be carried out if it is possible for the gainers to compensate the losers and still be better-off.
2. **Hicks' view:** Hicks gave his view from the loser's point of view. If losers cannot convince the gainers to not make the change, then the optimality is achieved. In other words, a change should be carried out if it is impossible for the losers to influence the gainers to abstain from the change.

Despite their diverse approaches, both criteria are essentially the same, which is why they are collectively known as the 'Kaldor-Hicks Criterion'.

5.2.3 Utility possibility curve



The diagram shows utilities for consumer A and B at point Q, portraying their income distribution. A policy change shifts them from Q to T on curve DE, a move that the Pareto criterion cannot assess. The possibility curve DE intersects points R, G, and S, showing that through income redistribution, in which individual B compensates individual A for losses, they can move from point T to R. At R, individual A's welfare is the same as that at Q. On the other hand, individual B is better off at R than at Q, pointing an increase in social welfare moving from Q to R.

Another example of Kaldor-Hicks Compensation Criterion can be a scenario where a city plans to construct a new highway for 10, 000 middle-class commuters who will benefit from this construction as it will reduce their daily travelling time by half-an-hour (we may assume that this benefit is equivalent to Rs.5). In a period of one year having 250 workdays, each commuter will gain Rs. 1, 250 in time savings (250 workdays * 5). On the other side, this highway construction will also lead to the displacement of 500 low-income residents (assume that each resident will incur a loss estimated at Rs. 15, 000 in shifting to a new place). Therefore, commuters will have a total annual gain of Rs. 1, 25, 00, 000 (10,000 * 1,250) and displaced residents will face a total loss of Rs. 75, 00, 000.

According to Kaldor-Hicks Criterion, the gainers can compensate the losers and can still left with a part of the gains as net benefits. Therefore, total gain is greater than total loss and the policy creates a net gain. Hence the policy of constructing the new highway will be considered as an improvement in economic efficiency, even if actual compensation is not done.

Although this criterion explains the determination of net gains but it suffers from a drawback too. The Kaldor-Hicks criterion can accurately reflect the changes in social welfare only if marginal utility of money is equal for the two groups of stakeholders – commuters and residents, in the above example. It is so because, otherwise, Rs. 1, 250 gain for the middle-class commuters will be much less than Rs. 15, 000 losses to the low-income displaced residents. The marginal utility of money is much higher for the low-income displaced residents as compared to the middle-class commuters.

It can be concluded that the Kaldor-Hicks compensation criterion justifies the new highway, creating a net economic benefit, only on efficiency grounds, but it ignores the fact of whether the compensation is actually made or not, hence, ignoring the equity or distribution aspect.

Criticism

1. This criterion implicitly assumes that the marginal utility of money is the same for all individuals in the society
2. The theory requires interpersonal utility comparisons, something welfare economists typically aim to avoid.
3. It neglects how income is distributed across the community. When income inequality exists, compensation from wealthier gainers to poorer losers may not adequately balance losses due to differing marginal utilities of money.
4. This criterion does not address actual compensation and only discusses about potential compensation.

CHECK YOUR PROGRESS – I

Q1. What do you understand by social welfare?

Q2. Define welfare economics

Q3. What is a utility possibility curve?

5.3 THE RAWLS THEORY OF JUSTICE

John Rawls, an American political philosopher, played a crucial role in reviving modern interest in political philosophy. Building upon the liberal tradition, Rawls employed the methodology of social contract theory, particularly John Locke's version, to derive his principles of justice. His

inception of "justice as fairness" visualises a society composed of free individuals with equal basic rights, working cooperatively within an egalitarian economic framework.

5.2.1 Theory of justice

In his influential work "A Theory of Justice", John Rawls argues that a just society is marked by several important virtues, with justice being the foremost. He asserts that justice must form the foundation of the social structure, guiding all political and legislative choices. Rawls' framework rests on two central principles of justice, which are selected by individuals placed behind a "veil of ignorance" or "original position", which is a hypothetical condition in which people do not know their own social position, abilities, or personal values, ensuring fairness and impartiality in their decisions.

Consider yourself designing the rules of a society without knowing whether you are born rich or poor, which caste you belong to, or whether you are able-bodied. What kind of society would you create - an egalitarian one where everyone has access to healthcare, education, employment, and a fair legal system, or a society where wealth and resources are concentrated among a few? Rawls' theory suggests we would choose the first option.

5.2.2 The Two Principles of Justice

1. **First Principle (Principle of Equal Liberty):** The first principle guarantees every citizen a set of well-known basic rights and liberties such as freedom of conscience, freedom of association, freedom of speech, personal liberty, the right to vote, hold public office, and be treated according to the rule of law, all in a manner that ensures these freedoms are equally available to everyone. These fundamental rights cannot be sacrificed or exchanged for other social or economic advantages and form the core framework for designing a society's political constitution

2. **Second Principle (Equal Opportunity and Difference principle):**

    a) **Fair Equality of Opportunity:** Positions and offices must be open to all under conditions of fair equal opportunity, ensuring everyone has sincere access to compete for advantageous social or economic positions.

    b) **Difference Principle:** Social and economic inequalities must be arranged so that they are to the greatest benefit of the least advantaged members of society.

Critical Appraisal

The Rawls' theory is not free from criticism. The proponents of different schools of thought have criticised the theory on various grounds. For instance, Robert Nozick has criticed Rawls' focus on redistribution. Being a libertarian, Nozick argues that individual rights, especially property rights are much more important than making a society equal. He argues in favor of a minimal state that protects its people from force, theft and fraud in the first place, and allows its people to be free to keep what they earn and does not take into account if it leads to equality or inequality. For him, so long as wealth is gained through fair means, it should be considered just even if the outcome is very unequal.

The other side of the political spectrum, socialist thinkers and collectivists have also criticised Rawls' theory. They have argued that it indirectly supports capitalism, as Rawls' theory allows a large gap between rich and poor, so long as the poorest get some benefit. Hence, the problem of real economic injustice does not get solved. Similarly, from a marxist point of view, it is argued that Rawls' theory ignored deeper problems like unfair ownership of private property, exploitation, and power imbalances in the market system.

Amartya Sen has also criticised Rawls' theory and questioned the assumption that everyone behind the "veil of ignorance" would agree on a single, universal idea of justice. Instead, he said, people might choose different but equally reasonable principles depending on their values, which indicates that justice can have many versions rather than just one.

5.3 THE BERGSON-SAMUELSON SOCIAL WELFARE FUNCTION

Social Welfare Function is the ordinal index of society's welfare. Abram Bergson introduced the concept of social welfare function in 1938, later developed by Samuelson, Tinter and Arrow.

$$W = F(U_1, U_2, \dots U_n)$$

Where W is the increasing function of utilities of different individuals.

5.3.1 Assumptions:

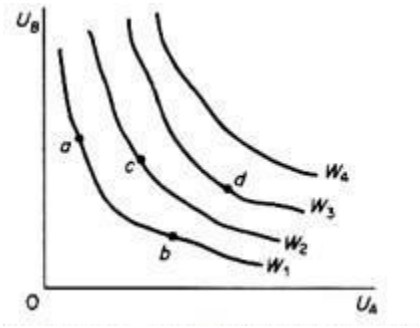
1. Social welfare is a function of each individual's wealth and income, and the distribution of income.
2. Presence of external economies and diseconomies.

3. Interpersonal comparison of utilities.
4. It is based on value judgements, and these should be consistent.

Bergson and Samuelson have explained their ideas by formalising the concept of social indifference contours, which is based on the idea of a social welfare function.

5.3.2 The Social Indifference Contours

The social indifference contour is the locus of combinations of utilities of A and B that yield the same level of social welfare.

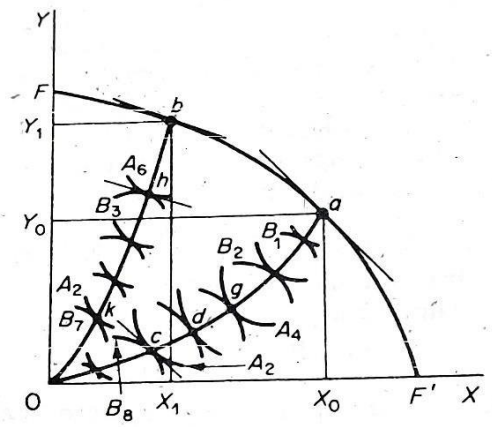


In the figure, W_1, W_2, W_3, W_4 are social indifference contours, where each curve shows a different combination of utility of the two consumers A and B, which give the same level of social welfare. The contours have the same properties as ordinary indifference curves. The further to the right a social indifference contour is, the higher the level of social welfare will be. For example, movement from point *b* to *c* (or *d*) increases the social welfare. Whereas movement from point *a* to *b* leaves the level of social welfare unaltered.

5.3.3 Grand Utility Possibility Frontier

The Grand Utility Possibility frontier (GUPF) is seen as an extension or graphical representation of the foundational work of Samuelson and Bergson. While it is not directly credited to a single person, it is most closely linked to the Bergson-Samuelson tradition of welfare economics. It shows different combinations of utilities between two individuals or groups that are Pareto efficient, i.e. it is impossible to make one better off without making someone else worse off than before. It represents the ultimate boundary of social choice, combining production efficiency with distributive justice.

Derivation of Grand Utility Possibility Frontier



In the above diagram, FF' is the Production Possibility Curve (PPC) on which points *a* and *b* show different product-mix of good X and Y which can be distributed optimally among the two consumers *A* and *B* in an infinite number of ways, as shown by the points of the Edgeworth contract curve of exchange corresponding to that particular product combination. For example, assume that the economy produces the output mix Y_0X_0 denoted by point *a* on the PPC curve. The points on the Edgeworth contract curve *0a* depict Pareto-optimal distributions of the product mix Y_0X_0. By mapping all the points on the contract curve *0a* into the utility space we get the utility possibility frontier say *SS'* for that particular commodity mix. Similarly, if we repeat the process for output mix Y_1X_1 denoted by point *b* on the PPC we get the utility possibility frontier RR' which maps out the Pareto-optimal points on Edgeworth contract curve *0b*.

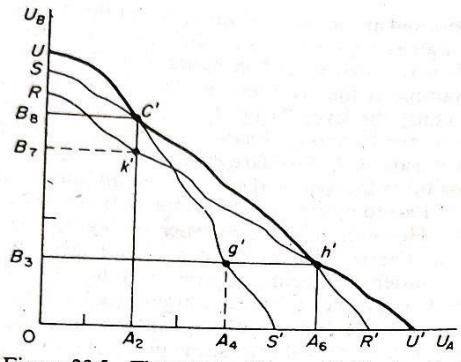


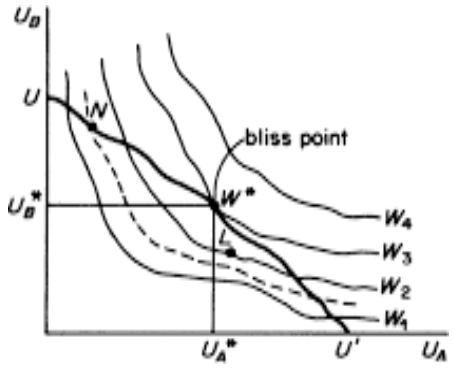
Figure 23.5 The grand utility possibility frontier

Since there are infinitely many points on the Production Possibility Curve (PPC), each representing a different product mix, they give rise to an infinite number of Utility Possibility Frontiers (UPFs). The envelope of these utility possibility frontiers gives us the Grand Utility Possibility Frontier. In other words, GUPF is the locus of all the Pareto-optimal points and

satisfy the marginal conditions of efficiency: efficiency in production, efficiency in distribution, efficiency in product composition. In the above diagram, UU' is the GUPF where each point shows maximum attainable utility of consumer B for any given utility level of consumer A. Another point to be noted is that all points on this curve satisfy the marginal condition MRPT=MRS i.e. the slope of the PPC be equalized to the MRS of the two commodities for the two consumers ($MRPT_{x,y} = MRS^A_{x,y} = MRS^B_{x,y}$).

Determination of the "Point of Bliss"

The point of bliss (or constrained bliss) shows maximum attainable social welfare given the economy's constraints. We can find it out by super imposing GUPF on a set of social indifference contours showing social welfare function. Bliss point is determined by the tangency of GUPF with the highest possible social indifference contour where social welfare will be maximized.



In the above diagram, UU' is the GUPF. W_1, W_2, W_3, W_4 are the social indifference contours? W* is the point of bliss where UU' is tangent to the highest possible social indifference contour W_3, and social welfare will be maximised. At this point, the two individuals will enjoy the levels of utility U^*_A and U^*_B.

Criticism

The Bergson-Samuelson social welfare function is criticised mainly on the following grounds: it requires interpersonal comparisons of utility, which are hard to measure, it relies heavily on ethical and political judgements, and hence, not practically usable in the case of large, complex societies without necessary simplifications.

Check your progress – II

Q1. What are the two principles of justice?

Q2. What do you understand by social welfare function?

Q3. What is a social indifference contour and grand utility possibility frontier?

5.4 SUMMARY

Social welfare refers to the overall well-being of people in a society. It includes not only income but also access to healthcare, education, housing, jobs, and equal rights. Economists study how policies affect people's lives and whether they improve or harm their living standards. Welfare economics is a dedicated branch of economics for the purpose of measuring and analyzing the social welfare. It looks at how economic decisions, actions, and policies impact people's well-being in society. Its main goal is to determine whether a specific economic change or policy benefits society. Welfare economists seek to answer questions like, "Does this policy help people?" and "Is this change fair to everyone?" Measuring social welfare is difficult because people have different needs and preferences. To overcome this problem, economists have developed various measures over time like the Kaldor-Hicks welfare criterion, Rawls' theory of justice, and the social welfare function.

In the past, economists like Bentham, Pigou, and Pareto leaned on utilitarianism and efficiency, assuming that happiness could be quantified (cardinal utility). However, this approach had many limitations. Later, new welfare economists like Kaldor, Hicks, Samuelson, Arrow, and Amartya Sen introduced improved methods that focused on fairness (equity), relative satisfaction (ordinal utility), and other important factors such as basic rights and capabilities.

This summary covers three major welfare theories:

- Kaldor-Hicks Compensation Criterion
- Rawls' Theory of Justice
- Bergson-Samuelson Social Welfare Function

1. Kaldor-Hicks Compensation Criterion

Nicholas Kaldor and John Hicks proposed this idea in 1939. They argued that a policy change is considered good if those who benefit could, in theory, compensate those who lose out and still be

better off. This concept is often used in cost-benefit analysis. For example, if a city builds a highway that saves time for thousands of commuters but displaces a few hundred poor families, the total benefit might outweigh the total loss. According to Kaldor-Hicks, the project is deemed efficient, even if the poor families do not receive compensation.

However, this idea has its issues. It assumes everyone values money the same way, which is not accurate. Losing ₹15,000 could be a serious problem for a poor family, while saving ₹1,250 might not matter much to a middle-class commuter. Additionally, this criterion overlooks whether compensation actually occurs; it only considers if it could occur. Thus, while it emphasizes efficiency, it does not ensure fairness.

2. Rawls' Theory of Justice

John Rawls, a political philosopher, proposed a new way to think about fairness. He used a thought experiment called the "veil of ignorance." In this scenario, people choose rules for society without knowing if they will be rich or poor, strong or weak. In this situation, they would likely opt for a fair system where everyone has basic rights and the poorest are protected.

Rawls outlined two main principles:

- Equal Liberty: Everyone should have the same basic rights, including freedom of speech, religion, and voting.
- Difference Principle: Inequality is acceptable only if it benefits the poorest members of society.

Rawls' ideas were highly influential but also received criticism. Robert Nozick, a libertarian, argued that people should keep what they earn, even if it results in inequality. Conversely, Marxists claimed Rawls still upheld capitalism and overlooked deeper issues like exploitation and unfair ownership. Amartya Sen also contended that people might disagree on what justice means, emphasising there's no universal definition.

3. Bergson-Samuelson Social Welfare Function

This approach attempts to combine the satisfaction (utility) of different individuals into one formula that represents total social welfare. It uses graphs called social indifference curves to illustrate different combinations of people's satisfaction that achieve the same welfare level.

Economists also utilise the Grand Utility Possibility Frontier (GUPF) to identify the best combination of utilities where resources are used efficiently. The "point of bliss" indicates where the economy reaches the highest possible welfare given its resources. However, this theory still requires comparisons between people's happiness, which can be challenging. It also relies on ethical and political value judgments.

Conclusion

Welfare economics helps us assess whether economic policies improve or worsen society. The three main approaches—Kaldor-Hicks, Rawls' Justice, and Bergson-Samuelson Function—provide different tools to measure and enhance welfare. Each method has its strengths and weaknesses. While some focus on overall gains, others prioritize fairness and justice. Together, they illustrate that enhancing welfare involves not only increasing wealth but also ensuring fairness, equality, and justice for all.

5.5 GLOSSARY

- **Social Welfare:** The overall well-being and quality of life of people in a society. This includes access to basic needs like healthcare, education, housing, and fair opportunities.
- **Welfare Economics:** A part of economics that looks at how economic policies and systems affect social welfare and how to improve it.
- **Pareto Efficiency:** A situation where no one can be better off without making someone else worse off.
- **Kaldor-Hicks Criterion:** A test for evaluating policy where a change is seen as beneficial if those who gain could compensate those who lose and still be better off. Actual compensation is not required.
- **Compensation Principle:** The idea that a policy is justified if those who gain can compensate those who lose while still maintaining a net gain.
- **Kaldor's Test:** This focuses on those who benefit: if people who gain can compensate those who lose and still benefit overall, the policy is justified.
- **Hicks' Test:** This focuses on those who lose: if those who lose cannot pay those who gain to stop the change, the policy is justified.
- **Utility:** A measure of satisfaction or happiness that people receive from goods, services, or life events.

- **Ordinal Utility: t**his ranks preferences without measuring the exact level of satisfaction. It is used in modern welfare economics.
- **Cardinal Utility:** This assigns specific numerical values to utility and assumes that satisfaction can be measured precisely. It was used in early welfare economics.
- **Utility Possibility Curve:** A graph showing different combinations of utilities for two people or groups that come from different economic outcomes.
- **Cost-Benefit Analysis:** A method for assessing policy decisions by comparing the total expected benefits to the total expected costs.
- **Marginal Utility of Money:** The extra satisfaction gained from having an additional unit of money. This usually decreases as income increases.
- **Rawls' Theory of Justice:** A political philosophy suggesting that a just society allows inequalities only if they benefit the least advantaged.
- **Veil of Ignorance:** A hypothetical situation where individuals design a just society without knowing their own position in it.
- **Original Position:** Rawls' concept where people decide on justice principles without knowledge of their personal situations.
- **Equal Liberty Principle:** Rawls' first principle states that each person has equal rights to basic liberties.
- **Difference Principle:** Rawls' second principle states that inequalities are acceptable only if they benefit the least advantaged in society.
- **Fair Equality of Opportunity:** Rawls' condition that everyone should have equal chances to get beneficial positions.
- **Libertarianism:** A political philosophy that highlights individual freedom and minimal government intervention. It opposes redistributive policies.
- **Nozick's Entitlement Theory:** Robert Nozick's theory argues that justice depends on the fair acquisition and transfer of property, not on achieving equality.
- **Social Indifference Curves:** Graphs that show combinations of utilities for individuals that lead to the same level of overall social welfare.
- **Social Welfare Function (SWF):** A mathematical function that combines individual utilities into a single measure of societal welfare.

- **Bergson-Samuelson Social Welfare Function:** A model that includes individual utilities to determine the best resource allocation for maximum social welfare.
- **Grand Utility Possibility Frontier (GUPF):** The limit showing all Pareto-efficient combinations of individual utilities based on available resources.
- **Point of Bliss:** The point on the GUPF where social welfare is at its highest. This is where the best indifference curve touches the frontier.
- **Efficiency in Production:** Making goods in a way that no extra output can be gained without increasing input.
- **Efficiency in Distribution:** Distributing goods so that it is impossible to make one person better off without making someone else worse off.
- **Capabilities Approach:** Proposed by Amartya Sen, this approach focuses on what individuals can do and who they can be, rather than just what they possess.
- **Utilitarianism:** A philosophy that supports maximizing total happiness or utility for the greatest number of people.
- **Equity:** The idea of fairness in economic results and resource distribution.
- **Interpersonal Utility Comparison:** Comparing levels of satisfaction or utility between individuals—considered ethically complex and methodologically challenging.

5.6 QUESTIONS FOR PRACTICE

A. Long-answer questions:

Q1. What is social welfare? How does it relate to economic policies and individual well-being?

Q2. Explain the challenges involved in measuring social welfare. Why are ethical value judgments important?

Q3. What is the Kaldor-Hicks Compensation Criterion? How does it differ from Pareto efficiency?

Q4. What are the assumptions of the Kaldor-Hicks Compensation Principle? Why are they important?

Q5. What is a utility possibility curve? How is it used to assess welfare changes between two individuals?

Q6. Explain Rawls' concept of the "original position" and "veil of ignorance." How does it ensure fairness?

Q7. What are Rawls' two principles of justice? Explain them with examples.

Q8. Critically examine Rawls' Theory of Justice. What are some major criticisms against it?

Q9. What is the Bergson-Samuelson Social Welfare Function? How does it help in evaluating social welfare?

Q10. Explain the concept of the "Point of Bliss" using the Grand Utility Possibility Frontier and social indifference contours.

B. Short-answer questions:

Q1. What is meant by social welfare?

Q2. Which economist introduced the concept of the Social Welfare Function?

Q3. What does the Kaldor-Hicks Criterion say about policy changes that harm some individuals?

Q4. What is the main drawback of the Pareto efficiency criterion?

Q5. Name two assumptions of the Kaldor-Hicks Compensation Principle.

Q6. What is the 'veil of ignorance' in Rawls' theory?

Q7. According to Rawls, why would people behind the veil of ignorance choose an egalitarian society?

Q8. What is the difference principle in Rawls' theory?

Q9. What is a social indifference contour?

Q10. What does the "point of bliss" represent in welfare economics?

5.7 SUGGESTED READINGS

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MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT-VI ASYMMETRIC INFORMATION

STRUCTURE

6.0 OBJECTIVES

After studying this unit, learner should be able to:

- **Define and differentiate** between perfect and imperfect information in economic markets.
- **Explain the concept** of asymmetric information and its pervasive role in modern economies.
- **Distinguish between** the two core problems arising from asymmetric information: adverse selection and moral hazard.
- **Analyze the "Theory of Lemons"** and its implications for market efficiency and potential collapse.
- **Understand the Principal-Agent Problem** as a unifying framework for analyzing information asymmetry across various fields.
- **Identify and evaluate** different market-based solutions and countermeasures, such as signalling, screening, and efficiency wages.
- **Apply the concepts** of adverse selection and moral hazard to key sectors, with a detailed focus on the insurance market.
- **Recognize the broader implications** of information asymmetry for market outcomes and social welfare.

6.1 THE CONCEPT OF INFORMATION IN ECONOMIC MARKETS

The foundation of classical and neoclassical economics rests on the assumption of perfect competition, a theoretical ideal where markets function with maximum efficiency. A key pillar of this model is the assumption of **perfect information**, which implies that all market participants—buyers, sellers, producers, and consumers—have complete and equal knowledge about all aspects of the market. This includes product quality, prices, production costs, and future market conditions. Under perfect information, rational agents make optimal decisions, leading to an efficient allocation of resources and the maximization of social welfare.

However, the real world is a realm of **imperfect information**. Participants in a market rarely possess all the necessary information to make fully informed decisions. The quality of a used car, the true health of a patient, or the future profitability of a new business are all examples of

information that is often incomplete or costly to obtain. This lack of complete information creates inefficiencies, but it is not, by itself, the most significant source of market failure.

A far more critical and pervasive problem is **asymmetric information**, a specific form of imperfect information where the available information is unequally distributed among market participants. This means that one party to an economic transaction possesses more or better information than the other. This imbalance creates an inherent advantage for the informed party and a significant disadvantage for the uninformed party, leading to a breakdown of normal market mechanisms.

The study of asymmetric information has been a cornerstone of modern microeconomic theory since the pioneering work of economists like George Akerlof, Michael Spence, and Joseph Stiglitz, who were collectively awarded the Nobel Prize in Economic Sciences in **2001** for their contributions. Their work demonstrated how the unequal distribution of information could lead to profound market failures, where competitive forces fail to produce efficient or socially optimal outcomes. This unit will explore the two primary manifestations of asymmetric information: adverse selection and moral hazard, and the market and policy solutions designed to address them

6.2 THE PERVASIVE ROLE OF ASYMMETRIC INFORMATION IN STAKEHOLDER RELATIONSHIPS

While the classical view of the firm focuses on a single objective, such as profit maximization, a more nuanced understanding recognizes that a firm is a complex entity with various stakeholders. These stakeholders—including owners (shareholders), managers, employees, creditors, suppliers, and customers—often have conflicting interests. The relationships between these stakeholders are frequently defined by asymmetric information, creating a series of intricate challenges that economists analyze through the **principal-agent framework**.

The **principal-agent problem** arises whenever one party, the **principal**, delegates a task to another party, the **agent**, and the principal cannot perfectly monitor the agent's actions or intentions. In this relationship, the agent typically possesses private information that the principal does not. This asymmetry creates two fundamental issues that we will explore in detail.

First, there is the pre-contractual problem of **adverse selection**, where the principal must choose an agent from a pool of candidates who have private information about their own characteristics, abilities, or motivations. For example, a company (principal) seeking to hire a new employee (agent) faces this problem. The potential employee has hidden information about their true work ethic, skills, and commitment. The firm, without this information, may mistakenly hire a less productive or unsuitable candidate.

Second, and equally significant, is the post-contractual problem of **moral hazard**. This arises after the contract is established. The principal cannot fully observe the agent's effort level or behavior, leading to the risk that the agent will act in a way that is detrimental to the principal's interests. An example is a firm's manager (agent) who, once hired, may choose to pursue personal goals, such as increasing the size of their department or securing higher-status perks, rather than focusing on the shareholders' (principals') primary goal of maximizing the firm's value.

This principal-agent framework is not limited to the firm-employee relationship. It applies broadly to:

- **Shareholders (Principals) and Managers (Agents):** As the owners of a public company, shareholders delegate day-to-day decision-making to a board and management team. The managers, however, have better information about the firm's internal operations and may use this information to pursue objectives that benefit themselves, such as excessive executive compensation or risky corporate expansion, rather than maximizing shareholder returns.
- **Creditors (Principals) and Borrowers (Agents):** A bank lending money to a firm face both adverse selection and moral hazard. Adverse selection occurs because the firm (borrower) has better information about its own risk level and ability to repay the loan. Moral hazard arises after the loan is granted, as the firm may use the borrowed funds for riskier projects than originally disclosed, knowing that the bank bears a significant portion of the downside risk.
- **Customers (Principals) and Service Providers (Agents):** When a customer hires a professional, such as a lawyer, doctor, or mechanic, the professional (agent) possesses specialized knowledge that the customer (principal) lacks. This can lead to the agent recommending unnecessary or more expensive services, as their interests are not perfectly aligned with the customer's.

Understanding these information asymmetries is crucial for analyzing the behavior of firms and their stakeholders. It highlights that even in competitive markets, the unequal distribution of information can lead to significant inefficiencies and the need for sophisticated institutional and contractual solutions.

6.3 CORE PROBLEMS OF ASYMMETRIC INFORMATION

The unequal distribution of information fundamentally changes the dynamics of a market. It leads to outcomes that are often inefficient, unfair, and can even cause a complete market breakdown. This section delves into the primary consequences of asymmetric information.

6.3.1 Adverse selection is an information-based market failure that occurs when one party in a transaction has more and better information about a **hidden characteristic** of the product, service, or individual being traded. This problem arises *before* the transaction is completed. The uninformed party is at a disadvantage because they cannot distinguish between high-quality and low-quality items. The term "adverse selection" refers to the fact that, in such markets, the uninformed party is left with a selection of items that are "adverse" to their interests.

The problem unfolds in a clear sequence:

1. **Information Imbalance:** One side of the market possesses private information that the other side lacks. For example, in the health insurance market, an individual knows their own health status (a hidden characteristic), but the insurance company does not.
2. **The Averaging Problem:** Since the uninformed party cannot differentiate between good and bad types, they must offer a single, "average" price for all of them. An insurance company, for instance, sets a premium based on the average health of the population, not the true risk of each individual.
3. **The Market Response:** This average price is too expensive for the good types, who know their true value is higher than the average. In the insurance example, healthy people, who are less likely to need medical care, find the average premium too high and choose not to buy a policy.
4. **The Adverse Spiral:** This leaves the market with a disproportionately high number of bad types. In our example, only the unhealthy individuals, who know their risk is high, find the average premium to be a good deal. With only the sick people in the risk pool, the insurance

company's costs rise, forcing them to raise premiums even higher. This, in turn, drives out all but the sickest individuals, leading to a vicious cycle that can cause the entire market to collapse.

6.3.2 The Theory of Lemons:

The most famous exposition of adverse selection is George Akerlof's "Theory of Lemons," which uses the used car market as a powerful metaphor. The central idea is that information asymmetry can cause the market for high-quality goods to shrink or even disappear entirely.

Consider a market with two kinds of used cars: high-quality cars and low-quality cars.

Scenario 1: Perfect Information

If both sellers and buyers can tell the difference between a high-quality car and a low-quality one, two separate, efficient markets will exist. As shown in the diagram, the supply (SH) and demand (DH) for high-quality cars will intersect at a market price of **$10,000**, with **50,000** units sold. Similarly, the supply (SL) and demand (DL) for low-quality cars will intersect at a market price of **$5,000**, with **50,000** units sold. In this ideal scenario, both types of cars are traded at their true value, and the market is efficient.

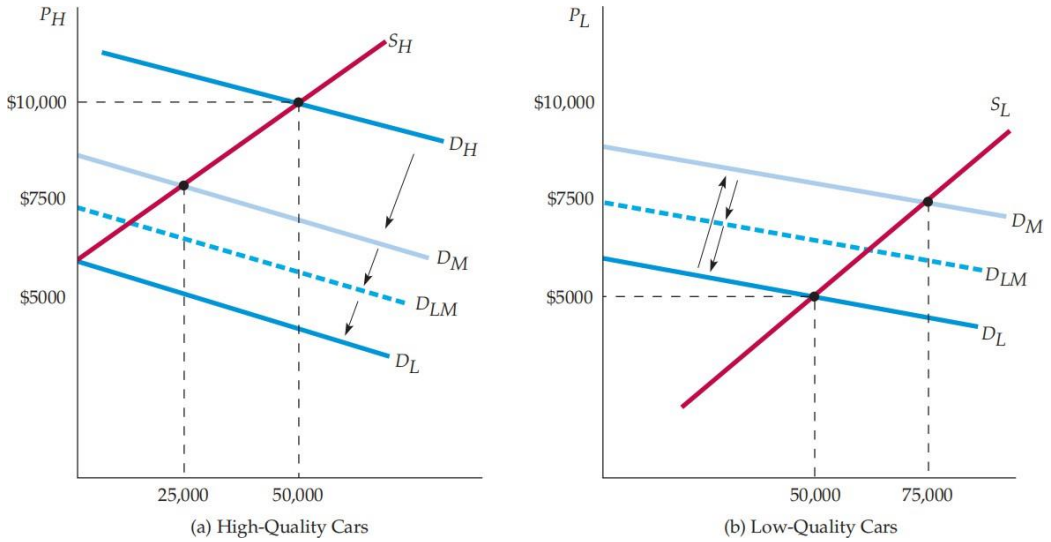
Scenario 2: Asymmetric Information

The reality is that sellers of used cars know much more about their quality than buyers do. When buyers can't distinguish between a high-quality car and a low-quality one, they initially assume an equal chance of getting either type. Based on the quantities sold in the perfect information scenario (50,000 of each), buyers might expect a 50-50 mix. They will, therefore, demand cars of "medium quality," represented by the demand curve DM in the diagram. This perceived demand curve is lower than the demand for high-quality cars but higher than the demand for low-quality cars. The resulting equilibrium price for these "medium quality" cars will be about **$7,500**.

However, this average price of $7,500 is problematic. For owners of high-quality cars, this price is too low, as they know their car is worth more. Consequently, fewer high-quality cars are offered for sale (only **25,000** in the diagram). Conversely, owners of low-quality cars are

delighted to sell their cars for $7,500, a price far above their true value. This leads to a flood of low-quality cars into the market (**75,000** units are sold).

Figure 6.1



The Adverse Spiral

As consumers begin to realize that the market is now heavily skewed towards low-quality cars—with about three-fourths of the total cars sold being low-quality—their perceptions change. Their perceived demand shifts to the left, which can be represented by a new demand curve, DLM, for "low- to medium-quality" cars. The resulting average price for cars drops even further, which in turn, drives even more high-quality cars out of the market. This process, a classic example of **adverse selection**, continues until the market price is too low to bring forth any high-quality cars for sale at all. At this point, the market collapses for high-quality goods, and only low-quality cars are sold. This phenomenon is known as the **lemons problem**: With asymmetric information, low-quality goods can drive high-quality goods out of the market.

This model explains why we see such adverse selection problems in other markets:

- **Health Insurance:** If an insurer cannot distinguish between healthy and unhealthy people, it charges a premium based on average health. This premium is too expensive for the healthy, who drop out, leaving a sicker, more expensive pool of clients.

- **Credit Markets:** When a lender cannot distinguish between low-risk and high-risk borrowers, they charge a high-interest rate that is profitable for high-risk borrowers but too expensive for low-risk ones, driving them out of the market.

6.3.3 Moral Hazard (The Problem of Hidden Actions)

Moral hazard is a market failure that occurs **after** a transaction has taken place. It arises when one party, whose actions are unobservable to the other, can take actions that are detrimental to the uninformed party's interests. This happens because the informed party is shielded from the full consequences of their actions by the contract or relationship itself. The core of the problem is a change in behavior: when the financial burden of a risky or negligent action is passed on to someone else, the incentive to be careful or diligent is reduced.

This problem is often referred to as a **"hidden action" problem**, because the key issue is the inability of the uninformed party (the principal) to observe or monitor the actions of the informed party (the agent) after a contract has been signed. This lack of oversight can lead to a divergence of interests, where the agent behaves in a way that benefits themselves but harms the principal.

Classic Examples of Moral Hazard:

- **Insurance:** A textbook example of moral hazard is the behavioral change that occurs after purchasing insurance. A person with comprehensive car insurance may be less careful about parking in a safe spot, or might drive more recklessly, knowing that the insurance company will cover the costs of an accident. The act of becoming less careful or taking on more risk is the moral hazard. Similarly, a person with health insurance might be more inclined to seek expensive, and possibly unnecessary, medical treatment because they are not bearing the full cost. The insurance company cannot perfectly monitor the insured's daily choices or the true necessity of every medical procedure.
- **Labor Market (Shirking):** In a firm, moral hazard arises between the employer (principal) and the employee (agent). Once hired at a fixed wage, an employee may choose to exert a lower level of effort, or **shirk**, because the employer cannot perfectly monitor their output or effort. Since the employee's pay is not directly tied to their productivity (due to the fixed wage), they are protected from the immediate financial consequences of their low effort,

and thus the incentive to work hard is diminished. This problem is particularly acute in situations where effort is difficult to measure, such as in creative or managerial roles.

- **Banking ("Too Big to Fail"):** A significant moral hazard problem exists in the financial sector, particularly with institutions deemed "too big to fail." When a bank is guaranteed a government bailout in the event of a crisis, its managers have a powerful incentive to take on excessive risk. The bank can reap the enormous profits from risky investments, but if those investments fail, the losses are socialized and passed on to the taxpayers. This creates a clear incentive for reckless behavior, as the bank's interests (maximizing profits) are not aligned with the public's interests (avoiding financial instability and bailouts).

6.3.4 The Principal-Agent Problem: A Unifying Framework

The **Principal-Agent Problem** is a theoretical model that provides a generalized framework for analyzing a wide range of relationships in which one party, the **principal**, delegates a task to another party, the **agent**. The core of the problem is a **conflict of interest** between the two parties, combined with the presence of **asymmetric information**. The agent possesses private information that is unavailable to the principal. The problem can be broken down into two components:

1. **Hidden Information (Adverse Selection):** This is a pre-contractual issue. The principal must choose an agent from a pool of candidates who have private information about their own intrinsic characteristics or "type" (e.g., skill level, motivation, or risk profile). For example, a homeowner (principal) hiring a contractor (agent) for a renovation project faces this problem because they cannot fully know the contractor's true skill, reliability, and past work quality before signing the contract. The principal's inability to distinguish between a highly skilled agent and a less competent one can lead to an adverse selection of the "bad type."
2. **Hidden Action (Moral Hazard):** This is a post-contractual issue. After the contract is in place, the principal cannot perfectly observe the agent's actions, effort level, or behavior. This creates an incentive for the agent to act in a way that benefits themselves at the expense of the principal. The agent’s behavior is unobservable and thus can be considered a "hidden action." For instance, once the homeowner hires the contractor, they cannot monitor every minute of the contractor's work. The contractor may be tempted to "shirk" by working less diligently, using lower-quality materials, or extending the project timeline to pad their bill, knowing that the homeowner cannot perfectly verify their actions.

The Principal-Agent framework is highly valuable because it provides a consistent lens to analyze these issues across various fields, including:

- **Shareholders and Managers:** As noted in the introductory text, the classic example of this problem is the separation of ownership and control in a large corporation. Shareholders (principals) delegate decision-making authority to a board and management team (agents). The agents, who have better information about the firm's internal operations, may pursue objectives that benefit themselves, such as excessive perquisite consumption (e.g., lavish offices or corporate jets) or personal empire-building through mergers and acquisitions that do not necessarily maximize shareholder value.
- **Patients and Doctors:** In this relationship, the patient is the principal, and the doctor is the agent. The doctor has specialized medical knowledge that the patient lacks, creating a significant information asymmetry. The patient trusts the doctor to make decisions that are in their best interest. However, a moral hazard could arise if a doctor recommends unnecessary medical procedures or tests to increase their own revenue.

The framework highlights that the principal's primary challenge is to design a **contract or incentive scheme** that aligns the agent's interests with their own. By doing so, the principal can mitigate the problems of adverse selection and moral hazard. These solutions often involve a combination of monitoring mechanisms, performance-based compensation, and other strategies to make the agent’s actions transparent and to align their financial incentives with the principal's objectives.

6.3.5 Information Asymmetry in Financial and Insurance Markets

The financial and insurance sectors are fundamentally built around the management of risk and information. Consequently, they are prime examples of markets where information asymmetry is a constant and defining challenge, leading to significant inefficiencies and the need for complex regulatory and contractual solutions.

Financial Markets: Information is the lifeblood of financial markets. The unequal distribution of information can distort prices and lead to misallocation of capital.

- **Lending:** A bank (principal) lending money to a firm (agent) is a classic principal-agent relationship. Before the loan is made, the firm has private information about the riskiness

of its projects and its likelihood of success. The bank, unable to perfectly distinguish a low-risk, diligent borrower from a high-risk, speculative one, will set an interest rate based on the **average risk** of the loan pool. This average rate is often too high for the safest borrowers, who will either opt out of the market or seek funding elsewhere. This leaves the bank with a disproportionate number of high-risk, "adverse" borrowers who are willing to accept the high interest rate, leading to **adverse selection**. After the loan is disbursed, **moral hazard** arises. The firm, now equipped with the bank's capital, may engage in actions that increase its own potential payoff but also increase the risk of default. For instance, it might take on a riskier, high-variance project than initially disclosed, knowing that if the project succeeds, the firm reaps the profits, but if it fails, the bank bears the loss. This is a problem of **risk-shifting**. The bank cannot perfectly monitor how its funds are being used.

- **Stock Market:** The stock market is also profoundly affected by information asymmetry. Corporate managers and insiders have superior information about the firm's true financial health, prospects, and hidden liabilities compared to an outside investor. This information gap can lead to market inefficiencies and can be a source of market volatility. The most egregious example of this is **insider trading**, where a person with non-public information about a company trades its stock for a profit. To combat this, regulatory bodies like the SEC in the United States mandate strict and transparent financial disclosures (e.g., quarterly and annual reports) to ensure information is made public and available to all investors.

Insurance Markets: The entire business model of insurance is a response to the problems of adverse selection and moral hazard.

- **Adverse Selection:** A health insurance company faces a severe adverse selection problem when setting premiums. If it cannot differentiate between healthy (low-risk) and unhealthy (high-risk) individuals, it must charge an average premium. This premium will be too expensive for the healthy people, who will drop their coverage. This leaves the insurance company with a risk pool dominated by unhealthy individuals. The company's costs will then rise, forcing it to raise premiums again. This can lead to a phenomenon known as the **"insurance death spiral,"** where premiums continuously increase and the pool of insured people becomes smaller and sicker, eventually causing the market to collapse.
- **Moral Hazard:** Once a person is insured, their behaviour may change. This is often referred to as a change from **"due care"** to **"over-consumption."** A person with fire

insurance may not be as careful with fire prevention. A person with health insurance may be more likely to seek expensive, even unnecessary, medical treatment because they are not bearing the full cost. The insurance company's challenge is to design contracts that mitigate this over-consumption. This is done through mechanisms such as:

- **Deductibles:** A fixed amount the insured must pay out of pocket before the insurance company starts to pay. This forces the insured to bear a portion of the initial cost, reducing the incentive for frivolous claims.
- **Co-payments:** A fixed amount the insured pays for a specific service (e.g., a doctor's visit).
- **Co-insurance:** The insured pays a percentage of the total cost after the deductible is met (e.g., 20% of the remaining bill). These mechanisms make the insured's consumption of services partially dependent on their own cost, which helps to align their incentives with those of the insurance company.

To survive, insurance companies must design sophisticated policies and use screening mechanisms to sort their clients into different risk categories and introduce incentives to mitigate moral hazard.

6.4 DECISION ISSUES IN A FIRM: STRATEGIES TO COMBAT ASYMMETRIC INFORMATION

Firms, as principals, cannot simply ignore the problems posed by asymmetric information. To survive and thrive in markets characterized by these challenges, they must develop sophisticated strategies to either reveal hidden information or to mitigate the risks of hidden actions. These strategies fall into two main categories: signalling and screening.

6.4.1 Signalling (Actions by the Informed Party)

Signalling is a proactive strategic action taken by the informed party (e.g., a high-quality seller) to credibly convey their private information to the uninformed party (e.g., a buyer or employer). For a signal to be a reliable indicator of quality, it must be costly. This is not simply a high price, but a cost that is less burdensome for the high-quality individual or firm than it would be for a low-quality one. This fundamental condition ensures that the signal is a genuine, un-fakeable indicator of quality and not a cheap imitation. In game theory, this is often referred to

as a **separating equilibrium**, where high-quality and low-quality types are successfully separated by the signal.

Key Examples of Signalling:

- **Education:** In the labor market, a university degree or an MBA acts as a powerful signal of a job candidate's inherent ability, discipline, and commitment. The cost of a degree—in terms of tuition fees, foregone earnings, time, and intellectual effort—is a significant barrier for less capable or motivated individuals. A prospective employer, who faces adverse selection in the hiring process, uses this signal to infer the candidate's unobservable qualities. Because a low-ability individual would find the cost of a degree prohibitively high (in terms of failure or difficulty), the completion of the degree credibly signals that the candidate is a "good type," thereby mitigating the employer's information problem.
- **Warranties and Guarantees:** A firm that produces a high-quality product can credibly signal its confidence by offering an extensive warranty or money-back guarantee. The economic logic is clear: the expected cost of honoring a long-term warranty is low for a firm that knows its product is durable and reliable. Conversely, for a low-quality producer, the expected cost of honoring the same warranty would be prohibitively high, as their products are likely to fail frequently. Thus, only the high-quality producer can afford to offer such a signal, which allows them to command a higher price and reassure consumers.
- **Brand Reputation and Advertising:** A strong, established brand reputation is a powerful signal of quality. Companies invest vast sums of money in building their brand over time through consistent quality, expensive marketing, and advertising. The sheer cost of this investment is a barrier to entry for low-quality firms, who could not sustain such an expense without the profits from a reliable product. This signal reduces the buyer's perceived risk, allowing the firm to build customer loyalty and maintain a price premium.

6.4.2 Screening (Actions by the Uninformed Party)

Screening is the inverse of signalling. It involves actions taken by the uninformed party (the principal) to induce the informed party (the agent) to reveal their private information through their choices. The uninformed party designs a set of choices or contracts, knowing that the

different types of informed parties will self-select the contract that is most suitable for them, thereby revealing their type. This is also a form of **separating equilibrium**, but driven by the uninformed party's design.

Key Examples of Screening:

- **Insurance Policies:** To combat adverse selection, insurance companies employ screening through policy design. They often offer a menu of policies with varying levels of coverage and cost. For example, a car insurance company might offer a low-premium policy with a very high deductible and a high-premium policy with a low deductible. A low-risk driver, who expects to have no accidents, will rationally choose the low-premium, high-deductible option, as they are confident they will not have to pay the deductible. A high-risk driver, knowing they are more likely to get into an accident, will choose the high-premium, low-deductible policy to minimize their out-of-pocket expenses. In this way, the company "screens" its clients and separates them into different risk pools, allowing it to charge an appropriate premium for each group.
- **Job Offers and Compensation Structures:** An employer, as the uninformed party, can screen job candidates by offering different types of contracts. For a sales role, the firm might offer a choice between a high fixed salary with a low commission or a low fixed salary with a high commission. A highly motivated and productive salesperson will choose the high-commission structure, confident in their ability to generate high sales and earn more. A less motivated or less confident salesperson will choose the high-fixed-salary option to reduce their risk. This choice reveals their type to the firm without a formal interview process.
- **Collateral in Lending:** A bank may require collateral, such as a mortgage on a house, for a loan. This acts as a powerful screening mechanism. A high-risk borrower who intends to default on the loan is less willing to put up valuable collateral than a low-risk borrower who is confident in their ability to repay the loan. The high-risk borrower's reluctance to offer collateral reveals their true type, allowing the bank to avoid making a bad loan

6.4.3 The Efficiency Wage Model: A Solution to Moral Hazard

While signalling and screening are critical tools for addressing adverse selection, the **efficiency wage model** is a powerful theory that explains a direct strategy to combat the moral hazard of

shirking in the labor market. The model posits that firms may find it profitable to pay wages above the market-clearing equilibrium level to increase worker productivity.

The core idea is that a firm's labor cost is not just about the wage paid per unit of time but the cost per unit of effective labor, which is the wage divided by the effort level. By paying a high wage, the firm creates a powerful incentive for workers to exert high effort.

The Shirking Model and Persistent Unemployment

In a perfectly competitive labor market, we would expect the wage to fall to a market-clearing level ($w*$), where the demand for labor equals the supply, and everyone who wants a job at that wage finds one. However, the efficiency wage model, specifically the **shirking model**, provides a compelling explanation for why we see persistent, involuntary unemployment.

The model is based on a fundamental principal-agent problem: since monitoring workers is costly or impossible, firms have imperfect information about their employees' productivity. In this scenario, workers face a choice: to be productive or to "shirk" (slack off).

If a firm were to pay the market-clearing wage, a worker who is fired for shirking could immediately find another job at the same wage. Since there is no financial penalty for being caught, workers have no incentive to be productive. To solve this moral hazard, firms must offer an **efficiency wage (**we**)** that is greater than the market-clearing wage. At this higher wage, the opportunity cost of losing the job is significant. A worker who is fired faces a substantial loss of income and a period of unemployment before potentially finding another job at the same high wage. This threat of unemployment acts as a powerful deterrent to shirking.

When all firms in the economy face this same problem, they will all offer an efficiency wage above the market-clearing level. This collective action has a crucial macroeconomic consequence: the total demand for labor will be less than the supply of labor, leading to an equilibrium with persistent unemployment.

The No-Shirking Constraint (NSC)

The relationship between the wage and the level of unemployment can be captured by the **No-Shirking Constraint (NSC)** curve. This curve shows the minimum wage a firm must pay to ensure that its workers do not shirk for each given level of unemployment. The greater the level

of unemployment, the higher the cost of losing a job for a worker, and thus the lower the wage needed to deter shirking. For this reason, the NSC curve is upward sloping.

The equilibrium in the labour market is determined at the intersection of the labor demand curve (DL) and the NSC curve. At this point, the firm's optimal wage choice perfectly aligns with the minimum wage required to prevent shirking. This equilibrium is stable and, by its very nature, involves an excess supply of labour, meaning that some workers are involuntarily unemployed. This model successfully explains why firms do not cut wages to increase employment; a lower wage would increase shirking, ultimately lowering productivity and firm profit.

The Solow Condition and Graphical Representation

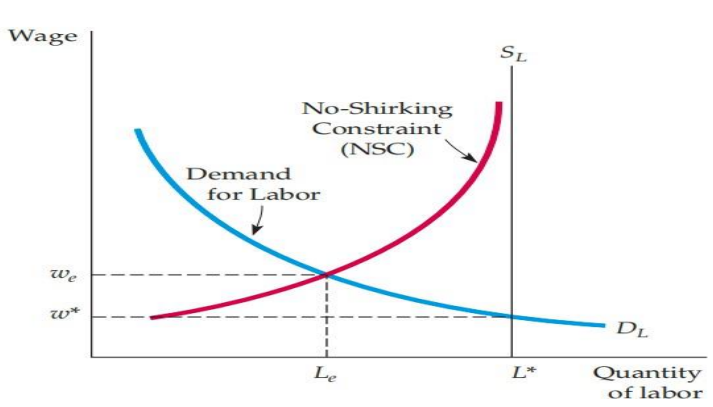
The firm's decision-making process is to minimise the cost of labour per unit of effort, which leads to the **Solow Condition**. This condition, derived from the first-order condition for cost minimisation, states that at the optimal efficiency wage, the elasticity of effort with respect to the wage must be equal to one:

$$\frac{\delta e(w)}{\delta w(e)} = 1$$

This condition implies that the firm should increase the wage as long as the marginal benefit (the increase in effort from a one-dollar wage increase) outweighs the marginal cost (the one-dollar wage increase itself). By paying the optimal efficiency wage, the firm encourages maximum effort and minimises the risk of shirking. This model also provides an explanation for the existence of involuntary unemployment in the economy, as many firms paying efficiency wages can push the market wage above the equilibrium level, leaving some workers unable to find jobs.

The determination of the optimal efficiency wage can be illustrated with a graph.

Figure 6.2



As shown in a labor market Figure 6.2, in a labor market where worker shirking is a concern, the traditional equilibrium of supply and demand for labor is altered. Instead of the market clearing at the intersection of labor supply ($s_L$and demand (D_L), firms must pay a higher wage to prevent employees from slacking off. This minimum wage, known as the **efficiency wage**, is represented by the **no-shirking constraint (NSC)** curve. The NSC curve slopes upward because, as unemployment decreases, the risk of job loss for shirking workers also decreases, requiring firms to offer a larger wage premium to motivate them. The equilibrium wage (w_e) and employment level (L_e) are thus determined by the intersection of the labour demand curve (D_L)) and the NSC curve. This new equilibrium wage is higher than the traditional market-clearing wage (w , and the employment level is lower (L_e<L). A key result of this model is that the NSC curve never intersects the labour supply curve, which means there will always be some level of **involuntary unemployment** in the market. Because firms are paying more than the market-clearing wage, they hire fewer workers (Le), resulting in a level of unemployment equal to the difference between the number of people willing to work at the market-clearing wage and the number of people actually hired (L −L_e).

6.5 QUESTIONS FOR PRACTICE

Q1 Differentiate between imperfect information and asymmetric information.

Q2 In the context of the Principal-Agent Problem, what is the key difference between the principal and the agent?

Q3 Why is a high-cost signal, such as an expensive advertising campaign, a credible signal of product quality?

Q4 What is the main purpose of a deductible in an insurance policy from an economic perspective?

Q5 Explain the concept of "shirking" in the labour market.

Q6 What is the primary motivation for a firm to pay an efficiency wage?

Q7 Briefly explain why asymmetric information is considered a cause of market failure.

B. Long Answer Type Questions

Q1 Critically analyze the "Theory of Lemons" by George Akerlof. Explain how it demonstrates the problem of adverse selection and discuss the conditions under which it can lead to a complete market collapse.

Q2 Explain the Principal-Agent Problem in detail. Discuss how it serves as a unifying framework for understanding both adverse selection and moral hazard.

Q3 Discuss and differentiate between market signalling and screening as solutions to asymmetric information.

Q4 Explain the concept of moral hazard and its implications for market outcomes. Discuss how firms and institutions design incentive-compatible contracts to mitigate moral hazard.

Q5 What is the efficiency wage model? Explain the economic logic behind it and discuss how it addresses the problem of moral hazard in the labour market.

6.6 Suggested Readings

- Dwivedi, D. N. (2012). *Microeconomics I: For the University of Delhi*. Pearson Education.
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MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT-7: MARKET FAILURE AND PUBLIC GOODS

STRUCTURE

7.0 OBJECTIVES

After studying this unit, learners should be able to:

- Define market failure and identify its primary causes.
- Explain the characteristics of public goods and why they are not efficiently provided by private markets.
- Analyse the concept of externalities and their implications for economic efficiency.
- Understand the free-rider problem and its role in the under-provision of public goods.
- Evaluate various solutions to market failures, including government intervention, taxes, and subsidies.
- Discuss the Theory of the Second Best and its relevance for public policy.
- Critically analyse the phenomenon of rent-seeking and its impact on economic efficiency and regulation.

7.1 INTRODUCTION

In the idealised model of perfect competition, the economy achieves a state of Pareto efficiency. This means that no person can be made better off without making someone else worse off. This ideal outcome is a cornerstone of welfare economics. It is predicated on a set of stringent assumptions, including a large number of buyers and sellers, homogeneous products, perfect information, and free entry and exit. When these conditions hold, the market, guided by the "invisible hand," ensures that the pursuit of individual self-interest aligns perfectly with the maximisation of social welfare. At the equilibrium price, the value that consumers place on the last unit of a good (marginal benefit) is exactly equal to the cost of producing that unit (marginal cost). This balance leads to a socially optimal level of output, where total surplus (the sum of consumer and producer surplus) is maximised. However, the real world is far more complex than this theoretical benchmark. The conditions required for perfect competition are rarely, if ever, fully met. When these assumptions are violated, the market mechanism fails to achieve an efficient allocation of resources. This phenomenon is known as market failure. It is a state where the market, left to its own devices, produces an outcome that is inefficient for society as a whole. In simple terms, market failure is a situation where the market, in its operation, fails to maximize social welfare.

In the theoretical framework of economics, the notion of perfect competition represents an ideal state where the allocation of resources is at its most efficient, a condition known as Pareto efficiency. This optimal condition exists when no individual's well-being can be improved without reducing someone else's. Such a perfect state is founded on a specific set of rigorous assumptions, including a vast number of participants, identical products, complete information, and unrestricted market entry and exit. When these criteria are met, the market, operating under the influence of the "invisible hand," naturally aligns the self-interested actions of individuals with the best interests of society. At the point of equilibrium, the value that buyers derive from the final unit of a product (its marginal benefit) precisely equals the expense of its creation (its marginal cost). This precise balance results in a socially optimal output level, where the total welfare of society—measured by the combined consumer and producer surplus-reaches its peak.

Yet, reality seldom mirrors this theoretical model. The prerequisites for perfect competition are rarely fully in place. The failure to meet these conditions leads to a breakdown in the market's ability to efficiently allocate resources. This breakdown is termed market failure. It describes a scenario where the market, without external intervention, generates a result that is inefficient for society at large. Essentially, a market failure occurs when the market's fundamental operations do not succeed in maximizing overall social welfare.

The existence of market failure provides the primary economic justification for government intervention in the economy. Rather than being a flaw in the free market system, it highlights the circumstances under which the system requires a guiding hand to correct its inherent shortcomings. This unit will delve into the key reasons for market failure and the various policy tools that can be used to correct it. We will explore the theory and practical implications of public goods, externalities, and the challenges posed by market imperfections such as monopoly power and asymmetric information.

7.2 THE CAUSES OF MARKET FAILURE

Market failure is not a single problem but a result of several underlying causes that prevent the market from reaching a socially optimal equilibrium. The primary reasons for market failure are the existence of public goods, externalities, and market imperfections.

7.2.1 Public Goods and the Free-Rider Problem

The existence of **public goods** is one of the most significant reasons for market failure. These goods differ from private goods in their unique characteristics of **non-rivalry** and **non-**

excludability. These two traits make it impossible for private firms to provide such goods efficiently.

- **Non-rivalry** in consumption means that the use of a good by one individual does not reduce its availability to other individuals. For example, the enjoyment you derive from a public park or a street light does not prevent others from using and benefiting from them as well. The marginal cost of providing the good to one more person is virtually zero. Conversely, a private good, like an ice cream cone, is rivalrous, meaning that one person's consumption of it prevents anyone else from enjoying it.
- **Non-excludability** means that it is either impossible or prohibitively costly to prevent people who have not paid for the good from consuming it. Once a good is provided, it is available to all. A classic example is national defence. Once a country's defence system is in place, it protects all citizens within its borders, whether or not they have contributed to its cost through taxes. Similarly, a public radio broadcast is non-excludable; you can listen to it for free even if you have not donated.

These two qualities lead to the free-rider problem, where an individual benefit from a good or service without contributing to its cost. Because public goods are non-excludable, individuals have a rational incentive to under-report their true valuation of the good. They know that if the good is provided, they will be able to enjoy it without contributing to its cost. This rational, self-interested behaviour leads to a situation where the total amount of private contributions is insufficient to cover the cost of the public good. Consequently, the good is either not provided at all or is provided at a level far below the socially optimal quantity. This is why essential public goods like national defence, lighthouses, and clean air are typically provided and funded by the government through compulsory taxation, which overcomes the free-rider problem by forcing everyone to contribute.

7.2.2 Externalities and their Impact

An externality is the uncompensated impact of an individual's or a firm's actions on the welfare of a third party. As a form of market failure, externalities create a divergence between the private costs or benefits of an action and the corresponding social costs or benefits. Consequently, the market's private transactions fail to incorporate these external effects, resulting in an inefficient allocation of resources.

- **Negative Externalities:** A negative externality occurs when an activity imposes an uncompensated cost on a third party. For instance, a steel factory that pollutes a river as a

byproduct of its production imposes a cost on the downstream community by harming their health, diminishing their property values, or reducing the fish population. The factory's private marginal cost (PMC) of production does not include this external cost of pollution. The social marginal cost (SMC), which includes both the PMC and the external cost, is therefore higher. Since the firm bases its production decisions on its PMC, it produces more than the socially optimal quantity. The market equilibrium quantity is greater than the socially optimal quantity, leading to over-production and a deadweight loss to society.

- **Positive Externalities:** When an activity provides a benefit to a third party, it is a positive externality. For instance, a person who restores an old, historic house in their neighbourhood not only enjoys the benefit themselves but also provides an aesthetic and historical benefit to their neighbours, increasing the value of their properties. The individual's private marginal benefit (PMB) from the house restoration is less than the social marginal benefit (SMB), which includes the external benefit to the neighbourhood. Because the individual only considers their PMB, will underinvest in restoration, falling short of the socially optimal level and leading to a state of under-consumption. The discrepancy between the market equilibrium and the socially optimal quantity results in a deadweight loss.

In both cases, the market fails to allocate resources efficiently because it does not account for the full social costs or benefits of an action, leading to an inefficient outcome.

7.2.3 Market Imperfections

Market failure can also be caused by market imperfections, which are deviations from the ideal conditions of perfect competition. These imperfections prevent prices from acting as accurate signals of a product's true value, thus hindering the market's ability to achieve an efficient outcome.

- **Monopoly Power:** A monopolistic market is characterized by a sole provider with substantial market power. This allows the firm to confront a downward-sloping demand curve, enabling it to set prices exceeding its marginal cost (P>MC). This stands in stark contrast to perfect competition, where firms are price takers and P=MC. By restricting output to raise the price, a monopolist creates a deadweight loss—a loss of total surplus that is not captured by either the consumer or the producer. This misallocation of resources leads to a socially inefficient outcome, as some consumers who value the good more than its marginal cost is unable to purchase it.

- **Asymmetric Information:** An asymmetry of information, where one party possesses superior knowledge during a transaction, can result in market failures such as adverse selection and moral hazard**.** As discussed in the previous unit, the "lemons problem" in the used car market is a classic example of adverse selection, where the seller has more information than the buyer about the car's quality. This can cause high-quality products to be driven out of the market by low-quality ones, leading to market breakdown. Similarly, in the labour market, an employer's lack of perfect information about a worker's effort level can lead to moral hazard, where the employee may shirk their duties, knowing that the employer cannot perfectly monitor them. In both cases, the information imbalance prevents the market from reaching an efficient outcome.

7.3 THE THEORY OF PUBLIC GOODS

The theory of public goods is a cornerstone of public finance, explaining why some goods and services are best provided by the government rather than the private sector. The failure of the private market to provide these goods is a direct consequence of its defining characteristics.

7.3.1 Defining Characteristics: Non-Rivalry and Non-Excludability

A pure public good is fundamentally characterized by the dual properties of non-rivalry and non-excludability. It is crucial to distinguish pure public goods from other types of goods based on these characteristics.

- **Pure Private Good:** Rivalrous and excludable (e.g., an apple, a concert ticket). These are the standard goods we see in most markets.
- **Pure Public Good:** A pure public good is defined by non-rivalry and non-excludability (e.g., national defence, a fireworks display). Markets struggle to provide them efficiently since they are difficult to price, and the marginal cost of accommodating an additional user is zero.
- **Common Resource:** Rivalrous but non-excludable (e.g., a public fishing ground, clean air). These goods are prone to the "tragedy of the commons," where individuals, acting in their own self-interest, deplete the resource, leading to its overuse and destruction.
- **Club Good (or Artificially Scarce Good):** Non-rivalrous but excludable (e.g., cable TV, a private swimming pool). They often exhibit natural monopoly characteristics, as it is efficient for a single firm to provide the service to all users due to the non-rivalry, but the ability to exclude non-payers allows for a price above marginal cost.

Understanding these distinctions is essential for proper policy design. The **non-excludability** of public goods is the primary reason for the **free-rider problem**, while the **non-rivalry** characteristic is what makes the efficient provision of the good a challenge for private markets, as a price of zero would be required for efficiency, but that would eliminate any profit incentive.

7.3.2 Efficient Provision and Pricing of Public Goods

For a private good, the socially efficient quantity is found where the horizontally summed market demand curve intersects the supply curve. This reflects the competitive allocation of a finite resource where the price represents consumers' marginal willingness to pay. Conversely, the demand for a public good is derived from the vertical summation of individual demand curves, as all individuals consume the same quantity but may assign different values to it. The socially efficient quantity of a public good is the point where the collective marginal benefit to all individuals equals the marginal cost of its provision, a principle known as the Samuelson Condition.

$$\sum_{i=1}^{n} MB_i = MC$$

Where MBi is the marginal benefit to individual i, and MC is the marginal cost of the public good.

Numerical Example: Consider a simple public good, a streetlight, with a constant marginal cost of $100. The neighbourhood has three residents, A, B, and C, with the following marginal benefits (MB) for each additional streetlight:

- **A:** $MB_A = 70 - 10Q$
- **B:** $MB_B = 50 - 5Q$
- **C:** $MB_C = 30 - 5Q$

The private market would fail to provide any streetlights because for any quantity, the individual marginal benefits are less than the cost of $100. For example, for the first streetlight (Q=1), the marginal benefits are MB_A=60, MB_B=45, and MB_C=25. No one would be willing to pay the full $100.

To find the socially optimal quantity, we vertically sum the marginal benefits:

$\sum_{i=A,B,C} MB_i = (70 - 10Q) + (50 - 5Q) + (30 - 5Q) = 150 - 20Q$

According to the Samuelson Condition, the optimal quantity is where the sum of the marginal benefits equals the marginal cost:

$150 - 20Q = 100$

$50 = 20Q$

$Q = 2.5$

The socially optimal quantity of streetlights is 2.5. Since we can only have whole streetlights, either 2 or 3 lights would be provided, but the market, left to its own, would provide zero. This example clearly demonstrates why the government, with its ability to tax and provide public goods, is essential for achieving social efficiency.

7.3.3 The Problem of Free-Riding

The free-rider problem is the central reason for the market failure of public goods. It is a classic collective action problem that prevents private solutions from emerging. The free-rider problem arises directly from non-excludability. A rational actor will be disinclined to fund a public good's cost, as they can consume its benefits regardless of their contribution.

This behaviour can be modelled using game theory, specifically a multi-person version of the Prisoner's Dilemma. For each individual, the dominant strategy is to free-ride, assuming others will contribute. If everyone follows this individually rational strategy, no one contributes, and the public good is not provided. The result is a Pareto inefficient outcome. The free-rider problem is a manifestation of the dilemma of collective action, where individually rational behaviour leads to a collectively irrational and socially suboptimal outcome. The government overcomes this problem by making contribution compulsory through taxation.

7.4 EXTERNALITIES: A DETAILED ANALYSIS

Externalities are a profound source of market failure, causing the social cost or benefit of an activity to diverge from its private cost or benefit.

7.4.1 Types of Externalities: Production and Consumption

Externalities can be categorized based on whether they arise from production or consumption and whether they are positive or negative.

- **Negative Production Externality:** A classic example is pollution from an industrial factory. The firm's **private marginal cost (PMC)** includes only the costs it bears directly, such as labor and raw materials. However, the factory's production imposes costs on society through air and water pollution, which affects the health of nearby residents and damages ecosystems. The **social marginal cost (SMC)** is the sum of the private cost and

the external cost of pollution. Since the firm only considers its private costs, it produces at a quantity where PMC = Marginal Benefit (demand), which is greater than the socially optimal quantity where SMC = Marginal Benefit. The result is overproduction and social inefficiency.

- **Positive Production Externality:** A good example is a firm that invests in research and development (R&D). The firm's private benefit from R&D is the profit from its new invention, but the knowledge it creates can spill over to other firms in the industry, who can use it to develop their own products. The **social marginal cost (SMC)** of the R&D is less than the **private marginal cost (PMC)**, as society benefits from the spillovers. Since the firm only considers its private costs, it will under-invest in R&D from a social perspective.
- **Negative Consumption Externality:** A common example is smoking in a public place. The smoker receives a private benefit from the cigarette but imposes an external cost on others through secondhand smoke. Another example is traffic congestion. As an individual drives a car during peak hours, they slow down other drivers, imposing a social cost that is not accounted for in their private cost of driving. The result is over-consumption of the good or activity that generates the negative externality.
- **Positive Consumption Externality:** An individual who gets a flu shot receives a private benefit by not getting sick, but also provides a social benefit by reducing the chance that others in the community will get sick. The individual's **private marginal benefit (PMB)** is less than the **social marginal benefit (SMB)**. Since the individual only considers their PMB, the number of flu shots consumed will be less than the socially optimal quantity.

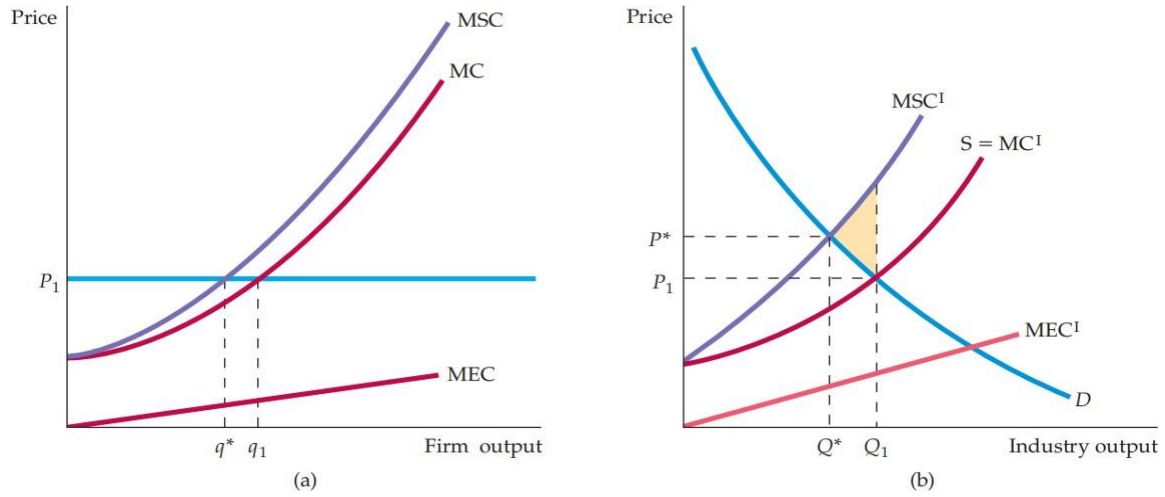
7.4.2 Graphical Analysis of Externalities

7.4.2.1 Negative Externalities and Inefficiency

The inefficiency caused by externalities can be clearly shown with a graph that illustrates the divergence between private and social costs and benefits. As market prices do not account for them, externalities can be a source of economic inefficiency. When firms disregard the social harms of their activities, the result is excessive output and avoidable societal costs.

To illustrate, consider the production choices of a steel plant that pollutes a river. Graph (a) depicts the decision-making process for a single firm within a competitive market.

Figure 7.1



EXTERNAL COST

In the presence of a **negative externality**, the **marginal social cost (MSC)** exceeds the **marginal cost (MC)**, with the difference being the **marginal external cost (MEC)**. As shown in (a), a profit-maximizing firm produces at q1, where price equals MC. The efficient output, however, is q∗, where price equals MSC. In graph (b), the industry's competitive output is Q1 at the intersection of the industry supply curve (MC^I and demand (D). The efficient output, Q∗, is lower, found at the intersection of demand and the industry's marginal social cost curve (MSC^I

The firm's private marginal cost (MC) curve dictates its production decisions. Given a market-determined price, the firm maximizes profit by producing at output q1, where its marginal cost equals that price. However, this production imposes an external cost on others, like downstream fishermen. This cost is captured by the upward-sloping Marginal External Cost (MEC) curve, which quantifies the incremental social harm per unit of output. From a societal standpoint, the firm's output is excessive. The efficient output level is q∗, where the product's price equals the Marginal Social Cost (MSC), which is the sum of the private marginal cost and the marginal external cost (MSC=MC+MEC). The MSC curve is derived by vertically summing the MC and MEC curves. As the graph indicates, the MSC curve intersects the price at a lower, more efficient output of q∗. Because the individual firm's actions do not influence the market price, it persists in producing at q1, resulting in excessive pollution.

Now, let's examine the collective impact of all steel plants polluting. In the second graph (b), the industry's supply curve (MC^I) is the aggregate of all firms' private marginal costs. The industry marginal social cost (MSC^I) is calculated by adding the industry marginal cost and the

total marginal external cost (MEC^I) for all firms. The efficient industry output level is where consumer marginal benefit, as shown by the demand curve (D), equals the MSC^I, which occurs at Q∗. However, the competitive industry produces at Q_1 , the intersection of the demand curve (D) and the private industry supply curve (MC^I). It is clear that the industry output Q_1 is excessive.

Each unit of steel produced results in some effluent being dumped. The inefficiency stems from the incorrect pricing of the product. The market price P_1 reflects only the firms' private costs, not the full social costs of production. The socially efficient price is P , where the market produces the efficient level of output Q . The cost to society of this inefficiency is the total social cost of the units produced between Q and Q_1, which is represented by the shaded triangle. For each unit produced in this range, the social cost (MSC^I) exceeds the social benefit (demand curve). This is the deadweight loss to society.

This inefficiency is not limited to the short run. In the presence of negative externalities, the average private cost of production is lower than the average social cost. This discrepancy provides an incentive for an excessive number of firms to enter and persist in the industry over the long term, as they are making a profit based on their private costs, even when it would be socially efficient for them to exit.

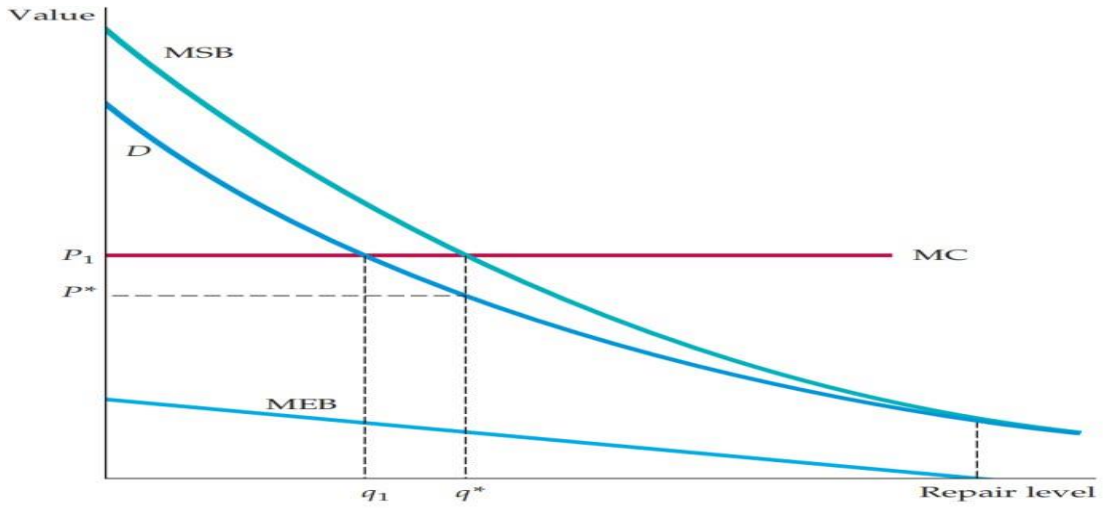
7.4.2.2 Positive Externalities and Inefficiency

Externalities can also result in underproduction, as demonstrated by the case of home repairs and landscaping. In Figure 7.2, the horizontal axis represents a homeowner's financial investment in these activities. The marginal cost (MC) curve for repairs is horizontal, indicating a constant per-unit cost. The demand curve (D) reflects the marginal private benefit to the homeowner. A homeowner, acting in their own self-interest, will choose to invest at q_1, where their private marginal benefit equals the marginal cost.

However, these improvements create external benefits for neighbours, as shown by the downward-sloping Marginal External Benefit (MEB) curve. This slope indicates that the marginal benefit to neighbours is high initially but diminishes with more extensive work. The Marginal Social Benefit (MSB) curve is the vertical summation of the marginal private benefit (D) and the marginal external benefit (MEB) at each output level (MSB=D+MEB).The efficient output level, q , is higher than the homeowner's chosen level and is found where the MSB and MC curves intersect. The inefficiency arises because the homeowner does not internalize all the benefits of their investment, leading to an investment level that is less than

socially optimal. Consequently, the market price P_1 is too high, and the efficient investment level would only be incentivized at a lower price, P .

Figure 7.2



Another classic instance of a positive externality is a firm's expenditure on research and development (R&D). The innovations and knowledge generated often cannot be completely protected, allowing other firms to imitate them and benefit without incurring the cost. Since the innovating firm does not capture the full social benefit of its investment, the market tends to underfund R&D.

The concept of externalities is also pertinent to other domains, such as network externalities, where one consumer's demand for a good is influenced by the purchases of others. For example, while some individuals might enjoy a crowded ski resort for social reasons, the resulting congestion could diminish the experience for other skiers who prefer shorter lift lines. This illustrates how both positive and negative network externalities can lead to market failures.

7.4.3 Solutions to Externalities and Government Intervention

Economists have proposed various solutions to correct for the inefficiencies created by externalities. When private solutions fail, government intervention is often necessary. The primary tools are:

- **Private Solutions (The Coase Theorem):** The Coase Theorem, proposed by Ronald Coase, posits that when property rights are clearly defined and transaction costs are minimal, private agents can negotiate a resolution to an externality issue independently. The theorem asserts that the efficient result will be achieved irrespective of the initial

assignment of those property rights. For example, if a noisy factory pollutes a nearby village, the village can pay the factory to reduce noise, or the factory can pay the village for the right to continue its operations. As long as negotiation is costless, the outcome will be efficient. However, the conditions of the Coase Theorem (zero transaction costs, clear property rights) are rarely met in the real world, especially with a large number of parties, which makes bargaining difficult or impossible.

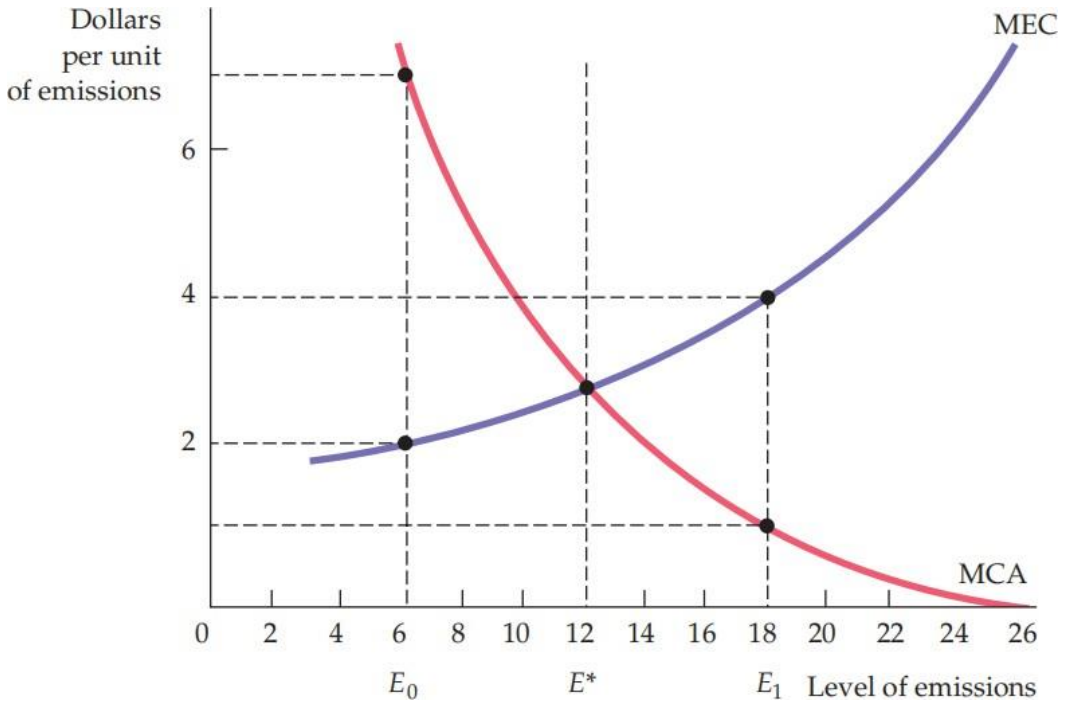
Correcting Inefficiency through Direct Policy Tools

The inefficiency caused by an externality can be corrected using various policy instruments. If a firm's production technology involves fixed proportions, the only way to mitigate the externality is to incentivize lower output, typically via an output tax. However, most firms can adjust their production technology and substitute inputs to reduce pollution, for example, by installing a scrubber on a smokestack.

To comprehend the mechanics of these policies, let's analyse a firm whose output and emissions decisions are distinct. We use a graph, as seen in Figure 7.3, with the horizontal axis representing emissions and the vertical axis showing the cost per unit of emissions, to examine this trade-off.

The **Marginal External Cost (MEC)** curve represents the social cost of the emissions, which is the increased harm associated with each additional unit of pollution. This curve slopes upward, as the harm from each additional unit of emissions gets higher as the total level of pollutants increases. For example, small levels of pollutants may cause little harm, but the harm can increase substantially as the level of pollutants rises. To better understand this, we can read the MEC graph from right to left, focusing on reducing emissions from existing levels. This perspective shows that the MEC for a small reduction from a high level of emissions (e.g., from 26 units) is high (over $6 per unit), reflecting a significant incremental benefit. As emissions are reduced further, the marginal social cost falls, eventually dropping below $2 per unit

Figure **7.3**



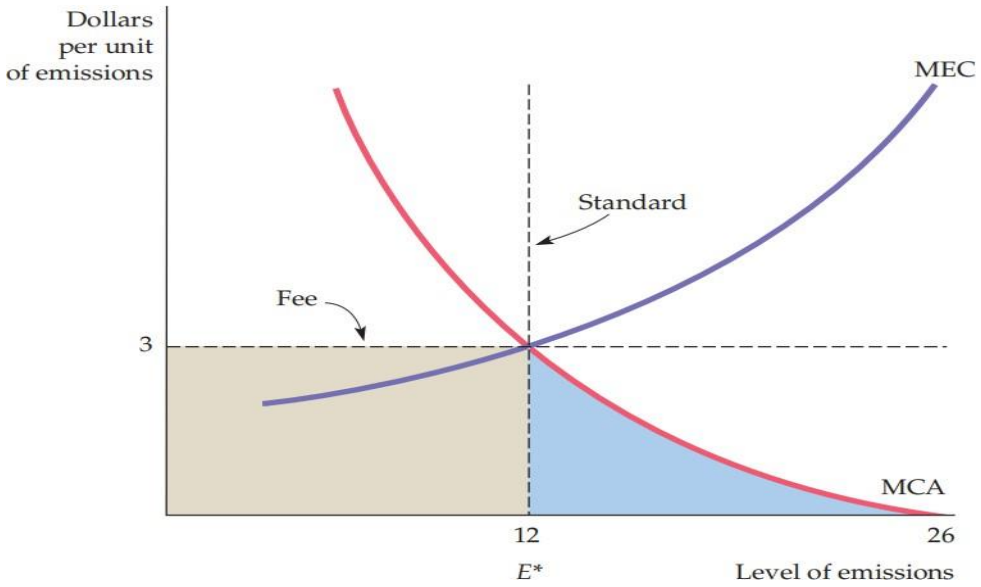
The **Marginal Cost of Abatement (MCA)** curve quantifies the additional cost a firm incurs to reduce emissions. This curve slopes downward because the marginal cost of abatement is low for small reductions and rises significantly for substantial ones. For example, a minor reduction may be inexpensive, while large reductions necessitate costly production process changes. When viewed from right to left, the MCA curve demonstrates that the marginal cost of abatement increases as greater reductions in emissions are pursued.

Without any abatement effort, a firm's profit-maximising level of emissions is where the marginal cost of abatement is zero. The socially efficient level of emissions is where the marginal external cost equals the marginal cost of abatement. The efficient level of emissions, for example, could be 12 units at a point where the marginal external cost of emissions, say $3, is equal to the marginal cost of abating emissions. If emissions are lower than this efficient level (e.g., 7 units), the marginal cost of abating emissions ($7) is greater than the marginal external cost of emissions ($2), meaning emissions are too low relative to the social optimum. Conversely, if the level of emissions is too high (e.g., 17 units), the marginal external cost of emissions ($4) is greater than the marginal cost of abatement ($1), indicating that emissions are too high.

Governments can encourage firms to reduce emissions to this efficient level in three primary ways:

1. **Emissions Standard**: is a regulatory approach that sets a legal limit on the amount of pollution a firm is permitted to release. Firms that exceed this limit may face significant penalties, including fines and criminal charges. As illustrated by **Figure 7.4**, the efficient emissions standard is set at the level where the Marginal External Cost (MEC) equals the Marginal Cost of Abatement (MCA). To comply, a firm must invest in pollution-abatement equipment, which in turn increases its average production costs. The standard effectively ensures that the firm operates at the socially efficient level of emissions.

   Figure 7.4

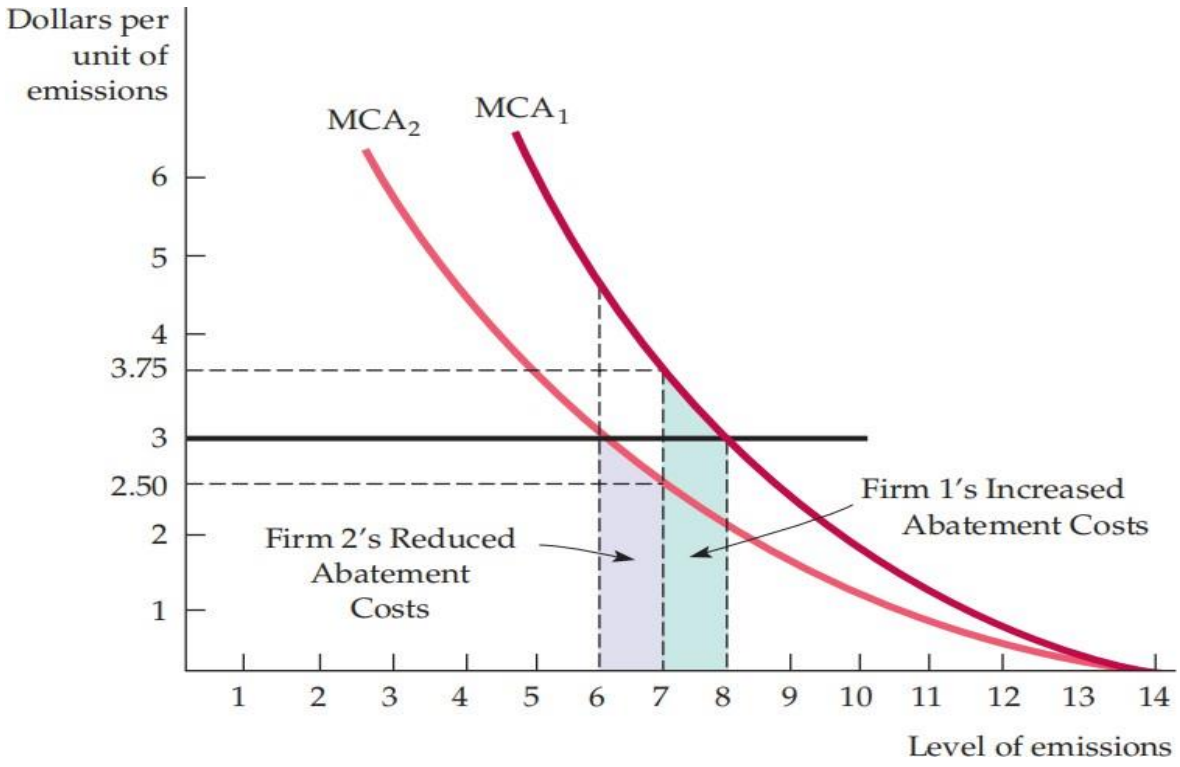


2. **Emissions Fee:** is a market-based tool that places a per-unit charge on a firm's emissions. A graph like **Figure 7.4** shows how an emissions fee (e.g., a $3 fee) can incentivize a firm to reduce its emissions from a high level to the efficient level. A firm will find it profitable to abate emissions as long as the marginal cost of abatement is less than the fee. For instance, reducing the first unit of emissions is very inexpensive, making abatement cheaper than paying the fee. Once the **marginal cost of abatement** surpasses the fee, the firm will opt to pay the fee instead of incurring the higher cost of abatement. The firm minimizes its total costs by reducing emissions to the level where its marginal cost of abatement is equal to the fee, which consist of both abatement costs and total fees paid. This approach encourages firms to reduce pollution in the most cost-effective way. In

essence, both a $3 emissions fee and a standard that limits emissions to 12 units can achieve the same efficient outcome at the point E*.

Tradable Emissions Permits: system is a third, market-based approach to achieving efficient emissions reduction. This method is particularly useful when the costs of abatement vary among firms and the government lacks perfect information about these costs and benefits. Under this system, each firm is required to hold permits for every unit of emissions it generates. A firm that emits pollutants without a permit is subject to significant monetary penalties. The government decides on the total number of permits to be issued, which effectively sets a maximum limit on total emissions for the entire industry. These permits are then made marketable; they can be bought and sold freely among firms.

Figure 7.5



The permit system ensures emissions are reduced at the minimum possible cost. Firms with a relatively high marginal cost of abatement (MCA) will find it more cost-effective to purchase permits than to reduce their own emissions. Conversely, firms with a lower MCA will profit from reducing their emissions and selling their excess permits to other firms. For example, as illustrated in Figure 7.5, if two firms each receive permits for 7 units of emissions, **Firm 1**, with a high MCA, might be willing to pay up to $3.75 for an additional permit. However, **Firm**

2, with a lower MCA, might only value its permit at $2.50. In this scenario, Firm 2 has a significant incentive to sell its permit to Firm 1 at a price between $2.50 and $3.75, which benefits both parties and leads to the most cost-effective overall reduction.

When a large number of firms and permits are involved, a competitive market for permits will emerge. The market equilibrium price for a permit will be equal to the marginal cost of abatement for all firms. This is because any firm whose marginal cost of abatement is lower than the market price of a permit would choose to reduce its own emissions and sell its permits, while a firm whose marginal cost of abatement is higher would buy permits to avoid the higher abatement costs. This market-based approach achieves the government's emissions goal while ensuring that the total abatement is carried out by those firms that can do it most cheaply. This makes tradable permits a highly appealing policy tool, as it combines the certainty of a standard (a fixed total level of emissions) with the cost-effectiveness of a fee system.

7.5 GOVERNMENT INTERVENTION: SECOND-BEST SOLUTIONS, REGULATION, AND RENT-SEEKING

While government intervention is often seen as the solution to market failure, it is not without its own set of challenges and potential pitfalls.

7.5.1 Government Intervention and its Tools

The government can intervene in the economy to address market failures through a variety of tools. The choice of tool depends on the specific market failure and the political and economic context.

- **Direct Provision of Public Goods:** For pure public goods like national defense, law enforcement, and infrastructure, the government can directly provide the good and finance it through compulsory taxation. This is a simple and effective way to overcome the free-rider problem.
- **Taxes and Subsidies:** This is a market-based solution that aims to internalize externalities. **Pigouvian taxes** are set equal to the external cost, which forces the polluter to pay for the social harm they cause. This incentivizes them to reduce pollution to the socially optimal level. **Subsidies** for positive externalities are designed to increase the output of a beneficial activity to its socially optimal level.
- **Regulation (Command-and-Control):** This involves setting legally binding standards, such as a maximum level of emissions or a requirement to install a specific type of

pollution-control technology. While effective, this approach can be inefficient because it does not allow for a flexible response to the problem. It treats all firms the same, regardless of the cost of abatement, and offers no incentive for firms to exceed the standard.

- **Establishing Property Rights:** As the Coase Theorem suggests, a lack of clear property rights is often at the root of an externality problem. The government can create or clarify these rights, enabling private parties to negotiate.

7.5.2 The Theory of the Second Best

The **Theory of the Second Best**, a seminal contribution by economists R.G. Lipsey and Kelvin Lancaster, is a crucial concept in welfare economics that complicates the simple notion that fixing one market imperfection will always improve social welfare. The theory states that if there are multiple market failures in a system, correcting just one of them may not necessarily lead to a more efficient or socially optimal outcome. In fact, it could make the situation worse.

Formally, the theorem posits that if a competitive market model has a single deviation from Pareto optimality (e.g., a monopoly or an externality), the most efficient outcome is achieved by correcting that one distortion directly. However, if there are two or more such distortions, simply removing one of them may not necessarily bring the economy closer to a Pareto optimal state. The interactions among the remaining distortions can be unpredictable and may create new, more significant inefficiencies.

For example, consider an economy with both a **monopoly** in one industry and a **negative externality** (e.g., pollution) in a different industry. A well-intentioned government policy might aim to correct the monopoly by forcing the monopolist to price at marginal cost. While this action moves the monopolist's industry towards efficiency, it does not account for the existing externality in the second industry. The new equilibrium might lead to a more distorted outcome overall, as the interactions between the two markets have been altered in a way that is no longer a "second-best" solution. The lesson for policymakers is clear: in the presence of multiple market imperfections, a piecemeal approach to reform can be counterproductive. Instead, a **general equilibrium** approach is required, where the interconnectedness of all markets is considered simultaneously. The theory of the second best suggests that sometimes, the optimal solution might be to leave a market distortion in place if its removal would exacerbate other, more significant, inefficiencies.

7.5.3 Rent-Seeking and its Implications for Regulation

Rent-seeking is the act of using social resources to obtain economic gain from others without creating any value for society. It is the pursuit of **economic rent**, which is a payment for a factor of production over and above what is necessary to produce it. Rent-seeking is a major issue in the context of government regulation and can lead to significant economic inefficiencies.

The concept was developed independently by economists Gordon Tullock and Anne Krueger. Tullock first analyzed the social cost of a monopoly created by government policy. He argued that the resources a firm spends to acquire and maintain a monopoly (e.g., through lobbying and legal fees) are a form of **deadweight loss** to society. Krueger then coined the term "rent-seeking" and expanded the analysis to include the costs of obtaining various government-created privileges, such as import quotas and licenses.

The social costs of rent-seeking are substantial. Instead of creating new wealth or improving productivity, rent-seeking behavior diverts valuable resources, such as the time of highly skilled lawyers, lobbyists, and managers, from productive activities to unproductive ones. These resources are essentially wasted from a social perspective. The total social cost of a rent-seeking activity is not just the transferred economic rent but also the value of the resources used in the pursuit of that rent.

The consequences for regulation are significant. Rent-seeking can lead to regulatory capture, a state where a regulatory body, established to serve the public interest, instead operates to benefit the industry it is tasked with overseeing. This can occur because the regulated industry has a strong, concentrated interest in the outcome of the regulation, while the public's interest is diffuse. Firms can use rent-seeking to influence the design and implementation of regulations, ensuring that they create rents for the firm or protect it from competition.

For example, a professional licensing board might impose overly strict requirements not to protect the public, but to limit the supply of new practitioners and increase the incomes of existing ones. Similarly, a government agency might be lobbied to set environmental standards that are difficult for new entrants to meet, but easy for established firms that have already made the necessary investments. In these cases, rent-seeking leads to a form of **government failure**, where government intervention, intended to correct market inefficiencies, instead creates new ones by misallocating resources and benefiting a select few at the expense of social welfare. This highlights the importance of designing regulatory and public policy frameworks that are transparent and insulated from special interest influence.

7.6 QUESTIONS FOR PRACTICE

A. Short Answer Type Questions

1. What is the Samuelson Condition, and what does it explain about the efficient provision of public goods?
2. Explain the key difference between a Common Resource and a Pure Public Good.
3. How can a Pigouvian tax be used to correct a negative externality?
4. What is the main argument of the Coase Theorem? Under what conditions does it fail?
5. Define regulatory capture and explain how it relates to rent-seeking.

B. Long Answer Type Questions

1. Explain the core causes of market failure, distinguishing between public goods, externalities, and market imperfections. Illustrate with a diagram how a negative production externality results in a deadweight loss.
2. Explain the theory of public goods. Discuss why a private market fails to provide public goods efficiently, referencing the free-rider problem and the vertical summation of demand curves.
3. Discuss and differentiate between a negative externality and a positive externality. How do emissions standards, emissions fees, and tradable emissions permits provide different mechanisms for correcting a negative externality?
4. Explain the Theory of the Second Best. Discuss its implications for government policy when there are multiple market failures.
5. What is rent-seeking? Explain how it can lead to inefficient government regulation and a misallocation of resources, providing a clear example.

7.7 SUGGESTED READINGS

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MASTER OF ARTS (ECONOMICS)

SEMESTER -III

MICRO ECONOMICS II

UNIT-8: CAPITAL BUDGETING, PREREQUISITES, INVESTMENT DECISION UNDER CERTAINITY

STRUCTURE

8.0 LEARNING OBJECTIVES

After reading this unit, learners will be able to:

- Understand the meaning and significance of capital budgeting in financial decision-making.
- Identify the key prerequisites for effective capital budgeting.
- Apply the Payback Period method (equal and unequal inflows) with formula and examples.
- Evaluate projects using the Net Present Value (NPV) method and interpret results.
- Analyse investment profitability using the Internal Rate of Return (IRR) criterion, along with its merits and demerits.

8.1 INTRODUCTION

Capital budgeting is one of the most important decision-making processes in financial management. Capital budgeting decisions are crucial because they determine the future growth and direction of the firm and also involve long-term commitments of scarce financial resources. They carry significant risk and uncertainty due to future market conditions and directly influence the value of the firm and the wealth of shareholders.

8.2 MEANING OF CAPITAL BUDGETING

Capital budgeting can be defined as the process of planning and assessing long-term investment decisions made by a business organization. It is a decision making process that involves deciding whether to invest in projects or assets such as new plants, new machinery, expansion into new markets, replacement of old equipment or research and development. It is used to determine which long-term investments are worth pursuing by analysing their expected benefits and costs**.** In capital budgeting, a company may evaluate a project's expected cash inflows and outflows over its lifetime to see if the potential profits align with an acceptable target threshold. This capital budgeting process is also referred to as investment analysis.

8.3 PREREQUISITE OF CAPITAL BUDGETING

Before a business can implement successful capital budgeting, several prerequisites must be met. These include obtaining precise financial data, defining long-term capital requirements precisely, and creating financial decision-making standards. A thorough comprehension of

these elements guarantees that long-term investment choices enhance shareholder wealth and are in line with strategic objectives.

i) Estimation of Capital Requirements

A firm must determine its long term investment and should know that how much capital is required for proposed projects. It includes estimating costs of machinery, land, buildings, technology, and working capital needs. It helps in determining sources of finance like debt, equity and retained earnings.

ii) Identification of Investment Opportunities

In order to identify Investment opportunities, firms must recognize feasible projects such as new ventures, expansion, replacement, modernization or diversification. Screening of projects should be based on economic, technical, and market feasibility and demand forecasting. Investment decisions must be consistent with the organization long term objectives, such as maximizing profit or market share. This ensures that chosen projects strategically advance the business.

iii) Estimation of Cash Flows

Cash flow refers to the actual net cash generated rather than accounting profits. It includes all incremental inflows and outflows directly attributable to the investment decision. A firm must estimate expected cash inflows and outflows in the future. It involves revenues, cost savings, taxes, inflation, risk, operating expenses and salvage value.

iv) Risk and Uncertainty Measurement

Prerequisite also includes risk analysis using probability distributions, scenario analysis, or sensitivity analysis and it is a must for investment initiatives that include uncertain future returns. Businesses need to assess both unsystematic risk (project-specific) and systematic risk (market-related).

v) Knowledge of Time Value of Money (TVM)

It is important to have a understanding of concepts like compounding, discounting, present value, and future value. Since cash flows occur over different periods, they must be adjusted using discount rates.

vi) Determination of the Cost of Capital

It includes understanding cost of equity, cost of debt and risk-adjusted rates. Firms must calculate their weighted average cost of capital (WACC). This serves as the discount rate in techniques like NPV and IRR.

vii) Selection of Appropriate Evaluation Techniques

Decision-makers must analyse different capital budgeting techniques as each method has different data requirements, assumptions, and limitations. It includes:

a) Payback Period (PBP)

b) Net Present Value (NPV)

c) Internal Rate of Return (IRR)

d) Profitability Index (PI)

e) Accounting Rate of Return (ARR)

viii) Consideration of Non-Financial Aspects

Apart from financial feasibility, projects must consider

a) Legal and regulatory framework

b) Social and environmental impacts

c) Strategic alignment with firm's goals

ix) Availability of Reliable Data and Forecasts

Accuracy in capital budgeting depends on quality of data. So, it requires reliable information on demand, cost estimates, taxation, inflation, interest rates and economic conditions.

x) Organizational Readiness and Decision-making Framework

The firm should have a clear decision-making structure for project evaluation. It requires skilled managers, financial analysts, and technical experts. Internal controls must ensure objectivity and minimize bias.

In short:

Before applying capital budgeting methods, a firm must ensure availability of reliable data, sound estimation of cash flows, correct discount rate, risk analysis, evaluation techniques, and strategic alignment of projects. These prerequisites form the foundation for making rational and profitable long-term investment decisions.

8.4 INVESTMENT DECISION UNDER CERTAINTY

Capital budgeting refers to the process of evaluating and selecting long-term investments that are consistent with the objective of wealth maximization. When investment decisions are taken under certainty, it is assumed that the expected costs and returns of projects are known with accuracy and without risk. In such a framework, several appraisal techniques are employed to rank and accept projects. Among these, the Payback Period Method**,** Net Present Value Method and Internal Rate of Return Criterion are the most widely used.

8.5 PAYBACK PERIOD METHOD

The Payback Period Method is one of the simplest and most widely used techniques in capital budgeting**.** It measures the time required for an investment project to "pay back" its initial cost out of the net cash inflows it generates.

8.5.1 Meaning

The Payback Period Method is a technique that is used to evaluate investment projects. The payback period is the length of time a project takes to recover its initial investment from its expected cash inflows or it measures the length of time required for the initial investment in a project to be recovered from the net cash inflows generated by that project. In simple words, it tells how quickly an investor can "get back" the money invested. Companies, financial experts, and investors frequently utilize the payback period to determine investment returns. One important task in corporate finance is capital budgeting. This is done by corporate financial analysts using the payback period.

8.5.2 Formula and steps (When Cash Flows are equal)

Formula:

Payback Period = Initial Investment / Annual Cash Flow.

This formula calculates how many years it will take for an investment's generated cash flows to recover the initial cost, providing a quick assessment of liquidity and risk.

Steps in Calculation:

1. Estimate the project's initial investment cost.
2. Forecast annual cash inflows from the project.
3. Accumulate inflows year by year until they equal the initial investment.

4. The time taken to reach this point is the payback period.

Decision Rule:

a) If the payback period ≤ maximum acceptable period (set by management), the project is accepted.

b) If it is longer**,** the project is rejected**.**

For example, *Case A: Equal Cash Inflows*

Project cost = ₹60,000

Annual cash inflow = ₹10,000

Payback Period is 60

8.5.3 Formula and steps (When Cash Flows are unequal)

Pay Back Period = Years before full recovery + (Unrecovered cost at the start of the year / Cash flow during the year of recovery).

To use this formula, first, calculate the cumulative cash flow for each period, identifying the year before the investment is fully recovered. Then, subtract the cumulative cash flow from that previous year from the initial investment to find the unrecovered cost.

Steps in Calculation:

1. Calculate cumulative cash flows: Determine the net cash flow for each period (year) and then sum them to find the cumulative cash flow for each successive period.
2. Identify the recovery year: Find the last year for which the cumulative cash flow is still negative. Let this be year 'A'.
3. Calculate unrecovered cost: Subtract the cumulative cash flow at the end of year 'A' (which will be a negative number) from the initial investment. This difference is the unrecovered cost.
4. Calculate the payback period:

   a) Years before full recovery (A): This is the last year with a negative cumulative cash flow.

   b) Unrecovered cost at the start of the year: This is the amount calculated in step 3.

c) Cash flow during the year (C): This is the net cash flow for the year immediately following year 'A'.

For example, Let's say an investment of Rs1,000 has the following cash flows: Year 1: Rs 300, Year 2: Rs 400, and Year 3: Rs 500.

1. Cumulative cash flows:

End of Year 1: Rs 300

End of Year 2: Rs 300 + Rs 400 = Rs 700

End of Year 3: Rs 700 + Rs 500 = Rs 1,200

2. Recovery year:

The cumulative cash flow becomes positive in Year 3, but the last negative balance was the initial investment of Rs 1,000.

3. Unrecovered cost:

The unrecovered cost at the start of Year 3 is Rs 1,000 – Rs 700 (cumulative cash flow at end of Year 2) = Rs 300.

4. Payback Period:

Years before full recovery (A) = 2 years

Unrecovered cost at the start of Year 3 (B) = Rs 300

Cash flow during Year 3 (C) = Rs 500

Payback Period = 2 + (Rs 300 / Rs 500) = 2 + 0.6 = 2.6 years.

8.5.4 Merits of Payback Period Method

i) **Simplicity and Ease of Use:** The method is simple and easy to calculate. Managers without advanced financial knowledge can understand and apply it quickly.

ii) **Focus on Liquidity**: It shows how quickly the investment will be recovered, which is crucial for firms facing liquidity constraints. It is also helpful for small businesses or firms operating in uncertain markets.

iii) **Risk Reduction**: Projects with shorter payback periods are considered less risky since they recover investment quickly. It is useful in industries where technology becomes obsolete rapidly.

iv) **Useful for Preliminary Screening**: It helps in the initial selection of projects by eliminating those with long recovery periods. It also serves as a guidelines before applying more sophisticated methods like NPV or IRR.

v) **Emphasis on Short-Term Forecasting**: Since it focuses on early cash inflows, forecasting errors are likely to be less compared to long-term projections.

8.5.5 Demerits of Payback period Method

i) **Ignores Time Value of Money (TVM):** Traditional Payback period method does not discount future cash inflows, treating ₹1 today as equal to ₹1 received several years later. This makes it less reliable for long-term investment decisions.

ii) **Ignores Cash Flows after Payback**: It only considers cash inflows up to the point where the investment is recovered. Profitable projects with high returns after the payback period may be rejected unfairly.

iii) **No Measure of Profitability**: Payback Period only measures how fast the initial cost is recovered; not how much wealth the project adds. It cannot differentiate between projects with the same payback period but different total returns.

iv) **Arbitrary Cut-off Point**: The decision rule depends on a subjective "acceptable payback period" chosen by management. There is no universal standard, leading to inconsistent decision-making.

v) **Short-Term Bias**: It only favours projects with quick recovery but possibly lower long-term benefits. It may discourage investments in strategic, long-duration projects (like R&D and Infrastructure) which create higher value in the long run.

vi) **Not Suitable for Mutually Exclusive Projects**: When comparing two or more competing projects, the shortest payback may not always be the best choice if other profitability indicators are ignored.

Therefore, when cash inflows are equal, the method becomes very simple and fast, but it still ignores profitability and time value. When cash inflow are unequal, the method is still usable but becomes more cumbersome and its limitations (ignoring profitability and time value) are felt even more strongly.

8.6 NET PRESENT VALUE METHOD (NPV)

The Net Present Value (NPV) method is one of the most widely used technique in capital budgeting. It helps decision-makers evaluate whether a proposed investment project is worthwhile.

8.6.1 Meaning

Net Present Value (NPV) method is used to evaluate investment projects by calculating the present value of expected future cash inflows and comparing it with the present value of cash outflows (initial investment cost).

8.6.2 Formula and steps:

NPV is calculated by subtracting the initial investment from the sum of the present values of all future expected cash flows. The formula for the present value of a single cash flow is PV = Cash Flow / (1 + i) ^ t, where 'i' is the discount rate and 't' is the number of time periods.

NPV = Cash Flow / (1 + i) ^ t – Initial Investment

If the NPV is **positive**, the project increases the firm's wealth; if it's **negative**, it decreases wealth.

Steps in Calculation

1. Estimate future cash inflows from the project (revenues, savings, etc.).
2. Determine the appropriate discount rate (generally the cost of capital or required rate of return).
3. Discount the future cash inflows to their present value.

   PV = Cash Flow / (1 + i) ^ t

   where i = discount rate, t = time period.
4. Subtract the present value of cash outflows (investment costs).
5. Interpret the result**:**
   a) NPV > 0 → Accept the project
   b) NPV < 0 → Reject the project
   c) NPV = 0 → Indifferent

For example: Suppose a project requires an investment of ₹1,00,000 and generates the following cash inflows:

Year	Cash Inflow (₹)
1	30,000
2	40,000
3	50,000
4	40,000

Discount rate = 10%

NPV = Cash Flow / (1 + 0.10) ^ t- 1,00,000

- PV(Year 1) = 30,000 / 1.1 = 27,273
- PV(Year 2) = 40,000 / (1.1)^2 = 33,058
- PV(Year 3) = 50,000 / (1.1)^3 = 37,565
- PV(Year 4) = 40,000 / (1.1)^4 = 27,324

Total PV of inflows = ₹1,25,220

NPV=1,25,220−1,00,000=₹25,220

8.6.3 Merits of NPV Method

i) **Time Value of Money Consideration**: NPV discounts future cash inflows and outflows, thus recognizing that a rupee today is worth more than a rupee tomorrow.

ii) **Wealth Maximization Objective**: It directly measures the increase in shareholders' wealth. A positive NPV means the project adds value to the firm, which aligns with the primary financial objective.

iii) **All Cash Flows Considered**: NPV takes into account the entire life span of the project by considering all inflows and outflows, not just early cash inflows.

iv) **Risk Adjustment Possible**: By adjusting the discount rate, the method can incorporate project risk and cost of capital differences.

v) **Comparative Superiority**: When comparing mutually exclusive projects, NPV provides a clear basis for selection. The project with the higher NPV is more beneficial.

vi) **Flexibility for Complex Decisions**: It is useful for analysing projects with irregular or uneven cash flows, expansions, replacements and mergers.

8.6.4 Demerits of NPV Method

i) **Complex Calculations**: As compared to simple methods like payback or ARR, NPV requires more complicated discounting calculations, which may be difficult for small firms without expertise.

ii) **Choice of Discount Rate**: The results depend heavily on the discount rate. A wrong estimation of the cost of capital can lead to incorrect project evaluation.

iii) **Not Easily Understood by Non-Financial Managers**: Since it involves concepts like present value, discounting, and cost of capital, Managers without a finance background may find it difficult.

iv) **Ranking Issues in Unequal Projects**: For projects of different scales (small vs. large investments), NPV alone may not give a fair comparison. A project with a higher NPV but requiring a much larger investment may not always be the better option.

v) **Ignores Non-Financial Factors**: It evaluates only monetary aspects. Qualitative factors such as environmental impact, employee satisfaction, or social benefits are not reflected.

vi) **Assumption of Certainty**: NPV assumes that future cash flows and discount rates can be estimated with reasonable accuracy, which in reality involves uncertainty and forecasting errors.

Conclusion:

NPV is the most reliable and theoretically sound method because it focuses on value creation and time value of money. However, its practical limitations like discount rate estimation and difficulty in handling qualitative factors mean that firms often use it along with other techniques.

8.7 INTERNAL RATE OF RETURN (IRR)

Capital budgeting involves evaluating long-term investment projects such as new plants, machinery or research and development. The objective is to select projects that maximize the firm's value. The Internal Rate of Return (IRR) is used to analyse the profitability of potential investment projects.

8.7.1 Meaning

It represents the discount rate at which the net present value (NPV) of a project's cash flows equals zero, effectively estimating the annualized rate of return generated by the project over its lifetime. Internal Rate of Return helps managers compare and rank projects based on their expected yield, aiding decisions on whether to accept or reject proposals.

IRR Decision Criterion (IRR Rule):

The primary IRR criterion for capital budgeting decisions is aligns with the goal of maximizing shareholder value:

Compare IRR with the Cost of Capital (k)

1. If IRR ≥ k → Accept the project (project generates returns at least equal to or higher than the cost of funds).
2. If IRR < k → Reject the project (project is not financially viable).
3. If the IRR = Cost of Capital, the project is considered to be a break-even investment, making it neutral.

This rule assumes that a project with an IRR higher than the cost of capital will generate returns sufficient to cover financing costs and create value. For mutually exclusive projects (where only one can be selected), the one with the highest IRR is typically preferred, though this can sometimes conflict with NPV rankings.

8.7.2 Formula and steps:

0 = NPV= ∑ [CFt / (1 + r)^t] - C0

Where

CFt – Cash flow in period t

r- IRR

t- Time period

CO- Initial Investment Cost

Steps in Calculation:

1. Estimate the **initial investment outlay**.
2. Forecast **future cash inflows** over the project's life.

3. Use **trial-and-error** or financial calculators/software to determine the discount rate that makes NPV = 0.
4. Compare IRR with the firm's cost of capital to make a decision.

For example, A firm invests **₹1,000** in a project. The project generates the following annual cash inflows:

- Year 1: ₹400
- Year 2: ₹400
- Year 3: ₹400

The company cost of Capital is 8%

Step 1: We apply formula

0 = NPV= ∑ [CFt / (1 + r)^t] - C0

Where IRR is the rate r that makes NPV = 0.

Step 2: Using Trial and Error Method
At 10% discount rate:

NPV= 400/1.1 + 400/1.1^2 + 400/1.1^3-1000

NPV=363.6+330.6+300.5−1000=−5.3

Result:
IRR ≈ 10%

Decision Rule:

- If IRR > Cost of Capital → Accept
- If IRR < Cost of Capital → Reject

The cost of capital is 8%, since 10% > 8%, the project is accepted.

8.7.3 Merits of IRR Method

i) **Time value of money consideration**: IRR takes into consideration the time value of money by discounting future cash inflows, unlike simpler methods such as the payback period. This gives a more realistic picture of project profitability.

ii) **Comprehensive measure of profitability**: IRR considers the entire cash flow stream of the project over its lifetime, not just up to a certain recovery period. Thus, it is a holistic measure of return.

iii) **Simple Interpretation**: IRR is expressed as a percentage return. Managers and investors can easily compare this return with the firm's cost of capital or required rate of return to make decisions.

iv) **Decision-Making Guidance**: The criterion provides a clear decision rule:

If IRR > Cost of Capital → Accept the project.

If IRR < Cost of Capital → Reject the project.

v) **Ranking of Projects**: When multiple projects are available, Internal Rate of Return helps in ranking them based on their relative profitability. Particularly useful in situations where firms face capital rationing with limited investment funds.

vi) **Risk Sensitivity**: Higher IRR indicates greater margin of safety over the cost of capital. Projects with IRR significantly higher than the hurdle rate or cost of capital are less sensitive to risk factors.

vii) **Universally Understood**: Since it is a rate of return measure, It is easily understandable by non-technical managers, investors, and stakeholders.

8.7.4 Demerits of IRR Method

i) **Problem of multiple IRRs**: When cash flows are unconventional (i.e., they change signs more than once, e.g., an initial inflow followed by an outflow), more than one IRR may exist. This creates confusion and makes decision-making difficult.

ii) **Assumption of Reinvestment at IRR**: IRR assumes that interim cash flows are reinvested at the project's IRR, which may be unrealistic. In contrast, NPV assumes reinvestment at the cost of capital, which is more practical.

iii) **Scale of Investment Ignored**: IRR does not consider the absolute size of investment. A smaller project with a very high IRR might appear better than a larger project with slightly lower IRR, even if the latter adds more wealth (higher NPV).

iv) **Difficulty in Ranking Mutually Exclusive Projects**: For mutually exclusive projects (where only one project can be selected), IRR may give misleading results because it does not account for differences in project scale, timing of cash flows or total value addition. NPV is more reliable in such cases.

v) **Not Additive**: Internal rate of return of individual projects cannot be added or averaged to find a portfolio IRR. So, It is less useful for evaluation of multi-project.

vi) **Computationally Complex**: IRR requires iterative trial-and-error methods or financial calculators/software for exact calculation, especially when cash flows are uneven. This makes it less straightforward as compared to payback period.

vii) **Conflicts with NPV**: In some situations, IRR and NPV may suggest different rankings of projects. When such conflicts arise, NPV is theoretically superior because it directly measures the increase in shareholder wealth.

Conclusion:

The IRR criterion is valuable because it incorporates the time value of money and provides simple and easy-to-understand percentage return. However, it suffers from serious limitations in cases of unconventional Cash flows, Scale differences and mutually exclusive projects Hence, in practice, firms often use Internal rate of return along with Net Present Value for more balanced decision-making.

8.8 SUMMARY

Capital budgeting is a key financial management procedure that directs long-term investment decisions and has a direct impact on firm's development, risk, and shareholder wealth. It requires prerequisites like identification of opportunities, accurate estimation of capital needs, cash flow forecasting, risk analysis, knowledge of time value of money, cost of capital, and suitable evaluation techniques. Under certainty, business use evaluation methods such as Payback Period (PBP), Net Present Value (NPV), and Internal Rate of Return (IRR). Payback is simple and liquidity-focused but ignores profitability and time value. Net Present value method is theoretically sound, considers all cash flows, and aligns with wealth maximization, though it is complex and depends on the discount rate. Internal rate of return provides an intuitive return-based measure but may give misleading results with unconventional cash flows or mutually exclusive projects. In practice, firms often combine NPV and IRR to make more reliable and balanced capital budgeting decisions.

8.9 QUESTIONS FOR PRACTICE

A. Short Answer Type Questions

Q1 What do you mean by Capital Budgeting and why it is important in financial Management?

Q2 What is meant by investment decisions under certainty? Give two examples of such situations.

Q3 List any five prerequisites of capital budgeting.

Q4 What is meant by the Payback Period (PBP) method?

Q5 Write the decision rule of the IRR Criterion in capital budgeting.

Q6 State two merits and two demerits of the NPV method.

Q7 Explain in one sentence each: (i) Time Value of Money, (ii) Cost of Capital, (iii) Cash Flow

Q8 What is the main difference between NPV and IRR methods?

B. Long Answer Type Questions

Q1 Discuss the prerequisites of capital budgeting in detail. Why are they important before applying evaluation techniques?

Q2 Explain the merits and demerits of the Payback Period Method with suitable examples.

Q3 "Net Present Value (NPV) is the most reliable technique of capital budgeting." Discuss.

Q4 Critically evaluate the Internal Rate of Return (IRR) method as a criterion for investment decision-making.

Q5 Compare and contrast Payback Period, NPV, and IRR methods of capital budgeting.

Q6 A project requires an initial investment of ₹1,00,000 and generates annual cash inflows of ₹25,000 for 5 years.

a) Calculate the Payback Period.

b) Decide whether the project is acceptable

Q1 A company invests ₹50,000 in a project expected to generate cash inflows of ₹15,000 annually for 5 years. The cost of capital is 10%.

a) Calculate the Net Present Value (NPV).

b) Should the project be accepted?

2. A project requires an investment of ₹1,20,000 and is expected to generate cash inflows of ₹40,000 per year for 4 years.

- Calculate the Internal Rate of Return (IRR) (approximate, by trial-and-error).
- If the cost of capital is 12%, should the project be accepted?

8.10 SUGGESTED READINGS

- H.L. Ahuja – Advanced Economic Theory: Microeconomic Analysis.
- Dominick Salvatore – Micro Economics: Theory and Applications.
- Prasanna Chandra – Financial Management: Theory and Practice
- I.M Pandey – Financial Management
- Khan, M.Y. & Jain, P.K. – Financial Management: Text, Problems and Cases.
- Koutsoyiannis, A. – Modern Economics