Microeconomics Theory And Analysis -II

DEECO529

Edited by:
Dr. Pooja Kansra

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CONTENTS

Unit 01: Theories of Distribution

Objectives

After going through this chapter you will be able

- to learn how factor prices are determined
- to learn about the equilibrium wage rate of labour
- to learn the need of marginal products in the determination of wage rate
- to learn about the shares that factors receive
- to learn about technical progress
- to learn how technical progress impacts on factor shares
- to learn about the shares that factors receive
- to learn about the distribution of the total products among the factors
- to learn how total product exhausts after distribution

Introduction

The theory of distribution is an essential part of micro economics. The theory of distribution states how incomes are earned by different factors employed in the production of various goods and services and also how the value of the productive factorsshows its share and contribution towards the total product. So, distribution is the way total output or wealth is distributed among labour, land, and capital. The theory of distribution is the effort to explanation for the sharing of the income among the factor owners of production. Economists have premeditated how the expenses of these factors (i.e., rent, wages, and profits) and the volume of their returns are set. In this chapter, we will study about the marginal productivity theory of distribution, factor share and technical progress and product exhaustion problemregarding the different aspects of distribution.

1.1   Marginal productivity theory of distribution

Marginal productivity theory of distribution is the oldest and most noteworthy theory of factor pricing. This theory is also identified as **micro theory of factor pricing.**Marginal productivity theory of distribution was, at first, propounded by the German economist T.H. Von Thunen. In the later stage, contributions to this theory was made by the economists like Karl Mcnger, Walras, Edgeworth, Clark etc.at the end of the 19th century. This theory puts forward a general interpretation of how the price of the factors of production is calculated.

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Definitions-

- *"The distribution of income of society is controlled by a natural law, if it worked without friction, would give to every agent of production the amount of wealth which that agent creates."* -J.B. Clark

- *"The marginal productivity theory contends that in equilibrium each productive agent will be rewarded in accordance with its marginal productivity."* -Mark Blaug

According to marginal productivity of distribution, the price of a factor tends to get equalized with the value of its marginal product. This means, rent is to be equal to the value of the marginal product (i.e., VMP) of land; wages are to be equal to the VMP of labour and same thing happens to capital also.

Assumptions

Rational Behaviour: All the factor owners as well as factor users are assumed to be rational human being so as to maximize their level of satisfaction as well as profit.

There is perfect competition in both product and factor markets: This means, there are large numbers of buyers and sellers dealing with the homogenous product or factor in a given market price who have perfect knowledge about the prevailing market conditions with the provision of free entry and exit to the market. Also, there is perfect mobility of the factors of production.

Full employment of factors: All factors are assumed to be employed fully in production. Hence, the provision of underproduction and over production is ruled out.

Operation of the law of diminishing returns: This theory is based on the operation of law diminishing returns. When additional factors are employed to increase production,the total products increase at a diminishing rate; hence, the returns from theadditional factor employed decrease.

Homogeneity and divisibility of the factor: Factors of production are identical and divisible to be employed in production.

Perfect Substitutability of factors: One factor can be substituted perfectly for another in production of a particular commodity.

Operation of the law of Variable Proportions: When a factor is used incrementally in production in the short run, returns to the factor appear in varied rate.

There are some elements or tools necessary to explain the marginal productivity theory of distribution. Let us now go through these elements-

Marginal physical product (MPP): MPP is the change in the total product of a firm due to the change in factor employment in production.

Marginal revenue product (MRP): MRP is the addition to the total revenue when more and more units of a factors are added to the fixed amount of other factors, i.e., MRP = MR XMPP

Value of the marginal product (VMP): Value marginal product of a factor means indirectly the market value of the marginal physical product. If we multiply the MPP of a factor by the price of the product, we will get the value of the marginal product (VMP) of that factor, i.e., VMP= P X MPP.

As we know,

MRP = MR X MPP

VMP = P X MPP

Under perfect competition, P = MR. (price under perfect competition equals marginal revenue)

Hence, MRP = VMP

But under Imperfect Competition, Since P > MR (since under imperfect competition, AR>MR)

∴ VMP > MRP

Explanation of the theory: Marginal productivity theory (MPT) states that price of each factor of production will be equal to its marginal productivity under perfect competition. Hence, the firm

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will employ that number of a given factor at which price is equal to its marginal productivity. This means firms employ each factor up to that number where its price is equal to its VMP. (= MRP).

Let us discuss this theory with the help of a diagram.

In figure 1.1, we measure units of labour in the horizontal axis and wage rate, revenue productivity in the vertical axis. MRP curve is a downward sloping curve because both marginal revenue and marginal physical product curves slope downward. Under perfect competition the wage for a firm is given. Hence, both average and marginal wage are equal which is shown by the horizontal line AW=MW. Above point E, MRP (=VMP)> wage rate(AW=MW), so, the firm can increase profit by increasing factor employment.

Below point E, (to the right of point E) MRP (=VMP)< wage rate (AW=MW), hence the firm reduces factor employment to avoid loss.

At point E, MRP(=VMP) = wage rate (AW=MW), the firm is in equilibrium i.e, wage equals marginal productivity.
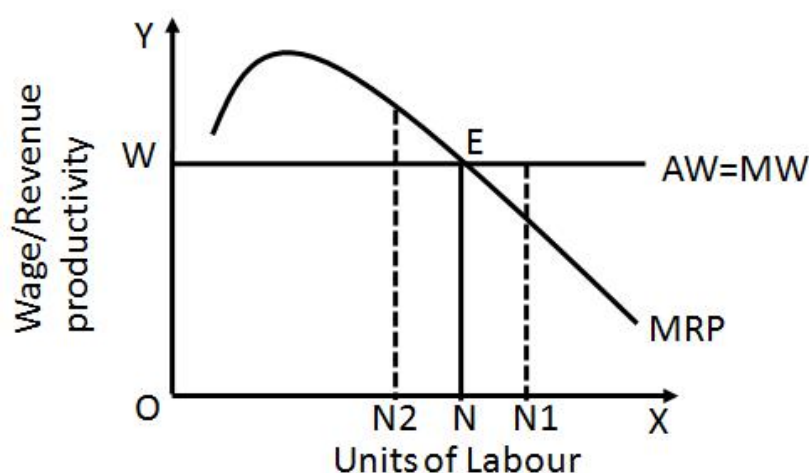
Figure 1.1: Determination of wage by marginal productivity

Finally, we can state that E is the point of equilibrium where the workers are paid according to their marginalproductivity. Since at this point, the workers are paid or distributed their contribution according to the marginal productivity,hence this theory is known as marginal productivity theory of distribution. Thus, in equilibrium we get,

MRP (or VMP) = AW = MW (wage rate).

MRP curve should cut MW (= AW) curve form above.

These two conditions are also known as equilibrium conditions (first one is necessary while the second one is sufficient condition) of marginal productivity theory of distribution.

Criticism of the theory:

- **Indeterminable of marginal product:**The products produced are joint product hence the marginal product of a specific factor (labour or capital) cannot be separately found out which turns the theory to be indeterminable.
- **Market imperfection:**The existence of perfect competition is very hardly found in the practical world although this theory assumes that there is perfect competition. As Chamberlin points out this theory is applicable to imperfect competition.

- **Full employment- not a real phenomenon:**The assumption that there exists full employment is unrealistic. In actual sense, the existence of full employment is far from reality.
- **Complicacy of factor substitution:**W. W. Leontief defined that there is no possibility of free factor substitution as assumed in the theorem and in case of some specific factors such as the organization or entrepreneurship there is hardly any scope of substitution.
- **One sided theory**:The theory ignores the supply side but only puts its focuson the demand side factors. As Samuelson opines the theory as the theory of one side for productive services by the firm.

1.2   Factor Share and Technical progress

The concept of factor shares as well as technical progress can also be interpreted from marginal productivity of the factors. Before knowing factor shares and technical progress, let us first know about some of the basic concepts relating the factor productivity.

Total product (TP) : The total product (TP) represents the total amount of output that a firm can produce with a given amount of labor employment in a given period of time frame. In this senses, it is clear that as the amount of factor changes, total output also changes.This can be defined as:

TP=F (L,K)

Average product (AP): Average product is defined as the output or total product per unit of factor employed in the production and it can be calculated by dividing the Total Product by the factor employment. Average product can be defined separately for each of the factor employed in the production.

 AP of labour (AP_L)= TP/L   and/or

 AP of capital (AP_K)= TP/K

Where, both L and K mean Labour and Capital respectively.

Marginal product (MP): The marginal product is defined as the extra units of output that results from an extra unit of the input employed in the production. Hence, this is the change in total output due to the change in inputs. Marginal productivity of factors can also be found out separately for each of the factors employed in the production.

MP of labour (MP_L) = $\triangle TP/\triangle L$

MP of capital (MP_K) = $\triangle TP/\triangle K$

Where, L and K mean labour and capital respectively.

Factor   shares   are   the   share   of   production   given   to   the factors   of   production, usually capital and labor. Factor shares can be derived from the production function. Let us assume the production function, Q=F (L,K)

A rational producer will always maximize his profit, so,

$$\pi = \max\{K, L\} F(K, L) * P - (rK + wL)$$

$$\pi = \max\{K, L\} F(K, L) * P - rK - wL$$

The equations define the profit of the producer as that difference between the revenue and the cost functions. The first part in the equation means the revenue as the product of total output and the market price and accordingly the second part defines the cost function.

Given P = 1, (price is given) we can calculate the wages and the rental rate of capital from first-order necessary conditions of thisequations as,

w = D_L{F (K, L)} -----(1)   and

 r = D_K {F (K, L)} ----- (2)

Expenditure allocated to labour and capital can be found out by multiplying both L and K with these equations.

Hence, from equation (1) and (2),

$wL = D_L\{F (K, L)\} * L$ and

$r K = D_K \{F (K, L)\} * K$

Since Q is the total product, so factor share can be defined here is as –

$wL/Q = [D_L\{F (K, L)\} * L]/ Q$ and

$r K/Q = [D_K\{F (K, L)\} * K] / Q$

$wL/Q = [D_{L]}F (K, L)\} * L] / D_K\{F (K, L)\}$ and

$r K/Q = [D_K \{F (K, L)\} * K] / D_K \{F (K, L)\}$

Here, wL/Q is share of factor by labour and r K/Q the share of factor by capital.

Technical progress

Technical progress refers to the development of a new and better production technique. It refers to the discovery or introduction of new and improved methods of used in producing goods. For example, if the changes in technology lead to an increase in productivity of labor or capital or both; this means there is an improvement in the method of production or there is technical progress.Technical progress shifts the production function as well as well as the isoquants upward.
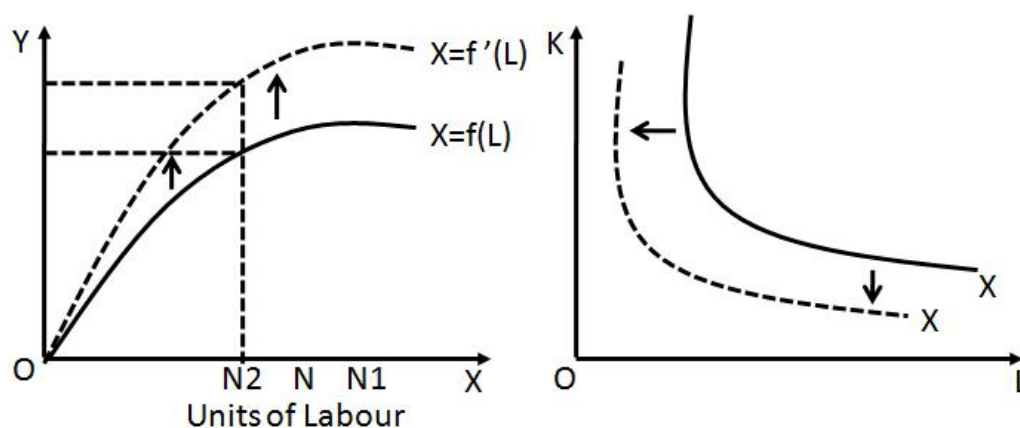
Figure 1.2: Effect of Technical progress on production function and isoquant

In both the panels of the above diagram, it is shown that there is a shift in the production function (in the left panel) as well as in isoquant (in the right panel) due to technical change or progress.

Broadly, there are two main types of technical progress-a) Embodied Technical Progress and b) Disembodied Technical Progress

Embodied Technical Progress: The Embodied TechnicalProgress means the enhanced technology which is exploited by investing in new apparatus or equipment. The new technical changes made are embodied in the equipment's or apparatus.

Disembodied Technical Progress: The disembodied TechnicalProgress means the enhanced or improved technology which allows increase in the output produced from given inputs without investing in new apparatus or equipment.

However, more precisely, Technical progress is divided into different categories such as

a) Labour using or capital saving Technical progress

b) Capital using or labour saving Technical progress

c) Neutral Technical progress

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But before explaining these technological changes, let us make clear the meaning of neutral technological changes. Regarding neutral technologicalprogress, there are two concepts: a) Hicks' Neutral Technological Change and b) Harrod's NeutralTechnological Change.

Hicks' Neutral Technological Change is the technological change where if certain ratio of two factors (viz-labour and capital) is being used to produce a certain output, the effect of neutral technological change is that it brings a change in the marginal productivity of each factor in the same proportion.

While Hicks' neutral technological change considers the ratio between the marginal products of the two factors, Harrods's showed neutral technological change in terms of the relationship between rate of profit and capital-output ratio. Hence, according to Harrods, neutral technological change is that which leaves the capital-output ratio unaffected when rate of profit is constant. So, when there is technological change and rate of profit remains invariable, technological change will be Harrods-neutral if and only if capital-output ratio also remains invariable.

Labour using or capital saving Technical progress: If at a constant K/L ratio the MRTS of laour for capital increases, this means that there is an improvement in the productivity of labour than that of capital used in production. In such a case more and more units of labour will be substituted for each additional units of capital used in production. The production function in that case is said to be labour intensive or labour using (capital saving) technical progress. Thus, labour using technical progress is the technical that causes marginal product of labour to increase relative to marginal product of capital. This can be shown as:

$$MRTSLK = \frac{\triangle M\ PL}{\triangle M\ PK} > 1$$

$\triangle M\ P_L > \triangle M\ P_K$

(MRTSL,K = $\triangle M\ PL$ / $\triangle M\ PK$)

Labour intensive technical progress is shown in the figure below where Labour is measured in the horizontal axis and Capital is measured throughout the vertical axis.

Figure 1.3: Labour using or capital saving Technical progress

In the diagram, Q1 is the isoquant prior to technical progress. Due to labour using technical progress, the marginal productivity of labor increases and it impacts on the slope of the isoquant. An increase in the slope of the isoquant (as shown by the tangent with Q2 isoquant) due to labour using technical progress shifts down the isoquant towards the axis measuring unit of labour. Hence, same level of output can be produced relatively less units of labour with its increasing marginal productivity.

Capital using or labour saving Technical progress: If at a constant K/L ratio the MRTS of labour for capital decreases, this means that there is an improvement in the productivity of capital than that of labour used in production. In such a case more and more units of capital will be substituted for each additional units of labour used in production. The production function in that case is said to be capital intensive or capital using (labour saving) technical progress. Thus, capital using technical progress is the technical that causes marginal product of capital to increase relative to marginal product of labour. This can be shown as:

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$MRTSLK = \dfrac{\triangle M\ PL}{\triangle M\ PK} < 1$

$\triangle M\ P_L < M\ P_K$

$(MRTSL,K = \triangle M\ PL\ /\ \triangle M\ PK)$

Capital using technical progress is shown in the figure below where Labour is measured in the horizontal axis and Capital is measured throughout the vertical axis.
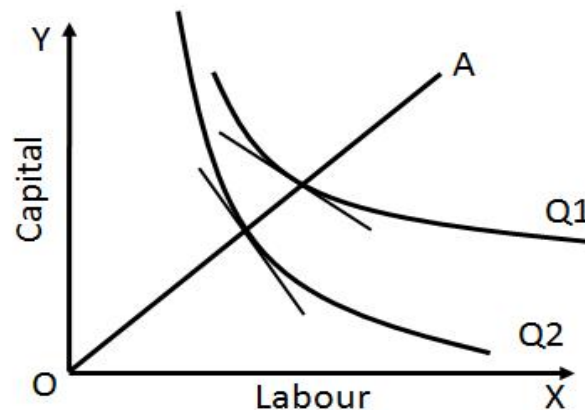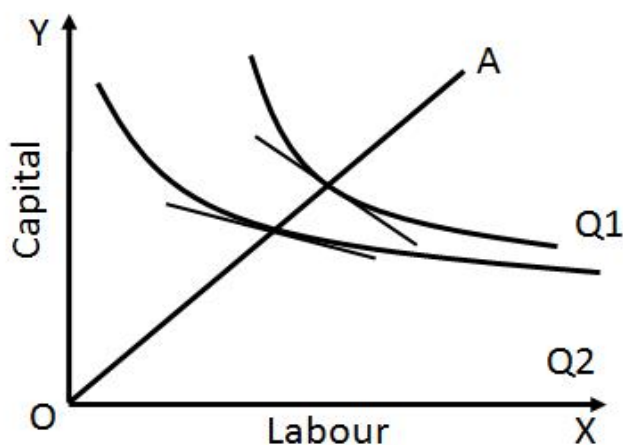

Figure 1.4: Capital using or labour saving Technical progress

In the diagram, Q1 is the isoquant prior to technical progress. Due to capital using technical progress, the marginal productivity of capital increases and it impacts on the slope of the isoquant. Due to capital using technical progress the isoquant shifts towards the axis measuring unit of capital. Hence, same levels of output can be produced by relatively less units of capital with its increasing marginal productivity.

Neutral Technical progress:

Technical progress is neutral when marginal productivity of both the factors (MP_L and MP_K) increases at the same proportion. Hence, the slope of the isoquant before and after technical progress remains the same. Due to neutral technical progress same levels of output can be produced by employing relatively less units of inputs in the production. This is shown in the figure below.
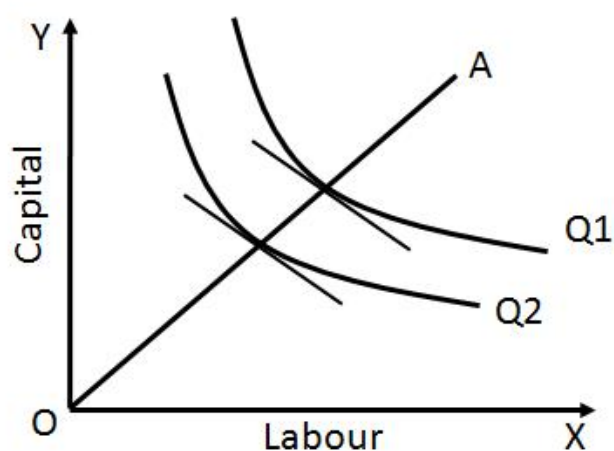
Figure 1.5 :Neutral Technical progress

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In the diagram, Q1 is the isoquant prior to technical progress and due to the neutral technical progress the isoquant shifts downward which means less unitsof factors are used to produce the same level of output with their increasing marginal products.

1.3 Product Exhaustion Theorem

The product exhaustion theorem is put forwarded by Euler. Hence, this is also known as Euler's theorem. This theorem states that if factors of production are rewarded equal to their marginal product, they will exhaust the total product. Later on, Wicksteed in the coordination of the laws of distribution demonstrated with the help of Euler's Theorem, that payment in accordance with marginal productivity to each of the factors exactly exhausts the total product. The problem of proving that the total production will be exactly exhausted when all factors are paid rewards equal to their marginal products has also been called "Adding- up Problem" or Product Exhaustion Problem.

Assumptions of the theorem

- This theorem assumes a linear homogeneous production function of first degree which implies that there is constant returns to scale
- Factors of production are supposed to be complementary.
- It is also assumed that the factors of production are perfectly divisible.
- The relative shares of the factors are constant and independent of the level of the product.
- There is a stationary, riskless economy where there are no profits.
- Thereexists always perfect competition.
- The theory is applicable only in the long-run.

Given these assumptions, this theory can be explained numerically as,

Q = (MPP$_L$) L + (MPP$_K$) K ------ (1)

Wherte,

Q=Total Output,

MP= Marginal Product,

L=Labour,

K=Capital.

To find out the value of output, let us multiply eqn. (1) by P,

$$P.Q = L.(MPP_L.P) + K.(MPP_K.P)$$
$$P.Q = L.VMP_L + K.VMP_K$$

Let us consider a homogenous production function,

$$Q = f(L,K)$$

This production function is homogenous of degree if$\in$

$$Q = f(\}L,\}K)$$
$$f(\}L,\}K) = \}^\in .f(L,K)$$

Differentiating with respect to λ, we get,

$$L.\frac{df}{dL} + K.\frac{df}{dK} = \in.\}^{v-1}.f(L,K)$$

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Since there is constant returns to scale, $v=1$, *so*,

$$L.(MPP_L) + K.(MPP_K) = f(L,K)$$

Again, since $Q = f(L,K)$ hence,

$$Q = L.(MPP_L) + K.(MPP_K)$$

Total payments to factor thus exhaust total physical output, so multiplying by price (P), we get,

$$P.Q = L.(MPP_L.P) + K.(MPP_K.P)$$

Thus,

$$P.Q = L.VMP_L + K.VMP_K$$

Euler's theorem can be explained with the help of the following diagram. Labour employment is measured in the horizontal axis and the total product is measured in the vertical axis.
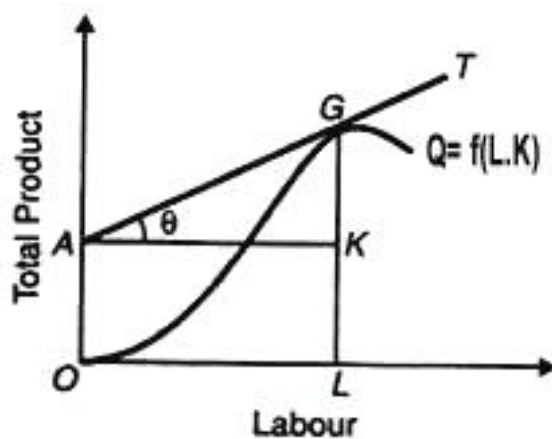
Figure: 1.6 Euler's theorem and factor share

At point G in the diagram the total product (GL) is fully exhausted (or distributed) between the two factors, capital (share of capital=KL) and labour (Share of labour=GK).

Importance of Euler's theorem

Euler's theorem has important importance in the field of factor pricing and factor sharing. A few of them are mentioned below-

- Euler's theorem finds the solution how the total output should be distributed among the factors of production in producing a particular commodity by a producer.
- Euler's theorem helps how a firm should employ its inputs to that extent at which the reward to the factor equals its marginal revenue product so that both efficiency and equitability criteria can be fulfilled.

Criticism of Euler's theorem:

Euler's theorem has been criticized by the economists in several grounds mostly relating to its assumptions-

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- Euler's theorem assumes the existence of constant returns to scale. But in reality, constant returns to scale are incompatible with competitive equilibrium.
- The entire analysis is based on the assumption that factors are fully divisible which is impractical and can be found in the real world.
- Assumption of perfect competition in the theory is totally unrealistic.

Summary

Let us refresh again the mains points of unit.

- According to marginal productivity of distribution, the price of a factor tends to get equalized with the value of its marginal product. This means, rent is to be equal to the value of the marginal product (i.e., VMP) of land; wages are to be equal to the VMP of labour and same thing happens to capital also. The theory states that price of each factor of production will be equal to its marginal productivity under perfect competition. Hence, the firm will employ that number of a given factor at which price is equal to its marginal productivity. This means firms employ each factor up to that number where its price is equal to its VMP. (= MRP).
- Factor shares are the share of production given to the factors of production, usually capital and labor. Factor shares are defined as:

  $wL/Q = [D_L\{F(K, L)\} * L]/Q$ and

  $rK/Q = [D_K\{F(K, L)\} * K]/Q$

  $wL/Q = [D_L\{F(K, L)\} * L]/D_K[F(K, L)]$ and

  $rK/Q = [D_K\{F(K, L)\} * K]/D_K[F(K, L)]$

  Here, wL/Q is share of factor by labour and rK/Q the share of factor by capital.

- Technical progress refers to the development of a new and better production technique. It refers to the discovery or introduction of new and improved methods of used in producing goods. Technical progress shifts the production function as well as well as the isoquants upward. Technical progress is divided into different categories such as

  Labour using or capital saving Technical progress

  Capital using or labour saving Technical progress

  Neutral Technical progress

- The labour using technical progress is the technical that causes marginal product of labour to increase relative to marginal product of capital. Again, the capital using technical progress is the technical that causes marginal product of capital to increase relative to marginal product of capital. Similarly, Technical progress is neutral when marginal productivity of both the factors (MP_L and MP_K) increases at the same proportion. Hence, the slope of the isoquant before and after technical progress remains the same.
- The product exhaustion theorem is put forwarded by Euler. Hence, this is also known as Euler's theorem. This theorem states that if factors of production are rewarded equal to their marginal product, they will exhaust the total product. Later on, Wicksteed in the coordination of the laws of distribution demonstrated with the help of Euler's Theorem, that payment in accordance with marginal productivity to each of the factors exactly exhausts the total product. The problem of proving that the total production will be exactly exhausted when all factors are paid rewards equal to their marginal products has also been called "Adding- up Problem" or Product Exhaustion Problem.

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Keywords

Marginal productivity-Additional product incremented to the total product due to the extra factor employed in the production.

Factor share- Share or return of the factor due to their contribution in production.

Technical progress –Improvement in the method of production which either lowers the cost of production or increases the level of production

Product exhaustion- When total product is exhausted due to the distribution of its share among the factors of production.

Self Assessment

1. Marginal productivity theory of distribution was propounded by?

A. Karl Marx

B. T.H. Von Thunen

C. J. R Hicks

D. None of the above

2. The other name of marginal productivity theory is -

A. Micro theory of distribution

B. Macro theory of distribution

C. Welfare theory of distribution

D. Risk theory of distribution

3. "The distribution of income of society is controlled by a natural law, if it worked without friction, would give to every agent of production the amount of wealth which that agent creates."-this view regarding marginal productivity theory of distribution was put forwarded by —

A. J. B. Say

B. J.B. Clark

C. T.H. Von Thunen

D. Karl Marx

4. Marginal revenue product (MRP) can be shown as-

A. MRP = Price X MPP

B. MRP = MR X MPP

C. MRP = AR X MPP

D. None of the above

5. Value marginal revenue product (VRP) can be shown as-

A. VMP = MR X MPP

B. VMP = MRP X MPP

C. VMP = P X MPP

D. VMP = P X MR

6. Under perfect competition, MRP = VMP because

A. MR = VMP
B. MRP = MC
C. MR = MC
D. P = MR

7. Technical progress refers to
A. Using new ideas in production
B. Increasing efficiency of the factors of production
C. The development of a new and better production technique
D. All the above

8. MP of labour is defined by
A. $\triangle TP/\triangle L$
B. $\triangle TP/\triangle K$
C. $\triangle TR/\triangle L$
D. $\triangle TR/\triangle K$

9. Technical progress is labour using when -

A. $\triangle M\ PL > \triangle M\ PK$
B. $\triangle M\ PL < \triangle M\ PK$
C. $\triangle M\ PL = \triangle M\ PK$
D. None of these

10. Technical progress is capital using when -

A. $\triangle M\ PL > \triangle M\ PK$
B. $\triangle M\ PL < \triangle M\ PK$
C. $\triangle M\ PL = \triangle M\ PK$
D. None of these

11. Technical progress is neutral when -

A. $\triangle M\ PL > \triangle M\ PK$
B. $\triangle M\ PL < \triangle M\ PK$
C. $\triangle M\ PL = \triangle M\ PK$
D. None of these

12. The product exhaustion theorem is put forwarded by
A. Karl Marx
B. J. R Hicks
C. Euler
D. None of these

13. Product Exhaustion Problem is also known as
A. Product Distortion Problem
B. Adding- up Problem

C. Product transformation Problem

D. None of these

14. Product exhaustion theorem is given as

A. Q = (MPPL) L + (MPPK) L

B. Q = (MPPL) K + (MPPK) K

C. Q = (MPPL) L + (MPPK) K

D. None of these

15. Which of the following is/are the assumption/s of Product exhaustion theorem

A. Constant returns to scale

B. Factors are complementary.

C. Factors of production are perfectly divisible.

D. All the above

Answers for Self Assessment

1.	B	2.	A	3.	B	4.	B	5.	C
6.	D	7.	D	8.	A	9.	A	10.	B
11.	C	12.	C	13.	B	14.	C	15.	D

Review Questions

1. What is the difference between MRP and VMP under perfect and imperfect competition?
2. How according to the marginal productivity wage rate is determined?
3. What is factor share and how can it be determined?
4. What is technical progress?
5. What are different types of technical progress?
6. State the product adding up problem.
7. What are the main implications of the product exhaustion problem?

📖 Further Readings

1. Microeconomics - A Koutsoyiannis, Macmillan Press, London, 1979
2. Microeconomics — Dominik Salvatore, Oxford University Press, New York, 2003.
3. Microeconomics — D N Dwivedi, Pearson, New Delhi, 2014.

Unit 02: Modern Theory of Distribution

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Objectives

After going through this chapter you will be able to

- learn about the determination of rent.
- learn about the determination of rent for a firm.
- learn how rent is determined for an economy.
- learn about the demand for labour.
- learn about the supply of labour.
- learn about determination of wage rate.
- learn about the demand for the entrepreneur.
- learn about the supply of entrepreneurs.
- learn about the determination of profit.

Introduction

The modern theory of distribution relates to the determination as well as distribution of factor incomes or returns among the different factors of production such as rent for land, wages for labour, profits for the entrepreneur, etc. During the determination of different factor incomes as per the modern theory of distribution, two major aspects, i.e., demand for and supply of the respective factor have been mainly focused. In this chapter, we will basically concentrate on the determination of rent, wages, and profit.

2.1   Determination of Rent

Before discussing about the modern theory of rent let us first know the concept of rent. Economic rent means the amount paid to the owner of a factor of production over and above the cost incurred to the engagement of the factors in the production process. These factors include land, labor, capital, etc. This represents the amount earned by the owner of the factor in access of the amount he would have earned normally.

De**finitions:**

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1. *According to Boulding, "Economic rent may be defined as payment made to a factor of production in excess of the minimum amount necessary to keep the factor in its present occupation."*

2. *According to Mrs. John Robinson, "The essence of the conception of rent is the conception of a surplus earned by a particular part of the factor of production over and above the minimum sum necessary to induce it to do its work"*

Boulding and Joan Robinson emphasized that whenever the supply of factor units to an industry or economy is not perfectly elastic, a part of the earnings of a factor will consist of surplus or economic rent, since the full price they get are not necessary to make all the factor units available.

According to modern theory of rent, rent is a surplus which arises due to difference between actual earning and transfer earning. Hence, in modern sense, rent is a surplus and it is a payment in excess of transfer earnings, i.e.,

Rent = Present Earnings - Transfer Earnings.

Here, transfer earning refers to the amount of money, which a factor of production could earn in its next best-paid use.

Modern economists opined that rent arises due to scarcity of land. Scarcity of land means that demand for land exceeds its supply. According to the modern view, rent will be determined at a point where the demand for land is equal to its supply. Let us suppose, a piece of land under a certain product, say- jute is yielding Rs. 100 and its next best use cottonneeds Rs. 80. Here, the transfer earnings are Rs. 80 and that is why in its present use it is generating a surplus of Rs. 20. This difference between the total return to a factor of production and its supply price which here is equal to Rs. 20 is said to be rent according to the modern theory of rent. Rent in this case has a broader meaning. It is applicable to all other factors of production (such as labor, capital, entrepreneurship) besides land.

According to the modern theory of rent, there are two main aspects of determination of rent- demand for the factor and supply of factor. Both of these determine the rent.

Demand for factor:

Rent depends on the factor of demand. Let us consider the factor in this regard. The land has derived demand, i.e., it depends on the demand for agricultural products. If demand for food grains increases, demands for land will also increase and vice-versa. The demand for land is influenced by its marginal productivity. It means as more and more land is brought under cultivation, its MP, diminishes since there applies the law of diminishing marginal productivity in agriculture. All these mean that there is an inverse relationship between demand for the factor and rent.

Supply of factor:

Rent also depends on the supply of factors, i.e., to what extent, there is the availability of factors of production. Again considering the earlier example, for a particular farm, supply of land may be perfectly elastic, but supply of land is fixed for the economy as a whole. Its supply is perfectly inelastic. It means, increase in the price of land will not suggest any increase in its supply.

Given the inverse relationship between demand for land and rent, supply of rent may have different possibilities depending on its elasticity which may impact the supply curve. There are three basic possibilities in this regard-

- Supply of factors of production is perfectly elastic.
- Supply of factors of production is perfectly inelastic.
- Supply of factors of production is less than perfectly elastic.

Supply of factors of production is perfectly elastic:

If we consider the supply of land from the perspective of a farm, it is observed as perfectly elastic.Hence, given the downward sloping demand curve of land, the supply curve here will be a horizontal straight line. This is shown in the diagram below,
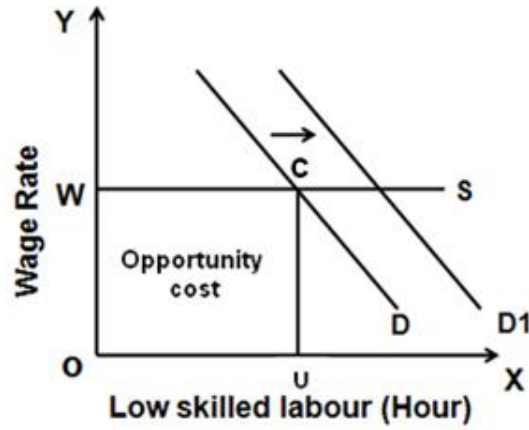
Figure 2.1: Determination of rent when supply of factors is perfectly elastic.

In such a case there is no rent for a firm even though there is a shift in demand for land. Following the modern concept of rant, there is no surplus earning in this case.

 Actual Earning = Transfer Earning

Hence, Actual Earning – Transfer Earning = Zero

In the diagram,

OW-OW=0

Under such situation, there will no rent even though there is a shift in the demand curve (D1) with the given supply curve.

Supply of factors of production is perfectly inelastic:

If we consider the supply of land from the perspective of entire economy, it is perfectly inelastic. The transfer earning in this case is zero, since land cannot be transferred toany other use; and it has only one use. Here, the whole income from land is appeared to be surplus, and soit is rent. In the diagram below, given the downward sloping demand curve of land (DD), the supply curve (S) will be a vertical straight line.

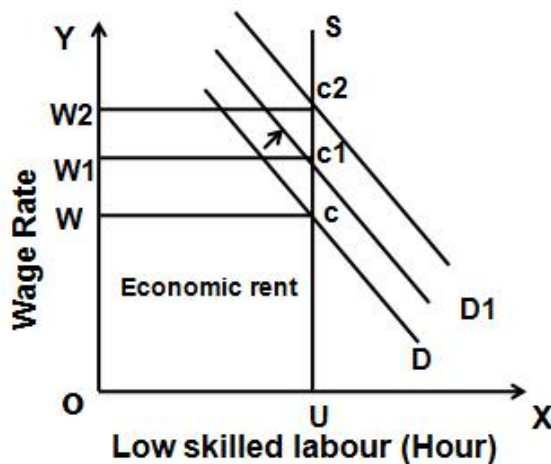Figure 2.2: Determination of rent when supply of factors is perfectly inelastic.

In the diagram,

Rent = Actual Earning (Since Transfer Earning is zero)

Rent=ABCD

Under such situation, an upward shift in the demand curve will raise rent.

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Supply of factors of production is less than perfectly elastic:

If there is a situation which lies in between these two extremes, i.e., the supply of land is normally elastic, but neither perfectly elastic nor perfectly inelastic, the supply curve in this case will be an upward sloping curve.
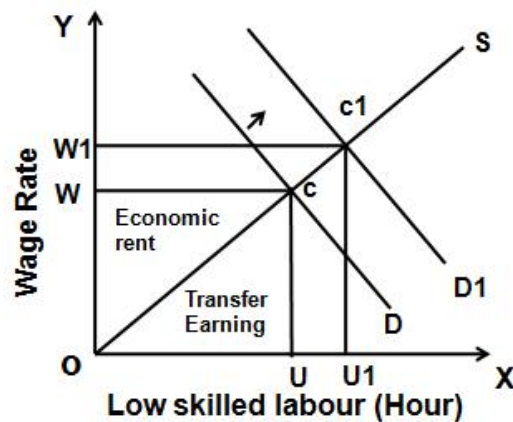

Figure 2.3: Determination of rent when supply of factorsis elastic.

In the diagram above, the demand for land shown by D curve and the supply of land is shown by S curve. The area OWCU is the total earning and OCU means the transfer earning. Hence the surplus here is reflected by the area OWC. This is termed as economic rent.

So,

OWCU-OCU

=OWC

=Economic rent.

2.2 Modern theory of wage determination

Modern theory of wages considers wages as a price of labour. A labour sells his services, which is utilized by a producer as a factor in the course of production. Modern economist opines that the price of labour (i.e. wage) is defined by interaction of two market forces, i.e, demand for and supply of labour. Wage is determined at the point where demand for and supply of labour are equal to each other. This theory is recognized as supply and demand theory of wages.

Demand for Labour

As like as land the demand for labor is also derived demand as it is derived from the demand of the product that labour produces.In this sense, the increase in the demand for the product raises the demand for labor. The labour is demanded by the entrepreneurs as it is used for the production of goods and services. The demand for labour also depends upon the marginal productivity and elasticity of labour.Since the marginal productivity curve of labour slopes downwards after a stage, the demand curve of labour will also slope downward. Hence, the demand curve of labour can be traced out from marginal productivity curve as is shown below. In the diagram, quantity of labour is measured horizontally whereas the wage rate is measured vertically. Following the downward sloping marginal productivity curve, demand curve for labour also slopes downward.

Figure 2.4: Demand for labour.

In the diagram, similar to the marginal productivity of labour, the demand for labour by a firm which is marked by D curve also falls.This means that, at a high wage rate firms employ less labour and vise versa.

Factors affecting the demand for labour:

Technological progress:A better technology or technical progress increases marginal productivity of labour and vice-versa. Thus, technological progress effects marginal productivity of labour.

Derived demand: The demand for labour relies on the demand for the goods and services produced by using labour. Hence, when there is an increase in the demand for goods and services produced by labour, the demand for labour by the firms also automatically increases.

Proportion of labour: The demand for labour also is also dependent on the ratio of labours other factors of production. The demand for labour is inelastic when a small amount of labour is engaged in the production of a product.

Cost of other Factors: The demand for labour is also dependent on the cost of other factors of production. If these other factors are costly, the owners of factors will substitute labour to these costly factor. Hence, the labour demand will be high and vice versa.

2.3 Supply of labour

Supply of labour, on the other hand, means the number of labourers who are willing and ready to sell their labour at the existing wage rates. Hence, we can state that generally, there is a positive relationship between supply of labour and prevailing wage rate, i.e, at a higher wage rate, labour supplied will be higher and vice versa.

Similar to the demand for labour, supply of labour in an economy also depends on some **economic factors** such as-

Existing employment: Supply of labour depends on the status and quality of existing employment. Higher positions, status, quality of the existing employment, more will be the interest of the workers to work.

Desire to increase monetary income: If there is strong tendency to increase money income of the workers, higher will be the supply of labour and vice versa.

Bargaining power of the labourers: If the labours are strong enough with a supportive labour organization, they will enjoy higher bargaining power which helps them to generate more amenities for the worker. In such a situation, labour supply will be higher.

Size of population: In most cases, size of population also matters. A relatively abundant size of populationprovides enough scope of cheap and easy availability of labour.

Income distribution: An inequality in income distribution in the country leads to an urge among the poor to get a job even at low wage rate thereby increasing the labour supply.

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Skill and efficiency level of workers: A higher level of efficiency enables works to get job easily.

Labour supply also depends on some **non-economic factors** as

- Family affection,
- Social conditions,
- Domestic environment.
- Mobility, flexibility and substitutability of Labour
- work-leisure preference ratio

Besides these, there are some**psychological factors** also which affect the supply of labour. Here, it can be mentioned that the decision of the worker about how much time he or she should devote to work and how much to leisure is an example of such psychological state.

Moreover, the labour supply also depends on the elasticity. The labour supply curve for a firm is perfectly elastic. The labour supply curve for an industry is less than perfectly elastic. At a high wage rate, labour supply will be high and vise versa. Again, in many a case, it is also observed that at a very high wage rate the labour prefers leisure to work; hence we get a backward bending supply curve of labour.

The labour supply curve is shown in the diagram below. During SB range, the labour supply curve is positively sloped curve showing the direct and proportional relationship between labour supply and wage rate. But beyond point B, (i.e., during range BS) the curve bends backward showing a negative relationship between wage rate and labour supply. This is because at a very high wage rate workers prefer leisure to work thereby diming the labour supply.
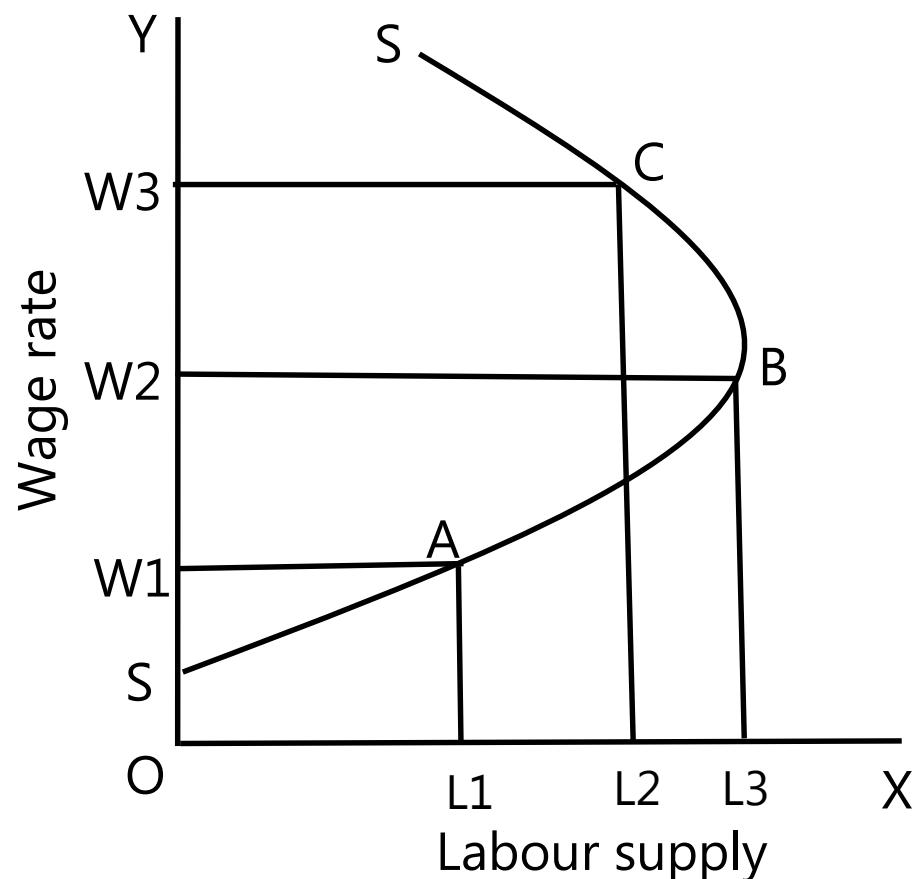
Figure 2.5: Supply of labour.

Determination of Equilibrium wage:

According to the modern theory of wage equilibrium wage rate is determined when demand for labour gets equalized to the supply of labour. In the diagram below, both demand for and supply

of labour is equal when labour demand curve and labour supply curve intersect with each other. Hence in the figure below,

- At E, Labour demand=Labour supply, hence, E is the equilibrium point and OW2 is the equilibrium wage rate.
- At OW3 wage rate, Labour demand < Labour supply, and there is excess labour supply.
- At OW1, Labour demand > Labour supply and there is excess labour demand.

Wage rate determined in a way is the wage rate of an industry.
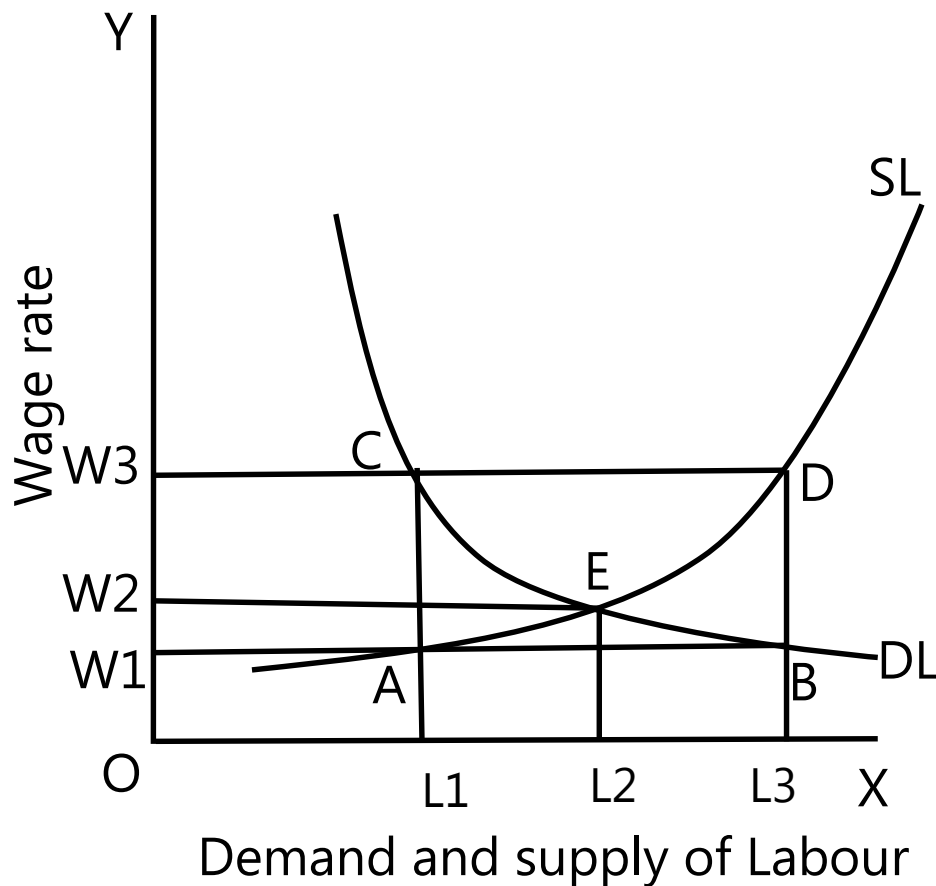
Figure 2.6: Determination of wage.

Similarly, from industry wage rate we can also find out the wage rate for a particular firm. In the diagram below, we have found out the wage rate for a particular firm. The firms face a perfectly elastic demand curve; the demand curve for a firm is horizontal straight line. Firms will employ any number of labour depending on its own cost structure at the prevailing wage rate determined by the industry. For a firm average wage equals its marginal wage rate. This is shown in the panel of the figure below.

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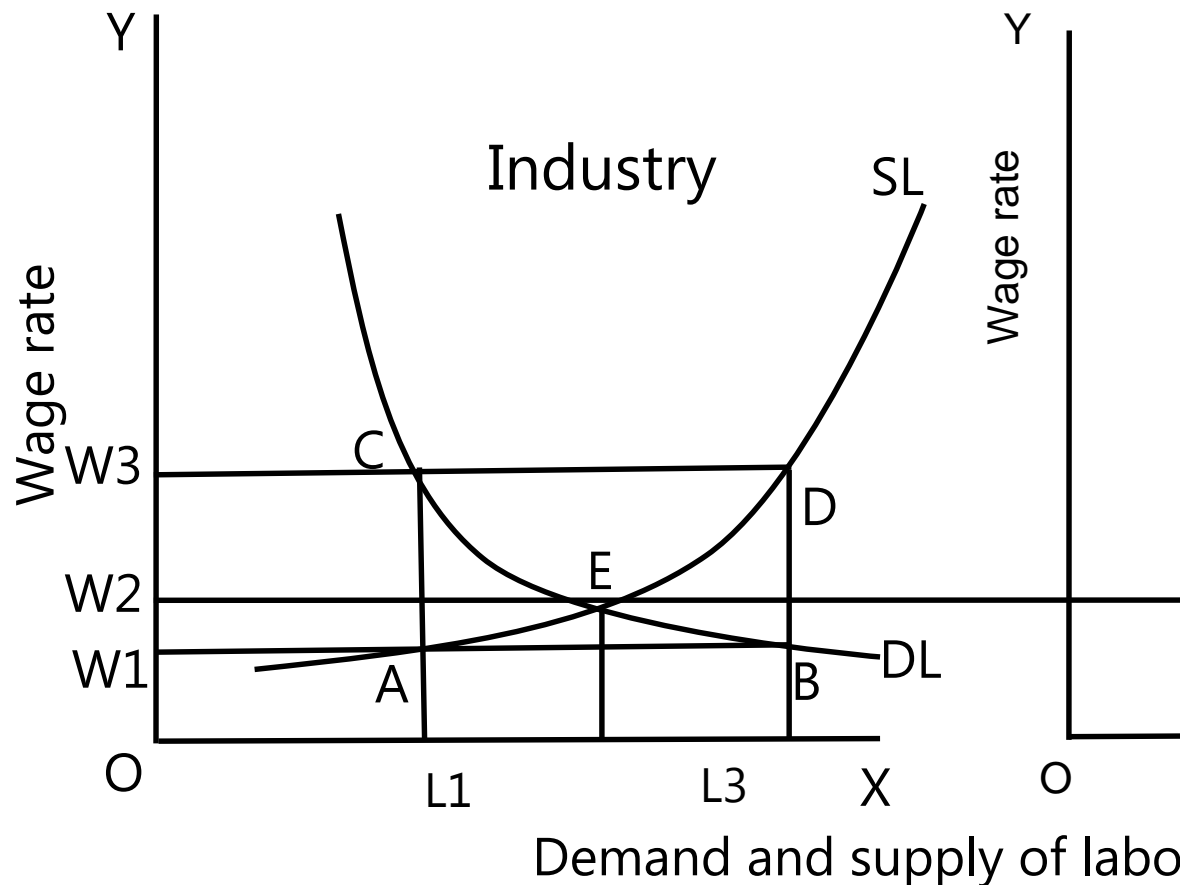
Figure 2.7: Determination of wage for a firm.

2.4   Determination of profit

Profit is simply the reward for the entrepreneur, rather than entrepreneurial functions. Profit is only a residual income but not a contractual income similar to other factors. In profits, there are much greater fluctuations when compared it to the return of the other factors. Unlike the other factors of production, profits may even be negative.

Definitions:

1.   *According to professor Alfred Marshall, " Profit are the earning of management".*

2.   *According to J. Benham, "Profits have their origin in uncertainty"*

3.   *According to professor Hawley, "Profit is the reward of bearing risk"*

From these all definitions it is clear that profit is the return of the managerial team because of either taking risk or facing uncertainty in a business set up.

Before determining profit, let us first go through some basic aspects regarding profit.

Gross Profit: Gross profit is the profit of a company after deducting the costs connected with making and selling its different products, or the costs services it provides. Gross profit can be calculated with the following formula:

Gross profit = Revenue - Cost of Goods Sold.

Hence, in accounting sense, Profit = TR-TC

There is different constituents or elements of gross profit. Some of them mentioned are-

•   Interest or return on entrepreneur's own capital.

•   Rent of land owned by the entrepreneur himself.

•   Entrepreneur wages or reward of management

- Reward or benefit of the Entrepreneur as risk taker.
- Gain as superior bargainer (or bargaining power)
- Monopoly Gains that an entrepreneur receive
- Gains from strategy (working framework)

Similarly, net profit is the profit of a company after deducting all other expenses. These expenses cover the costs of normal and ordinary business operation, depreciation and taxes. So,

Net Profit= Gross profit-Other expenses (including depreciation).

If these other expenses and charges exceed revenue, the company incurs a negative net profit or net loss.

Modern theory of profit is also called the demand and supply of profit. Profit is determined by the demand and supply of an entrepreneur. Profit is determined by the equality of demand and supply. The point at which the demand curve cuts the supply curve of an entrepreneur the profit will be determined. The point where demand for and supply of entrepreneur gets equal is also explained in term of opportunity cost of the entrepreneur.

Demand for profit:

The demand for an entrepreneur is a derived demand which depends on its marginal revenue productivity (MRP). If the MRP is higher, the demand for and entrepreneur will also be high and profit will also be high; again a lower MRP means a lower demand for the entrepreneur and in such case profit will also be less.

As the units of entrepreneur increase in an industry the MRP will decrease and vice versa. The demand for entrepreneur is shown in the figure with the help of downward sloping MRP curve.
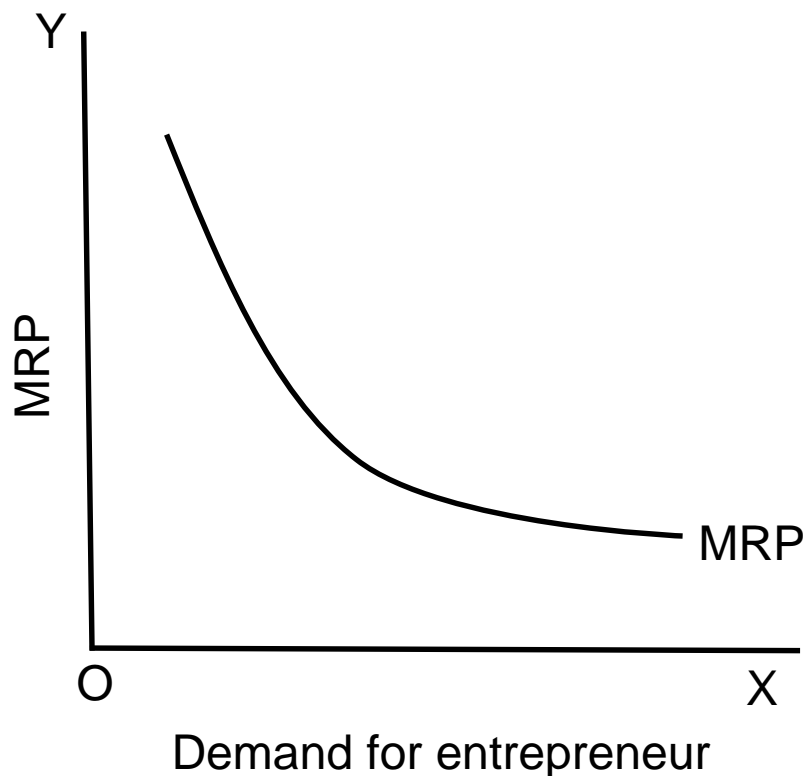
Figure 2.8: Demand for entrepreneur.

In the figure, a downward sloping MRP curve shows the different levels of demand for entrepreneur.

Supply of entrepreneur

The supply of entrepreneur depends on the rate of return or profit. There is a direct and positive relationship between the profit and the supply of the entrepreneur. If there is a higher the rate of

return or profit, the supply of entrepreneurs will be more and more and vice versa. Hence the supply curve is an upward sloping one. The supply curve of entrepreneur is shown in the diagram which is positively sloped showing a direct relationship between supply of entrepreneur and profit.
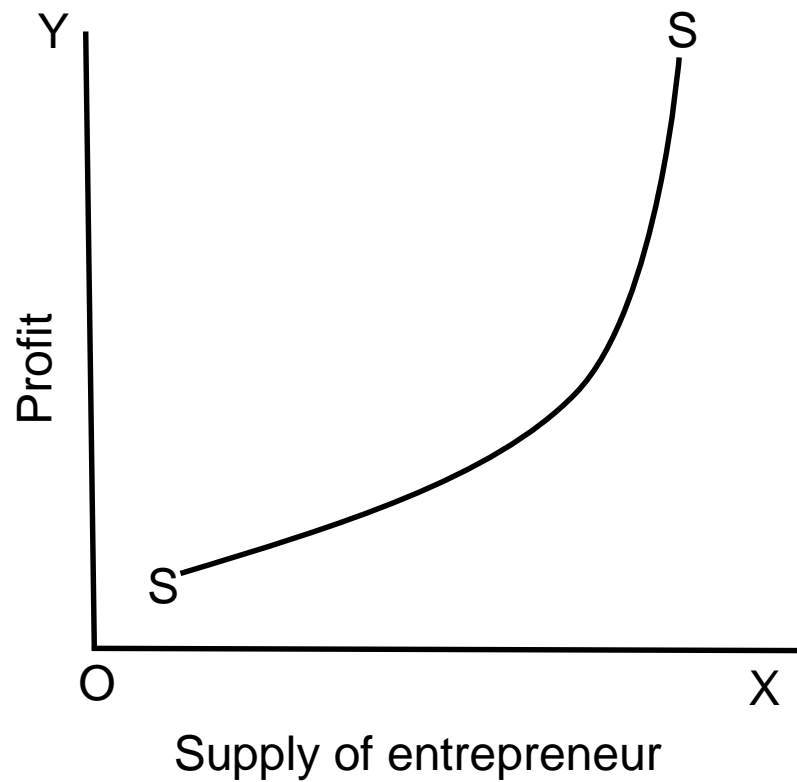
Figure 2.9: Supply of entrepreneur.

In the diagram, SS is the supply of entrepreneur curve which is upward sloping meaning an increase in supply of entrepreneur at an increasing profit.

Determination of Profit under perfect competition

Profit is determined when supply of entrepreneur and the demand for entrepreneur are equal. In the diagram below, at the point of intersection between demand for and supply of entrepreneur curves show the equilibrium point.
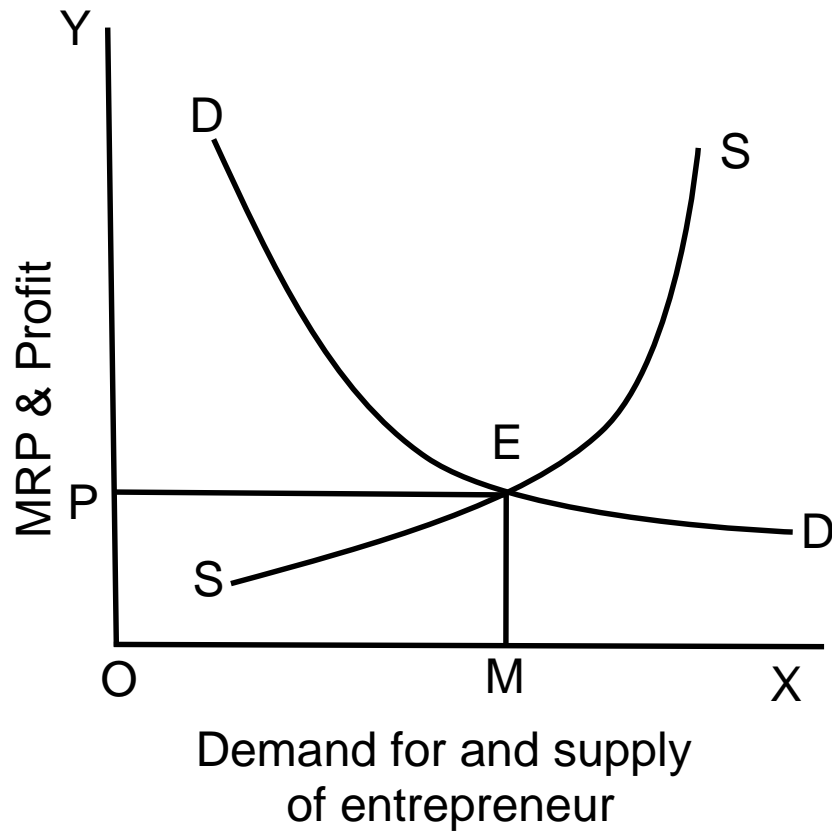
Figure 2.10: Determination of profit.

At point E, both demand for entrepreneur (DD) and supply of entrepreneur (SS) gets equal. E is the equilibrium point. Equilibrium profit is OP and demand for and supply of entrepreneur is OM.This happens in competitive market. But under imperfect competition, the entrepreneurs have a good control over production hence he earns super normal profit. Hence, under imperfect competition,

Total profit (TP) = supernormal profit + normal profit

This is shown in the figure below,
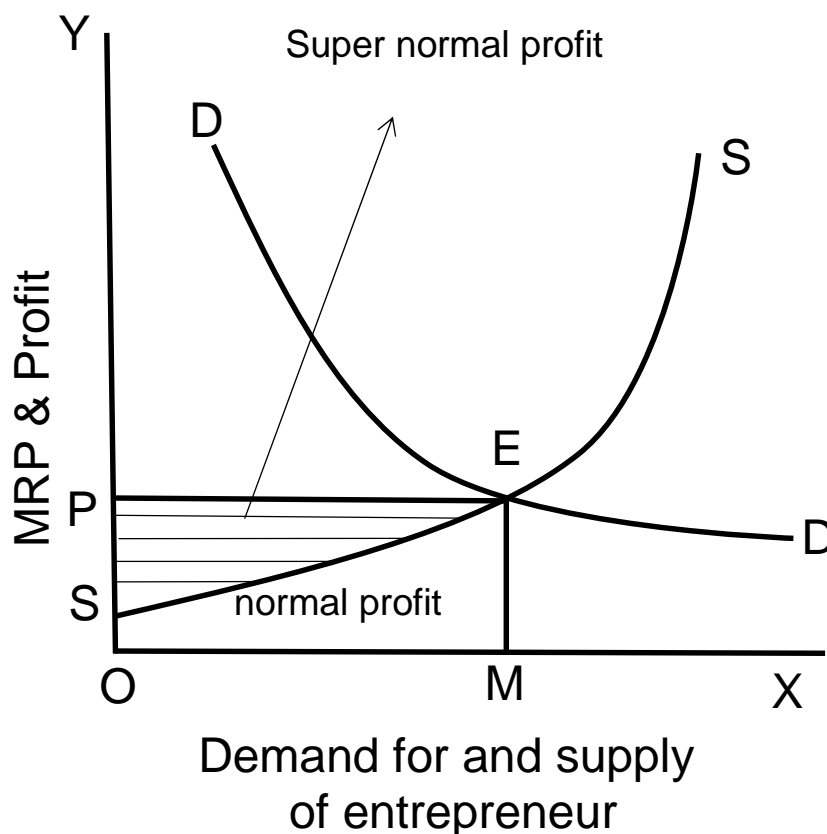
Figure 2.11: Determination of profit under imperfect competition.

Under imperfect competition a firm in the short can earn super normal profit. It is the marked area in the diagram. Therefore, total profit counts both normal and the super normal profit. In the diagram, it is PSE+SEMO=PEMO.

Summary

Let us go through the basic points of the chapter-

- According to modern theory of rent, rent is a surplus which arises due to difference between actual earning and transfer earning. Hence, in modern sense, rent is a surplus and it is a payment in excess of transfer earnings, i.e.,

  Rent = Present Earnings - Transfer Earnings.

- Modern economists opined that rent arises due to scarcity of land. Scarcity of land means that demand for land exceeds its supply. According to the modern view, rent will be determined at a point where demand for land is equal to its supply.

- There are three basic possibilities under which rent is determined-

  o Supply of factors of production is perfectly elastic.

  o Supply of factors of production is perfectly inelastic.

  o Supply of factors of production is less than perfectly elastic.

- Modern theory of wages considers wages as a price of labour. A labour sells his services, which is utilized by a producer as a factor in the course of production. Modern economist opines that the price of labour (i.e. wage) is defined by interaction of two market forces, i.e, demand for and supply of labour. Wage is determined at the point where demand for and supply of labour are equal to each other.

- Factors affecting the demand for labour
  - o Technological progress
  - o Derived demand
  - o Proportion of labour
  - o Cost of other Factors
- Economic and non-economic factors affecting supply of labour are
  - o Existing employment
  - o Desire to increase monetary income
  - o Bargaining power of the labourers
  - o Size of population
  - o Income distribution
  - o Skill and efficiency level of workers
  - o Family affection,
  - o Social conditions,
  - o Domestic environment.
  - o Mobility, flexibility and substitutability of Labour
  - o work-leisure preference ratio
- Profit is simply the reward for the entrepreneur, rather than entrepreneurial functions. Profit is only a residual income but not a contractual incomesimilar to other factors. In profits, there are much greater fluctuations when compared it to the return of the other factors. Unlike the other factors of production, profits may even be negative.

Keywords

Modern theory of rent- Determines rent with the help of demand and supply of land.

Modern theory of wage- Determines wage with the help of demand and supply of labour.

Modern theory of profit - Determines profit with the help of demand and supply of entrepreneur.

Self Assessment

1. In modern sense, rent is defined as

A. Rent = Present Earnings - Transfer Earnings.
B. Rent = Present Earnings + Transfer Earnings.
C. Rent = Present Earnings > Transfer Earnings.
D. Rent = Present Earnings < Transfer Earnings.

2. Which of the following statements is correct

A. Rent is a payment less than transfer earnings.
B. Rent is determined by demand for and supply of land.
C. Land has no derived demand.
D. None of these

3. Find out the wrong statement-

A. Modern economists opined that rent arises due to scarcity of land.
B. Rent is a differential surplus between actual earning and transfer earning.
C. Rent is determined by demand for and supply of land.

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D. Land has no derived demand.

4. Modern theory of wages regards

A. Wages as a price of labour
B. Wages as a time of labour
C. Wages as a MPP of labour
D. None of the above

5. Modern theory of wages is known as

A. Labour theory of value
B. Supply and demand theory of wages
C. Macro theory of labour
D. None of the above

6. Demand for labour depends upon

A. The average productivity of labour
B. The Total productivity of labour
C. The marginal productivity of labour
D. All the above

7. The demand curve of labour

A. Slopes upward
B. Slopes downward
C. Moves horizontally
D. None of these

8. Which of these is not a factor affecting demand for labour

A. Technological progress
B. Direct demand
C. Proportion of labour
D. cost of other factors

9. Which of these is not a factor affecting supply of labour

A. Size of population
B. Skill and efficiency level of workers
C. Mobility, flexibility and substitutability of Labour
D. All of these

10. The labour supply curve for a firm is

A. imperfectly elastic
B. Less elastic
C. Perfectly elastic
D. More elastic

11. Who said, "Profits have their origin in uncertainty"?

A. Knight

B. Benham

C. Keleki

D. None of them

12. Who said,"Profit is the reward of bearing risk"?

A. Knight

B. Clark

C. Hawley

D. Kalecki

13. Which of the following is a constituents of profits.

A. Reward of the Entrepreneur as risk taker

B. Gain as superior bargainer

C. Monopoly Gains

D. All of these

14. The demand for an entrepreneur depends on its

A. Marginal revenue productivity

B. Marginal Physical productivity

C. Marginal revenue

D. All of these

15. The supply of entrepreneur depends on

A. The rate of expenditure

B. Capital accumulation

C. The rate of return or profit

D. None of these

Answers for Self Assessment

1.	A	2.	B	3.	D	4.	A	5.	B
6.	C	7.	B	8.	B	9.	D	10.	C
11.	B	12.	C	13.	D	14.	A	15.	C

Review Questions

1. What is rent?
2. How can rent be determined for a firm?
3. How is rent determined for a the economy?
4. What are different factors affecting demand for labour?
5. What are different factors affecting supply of labour?
6. Why does the labour supply curve bends backwards?

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7. Is difference between gross and net profit?

8. How can be profit determined under imperfect competition?

Further Readings

1. Microeconomics - A Koutsoyiannis, Macmillan Press, London, 1979

2. Microeconomics — Dominik Salvatore, Oxford University Press, New York, 2003.

3. Microeconomics — D N Dwivedi, Pearson, New Delhi, 2014.

Unit 03:Macro Theories of Distribution

Objectives

After going through this chapter you will be able to

- learn about the different forms of rent.
- learn about determination of rent by Ricardo.
- learn how differential surplus causes in production rent.
- learn briefly about Karl Marx.
- learn about surplus value of production.
- Learn how wage is determined from surplus value.
- learn briefly about the determination of profit by Kaleki,
- learn how degree of monopoly power determines share of wage and profit,
- learn about the distribution of national income into wages and profits by using Lerner's index.

Introduction

Macro theories of distribution deal withresolving the determination of aggregate rewards of differentfactors of production in national income. It explains the share of the total national income that each factor of production receives. In this unit we will discuss about three different aspects of the macro theories of distribution. Firstly, we analyze the Ricardian theory of rent. In the next phase, we will examine the Marxian theory and finally, we will discuss about Kalecki's contribution towards macro theory of distribution.

3.1   Ricardian Theory

Before discussing the Ricardian theory of rent, let us first know about some of the basic concept of rent.

Economic Rent: Economic rent may is defined as the disbursement made to the factors of production above and over the minimum amount essential to keep the factor in its current occupation.

Gross Rent: Gross rent is the rent paid for the services of land and capital engaged on it. It covers the following:

- Payment made to land for its use.
- Interest on capital invested.
- Wages that the landlord receives for his own services for supervising the investment.

Contractual Rent: Contractual Rent is the amount paid to the land lord by tenants because of some contracts which may sometimes be verbal or written. It may be equal or unequal to the economic rent.

Scarcity Rent: Scarcity Rent applies to those factors of productionsupply of which is less elastic. It arisesbecause of the paucity of factors of production.

Quasi Rent: It is the surplus acquired by manmade factors of production supply of which is fixed (inelastic) in short period but variable (elastic) in long period.

Now let discuss the Ricardian theory of rent. David Ricardo was one of the prominent English economists. He was one of the four pillars of classical economists. David Ricardo developed the theory of rent in the year 1817. Ricardo used the concept of economic rent to analyze a particular question.Devid Ricardo defined rent as,-

"that portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible powers of the soil."

Assumptions:

- The supply of land is given or fixed.
- The original powers (such as fertility of land) are gifted by nature and not because of human efforts.
- Land is supposed to be a non-perishable factor of production. It is also stated by Ricardo that the power and fertility of land is indestructible.
- Land has only one use (i.e. Cultivation and the possibility of other alternative usesare ruled out).
- Land differs in fertility (i.e., different lands have different levels of fertility).
- Land is utilized according to the order of fertility. At first, the most fertile land is cultivated and thereafter the next grade land is used for cultivation.
- There operates the law of diminishing returns in agriculture.
- There exists always perfect competition in the economy.
- There exists marginal land or 'no rent land'. This is the grade of land beyond which no land is used for cultivation.

Why is there rent?

According to Ricardo rent arises because of the differences in the fertility of the soil.So, he stated that rent is that part which shows the differential surplus of land when various grades of land are brought under cultivation. Ricardo assumes that the different grades of lands are cultivated gradually in descending orders; the first grade land is cultivated at first, then the second grade, after that the third grade of land is brought for cultivation and so on.With the increase in the size of existing population and also with the consequent rise in the demand for agricultural produce (i.e, food items), gradually the inferior grades of lands are also brought for cultivation, thus creating a differential surplus in production or rent for the superior grades.

To explain the theory let us suppose, there are three different plots of land of land of equal size and each of them are used to produce corn.The cost of production in this case, is the same for each of the plots of land. The first grade land (i.e, the most fertile plot), produces 40 qtls. of corn, the second grade 30 qtls. and the third grade land (i.e., the less fertile plot), only 25 qtls.Hence, the first grade land shows a differential surplus of production of 10 qtls. over the second grade; the second grade earns a differential surplus of production of 5 qtls over the third grade and the third one earns no surplus. So, when the second grade of land is cultivated, there arises rent equal to 10 qtls from first grade land (rent=differential surplus, i.e., 10 qtls) and similarly as and when the third grade land is cultivated, it raises a differential surplus of a total 15 qtls from both and first and second grade land (i.e., 10+5=15)

Thus, according to Ricardo, rent is equal to the value of the differential surplus from each category of land used for cultivation. The first two plots are called here as the intra-marginal and the third plot is the marginal (or no-rent) land. Thus, the differences in the fertility level of the different plots of land raise rent for the superior plots of lands.

Ricardian theory of rent can explained with help of the diagram below-
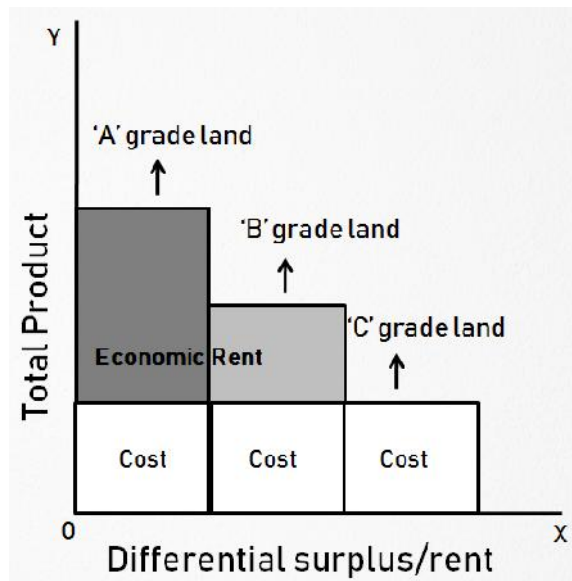
Figure 3.1: Ricardian theory of rent

In the diagram, the horizontal axis, OX measures the differential surplus or rent and the vertical axis, OY measures the total product. Different grades of land used for cultivation is shown by columns. The cost of production in each category of land is given, i.e., the blank area in each column. In the figure,

Surplus from A grade of land when B grade land is used for cultivation = the dark grey area.

Surplus from B grade of land when C grade land is used for cultivation = the light grey area.

Surplus from both A and B grades of land when C grade land is used for cultivation = the dark grey area + the light grey area.

Hence, in this case the **total rent = the dark grey area + the light grey area.**

Criticism:

- Ricardo considers the supply of land as fixed or inelastic. But land has different alternative uses. Hence, it is clear that the supply of land to a specific use is not inelastic or fixed.

- Ricardo's sense of order of cultivation of lands in accordance with variation in fertility is also not also realistic. If the price of the product falls, the marginal land need not necessarily go out of cultivation first.

- The productivity of land does not depend on the level fertility of land alone. It also depends on some other factors such as position, investment and adequate use of capital.

- As assumed by Ricardo, land does not possess any original and indestructible powers, as it is seen the fertility of land gradually diminishes over time.

- Ricardo's assumption of no-rent land is also an unrealistic concept as; in practical sense every plot of land earns some rent, although the amount may be small.

- Ricardo restricted rent to land alone, but modern economists have shown that rent may arise in return to any factor of production, the supply of which is variable or inelastic.

3.2   **Marxian Theory**

Before explaining the Marxian theory, let us first some basic things about Marx.

Karl Heinrich Marx (5 May 1818 – 14 March, 1883) was a great German philosopher,economist, historian, sociologist, political theorist and socialist revolutionary. He was born in Trier, Germany. Marx studied law and philosophy at the university level. Due to some his publications relating to political issues, Marx had to be stateless and lived in exile with his wife and children in London for a long period, where he reunited his ideas and continued to develop his thought and reflections in assistance and collaboration with his German friend, contemporary thinker Friedrich Engels and thus he published his writings, researching all he could in the reading room of the British Museum. His famous titles are - The 1848 pamphlet, The Communist Manifesto and the three-volume Das Kapital (1867–1883).

Marx developed theory of wage in the period 1849-1883.Marxian theory is basically based on the basic assumptions that similar to the other articles, labor is also an article or object which could be bought against the payment of its price i.e. also known as wages. The theory of wage developed by Marxdepends on the labor theory of value (LTV) and hence it is also known as theory of surplus value.The payment to labour, according to Karl Marx, is at the subsistence level which is much more less than in ratio to time, labor takes to generate items. Marxd said that this surplus goes to the owner of the produce. Karl Marx is famous for his excellence in the favor of labor.

According to Marx, labor is seemed to be an article (or commodity as well) which can be bought on payment of a definite price. In case of an ordinary commodity, the price of a product is defined by the time and effort spent to produce it. But the laborer is not paid in proportion to the effort and time needed to produce it and the surplus or the excess thus raised exploiting the labour goes to the management or the owners to meet their other expenses.

Thus, Marx explained the surplus value from capitalist point of view as the amount related to profit. He denoted surplus value by S.

Value of total product = **C+V+S**

Where, C= constant capital, V= variable capital, S = surplus value.

The ratio of surplus value (S) to the variable capital (V) has been termed by Marx as rate of exploitation.

Rate of exploitation=$\dfrac{S}{V}$

When there is a scope of type of exploitation takes place, the producers will try to increase their profits by increasing the volume of production and number of hours of work that the workers are engaged. Hence, the competition among the capitalists forces them to reduce the price of their products.This is done with the help of introduction of labour saving machines which enhances the labour productivity. The process of replacing labour by machines generates industrial reserve army which continuously tends to increase as capitalism develops.

The larger is the industrial reserve army; the worse is the condition of the workers. By this process capitalists are now able to cut down wages they pay to the workers to the semi starvation level and they appropriate more and more surplus value out of their produce. Hence, the condition of the workers deteriorates increasingly. This situation is also known as the law of increasing misery.

Marxian theory can be explained with the help of the following diagram. In the diagram wage rate is measured through the vertical axis (OY) and the number of labour employed is measured across the horizontal axis (OX). In the figure, the labour demand curve shows the negative relationship between wage rate and demand for labour by the capitalists, i.e., at high wage rate labour demand by capitalists is low and vice versa. Similarly labour supply curve shows a positive relationship between wage rate and labour employment, i.e., at a high wage rate more and more number of workers will be willing to work and vice versa.

From the diagram it is clear that ata high wage rate W, there is an increase in the industrial reserve army to RA (LL1), because capitalists will not be interested to employ workers thereby creating the situation of excess supply of labour. This increase in unemployed labour force is known as 'industrial reserved army' and this is due the desire of excess capitalists profits. As industrial reserve army increases, capitalists adopts labour saving machine and reduces wage rate from OW further to OM to have more surplus value. Thus, it is observed that the industrial reserve army is

due the strong desire of the capitalists to acquire more and more surplus value which is as indicated earlier shown by the ratio, $\frac{S}{V}$.
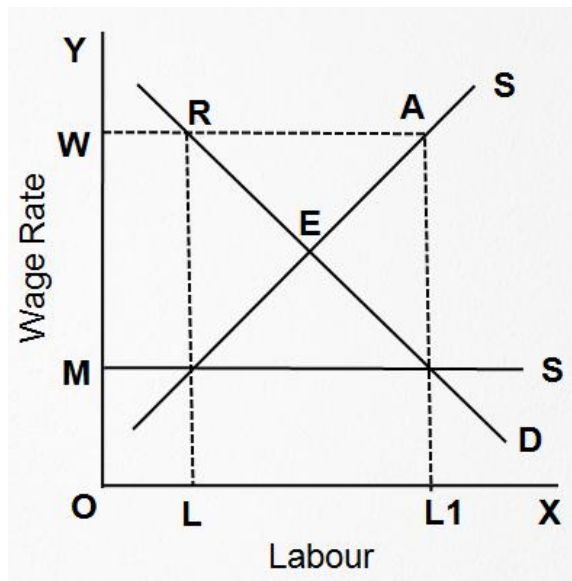
Figure 3.1: Marxian surplus value

Criticism:

However Marxian theory is also not free from criticism. Following points are mentioned in this regard-

- **Unrealistic surplus value**: The basis of the Marxian theory is surplus value. But in reality, rather the values the real tangible prices matter. Thus, the theory has created an abstract world which makes it difficult to realize proper working of capitalism.

- **Technology does not Create Unemployment:** According to Marx due to use of technology, industrial reserve army expands. But in the long run, technologygenerates more employment opportunities by increasing demand and income.

- **Static analysis:**According to Schumpeter Marxian theory is based the two basic facts-(a) Labour theory of value and(b) Modified version of subsistence theory of wages which make the a static economic analysis.

- **Falling Tendency of Profits - not Correct:**Marx argued that due to the competition among the capitalists to earn higher surplus valuethere is a falling tendency of profits. But as development proceeds, capital output ratio falls and as a result output as well profits increases.

- **Ignores technical progress:**Marx ignores what happens when there is an increase in efficiency or the marginal productivity of the factor which indicates the existence of the technical progress.

3.3   Contribution of Kalecki

The main contribution of Kaleckiis regarding formulation of profit equation which is influenced by the basics of Marxist economics of surplus value and also, the organic composition of capital. Marx did not explain the total volume of profits in a given period. Later on, it was Kalecki who derived the relationship concisely.

According to his profit theory of distribution, Kalecki stated that profit share from national income is a direct and proportional function of degree of monopoly power. Similarly, profit share out of national income is also a direct function of the ratio between raw material costs to the wage cost.

Now let us consider the definition of Kalecki. According to Kalecki,

"According to [my] first theory the absolute level of profits is determined by capitalist consumption and investment. According to [my] second theory the relative share of profits in national income is determined by the degree of monopoly" - (Kalecki 1991, p. 121, emphasis in original)

Assumptions:

- The economy is divided into two parts: a) workers who earn wages and b) capitalists who earn profits.
- Workers do not have the tendency to save, i.e., spend all wages they earn.
- The economy is a closed economy, with no foreign or public sectors.
- Industries are observed to work with excess capacity.
- Lerner's degree of monopoly power holds good.
- Marginal cost (MC) includes only labour cost and raw material cost.
- Labour cost includes wages of labour alone.
- Salaries are the part of the income of capitalists.
- Thus, P-M indicates profits; this includes entrepreneurial profits (i.e., including dividend) and overhead costs (i.e., interest, depreciation and salaries)
- The firms have the condition of SMC= SAC over a range,also called the range of practical capacity.

Given the above assumptions, Kalecki derived the following identity:

$P + W = C_W + C_P + I$

where,

P = gross profit (i.e., profit + depreciation),

W = total wages,

C_W = workers' consumption,

C_P = capitalists' consumption; and

I = gross investment in the economy.

Since workers do not save: so,

$W = C_W$

The identity can be simplified as:

$P = C_P + I$

This is the famous profit equation, i.e., profit equals the sum of capitalists' consumption and investment.

Kalecki analyses the causal link between the two sides of the equation, viz., does C_P+I determine P (profit) or vice-versa?

Its answer exclusively depends on the decision of entrepreneurs. They may decide to consume and invest more in the current period than in the previous period but cannot decide to earn more. Hence, it is the C_P+I that determine P, but not vice-versa.

The distribution of national income in terms of profit and wages depends upon the degree of the monopoly in the economy (which in fact, is based on Lerner's equation) as shown by:

$$M = \frac{P-m}{p}$$

Since, MC (m) = AC (a), we can restate the above as:

$$M = \frac{P-a}{p} \text{ or } PM = P - a$$

Now, $P - a$ here means, the gross income of the capitalists for each unit of output. Similarly, the gross output or income of capitalists for the total quantity of good is given as:

XPM=x (P-a).

Hence, the gross profit output or income for all the firms (or for the economy as a whole) is:

ExPM = Ex(P-a)

Here, the total amount of the income of the goods produced and sold in the economy is:ExP

This is also known as the aggregate turnover (T).

T is made up of the value of gross national product plus the value of the raw materials. Thus,

$$= \text{ where, } \frac{ExPM}{T} = ExP \quad \frac{Ex(P-a)}{T}$$

Now, $\frac{ExPM}{ExP} \quad \frac{Ex(P-a)}{T}$

Here, $\frac{ExPM}{ExP}$ is the ratio of CY to Agg turn over. Let's show it as, μ

Thus, $\mu = \frac{Ex(P-a)}{ExP}$

$$\frac{\text{Gross capital income}}{\text{Aggregate turn over}}$$

Effect on the share of wage and profit when the degree of monopoly power changes:

$$\text{Profit} = Ex(P - a)$$
$$= Y - W$$

$$\mu = \frac{Ex(P-a)}{T}$$

$$\mu = \frac{Y - W}{T}$$

$$\mu T = Y - W$$

$$\mu T/W = \frac{Y - W}{W}$$

$$= \frac{Y}{W} - \frac{W}{W}$$

$$\mu T/W = \frac{Y}{W} - 1$$

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$$\frac{Y}{W} + \mu T / W \text{ or,} \quad = \quad \frac{W}{Y} \quad \frac{1}{1 + \sim T / W}$$

Hence, it is clear that the share of wage (W/ Y) is a decreasing function of degree of monopoly power and the ratio of raw material costs to wage costs.

Summary

Let us go through the basic points of the chapter-

- David Ricardo was one of the prominent English economists. He was one of the four pillars of classical economists. David Ricardo developed the theory of rent in the year 1817. Ricardo used the concept of economic rent to analyze a particular question.Devid Ricardo defined rent as,-

  "that portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible powers of the soil."

- According to Ricardo rent arises because of the differences in the fertility of the soil.So, he stated that rent is that part which shows the differential surplus of land when various grades of land are brought under cultivation. Ricardo assumes that the different grades of lands are cultivated gradually in descending orders; the first grade land is cultivated at first, then the second grade, after that the third grade of land is brought for cultivation and so on.With the increase in the size of existing population and also with the consequent rise in the demand for agricultural produce (i.e, food items), gradually the inferior grades of lands are also brought for cultivation, thus creating a differential surplus in production or rent for the superior grades.

- Marx developed theory of wage in the period 1849-1883. Marxian theory is basically based on the basic assumptions that similar to the other articles, labor is also an article or object which could be bought against the payment of its price i.e. also known as wages. The theory of wage developed by Marxdepends on the labor theory of value (LTV) and hence it is also known as theory of surplus value.The payment to labour, according to Karl Marx, is at the subsistence level which is much more less than in ratio to time, labor takes to generate items. Marxd said that this surplus goes to the owner of the produce. Karl Marx is famous for his excellence in the favor of labor.

- According to Marx, labor is seemed to be an article (or commodity as well) which can be bought on payment of a definite price. In case of an ordinary commodity, the price of a product is defined by the time and effort spent to produce it. But the laborer is not paid in proportion to the effort and time needed to produce it and the surplus or the excess thus raised exploiting the labour goes to the management or the owners to meet their other expenses.

- The main contribution of Kaleckiis regarding formulation of profit equation which is influenced by the basics of Marxist economics of surplus value and also, the organic composition of capital. Marx did not explain the total volume of profits in a given period. Later on, it was Kalecki who derived the relationship concisely.

- According to his profit theory of distribution, Kalecki stated that profit share from national income is a direct and proportional function of degree of monopoly power. Similarly, profit share out of national income is also a direct function of the ratio between raw material costs to the wage cost.

Keywords

Ricardian theory of rent- Determines rent with the help of differential supply of soil.

Marxian theory- Determines surplus value on exploitation of wage generating unemployment.

Kalecki's theory - Determines profit share from national income on basis of degree of monopoly power.

Review Questions

1. What is rent?
2. How can rent be considered as a differential surplus?
3. How can rent be determined? Cite an example
4. What are the drawbacks of the Ricardian theory?
5. What is industrial reserve army? How is it created?
6. What is the process of earning surplus profit according to Marx?
7. In what areas Kalecki brought the development on Marxian theory?
8. How wage share of income is dependent on degree of monopoly power?

Self Assessment

1. Economic rent may be defined as

A. Payment made to a factor of production in excess of the minimum amount necessary to keep the factor in its present occupation
B. Present Earnings - Transfer Earnings.
C. Differential surplus
D. None of these

2. Gross rent is

A. Present Earnings - Transfer Earnings.
B. Differential surplus
C. The rent which is paid for the services of land and capital invested on it.
D. All of these

3. Gross rent includes-

A. Payment for the use of land
B. Interest on capital invested on it
C. Wages for the services of land lord for supervising the investment in land.
D. All of the above

4. Quasi rent is

A. The surplus earned by man made factors of production whose supply is inelastic.
B. Wages for the services of land lord for supervising the investment in land.
C. Payment for the use of land.
D. Interest on capital invested on it.

5. David Ricardo developed the theory of rent in

A. 1850
B. 1776
C. 1817
D. 1878

6. According to Ricardo, the supply of land is

A. Unlimited
B. Fixed
C. Elastic
D. None of the above

7. According Ricardo rent arise due to the difference

A. Quantity
B. Productivity
C. Fertility
D. None of these

8. Karl Heinrich Marx was born in

A. London
B. Trier, Germany
C. Paris, France
D. Frankfort, Germany

9. Marxian theory of wage depends on

A. Wage theory
B. Risk theory
C. The labor theory of value
D. All the above

10. Marx defined rate of exploitation as

A. S/V
B. S+V+C
C. S+V
D. All the above

11. Who explained the concept of increasing misery.

A. Hoper
B. Marx
C. Bonham
D. All of them

12. In Kalecki's theory, P + W = Cw+ Cp+ I, P represents

A. Price
B. Product
C. Profit
D. None of these

13. In Kalecki's theory, P + W = Cw+ Cp+ I, Cw represents

A. Consumers' price
B. Workers' consumption
C. Profit
D. None of these

14. Lerner's equation is shown by :

A. M=(P-M)/P
B. M=(M-P)/M
C. M=(PXM)/P
D. None of these

15. According to Kalecki, there is an effect on the share of wage and profit

A. When national income changes
B. When the degree of monopoly power changes
C. When wage changes
D. None of these

Answers for Self Assessment

1.	A	2.	C	3.	D	4.	A	5.	C
6.	B	7.	C	8.	B	9.	C	10.	A
11.	B	12.	C	13.	B	14.	A	15.	B

Further Readings

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Unit 04: The Economics of Welfare

CONTENTS

Objectives

After this you will be able to

- learn briefly about the individualabout social welfare.
- learn how utility or satisfaction determines both individual as well as social welfare.
- learn how Pigou uses the dual criterion to define welfare.
- learn briefly about the determination of profit by Kaleki,
- learn how the degree of monopoly power determines the share of wage and profit,
- learn about the distribution of national income into wages and profits by using Lerner's index.
- learn briefly about problems and limitations of determining social welfare,
- learn about the possibility of solutions and extension of the analysis of social welfare.
- learn equity and efficiency and determination of social welfare by Bergson,
- learn about the determination of social welfare and optimum welfare bygrand utility possibility curve.

Introduction

Welfare means the improvement or enhancement of the quality of life as well as the standard of living. It takes place both onan individual and social level. Individual welfare means the enhancement in the life of an individual. Social welfare is the sum of individual welfare. Social welfare simply means the assistance received by all theindividuals and families of a country inneed, from different programs such as health care assistance, food supply, and unemployment allowances, old age pension, proper health care and medications, educational facilities, access towell-equipped infrastructure, disaster relief, etc. The government provides such assistance or grants to individuals or citizens directly or indirectly for the betterment of their living standards. In this chapter, we will discuss individual and social welfare, Pigou's concept of welfare,the role of value judgment, problems of social welfare maximization,and alsosocial justice and social welfare.

Microeconomics Theory and Analysis – II

4.1 Individual and Social Welfare

Welfare economics deals with how markets form and the share of economic goods and assetsto find out the overall betterment level of society. Using the approaches like cost-benefit analysis as well as social welfare functions, welfare economics defineshow the economy changes with the costs and benefits.Welfare economics is based on the assumption of interpersonal measurement and comparison of utilityamong the individuals, and also the ethical and philosophical values about well-being.

Regarding welfare let us consider some of the definitions-

- "That branch of study which endeavors to formulate propositions by which we may rank on the scale of better and worse, alternative economic situations open to society" – Mishan

- "Welfare economics is concerned with the conditions which determine the total economic welfare of a community"- Oscar Lange

- "Welfare economies is that branch of economic science that attempts to establish and apply the criteria of propriety to economic policies" –Rider

From the above definition is clear that welfare economics is a separate branch of economics that basically deals withestablishing and applying the criteria of propriety to economic policies. This is based on some propositions by which we may rank on the scale of better and worse, alternative economic situations open to society that is concerning the economy or the community as a whole.

Welfare economics defines how the structure of markets and the allocation of economic goods and resources determines the overall well-being of society. Using tools such as cost-benefit analysis and social welfare functions, welfare economics evaluates the costs and benefits of changes to the economy.Welfare economics depends on the assumption of interpersonal measurability and comparability of human welfare across individuals, and the value of other ethical and philosophical ideas about well-being.

A widely held view is that welfare economics is positive and normative.Welfare economics is positive economics because it attempts to examine and predict the welfare implications of the functioning of the economic system.Welfare economics is normative economics because it provides guidelines for policy formulations to maximize social welfare depending on value judgments.

Individual welfare refers to the sum-total of satisfaction derived by an individual from the consumption of certain goods. Individual satisfaction is linked with individual choice. This means an individual's preference in the consumption of a bundle of goods. An individual chooses the combination of goods that gives him the maximum satisfaction. Individual welfare is derived from the individual utilityof the consumption of goods. This determines the individual satisfaction level.

On the other hand, social welfare is the sum of the satisfaction of all the individuals in society. The object of social welfare is to ensure for each human being the economic necessities, a decent standard of health and living conditions, equal opportunities with his fellow citizens, and the highest possible degree of self-respect.It is individual welfare that is the basis of social welfare.

There are two ways to determine utility or satisfaction from the consumption of goods.

a) **Demand theory (Marshall)- cardinal measurement of utility -**According to Marshallian utility analysis utility is measured in quantitative units (utils) and it is additive. The utility can be interpersonally comparable. Hence, utility is expressed in terms of Total Utility (TU)and Marginal Utility (MU).Total utility is the total level of satisfaction derived by an individual from the consumption of a definite bundle of a commodity. Similarly, marginal utility is the extra satisfaction derived by an individual from the consumption of an extra unit of a commodity. In this analysis, the operation of the law of diminishing marginal utility is assumed to be existent. This means when the consumer increases the consumption of certain units of a commodity the utility derived from each successive unit of consumption gradually goes on diminishing. Thus, the cardinal utility may be used as the level of satisfaction. The level of satisfaction in turn means the levelof welfare. Thus,

the utility derived by consuming a bundle of the commodity by an individual means the individual welfare. A sum of utility or satisfaction, hence the welfare of all individuals living in a society is social welfare.

b) **Indifference curve theory (Hicks)- ordinal measurement of utility –**According to this theory consumer ranks the consumption bundles according to the order of priority (choice). This approach is based on the fact that the utility of a commodity is not measurable in absolute quantity, but it is possible for a consumer to express subjectively whether the utility derived from the consumptionof a commodity is more or less or equal when compared to another.In this type of utility, the indifference preference of the combination of the goods is to be selected.Similar to the cardinal utility analysis, here, also the law of diminishingmarginal rate of substitution (MRS) is applicable. This means when a consumer goes on increasing the consumption of a certain commodity,he will be gradually releasing the lesser and lesser unit of the other commodityin order to remain at the same level of satisfaction from different combinations of consumption. Thus, the satisfaction or utility derived from the different combinations of goods reflects the level of welfare for the consumer. This is said to be the individual welfare. The sum of the individual welfare is known to be social welfare in this sense.

4.2 Pigou's concept of Welfare

Arthur Cecil Pigou was a professor of economics at the University of Cambridge. He is the founder of "Welfare Economics".His leading ideas on welfare economics are found in his "Economics of Welfare" (1920). Prof. Pigou popularized the word welfare and gave concrete meaning to it.According to Pigou-

welfare is *"that part of social (general) welfare that can be brought directly or indirectly into relation with the measuring rod of money."*

Hence, economic welfare implies the satisfaction of utility derived by an individual from the use of exchangeable goods and services.According to Pigou, welfare is a psychological phenomenon and it resides in a man's state of mind which is made up of his satisfactions or utilities.

The basis of welfare is the extent to which an individual's desires are met.Individual welfare depends on the level of utility an individual consumer gets out of the consumption of a certain bundle of goods.Social welfare is regarded as the summation of all individual welfares in a society.

According to Pigou, there are two conditions to maximize welfare-

a) The first condition states that welfare is said to increase when national income increases. Given the same tastes and income distribution, an increase in national income represents an increase in welfare.

b) Second, for welfare maximization the distribution of the national income is equally important. If national income remains constant, transfers of income from the rich to the poor would improve welfare.

There are some assumptions on which Pigou's welfare criteria is based:

a) Each individual tries to maximize his satisfaction from his expenditure on different goods and services.

b) Satisfactions are comparable both intra-personally and interpersonally.

c) The law of diminishing marginal utility of income applies. It means that the marginal utility of income falls, as income increases. As a result, the gain in the utility of an additional amount of

income to a poor man is greater than the loss of utility to a rich man from the same amount of income.

d) There is equal capacity for satisfaction. It implies that different people derive the same satisfaction out of the same real income. Given these assumptions, it is possible to satisfy the Pigovian conditions of maximum social welfare on the basis of his dual criterion.

Pigou's dual criterion:

Pigou's dual criterion is based on the Pigovianconditions. As stated above in the conditions-

First, an increase in the national income 'brought about either by increasing some goods without diminishing others or by transferring factors to activities in which their social value is higher,' is regarded as an improvement in welfare without reducing the share of the poor.This condition has strictly relatedto the increase or decrease of national income or output of a country. Whether there is an increase or decrease inincome or output of the country, it will have a direct impact on the increase or decrease of social welfare. Thus, it is the volume or size of the national output or welfare of a country thatdecidessocial welfare. This can also besaid as the income aspect of Pigoviansocial welfare.

Second, any reorganization of the economy which increases the share of the poor without reducing the national income is also considered an improvement in social welfare. This means even though the national income remains the same, a transfer of resources from the richer section of the society to the poorer section means an improvement in the society. This can also be said as the distribution aspect of Pigovian social welfare.

Pigou has made a distinction between private and social costs to analyze his criterion. Pigou introduced the concept of private marginal cost (PMC), private marginal benefit (PMB), social marginal cost (SMC), and social marginal benefit (SMB) in this regard.

The private marginal cost (PMC) of a commodity is the cost of producing an additional unit.It is related to a private entrepreneur. The cost that an individual entrepreneur incurs in producing certain additional units of output is hence said to be the private marginal cost (PMC). The social marginal cost (SMC) is the expense or damage to society as a consequence of producing that commodity. When a producer producescertain output for his own profit motives, it may have a negative impact (such as pollution) on society. It is the cost to society. This is known as social marginal cost (SMC).

Similar to PMC and SMC, there may be a private marginal benefit (PMB) and social marginal benefit (SMB) due to the production of a certain commodity. Private marginal benefit can be measured by the selling price of the commodity. It is the extrabenefit received by an individual by selling his extra unit of output. Social marginal benefit refers to the extra benefit that society gets from the production of an additional unit.

By making a distinction between social and private valuations of economic activity, Pigou analyses the effect of externalities in social welfare.The presence of externalitiesin production was seen by Prof. Pigou as the divergence between social net product and private net product.The divergence between the two products shows itself in the form of externalitiesof production associated with marginal increments of output.

In some cases,the social net product is more than the private product while in others private product is greater than the social product. He was of the opinion that the state should equalize the private net product with the social net product, if, in an industry where the private net product is more, it should be taxed, and if another industry shows a lesser private net product, it ought to be subsidized.For Pigou, the social optimum prevails when marginal social products are equal in all industries and thus production of real wealth is maximized.

Assuming that all the productive resources are being employed and that there is no cost of movement between different occupations and places, it can be concluded that the national dividend is the largest when the values of the marginal social net products are equal in all industries. If this arrangement prevails, society is having its "ideal output".

Criticism:

- The notion of maximization is not clear. In, Pigovian theory the concept of maximization of social welfare depends on an abstract idea of either increase in income or transfer of resources from rich to poor; but no concrete analysis has been given.
- Pigou measures 'welfare' cardinally. The biggest mistake that did is welfare is supposed to be based on cardinal measurability, but in some cases, it is very difficult to find out numeric value of level satisfaction derived by an individual from consumption of a commodity.
- National Income is not an accurate measure of welfares. Pigou only focuses on the national income as the measuring rod of welfare; but ignores some aspects as the standard of living, quality of life, happiness, etc. which also impacts significantly on the wellbeing of the people.
- Pigou does not clarify the ethical relation of welfare. Pigou did not clearly state the rightness and wrongness of a certain level of satisfaction or utility.

Despite these demerits, the Pigovian analysis has led modern economists to expound on the 'compensation principle' and the 'social welfare function' which are attempts at giving a new tinge to welfare economics.

4.3   Role of Value Judgement

Value judgment is a judgment of the rightness or wrongness of something or someone based on a comparison.A value judgment can refer to a judgment based upon a particular set of values or on a particular value system.

Some statements like 'this will increase social welfare', 'Social development is expected', 'inequalities in the society are to be reduced', are examples of value judgments. To know value judgment we need to know the positive and normative statements.

Positive statements are objective, factually based comments that can be tested. They are not influenced by the opinion or prejudice of people.They allow scientific testing to take place that can be accepted or rejected.

Normative statements are subjective, questionable comments that are difficult to test.They are influenced by the opinion or prejudice of people.Normative statements require value judgments.This means value judgments evaluate things with respect to certain standards or norms.

Value judgments have an important role in economic decision-making. Economic agents have to choose between alternative options.For every decision made there is an opportunity cost.The future of every decision is uncertain.This means that choices have to be made that will lead to uncertain outcomes.Economic decision-making and policy are based on value judgments.

Value judgment also impactsthe determination of social welfare. Welfare depends on utility or levels of satisfaction. As already stated, there are two forms of welfare- individual welfare and social welfare.Individual welfare is derived from the individual level of satisfaction from the consumption of different combinations of goods.Social welfare is the sum of individual welfare.

Value judgments mean the conceptions or ethical beliefs of the people about what is good or bad based on ethical, political, philosophical, and religious beliefs of the people.Now, the question arises whether value judgments should be included in welfare economics or not.

Robbins and his followers have been asserting that the inclusion of value judgments would make our subject unscientific and therefore, according to them, economists should refrain from making value judgments.

But modern economists are on the view that value judgments should be considered, and economists should comment upon the desirability of economic policies and issues.Value judgment has an impact on social welfare function. Here is a statement in this regard-

"The social welfare function can be thought of as a function of each individual's welfare which in turn depends both in his personal well being and on his appraisal of the distribution of welfare among all members of the community"- Prof. Scitovsky

The value judgments required to construct social welfare function may be obtained in two ways-

- Dictatorial manners
- Democratic process

In a dictatorial manner, the social welfare function depends upon the value judgments of the person or institution that has been assigned by the society to do so to a particular authority.

The authorized person or institution must be unbiased for true value judgments regarding social welfare because changes in social welfare will depend upon his justifications. In this case, Bergson and Samuelson have introduced the concept of a "Superman" who undertakes the value judgments about the changes in social welfare. He takes decisions in relation to the solution of various problems in the economy.

In the democratic process, the social welfare function is decided through the method of voting by individuals, and majority rule and a common consensus arrive among the individuals. The political system comes into the jurisdiction of determining social welfare by value judgment.

The modern age witnesses people elect their own representatives and these representatives constitute the government by democratic process. The representative authority is responsible fortaking decisions regarding the framing of various plans and policies on the basis of value judgments.

It is expected that all the policy decisions taken by the government are likely to maximize social welfare instead of maximizing the welfare of a particular person.

Bergson and Samuelson expressed that social welfare function achieved either by dictatorial manner or by democratic process depending on value judgments must be consistent.

4.4   Social Justice and Social Optimum

To know social justice and social optimum, we need to know efficiency and equity. Efficiency is concerned with the optimal production and allocation of resources given existing factors of production. There are different types of efficiencies:

- Allocative Efficiency: Allocative efficiency occurs when all goods and services within an economy are distributed according to consumer preferences.

- Productive efficiency: Productive efficiency is observed when theoptimal combination of certain inputs results in the maximum or optimumlevel of output at minimal costs.

- Dynamic efficiency: It occurs over time, as innovation and new technologies reduce production costs.The introduction of new technology is subject to dynamic efficiency.

- Social Efficiency: This type of equity is concerned with the distribution and allocation of resources in society. This type of efficiency occurs when goods and services are optimally distributed within an economy, also taking externalities into account.

- X-efficiency: It occurs when a firm or an entrepreneur has an incentive to produce maximum output at a given level of input.

Equity is concerned with how resources are distributed throughout society.Again, there are different types of equity.

- Vertical equity: Vertical equity is concerned with the relative income and welfare of the whole population. It is concerned with how equitably resources are distributed and may imply higher tax rates for high-income earners and lower taxes for lower-income levels.

- Horizontal equity: Horizontal equityis treating everyone in the same situation the same. This means similar treatment for similar income categories. For example, everyone earning £15,000 should be taxed at the same rate.

Both efficiency and equity lead to maximum or optimum social welfare.Pareto defined how efficiency in consumption, production, and product mix leads to social welfare.

Bergson's social welfare function and the grand utility possibility frontier can be used to find social justice and the social optimum. A social welfare function is analogous to individual consumers' utility function. It provides a ranking of alternative states in which different individuals enjoy different utility levels.

Bergson's Social Welfare Function:

In the diagram, Bergson's social welfare function is drawn. W1, W2, and W3 are the social welfare function or community indifference curve. Each curve shows the locus of combinations of two goods that yield the same level of satisfaction. In the diagram, let us consider a social welfare function W1. Points and a and b in the W1 social indifference curveshow the same level of welfare. The higher the social indifference curve shows the higher level of welfare or wellbeing to the society. In the diagram point, d>c>a,b in terms of utility. This means W3>W2>W1.
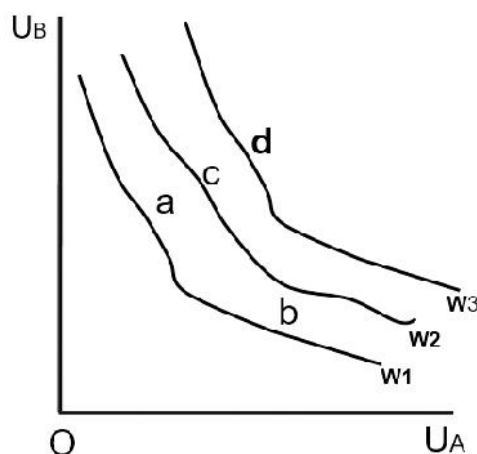
Figure4.1 :Bergson's social welfare function

These are social indifference functions similar to the individual indifference curve.Higher functions show a higher level of satisfaction.

Assumptions:

Following are the assumptions of Bergson's social welfare function.

- There are two factors, L and K.
- There are two goods, X and Y.
- There are two consumerswhose preferences are represented by the indifference curve.
- The goal of consumers is to maximize utility and the goal of producers is to maximize profit.
- Production functions are independent.
- The utilities of consumers are independent.

Given these assumptions, a social welfare function can be defined as:

W= f (UA, UB).

Where, UA and UB are the utilities of two different individuals.

If we showthis function with the help of a diagram, the efficiency in product mix is at point e, where,

$MRTS = MRS^A_{xy} = MRS^B_{xy}$

Point e, is the point where the highest or grand utility is derived by the production possibility frontier (PPF). Here, the marginal rate of technical substitution i.e, production efficiency equates to the marginal rate substitution of the consumers i.e., consumption efficiency.
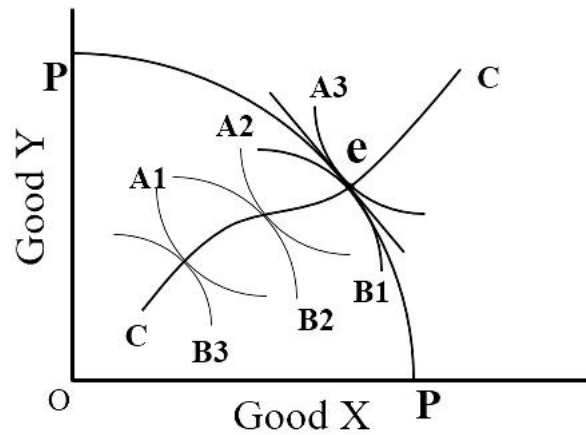
Figure 4.2: Bergson's social justice and social optimum

From such a grand utility point from the PPF curve, we derive the grand utility possibility frontier. All the points of the grand utility possibility frontier. A grand utility–possibility frontier or utility possibilities curve, is analogous to the production–possibility frontier. It shows the maximum amount of utility of a person given each level of utility attained by all others in society. The utility–possibility curve or frontier is the upper frontier of the utility possibilities that shows the utility levels by an agent from a given amount of output. These utility levels are derived from a consumer Edgeworth box. The slope of the curveshows the trade-off of utilities between two individuals. Thus, it shows the utility gain of an individual at the cost of utility loss of another individual. All the points on the curve are Pareto efficient. So, the utility possibility curve or frontier represents the social optimum and maximization of the given social welfare function.

The grand utility possibility frontieris shown in the diagram below-

UU is the utility possibility frontier. UPF is a downward sloping curve.
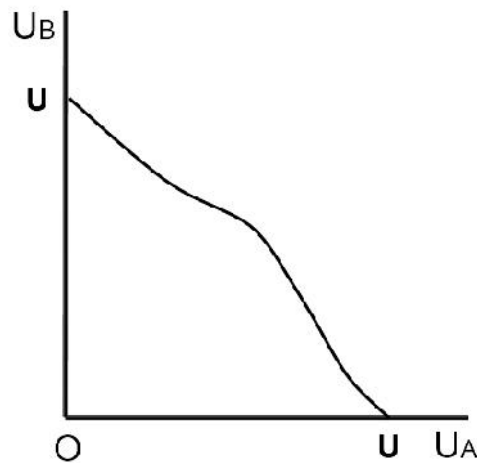
Figure 4.3: Bergson's utility possibility frontier
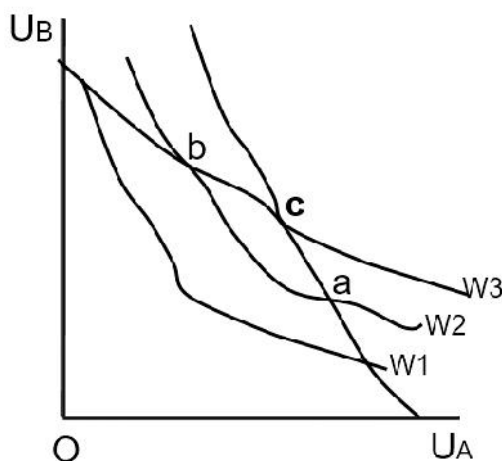
Figure 4.4: Bergson's utility possibility frontier

Grand utility possibility is combined with social welfare function as shown by a set of social indifference curves. In the diagram, W1, W2 and W3 are social indifference or community indifference curve. Points a, b and are different points corresponding to the social indifference curve and utility possibility frontier. Given these points, W3 is the highest possible community indifference curve that is achieved by the given utility possibility frontier. This is the 'point of bliss' that represents the highest possible (optimum) social welfare.

4.5   Problems and Limitations of Welfare Maximization

There are certain problems of and limitations of social welfare maximization. These are discussed one by one through the following points-

- **Existence of community indifference curve in output space-**The community indifference curve does not have a unique shape, like the individual indifferent curve.This variation in slope causes difficulty to find out the maximum social welfare by using the grand utility possibility curve.

- **Existences of externality -**Due to the presence of externality two possibilities were found to occur. These are counted to be some serious bottlenecks:

First, Pareto optimal conditions are violated.

Second, the constants embedded in the system lose their significance as 'prices' because they do not reflect all the costs and benefits of action to society as a whole.

- **The shape of the community indifference curve is not unique as it exists in output as well as utility space–**The reason non-uniqueness of the community indifference curve is shown in the diagram below where every point on the product mix relates to the grand utility possibility frontier and the 'point of bliss' at point c corresponds to the highest possible social indifference curve.

Figure 4.4: Utility possibility frontier and community indifference curve

- **Joint and intermediate products -** Products are produced jointly but maximization of social welfare is only determined for single products. Interlinkage of different products in production causes difficulty to find out maximization of social welfare due to the presence of the joint products.
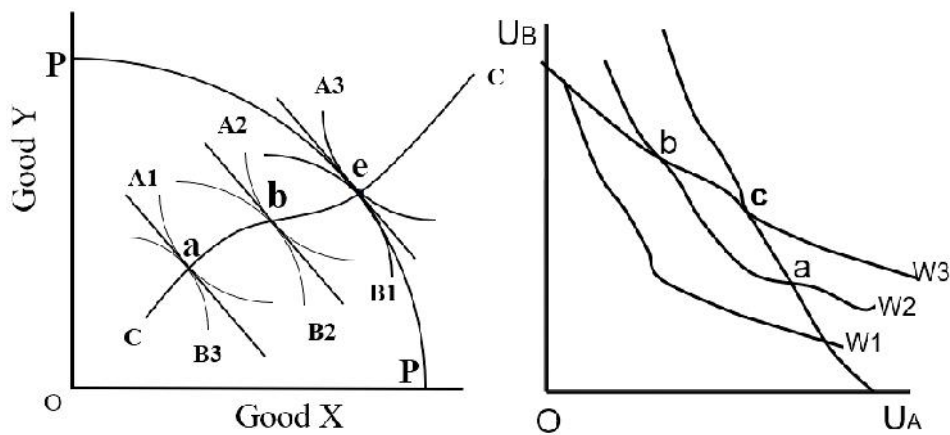
- **Decreasing returns to scale -** In maximization of social welfare, constant returns to scale are assumed to hold good.In presence of decreasing returns to scale, the value of output will exceed the total payment to the factors of production: productsare not 'exhausted' by factor payments. This creates ambiguity about how to treat the imbalance between the total value of output and total payments to factor owners in determining social welfare.

- **Elastic supply of factors -** Maximization of social welfare is determined on the basis of constant quantities of factor supply. Factor supply is elastic in nature. Elastic supply of factors impacts the production possibility curve. Equilibrium in product mix is difficult to find out in the presence of elastic supply of factors.

- **Indivisibilities in production-** Ifmany firms exist in production and if the production methods are indivisible, the small firms cannot take advantage of the lower costs of the large-scale production.The small firms produce below PPC.Due to indivisibility, they cannot make full use of available technical knowledge.

- **Increasing returns to scale -** Increasing returns to scale causes serious difficulties.It affects the position ofthe isoquant rather than the shape.Increasing returns to scale impacts the average cost curve as well as the production possibility curve which in return affects the level of production.The level of production impacts social welfare.

Summary

Welfare economics defines how the structure of markets and the allocation of economic goods and resources determines the overall well-being of society. Using tools such as cost-benefit analysis and social welfare functions, welfare economics evaluates the costs and benefits of changes to the economy.Welfare economics depends on the assumption of interpersonal measurability and comparability of human welfare across individuals, and the value of other ethical and philosophical ideas about well-being.Individual welfare refers to the sum-total of satisfaction derived by an individual from the consumption of certain goods. Individual satisfaction is linked with individual choice. This means an individual's preference in the consumption of a bundle of goods. An individual chooses the combination of goods that gives him the maximum satisfaction. Individual welfare is derived from the individual utilityof the consumption of goods. This determines the individual satisfaction level. On the other hand, social welfare is the sum of the satisfaction of all

the individuals in society. The object of social welfare is to ensure for each human being the economic necessities, a decent standard of health and living conditions, equal opportunities with his fellow citizens, and the highest possible degree of self-respect.It is individual welfare that is the basis of social welfare.There are two ways to determine utility or satisfaction from the consumption of goods- a. Demand theory (Marshall)- cardinal measurement of utility - According to Marshallian utility analysis utility is measured in quantitative units (utils) and it is additive. The utility can be interpersonally comparable. b. Indifference curve theory (Hicks)- ordinal measurement of utility – According to this theory consumer ranks the consumption bundles according to the order of priority (choice). This approach is based on the fact that the utility of a commodity is not measurable in absolute quantity, but it is possible for a consumer to express subjectively whether the utility derived from the consumption of a commodity is more or less or equal when compared to another.

According to Pigou-welfare is *"that part of social (general) welfare that can be brought directly or indirectly into relation with the measuring rod of money."* Hence, economic welfare implies the satisfaction of utility derived by an individual from the use of exchangeable goods and services. According to Pigou, welfare is a psychological phenomenon and it resides in a man's state of mind which is made up of his satisfactions or utilities. The basis of welfare is the extent to which an individual's desires are met. Individual welfare depends on the level of utility an individual consumer gets out of the consumption of a certain bundle of goods. Social welfare is regarded as the summation of all individual welfares in a society. According to Pigou, there are two conditions to maximize welfare- a. The first condition states that welfare is said to increase when national income increases. Given the same tastes and income distribution, an increase in national income represents an increase in welfare. b. Second, for welfare maximization, the distribution of the national income is equally important. If national income remains constant, transfers of income from the rich to the poor would improve welfare.

Value judgment is a judgment of the rightness or wrongness of something or someone based on a comparison.A value judgment can refer to a judgment based upon a particular set of values or on a particular value system.Some statements like 'this will increase social welfare, 'Social development is expected', 'inequalities in the society are to be reduced', are examples of value judgments. Value judgments have an important role in economic decision-making. Economic agents have to choose between alternative options.For every decision made there is an opportunity cost.The future of every decision is uncertain.This means that choices have to be made that will lead to uncertain outcomes.Economic decision-making and policy are based on value judgments. Value judgment also impacts the determination of social welfare. The value judgments required to construct social welfare function may be obtained in two ways- a. Dictatorial manners and b. Democratic process. In a dictatorial manner, the social welfare function depends upon the value judgments of the person or institution that has been assigned by the society to do so to a particular authority.The authorized person or institution must be unbiased for true value judgments regarding social welfare because changes in social welfare will depend upon his justifications. In this case, Bergson and Samuelson have introduced the concept of a "Superman" who undertakes the value judgments about the changes in social welfare. He takes decisions in relation to the solution of various problems in the economy.In the democratic process, the social welfare function is decided through the method of voting by individuals, and majority rule and a common consensus arrive among the individuals. The political system comes into the jurisdiction of determining social welfare by value judgment.

Social Justice and Social Optimum - Both efficiency and equity lead to a maximum or optimum social welfare. Pareto defined how efficiency in consumption, production, and product mix leads to social welfare. Bergson's social welfare function and the grand utility possibility frontier can be used to find social justice and the social optimum. A social welfare function is analogous to individual consumers' utility function. It provides a ranking of alternative states in which different individuals enjoy different utility levels. Grand utility possibility is combined with social welfare function represents the highest possible (optimum) social welfare.

Following are certain problems of and limitations of social welfare maximization.

a. Existence of community indifference curve in output space

b. Existences of externality.

c. The shape of the community indifference curve is not unique as it exists in output as well as

utility space Joint and intermediate products

d. Decreasing returns to scale

e. Elastic supply of factors

f. Indivisibilities in production

g. Increasing returns to scale

Keywords

Individual welfare- Utility derived by an individual from different consumption bundles.

Social welfare- The sum of individual welfare living in a society.

Value judgments- A judgment of the rightness or wrongness of something or someone based on a comparison.

Optimum social welfare -Highest possible social welfarerepresented by grand utility possibility curve combined with social welfare function.

Self Assessment

1. Who said, "Welfare economics is concerned with the conditions which determine the total economic welfare of a community"?

A. Oscar Lange

B. Kaldor

C. Hicks

D. Pareto

2. Welfare economics is a positive economics because

A. It deals with human being

B. It is based on value judgement

C. It attempts to examine and predict the welfare implications of the functioning of the economic system.

D. All the above

3. Welfare economics is a normative economics because

A. It provides guidelines for policy formulations to maximize social welfare depending on value judgments.

B. It is based on value judgement

C. It attempts to examine and predict the welfare implications of the functioning of the economic system.

D. None of these

4. Who is the founder of "Welfare Economics"?

A. Hicks

B. Pareto

C. Pigou

D. All of them

5. Social welfare is regarded as

A. Welfare received by an individual
B. Market value of all goods and services
C. Total product of the country
D. The summation of all individual welfares in a society

6. The private marginal cost of a commodity is

A. The cost of producing an additional unit
B. The cost of producing total units
C. Both of these
D. None of these

7. Social marginal benefit refers to

A. The total benefit that society gets from the production of an additional unit.
B. The cost of producing an additional unit
C. The cost of producing total units
D. None of these

8. Pigou measure 'welfare'

A. Cardinally
B. Ordinally
C. Both
D. None

9. According to democratic rule of value judgments

A. A dictator takes all decision
B. People decides everything by voting
C. Both are true
D. None of them are correct

10. According to authoritarian rule of value judgments

A. A superhuman takes all decision
B. People decides everything by voting
C. Both are true
D. None of them are correct

11. Pareto criterion is violated due the

A. Due to value judgment
B. Due to ethical beliefs
C. Existence of externality
D. All of these

12. Due to increasing returns to scale the AC curve

A. Slopes upward
B. Becomes stagnant
C. Slopes downward
D. Does not change

13. Which is not type of efficiency in welfare economics

A. Allocative Efficiency
B. Productive efficiency
C. Social Efficiency
D. Consumption efficiency

14. X-efficiency occurs when

A. A firm has an incentive to produce maximum output with a given amount of input.
B. A firm produces below AC
C. A firm face decreasing costs
D. None of these

15. Horizontal equity

A. Treats everyone in the same situation differently.
B. Treats everyone in the same situation the same.
C. Both are correct
D. None of them are correct

Answers for Self Assessment

A	2.	C	3.	A	4.	C	5.	D
A	7.	A	8.	A	9.	B	10.	A
C	12.	C	13.	D	14.	A	15.	B

Review Questions

1. What is individual welfare?
2. What is social welfare?
3. What is Pigou's condition of welfare?
4. What is the democratic rule of value judgment?
5. What is the dictatorial rule of value judgment?
6. How does value judgment determine social welfare?
7. Explain briefly Bergson's concept of social welfare?
8. State briefly and show graphically the concept of the community indifference curve.
9. What point of 'point of bliss'? Explain diagrammatically how it can determine the optimum social welfare.
10. Briefly explain the problems and limitations of social welfare.

Further Readings

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Unit 05:Criteria for Welfare Improvement

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Objectives
Introduction
5.1   Conditions For Pareto Optimality
5.2   General Ethical Criterion & Kaldor's Criterion
Summary
Keywords
Self Assessment
Answers for Self Assessment
Review Questions
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Objectives

After this chapter, you will be able to

- learn about Pareto improvement,
- learn about Pareto optimality,
- learn about the conditions of Pareto optimality.
- learn about Pigou and Pareto's concept of welfare,
- learn about Kaldor's improvement on welfare over Pareto,
- learn about the use of the compensation principle in determining social welfare.

Introduction

As discussed in the previous chapter, welfare means the improvement or enhancement of the quality of life as well as the standard of living. It takes place both onan individual and social level. Individual welfare means the enhancement in the life of an individual. Social welfare is the sum of individual welfare. Thus, social welfareimplies the assistance received by all theindividuals and families of a country inneed, from different programs such as health care assistance, food supply, and unemployment allowances, old age pension, proper health care and medications, educational facilities, access towell-equipped infrastructure, disaster relief, etc. The government provides such assistance or grants to individuals or citizens directly or indirectly for the betterment of their living standards. In this chapter, we will be discussing the different conditions given by Pareto relating to achieving different kinds of efficiencywhich imply maximization of social welfare. We will also go across the general ethical conditions and Kaldor's criterion of compensating principle to achieve maximum social welfare.

5.1   Conditions For Pareto Optimality

Before explaining the different conditions mentioned by Pareto, let us first go throughsome of the basic concepts given by Pareto while explaining the social welfare such as Pareto improvement, Pareto dominated, and Pareto optimality or efficiency.

Pareto improvement: Given an initial situation, a Pareto improvement is a situation where at least one person is better off without anybody is worse off. This means the movement from the off-contact curvein the Edgeworth box to a point on the contract curve.

Pareto dominated situation:A situation is called Pareto dominated if there exists a possible Pareto improvement. This is the initial point off the contact curve before redistribution in terms of the Edgeworth box.

Pareto optimality or efficiency:A situation is called Pareto optimal or Pareto efficient where it is not possible to make anyone better off without making some others worse off. In terms of the Edgeworth box, we can map the situation when redistribution takes place, i.e., the point on the contract curve.

Pareto efficiency is when an economy has its resources and goods allocated to the maximum level of efficiency, and no change can be made without making someone worse off.Pure Pareto efficiency exists only in theory, though the economy can move toward Pareto efficiency.

Assumptions of Pareto efficiency:

- It is assumed that two commodities, X and Y are being produced and consumed in the economy.
- There are two consumers as well as two producers (A and B) in the economy.
- There are two factors of production (i.e., K and L) in the economy.
- There is perfect competition in the economy.
- Pareto efficiency assumes a static analysis in the economy.
- There exists the law of diminishing returns, and utility.

Conditions of Pareto optimality:

Pareto's efficiency can be seen from three different aspects also said as Paretian conditions:

- Efficiency in consumption (Exchange)
- Efficiency in production (Allocation of inputs)
- Efficiency in both production and consumption (Product mix)

In these three areas, we can easily find out how Paretian efficiency is achieved. In the first one, Paretian efficiency can be found out by using the indifference curve analysis. Efficiency in production similarly can be traced out by using the isoquant curve approach. The thirdone however may be found out by using production possibility as well as the indifference curve. Now let us explain these in detail one by one.

Efficiency in consumption (Exchange):

Efficiency in exchange occurs if it is not possible to increase the utility or welfare of one consumer without reducing the utility or welfare of another consumerby redistributing any given bundle of goods between two consumers.

To cite an example here, let us assume that there are two individuals, of them, one with a basket of fruits and the other with a bundle cloth. Both of these individuals can be made better off by exchanging fruits for cloth. In such a scenario, an efficient exchange system will allow the exchange of fruits and cloth to take place until neither of the individuals can be made better off without at least one of them becoming worse off.

In the case of a multi-product and multi-consumer economy where everything is expressed in terms of money, the exchange is far more complicated and it obviously involves the use of money to simplify exchange. But the procedure is the same here also. So long as there is the provision that the products can be redistributed to make at least one person better off without making the other worse off, the economy does not operate optimally or operate under-optimally from the viewpoint of efficiency in exchange.

Thus, Pareto efficiency or optimality in exchange is an economic state where goods cannot be redistributed to make one individual better off without making another individual worse off. It implies that goods are distributed in the most economically efficient manner. Similarly, all individuals in an economy are said to be in a Pareto optimum state or achieving the maximum

welfare when no economic changes can make one individual better off without making at least one other individual worse off.

Pareto efficiency for two individuals can be shown by individual indifference curves as well as their marginal rate of substitution. According to the Pareto efficiency in exchange, the Marginal Rate of Substitution (MRS) between any two goods must be the same for every consumer of both products:
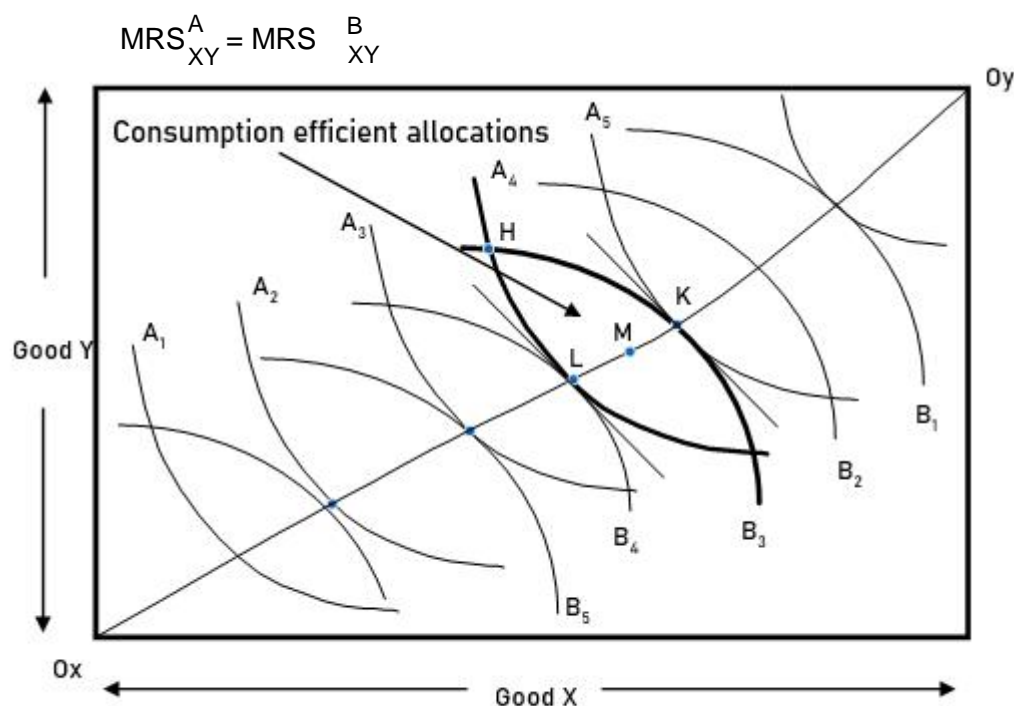
$$MRS^A_{XY} = MRS^B_{XY}$$

Fig. 5.1: Efficiency in exchange

Here, MRS^A_{xy} is the marginal rate of substitution of good x for good y for individual A and

MRS^B_{xy} is the marginal rate of substitution of good x for good y for individual B.

To explain the efficiency in consumption or exchange, we have taken the Edgeworth box diagram. The Edgeworth box is a graphical representation of a market with just two commodities, X and Y, and two consumers. It is a two-dimensional representation of the utility levels of two individuals and two items that are finite in supply. Ox is the origin from which the utility of individual A is measured and Oy is the origin from which the utility level of B is measured. A1, A2, A3, A4, A5, etc. are the indifference curves of individual A which measures his successively higher levels of utility. Similarly, B1, B2, B3, B4, B5 indifference curves measure individual B's successively higher levels of utility. Connecting the corresponding tangency points of the indifference curves of both individuals, we get a curve known as the **contract curve** (In the diagram, the curve connecting Ox and Oy). The contract curve represents all the points to be in Pareto optimal. Any point, off the contact curve is said to be Pareto dominated. This means, there is further scope of having efficiency after a proper redistribution. To explain these, let's consider the initial distribution of two goods between two individuals takes place at point H which is off the contract curve. At point H, individual A's utility is defined by A4 indifference curve and individual B's utility is defined by B3 indifference curve. This point is a sub-optimal point and hence Pareto dominated. The reason behind this is that a movement from this point to the contract curve by redistribution makes either each individually or both better off as they may reach a higher indifference curve with higher levels of satisfaction while the other utility levels remain intact. This is what is said as Pareto improvement. In such a case, if there is movement from point H to K, A will reach a higher indifference curve, i.e., A5 while individual B remains on his old indifference curve B3. This

indicates that individual A is better off (now on a higher indifference curve with higher levels of satisfaction) while B is not worse off (remains on his same indifference curve). Thus, point K lies on the contract curve which means the efficient distribution of two goods and hence is said as Pareto optimal point. Similarly, a movement from point H to L means individual B moves to a higher indifference curve, i.e., B4 from B3 but individual A remains on his earlier indifference curve. This again means that B is better off (moves to a higher indifference curve) but A is not worse off (remains on the same indifference curve). Point L on the curve means the Pareto optimal point. Again, a movement from point Hto any other point in between L and K, let's consider point M means both the individuals will be better off as both of them will be on a higher indifference curve. Hence, point M is a Pareto optimal point. Thus, any point on the contract curve means the Pareto optimal point of efficient distribution of both goods. These points will maximize the utility levels or welfare between the two individuals. The same thing can be generalized for many individuals. This is how efficiency in exchange can be attained.

Efficiency in Production (Allocation of inputs):

Production efficiency takes place when the available inputs or factors (such as labour,L and capital, Kl) of production are distributed or allocated in the production of two products in such a way so that it is no longer possible to reallocate the factors to increase the output of one product without reducing the output of another product. In some cases, it is possible to increase the production of the products by rearranging and reallocating the inputs without having any additional cost. This is because some inputs are more productivein some uses as compared to others.

For example, let us suppose there are two sector-agriculture sectors and the industrial sector. There is excess labour in the agriculture sector and labour shortage in the industrial sector. The productivity of the labour in the industrial sector is higher than that of the agricultural sector. In such a situation, it is possible to reallocate laboursbetween the sectors and shift some labours from agriculture to industry. Thus, the productivity of the industrial sector can be increased without decreasing the products of the industrial sector. This is how efficiency in production can be achieved.

Pareto efficiency for two factors can be shown by isoquants as well as their marginal rate of technical substitution. According to the Pareto efficiency in production, the Marginal Rate of Technical Substitution (MTRS) between any two goods must be the same for every producer of both products:
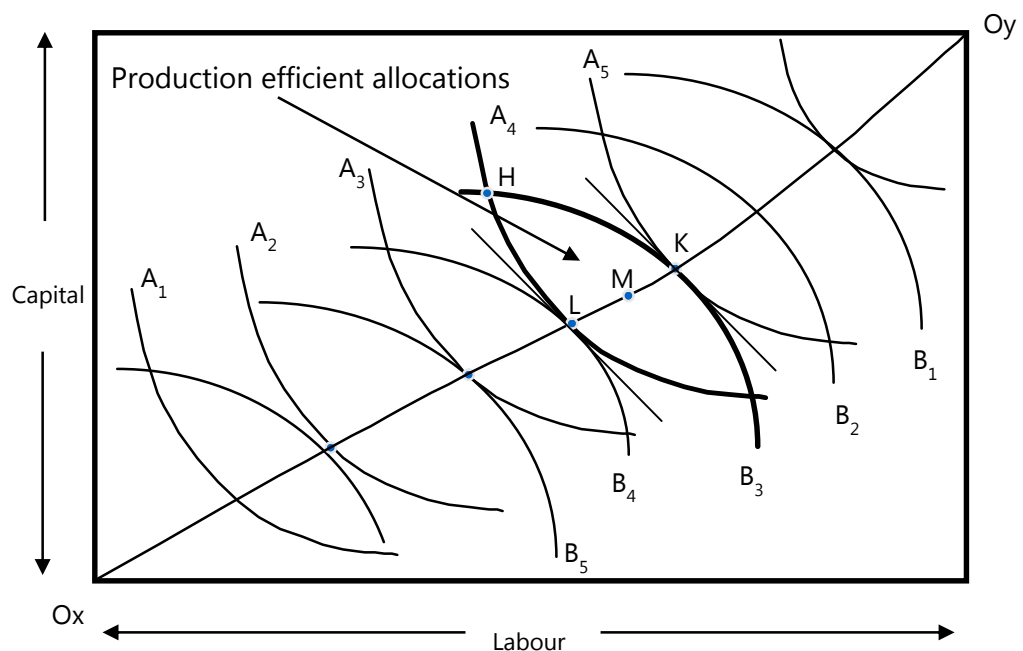
$$MRTS^X_{LK} = MRTS^Y_{LK}$$

Fig. 5.2: Efficiency in production

Here, $MRTS^X_{LK}$ is the marginal rate of technical substitution of labour for capital for good X and

$MRTS^Y_{LK}$ is the marginal rate of technical substitution of labour for capital for good Y.

To explain the efficiency in production, we have taken the Edgeworth box diagram. Ox is the origin from which the output of good X by using labour and capitalas inputs is measured and Oy is the origin from which the production of good Y is measured. A1, A2, A3, A4, A5, etc. are the isoquantsfor different levels of output ofgood X. Similarly, B1, B2, B3, B4, B5 isoquants measure different output levels of good Y. Connecting the corresponding tangency points of the isoquants of both the goods, we get a curve known as the **contract curve**(In the diagram, the curve connecting Ox and Oy). The contract curve represents all the points to be in Pareto optimal. Any point, off the contact curve, is said to be Pareto dominated. This means, there is further scope of having efficiency in the production of both the goods after a proper redistribution of inputs. To explain these, let's consider the initial distribution of factorsin the production of two goods takes place at point H which is off the contract curve. At point H, the output of good X is defined by A4 isoquant and the output of good Y is defined by B3 isoquant. This point is a sub-optimal point and hence Pareto dominated. The reason behind this is that a movement from this point to the contract curve by reallocation of factorsincreases the production of X or Y or both as one good may be produced at a higher isoquant with higher levels of output while the output levels of the other remain intact. This is what is said as Pareto improvement. In such a case, if there is movement from point H to K, the output of good X increases, i.e., moves from A4 to A5 while the output of Y remains the same on the old isoquant B3. This indicates that output of good X increases (now on a higher isoquant with higher levels of output) while production of Y is not worse off (remains on the same isoquant). Thus, point K lies on the contract curve which means the efficient reallocation offactors and hence is said as Pareto optimal point. Similarly, a movement from point H to L means the production of good Y increases, i.e., B4 from B3 but the output of good X remains on the earlier isoquant. This again means that output of Y increases (moves to a higher isoquant) but good X is not worse off (remains on the same isoquant). Point L on the curve means the Pareto optimal point. Again, a movement from point H to any other point in between L and K, let's consider point M; it means the output of both the products will increase as both of them will be on a higher isoquant. Hence, point M is a Pareto optimal point. Thus, any point on the contract curve means the Pareto optimal point of efficient allocation of factors in production both the goods. These points will maximize the output levels of the two goods. The same thing can be generalized for many goods. This is how production efficiency can be attained.

Efficiency in both production and consumption (Product mix) :

According to the Pareto efficiency in product mix, the bundle of factors used and the bundle of goods produced in the economy are so distributed that increasing production of one good and increasing satisfaction of one person is impossible without decreasing production of another.

This condition means that the optimum quantities of different commodities are to be produced with the given factor combinations. In this sense, it can be stated that "the marginal rate of substitution between any pair of products for any person consuming both must be the same as the marginal rate of transformation (for the commu-nity) between them." This can be expressed as,

$$MRTS_{XY} = MRS^A_{XY} = MRS^B_{XY}$$

Here, $MRTS_{XY}$ = Marginal rate of technical substitution of good X for Y,

MRS^A_{XY} = Marginal rate of substitution of good X for Y for individual A,

MRS^B_{XY} = Marginal rate of substitution of good X for Y for individual B.

Since the MRTS shows the rate at which a good can be transformed into another; and the MRS shows the rate at which the consumers are able and willing to exchange one good for another;these rates must be equal for a Pareto-optimal situation to be attained.

Efficiency in product mix can be explained with the help of the diagram below-
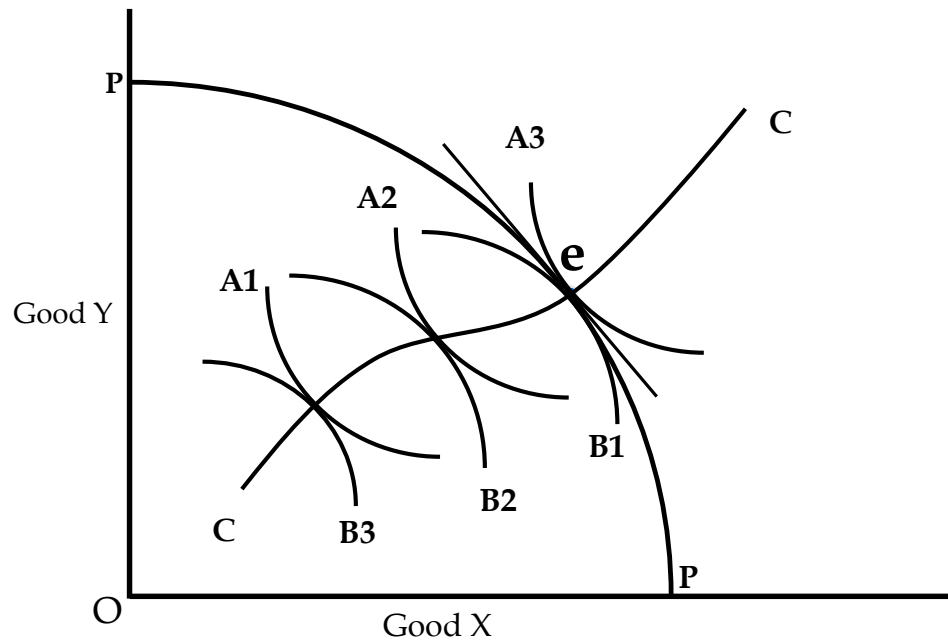
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Fig. 5.3: Efficiency in product mix

In the diagram, the horizontal axis measures good X and the vertical axis measures good Y. A1, A2, A3 are the indifference curves measuring individual A's utility level and B1, B2, B3 are the indifference curves of utility levels of individual B. CC is the contract curve drawn by connecting the corresponding tangency points of the indifference curves of both individuals. All the points on the contract curve mean the optimal distribution of the two goods and hence, Pareto optimality. Point**e**, on the contract curve, hence is an efficient point. But at this point, the slope of the production possibility curve is also the same as the slope of the indifference curve. At point e, there is efficiency in the allocation of factors of production from the viewpoint of production efficiency, and at the same time, there is efficiency in exchange. This means the marginal rate of technical substitution of the factor in producing two goods is equal to the marginal rate of substitution of the goods between the consumers. Hence, at point e, the efficiency in product mix is said to be attained.

Pareto optimality can be shown with help of the diagram below. In the diagram below, the horizontal axis measures individual A's utility and the vertical axis measure individual B's utility. P is the point of initial distribution. It corresponds to Pareto dominated point. The MN curve represents the Edgeworth contract curve where all the points on this curve represent optimality or efficiency. Any movement from point P to the MN curve represents a Pareto improvement. Now,

- A movement from P to Q means A's utility level is the same but B is better off.

- A movement from P to R means B's utility level is the same but A is better off.

- A movement from P to S means both A and B is better off.

Hence, the efficiency or optimality and can be reached at any point in between the range Q to R where either A or B (at least one) or both may be better off by having a proper redistribution of wealth. Hence, after an initial Pareto dominated allocation (point P), there may be improvement (movement from P to Q or R or S)and finally there is optimality or efficiency in Paretian (the range between Q to R) sense.
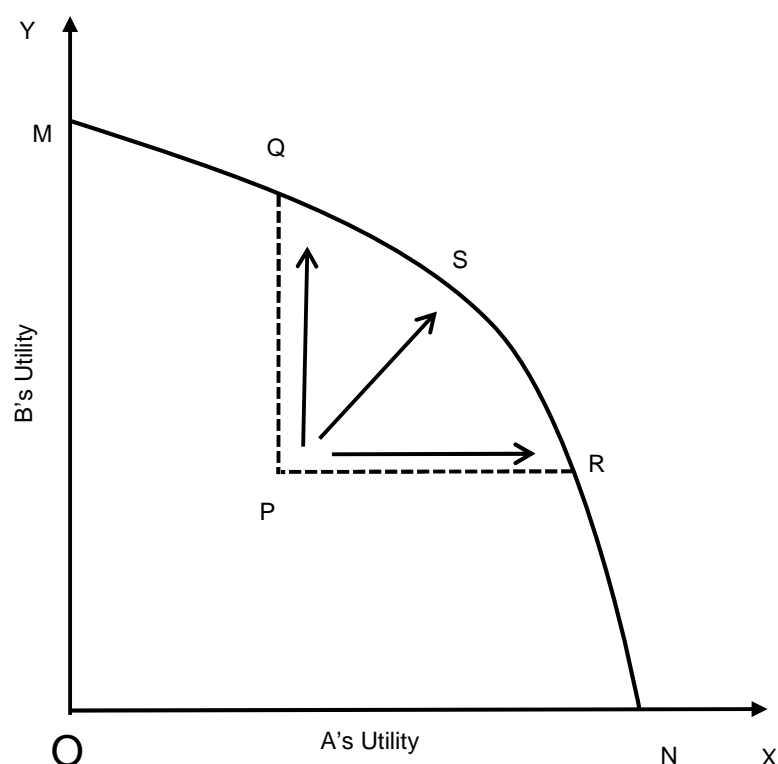
Fig. 5.4: Paretian welfare

5.2 General Ethical Criterion & Kaldor's Criterion

To know about Kaldor's criterion, let us first have an overview of Pigovianand Paretian criterion and their basic concepts as Kaldor developed his criterion removing the drawbacks of the Pigoviancriterion.

Pigovian criterion is based on two main principles or conditions. The first condition states that welfare is said to increase when national income increases. Given tastes and income distribution, an increase in the national income represents an increase in welfare. Secondly, the distribution aspect. If national income remains constant, transfers of income from the rich to the poor would improve welfare.Pigou's criterion is criticized on some of the grounds as-

- This criterion is based on the cardinal measurement of utility which seemed to be unscientific to have a proper and realistic measurement of utility.

- As stated by Pigou, national income is not an accurate measurement of welfare as it only considers the nominal aspects but ignores the real concepts.

- Besides, Pigou does not clarify the ethical relationship of welfare.

Pareto, however, tried to remove some of the deficiencies of Pigovian criterion and attempted to give a proper realistic view of welfare. According to him, any change that makes at least one individual better off and no one worse off is an improvement in social welfare. He defines the initial distribution of anything where there is a scope of improvement which is said as Pareto dominated position. Similarly, a movement from the initial to the efficient position is known as Pareto improvement. The final resting position of any distribution is said to be as Pareto optimality. Pareto wanted to see the efficiency under three different conditions as stated above:

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Firstly, according to Pareto, efficiency in exchange occurs if it is not possible to increase the utility or welfare of one consumer without reducing the utility or welfare of another consumer by redistributing any given bundle of goods between two consumers.

Secondly, Production efficiency takes place when the available inputs or factors (such as labour,L and capital, Kl) of production are distributed or allocated in the production of two products in such a way so that it is no longer possible to reallocate the factors to increase the output of one product without reducing the output of another product.

Thirdly, according to the Pareto efficiency in product mix, the bundle of factors used and the bundle of goods produced in the economy are so distributed that increasing production of one good and increasing satisfaction of one person is impossible without decreasing production of another.

Paretian criterion is not fully free the drawbacks. Pareto failed to evaluate the change in social welfare resulting from any economic reorganization which harms somebody and benefitsothers.

Kaldor's Criterion: Considering all the drawbacks and the assessments, Kaldor came up with some addition and modification in the criteria of welfare determination. Kaldor (and Hicks) made an effort to evaluate the change in social welfare resulting from any economic reorganization which harms somebody and benefits others. Kaldor put forward his criterion on the basis of the "Compensation Principle". To explain Kaldor's criterion, lets first take the assumptions:

- Each individual's satisfactions are independent of the others.
- There is the absence of externalities in production and consumption.
- The tastes of each individual are constant.
- It is possible to separate the problems of production and exchange from the problem of distribution.
- It is assumed that utility is measured ordinarily and interpersonal comparisons are impossible.

Given these assumptions, according to Kaldor, if a certain change in economic organization or policy makes some people better off and others worse off, then that change will increase social welfare if those who gain from the change could compensate the losers and still be better off than before.

To explain this, let us cite one hypothetical situation. If in a situation, A is so much better off than B that he could compensate B for his loss and still have something left over, then this is an improvement in social welfare.

Let us now show Kaldor's criterion with the help of the diagram. In the diagram below, the horizontal axis measures individual A's utility and the vertical axis measure individual B's utility. P is the point of initial distribution. It corresponds to Pareto dominated point. The MN curve represents the Edgeworth contract curve where all the points on this curverepresent optimality or efficiency. Any movement from point P to the MN curve represents a Pareto improvement. Now,

- A movement from P to Q means A's utility level is the same but B is better off.
- A movement from P to R means B's utility level is the same but A is better off.
- A movement from P to S means both A and B is better off.

This is what we got in Paretian sense. But Pareto fails to find out any solution for the movement when it is beyond the range of Q to R. Let us suppose the movement takes place from P to T which lies outside range Q to R due to a policy change.Here, A is not capable to increase his utility i.e., he is worse off but B,s utility increases, i.e., B is better off. In this case it is a failure of Pareto criterion.

Kaldor's compensation criterion is the answer to this situation.If B can compensate A and still have something left over with B, then B will be better off and there is at least one individual better off.This is social welfare.

In the diagram, a movement from P to T is meaning social welfare according to Kaldor if at T, using compensating variation principle in income or utility,still there is something net increment in welfare, it is a social welfare in a Kaldorian sense. Hence, point T which is also lying in the Pareto optimality range, now be the point of efficiency or enhancement of social welfare when compared to point P.
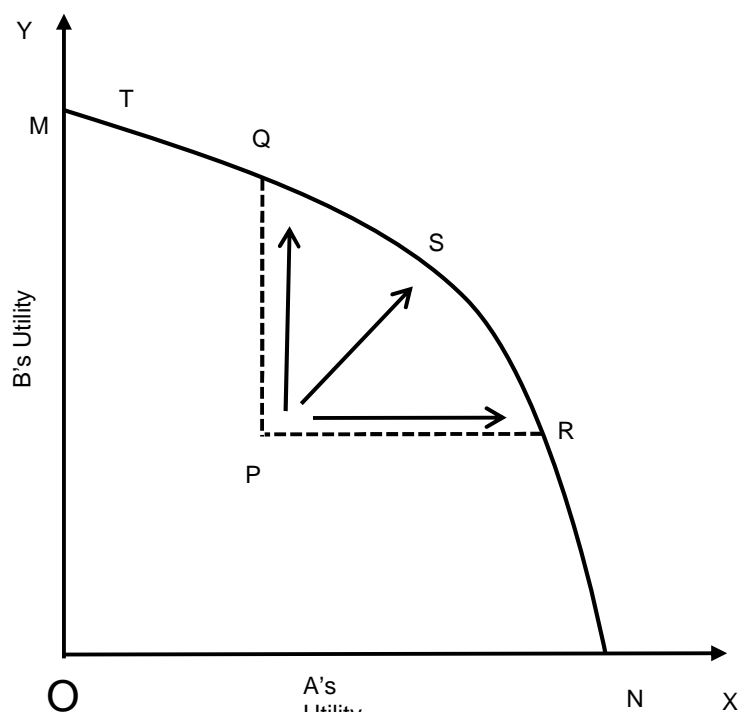
Fig. 5.5: Kaldor's welfare by compensation principle

However, Kaldor's criterion is not also free from certain drawbacks,

- This principle depends on the psychology of the consumers or the beneficiaries. Hence, this principle works only if the gainers compensate losers.

- Problem of externality is also associating with this criterion. Because of impact of externality, it is difficult to find out the net benefits of the beneficiaries.

- The tastes of each individual are assumed to be constant during this analysis. But in reality, it may not happen so.

- Although Kaldor introduces the compensation principle, but it is very difficult to apply compensation criteria for distribution and measurement of income, utility or wealth.

Summary

The basic concepts of Paretian economics are- Pareto improvement, Pareto dominated, and Pareto optimality or efficiency.

Pareto improvement: Given an initial situation, a Pareto improvement is a situation where at least one person is better off without anybody is worse off. This means the movement from the off-contact curve in the Edgeworth box to a point on the contract curve.

Pareto dominated situation: A situation is called Pareto dominated if there exists a possible Pareto improvement. This is the initial point off the contact curve before redistribution in terms of the Edgeworth box.

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Pareto optimality or efficiency: A situation is called Pareto optimal or Pareto efficient where it is not possible to make anyone better off without making some others worse off. In terms of the Edgeworth box, it is the situation after redistribution takes place, i.e., the point on the contract curve.

Pareto efficiency is when an economy has its resources and goods allocated to the maximum level of efficiency, and no change can be made without making someone worse off. Pure Pareto efficiency exists only in theory, though the economy can move toward Pareto efficiency.

Assumptions of Pareto efficiency:

- It is assumed that two commodities, X and Y are being produced and consumed in the economy.
- There are two consumers as well as two producers (A and B) in the economy.
- There are two factors of production (i.e., K and L) in the economy.
- There is perfect competition in the economy.
- Pareto efficiency assumes a static analysis in the economy.
- There exists the law of diminishing returns, and utility.

Conditions of Pareto optimality:

Pareto's efficiency can be seen from three different aspects also said as Paretian conditions:

- Efficiency in consumption (Exchange)
- Efficiency in production (Allocation of inputs)
- Efficiency in both production and consumption (Product mix)

In these three areas, we can easily find out how Paretian efficiency is achieved. In the first one, Paretian efficiency can be found out by using the indifference curve analysis. Efficiency in production similarly can be traced out by using the isoquant curve approach. The third one however may be found out by using production possibility as well as the indifference curve. Now let us explain these in detail one by one.

Efficiency in consumption (Exchange):

Efficiency in exchange occurs if it is not possible to increase the utility or welfare of one consumer without reducing the utility or welfare of another consumer by redistributing any given bundle of goods between two consumers.

Pareto efficiency or optimality in exchange is an economic state where goods cannot be redistributed to make one individual better off without making another individual worse off. It implies that goods are distributed in the most economically efficient manner. Similarly, all individuals in an economy are said to be in a Pareto optimum state or achieving the maximum welfare when no economic changes can make one individual better off without making at least one other individual worse off.

Pareto efficiency for two individuals can be shown by individual indifference curves as well as their marginal rate of substitution. According to the Pareto efficiency in exchange, the Marginal Rate of Substitution (MRS) between any two goods must be the same for every consumer of both products:

$$MRS^A_{XY} = MRS^B_{XY}$$

Here, MRS^A_{xy} is the marginal rate of substitution of good x for good y for individual A and

MRS^B_{xy} is the marginal rate of substitution of good x for good y for individual B.

Efficiency in Production (Allocation of inputs):

Production efficiency takes place when the available inputs or factors (such as labour,L and capital, Kl) of production are distributed or allocated in the production of two products in such a way so that it is no longer possible to reallocate the factors to increase the output of one product without reducing the output of another product. In some cases, it is possible to increase the production of the products by rearranging and reallocating the inputs without having any additional cost. This is because some inputs are more productive in some uses as compared to others.

Pareto efficiency for two factors can be shown by isoquants as well as their marginal rate of technical substitution. According to the Pareto efficiency in production, the Marginal Rate of Technical Substitution (MTRS) between any two goods must be the same for every producer of both products:

$$MRTS^{X}_{LK} = MRTS^{Y}_{LK}$$

Here, $MRTS^{X}_{LK}$ is the marginal rate of technical substitution of labour for capital for good X and

$MRTS^{Y}_{LK}$ is the marginal rate of technical substitution of labour for capital for good Y.

Efficiency in both production and consumption (Product mix) :

According to the Pareto efficiency in product mix, the bundle of factors used and the bundle of goods produced in the economy are so distributed that increasing production of one good and increasing satisfaction of one person is impossible without decreasing production of another.

This condition means that the optimum quantities of different commodities are to be produced with the given factor combinations. In this sense, it can be stated that "the marginal rate of substitution between any pair of products for any person consuming both must be the same as the marginal rate of transformation (for the commu-nity) between them." This can be expressed as,

$$MRTS_{XY} = MRS^{A}_{XY} = MRS^{B}_{XY}$$

Here, $MRTS_{XY}$= Marginal rate of technical substitution of good X for Y,

MRS^{A}_{XY}= Marginal rate of substitution of good X for Y for individual A,

MRS^{B}_{XY}= Marginal rate of substitution of good X for Y for individual B.

Since the MRTS shows the rate at which a good can be transformed into another; and the MRS shows the rate at which the consumers are able and willing to exchange one good for another; these rates must be equal for a Pareto-optimal situation to be attained.

Kaldor stated his criteria to remove the drawbacks of Pigou and Pareto.

Kaldor's Criterion: Considering all the drawbacks and the assessments, Kaldor came up with some addition and modification in the criteria of welfare determination. Kaldor (and Hicks) made an effort to evaluate the change in social welfare resulting from any economic reorganization which harms somebody and benefits others. Kaldor put forward his criterion on the basis of the "Compensation Principle". To explain Kaldor's criterion, lets first take the assumptions:

- Each individual's satisfactions are independent of the others.
- There is the absence of externalities in production and consumption.
- The tastes of each individual are constant.
- It is possible to separate the problems of production and exchange from the problem of distribution.
- It is assumed that utility is measured ordinarily and interpersonal comparisons are impossible.

Given these assumptions, according to Kaldor, if a certain change in economic organization or policy makes some people better off and others worse off, then that change will increase social

welfare if those who gain from the change could compensate the losers and still be better off than before.

To explain this, let us cite one hypothetical situation. If in a situation, A is so much better off than B that he could compensate B for his loss and still have something left over, then this is an improvement in social welfare.

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- The tastes of each individual are assumed to be constant during this analysis. But in reality, it may not happen so.

- Although Kaldor introduces the compensation principle, but it is very difficult to apply compensation criteria for distribution and measurement of income, utility or wealth.

Keywords

Pareto improvement: Given an initial situation, a Pareto improvement is a situation where at least one person is better off without anybody is worse off.

Pareto dominated situation: A situation is called Pareto dominated if there exists a possible Pareto improvement.

Pareto optimality or efficiency: A situation is called Pareto optimal or Pareto efficient where it is not possible to make anyone better off without making some others worse off.

Efficiency in consumption: Efficiency in exchange occurs if it is not possible to increase the utility or welfare of one consumer without reducing the utility or welfare of another consumer by redistributing any given bundle of goods between two consumers.

Efficiency in Production: Production efficiency takes place when the availability of production is allocated in the production of two products in such a way that it is no longer possible to reallocate the factors to increase the output of one product without reducing the output of another product.

Efficiency in both production and consumption: According to the Pareto efficiency in product mix, the bundle of factors used and the bundle of goods produced in the economy are so distributed that increasing production of one good and increasing satisfaction of one person is impossible without decreasing production of another.

Kaldor's Criterion: If a certain change in economic organization or policy makes some people better off and others worse off, then that change will increase social welfare if those who gain from the change could compensate the losers and still be better off than before.

Self Assessment

1. Pareto improvement is a situation

A. Where at least one person is better off without anybody is worse off.

B. Where no one is better off without anybody is worse off.

C. Where some people are better off and some are worse off.

D. All the above

2. Pareto optimality is a situation

A. Where at least one person is better off without anybody is worse off.

B. Where no one is better off without anybody is worse off.

C. Where some people are better off and some are worse off.

D. All the above

3. Pareto dominated is a situation

A. Where at least one person is better off without anybody is worse off.

B. Where no one is better off without anybody is worse off.

C. Where some people are better off and some are worse off.

D. Where there is provision of betterment by redistribution.

4. According o Pareto, the efficiency in consumption is found when,

A. MRSxy for individual A = MRSxy for individual B

B. MRSxy for individual A >MRSxy for individual B

C. MRSxy for individual A <MRSxy for individual B

D. All the above

5. According o Pareto, the efficiency in production is found when,

A. MRTSLK of commodity X > MRTSLK of commodity Y

B. MRTSLK of commodity X = MRTSLK of commodity Y

C. MRTSLK of commodity X < MRTSLK of commodity Y

D. None of the above

6. Pareto defines Optimality between consumption and exchange

A. When MRSxy> MRTSLK

B. When MRSxy = MRTSLK

C. When MRSxy< MRTSLK

D. None of the above

7. The concept of "Compensation Principle" was developed by

A. Pigou

B. Pareto

C. Kaldor

D. Marshall

8. Which of the following is the assumption of Kaldor's criterion?

A. There is the absence of externalities in production and consumption.

B. The tastes of each individual are constant.

C. It is possible to separate the problems of production and exchange from the problem of distribution.

D. All the above

9. The dual criterion of welfare economics was developed by

A. Pigou
B. Pareto
C. Kaldor
D. Marshall

10. According to the compensation principle,

A. The losers compensate the gainers
B. The gainers compensate the losers
C. Every one compensates each other
D. All of the above

11. The double criterion was developed by

A. Pigou
B. Pareto
C. Kaldor
D. Scitovsky

12. Pareto criterion fails when

A. Everyone in the society is better off.
B. Somebody in the society is better off.
C. Somebody is better off but some are worse off
D. None of these.

13. Kaldor's criterion is applicable when

A. Everyone in society is better off.
B. Somebody in the society is better off.
C. Somebody is better off but some are worse off
D. All of these.

14. When there is efficiency in product mix,

A. Slope of indifference curve equals the slope of the isoquant
B. Slope of the budget line equals the slope of the iso-cost line
C. Both are correct
D. None of them are correct.

15. Which of the following is used in welfare analysis

A. Edgeworth box
B. Hicksian indifference curve
C. Isoquants
D. All the above.

Answers for Self Assessment

1.	A	2.	B	3.	D	4.	A	5.	B
6.	B	7.	C	8.	D	9.	B	10.	B
11.	D	12.	C	13.	C	14.	C	15.	D

Review Questions

1. What is Pareto improvement?
2. What is a Pareto-dominated point?
3. What is Pareto efficiency or optimality?
4. Mention the conditions of Pareto optimality.
5. Mention Pigo's condition to reach social welfare.
6. Explain how is efficiency in exchange can be achieved?
7. How can the efficiency in production be shown?
8. Show how to reach optimality in production and consumption simultaneously.
9. Explain how welfare can be reached according to Pareto?
10. Explain Kaldor's principle of attaining social welfare.

Further Readings

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Web Links

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Dr. Tirtha Saikia, Lovely Professional University

Unit 06: The Problem of Market Failure and Externality

CONTENTS

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6.1   Definition of Externality & Positive and Negative Externality

6.2   Methods of Solving Problems of Externalities & Taxes and Subsidies

6.3   Property Rights & Direct Government Regulation

Summary

Keywords

Review Questions

Self Assessment

Answers for Self Assessment

Further Readings

Objectives

After this chapter, you will be able to

- learn about the meaning of externality,
- learn about the different types of externalities,
- learn how externalities impact production and consumption.
- learn briefly how taxation reduces negative externality,
- learn how subsidies encourage positive externality,
- learn about socially optimal output when externality is neutralized.
- learn briefly how property right is defined,
- learn the Coase theorem,
- learn about socially optimal output by govt. intervention.

Introduction

The externality is the situation when the cost or benefit is caused by a producer or consumer that is not financially incurred or received by that particular producer or consumer. It may be both positive and negative and is observed either in the production or in the consumption of a good or service.Externalities are generally found in environmental issues, such as natural resources or public health. Besides the environmental issues, externality may be found in different production and consumption activities. A positive externality helps a producer or a consumer in having benefit from his production or consumption. Similarly, a negative externality causes loss to the producer or the consumer concerned. Because of the presence of externalities in production and consumption, the market fails to find the equilibrium level of output; hence the situation is known as market failure due to externality.In this chapter, we will be discussing the different types of externalities present in both production and consumption activities. Besides, we will also discuss the methods of solving problems of externalities,taxes and subsidies,property rights anddirect government regulation.

Microeconomics Theory and Analysis – II

6.1 Definition of Externality & Positive and Negative Externality

Before knowing about the positive and negative externalities, let us first know about the basic concept of externality. As has been mentioned earlier, an externality is a situation when the cost or benefit is caused by a producer or consumer that is not financially incurred or received by that particular producer or consumer.Externalities arise whenever the actions of one economic agent directly affect another economic agent outside the market mechanism.It is an impact of unrelated third parties on consumption or production.

Before analyzing the different types of externalities, we need to know about the cost-benefit analysis of externality. For this again, the following concept of cost-benefits are to be known-

- Private cost: The private cost is the price or cost of an activity to an individual consumer or producer. For example, cost of consumption or production of a cigar by an individual producer or consumer.

- Social cost: The social cost is the total cost of an activity or loss, not just only to a particular firm but to the rest of society as well. For example, net damage to society due to pollution.

- Private benefit: The private benefit is the benefit of an activity to an individual consumer or producer.

- Social benefit: The social benefit is the total benefit of activity, not just to the producer but to the rest of society as well. For example- the benefit of production or the consumption of vaccination.

Externalities can either be positive or negative. They can also occur from production or consumption. There are different types of externalities present in the real world. Such as,

- Externalities can be divided as:

- Positive externality in production.

- Negative externality in production.

- Positive externality in consumption.

- Negative externality in consumption.

Positive externality in production: This happens inproduction when there is an increase in production because of the impact of some external factors. When a firm's production increases the well-being of others but the firm is not compensated by those others. Example: Beehives of honey producers near paddy fields have a positive impact on pollination and agricultural output. Let us take some other situations: Some situations:

- A new highway reduces the transport cost of individual firms.

- The expansion of industry creates additional demands for the industries that supply raw

  materials, machinery to it.

We can now analyze the positive externality in production in terms of the cost-benefit approach. In the case of a positive externality, marginal social benefit (MSB) is always greater than marginal private benefit (MPB), i.e.,

MSB > MPB
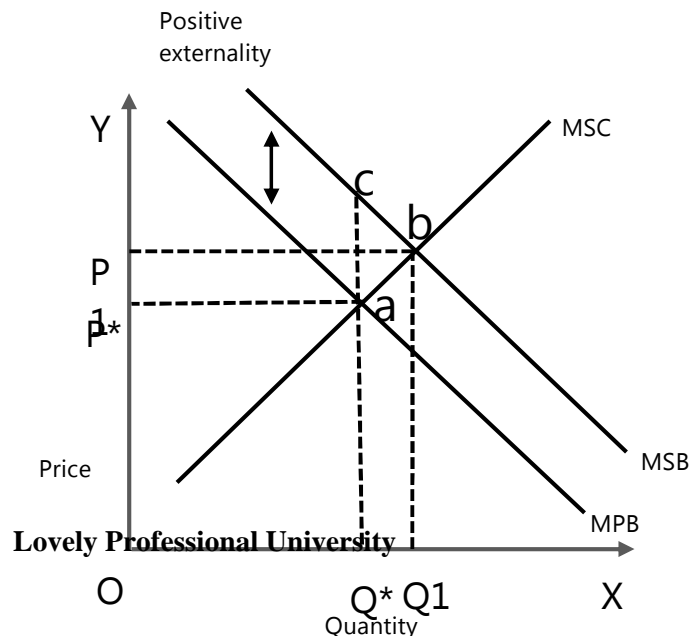
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Fig. 6.1: Positive externality in production

In the diagram, price is measured in the vertical axis and the quantity is measured in the horizontal axis. The production and consumption are at OQ* level of outputand OP* price. This is determined by the interaction of marginal social cost (MSC) and marginal private benefit (MPB) curve. But, when the equilibrium is considered from the viewpoint of marginal social benefit (MSB) and marginal social cost, we notice that the society is benefiting from this kind of production. i.e., MSB > MPB. This is due to the presence of positive externality in production. Because of theextra benefits from production society has now some scope of having some additional output. This situation means that there is actually underproduction in society. This underproduction is shown by Q*Q1 in the diagram. The gain to the society hence can be shown as abc area in the diagram. We may say this situation to be Pareto efficient.

Negative externality in production: This happens in production when there is a net loss due to production because of the impact of some external factors. When a firm's production reduces the well-being of others who are not compensated by the firm.For example, a polluting paper millestablished in a small locality is emitting hazardous smog and it is causing environmental pollution in the nearby area due to its operation.
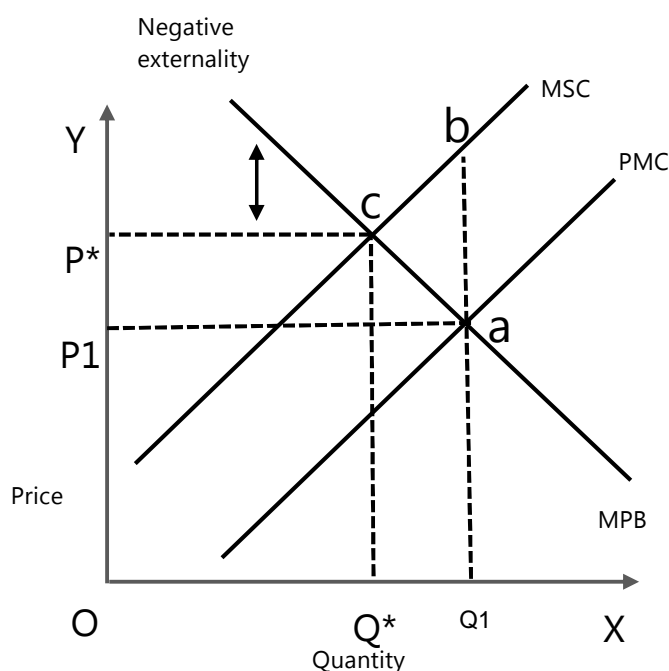
Fig. 6.2: Negative externality in production

In the diagram, price is measured on the vertical axis and quantity is measured on the horizontal axis. The production and consumption are at OQ* level of output and OP* price. This is determined by the interaction of marginal social cost (MSC) and marginal private benefit (MPB) curve. But, when the equilibrium is considered from the viewpoint of society, the marginal social cost (MSC) and private marginal cost, we notice that there is a net loss to the societythis kind of production. i.e., MSC> MPC. This is due to the presence of negative externality in production. Because of the extra benefits from production society has now some scope of having some additional output. This situation means that there is actually overproduction in society which is due to negative externality. This overproduction is shown by Q*Q1 in the diagram. The loss to the society hence can be shown as abc area in the diagram. We may say this situation to be Pareto efficient.

Positive externality in consumption: Positive externality happens in consumption when there is a benefit due to consumption because of the impact of some external factors. When an individual's

consumption increases the well-being of others but the individual is not compensated by those others. For example, when an individualgetsvaccinated in an area, others have fewer chances of being infected.

Negative externality in consumption: Negative externality happens in consumption when there is a net loss due to consumption because of the impact of some external factors. When an individual's consumption reduces the well-being of others who are not compensated by the individual. For example, let us imagine a situation where youth is smoking cigars in a public place is responsible for passive smoking by others and causes unforeseen health issues.

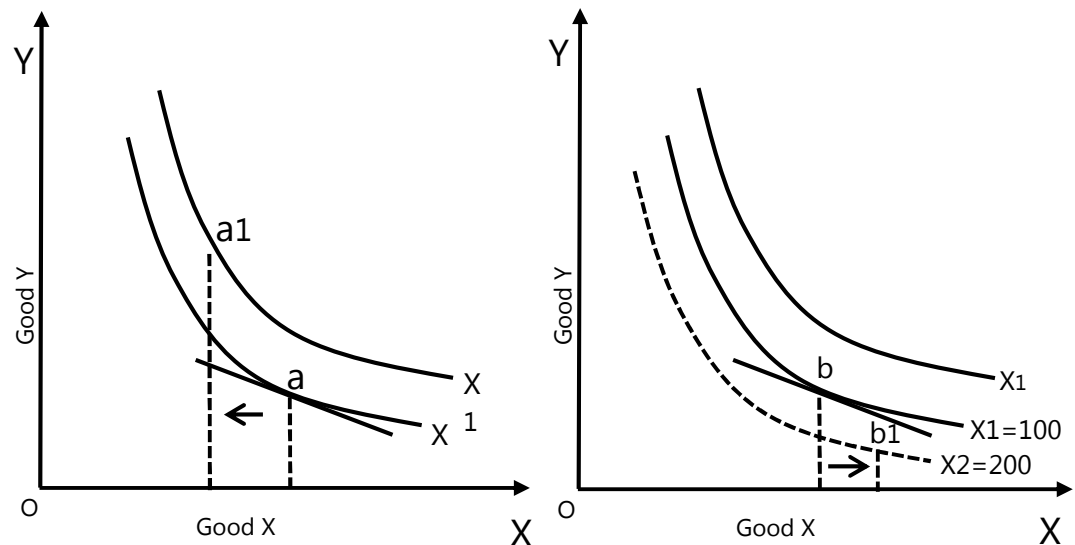Externalities in consumption can be shown in the diagrams below-

Fig. 6.3: Consumption in absence of externalities

In the diagram above, good X is measured horizontally and good Y is measured vertically. The level of consumption is shown by the indifference curves. In the diagram, in absence of externality in consumption MRSxyfor both the individuals are similar at a and b. This is shown in the diagram above in both the panels with the help of the slope of the indifference curves and the tangents at points a and b.

But, in presence of externality in consumption, suppose, A is unaffected by B's consumption but B's utility is reduced by A's consumption of commodity X, but not of Y.Suppose that redistribution is such as to decrease the consumption of X by consumer A.This shifts the utility map of B downwards showing the increase in the utility due to reduction in consumption of good X by A.

If redistribution is such that consumer A moves to point a1 and B moves to b1.The total welfare has increased although MRSx,y is not the same for both.In this situation, A is on the same indifference curve but B moves to a higher indifference curve.This means when externality in consumption exists, Pareto optimality does not exist.

6.2 <u>Methods of Solving Problems of Externalities & Taxes and Subsidies</u>

The presence of externality causes market failure because under that situation the existing market fails to find out the optimal level of output. As has been discussed earlier, externality in production and consumption is the impact of external factors. Once it is possible to find out that there exists externality, it is needed to be neutralized and hence we can find out the optimality in the market. This can be done by using some methods to neutralize the externality. The common methods in this case are :

- Price-based measures such as taxes and subsidies and
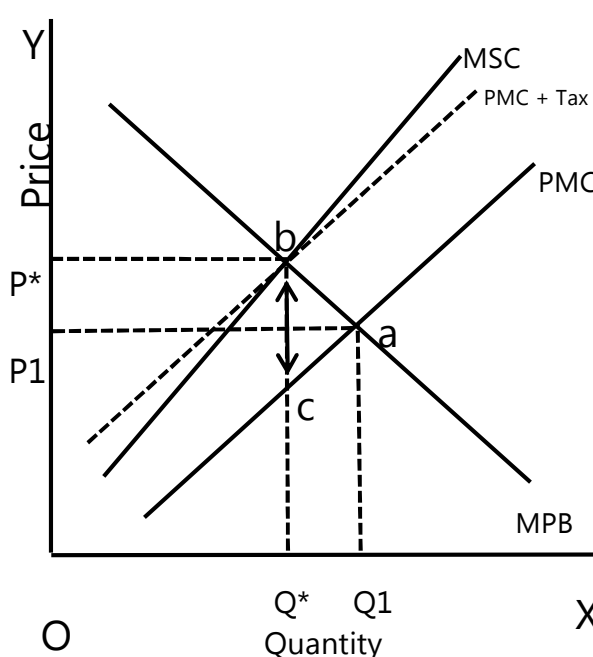- Quantity-based measures such as laws, regulations, guidelines, etc.

Generally, taxes are levied when there is the presence of negative externality, and subsidies are assigned forpositive externality found whether in production or in consumption.

When we are talking about taxation, it is of two types:

- a tax set equal to each firm's marginal efficiency of capital (MEC) and
- an environmental or 'green' tax.

In this regard, we may mention the approach developed by A.C. Pigou. Arthur Cecil Pigou (1877–1959) proposed a solution to neutralize the issue of externalities that has become a standard approach. He suggested imposing a per-unit tax on a good affected by externality, thereby generating negative externalities equal to the marginal externality at the socially efficient quantity. This is known as a Pigouvian tax. According to Pigou, the tax that is added is the difference, at the socially efficient quantity, between MSC and the MPC.The new supply curve which is defined as a marginal private cost curve created by the addition of the tax intersects demand at the sociallyefficient quantity. As a result, the new competitive equilibrium, taking account of the tax, is efficient.

Fig. 6.4: Pigouvian tax

In the diagram above the Pigouvian tax is defined. Price is defined vertically and quantity is defined horizontally. OQ1 output is determined at OP1 price. As a result of negative externality, there is overproduction at a relatively smaller price. The extent of extent externality is shown by the difference between MSC and PMC. Society is paying a high price because of such a kind of production. Hence. This is be neutralized by introducing tax according to Pigou. The amount of tax in this regard should be equal to the difference between MSc and PMC so that a socially optimal level of output OQ* can be reached. Hence, Pigouvian Tax in this regard is, :

Tax = MSC-PMC

Or,

MSC= PMC+Tax

Optimal production:OQ*

Price after tax :OP*

In a similar way, a subsidy may be granted to generators of positive externalities i.e., activities that are related to social wellbeing, to ensure a higher level of consumption and production than would arise through the completely free interaction of market forces.The presence of positive externality is always beneficial for society as it increases the social output.

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A Pigouvian subsidy is a subsidy that is used to encourage actions and behaviour that has positive effects on others who are not involved or society at large. In the diagram, it is seen at the OP1 level of price the output produced is OQ1 which is observed to be underproduction as it has far more possibilities to increase to reach the socially desirable level of output.
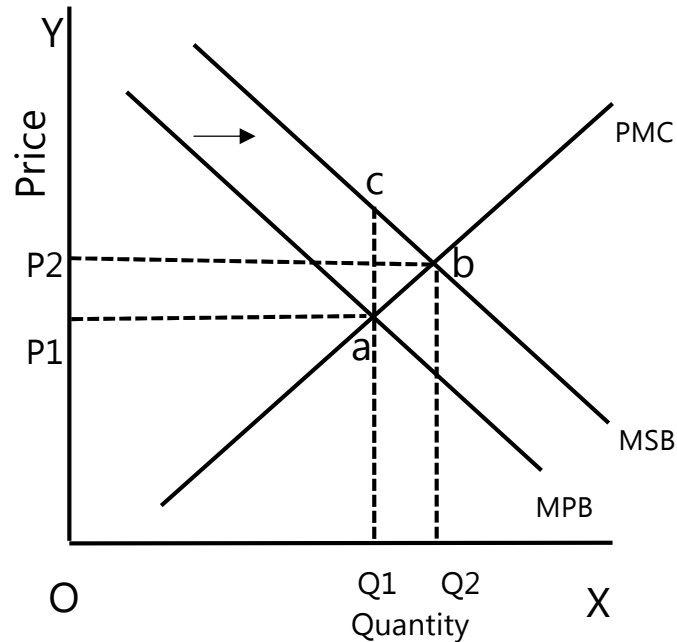

Fig. 6.5: Pigouvian subsidy

In absence of subsidy, the output level is at point a. According to Pigou this sort of output is to be encouraged by adding subsidy so that the maximum social output is to be at point b where it is defined to be OQ2 and the price OP2. Hence the total amount of subsidy is equal to abc.

Technically, demand increases with an increased supply, the price rises as a response to the increased demand.The price to the consumer stays low however as the subsidy negates the normal market forces that would make the consumer pay the higher price.

Although Pigou introduces the case of taxation and subsidy to neutralize the impact of subsidy in practice, there are various difficulties are likely to arise in identifying the presence of subsidy:

- It is not only extremely difficult to identify the impact of external costs and benefits, but it is also an arbitrary matter trying to prescribe a monetary measurement or assign monetaryvalue to them.

- From an environmental point of view, merely imposition of a tax on pollution does not solve all the problems, as pollution is still allowed to continue; the tax only provides a market-led way to induce firms to find cleaner and alternative ways of producing so as to reduce their costs.

- Taxation of pollution needs regular, complex, and costly monitoring of, and as offending firms are likely to be generating different quantities and types of pollution which is very impractical.

- There might arise distortions and inefficiencies in terms of the cost of collecting a pollution tax.

6.3   Property Rights & Direct Government Regulation

Property rights in economics mean how a resource or economic good is used and owned by an economic agent.Resources can be owned by individuals, associations, collectives, or governments

which we mean to an economic agent.Property rights can be viewed as an attribute of an economic good. Generally, property right involves three aspects:

- The right to use the good.
- The right to earn income from the good.
- The right to transfer the good to others, alter it, abandon it, or destroy it

In economics, externalities may be the impact of intentional or unintentional actionson economic activity by unrelated third parties. It may be positive or negative but require resolution for all parties to be treated equally and fairly.In presence of externality, Pareto optimality cannot be achieved.There is always the problem of underproduction and overproduction due to externality.

The measures of externality as counted earlier are Pigouvian taxfor correcting negative externality and subsidyfor encouragingpositive externality.

From an environmental point of view, a tax on pollution does not solve the problem, it merely provides firms to find a cleaner and more organized way of production. Besides, taxation of pollution would require regular, complex and very costly monitoring. Also, distortions and inefficiencies might arise in terms of the cost of collecting a pollution tax.

Ronald Coase explained how assigning property rights to different parties could find a solution for such problems. Coase has provided his theorem in two parts:

Coase Theorem (Part I):*When there are well-defined property rights and costless bargaining, then negotiations between the party creating the externality and the party affected by the externality can bring about the socially optimal market quantity.*

Coase Theorem (Part II):*The efficient quantity for a good producing an externality does not depend on which party is assigned the property rights, as long as someone is assigned those rights.*

Explanation of Coase theorem: Coase theorem can be best explained with the help of an example. Let us consider a firm polluting a river enjoyed by some individuals in a locality. If the firm ignores the fact that the river is accessed by individuals also, there is too much pollution. Here, the firm is beneficiary and the benefit of the firm will be at the cost of the individuals in the locality. Hence, the firm is a gainer and the individuals are the losers. In such a case, the right of ownershipmatters. We may have here two different scenarios.

Case 1 - Individuals own the river: If the river is owned by individuals, then individuals can charge firms for polluting the river.

Case 2 - Firms own river: If the river is owned by the firm, then the firm can charge individuals for usingor polluting less.

In both cases mentioned above, the charge will be as per the marginal damage (MD).The individuals will charge firms according to the marginal damage (MD) per unit of pollution.In the other case, the firms will also charge individuals according to the MD per unit of pollution reduction.

Thus, according to the Coase theorem, in the case of market incompetencecaused by externalities, individuals (or firms) are able to negotiate a commonly beneficial, socially requiredresult as long as there are no costs connected with the negotiation process.

In this situation, the result is expected to hold irrespective of the fact that whether the polluter has the right to pollute or the average affected bystander has a right to a clean environment.

Corrective instruments: To avoid such a situation, the government can correct the market incompetence or inefficiency by employing some instruments.Some of themcan be classified as mentioned above as price-based and quantity-based measures. The price-based measures are:

- Imposition of corrective taxes above the marginal damage to discourage pollution.
- Significantly high subsidy to individual consumers and firms to produce more the goods having positive externality.

Similarly, the quantity-based measures include command and control measures adopted by the government. Some them to be mentioned are:

- Command-and-control regulation may come up in the form of government-imposed standards, targets, process requirements, or outright bans.
- Besides, govt. may protect the environment or other companies and even the individuals that use the commodity which causes a negative impact or generates negative externality.

Summary

An externality is a situation when the cost or benefit is caused by a producer or consumer that is not financially incurred or received by that particular producer or consumer.Externalities arise whenever the actions of one economic agent directly affect another economic agent outside the market mechanism.It is an impact of unrelated third parties on consumption or production.The presence of externality can assed with the help of concepts of social cost and benefits such as-

- Private cost: The private cost is the price or cost of an activity to an individual consumer or producer.
- Social cost: The social cost is the total cost of an activity or loss, not just only to a particular firm but to the rest of society as well.
- Private benefit: The private benefit is the benefit of an activity to an individual consumer or producer.
- Social benefit: The social benefit is the total benefit of activity, not just to the producer but to the rest of society as well.

Externalities can either be positive or negative. They can also occur from production or consumption. There are different types of externalities present in the real world. Such as,

- Externalities can be divided as:
- Positive externality in production.
- Negative externality in production.
- Positive externality in consumption.
- Negative externality in consumption.

Positive externality in production: This happens in production when there is an increase in production because of the impact of some external factors. When a firm's production increases the well-being of others but the firm is not compensated by those others. Example: Beehives of honey producers near paddy fields have a positive impact on pollination and agricultural output.

Negative externality in production: This happens in production when there is a net loss due to production because of the impact of some external factors. When a firm's production reduces the well-being of others who are not compensated by the firm. For example, a polluting paper millestablished in a small locality is emitting hazardous smog and it is causing environmental pollution in the nearby area due to its operation.

Positive externality in consumption: Positive externality happens in consumption when there is a benefit due to consumption because of the impact of some external factors. When an individual's consumption increases the well-being of others but the individual is not compensated by those others. For example, when an individual gets vaccinated in an area, others have fewer chances of being infected.

Negative externality in consumption: Negative externality happens in consumption when there is a net loss due to consumption because of the impact of some external factors. When an individual's consumption reduces the well-being of others who are not compensated by the individual. For example, let us imagine a situation where youth is smoking cigars in a public place is responsible for passive smoking by others and causes unforeseen health issues.

The presence of externality causes market failure because under that situation the existing market fails to find out the optimal level of output. The common methods in this case are :

- Price-based measures such as taxes and subsidies and
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Although Pigou introduces the case of taxation and subsidy to neutralize the impact of subsidy in practice, there are various difficulties are likely to arise in identifying the presence of subsidy:

- It is not only extremely difficult to identify the impact of external costs and benefits, but it is also an arbitrary matter trying to prescribe a monetary measurement or assign monetary value to them.
- From an environmental point of view, merely imposition of a tax on pollution does not solve all the problems, as pollution is still allowed to continue; the tax only provides a market-led way to induce firms to find cleaner and alternative ways of producing so as to reduce their costs.
- Taxation of pollution needs regular, complex, and costly monitoring of, and as offending firms are likely to be generating different quantities and types of pollution which is very impractical.
- There might arise distortions and inefficiencies in terms of the cost of collecting a pollution tax.

Property rightshave an important role in neutralizing the externality. In economics, it means how a resource or economic good is used and owned by an economic agent.Resources can be owned by individuals, associations, collectives, or governments which we mean to an economic agent.Property rights can be viewed as an attribute of an economic good.

In presence of externality, Pareto optimality cannot be achieved.There is always the problem of underproduction and overproduction due to externality.

The measures of externality as counted earlier are Pigouvian taxfor correcting negative externality and subsidyfor encouragingpositive externality.

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Thus, according to the Coase theorem, in the case of market incompetence caused by externalities, individuals (or firms) are able to negotiate a commonly beneficial, socially required result as long as there are no costs connected with the negotiation process.

In this situation, the result is expected to hold irrespective of the fact that whether the polluter has the right to pollute or the average affected bystander has a right to a clean environment.

Corrective instruments: To avoid such a situation, the government can correct the market incompetence or inefficiency by employing some instruments. Some of them can be classified as mentioned above as price-based and quantity-based measures. The price-based measures are:

- Imposition of corrective taxes above the marginal damage to discourage pollution.
- Significantly high subsidy to individual consumers and firms to produce more the goods having positive externality.

Similarly, the quantity-based measures include command and control measures adopted by the government. Some them to be mentioned are:

- Command-and-control regulation may come up in the form of government-imposed standards, targets, process requirements, or outright bans.
- Besides, govt. may protect the environment or other companies and even the individuals that use the commodity which causes a negative impact or generates negative externality.

Keywords

Externality: An externality is a situation when the cost or benefit is caused by a producer or consumer that is not financially incurred or received by that particular producer or consumer.

Private cost: The private cost is the price or cost of an activity to an individual consumer or producer.

Social cost: The social cost is the total cost of an activity or loss, not just only to a particular firm but to the rest of society as well.

Private benefit: The private benefit is the benefit of an activity to an individual consumer or producer.

Social benefit: The social benefit is the total benefit of activity, not just to the producer but to the rest of society as well.

Positive externality in production: When production increases the well-being of others but the firm is not compensated by those others.

Negative externality in production: When a production reduces the well-being of others who are not compensated by the firm.

Positive externality in consumption: When consumption increases the well-being of others but the individual is not compensated by those others.

Negative externality in consumption: When consumption reduces the well-being of others who are not compensated by the individual.

Pigouvian tax: The tax that is added is the difference, at the socially efficient quantity, between MSC and the MPC.

Pigouvian subsidy: a subsidy may be granted to generators of positive externalities.

Coasetheorem: It explained how assigning property rights to different parties could find a solution for such problems.

Self Assessment

1. Which of the following is not a type of externality

A. Positive externality in production.
B. Negative externality in production.
C. Neutral externality in consumption.
D. Negative externality in consumption.

2. Private benefit is the benefit of

A. An activity to an individual consumer or firm.
B. An activity to the society.
C. An activity to a social organization.
D. None of the above

3. An example of positive externality in production is

A. Passive smoking
B. Cigar production
C. Beehives of honey producers
D. All of the above

4. An example of a negative externality in consumption is

A. Passive smoking
B. Cigar production
C. Beehives of honey producers
D. None of the above

5. An example of positive externality in consumption is

A. Cigar production
B. Drinking alcohol
C. Vaccination
D. Passive smoking

6. An example of a negative externality in production is

A. Cigar production
B. Vehicular emission

    C. Industrial smog

    D. All of these

7.Price based measures to control externality include

    A. Taxes and subsidies

    B. Regulation

    C. Quota's fixation

    D. None of these

8. Price based measures to control externality include

    A. Taxes and subsidies

    B. Regulation

    C. Quota's fixation

    D. None of these

9. According to Pigou, in case of a positive externality, which of the following should be initiated

    A. Taxes

    B. Subsidy

    C. Both

    D. None

10. According to Pigou, in case of negative externality, which of the following should be initiated

    A. Taxes

    B. Subsidy

    C. Both

    D. None

11. Deadweight loss is due to

    A. Positive externality

    B. Negative externality

    C. Both

    D. None

12. In presence of externality which of the situations prevail

    A. Pareto optimality violated

    B. Tax failure

    C. Subsidy promoted

    D. None of the above

13. The concept of property rights regarding environmental goods is developed by

    A. J.R. Hicks

B. Ronald Coase

C. J.B. Say

D. All of them

14. Which of the following is a corrective measure to control pollution

A. Corrective taxes

B. Quota fixation

C. Price fixation

D. All of these

15. Which of the following is a command-and-control measure to control pollution

A. Targets fixation

B. Quota fixation

C. Price fixation

D. All of these

Answers for Self Assessment

1.	C	2.	A	3.	C	4.	A	5.	C
6.	D	7.	A	8.	B	9.	B	10.	A
11.	B	12.	A	13.	B	14.	D	15.	A

Review Questions

1. What is an externality?
2. Define the concept of private cost and private benefit?
3. What are the different types of externalities?
4. Define the concept of positive externality in production and consumption?
5. Define the negative externalities in production and consumption?
6. What is Pigouvian tax and subsidy?
7. State the Coase theorem.
8. Discuss how the presence of externality impacts the socially optimal output.
9. Discuss the impact of Pigouvian tax and subsidy on the social output.
10. Discuss Coase theorem with proper examples.

Further Readings

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Unit 07: Tragedy of Commons

Objectives

After this chapter, you will be able to

- learn about the meaning of market imperfection,
- learn about the different types of markets that exist due to imperfection in the market,
- learn the difference between market imperfection and market failure.
- learn about the meaning and difference of public and private goods,
- learn how the free-rider problem is associated with the public good.
- learn about the theory of second best,
- learn about the difference between first best and second best,
- learn how social optimality can be found with the help of the theory of second-best theory.

Introduction

The concept of the tragedy of commons was first introduced formally by Garrett Hardin, an evolutionary biologist when he wrote a scientific paper entitled "The Tragedy of the Commons" in a peer-reviewed journal in 1968. The paper was about the increasing concern of overpopulation. Hardin used a very suitable example of sheep grazing land in this regard. He took it from the early English economist William Forster Lloyd while addressing the adverse impacts of the scenario of overpopulation.In that example, grazing lands were private property and its use was limited by the farsightedness of the landowner in order to preserve the value of the land as well as the health of the herd. Grazing lands will become over-grazed with livestock over time as the food the animals consume is shared among all the sheepherders.Hardin relates this example to the human being; each person would try to fulfill his self-interest and consume as much of the common resource as possible, thereby creating the scarcity of the resource. This will bring a common shortage of resources for all. This is referred to as the tragedy of commons to all.

In this chapter, we will also consider the market imperfection. It is a situation when any economic market does not meet the rigorous solution to find out the optimal price and output due to the presence of some extraordinary factors. The market imperfection may be observed due to the presence of externality. We will discuss how public goods and the free-riders problem is associated with defining social output. Using these concepts level of welfare and the theory of second-best will also be discussed in the upcoming subsequent of this chapter.

Microeconomics Theory and Analysis – II

1.1 **Market Imperfections**

Market imperfections mean any deviations from the assumptions of perfect competition. That is before knowing market imperfection let's know briefly about the market perfection. A market is said to be perfect when it satisfies the following conditions to be mentioned-

- There should be a large number of buyers and sellers.

- There should be free entry and exit of new firms into the industry.

- The price is given and constant for the firms.

- The products produced are perfectly homogenous in character.

- There is perfect mobility of factor of production in the industry.

- Both the buyers and sellers have full information about the existing market conditions.

- There is no transportation cost.

Having these conditions or assumptions given, it ispossible that the market could find out the equilibrium in presence of the market mechanism. Again,the market mechanism involves the procedure of the determination of market equilibrium on the basis of prevailing demand and supply in the market. But, any deviation in the fulfillment of at least one of the conditions mentioned may lead to a situation of deviation of the derivation of a perfect competition market.Many of the assumptions in a perfectly competitive model are implicit rather than explicit — that is, they are not always stated. A violation of the assumption means imperfection in the market.

The deviation from perfect competition occurs when there are a relatively small number of firms operatingin an industry. Relating to the number of firms operating in the market, an imperfection in the market can be seen from different angles.

Perfect competition is supposed to be nonexistent in an actual scenario as simultaneous attainment of these conditions is very hard to find. Many economic thinkers' comment that the existence of perfect competition is next to impossible and it is basically a theoretical concept. Most of the markets we observe hence come under the category of an imperfect market.

Noted that monopolistic competition is said to be near perfect competition with a similar number of firms operating in the market but with slightly differentiated products and the existence of selling and advertising costs.

Also, there is a difference between the two forms of market relating tofirm and industry and the nature of thedemand curve.

In the product market, the other forms of the market here to be mentioned that Monopoly, duopoly, and oligopoly.

Monopoly: When one firm produces for the entire market in which case the firm is referred to as a monopoly. Here the single firms control the entire market of large numbers of buyers thereby enjoying the power to exclusively determine the price of the commodity. Supernormal profit at the loss of consumer surplus is a common phenomenon in this type of market. Monopoly may be seen in both the private and public sectors. Discretion of owning the raw material by fewer firms, geographical barrier, limited technical know-how adopted by some specific firms, legal restriction, and difference in elasticities are some of the reasons forthe growth of monopolies.

Duopoly: A duopoly consists of two firms operating in a market. The market here is owned by two competing firms for a particular product or service they provide. Here, the consequence may be either agreement between or competition the firms, and according to the prospect will be emerging either an equal share of the market or as a leader-follower relationship.

Oligopoly: An oligopoly represents a situation when there exist more than two firms in a market but less than the many firms assumed in a perfectly competitive market. Here, there may be a collusive or non-collusive form of oligopoly. If there is a formal or informal agreement between or among the firms present in the market, this is said collusive form of oligopoly. A non-collusive oligopolist is always found to have faced competition from his counterpart.

In factor marketsalso, we get the different forms of markets such as monopsony or bilateral monopoly, etc..

Monopsony: Monopsony is a market condition in which there is only one buyer, the monopsonist. It emerges when the rights or willingness of purchasing a particular product is owned by a specific buyer. This is just opposite to a monopoly existing in the product market.

Bilateral monopoly: Bilateral monopoly is a market with one firm/individual, a monopolist, on the supply side, and one firm/individual, a monopsonist, on the demand side. This means there is a direct one-to-one dealing of a good between the single buyer and the single seller. The prospect in the market here depends on the strength of bargaining power.

Now let us know about several possibilities of the existence of externalities. Some of them are discussed below-

Existences of externality: As discussed in the earlier chapter, an externality is a situation when the cost or benefit is caused by a producer or consumer that is not financially incurred or received by that particular producer or consumer.Externalities arise whenever the actions of one economic agent directly affect another economic agent outside the market mechanism.It is an impact of unrelated third parties on consumption or production.Due to the presence of externality two possibilities were found to occur:

- First, Pareto optimal conditions are violated.
- Second, the constants embedded in the system lose their significance as 'prices' because they do not reflect all the costs and benefits of action to the society as a whole.

The presence of an externality not only prevents the market to achieve the Pareto optimality but also impacts on inefficiency in social welfare.

Decreasing returns to scale: Decreasing returns to scale is the situation when a successive increase in output falls as and when there is a gradual increase in the inputs, i.e., output increases less proportionately than the increase in inputs. In presence of decreasing returns to scale, the value of output will exceed the total payment to the factors of production: productsare not 'exhausted' by factor payments. This creates ambiguity about how to treat the imbalance between the total value of output and total payments to factor owners in determining social welfare.

Increasing returns to scale: Increasing returns to scale is the situation when a successive increase in output increases as and when there is a gradual increase in the inputs, i.e., output increases more proportionately than the increase in inputs. Increasing returns to scale affects the position of the isoquant rather than the shape.Increasing returns to scale impacts the average cost curve as well as the production possibility curve which in return affects the level of production.Level of production impacts in the markets hence the market imperfection is there.

Indivisibilities in production: Invisibility is the situation whenany output level below some of the technical inabilities such asthe physical failure, or economic ineptness of running a machine or other equipment at below its optimal operational capacity results in under capacity utilization of machines which impacts the level of output per input. Ifmany firms exist in production and if the production methods are indivisible, the small firms cannot take advantage of the lower costs of large-scale production.The small firms produce below the production possibility curve.Due to indivisibility, they cannot make full use of available technical knowledge.

From the above discussion, it is clear that market imperfection may lead to market failure. Market failure is an economic situation defined by an inefficient distribution of goods and services in the free market. In such a scenario the prevailing market fails to find a successful solution for the market. There is the situation of underproduction or overproduction in the market.

Under such a situation, each individual makes the correct decision for him/herself, but those prove to be the wrong decisions for the group. Hence, there is a discrepancy in the market equilibrium. This state is explained as the Pareto inefficiency. Under market imperfection, there is a loss of economic welfare because of the motive of private profit. Private producers are found to have more, i.e., overproduction at the cost of the society; marginal social cost being higher than the marginal private cost.

Motivation towards profit leads to inefficiency in production and consumption causing market failure. Market failure in many a case however is interlinked with the situation of market competitiveness

1.2 Public Goods and Free Rider Problem

Public goods are collectively consumed, and one person's consumption does not affect and prevent another person's consumption.Private goods are independently consumed and one person's consumption affects andprevents another person's consumption.

Public goods have two main characteristics:

Non-rivalry: The character of non-rivalry means that there is no competition for achieving public goods by any person. This means one person's consumption of a particular good does not mean that the others will not get theopportunity of using it simultaneously. For example,the Use of a public road by one individual does not limit its access for the others.

Non-excludability: In the case of public goods the restriction on the usage of a product is notlimited to the people who have paid for it.For consumption nobody pays or a person cannot be excluded on the basis of the payment made on it. For example, in the case of street lights, a person cannot be ruled out of getting access to lights because he has not paid.

Categorization of different public goods: Public goods can be differentiated from private, merit, or clubbed goods from different aspects. If a good is non-rival and non-excludable, it is a public good. Example of public goodsisthe road, railway, bridge, street lights, traffic lights, etc. The environmentis considered to be a public good. On the other extreme, if a good is completely excludable and there is rivalry for a good, it is said as a private good for example all goods used by the individuals for their personal consumption such as clothes, cosmetics are private goods. A good which is rival but non-excludable is said as a common good. In this case, the excess is limited but the users need not pay for using it, for example- public parks or playground.

	Excludable	Non-excludable
Rival	Private goods (Clothes, Cosmetics)	Common good (Public perks, Playground)
Non- Rival	Club good (Telephone, Electricity)	Public good (Road, Bridge)

Table 7.1:Categorization of goods

Similarly, a good where there is rivalry for having a good, but the user is nonexcludable., needs to pay for using it for example-telephone and electricity can be used a user limitlessly against the payment made on it. This type of good is known as clubbed goods. In table 7.1, a list of such categorizations has been displayed.

Hence, public goods are the commodities or services provided by the nature of the government of a country, free of cost or by taxing a few people to offer mass benefits to the public in general such, as roads, bridges, railways, etc.

The Free-Rider Problem: Free rider problem is a common phenomenon found in the determination of the socially optimal level of output in presence of market failure. A free rider is a user of a good who doesnot payfor gettingthe benefit of using a good. A free-rider problem is a situation in which individuals or businesses are receiving benefits from the use of any public good or utility service but without actually contributing anything in getting them. Thus, it creates an unfair balance in the distribution or allocation of revenues or other resources. In such a situation, it remains a very difficult task to find out the real benefit creating a situation like market failure. Here, it's given two cases to observe the situation.

Case 1: Let us assume that someone builds a lighthouse in a seashore.All sailors passed by the area will benefit from its illuminationeven though they don't pay towards its upkeep.

Case 2: Assume the case of cleaning a common kitchen area. It would be good if we all contributed to cleaning the kitchen but there is a common temptation in this regard to leaving for someone else – 'who will do it all for us?'

In either case, it is observed the resources have created some generators for he is not properly paid. The generator of the lighthouse incurs a definite amount of cost but he is not paid by the users (sailors who get the benefits) properly for its benefit. Hence, it will be a difficult task for the generator to find optimal revenue generated or optimal level of lights illuminated. Similarly, the

owner of the common kitchen will find it difficult to find out the optimal level of use and utilization to manage the cost of the kitchen.

Public goods create a free-rider problem because the quantity of the good that a person is able to consume is not influenced by the amount that the person pays for the good. There are some serious consequences because of the free-rider problem:

- Non-production-Due to the presence of free-riders the generators in most cases are discouraged to produce a good.

- Under–production– Producers cannot find out the actual cost-benefit of the goods generated and hence production often takes place below the optimal level.

- Over-production – Because of failing to analyze the actual picture, most often an inflated picture of the situation of generating a good is realized by the creators of a good and there is the possibility of overproduction as well.

A free-rider problem is also said to occur when there is the overconsumption of shared resources.

This is also known as The Tragedy of the Commons. As mentioned earlier, the tragedy of commons explains ones' tendency to make the best decisions to fulfill his self-interest, irrespective of the negative impact the others may have. When there is the overuse of a common or public good by one or more individuals may reduce its availability that could cause shortage of access for the others and ultimately brings catastrophe to the others. Here, we can cite the example of grazing field where initial the number of users were limited and hence the field could feed the cows sustainably. As an when the number of cows increased by at least one user the sustainability of grass availability is deteriorated. This explained in the snapshots of the picture.
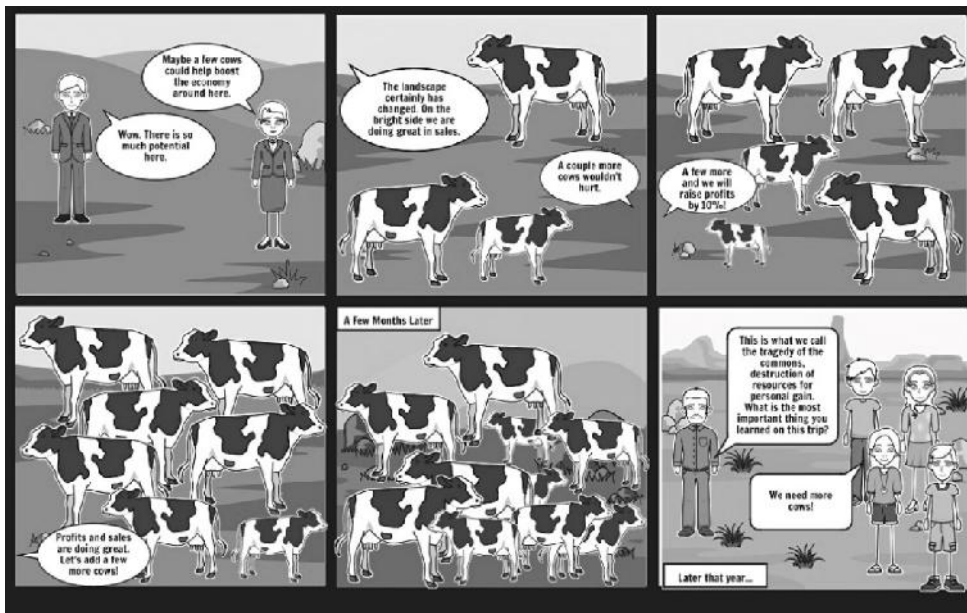
Fig. 7.1 : Tragedy of commons shown

Similar other examples depicting the scenario of tragedy of commons can be drawn with the help of the following situations.

- Overfishing a river by fishermenmay cause the unavailability of fish of the others.
- Overuse of groundwater by some users may reduce its reserve for others.

Solution for free rider:

- Tax and government provision:This ensures everyone who benefits from the service should make the payment towards meeting the cost of production of the generation of the service. This is how the issue of the free-rider can be neutralized.Cost of production also helps in minimizing the wastage of resources.

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- Appealing to people's altruism: Another measure is to persuade people to involve themselves in the cost of producing public goods.This involves motivating people to make awareness to develop a sense of developing an attitude towards rationalizing their behaviour. In the case of some goods, for example- while visiting a garden, it is possible to raise funds by asking people who visit the garden for donations if he enjoys his visit.
- Make a public good private:Another measure is to change the ownership of the goods. Transferring the ownership of public goodsfrom public to private investors, the wastage can be protected and efficiency in use can be ascertained.Example: Privatization of PSUs can increase efficiency. This is also said exit policy in India.
- Legislation: By making some laws or regulations also a free riders' problems to some extent can be minimized. There are different ways to implement such legislation. Quota – Fixation of a definiteand maximum amount to be used by a user of public goodswith legal provisions may be helpful to minimize the problem of free- rider.
  - Quotas may be fixed on the volume of quantities used by a user at a time. However, it is difficult to implementsuch kinds of quotas in practical scenarios. Monitoring such quotas also remains a hurdle task.
  - Quotas may be fixed on the size of the equipment or tool used to extract such goods. For example, in case a fisher fishing in a river, a fixation ofthe size of his net used for fishing or number of fishing vessels may limit the over-extraction of public goods and hence the wastages can be prevented.
- Another way is to provide compensation tothe user of public goods so that they can be kept away from using such goods. In the example of the fishermen above, fishermencan be compensated by providing financial support if it is his prime occupation, to move away from fishing.

1.3   Theory of Second Best & Implications of Second-Best Theory

The theory of the second-best concerns the situation when one or more optimality conditions of Pareto optimality cannot be satisfied.

The economists like Richard Lipsey and Kelvin Lancaster showed in the year 1956, that if at least one of the optimality conditions in an economic model, cannot be satisfied, in that case, it is most likely that the next-best solution involves changing the other variables away from the standards that would otherwise be optimal.

Before knowing the theory of second best, let us first explain the concept of first best briefly-

Let us assume that in a small perfectly competitive open economy where there are no market imperfections, no externalities in production or consumption, absence of public goods, all resources are owned privately, and everyone works rationally in the presence of perfect information. In that case, we will get the scenario that markets are always clear and hence no excess and surplus in the marketand also, there are no adjustment costs or unemployment of resources.

The optimal government policy, in this case, is laissez-faire. The state has no intervention in economic activities. Thus, with a laissez-faire policy, the resulting equilibrium would be called first best. The economy will be in a state of equilibrium.

This market conditions can be said as optimal since there is no conceivable way of increasing economic efficiency at a first-best equilibrium.The firstbest solution is hence said as Pareto optimal.

But the real world is unlikely to be so perfectly characterized. Markets will likely have numerous distortions and imperfections. Even though we get some sort of characteristics of perfect perfection, it is only near to a perfectly competitive market. This is because there may be the presence of externality and public good which makes it very complexto find the optimal level of output. Besides some markets have a small number of firms, each of which has some control over the price and hence market that prevails and makes a positive economic profit.

Under such conditions, although governments invariably set taxes on consumption, profit, property, assets, and so on to meet the market equilibrium, still it remains to be an unsolved task in way of finding out the optimality in the market. Finally, information is rarely perfectly and costlessly available and hence it is difficult to achieve Pareto optimality.

Hence, in the real-life scenario, the more practical solution is likely to be the theory of second best. The second-best theory states that if any of the Pareto optimal conditions are not satisfied, it is neither necessary nor desirable to satisfy the remaining conditions. The optimum situation, in this case, can be attained only by neglecting the other conditions.

Let us cite the example of a mining monopolistwho is also a polluter. Mining leads to dumping thenearby river and generates deadly dust which causes the worker's lungs to be affected. Suppose, in addition, that there is nothing at all that can be done about the pollution without also reducing the level of production which again is not desirable for the economy or the society as a whole. In such a situation it becomes difficultto find out a balance between the level of output and the level of pollution. However,the government is able to break up the monopoly with the help of some restriction or regulation.

Pollution is highly associated with production. An increase in production will most likely increase pollution. Thus, it is not clear that eliminating the monopoly simply increases efficiency.

Thus, the situation of the theory of second-best can be mapped with the help of the following diagram-
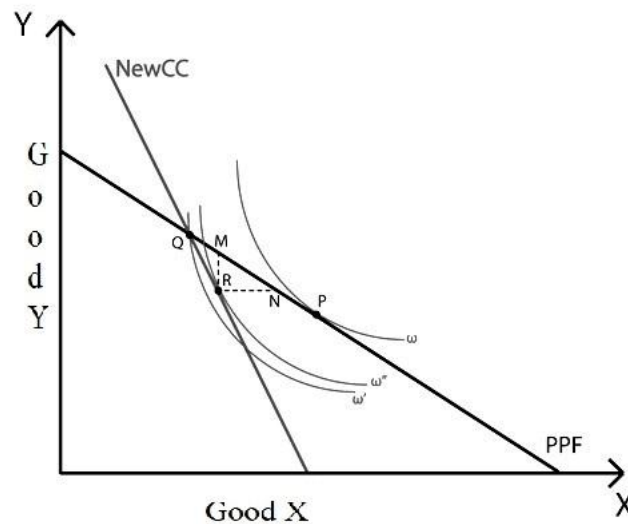

Fig. 7.2 : The theory of second best

In the diagram, the production possibility frontier (PPF) along with the indifference curves w reaches the equilibrium at point P where the PPF is tangent to ω. Since this point lies on the PPF and an indifference curve simultaneously, it defines that production and consumption are at optimum.

If we draw a new constraint condition, i.e., NewCC, it means that point P is no longer achievable. In such a case, Q could be the second-bestchoiceas it lies both on PPF and NewCC. But, rather, thesecond-best point could be R, which lies inside the transformation line. The reason behind this is that an improvement on welfare can be reached by moving to point R, because point R lies on a higher indifference curve, i.e., ω'' which means a higher level of welfare. Now, the range MN is theoretically more effective than R, but the remarkable point here is that the points on the segment MN cannot be achieved. Hence point R is the second-best solution in this case. Hence, when one marginal condition of Pareto optimality is not satisfied, (i.e., MRSxy is not equal to MRT$_{LK}$) it may be better to violate the other marginal conditions of Pareto optimality to achieve the maximum social welfare. This is how the theory of second best is explained.

Summary

The concept of the tragedy of commons was first introduced formally by Garrett Hardin, an evolutionary biologist when he wrote a scientific paper entitled "The Tragedy of the Commons" in a peer-reviewed journal in 1968. The paper was about the increasing concern of overpopulation. Hardin used a very suitable example of sheep grazing land in this regard. He took it from the early English economist William Forster Lloyd while addressing the adverse impacts of the scenario of overpopulation. In that example, grazing lands were private property and its use was limited by the farsightedness of the landowner in order to preserve the value of the land as well as the health of the herd. Grazing lands will become over-grazed with livestock over time as the food the animals consume is shared among all the sheepherders. Hardin relates this example to the human being; each person would try to fulfill his self-interest and consume as much of the common resource as possible, thereby creating the scarcity of the resource. This will bring a common shortage of resources for all. This is referred to as the tragedy of commons to all.

Market imperfections mean any deviations from the assumptions of perfect competition. That is before knowing market imperfection let's know briefly about the market perfection.

The deviation from perfect competition occurs when there are a relatively small number of firms operatingin an industry. Relating to the number of firms operating in the market, an imperfection in the market can be seen from different angles.

Perfect competition is supposed to be nonexistent in an actual scenario as simultaneous attainment of these conditions is very hard to find. Many economic thinkers comment that the existence of perfect competition is next to impossible and it is basically a theoretical concept. Most of the markets we observe hence come under the category of an imperfect market.

Noted that monopolistic competition is said to be near perfect competition with a similar number of firms operating in the market but with slightly differentiated products and the existence of selling and advertising costs.

In the product market, the other forms of the market here to be mentioned that Monopoly, duopoly, and oligopoly.

Monopoly: When one firm produces for the entire market in which case the firm is referred to as a monopoly. Here the single firms control the entire market of large numbers of buyers thereby enjoying the power to exclusively determine the price of the commodity. Supernormal profit at the loss of consumer surplus is a common phenomenon in this type of market.

Duopoly: A duopoly consists of two firms operating in a market. The market here is owned by two competing firms for a particular product or service they provide. Here, the consequence may be either agreement between or competition the firms, and according to the prospect will be emerging either an equal share of the market or as a leader-follower relationship.

Oligopoly: An oligopoly represents a situation when there exist more than two firms in a market but less than the many firms assumed in a perfectly competitive market. Here, there may be a collusive or non-collusive form of oligopoly.

In factor marketsalso, we get the different forms of markets such as monopsony or bilateral monopoly, etc..

Monopsony: Monopsony is a market condition in which there is only one buyer, the monopsonist. It emerges when the rights or willingness of purchasing a particular product is owned by a specific buyer. This is just opposite to a monopoly existing in the product market.

Bilateral monopoly: Bilateral monopoly is a market with one firm/individual, a monopolist, on the supply side, and one firm/individual, a monopsonist, on the demand side. This means there is a direct one-to-one dealing of a good between the single buyer and the single seller.

The presence of an externality not only prevents the market to achieve the Pareto optimality but also impacts on inefficiency in social welfare.

Existences of externality: Externalities arise whenever the actions of one economic agent directly affect another economic agent outside the market mechanism.It is an impact of unrelated third parties on consumption or production.Due to the presence of externality two possibilities were found to occur:

- First, Pareto optimal conditions are violated.

- Second, the constants embedded in the system lose their significance as 'prices' because they do not reflect all the costs and benefits of action to the society as a whole.

Decreasing returns to scale: In presence of decreasing returns to scale, the value of output will exceed the total payment to the factors of production: productsare not 'exhausted' by factor payments. This creates ambiguity about how to treat the imbalance between the total value of output and total payments to factor owners in determining social welfare.

Increasing returns to scale: Increasing returns to scale affects the position of the isoquant rather than the shape.Increasing returns to scale impacts the average cost curve as well as the production possibility curve which in return affects the level of production.Level of production impacts in the markets hence the market imperfection is there.

Indivisibilities in production: Ifmany firms exist in production and if the production methods are indivisible, the small firms cannot take advantage of the lower costs of large-scale production.The small firms produce below the production possibility curve. Due to indivisibility, they cannot make full use of available technical knowledge.

Market imperfection may lead to market failure. Market failure is an economic situation defined by an inefficient distribution of goods and services in the free market. In such a scenario the prevailing market fails to find a successful solution for the market. There is the situation of underproduction or overproduction in the market.

Public goods are collectively consumed and one person's consumption does not affect and prevent another person's consumption.Private goods are independently consumed and one person's consumption affects andprevents another person's consumption.

Public goods have two main characteristics:

Non-rivalry: The character of non-rivalry means that there is no competition for achieving public goods by any person. This means one person's consumption of a particular good does not mean that the others will not get theopportunity of using it simultaneously.

Non-excludability: In the case of public goods the restriction on the usage of a product is notlimited to the people who have paid for it. For consumption nobody pays or a person cannot be excluded on the basis of the payment made on it.

Categorization of different public goods: Public goods can be differentiated from private, merit, or clubbed goods from different aspects. If a good is non-rival and non-excludable, it is a public good. Example of public goods is the road, railway, bridge, street lights, traffic lights, etc. The environment is considered to be a public good. On the other extreme, if a good is completely excludable and there is rivalry for a good, it is said as a private good for example all goods used by the individuals for their personal consumption such as clothes, cosmetics are private goods. A good which is rival but non-excludable is said as a common good. In this case, the excess is limited but the users need not pay for using it, for example- public parks or playground.

Similarly, a good where there is rivalry for having a good, but the user is nonexcludable., needs to pay for using it for example-telephone and electricity can be used a user limitlessly against the payment made on it. This type of good is known as clubbed goods.

The Free-Rider Problem: Free rider problem is a common phenomenon found in the determination of the socially optimal level of output in presence of market failure. A free rider is a user of a good who does not pay for getting the benefit of using a good. A free-rider problem is a situation in which individuals or businesses are receiving benefits from the use of any public good or utility service but without actually contributing anything in getting them. Thus, it creates an unfair balance in the distribution or allocation of revenues or other resources. In such a situation, it remains a very difficult task to find out the real benefit creating a situation like market failure.

Public goods create a free-rider problem because the quantity of the good that a person is able to consume is not influenced by the amount that the person pays for the good. There are some serious consequences because of the free-rider problem:

- Non-production-Due to the presence of free-riders the generators in most cases are discouraged to produce a good.
- Under–production– Producers cannot find out the actual cost-benefit of the goods generated and hence production often takes place below the optimal level.

- Over-production – Because of failing to analyze the actual picture, most often an inflated picture of the situation of generating a good is realized by the creators of a good and there is the possibility of overproduction as well.

A free-rider problem is also said to occur when there is the overconsumption of shared resources.

This is also known as The Tragedy of the Commons.The tragedy of commons explains ones' tendency to make the best decisions to fulfill his self-interest, irrespective of the negative impact the others may have. When there is the overuse of a common or public good by one or more individuals may reduce its availability that could cause shortage of access for the others and ultimately brings catastrophe to the others.

Solution for free rider:

- Tax and government provision.
- Appealing to people's altruism.
- Make a public good private.
- Legislation: By making some laws or regulations also a free riders' problems to some extent can be minimized. Quota – Fixation of a definite and maximum amount to be used by a user of public goods with legal provisions may be helpful to minimize the problem of free- rider.
- Another way is to provide compensation to the user of public goods so that they can be kept away from using such goods.

The theory of the second-best concerns the situation when one or more optimality conditions of Pareto optimality cannot be satisfied.

The economists like Richard Lipsey and Kelvin Lancaster showed in the year 1956, that if at least one of the optimality conditions in an economic model, cannot be satisfied, in that case, it is most likely that the next-best solution involves changing the other variables away from the standards that would otherwise be optimal.

The second-best theory states that if any of the Pareto optimal conditions are not satisfied, it is neither necessary nor desirable to satisfy the remaining conditions.The optimum situation, in this case, can be attained only by neglecting the other conditions.

Keywords

Market imperfections: Market imperfections mean any deviations from the assumptions of perfect competition

Public goods: Public goods are collectively consumed and one person's consumption does not affect and prevent another person's consumption.

Free rider: A free rider is a user of a good who does not pay for getting the benefit of using a good.

The second-best theory: The second-best theory states that if any of the Pareto optimal conditions are not satisfied, it is neither necessary nor desirable to satisfy the remaining conditions.

Self Assessment

1. Market imperfections mean

A. Any deviations from the assumptions of perfect competition.
B. A violation in assumption in such an assumption means imperfection in the market.
C. Both are correct
D. Both are incorrect.

2. Which of the following form of the market means market imperfection?

A. Monopoly
B. Duopoly
C. Oligopoly
D. All the above

3. Monopsony is a market form having

A. One seller
B. One buyer
C. a large number of buyers
D. a large number of sellers

4. In Bilateral monopoly, there is only

A. One seller
B. One buyer
C. One buyer and one seller
D. None of these

5. Which of the following is a reason of market failure

A. Externality
B. Increasing returns to scale
C. Indivisibilities in production
D. All the above

6. Which of the following is a feature of public good?

A. Non-Rivalry
B. Non-excludability
C. Both of these
D. None of these

7. Which of the following is a feature of private good?

A. Non-Rivalry
B. Non-excludability
C. Rivalry
D. None of these

8. An example of a public good is

A. Car
B. Street light
C. Building
D. None of these

9. An example of a private good is

A. Sunshine

B. Streetlight

C. Car

D. None of these

10. An example of the common good is

A. Sunshine

B. Electricity

C. Street light

D. Public Park

11. An example of the common good is

A. Public Park

B. Sunshine

C. Electricity

D. Street light

12. Consequences of free-rider problem is

A. Non-production

B. Under–production

C. Overproduction

D. All the above

13. Overconsumption of shared resources is known as

A. Tragedy of commons

B. Free riders problem

C. Non-inclusive effect

D. All of these

14. Laissez-faire policy is related to the theory of?

a. First best

b. Second best

c. Both

d. None

15. The first best solution is given by

A. Pareto optimality

B. Pigouvian Tax

C. social indifference curve

D. All the above

16. When there is the violation in Pareto optimality, the solution is given by

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A. First best
B. Second best
C. Both
D. None

17. The second-best theory states that if any of the Pareto optimal conditions is not satisfied,

A. It is neither necessary nor desirable to satisfy the remaining conditions.
B. There may not be social welfare
C. There is inefficiency
D. None of these

Answers for Self Assessment

1. C	2. D	3. B	4. C	5. D
6. C	7. C	8. B	9. C	10. D
11. C	12. D	13. A	14. A	15. A
16. B	17. A			

Review Questions

1. What is market imperfection?
2. Define different forms imperfect markets?
3. What are the impacts of externality in market?
4. What is a public good?
5. Define different categories of goods according to their characteristics.
6. Explain the free rider's problem.
7. How would you solve the free rider's problem?
8. Mention the consequences of free riders' problem.
9. Explain different situations of the tragedy of commons.
10. Discuss the theory of the second-best.

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Unit 08: Meaning of General Equilibrium

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1.2   Partial Vs General Equilibrium Approach

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Self Assessment

Answers for Self Assessment

Review Questions

Further Readings

Objectives

After this chapter, you will be able to

- learn about the interrelationship of the markets,
- learn about the interdependence of the markets,
- learn how the flow of income and demand connects the markets.
- learn about the concept of equilibrium,
- learn about the use of partial equilibrium,
- learn the sectoral flow of income and demand and the concept of general equilibrium.

Introduction

In economics, everything is determined with the help of the market. A market is a system where the two forces demand and supply work. Demand comes from the buyer's end and supply can be analyzed from the seller's point of view. These two forces after mutual interaction set the equilibrium in the market. Any imbalance between these two forces causes distortions in the market in the form of excess and shortages. This is also said as operation of the market mechanism. That is to say, a market is clear when the market mechanism or price mechanism operates correctly. In the real-lifescenario,we do have different forms of the market such as product market and factor market. In a product market, the products are bought and sold, and hence the price and volume of the products are determined. But, in the factor market purchase and sale of the factors of production or the input are done by the owner of the products and the producers of the product. Here unlike the product market, the producer is a buyer of the factor instead of a seller.Again, in the product market, mostoften, the price and output level of a particular is determined at a particular point in time assuming all the price and output of all other products to be given and constant. But actually, it may not be so. In real-lifesituations, each of the marketsis interrelated and interdependent relating to the impact of price and output level. No market is independent. And it is necessary to determine the price and output of a market in relation to the price-output of the other markets. When the price-output of a particular market is determined in isolation of the others this is the situation of partial equilibrium analysis. But when all markets are considered altogether and there is simultaneous determination of price and output in all the markets, this is the scenario of general equilibrium. In this chapter, we will be discussing the interdependence and interrelationships of different forms of the market. We will also try to find out the concept of both partial and general markets and determine the different situations how the equilibrium in both these markets can ascertain. We will then be able to find out the impact of one market on another.

Microeconomics Theory and Analysis – II

1.1 <u>Interdependence of Markets</u>

The interrelationship between or among different markets causes interdependence of markets.Change in demand and supply condition of one market changes the demand and supply conditions of the other markets. In this case, let us cite the example of markets in complementary and substitute goods. A complementary commodity is a commodity where some goods are demanded or consumed together. For example, car and petrol are demand togetherand, in that case, the increase and decrease of price quantity supplied car depends on the price and supply of petrol also. This is because of the fact that both these commodities being complementary to each other are interconnected and interdependent. Similarly, substitute goods are those goods whereas the price demand of one commodity impacts the price and demand for the other, i.e., when the price of a commodity increases the demand for the other increases. In such a scenario the price-demand structure of a particular product depends on the price-demand conditions of the other. This commodity, in either case,isinterconnected to each other, so the change in demand in one market affects the other markets.

The importance of the study of general equilibrium can be appreciated from the interconnection and interrelatedness of the countless markets in the economy. Let us consider a two-sector economy to show the circular flow of income between the Household and business sector (firm). The interdependence of the activity in such a case within an economic system can be illustrated with help of the figure 8.1.
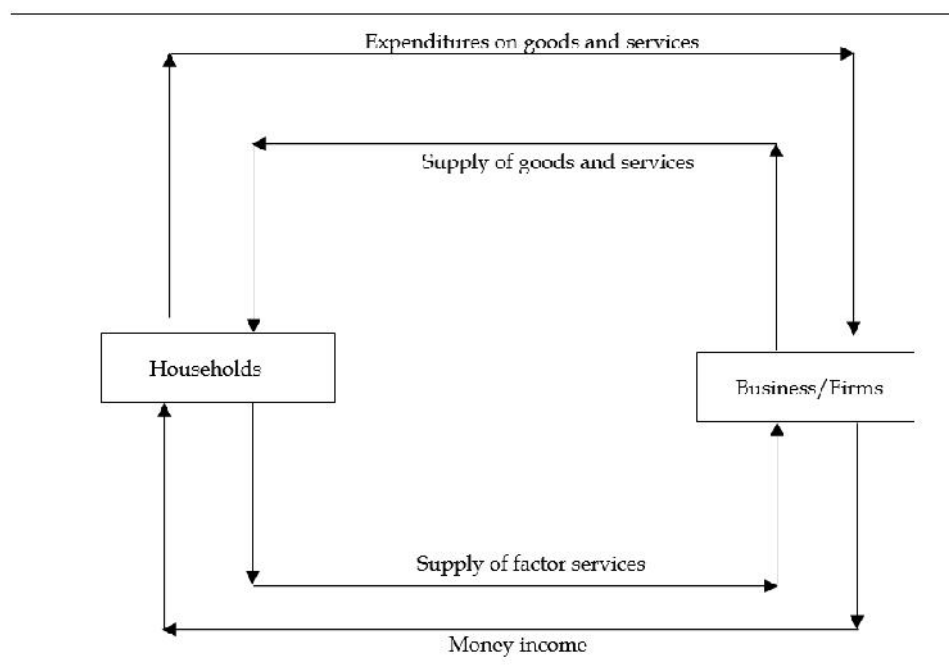

Fig. 8.1: Circular flows in a two-sector economy showing their interdependence

In the figure above, we have seen that the economy is dependent across the sectors. Here, for better clarity two sectors: household and business are considered for study.It is observed that the household sector provides factor service (i.e., labour service) to the firms in the first round, and, in return, the firms provide money income to the household sector.

In the second round, the household sector makes its consumption expenditure from the income it receives as factor income from the firms while purchasing the goods and services from the business sectors (firms). The firms in response provide goods and services to the household sector.

Here the sectors in the economy are found to have been dependent on each other.No sector in such can be analyzed in absence of the others.

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Let us consider one more example depicting such a kind of interrelationship. Suppose,the demand for houses in a particular city increases.Increased demand for housesincreases houseto rent.The housing industry is now being profitable attracts new investors to invest and new construction starts.Factor demand, viz., the demand for land, labour, and capital and demand for construction materials such as steel, cement, and bricksincrease.

As and when the demand for these intermediate goods has increased, the firms producing these goods will demand more factors to produce these goods.Hence there will be a larger factor income flow to the household sector.

An increase in household income increases demand for consumer goods.

Thus, there is a complex interrelationship between the product and the factor market.

This relationship will be even more complicated when the change in relative prices ofproduct and factor causesproduct substitution and factor substitution.Hence, the various markets act and react inresponse to change in interconnected markets. This type of interlinkage is shown in the figure below-
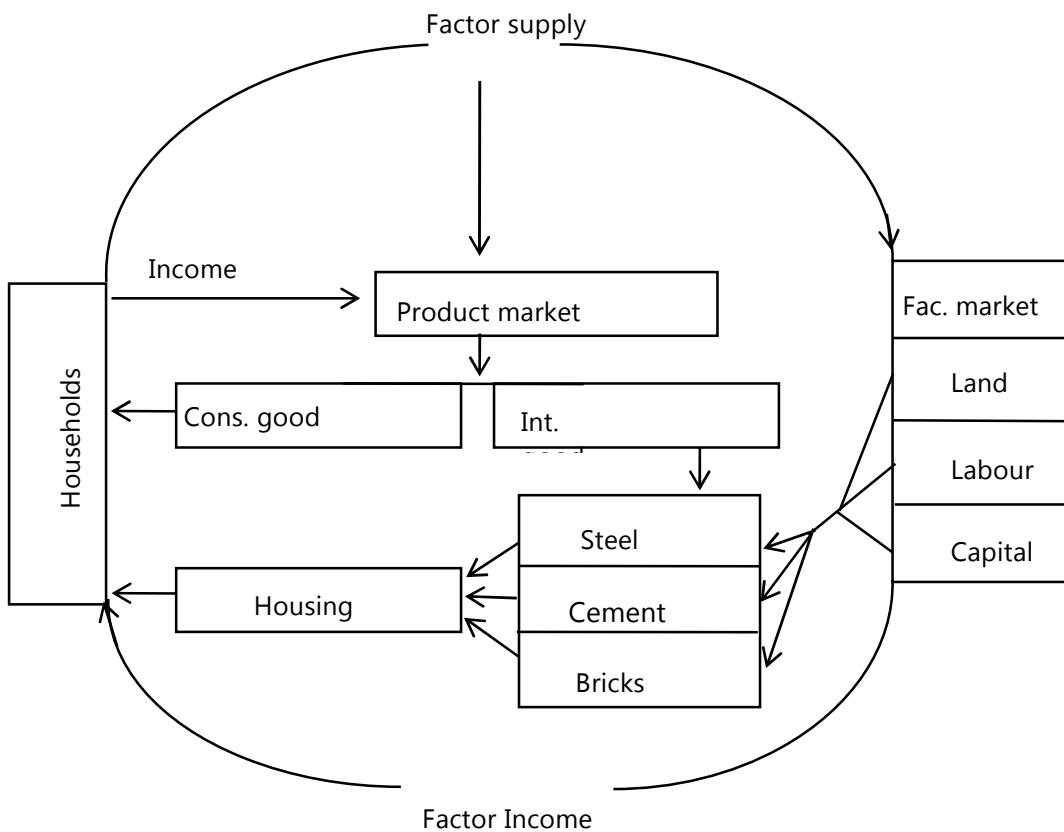

Fig. 8.2: Interdependence of various markets

In the figure 8.2, the interdependence of the various markets is shown. The household supplies labour to the factor market as well as to the product market. Product market produces both consumer goods and intermediate goods. Consumer goods are directly purchased by the household sector whereas intermediate goods like steel, cement, and bricks are purchased by the housing sector to use as inputs for the construction of the houses and finally the houses so built are demanded by the household sector.Against the purchase of the consumer goods the household provides income to the product market which is actually the expenses of the household sector in the purchase of different goods. Factor market provides factor services in producing different intermediate goods which are sold in the product market were demanded housing construction. Thus, the factor marketis also linked with the product market directly and household indirectly. So, the interrelationship and interdependence among all these markets are very complex. Hence, one market cannot be analyzed independently in absence of the other because of such strong interlinkages.

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The price and demand of one market do affect and are affected by other markets.Derive demand is an example of the consequence of the interdependence of markets. Let us consider two substitute goods – tea and coffee to explain the concept of interdependence.

Equilibrium in both tea and coffee markets is determined with the help of the demand and supply of tea and coffee.

Any exogenous change in one of two markets will disturb the equilibrium of the other market. This is shown with help of the diagrams below-
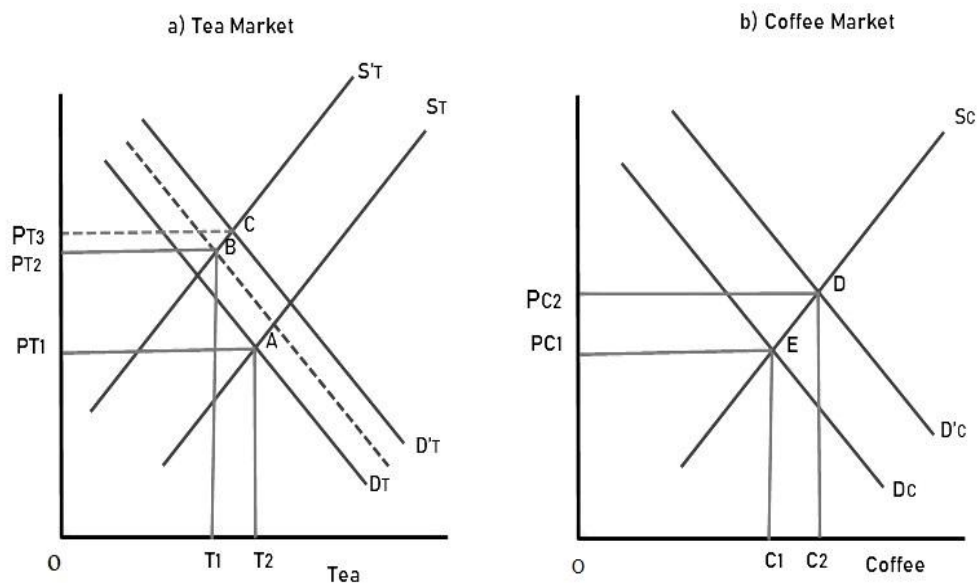

Fig. 8.3: Interdependence of the substitute commodities.

In the first panel of the diagram, the equilibrium of the tea market is at point A with price OPT1 and demand and supply of tea at OT1. At this stage, the coffee market gets settled at E with priceOPC1 and demand and supply of coffee at OC1.When the price of tea increases from OPT1 to, say, OPT3, the consumer consumes at C in the first panel. It impacts the coffee market,and hence the demand for coffee increases from DC to D'Cassome people move from consumption of tea to consumption of coffee since coffee is the substitute commodity for coffee. The coffee market now settles at point D with OPC2 price and demand and supply being OC2. Such an increase in the price of coffeeimpacts its customers; some move back again to prefer teathereby adjusting demand for tea. Finally,the tea market settles at B and the coffee market at D. This is how the deviation in the equilibrium in one market impacts the equilibrium of the other market. Markets in such cases are interrelated and interdependent to each other.

1.2   Partial Vs General Equilibrium Approach

Concepts Equilibrium: Before explaining the equilibrium, we need to know the concept of equilibrium. The word equilibrium is derived from the Latin word "aequilibrium" which means equal balance. It is used in economics and was imported from physics. In physics, it means a state of even balance in which opposing forces neutralize each other.

Equilibrium can be defined as: "A position from which there is no net tendency to move".

In economics, equilibrium implies a position of rest characterized by the absence of change.It is a state where an economic system stabilizes after some initial deviation or disturbances. There are various types of equilibrium such as stable equilibrium, unstable equilibrium, static equilibrium, dynamic equilibrium, partial equilibrium, general equilibrium, etc.

Here we will be confinedto the analysis of both partial and general equilibrium.

Partial equilibrium: Partial equilibrium is a condition of economic equilibrium which takes into consideration only a part of the market, ceteris paribus, to attain equilibrium.This means,ina partial equilibrium the equilibrium of a submarketirrespective of the impact of the total system of the market is determined.

According to George Stigler, "A partial equilibrium is one which is based on only a restricted range of data, a standard example is the price of a single product, the prices of all other products being held fixed during the analysis."

Thus, partial equilibrium analysis uses supply and demand curves of a particular product in a particular market and ignores effects that occur beyond these markets. So, economic analysis under partial equilibrium focuses on policy effects within a single market and does not address effects external to the market.

Let us now cite the example of the existence of partial equilibrium.

Consumer's Equilibrium: With the application of partial equilibrium analysis, a consumer's equilibrium is shown when he is receivingthe maximum total satisfaction from a certain expenditure and in a given set of situationsconcerning to the price and supply of the commodity.

Characteristics of partial Equilibrium:

- Only one price prevails in the market for a single product where the number of goods purchased by a buyer = total quantity produced by different firms.
- All the firms produce till that level where MC=MR, andsell at market price.
- The number of factors which its owners want to sell = the quantity which the entrepreneurs are ready to hire.

In partial equilibrium analysis, the price and quantity of a commodity is determined on the basis of the marginal conditions keeping the price and output of the others to be given and constant. The equilibrium so reached clears the from the excess and shortages. Partial equilibrium is based on certain assumptions-

Assumptions

- Commodity price is given and constant for the consumers.
- Consumers' tastes and preferences, habits, incomes are also considered to be constant.
- Prices of substitute or complementary are known as well as constant.
- The industry also gets factors of production at a known and constant price.
- Prices of the products that the factor of production helps in producing and the price and quantity of other factors are known and constant.
- There is perfect mobility of factors of production between occupation and places.

Under conditions of the given above assumptions, the price and output of a commodity are determined in a single market to search for partial equilibrium. Now let us show how the partial equilibrium is reached in the market with the help of the following diagram-

As has been discussed partial or particular equilibrium analysis is the study of the equilibrium position of an individual, a firm, an industry, or a group of industries viewed in isolation. This method considers the changes in one or two variables keeping all others constant.The ceteris paribus is the crux of partial equilibrium analysis. In the diagram, simple demand and supply functionis used to reach the equilibrium in the market. As it is well-known the demand function reflects the buyer's preference to purchase a commodity at a different price in the market. It is a downward sloping demand curve showing the inverse relationship between price and quantity

demand. In the diagram, D is the demand curve. Similarly, the supply function measures the seller's preference to sell or supply a commodity at a different price in the market. It is an upward sloping curve showing the positive relationship between price and quantity supplied.In the diagram, S means the supply curve. E is the equilibrium of a single market, where both the demand function and supply function intersect with each other. At this point,supply becomes equal to demand.

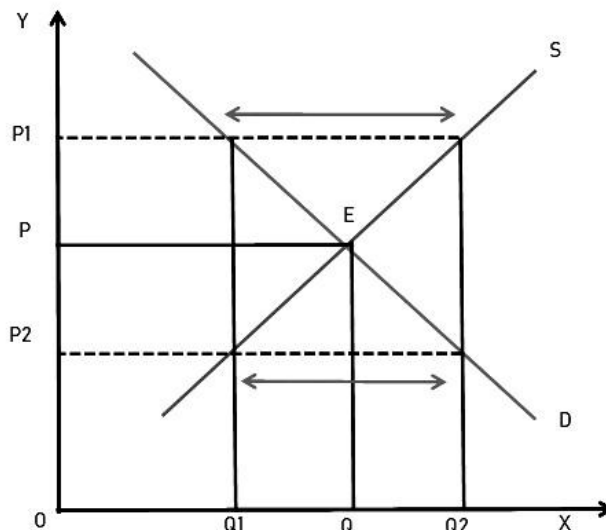In the equilibrium, the surplus and deficit are shown by the top and bottom arrow lines.

Fig. 8.4: Partial equilibrium analysis

At price OP1, supply exceeds demand since high price causes the law demand for goods by the consumers and high quantities to be supplied by the produces. Hence, this scenario is explained as excess supply (or shortage of demand). Price in the consequent period falls due to unsold stocks in the market. Similarly, at OP2 price, demand exceedsthe supply of the commodity as at low-price,the sellers are not interested to sell their products in the market. This situation is explained as excess demand (or shortage of supply) in the market. In the subsequent period, price increases as so many buyers at such a price remainunpurchased the good even though they are interested. Both these situations lead to an increase or decrease in the price in the market. Hence, the market reaches a price at OP where these excesses and shortages disappear from the market. At point E, demand and supply get equal (both the curves intersect) and hence this is explained as the equilibrium of the market. This happens in the case of a particular commodity when the assumptions mentioned above prevails. This is how we can reach partial equilibrium in a market.

General Equilibrium: General equilibrium is the state in which all markets, as well as all decision-making units, are in simultaneous equilibrium. The fundamentalcharacter of any economic system is interdependence among its constituent parts. In such cases, the markets of all commodities and all productive factors are interrelated and prices in all markets are simultaneously determined.

To explain the interdependence of the general equilibrium, let us consider Fig 8.5 and assume that the economic activity in the system takes the form of two flows between the consumer sector and the business sector:

Real flow: It is the exchange of goods for the services of factors of production. Firms produce and offer final goods to the household sector and buyers (consumers) offer to firms the services of factors which they own.

The disposal of the workerbythe householdis the factor-service received by the firms. Similarly, the commodities supplied by the firm turns equal to the goods received by the household sector

Monetary flow: The consumers receive income payments from the firm for offering factor services. These incomes are spent by consumers for the acquisition of the finished goods produced by the business sector. This is monetary flow.

The expenditure of firms becomes the money income of the household. Similarly, the expenditures of households become the receipts of firms, which they once again pay the households for the factor services which they supply.

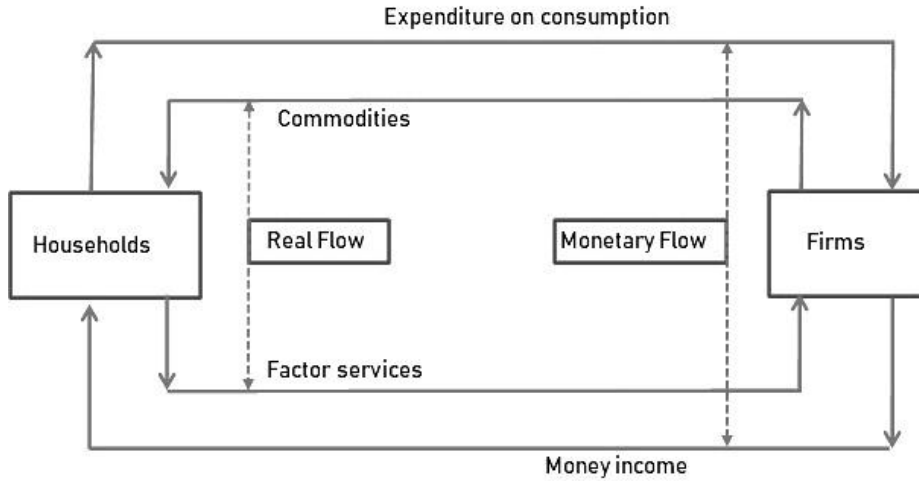The real flow and monetary flow is shown in the diagram, below-

Fig. 8.5: Real flow and monetary flow

Features of general equilibrium: General equilibrium analysis holds the following features-

- A general equilibrium exists in each market at a positive price.
- Each consumer maximizessatisfaction and each firm maximizes profit.
- There is neither excess demand nor excess supply.
- There is Pareto optimality.

When all submarkets in an economic chain of a system are in equilibrium, general equilibrium is said to be achieved. This means that at a positive price, all submarketsare cleared simultaneously. In relation to the earlier example ofthe housing industry (Fig.8.1), the markets for input (factor service), intermediate product (steel, brick, cement),the market for houses, consumer goods, etc. reaches the equilibrium simultaneously. The character of interdependence and interrelationship leads all the related submarkets to the simultaneous equilibrium.   Let us nowshow the simultaneous equilibrium of producer and consumer with the help of the following diagram-
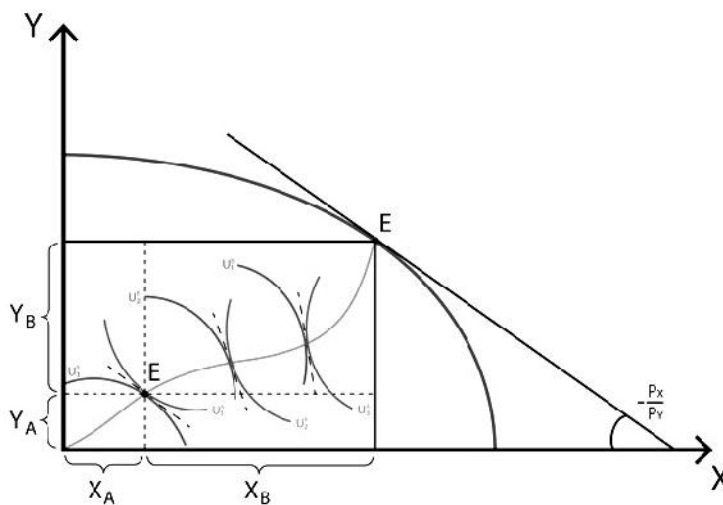

Fig. 8.6: Simultaneous equilibrium between producer and consumer

In fig 8.6, we have seen the consumer equilibrium is achieved at point E in the Edgeworth box diagram where the indifference curves of both individuals are becoming tangent to each other. The efficiency in exchange is said to have been achieved at that point. It also means the Pareto optimality. Similarly, the point E at the production possibility curve means the producers' equilibrium as at this point the production possibility curve of a producer is becoming the tangentto the isocost line or the price line meaning the highest possible product is achieved by the producer with his budget limitation. Now, fig. 8.6 means both producers and consumers are simultaneously in equilibrium at a positive price with the common slope of the tangents. Thus, both markets are in equilibrium. This is how the general equilibrium is achieved.

Summary

The interrelationship between or among different markets causes interdependence of markets. Change in demand and supply condition of one market changes the demand and supply conditions of the other markets. When the price of a commodity increases the demand for the other increases. In such a scenario the price-demand structure of a particular product depends on the price-demand conditions of the other. This commodity, in either case, is interconnected to each other, so the change in demand in one market affects the other markets. The importance of the study of general equilibrium can be appreciated from the interconnection and interrelatedness of the countless markets in the economy.

Let us consider one example depicting such a kind of interrelationship. Suppose,the demand for houses in a particular city increases.Increased demand for houses increases house to rent. The housing industry is now being profitable attracts new investors to invest and new construction starts.Factor demand, viz., the demand for land, labor, and capital and demand for construction materials such as steel, cement, and bricksincrease.

As and when the demand for these intermediate goods has increased, the firms producing these goods will demand more factors to produce these goods.Hence there will be a larger factor income flow to the household sector.An increase in household income increases demand for consumer goods. Thus, there is a complex interrelationship between the product and the factor market.

The price and demand of one market do affect and are affected by other markets.Derive demand is an example of the consequence of the interdependence of markets.

Concepts Equilibrium: Before explaining the equilibrium, we need to know the concept of equilibrium. The word equilibrium is derived from the Latin word "aequilibrium" which means equal balance. It is used in economics and was imported from physics. In physics, it means a state of even balance in which opposing forces neutralize each other.

Equilibrium can be defined as: "A position from which there is no net tendency to move".

In economics, equilibrium implies a position of rest characterized by the absence of change. It is a state where an economic system stabilizes after some initial deviation or disturbances. There are various types of equilibrium such as stable equilibrium, unstable equilibrium, static equilibrium, dynamic equilibrium, partial equilibrium, general equilibrium, etc.

Partial equilibrium: Partial equilibrium is a condition of economic equilibrium which takes into consideration only a part of the market, ceteris paribus, to attain equilibrium. This means, in a partial equilibrium the equilibrium of a submarket irrespective of the impact of the total system of the market is determined.

According to George Stigler, "A partial equilibrium is one which is based on only a restricted range of data, a standard example is the price of a single product, the prices of all other products being held fixed during the analysis."

Characteristics of partial Equilibrium:
- Only one price prevails in the market for a single product where the number of goods purchased by a buyer = total quantity produced by different firms.
- All the firms produce till that level where MC=MR, andsell at market price.

- The number of factors which its owners want to sell = the quantity which the entrepreneurs are ready to hire.

In partial equilibrium analysis, the price and quantity of a commodity are determined on the basis of the marginal conditions keeping the price and output of the others to be given and constant. The equilibrium so reached clears the from the excess and shortages. Partial equilibrium is based on certain assumptions-

Assumptions
- Commodity price is given and constant for the consumers.
- Consumers' tastes and preferences, habits, incomes are also considered to be constant.
- Prices of substitute or complementary are known as well as constant.
- The industry also gets factors of production at a known and constant price.
- Prices of the products that the factor of production helps in producing and the price and quantity of other factors are known and constant.
- There is perfect mobility of factors of production between occupation and places.

Under conditions of the given above assumptions, the price and output of a commodity are determined in a single market to search for partial equilibrium. Now let us show how the partial equilibrium is reached in the market with the help of the following diagram-

General Equilibrium:
General equilibrium is the state in which all markets, as well as all decision-making units, are in simultaneous equilibrium. The fundamentalcharacter of any economic system is interdependence among its constituent parts. In such cases, the markets of all commodities and all productive factors are interrelated and prices in all markets are simultaneously determined.

To explain the interdependence of the general equilibrium, let us consider Fig 8.5 and assume that the economic activity in the system takes the form of two flows between the consumer sector and the business sector:

Real flow: It is the exchange of goods for the services of factors of production. Firms produce and offer final goods to the household sector and buyers (consumers) offer to firms the services of factors which they own.

Monetary flow: The consumers receive income payments from the firm for offering factor services. These incomes are spent by consumers for the acquisition of the finished goods produced by the business sector. This is monetary flow.

Features of general equilibrium: General equilibrium analysis holds the following features-
- A general equilibrium exists in each market at a positive price.
- Each consumer maximizessatisfaction and each firm maximizes profit.
- There is neither excess demand nor excess supply.
- There is Pareto optimality.

When all submarkets in an economic chain of a system are in equilibrium, general equilibrium is said to be achieved. This means that at a positive price, all submarkets are cleared simultaneously. In relation to the earlier example of the housing industry, the markets for input (factor service), intermediate product (steel, brick, cement), the market for houses, consumer goods, etc. reaches the equilibrium simultaneously. The character of interdependence and interrelationship leads all the related submarkets to the simultaneous equilibrium.

Keywords

Interdependence of markets: When one market depends on another market relating to the determination of price and output.

Equilibrium:A position from which there is no net tendency to move.

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Partial equilibrium: Partial equilibrium is a condition of economic equilibrium which takes into consideration only a part of the market, ceteris paribus, to attain equilibrium.

General Equilibrium: General equilibrium is the state in which all markets, as well as all decision-making units, are in simultaneous equilibrium.

Self Assessment

1. Factor markets and product markets are

   A. Interrelated
   B. interconnected
   C. Interdependent
   D. All the above

2. Product market involves the production of

   A. consumer goods
   B. Intermediate goods
   C. Both of these
   D. None of these

3. Output of the factor market involves

   A. Steel
   B. Cement
   C. Bricks
   D. All of these

4. Household sector receives income from

   A. Product market
   B. Factor market
   C. Both
   D. None

5. Household sector provides factors to

   A. Product market
   B. Factor market
   C. Both
   D. None

6. Business sector receives …………… from the household sector

   A. Income
   B. Goods
   C. Factor service
   D. All of these

7. Business sector provides …………… to the household sector

A. Income
B. Goods
C. Factor service
D. All of these

8. Which one is the output of the product market

A. Steel
B. Cement
C. Bricks
D. Goods

9. The word equilibrium is derived from

A. The Latin word "aequilibrium"
B. The Latin word "equilibria"
C. The Latin word "aequilibria"
D. The Latin word "equili"

10. Which one is the assumption of partial equilibrium analysis-

A. Commodity price is given and constant for the consumers.
B. Consumers' tastes and preferences, habits, incomes are also considered to be constant.
C. Prices of substitute or complementary are known as well as constant.
D. All the above

11. One of the characteristics of partial equilibrium analysis is

A. Only one price prevails in the market for a single product
B. Multiple pricesprevail in the market for a single product
C. No price prevails in the market for a single product
D. None of these

12. Select the features of general equilibrium analysis

A. A general equilibrium exists in each market at a positive price.
B. Each consumer maximizes satisfaction and each firm maximizes profit.
C. There is neither excess demand nor excess supply.
D. All the above

13. Farms provides household sector

A. Commodities
B. Factor services
C. Income
D. None of these

14. Determination of price of orange in a market ignoring the prices of other commodities is an example of

A. Partial equilibrium analysis

B. General equilibrium analysis

C. Both

D. None

15. Determination of wage of the workers in a market considering the price of all other inputs simultaneously an example of

A. Partial equilibrium analysis

B. General equilibrium analysis

C. Both

D. None

Answers for Self Assessment

l.	A	2.	C	3.	D	4.	B	5.	B
6.	C	7.	A	8.	D	9.	A	10.	D
11.	A	12.	D	13.	A	14.	A	15.	B

Review Questions

1. What do you mean by interrelationship of markets?
2. What is market independence?
3. What is equilibrium?
4. What is real flow?
5. How can be the monetary flow between two sectors?
6. What are the different types of equilibrium?
7. Distinguish between partial and general equilibrium.
8. Show the market interconnectedness of any two markets with an example.
9. Explain how a single market reaches equilibrium.
10. Explain with an example how two markets reach the equilibrium simultaneously.

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Unit 09: Approaches to General Equilibrium

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Introduction
9.1   Classical & Neo-Classical View
9.2   Input and Output Approaches to General Equilibrium
Summary
Keywords
Self Assessment
Answers for Self Assessment
Review Questions
Further Readings

Objectives

After this chapter, you will be able to

- learn about the concept of general equilibrium theory from the classical economist's point of view,
- learn about the neo-classical idea of general equilibrium,
- learn the difference in view between the classical and neo-classical systems in general equilibrium.
- learn about the input-output method,
- learn about assumptions and limitations of the input-output method,
- learn how the input-output method is used in general equilibrium analysis.

Introduction

The prominent contemporary interpretation of the classical version put forward by such authors as Adam Smith and Karl Marx is that of essential continuity with the neoclassical economics that followed it. The fundamental necessities of economic treatise embodied in the last part of the twentieth-century version of competitive general equilibrium of neoclassicism were remarkably observed in and propelled by the Arrow-Debreu model in 1954. However, it differs in some cases, from that of the classical version that founds more comprehensive progress. The focal point of the neoclassical general equilibrium vision is that it is detected as assigning the theoretical basis for Smith's classic perception that the unplanned significances of economic agents acting in their way of interests will lead to common rationality rather than chaos. It is commonly thought the Arrow-Debreu general equilibrium captures the crux of the concept of Smith's invisible hand, and thus it shadows that a neoclassical vision of equilibrium and so the economy informs the procedures and strategies for the economic changeover in post-Communist economies.

The classical vision of a capitalist economy differs from the neoclassical view in the sense that the sense of equilibrium altered as the Arrow-Debreu model became the means of expressing the workings of market economies. The clash of equilibrium is found on several fundamental issues such as the role of markets, power, efficiency, time, institutions, the nature of exchanges, and the types of equilibrium conditions sought by the theories.

The neoclassical vision underlies current shock therapy policy references by western advisors. But it has devastating effects on the transitional economies. On contrary, classical economists analyze shock therapy through the theories of classical economists to suggest substitute policy

recommendations. In this chapter, besides the distinction of the classical and neoclassical versions of general equilibrium, we will be analyzing the input-out technique used in general equilibrium.

9.1 Classical & Neo-Classical View

The classical and neoclassical views to general equilibrium analysis can be seen from some aspects-

- Efficiency
- Role of market
- Equilibrium conditions
- Time
- Nature of exchange
- Power
- Institutions

Now let us discuss one by one these concepts in the case of the versions.

Classical View: As has been mentioned this version has been propounded by Adam Smith, Ricardo, Malthus, Mill, etc. economists, hence the basic concepts of equilibrium of this version rely on their psychology and judgments.

Efficiency: Classical economists argues that there should be dynamic and developmental efficiency. Dynamic efficiency is said to have taken place when it is not possible to make one generation better off without making the other generation worse off. Hence, it is closely connected to the idea of the "golden rule of saving".Dynamic efficiency takes place over time. It is strongly linked to innovation within a market. It is also connected to improvements in both the range of choice for consumers as well as the performance, reliability,or quality of products. Developmental efficiency is also associated with achieving higher levels of technology over time. According to classical economists, the market plays a leading role in appreciating dynamic and developmental efficiency.

Role of the market: Markets play a very critical role in a disequilibrium system forthe search for profit breaks. Hence, the equilibrium according to the classical system starts with state disbalance and after mutual interaction of the oppressing forces over time, the system finds out the equilibrium in the market by self-adjusting forces. The classical economists put forward the idea of the systematic propensity towards the equalization of profit rates crosswise the industries.

In their attempt to obtain maximize profit, the capitalists search for and explore profit breaks by cumulative investments where profit breaks are high and reducing investments where profit breaks are low. Hence, it is the market that plays the determinant role of finding equilibrium.

Equilibrium conditions: The classical approach to finding out general equilibrium developed by Smith and Marx is the kind of adjustments towards an equal rate of profit within a definite system-wide markup pricing model. In this case, it is to be mentioned that the price of production will be calculated in the long term by a markup of profit over and above the costs. This means the "prices of production" are to be determined in long term by a markup of profit over costs of production that is equi-proportionate across all industries. The classical system, therefore,searchesfor"necessary,"not"sufficient," conditions to be fulfilled given the set of institutions in the economy.

Time: Regarding time, the classical thinks that the general equilibrium is established in real historical time.

According to Robinson-

"Themainpreoccupationofclassicaleconomistswaswithahistoricalprocessofaccumulationinacapitalisteconomya nditsrelationtothedistribution oftheproductofindustrybetweentheclassesofsociety…………."

For classical theory, decisions and willingness to consume today are analyzed in the light of their consequences and expectations for the future.

Nature of exchange: The classical system agrees that the exchange occurs both at equilibrium as well as disequilibrium prices.Pricesvaryinrealmarketsandso allpurchasescannotbecalled

equilibrium purchases, because it is an exchange that initiates the dynamic adjustmentsthat the classicalist considers to be the center of the capitalist system.According to classicaleconomists,whenquantitydemandedexceeds,quantitysupplied, themarketpricetendstorise,and vice versa.

Power: Power delivers a degree of strain within classical economics. According to Marx, it is differential power between owners of the means of production (owners) and laborers that causes the exploitation of the laborers by the capitalists. According to Smith, power is normally, the potential impediment to the equitable action of the invisible hand and market system. According to classical economics, Powerdoes not destroy the equilibrium, rather it identifies the core areas where public action is supposed to be necessary to increase competition and to permit for the existence of dynamic adjustment.

Institutions: For classical economics, institutions are the central authority to analyze economic activity. Here the institutions mean political stability,honest government, dependable legal system,property rights, and competitive and open markets. Although the classical economists ruled out the possibility of any kind of state intervention on the economic activities as they mainly focussed on Laissez-faire policy, still for analysis of the performance of economic activities the existence of these institutions is very important to promote stability in the system. Hence, institutions for the classicalists are necessary for all economic activities.

Neoclassical view: The neo-classical economists led by Arrow-Debru, Walrus, etc. had slightly different views as compared to that of the classical economists. Following are some points mentioning the difference in opinion of the neo-classical school.

Efficiency: The neo-classical economists argues that there should be allocative efficiency rather than dynamic and developmental efficiency. Allocative efficiency is a situation where production takes place according to the consumers' preferences. Here, every good is produced up till that point where the marginal benefit of the consumers is equal to the marginal cost of producing the last unit of commodity.

Role of the market: Markets play a crucial role to facilitate exchange.In the neoclassical system, the economy is defined asapureexchangeeconomy where productiondoesnotplayanimportantrole.In a neoclassical system, markets rather than playing a production-based, creative role, promotes the purposes of facilitating exchange. They focus more on distribution aspects for efficiency.Efficiency in the economy can be reached if there is proper functioning of the markets.

Equilibrium conditions: Equilibrium conditions in neoclassical economics are said to be sufficient, but not necessary, unlike the classical system. They only focussed the on fulfillment of the equilibrium.

The equilibrium, according to neoclassical economics, is on static and allocative efficiency not on dynamic efficiency as in the classical view.The neoclassical general equilibrium theory searches for sufficient conditions to attain the condition of existence of general equilibrium.

Time: According to the neoclassical view, the equilibrium is not set in actual historical time butratherin rational or logicaltime,where the issueofdynamicchangeisabridgedtothe notion of stability, and where stability is hypothesized as motorized movements in alterable Euclidean space. For general equilibrium theory, the exchange does not take place at disequilibrium. Rather, in a neo-classical system, the auctioneer, calls out prices until equilibrium prices are reached, and only in that case exchange does occur which allows for the instantaneous clearing of all markets. Such market-clearing needstheauctioneertobeaccurate at eachtimeequilibriumpricesaredetermined.Hence, in general, in equilibrium theory, the stability levels are all determined at a time "0," and are not inrealhistoricaltime.In general equilibrium theory, there is no provision of everydaytradingbymarketcontestants. This is because tradingoutsideequilibrium,or "false trading," is not permitted in the analysis.

Nature of exchange: Exchange in neo-classical economies takes place only when once equilibrium prices are reached.In a neo-classical system, the auctioneer, calls out prices until equilibrium prices are reached, and only in that case exchange does occur which allows for the automatic clearing of all markets.

Price so determined is known to be the market-clearing price with there is no excess or shortage.

Power: In neo-classical economics, power destroys the equilibrium.Theneoclassicalgeneral equilibrium theory is clear only if we assume that there exists no power in the economy. No one except the auctioneercan have a significant degree of power to influence prices or output. If there

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exists any degree of market power in the market, the market-clearing equilibrium of the general equilibrium situation does not exist.Besides these, in the neoclassical view, questions of power are not talked about, as it is simply presumed that no individual or firm has it.

Institutions: The neo-classical economists de-emphasized the role and presence of an institution. The presence of an institution and controlling a market by it puts so many restrictions and hinders the smooth functioning of the market. Unlike the classical system where the existence of the institution is emphasized, in the neoclassical system, since the role of power has been neglected in the market, everything is supposed to be determined automatically.

9.2   Input and Output Approaches to General Equilibrium

Input-output analysis(I-O), a form of macroeconomic analysis was originally developed by W.W.Leontief (1906–1999) and is based on the interdependences between diverse economic sectors or industries. Later on, Leontiefwon the Nobel Memorial Prize in Economic Sciences for his monumental work in this field.

The I-O analysis shows the outputs of one sector in the economy as inputs into another.Thus, I-O analysis shows the interdependence of each industry on the other.

The input-output is based on input-output tables which include a series of rows and columns of data.The data thus shown quantifies the supply chain for the sectors or the industries of an economy. Sectors or industries are listed in the headers of each row and column. Each column of data corresponds to the level of inputs that are used in that industry's production function. More precisely, I-O depends on the creation of a table in which each horizontal row means how one industry's total output is separated among different production courses and ultimate consumption. Each vertical column describes the combination of productive inputs utilized within an industry. For example, let us assume, the first row of a table of an economy defines the total output of trucks, it shows that some trucks are used in the manufacture of more trucks, some in the production of agricultural goods, some quantity in the production of houses, some quantity by private households, and so on. If all the numbers are calculated crosswise the row, the total quantity of trucks produced is attained. Such a table illustrates the dependence of each sector or industry on the output of another industry: viz.- an increase in food products requires an increase in the production of trucks.

To cite another example, the column for auto manufacturers shows the inputs required for making automobiles such as the amount of steel, electronics, plastic, aluminum,and so on. The input-output models comprise separate tables explaining the amount of labour required per unit of investment.

Assumptions of input-output analysis: The input-output analysis is based on the following assumptions-

- The economy is divided into a finite number of sectors/industries, each of which produces only one homogenous commodity. The possibility of the production of joint products is ruled out.
- Each industry uses inputs in a rigidly fixed proportion.
- Factor and commodity prices are given and constant.
- The production function of all the producing sectors is found as linearly homogeneous.

Uses of input-output analysis: The input-output analysis has the following uses to be mentioned very briefly--

- Input-output analysis is used mostly for forecasting purposes. It is used to obtain projections of demand, output, employment, and investment for a country or region.
- Input-output analysis is essentially used by policymakers in framing economic and social policies. Input-output analysis helps provide necessary information for the formulation of economic policies.
- Input-output analysis is widely used in calculating the aggregate economic variable. Input-output analysis is useful for national income accounting.

- The interrelations between various sectors or industries, as expressed in the input-output table, deliver a signal concerning potential trends in which they are expected to combine.
- Given a certain final product target, the input-output can show the production necessities of numerous sectors.

Limitation: Most of the limitation of the input-output analysis is based on assumptions. The input-output analysis has the following limitations-

- The input-output analysis is based on the assumption of fixed input coefficients. But, technology and input prices change over time, and these are likely to significantly disturb the proportions in which inputs are united in the production of many goods.
- Input-output analysis is based on linear equations on which the outputs of one industry are shown as the inputs of the others. This is unrealistic in practical analysis.
- Labour is the only input that is considered to be a scarce factor in the input-output analysis. This is also unrealistic in practice.
- Final demand, in the input-output analysis,is assumed to be given and constant and hence treated as independent of the production sector.

Leontief's input-output system: W.W. Leontief emphasized the input-output analysis with the help of the input-output table. The input-output table is based on the payoff values of different sectors.Let us explain it with the help of an example.

Model of input-output analysis: Input-output is a method in which the economy is signified by a set of linear production functions telling the interrelationship among all sectors/ industries. An input-output model is a part of general equilibrium theory because it deals with interdependence between industries. An input-output model contains the following steps-

- Step (i) - Construction of theinput-output table.
- Step (ii) – Computation of the technical coefficients.
- Step (iii) – Formulation of a set of simultaneous equations.
- Step (iv) – Solution of the simultaneous equations to get the values of the unknowns in the general equilibrium problem.

Leontief's input-output table: An assumed Leontief table has been formed below to show the input-output analysis.

Producing sector ↓	Using Sector →		Final demand	Gross output
	I	II		
I	300	600	100	1000
II	400	1200	400	2000
Primary inputs	20	10	–	30

Table 9.1: Input-output table

In the above-mentioned input-output table, Row1 shows that industry I produce 1000 units of output, out of which 300 units of products are used up by industry I itself, and 600 units are by industry II. Thus, 900 units are used as intermediate inputs by both the two industries, the other 100 units are available for final consumption. Similarly, the second row indicates that industry II produces 2000 units of output, out of which 400 units of those are used by industry I, and another 1200 units by industry II itself, and the remaining 400 units are existing for final consumption. Again, of the 2000 units produced by industry II, the 1600 units are used as intermediate inputs. The last row in the table indicates the amount of primary input used by both two industries.

In table 9.1, the first column indicates the input requirement of industry I to generate 1000 units of output–it requires 300 units of its own, 400 units of industry II, 20 units of primary input.

The second column of the tableindicates the input requirement of industry II to produce 2000 units of output whereas it requires 600 units of industry I's output, 1200 units of its own, 10 units of primary input.

The final demand column indicates that for final consumption, the economy needs 100 units of industry I's output, and 400 units of industry II's output. The last column in the table indicates the total output produced by both the industries and the total primary input required.

Leontief's input-output table: The generalization of the Leontief input-output table can be done as follows-

Producing sector	Using Sector				Final demand	Gross output
	I	II	III	...... n		
I	X_{11}	X_{12}	X_{13}	.... X_{1n}	F_1	X_1
II	X_{21}	X_{22}	X_{23}	.... X_{2n}	F_2	X_2
III	X_{31}	X_{32}	X_{33}	.... X_{3n}	F_3	X_3
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
n	X_{n1}	X_{n2}	X_{n3}	X_{nn}	F_n	X_n

Table 9.2: Input-output table

In the table, we get the following notations-

X1, X2, X3…..n is the total output of different sectors/ industries in an economy

X11, X12, X1n is the amount of output of sector/industry I used as inputs in sectors/ industries I, II, III, … n.

X21, X22, X2n is the amount of output of sector industry II used as inputs in sectors/industries I, II, …n. and so on.

From above table we get,

X1 = X11 + X12 + X13 +...+ X1n + F1

So, in general if we sum up the outputs, we get,

$$X_i = \sum_{j=1}^{n} X_{ij} + F_i$$

Or, $$X_i = \sum_{j=1}^{n} a_{ij} X_j + F_i \qquad \text{for all i}$$

The solution of the equations can be given with help of matrix form-

$$\begin{bmatrix} X1 \\ X2 \\ . \\ . \\ . \\ Xn \end{bmatrix} = \begin{bmatrix} a11 & a12 & .... & a1n \\ a21 & a22 & ...... & a2n \\ . \\ . \\ . \\ an1 & an2 & .... & ann \end{bmatrix} \begin{bmatrix} X1 \\ X2 \\ . \\ . \\ . \\ Xn \end{bmatrix} + \begin{bmatrix} F1 \\ F2 \\ . \\ . \\ . \\ Fn \end{bmatrix}$$

- So, from the above we get, X=AX+F

- X =Total Output Vector

- A = Input-Output Coefficient Matrix

- F = Final Demand Vector

- Now,   X=AX+F

X-AX=F,

$$(I-A)X=F,$$

$$X=(I-A)^{-1} F$$

Where I, is identity Matrix.

A is Technology Matrix

(I-A), is called Leontief Matrix.

By Solving the above-given equation, we can determine the output levels for various industries (or sectors) of an economy.

Summary

The classical vision of a capitalist economy differs from the neoclassical view in the sense that the sense of equilibrium altered as the Arrow-Debreu model became the means of expressing the workings of market economies. The clash of equilibrium is found on several fundamental issues such as the role of markets, power, efficiency, time, institutions, the nature of exchanges, and the types of equilibrium conditions sought by the theories.

The neoclassical vision underlies current shock therapy policy references by western advisors. But it has devastating effects on the transitional economies. On contrary, classical economists analyze shock therapy through the theories of classical economists to suggest substitute policy recommendations. In this chapter, besides the distinction of the classical and neoclassical versions of general equilibrium, we will be analyzing the input-out technique used in general equilibrium.

The classical and neoclassical views to general equilibrium analysis can be seen from some aspects-

- Efficiency

- Role of market

- Equilibrium conditions

- Time

- Nature of exchange

- Power

- Institutions

Now let us discuss one by one these concepts in the case of the versions.

Classical View: As has been mentioned this version has been propounded by Adam Smith, Ricardo, Malthus, Mill, etc. economists, hence the basic concepts of equilibrium of this version rely on their psychology and judgments.

Efficiency: Classical economists argues that there should be dynamic and developmental efficiency. Dynamic efficiency is said to have taken place when it is not possible to make one generation better off without making the other generation worse off. Hence, it is closely connected to the idea of the "golden rule of saving".

Role of the market: Markets play a very critical role in a disequilibrium system forthe search for profit breaks. Hence, the equilibrium according to the classical system starts with state disbalance and after mutual interaction of the oppressing forces over time, the system finds out the equilibrium in the market by self-adjusting forces.

Equilibrium conditions: The classical approach to finding out general equilibrium developed by Smith and Marx is the kind of adjustments towards an equal rate of profit within a definite system-wide markup pricing model.

Time: Regarding time, classical economists believe that the general equilibrium is established in real historical time.

Nature of exchange: The classical system agrees that the exchange occurs both at equilibrium as well as disequilibrium prices.Pricesvaryinrealmarketsandso allpurchasescannotbecalled equilibrium purchases, because it is an exchange that initiates the dynamic adjustmentsthat the classicalist considers to be the center of the capitalist system.

Power: Power delivers a degree of strain within classical economics. According to Marx, it is differential power between owners of the means of production (owners) and laborers that causes the exploitation of the laborers by the capitalists.

Institutions: For classical economics, institutions are the central authority to analyze economic activity. Here the institutions mean political stability,honest government, dependable legal system,property rights, and competitive and open markets.

Neoclassical view: The neo-classical economists led by Arrow-Debru, Walrus, etc. had slightly different views as compared to that of the classical economists. Following are some points mentioning the difference in opinion of the neo-classical school.

Efficiency: The neo-classical economists argues that there should be allocative efficiency rather than dynamic and developmental efficiency. Allocative efficiency is a situation where production takes place according to the consumers' preferences.

Role of the market: Markets play a crucial role to facilitate exchange.In the neoclassical system, the economy is defined asapureexchangeeconomy where productiondoesnotplayanimportantrole.In a neoclassical system, markets rather than playing a production-based, creative role, promotes the purposes of facilitating exchange.

Equilibrium conditions: Equilibrium conditions in neoclassical economics are said to be sufficient, but not necessary, unlike the classical system. They only focussed the on fulfillment of the equilibrium.

Time: According to the neoclassical view, the equilibrium is not set in actual historical time butratherin rational or logicaltime,where the issueofdynamicchangeisabridgedtothe notion of stability, and where stability is hypothesized as motorized movements in alterable Euclidean space.

Nature of exchange: Exchange in neo-classical economies takes place only when once equilibrium prices are reached.In a neo-classical system, the auctioneer, calls out prices until equilibrium prices are reached, and only in that case exchange does occur which allows for the automatic clearing of all markets.

Power: In neo-classical economics, power destroys the equilibrium.Theneoclassicalgeneral equilibrium theory is clear only if we assume that there exists no power in the economy. No one except the auctioneercan have a significant degree of power to influence prices or output.

Institutions: The neo-classical economists de-emphasized the role and presence of an institution. The presence of an institution and controlling a market by it puts so many restrictions and hinders the smooth functioning of the market.

Input-output analysis(I-O): Input-output analysis, a form of macroeconomic analysis was originally developed by W.W.Leontief (1906–1999) and is based on the interdependences between diverse economic sectors or industries. Later on, Leontiefwon the Nobel Memorial Prize in Economic Sciences for his monumental work in this field.

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Keywords

Classical version: classical version is the version in which the core issues of economics are put forward by such authors as Adam Smith and Karl Marx.

Neoclassical version: Neoclassical version is the version in which the issues of economics are reinterpreted by such authors as Arrow-Debreu, Walrus, etc.

Input-output analysis(I-O): Input-output analysis shows the interdependences (in terms of their inputs and outputs) between diverse economic sectors or industries.

Self Assessment

1. According to whom there should be dynamic and developmental efficiency?

A. The classical economists

B. The neo-classical economists

C. Keynesian economists

D. All of them

2. "Markets play a crucial role in a disequilibrium system of exploration for profit opportunities." Who opined this?

A. The neo-classical economists

B. Keynesian economists

C. The classical economists

D. All of them

3. Exchange takes place both at equilibrium and disequilibrium prices in

A. In classical economies

B. In neo-classical economies

C. In Keynesian economies

D. All the above

4. The ………..argues that there should be allocative efficiency

A. Classical economists
B. Neo-classical economists
C. Keynesian economies
D. All the above

5. For whom, "Efficiency in the economy can be reached if there is a proper functioning of the markets"?

A. Classical economists
B. Keynesian economies
C. Neo-classical economists
D. None of the above

6. Who argued that the general equilibrium is not set in real historical time?

A. Classical economists
B. Neo-classical economists
C. Keynesian economies
D. None of the above

7. Exchange takes place only when once equilibrium prices are reached in

A. In classical economies
B. In neo-classical economies
C. In Keynesian economies
D. All the above

8. Input-output analysis was originally developed by

A. W.W. Leontief
B. Prof. Walras
C. A.C. Pigou
D. All of them

9. Find out the correct assumption of the input-output system

A. Each industry uses inputs in a rigidly fixed proportion.
B. Factor and commodity prices are given.
C. The production function of the producing sectors is linearly homogeneous.
D. All the above

10. Input-output analysis is used to obtain projections of

A. Demand
B. Output
C. Employment and investment for a country or region

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D. All the above

11. Input-Output analysis is helpful

A. In providing necessary information for the formulation of economic policies.
B. In hindrance of economic policies.
C. Both are correct
D. Both are incorrect

12. Input-Output analysis is useful for…………….accounting.

A. Personal income
B. Disposable income
C. National income
D. None of these

13. Input-output system with the help of

A. The input-output table
B. The input-output graph
C. The input-output modal
D. All the above

14. Which is one is wrong step input-output analysis

A. Construction of input-output table
B. Computing technical coefficients
C. Analysis of the variables
D. Solving the simultaneous equations to obtain the values of the unknowns in the general equilibrium problem.

15. In input-output matrix, X=AX+F, X stands for

A. Total output Vector
B. Total input Vector
C. Both
D. None

16. In the input-output matrix, X=AX+F, A stands for

A. Total output Vector
B. Total input Vector
C. Input-Output Coefficient Matrix
D. None of these

Answers for Self Assessment

1.	A	2.	C	3.	A	4.	B	5.	C

6.	B	7.	B	8.	A	9.	D	10.	D
11.	A	12.	C	13.	A	14.	C	15.	A
16.	C								

Review Questions

1. Mention the ideological difference between the classical and the neoclassical system.
2. What is input-output analysis?
3. What is the nature of exchange according to the classical view?
4. What is the role of the market according to the neoclassical point of view?
5. How does time play role in both classical and neoclassical general equilibrium?
6. How is the equilibrium determined in neoclassical general equilibrium theory?
7. What is the role of power in classical and neoclassical general equilibrium theory?
8. How is efficiency determined in a classical system?
9. What are the assumptions and uses of input-output analysis?
10. Show stepwise how an input-output problem is solved.

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Dr. Tirtha Saikia, Lovely Professional University

Unit 10:Stability and Uniqueness of General Equilibrium

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10.2   Stability and Uniqueness of Equilibrium

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Self Assessment

Answers for Self Assessment

Review Questions

Further Readings

Objectives

After this chapter, you will be able to

- learn about efficiency in consumption,
- learn about the possibility of exchange between two individuals,
- learn about exchange and terms oftrade between two countries with or without a barter system.
- learn about the existence, stability, and uniqueness of equilibrium in a market,
- learn about the interdependence of the markets,
- learn how the existence, stability, and uniqueness of equilibrium are found in both partial and general equilibrium analysis.

Introduction

In a pure exchange economy, it is assumed that there is consumption without production. The exchange takes place between two individuals and the distribution of the goods takes place between the individual consumers. In such cases, mutual bargaining between the agents takes place and it is observed that after successful negotiation both the parties get settled at a point where both them can find themselves with the best possible level of satisfaction. This is explained by the Edgeworth box diagram. This is the situation of Pareto optimality where the level of satisfaction of none of the individuals is seen to be decreased but at one both are better off.

Here, the three issues relating to equilibrium are worth mentioning. Firstly, an equilibrium is said to have existed when the quantity demanded equals the quantity suppliedat a positive price.The equilibrium which we assumed to exist is stable if the demand function for a particular product cuts the supply function of that product from above.Similarly, the uniqueness of equilibrium means the situation where the slope of the excess demand function, (i.e., the curve showing the difference between quantity demand and quantity supplied at any one price)

In this chapter, we will first discuss how to find consumption without production in a pure exchange economy. Secondly, we will also be focussing on the existence of different kinds of equilibrium and how the stability and uniquenessof such equilibrium could be found.

10.1 Consumption Without Production (Pure Exchange) Bargaining Existence

In a pure exchange economy, it is assumed that there is consumption without production. This means the scenario when two goods are supplied to the individual consumers in the economy externally from the system.

For this let us suppose:

(1) There are two goods, out of which some specific bundles have been supplied to the individual consumers for consumption, and

(2) There are two consumers and the exchange of commodities has to occur between them and equilibrium is reached regarding the distribution of these goods.

Let us now show how to reach efficiency in exchange given these conditions-

Efficiency in consumption (Exchange)

Regarding efficiency in exchange, the Pareto efficiency in exchange states that the Marginal Rate of Substitution (MRS) between any two products must be the same for every consumer of both products, i.e.,

$$MRS^A_{xy} = MRS^B_{xy}$$

Here, A and B are two individuals, x and y are the commodities.

The Marginal Rate Substitute (MRS) is also known to be the slope of the indifference curve. The slope of the indifference curve can be found by drawing a tangent at that point.
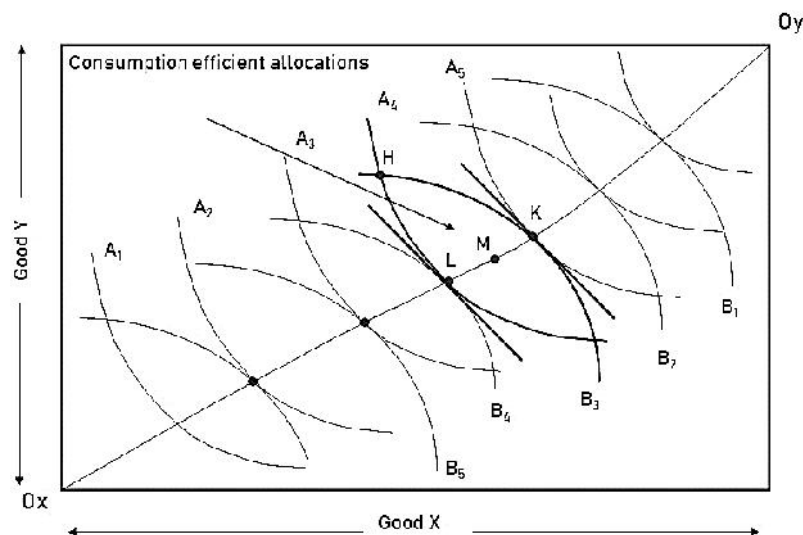

Fig. 10.1: Consumption without production

To explain the efficiency in consumption or exchange, we have taken the Edgeworth box diagram. The Edgeworth box is a graphical representation of a market with just two commodities, X and Y, and two consumers. Itis a two-dimensional representation of the utility levels of two individuals and two items that are finite in supply. Ox is the origin from which the utility of individual A is measured and Oy is the origin from which the utility level of B is measured. A1, A2, A3, A4, A5, etc. are the indifference curves of individual A which measure his successively higher levels of utility. Similarly, B1, B2, B3, B4, and B5 indifference curves measure individual B's successively higher levels of utility. Connecting the corresponding tangency points of the indifference curves of both individuals, we get a curve known as the **contract curve** (In the diagram, the curve connecting Ox and Oy). The contract curve represents all the points to be in Pareto optimal. Any point, off the contact curve, is said to be Pareto dominated. This means, there is further scope of having efficiency after a proper redistribution. To explain these, let's consider the initial distribution of two goods between two individuals takes place at point H which is off the contract curve. At point H, individual A's utility is defined by the A4 indifference curve and individual B's utility is defined by the B3 indifference curve. This point is sub-optimal and hence Pareto dominated. The reason

behind this is that a movement from this point to the contract curve by redistribution makes either each individually or both better off as they may reach a higher indifference curve with higher levels of satisfaction while the other utility levels remain intact. This is what is said as Pareto improvement. In such a case, if there is movement from point H to K, A will reach a higher indifference curve, i.e., A5 while individual B remains on his old indifference curve B3. This indicates that individual A is better off (now on a higher indifference curve with higher levels of satisfaction) while B is not worse off (remains on his same indifference curve). Thus, point K lies on the contract curve which means the efficient distribution of two goods and hence is said as Pareto optimal point. Similarly, a movement from point H to L means individual B moves to a higher indifference curve, i.e., B4 from B3 but individual A remains on his earlier indifference curve. This again means that B is better off (moves to a higher indifference curve) but A is not worse off (remains on the same indifference curve). Point L on the curve means the Pareto optimal point. Again, a movement from point H to any other point in between L and K, let's consider point M means both the individuals will be better off as both of them will be on a higher indifference curve. Hence, point M is a Pareto optimal point. Thus, any point on the contract curve means the Pareto optimal point of efficient distribution of both goods. These points will maximize the utility levels or welfare between the two individuals. This is how two individual consumers can reach an efficient level of consumption by the exchange when there is no production.

The pure exchange model demonstrates the advantages of mutually voluntary exchange. This is also observed in international trade. When the competition is from another country, the model demonstrates how international trade can generate both winners and losers in the economy. In this regard, we may mention both Adam Smith and Ricardian models of international trade. The Ricardian model shows that trade can be advantageous for countries.

Economists usuallymention a consequence in which there are both victors and failures as income redistribution because the winners (victors) can be characterized as getting a higher real income, while those who lose hurt from a lower real income.

In this model, we ignore the production process and assume more simply that individuals are endowed with a stock of consumption goods. Here, trade can result in a redistribution of income.

Now let us cite another example to explain this model. Suppose there are two individuals: Farmer A and Farmer B. Farmer A lives on a particular food, i.e., X while Farmer B lives on another food Y.One day these two farmers meet,by a situation.They could discover that the other farmer (his counterpart)maintains his family with a different product, and hence now the farmers begin to discuss the likelihood of a trade.The farmers consider trade for the simple cause that each of them wishes to consume a diversity of goods. Assuming that, trade is supposed to be by the farmers, one question worth asking is, what factors will determine the terms of trade?

The terms of trade are defined as the quantity of one good that is exchanged for a quantity of another.In this case, the question arises, how many quantities of X can be exchanged for how many Y?

It is typical to express the terms of trade as a ratio. Thus, if two X can be exchanged for three Y, we can write the terms of trade as follows:

TOT=2 X / 3Y,

where TOT refers to terms of trade.

The terms of trade are also equivalent to the ratio of prices between two goods. Suppose,Px is the price of X and Py is the price of Y, then-

TOT=Py/Px

We can refer to this price ratio as the price of X in terms of Y — that is, how many Y one can get in exchange for every X. This simply means, MRSxy=Py/px in the terminology of indifference curve.

This model considers the economy to be a barter economy.This means that no money is being exchanged between the agents. Instead, one good is exchanged for another good.However, monetary expressions are given to explain here the terms of trade vividly.

In the case of two economies with or without barter trade same types of exchange may happen.

Here, the price ratio will be defined as the price of export (Px) to the price of import (Pm), so

TOT= Px/Pm.

10.2 Stability and Uniqueness of Equilibrium

Before knowing about the stability and uniqueness of equilibrium, we need to know whether there exists equilibrium or not. An equilibrium is said to have existed when the quantity demanded equals the quantity suppliedat a positive price.Thus, existence means the balancing position of buyers and sellers at a positive price. This can be best explained with help of partial equilibrium analysis.

The equilibrium which we assumed to exist is stable if the demand function for a particular product cuts the supply function of that product from above. Similarly, the uniqueness of equilibrium means the situation where the slope of the excess demand function, (i.e., the curve showing the difference between quantity demand and quantity supplied at any one price).

Fig. 10.2: Partial equilibrium analysis

For a better explanation of the above-mentioned concepts, let us take the example of partial equilibrium analysis. In equilibrium in figure 10.1, the quantity demanded equals the quantity supplied, i.e.,Qd=Qs.The price determined at a point is known as the equilibrium price. At the equilibrium price, there is neither excess demand nor excess supply, i.e, Excess demand(Ed)=0,The market is said to be cleared.

At point E in fig. 10.2, both demand and supply curves intersect.Hence, there exists equilibrium at point E.

The equilibrium is stable when the demand function cuts the supply function from above but unstable if the demand function cuts the supply function from below. In the figure, this condition is seen to be successful. Hence, the equilibrium above is stable.

If the slope of the excess demand function is negative at the point of equilibrium and there is only one point of intersection between the demand and supply curve, the equilibrium is unique.

The demand and supply curve intersects once only at point E, in the diagram, and Ed=0 at this point.Hence, at point E, the equilibrium is unique.

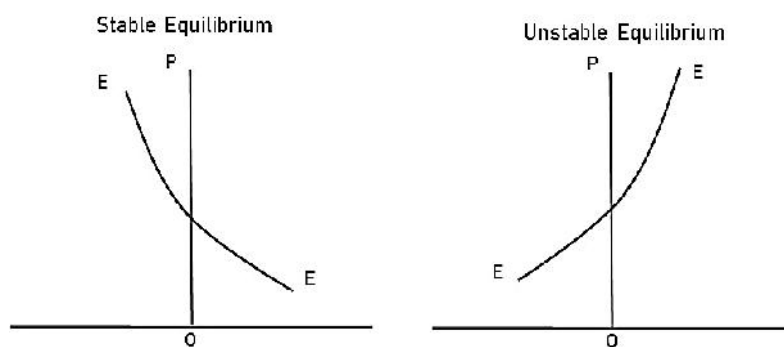In terms of Excess demand function (Ed), the existence, stability, and uniqueness can be defined asEd=Qd-Qs

Fig. 10.3: Stable and unstable equilibrium

In terms of the Excess demand function (Ed), the existence, stability, and uniqueness can be defined asEd=Qd-Qs.

In the figure, 10.3 EE is the excess demand function Ed is equal to zero when it cuts the perpendicular line from above with its negative slope. In panel A, the equilibrium is hence stable. But is unstable in panel B because the slope of the excess demand function in this type of equilibrium is positive. (Ed is upward sloping).

Similarly, regarding the criteria of the existence of equilibrium, we may be getting the scenario of the non-existence of multiple existences of the equilibrium.

If the excess demand function cuts the supply function on multiple occasions, it is the case of multiple equilibria. In panel A of fig.10.4, Ed cuts the perpendicular line on two occasions from above. It is the case of multiple equilibria.
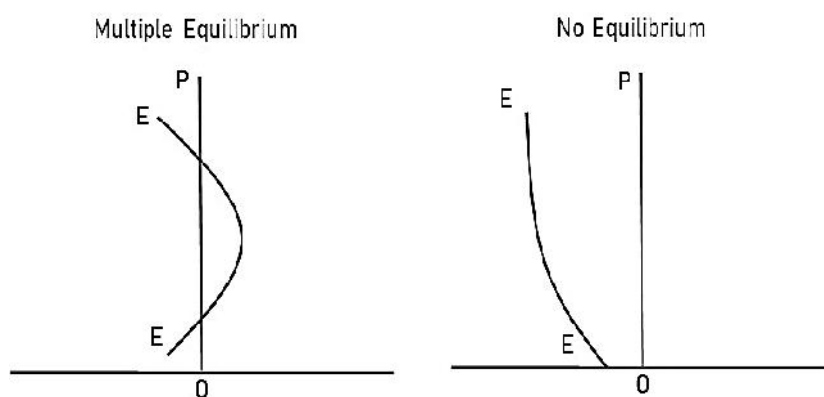

Fig. 10.4:Non-existence & multiple existences of equilibria.

Similarly, Panel B in the figure shows that the excess demand function has not cut the supply function as shown by the perpendicular line at any point. Hence there do not exist any equilibria.

Let us find the general equilibrium in two interdependent markets with Stability and Uniqueness. Let's examine the competitive markets for DVD rentals and movie theater tickets. Both the markets are interdependent here. Here, the equilibrium of a particular market cannot be determined without determining the equilibrium of the other.

The two markets are closely connected since DVD players give most consumers the selection of viewing movies at home as well as at the theater.

Variations in pricing policies that interrupt one market are likely to distract the other, which in turn causes feedback effects in the first market.

The existence, stability, and uniqueness of the two markets are simultaneously determined in figure 10.5 where the DVD market and movie markets are considered.
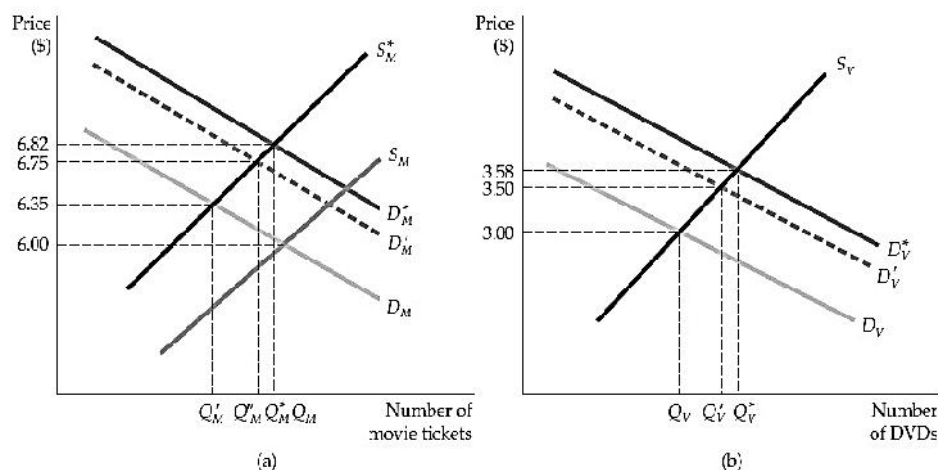
Fig. 10.5: existence and stability of equilibrium in general equilibrium analysis

Here, both DVDs and movies are substitutesfor each other and hence an increase in the price of movie tickets increases the demand for DVDs. In the diagram, it is shown that the initial equilibrium for the movie market settles withthe demand and supply of movie ticket QM for$6 per ticket in panel A of the diagram above. On the other hand, the equilibrium in the DVD market settles with Qv demand and supply of DVDs at a $ 3 price in panel B of the diagram. Now, an increase in the price of movie ticketsfrom $6 to $6.35 causes the equilibrium to shift leftward and settle at the Q′M level of demand and supply. This impacts the DVD market. An increase in the price of movie tickets increases the demand for the DVDs and there is a shift in the demand curve of the DEDshence in the DVD market, the new equilibrium settles at $3.5 price demand supply being Q′V. Here, since the price of DVDs now is high some viewers will move back again to the theatre and the demand for the movies will now increase again which is shown by Q″M for $6.75. The process thus continues and both markets finally settle at a new equilibrium, i.e., the movie market at a Q*M level of demand and supply of$6.82 and the DVD market with a Q*V level of demand and supply of$3.58.

Thus, in general equilibrium, the equilibrium of a submarket is related to the other submarket and the equilibrium we reach or exists finally is a stable one.

Summary

In a pure exchange economy, it is assumed that there is consumption without production. The exchange takes place between two individuals and the distribution of the goods takes place between the individual consumers. In such cases, mutual bargaining between the agents takes place and it is observed that after successful negotiation both the parties get settled at a point where both them can find themselves with the best possible level of satisfaction. This is explained by the Edge worth box diagram. This is the situation of Pareto optimality where the level of satisfaction of none of the individuals is seen to be decreased but at one both are better off.

Here, the three issues relating to equilibrium are worth mentioning. Firstly, an equilibrium is said to have existed when the quantity demanded equals the quantity supplied at a positive price. The equilibrium which we assumed to exist is stable if the demand function for a particular product cuts the supply function of that product from above. Similarly, the uniqueness of equilibrium means the situation where the slope of the excess demand functions.

In a pure exchange economy, it is assumed that there is consumption without production. This means the scenario when two goods are supplied to the individual consumers in the economy externally from the system.

For this let us suppose:

(1) There are two goods, out of which some specific bundles have been supplied to the individual consumers for consumption, and

(2) There are two consumers and the exchange of commodities has to occur between them and equilibrium is reached regarding the distribution of these goods.

Let us now show how to reach efficiency in exchange given these conditions-

Efficiency in consumption (Exchange)

Regarding efficiency in exchange, the Pareto efficiency in exchange states that the Marginal Rate of Substitution (MRS) between any two products must be the same for every consumer of both products, i.e.,

$$MRS^A_{xy} = MRS^B_{xy}$$

Here, A and B are two individuals, x and y are the commodities.

The Marginal Rate Substitute (MRS) is also known to be the slope of the indifference curve. The slope of the indifference curve can be found by drawing a tangent at that point.

The pure exchange model demonstrates the advantages of mutually voluntary exchange. This is also observed in international trade. When the competition is from another country, the model demonstrates how international trade can generate both winners and losers in the economy. In this regard, we may mention both Adam Smith and Ricardian models of international trade. The Ricardian model shows that trade can be advantageous for countries.

Economists usually mention a consequence in which there are both victors and failures as income redistribution because the winners (victors) can be characterized as getting a higher real income, while those who lose hurt from a lower real income.

In this model, we ignore the production process and assume more simply that individuals are endowed with a stock of consumption goods. Here, trade can result in a redistribution of income.

Before knowing about the stability and uniqueness of equilibrium, we need to know whether there exists equilibrium or not. An equilibrium is said to have existed when the quantity demanded equals the quantity suppliedat a positive price. Thus, existence means the balancing position of buyers and sellers at a positive price. This can be best explained with help of partial equilibrium analysis.

The equilibrium which we assumed to exist is stable if the demand function for a particular product cuts the supply function of that product from above. Similarly, the uniqueness of equilibrium means the situation where the slope of the excess demand functions, (i.e., the curve showing the difference between quantity demand and quantity supplied at any one price).

Similarly, regarding the criteria of the existence of equilibrium, we may be getting the scenario of the non-existence of multiple existences of the equilibrium.

If the excess demand function cuts the supply function on multiple occasions, it is the case of multiple equilibria.

Let us find the general equilibrium in two interdependent markets with Stability and Uniqueness.Let's examine the competitive markets for DVD rentals and movie theater tickets. Both the markets are interdependent here. Here, the equilibrium of a particular market cannot be determined without determining the equilibrium of the other.

The two markets are closely connected since DVD players give most consumers the selection of viewing movies at home as well as at the theater.

Variations in pricing policies that interrupt one market are likely to distract the other, which in turn causes feedback effects in the first market.

Thus, in general equilibrium, the equilibrium of a submarket is related to the other submarket and the equilibrium we reach or exists finally is a stable one.

Keywords

Existence of equilibrium: An equilibrium is said to have existed when the quantity demanded equals the quantity suppliedat a positive price.

Stability of equilibrium: The equilibrium is stable if the demand function for a particular product cuts the supply function of that product from above.

The uniqueness of equilibrium: The uniqueness of equilibrium means the situation where the slope of the excess demand function

Pareto optimality in exchange: Pareto efficiency in exchange states that the Marginal Rate of Substitution (MRS) between any two products must be the same for every consumer of both products.

Terms of trade in exchange: The terms of trade in exchange are defined as the quantity of one good that is exchanged for a quantity of another.

Self Assessment

1. Which one is true regarding Pareto optimality
A. No one can be better off without anyone worse off
B. Everyone can be made better off
C. No one can be made better off
D. All the above

2. Regarding Pareto improvement, find the correct one
A. No one can be better off without anyone worse off
B. Someone can be better off without anyone worse off
C. Everyone can be made better off
D. No one can be made better off

3. Consumers are at optimum according to Pareto when
A. MRS of two goods for the consumers is increasing
B. MRS of two goods for the consumers are unequal
C. MRS of two goods for the consumers are equal
D. MRS of two goods for the consumers is decreasing

4. Terms of two goods X and Y can be defined as
A. TOT= Py X PX
B. TOT=Py – Px
C. TOT=Py/Px
D. All the above

5. The relation between the indifference curve and price ratios in consumption is given as
A. MRSxy=Py - px
B. MRSxy=Py/px
C. MRSxy=Py X px
D. None of these

6. While a consumer is in equilibrium, the MRS is
A. Increasing
B. Decreasing
C. Constant
D. None of these

7. Price ratios regarding exchange for an economy are defined as
A. TOT= Px + Pm.
B. TOT=Py/Px

C. TOT=Py + Px

D. TOT= Px/Pm

8. Existence of an equilibrium means

A. Whether there exists a solution for a general equilibrium or not

B. Whether the equilibrium exists is stable or not

C. Whether the equilibrium exists is unique or not

D. All the above

9. Stability of an equilibrium means

A. Whether there exists a solution for a general equilibrium or not

B. Whether the equilibrium exists is stable or not

C. Whether the equilibrium exists is unique or not

D. None of these

10. The uniqueness of an equilibrium means

A. Whether there exists a solution for a general equilibrium or not

B. Whether the equilibrium exists is stable or not

C. Whether the equilibrium exists is unique or not

D. None of these

11. In equilibrium, the excess demand is defined as

A. Ed=Qd-Qs

B. Ed=Qd+Qs

C. Ed=Qd/Qs

D. None of these

12. In equilibrium, the excess demand is

A. Zero

B. One

C. Negative

D. Elastic

13. If the excess demand function intersects a perpendicular line at more than one point, it means

A. No equilibrium

B. One equilibrium

C. Multiple equilibria

D. All the above

14. If the excess demand function does not intersect a perpendicular line at any one point, it means

A. No equilibrium

B. One equilibrium

C. Multiple equilibria

D. None of these

15. If the excess demand function intersects a perpendicular line at only one point, it means
A. No equilibrium
B. Unique equilibrium
C. Multiple equilibria
D. All of these

Answers for Self Assessment

1.	A	2.	B	3.	C	4.	C	5.	B
6.	B	7.	D	8.	A	9.	B	10.	C
11.	A	12.	A	13.	C	14.	A	15.	B

Review Questions

1. What is efficiency in exchange?
2. What are the conditions of exchange?
3. What is the uniqueness of equilibrium?
4. What is excess demand?
5. What are the stability conditions of equilibrium?
6. What do you mean by the existence of equilibrium?
7. Define the case non-existence and multiple existences of the equilibrium.
8. Explain with a suitable example how is it possible to attain efficiency in exchange.
9. With the help of partial equilibrium analysis, show how can we reach the existence and stability conditions of equilibrium.
10. Show the existence and stability of equilibrium in general equilibrium analysis.

📖 Further Readings

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01-a-simple-pure-exchange-economy.html

Dr. Tirtha Saikia, Lovely Professional University

Unit 11: Production without Consumption

CONTENTS
Objectives
Introduction
11.1   Production Without Consumption in One Sector Model
11.2   Relationship Between Output Mix and Real Factor Prices
Summary
Keywords
Self Assessment
Answers for Self Assessment
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Further Readings

Objectives

After this chapter, you will be able to

- learn about efficiency in production,
- learn about the derivation of PPC production without consumption,
- learn about the one producer, and one consumer modal.
- learn about output mix,
- learn about factor prices,
- learn the linkage between output mix and real factor price can be established mathematically.

Introduction

To understand the concept of production without consumption let us first know about the different sectors in an economy. Generally, there are four sectors of an economy. They are-

- Household sector.
- Business sector.
- Government sector.
- Foreign trade/external sector.

Basically, in a one-sector model, we get only the household sector. Here,the production and consumption of a single producer or the consumer are studied. In a two-sector model, the interlinkages between two sectors, i.e., business and household are considered.In this structure, the household sector helps the business sector by providing labour, and the business sector, in return,pays back the wages (factor payment) to the household sector in the first phase. In the second phase, the business sector supplies the goods and services it produces to the household sector for which the household sectormakes its expenses for the purchase of goods produced by the business sector. This is how the two sectors are interlinked.

In a three-sector model, the banking sector plays the role of the third sector besides the above-mentioned sectors. In the between sector, the operations of the banks come in. The banking sector provides loans and receives deposits from households. Similarly, the banks receive deposits from the business sector and also provide loans to the business sector as

well. Thus, both households and businesses are interlinked bythe banking sector. In a simple closed economy, we find the existence of two-sectorstructures. However, in the case of the open economy, there is the existence of a four-sector modal where we see additionally one sector besides these above-mentioned three sectors.

In today's, modern and open economies the external relations of a country with the rest of the world are major determinants of economic integration and development. The external relations of a country can be measured by the volume of trade and commerce which depends on the extent of export and imports. Hence, foreign trade plays the role of the fourth sector in a four-sector economic model. Foreign trade links with household and business sectors in terms of export and import of different commodities and also establishes its relationship with the banking sector for its financial dealings.

In this chapter, we will study production without consumption. With production and without consumption in one sector, we will find out the production in the business sector.

Also, about this, we will study one producer - one consumer case, i.e., Robinson Crusoe economics.

11.1 Production Without Consumption in One Sector Model

In one sector case, a producer gets the production efficiency when we cannot produce more of a good without producing less of another. To appreciate its underlying idea, we may have to recall the concept of opportunity cost. i.e., the cost of producing more X can be readily measured by the reduction in Y output. It represents the probable benefits that an individual producer misses out on when selecting one substitute over another. Opportunity costs can be easily overlooked as they are unseen by nature.

Production without consumption means the one-sector model where there is only the production takes place. Technical efficiency is an important issue that shows production optimality. Edgeworth box interoperates technical efficiency very well. The diagram below shows the efficiency in production efficiency in producing two goods.
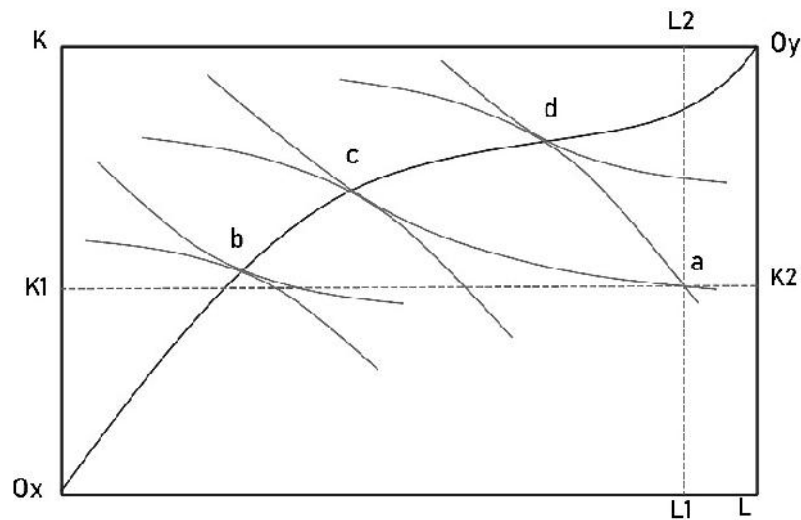

Figure 11.1: Edgeworth box

In figure 11.1, a is the Pareto dominated point where the allocation of different factors in the production of two goods is inefficient. Hence there is the scope of redistribution or reallocation of factors to have optimal production of goods. So, a movement from point a to c or a to d or any other points in between c and d means the efficient allocation of resources for the production of the two goods. Thus, with limited use of resources, the production of at least one good or both the good has now increased without reducing the production of the other good. The points in that range mean the efficient point or efficient allocation of resources. The Ox Oy curve is said to be the contract curve which is derived by joining the

tangency points of the isoquants of the two commodities. Each of the points on the contract curve means the efficient allocation of factors and any off-contract curve point is a technically inefficient point.

From the contract derived from the Edgeworth box diagram, we can easily find out the production possibility curve. A productionpossibility curve (PPC) is also known as a production possibility frontier or transformation curve. It shows various combinations of the quantities of two goods that can be produced within the given inputs or resources and technology which shows all the probable alternatives of two products that can be produced by using all the inputs or factors of production and in that scenario the given resources are optimally and efficiently operated per unit time. Now let us derive the PPC from the Edgeworth contract curve.
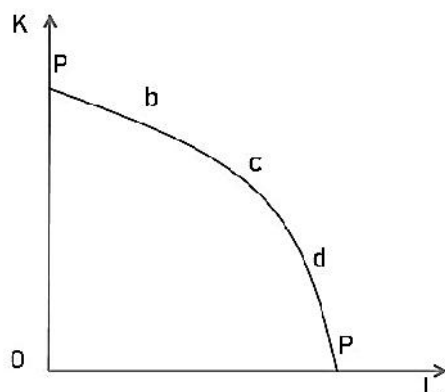
Figure 11.2:PPC drawn from Edgeworth box

Corresponding to all the points (b,c,d) of the Edge worth contract curve, we may now draw a curve and display it in figure 11.2 and thus got a curve named PP. PP is the production possibility curve. In the figure, point b,c, and d mean the different production possibilities of two goods by using different combinations of labour and capital. The region under this curve means the feasible region where all combinations of goods can be produced with certainty but to the right of the curve, it means production impossibilities with limited resources.

Once have the PPC, we can now derive the Production possibility (PPC) curve with excess demand for labour.
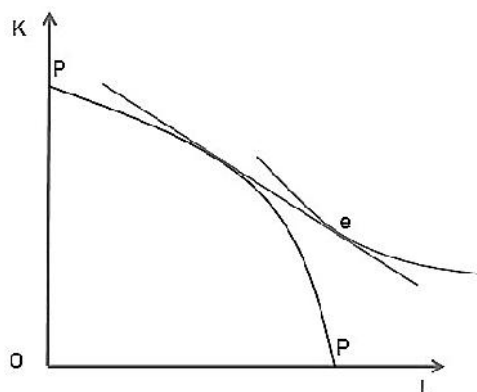
Figure 11.3:Production possibility (PPC) curve with excess demand for labour

The excess labour used in production shows the production possibilities lie beyond the range the producer can produce. In figure 11.3, point e indicates that the excess unit of labour with relatively less unit of capital is combined for the production of the two goods which eventually makes it wasteful for a rational producer with his limited resources. However, by rearranging the inputs the producer can move back to the production possibility curve where there will be no excesses or surpluses.

Microeconomics Theory and Analysis – II

This can be shown with the help of the diagram below-
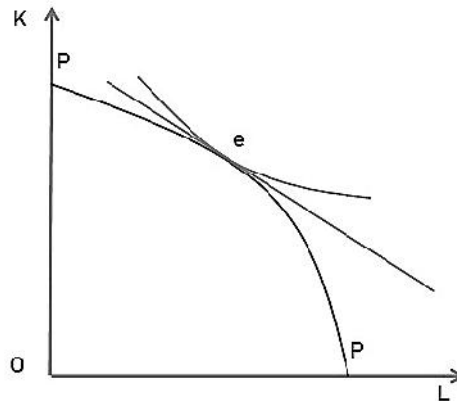
Figure 11.4:Production possibility (PPC) curve with no excess.

Finally, figure 11.4 depicts the production equilibrium with no excess and shortages in the market. This is the one sector equilibrium where production takes place without consumption.

In this regard, let us discuss a case of one producer, and one consumer modal- the **Robinson Crusoe model.** It is a story of a young man who had to survive on a deserted island as a result of a sea storm accident with his ship. He used to produce to feed himself on that solitary island.

A Robinson Crusoe economy is a popular and simple framework used to learn some vital issues in economics. It assumes an economy with one consumer, one producer, and two goods. Here, the title "Robinson Crusoe" is an orientation to the 1719 novel of the same name authored by Daniel Defoe.

The assumptions of the model to examine general equilibrium with production are as follows;

- The island is cut off from the rest of the world.
- There is only a single economic agent (Crusoe himself)
- All commodities on the island have to be produced or found from existing stocks.
- He acts both as a producer to maximize profits, as well as a consumer to maximize his utility.

Robinson Crusoe multi-tasks in the economy by being both the producer and consumer at the same time, where he can either prefer to appreciate the scenery of the isolated island on which he has found himself or devote his time hunting and gathering coconuts.

He needs to balance his satisfaction increasing his search for day-dreaming or utility diminishing his pursuit of production and releasing his hunger.

Crusoe's indifference curves draw his liking for rest and coconuts whereas the production function indicates the technological relationship between the phenomenon that how much he works and how many coconuts he gathers.

Production function and indifference curve: The point at which Crusoe reaches an equilibrium between the number of hours he works and takes rest can be found when the highest indifference curve becomes the tangent to the production function.

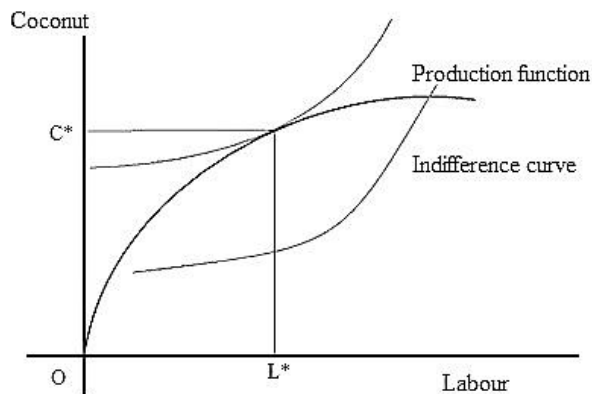This can be depicted in the diagram below-

Figure 11.5:Production function and indifference curve

The point at which Crusoe will reach an equilibrium in search of the balance between the number of hours he works and takes rest can be found when the highest indifference curve is tangent to the production function. In figure 11.5, it is observed with L* labour and C* consumption.

Equilibrium under such a case may be as follows-

At equilibrium, the demand for coconuts will equal the supply of coconuts and the demand for labour will equal the supply of labour.Graphically this occurs when the diagrams under consumer and producer are superimposed.

Hence, MRSLeisure,Coconuts = w

$\qquad$ MPL = w

$\qquad$ MRSLeisure, Coconuts = MPL

This ensures that the slopes of the indifference curves and the production set are the same.
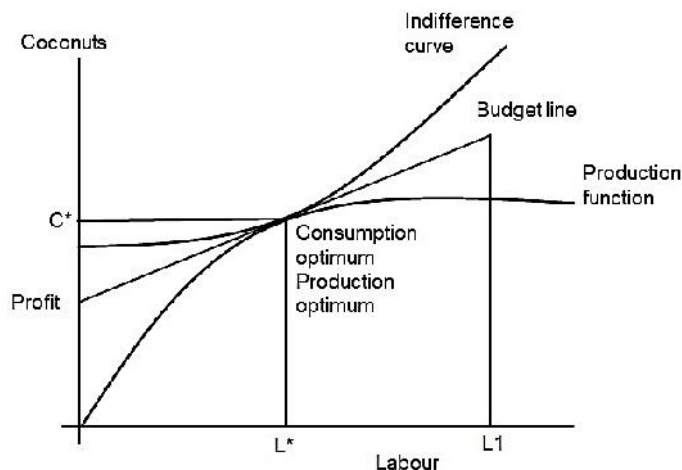

Figure 11.6: Equilibrium with production function and indifference curve

Finally, the equilibrium in a Robinson Crusoe model can be depicted in diagram 11.6. The equilibrium is reached with C* and L* coconuts and labour. At this combination both production and consumption equilibrium for the same agent is observed. However, this happens purely in absence of any exchange. Thus,

MRSLeisure, Coconuts = w

MPL = w

MRSLeisure, Coconuts = MPL

This ensures that the slopes of the indifference curves and the production set are the same.

11.2 Relationship Between Output Mix and Real Factor Prices

Output mixed is achieved at Pareto optimal point.

At Pareto efficiency, we need to consider individual preferences and production possibilities together.

The necessary condition to achieve this is that the marginal rate of substitution for any two goods must be equal to the marginal rate of product transformation of the two goods. That is-

$$MRS_{xy}=MRPT_{xy}$$

Thus, consider that goods are X and Y; one individual whose utility function is given by U(X,Y); and society's production possibility frontier is written as T(X,Y)=O.

The problem is to maximize utility subject to these production constraints.

Setting up the Lagrange expression-

$l = U(X,Y)+\lambda[T(X,Y)]$

From this, the first-order condition is-

$$\frac{\partial l}{\partial X} = \frac{\partial U}{\partial X} + \} \frac{\partial T}{\partial X} = 0$$

$$\frac{\partial l}{\partial Y} = \frac{\partial U}{\partial Y} + \} \frac{\partial T}{\partial Y} = 0$$

$$\frac{\partial l}{\partial \}} = T(X,Y) = 0$$

If we combine the first two equations we get,

$$\frac{\partial U / \partial X}{\partial U / \partial Y} = \frac{\partial T / \partial X}{\partial T / \partial Y}$$

or, MRS (X for Y) = $-\dfrac{\partial Y}{\partial X}$ = MRT (X for Y)

Further, we know that MRS (X for Y) = $\dfrac{Px}{Py}$

Hence, MRS=MRT= $\dfrac{Px}{Py}$

The linkage between factor and goods markets is given by,

$$\frac{\partial U / \partial X}{\partial U / \partial Y} = \frac{\partial Y / \partial K}{\partial X / \partial K} = \frac{\partial Y / \partial L}{\partial X / \partial L}$$

This equation says that the marginal rate of substitution in consumption must be equated with the marginal rate of transformation.

If the marginal utility of X is relatively high (relative to Y), then we want the marginal product of K in the production of Y to be relatively low (relative to the marginal product of Kin).

The reason is that if we get more utility from the consumption of X at the margin, we must be willing to allocate relatively more K to its production.

The marginal condition is satisfied because of the tangency condition between the community indifference curve and the PPF.

That is, MRTS (X for Y) = MRPT (X for Y).

If you consider shifting one unit of K from the production of X to that of Y, then using PPF we get,

$$-\frac{dX}{dY} = \frac{\partial Y/\partial K}{\partial X/\partial K} = MRPT(X for Y) and$$

$$-\frac{dX}{dY} = \frac{\partial Y/\partial L}{\partial X/\partial L} = MRPT(X for Y)$$

But the tangency condition between the community indifference curve and the PPF gives,

$$\text{MRTS(X for Y)} = \frac{\partial U/\partial X}{\partial U/\partial Y} = \text{MRPT(X for Y)}$$

From above, we get-

$$\frac{\partial U/\partial X}{\partial U/\partial Y} = \frac{\partial Y/\partial K}{\partial X/\partial K}$$

$$\frac{\partial U/\partial X}{\partial U/\partial Y} = \frac{\partial Y/\partial L}{\partial X/\partial L}$$

The link between prices of goods and prices of factors can be seen from-

$$P_K = (\partial X/\partial K)P_X = (\partial Y/\partial K)P_Y,$$

$$P_L = (\partial X/\partial L)P_X = (\partial Y/\partial L)P_Y$$

$$\frac{P_K}{P_L} = \frac{(\partial X/\partial K)P_X}{(\partial Y/\partial L)P_Y} = \frac{(\partial Y/\partial K)P_Y}{(\partial X/\partial L)P_X}$$

This happens because, in equilibrium, we get

$$\frac{P_X}{P_Y} = \frac{\partial U/\partial X}{\partial U/\partial Y}$$

But prices of capital and labour are equal to their marginal contributions to the production of X and Y.So,

$$\frac{P_X}{P_Y} = \frac{\partial U/\partial X}{\partial U/\partial Y}$$

$$P_K = (\partial U/\partial X).(\partial X/\partial K) = P_X(\partial X/\partial K) and$$

$$P_L = (\partial U/\partial X).(\partial X/\partial L) = P_X(\partial X/\partial L)$$

Thus, from these equations we get,

$$\frac{P_K}{P_L} = \frac{\partial U/\partial K}{\partial U/\partial L}$$

Although the consumers do not obtain utility from capital and labour, however, the prices of K and L, reflect the 'indirect utility generated by capital and labour through transformation into X and Y, which are consumed.

Summary

To understand the concept of production without consumption let us first know about the different sectors in an economy. Generally, there are four sectors of an economy. They are-

- Household sector.
- Business sector.
- Government sector.
- Foreign trade/external sector.

Basically, in a one-sector model, we get only the household sector. Here, the production and consumption of a single producer or the consumer are studied. In a two-sector model, the interlinkages between two sectors, i.e., business and household are considered. In this structure, the household sector helps the business sector by providing labour, and the business sector, in return, pays back the wages (factor payment) to the household sector in

the first phase. In the second phase, the business sector supplies the goods and services it produces to the household sector for which the household sector makes its expenses for the purchase of goods produced by the business sector. This is how the two sectors are interlinked.

In a three-sector model, the banking sector plays the role of the third sector besides the above-mentioned sectors. In the between sector, the operations of the banks come in. The banking sector provides loans and receives deposits from households. Similarly, the banks receive deposits from the business sector and also provide loans to the business sector as well. Thus, both households and businesses are interlinked by the banking sector. In a simple closed economy, we find the existence of two-sector structures. However, in the case of the open economy, there is the existence of a four-sector modal where we see additionally one sector besides these above-mentioned three sectors.

In today's, modern and open economies the external relations of a country with the rest of the world are major determinants of economic integration and development. The external relations of a country can be measured by the volume of trade and commerce which depends on the extent of export and imports. Hence, foreign trade plays the role of the fourth sector in a four-sector economic model. Foreign trade links with household and business sectors in terms of export and import of different commodities and also establishes its relationship with the banking sector for its financial dealings.

In one sector case, a producer gets the production efficiency when we cannot produce more of a good without producing less of another. To appreciate its underlying idea, we may have to recall the concept of opportunity cost. i.e., the cost of producing more X can be readily measured by the reduction in Y output. It represents the probable benefits that an individual producer misses out on when selecting one substitute over another. opportunity costs can be easily overlooked as they are unseen by nature.

Production without consumption means the one-sector model where there is only the production takes place. Technical efficiency is an important issue that shows production optimality. Edgeworth box interoperates technical efficiency very well.

From the contract derived from the Edgeworth box diagram, we can easily find out the production possibility curve. A productionpossibility curve (PPC) is also known as a production possibility frontier or transformation curve. It shows various combinations of the quantities of two goods that can be produced within the given inputs or resources and technology which shows all the probable alternatives of two products that can be produced by using all the inputs or factors of production and in that scenario the given resources are optimally and efficiently operated per unit time.

Corresponding to all the points of the Edgworth contract curve, we may get the production possibility curve. The region under this curve means the feasible region where all combinations of goods can be produced with certainty but to the right of the curve, it means production impossibilities with limited resources.

The excess labour used in production shows the production possibilities lie beyond the range the producer can produce. The excess unit of labour with relatively less unit of capital is combined for the production of the two goods which eventually makes it wasteful for a rational producer with his limited resources. However, by rearranging the inputs the producer can move back to the production possibility curve where there will be no excesses or surpluses.

Finally, we the production equilibrium with no excess and shortages in the market. This is the one sector equilibrium where production takes place without consumption.

In this regard, let us discuss a case of one producer, and one consumer modal- the **Robinson Crusoe model.** It is a story of a young man who had to survive on a deserted island as a result of a sea storm accident with his ship. He used to produce to feed himself on that solitary island.

A Robinson Crusoe economy is a popular and simple framework used to learn some vital issues in economics. It assumes an economy with one consumer, one producer, and two goods. Here, the title "Robinson Crusoe" is an orientation to the 1719 novel of the same name authored by Daniel Defoe.

The assumptions of the model to examine general equilibrium with production are as follows;

- The island is cut off from the rest of the world.
- There is only a single economic agent (Crusoe himself)
- All commodities on the island have to be produced or found from existing stocks.
- He acts both as a producer to maximize profits, as well as a consumer to maximize his utility.

Robinson Crusoe multi-tasks in the economy by being both the producer and consumer at the same time, where he can either prefer to appreciate the scenery of the isolated island on which he has found himself or devote his time hunting and gathering coconuts.

He needs to balance his satisfaction increasing his search forday-dreaming or utility diminishing his pursuit of production and releasing his hunger.

Crusoe's indifference curves draw his liking for rest and coconuts whereas the production function indicates the technological relationship between the phenomenon that how much he works and how many coconuts he gathers.

The relationship between Output Mix and Real Factor Prices can be shown by the output mix which is achieved at Pareto optimal point.

At Pareto efficiency, we need to consider individual preferences and production possibilities together.

The necessary condition to achieve this is that the marginal rate of substitution for any two goods must be equal to the marginal rate of product transformation of the two goods. That is-

$$MRS_{xy} = MRPT_{xy}$$

Thus, consider that goods are X and Y; one individual whose utility function is given by U (X,Y); and society's production possibility frontier is written as T (X,Y) =O.

By solving this utility function with the help of the Lagrange solution we can reach finally,

$$\frac{P_K}{P_L} = \frac{\partial U / \partial K}{\partial U / \partial L}$$

Although the consumers do not obtain utility from capital and labour, however, the prices of K and L, reflect the 'indirect utility generated by capital and labour through transformation into X and Y, which are consumed.

Keywords

Production without consumption: Production without consumption means the one-sector model where there is only the production takes place.

Robinson Crusoe economy:A Robinson Crusoe economy is a popular and simple framework used to learn some vital issues in economics.

Output Mix: The equilibrium between production and consumption.

Self Assessment

1. An example of one producer, one consumer modal is
A. Two sector modal
B. Robinson Crusoe model
C. Robin hood modal
D. All the above

2. The correct assumption of one producer, one consumer modal is
A. The island is cut off from the rest of the world.
B. There is only a single economic agent.
C. All commodities on the island have to be produced or found from existing stocks.
D. All of these

3. "He multi-tasks in the economy by being both the producer and consumer"-This statement is true for
A. One producer one consumer modal
B. Robinson Crusoe model
C. Both
D. None

4. A point on the contract curve is
A. Technically inefficient
B. Technically infeasible
C. Technically efficient
D. None of these

5. If consumers' equilibrium is to the right of the producers' equilibrium in the common tangent, it means
A. Simultaneous equilibrium
B. Excess supply
C. Excess demand
D. None of the above

6. A point off the contact curve is
A. Technically inefficient
B. Technically infeasible
C. Technically efficient
D. Both (a) and (b)

7. Which one is not an example of one producer, one consumer modal is
A. Two-factor modal
B. Stolper-Samuelsion modal
C. Robin hood modal
D. All the above

8. contact curve is related to
A. Walras box
B. Eulers' box
C. Edgeworth box
D. All the above

9. Output mixed is achieved at Pareto optimal point.
A. Pareto optimal point
B. Consumer's equilibrium
C. Producers' equilibrium
D. All the above

10. When the marginal rate of substitution for any two goods is equal to the marginal rate of product transformation of the two goods, it is called
A. Seller's equilibrium
B. Producers' equilibrium
C. Pareto optimal point
D. All the above

11. For goods are X and Y, the utility function is given by
A. U(X,Y)
B. U(P,Q)
C. Both of these
D. None of these

12. Society's production possibility frontier for two goods X and Y is written as
A. U(X,Y)
B. U(P,Q=0
C. T(X,Y)=0
D. None of these

13. When MRS=MRT, the price ratios are given as
A. Px X Py
B. Px + Py
C. Px – Py
D. Px/Py

14. When the marginal rate of transformation of any two inputs for any two goods is equal to each other, it is called
A. Consumer's equilibrium
B. Pareto optimal point
C. Investors' equilibrium
D. All the above

15. For goods are X and Y, the production function is given by
A. Q (X,Y)
B. U (X,Y)
C. U(P,Q)

D. None of these

Answers for Self Assessment

1.	B	2.	D	3.	C	4.	C	5.	C
6.	D	7.	D	8.	C	9.	A	10.	C
11.	A	12.	A	13.	D	14.	D	15.	A

Review Questions

1. How many sectors are there in an economy?
2. What are the different sectors in a three-sector economy?
3. What do you mean by production without consumption?
4. What is output mix?
5. What is a contract curve? How can it be derived?
6. Explain how can the equilibrium in a sector model be achieved.
7. Describe the case of one producer and one consumer model when the exchange is absent.
8. Define Lagrange utility function.
9. Establish the linkage between output mix and real factor price with the help of the Lagrange function.

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Dr. Tirtha Saikia, Lovely Professional University

Unit 12: Effect of Changes in Factors Supply

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Objectives

After this chapter, you will be able to

- learn about Rybozynski Theorem,
- learn about the relation between factor price and output,
- learn about the relation between factor price and terms of trade,
- learn about the Stolper-Samuelson analysis of effects of change in relative factor price,
- learn about the change in relative factor price in producing a commodity,
- learn about changes in prices of a commodity due to changes in relative factor price,
- learn about the existence, stability and uniqueness of equilibrium in a market,
- learn about the interdependence of the markets,
- learn how the existence, stability and uniqueness of equilibrium are found in both partial and general equilibrium analysis.

Introduction

In this chapter, we will see, how the effect of changes in factor supply impacts trade and other economic activities. First of all, we will consider the Rybozynski theorem which indicates that a rise in the supply of one of the factors used in production, while the other factors remain constant, results in the rise in output of the good which uses the factor intensively in production and the output of the other good declines in real quantities, given that commodity and prices of the factor remain unchanged.

We will also consider the relationship between relative commodity and factor supply. In this regard, Stolper-Samelson theorem. The Stolper-Samuelson theory indicates that free international trade results in a decrease in the real income of the comparatively scarce factor of the nation and increases the real income of the comparatively abundant factor of the nation.

Finally, we will also consider the general equilibrium and Pareto optimality in this regard.

12.1 Effect of Changes in Factors Supply in Closed Economy (Rybozynski Theorem)

Rybozynski theorem indicates that a rise in the supply of one of the factors used in production, while the other factors remainconstant, results in the rise in output of the good which uses the factor intensively in production and the output of the other good declines in realquantities, given that commodity and prices of the factor remain unchanged. This means that when the availability of some resourcesrises, those industrieswhichuse those resources intensively will now increase their output while the other industries will reducetheir output. The factor ratio used in each industry measures the relative factor intensity.

The essence of the theorem is that there is unbalanced growth in a factor supply thatleads to strong irregular changes in the output level of two kinds of industries (i.e., capital-intensive and labour-intensive) at given commodity prices.

To explain this theory, let us suppose in a labour-surplus country, the labour supply has increased. It increases the output of the labour-intensive product, say- cloth here, and reduced the output of the capital-intensive product, say steel in this case. The production ofcloth in more quantitiesincreases the demand for labour.

In such a situation, if more labourersare not used in combination with capital, labour productivity will fall. This results ina shortage of labour in the sector that is labour-intensive (for example- food) and eventually, there will be a fall in the level of output of food.

To explain the theorem, let's first consider the underlying assumptions of the theorem.

Assumptions:

- The theory assumes that trade happens between two countries.
- That the theory assumes thatthe country taken for the study is labour-abundant and there is capital scarcity as well.
- This country produces only two commodities, i.e., cloth and steel.
- The production of these commodities needs two factors i.e., labour and capital.
- The theory assumes thatboth capital and labour are perfectlysubstitutable, perfectly divisible and perfectly mobile to some degree.
- It further states that cloth is supposed to be a labour-intensive good and steel to be a capital-intensive good.
- There is perfect competition products market and also in the factor markets.
- The theory assumes thatthere is a homogenous production function of degree onethat indicates there are constant returns to scale in production.
- The factor, as well as the commodity prices, are given and constant.
- The theory assumes thatthe factor supply of labour expands and capital remains the same.

Given these assumptions let us now consider the following diagram to explain the Rybozynski theorem-

Figure 12.1: Rybozynski theorem

Figure 12.1 depicts the cases of the Rybozynski theorem. Capital and the capital-intensive product, i.e., steel are considered vertically and the labourand labour-intensive product, i.e., the cloth are taken horizontally in the diagram. In the diagram, OxA is the non-linear contract curve. The production takes place at A. The capital-labour (K-L) ratio in cloth is measured by the slope of the line OxA and the slope of the line OyA measures the K-L ratio in steel.

If the supply of labour increases by Oy′ but the capital stock remains the same, OxB is the non-linear contract curve. Production, in this case, takes place at B. The slope of the line OxBmeasures the K-L ratio in cloth and the K-L ratio in steel is similarly measured by the slope of the line OyB.

The factor intensity in the two goods remains the same at points A and B. Since A and B are lying on the same line OxB, the K-L ratio in cloth remains the same.

On the other hand, the line OyB is parallel to Oy′B. Since the slope of OyB and Oy′B are equal, there are no variations also in the K-L ratio in the capital-intensive good, i.e., steel.

When the factor- intensity in both the goods remains the same, there will be no change in the prices of the two factors. It shows that the Rybczynaski theorem disproves the prospect of factor price equalisation.

The increase in the labour supply in the labour-abundant country and the increase in the stock of capital in the capital-abundant country sets the prices of two factors to remain constant.Hence, the prices of the two goods also remain the same as before.

There will be an increase in cloth production after the increase in the labour supply since OxB>OxA. The production of K-intensive goodsand steel decreases after there is an expansion in the labour supplyin this country since OyA>Oy′B.

The constancy of the prices of the commodities suggests that the terms of trade remain unaffected. However, the equilibrium with given prices, when the supply of one factor is increasing, may not be not compatible with general equilibrium.

The general equilibrium in such a situation can be possible only if the commodity price intensive in the growth factor falls. It means the terms of trade, in that case, are most likely to turn out to be worse for the country in which one factor has been expanding.

From the Rybozynski theorem, we can draw the fate of international trade. Figure 12.2 assumes cloth on the horizontal axis and steel on the vertical axis. PP is the production possibility curve before the expansion of output. The international terms of trade are denoted by the slope of bb. The production equilibrium is determined at R.
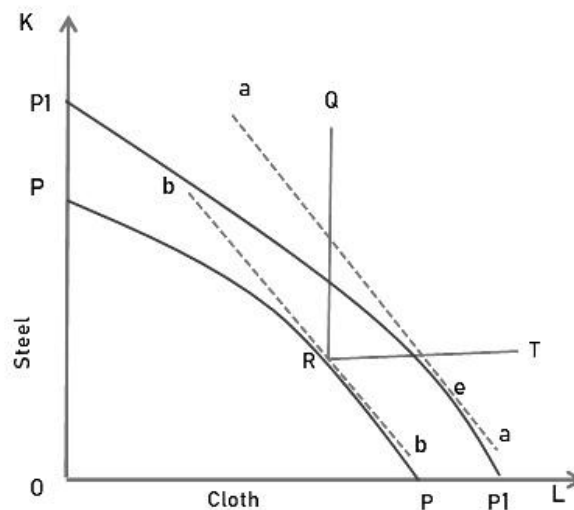
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Figure 12.2: Rybozynski theorem and international trade

The expansion of output is shown by P1P1. If the prices of two commodities remain the same, the terms of the trade line are shown by aa and are parallel to bb. The production equilibrium takes place now at e where aa is tangent to P1P1.

Point, e shows a larger production of labour-intensive goods, i.e., cloth and decreased output of the capital-intensive commodity, i.e., steel. This can happen only if the capital-intensive commodity, steel is an inferior commodity.

The new position of equilibrium must be lying on that part of the production possibility curve, P1P1 that lies between the range of the lines RQ and RT. The slope of this segment on the curve P1P1 is less steep than the slope of PP at R. It means that the price of cloth will be relatively cheaper and that of steel is relatively dearer. This implies that there is a deterioration of terms of trade due to an increase in the labour supply.

12.2 Relationship Between Relative Commodity and Factor Prices

The connection between relative commodity and factor prices is explainedwith the help ofStolper and Samuelson's theory of international trade.

The Stolper-Samuelson theoryindicates that free international trade results in a decrease in the real income of the comparatively scarce factor of the nationand increases the real income of the comparatively abundant factor of the nation.

Assumptions:

Let us consider the assumption of the Stolper-Samuelson theorem:

- One of the two countries engaged in trading, produces two commodities, i.e., example - cloth and steel, and also employs the two factors such as labour and capital.
- The production function relating to each of the two goods is homogenous of degree one. This means there exist constant returns to scale.
- The factors, capital and labour are assumed to be fully employed.
- The factors of production are assumed to be given in supply.
- There is the existence of the conditions of perfect competition in the product and also in the factor markets.
- The given country is supposed to be labour-abundant, and, capital-scarce.
- Cloth is assumed to be a labour-intensive commodity while steel is capital-intensive.
- There exist fixed international terms of trade.

- Neither of these two commodities is the input in the production of the other commodity.
- The factors of production are mobile between the industries or sectors but immobile between the two countries.
- There is a non-existence of transportation costs.

Given these assumptions, the theory of Stolper–Samuelson is a basic theorem in Heckscher–Ohlin trade theory. It portrays the relationship between relative prices of quantities of output produced and comparative rewards of the factors — precisely, real wages of labour and real returns to capital.

The Stolper–Samuelsontheorem indicates that the increase in the relative commodity price of goods will lead to an increase in the real return to the intensively used factor in the production of the good, and contrariwise, to a decline in the real return to the other factor.

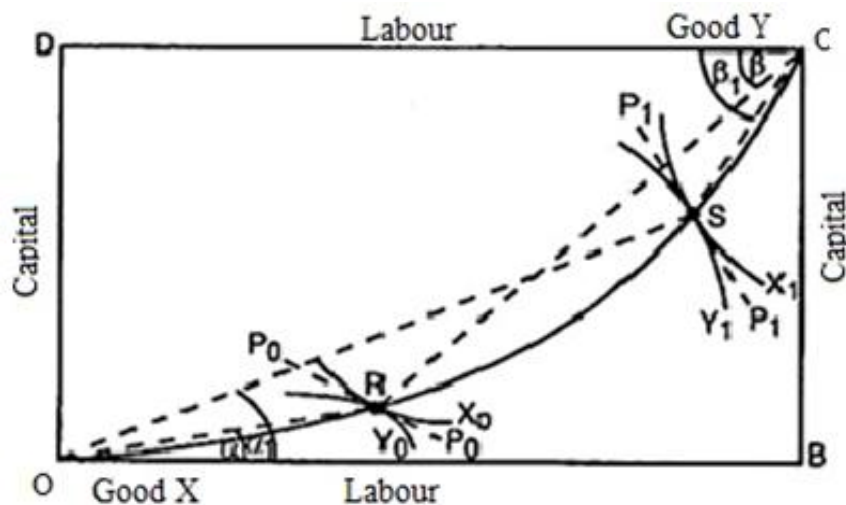Stopler- Samuelson Theorem can be explained through Edgeworth Box-

Figure 12.3: Stopler- Samuelson theorem

In the diagram, both labour and capital are measured on the horizontal axis and vertical axis respectively. O is the point of origin for the labour-intensive commodity, i.e., cloth and on the other hand, C is the point of origin for the capital-intensive good, i.e., steel.

If there is no trade, production takes place at point R, and, R is the point of tangency of isoquant X0 of cloth, isoquant Y0 of steel and the factor price line defined as P0P0.

Here, the capital-labour (K-L)ratio in cloth at R = Slope of line AR = Tan α

and so, the capital-labour (K-L) ratio in steel at R = Slope of line RC = Tan β

After the trade is commenced, the production takes place at S, (at a higher point from the perspective of cloth at a lower point from the perspective of steel), with higher isoquant X1, and subsequently lower isoquant Y1 and the factor price line is P1P1.

capital-labour (K-L) ratio in cloth at S = Slope of line AS = Tan α1

capital-labour (K-L) ratio in steel at S = Slope of line SC = Tanβ1

Since, as mentioned in the diagram,

 Tan α1 > Tan α   and

Tan β1 > Tan β,

The capital-labour (K-L) ratio rises in both the goods in this country.

The after-expansion factor price line, i.e., P1P1 is steeper than the original factor price line, i.e., P0P0.

It states that the price of labour rises as compared to that of the price of capital.

As the production of exportable goods, i.e., cloth expands, the inputs are transferred from the steel industry to the cloth industry. The increased volume of production of cloth and the resource transfer to this industry will increase the price of cloth as compared to that of steel.
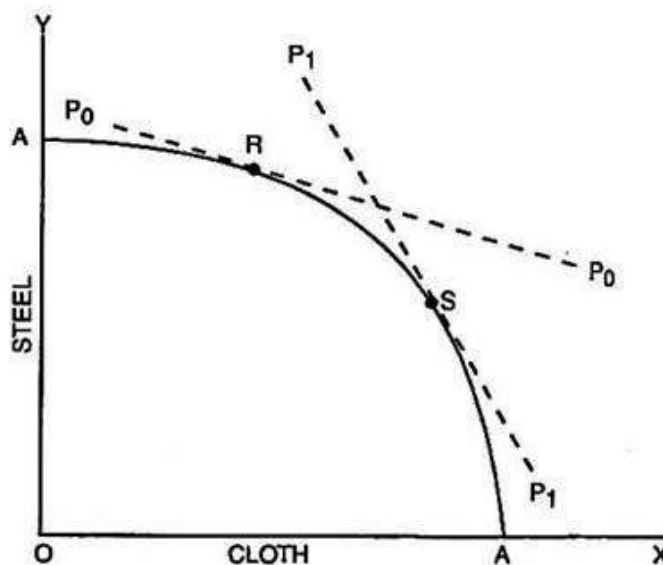

Figure 12.3: Effect of factor price on international trade

In the absence of trade, production is observed to take place at point R, and in presence of trade, production occurs at S.The price ratio of cloth to steel at S is higher than that of the price ratio of the same at point R.

The slope of P1P1, at S > Slope of P0P0, at R

Hence, the price ofcloth increases, and the price of steel falls.

Thus, relative changes in the prices of two commodities result in changes in the price of labour and capital.

12.3 General Equilibrium and Pareto Optimality

In economics, everything is determined with the help of the market. A market is a system where the two forces demand and supply work. Demand comes from the buyer's end and supply can be analyzed from the seller's point of view. These two forces after mutual interaction set the equilibrium in the market. Any imbalance between these two forces causes distortions in the market in the form of excess and shortages. This is also said as operation of the market mechanism. That is to say, a market is clear when the market mechanism or price mechanism operates correctly. In the real-life scenario, we do have different forms of the market such as product market and factor market. In a product market, the products are bought and sold, and hence the price and volume of the products are determined. But, in the factor market purchase and sale of the factors of production or the input are done by the owner of the products and the producers of the product. Here unlike in the product market, the producer is a buyer of the factor instead of a seller. Again, in the product market, most often, the price and output level of a particular is determined at a particular point in time assuming all the price and output of all other products to be given and constant. But actually, it may not be so. In real-life situations, each of the markets is interrelated and interdependent relating to the impact of price and output level. No market is independent. And it is necessary to determine the price and output of a market about the price-output of the other markets. When the price-output of a particular market is determined in isolation from the others this is the situation of partial equilibrium analysis. But when all markets are considered altogether and there is simultaneous determination of price and output in all the markets, this is the scenario of general equilibrium.

Assumptions of general equilibrium:

- Free, capitalistic market.
- Perfect competition in the product market, product prices are given

- Perfect competition in the factor market, factor prices are given.
- Equilibrium determined simultaneously in both product and factor markets.
- Other things remaining constant,
- Static, no growth.
- Diminishing returns.
- There is an interconnection between product and factor markets.
- Partial equilibrium in individual markets, can lead to general equilibrium.
- Achieved through adjustments of product and factor Price.
- All resources are allocated in an optimum manner.
- Welfare of all units is maximised.
- Laissez-faire, no government interference.
- Efficient and Equitable market.

Pareto Optimality: A Market situation, wherein it is not possible to make oneperson better off, without makinganother worse off.

This means there is an optimum allocation ofresources.If resources are not allocatedoptimally, it is possible to increase orimprove one unit's welfare withoutdecreasing another's. Pareto optimality depends on the following assumptions-

Assume that two commodities are beingproduced.

- There are two firms.
- Two factors of production, K and L.
- Two consumers or producers- X and Y.
- Perfect competition,
- Static analysis,
- Diminishing returns, and utility

Conditions of Pareto Optimality:

Pareto's efficiency can be seen from three different aspects also said as Paretian conditions:

- Efficiency in consumption (Exchange)
- Efficiency in production (Allocation of inputs)
- Efficiency in both production and consumption (Product mix)

In these three areas, we can easily find out how Paretian efficiency is achieved. In the first one, Paretian efficiency can be found by using the indifference curve analysis. Production efficiency similarly can be traced out by using the isoquant curve approach. The third one however may be found ``by using production possibility as well as the indifference curve. Now let us explain these in detail one by one.

Efficiency in consumption (Exchange):

Exchange efficiency occurs if it is not possible to increase the utility or welfare of one consumer without reducing the utility or welfare of another consumer by redistributing any given bundle of goods between two consumers.

To cite an example here, let us assume that there are two individuals, of them, one with a basket of fruits and the other with a bundle of cloth. Both of these individuals can be made better off by exchanging fruits for cloth. In such a scenario, an efficient exchange system will allow the exchange of fruits and cloth to take place until neither of the individuals can be made better off without at least one of them becoming worse off.

In the case of a multi-product and multi-consumer economy where everything is expressed in terms of money, the exchange is far more complicated and it involves the use of money to simplify

exchange. But the procedure is the same here also. So long as there is the provision that the products can be redistributed to make at least one person better off without making the other worse off, the economy does not operate optimally or operate under-optimally from the viewpoint of efficiency in exchange.

Thus, Pareto efficiency or optimality in exchange is an economic state where goods cannot be redistributed to make one individual better off without making another individual worse off. It implies that goods are distributed in the most economically efficient manner. Similarly, all individuals in an economy are said to be in a Pareto optimum state or achieving the maximum welfare when no economic changes can make one individual better off without making at least one other individual worse off.

Pareto efficiency for two individuals can be shown by individual indifference curves as well as their marginal rate of substitution. According to the Pareto efficiency in exchange, the Marginal Rate of Substitution (MRS) between any two goods must be the same for every consumer of both products:
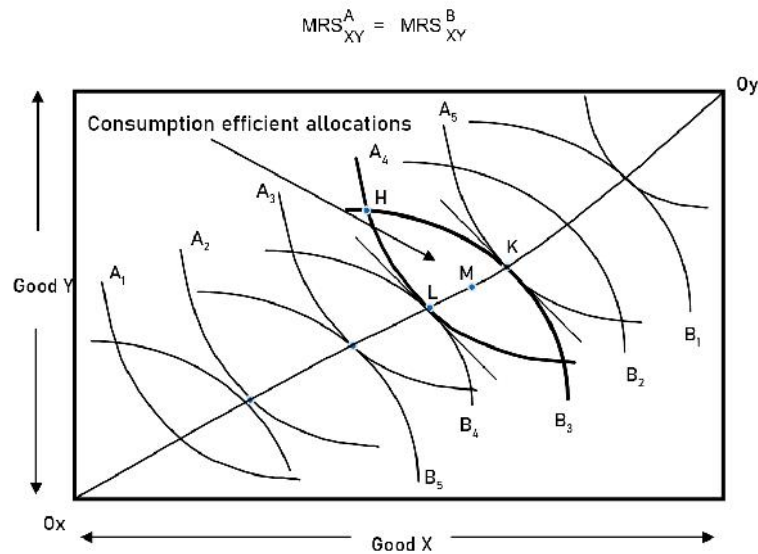
$$MRS^A_{XY} = MRS^B_{XY}$$

Figure 12.4: General equilibrium in consumption

Here, MRS^A_{xy} is the marginal rate of substitution of good x for good y for individual A and

MRS^B_{xy} is the marginal rate of substitution of good x for good y for individual B.

To explain the efficiency in consumption or exchange, we have taken the Edgeworth box diagram. The Edgeworth box is a graphical representation of a market with just two commodities, X and Y, and two consumers. It is a two-dimensional representation of the utility levels of two individuals and two items that are finite in supply. Ox is the origin from which the utility of individual A is measured and Oy is the origin from which the utility level of B is measured. A1, A2, A3, A4, A5, etc. are the indifference curves of individual A which measure his successively higher levels of utility. Similarly, B1, B2, B3, B4, and B5 indifference curves measure individual B's successively higher levels of utility. Connecting the corresponding tangency points of the indifference curves of both individuals, we get a curve known as the **contract curve**(In the diagram, the curve connecting Ox and Oy). The contract curve represents all the points to be in Pareto optimal. Any point, off the contact curve, is said to be Pareto dominated. This means, there is further scope of having efficiency after a proper redistribution. To explain these, let's consider the initial distribution of two goods between two individuals takes place at point H which is off the contract curve. At point H, individual A's utility is defined by the A4 indifference curve and individual B's utility is defined by the B3 indifference curve. This point is sub-optimal and hence Pareto dominated. The reason behind this is that a movement from this point to the contract curve by redistribution makes either each individually or both better off as they may reach a higher indifference curve with higher levels of satisfaction while the other utility levels remain intact. This is what is said as Pareto improvement. In such a case, if there is movement from point H to K, A will reach a higher indifference curve, i.e., A5 while individual B remains on his old indifference curve B3. This indicates that individual A is better off (now on a higher indifference curve with higher levels of satisfaction) while B is not worse off (remains on his same indifference curve). Thus, point K lies on

the contract curve which means the efficient distribution of two goods and hence is said as Pareto optimal point. Similarly, a movement from point H to L means individual B moves to a higher indifference curve, i.e., B4 from B3 but individual A remains on his earlier indifference curve. This again means that B is better off (moves to a higher indifference curve) but A is not worse off (remains on the same indifference curve). Point L on the curve means the Pareto optimal point. Again, a movement from point H to any other point in between L and K, let's consider point M means both the individuals will be better off as both of them will be on a higher indifference curve. Hence, point M is a Pareto optimal point. Thus, any point on the contract curve means the Pareto optimal point of efficient distribution of both goods. These points will maximize the utility levels or welfare between the two individuals. The same thing can be generalized to many individuals. This is how to exchange efficiency can be attained.

Efficiency in Production (Allocation of inputs):

Production efficiency takes place when the available inputs or factors (such as labour, L and capital, Kl) of production are distributed or allocated in the production of two products in such a way that it is no longer possible to reallocate the factors to increase the output of one product without reducing the output of another product. In some cases, it is possible to increase the production of the products by rearranging and reallocating the inputs without having any additional cost. This is because some inputs are more productive in some uses as compared to others.

For example, let us suppose there are two sector-agriculture sectors and the industrial sector. There is excess labour in the agriculture sector and labour shortage in the industrial sector. The productivity of the labour in the industrial sector is higher than that of the agricultural sector. In such a situation, it is possible to reallocate labour between the sectors and shift some labours from agriculture to industry. Thus, the productivity of the industrial sector can be increased without decreasing the products of the industrial sector. This is how production efficiency can be achieved.

Pareto efficiency for two factors can be shown by isoquants as well as their marginal rate of technical substitution. According to the Pareto efficiency in production, the Marginal Rate of Technical Substitution (MTRS) between any two goods must be the same for every producer of both products:
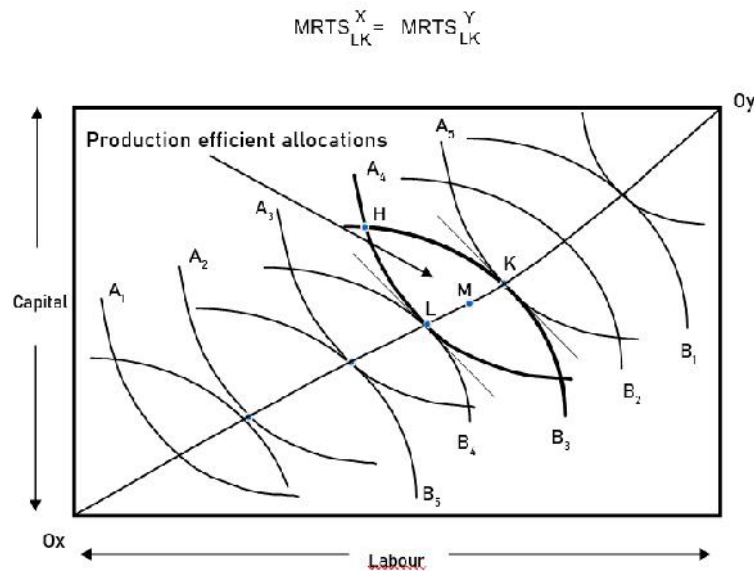
$$MRTS_{LK}^{X} = MRTS_{LK}^{Y}$$

Figure 12.5: General equilibrium in production

Here, $MRTS_{LK}^{X}$ is the marginal rate of technical substitution of labour for capital for good X and

$MRTS_{LK}^{Y}$ is the marginal rate of technical substitution of labour for capital for good Y.

To explain the production efficiency, we have taken the Edgeworth box diagram. Ox is the origin from which the output of good X by using labour and capital as inputs is measured and Oy is the origin from which the production of good Y is measured. A1, A2, A3, A4, A5, etc. are the isoquants

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for different levels of output of good X. Similarly, B1, B2, B3, B4, B5 isoquants measure different output levels of good Y. Connecting the corresponding tangency points of the isoquants of both the goods, we get a curve known as the **contract curve**(In the diagram, the curve connecting Ox and Oy). The contract curve represents all the points to be in Pareto optimal. Any point, off the contact curve, is said to be Pareto dominated. This means, there is further scope of having efficiency in the production of both the goods after a proper redistribution of inputs. To explain these, let's consider the initial distribution of factors in the production of two goods takes place at point H which is off the contract curve. At point H, the output of good X is defined by A4 isoquant and the output of good Y is defined by B3 isoquant. This point is sub-optimal and hence Pareto dominated. The reason behind this is that a movement from this point to the contract curve by reallocation of factors increases the production of X or Y or both as one good may be produced at a higher isoquant with higher levels of output while the output levels of the other remain intact. This is what is said as Pareto improvement. In such a case, if there is movement from point H to K, the output of good X increases, i.e., moves from A4 to A5 while the output of Y remains the same on the old isoquant B3. This indicates that output of good X increases (now on a higher isoquant with higher levels of output) while production of Y is not worse off (remains on the same isoquant). Thus, point K lies on the contract curve which means the efficient reallocation of factors and hence is said as Pareto optimal point. Similarly, a movement from point H to L means the production of good Y increases, i.e., B4 from B3 but the output of good X remains on the earlier isoquant. This again means that output of Y increases (moves to a higher isoquant) but good X is not worse off (remains on the same isoquant). Point L on the curve means the Pareto optimal point. Again, a movement from point H to any other point in between L and K, let's consider point M; it means the output of both the products will increase as both of them will be on a higher isoquant. Hence, point M is a Pareto optimal point. Thus, any point on the contract curve means the Pareto optimal point of efficient allocation of factors in the production of both the goods. These points will maximize the output levels of the two goods. The same thing can be generalized for many goods. This is how production efficiency can be attained.

Efficiency in both production and consumption (Product mix) :

According to the Pareto efficiency in product mix, the bundle of factors used and the bundle of goods produced in the economy are so distributed that increasing the production of one good and increasing the satisfaction of one person is impossible without decreasing the production of another.

This condition means that the optimum quantities of different commodities are to be produced with the given factor combinations. In this sense, it can be stated that "the marginal rate of substitution between any pair of products for any person consuming both must be the same as the marginal rate of transformation (for the commu-nity) between them." This can be expressed as,

$$MRTS_{XY} = MRS^A_{XY} = MRS^B_{XY}$$

Here, $MRTS_{XY}$ = Marginal rate of technical substitution of good X for Y,

MRS^A_{XY} = Marginal rate of substitution of good X for Y for individual A,

MRS^B_{XY} = Marginal rate of substitution of good X for Y for individual B.

Since the MRTS shows the rate at which a good can be transformed into another; and the MRS shows the rate at which the consumers are able and willing to exchange one good for another; these rates must be equal for a Pareto-optimal situation to be attained.

Efficiency in product mix can be explained with the help of the diagram below-
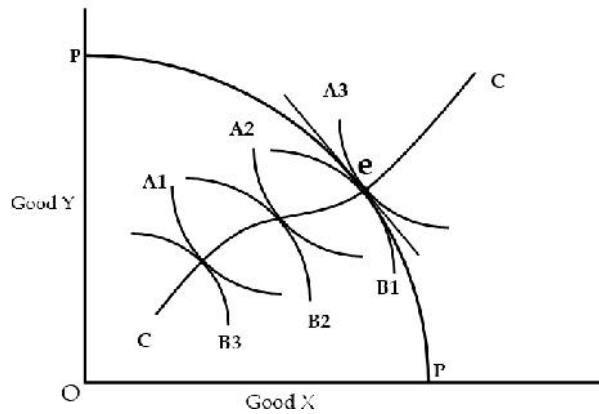
Fig.:

Figure 12.5: General equilibrium in consumption and production

In the diagram, the horizontal axis measures good X and the vertical axis measures good Y. A1, A2, A3 are the indifference curves measuring individual A's utility level and B1, B2, B3 are the indifference curves of utility levels of individual B. CC is the contract curve drawn by connecting the corresponding tangency points of the indifference curves of both individuals. All the points on the contract curve mean the optimal distribution of the two goods and hence, Pareto optimality. Point **e**, on the contract curve, hence is an efficient point. But at this point, the slope of the production possibility curve is also the same as the slope of the indifference curve. At point e, there is efficiency in the allocation of factors of production from the viewpoint of production efficiency, and at the same time, the exchange is efficient. This means the marginal rate of technical substitution of the factor in producing two goods is equal to the marginal rate of substitution of the goods between the consumers. Hence, at point e, the efficiency in product mix is said to be attained.

Summary

In this chapter, we have seen, how the effect of changes in factor supplies impacts trade and other economic activities.

We have also considered the relationship between relative commodity and factor supply.

Finally, we have also considered the general equilibrium and Pareto optimality in this regard.

Rybozynski theorem indicates that a rise in the supply of one of the factors used in production, while the other factors remainconstant, results in the rise in output of the good which uses the factor intensively in production and the output of the other good declines in realquantities, given that commodity and prices of the factor remain unchanged. This means that when the availability of some resourcesrises, those industrieswhichuse those resources intensively will now increase their output while the other industries will reducetheir output. The factor ratio used in each industry measures the relative factor intensity.

The essence of the theorem is that there is unbalanced growth in a factor supply thatleads to strong irregular changes in the output level of two kinds of industries (i.e., capital-intensive and labour-intensive) at given commodity prices.

The constancy of the prices of the commodities suggests that the terms of trade remain unaffected. However, the equilibrium with given prices, when the supply of one factor is increasing, may not be not compatible with general equilibrium.

The general equilibrium in such a situation can be possible only if the commodity price intensive in the growth factor falls. It means the terms of trade, in that case, are most likely to turn out to be worse for the country in which one factor has been expanding.

The connection between relative commodity and factor prices is explainedwith the help ofStolper and Samuelson's theory of international trade.

The Stolper-Samuelson theoryindicates that free international trade results in a decrease in the real income of the comparatively scarce factor of the nationand increases the real income of the comparatively abundant factor of the nation.

In economics, everything is determined with the help of the market. A market is a system where the two forces demand and supply work. Demand comes from the buyer's end and supply can be analyzed from the seller's point of view. These two forces after mutual interaction set the equilibrium in the market. Any imbalance between these two forces causes distortions in the market in the form of excess and shortages. This is also said as operation of the market mechanism. That is to say, a market is clear when the market mechanism or price mechanism operates correctly. In the real-life scenario, we do have different forms of the market such as product market and factor market. In a product market, the products are bought and sold, and hence the price and volume of the products are determined. But, in the factor market purchase and sale of the factors of production or the input are done by the owner of the products and the producers of the product. Here unlike in the product market, the producer is a buyer of the factor instead of a seller. Again, in the product market, most often, the price and output level of a particular is determined at a particular point in time assuming all the price and output of all other products to be given and constant. But actually, it may not be so. In real-life situations, each of the markets is interrelated and interdependent relating to the impact of price and output level. No market is independent. And it is necessary to determine the price and output of a market about the price-output of the other markets. When the price-output of a particular market is determined in isolation from the others this is the situation of partial equilibrium analysis. But when all markets are considered altogether and there is simultaneous determination of price and output in all the markets, this is the scenario of general equilibrium.

Assumptions of general equilibrium:

- Free, capitalistic market.
- Perfect competition in the product market, product prices are given
- Perfect competition in the factor market, factor prices are given.
- Equilibrium determined simultaneously in both product and factor markets.
- Other things remaining constant,
- Static, no growth.
- Diminishing returns.
- There is an interconnection between productand factor markets.
- Partial equilibrium in individual markets, can lead to general equilibrium.
- Achieved through adjustments of productand factor Price.
- All resources are allocated in an optimummanner.
- Welfare of all units is maximised.
- Laissez-faire, no government interference.
- Efficient and Equitable market.

A Market situation, wherein it is not possible to make oneperson better off, without makinganother worse off.

This means there is an optimum allocation ofresources.If resources are not allocatedoptimally, it is possible to increase orimprove one unit's welfare withoutdecreasing another's. Pareto optimality depends on the following assumptions-

Assume that two commodities are beingproduced.

- There are two firms.
- Two factors of production, K and L.
- Two consumers or producers- X and Y.
- Perfect competition,
- Static analysis,
- Diminishing returns, and utility

Conditions of Pareto optimality:

Pareto's efficiency can be seen from three different aspects also said as Paretian conditions:

- Efficiency in consumption (Exchange)

- Efficiency in production (Allocation of inputs)
- Efficiency in both production and consumption (Product mix)

In these three areas, we can easily find out how Paretian efficiency is achieved. In the first one, Paretian efficiency can be found by using the indifference curve analysis. Production efficiency similarly can be traced out by using the isoquant curve approach. The third one however may be found by using production possibility as well as the indifference curve. Now let us explain these in detail one by one.

Exchange efficiency occurs if it is not possible to increase the utility or welfare of one consumer without reducing the utility or welfare of another consumer by redistributing any given bundle of goods between two consumers.

To cite an example here, let us assume that there are two individuals, of them, one with a basket of fruits and the other with a bundle of cloth. Both of these individuals can be made better off by exchanging fruits for cloth. In such a scenario, an efficient exchange system will allow the exchange of fruits and cloth to take place until neither of the individuals can be made better off without at least one of them becoming worse off.

In the case of a multi-product and multi-consumer economy where everything is expressed in terms of money, the exchange is far more complicated and it involves the use of money to simplify exchange. But the procedure is the same here also. So long as there is the provision that the products can be redistributed to make at least one person better off without making the other worse off, the economy does not operate optimally or operate under-optimally from the viewpoint of efficiency in exchange.

Thus, Pareto efficiency or optimality in exchange is an economic state where goods cannot be redistributed to make one individual better off without making another individual worse off. It implies that goods are distributed in the most economically efficient manner. Similarly, all individuals in an economy are said to be in a Pareto optimum state or achieving the maximum welfare when no economic changes can make one individual better off without making at least one other individual worse off.

Pareto efficiency for two individuals can be shown by individual indifference curves as well as their marginal rate of substitution. According to the Pareto efficiency in exchange, the Marginal Rate of Substitution (MRS) between any two goods must be the same for every consumer of both products:

$$MRS_{XY}^{A} = MRS_{XY}^{B}$$

Production efficiency takes place when the available inputs or factors (such as labour, L and capital, Kl) of production are distributed or allocated in the production of two products in such a way that it is no longer possible to reallocate the factors to increase the output of one product without reducing the output of another product. In some cases, it is possible to increase the production of the products by rearranging and reallocating the inputs without having any additional cost. This is because some inputs are more productive in some uses as compared to others.

For example, let us suppose there are two sector-agriculture sectors and the industrial sector. There is excess labour in the agriculture sector and labour shortage in the industrial sector. The productivity of the labour in the industrial sector is higher than that of the agricultural sector. In such a situation, it is possible to reallocate labour between the sectors and shift some labour from agriculture to industry. Thus, the productivity of the industrial sector can be increased without decreasing the products of the industrial sector. This is how production efficiency can be achieved.

Pareto efficiency for two factors can be shown by isoquants as well as their marginal rate of technical substitution. According to the Pareto efficiency in production, the Marginal Rate of Technical Substitution (MTRS) between any two goods must be the same for every producer of both products:

$$MRTS_{LK}^{X} = MRTS_{LK}^{Y}$$

According to the Pareto efficiency in product mix, the bundle of factors used and the bundle of goods produced in the economy are so distributed that increasing the production of one good and increasing the satisfaction of one person is impossible without decreasing the production of another.

This condition means that the optimum quantities of different commodities are to be produced with the given factor combinations. In this sense, it can be stated that "the marginal rate of substitution between any pair of products for any person consuming both must be the same as the marginal rate of transformation (for the commu-nity) between them." This can be expressed as,

$$MRTS_{XY} = MRS^A_{XY} = MRS^B_{XY}$$

Here, $MRTS_{XY}$= Marginal rate of technical substitution of good X for Y,

MRS^A_{XY}= Marginal rate of substitution of good X for Y for individual A,

MRS^B_{XY}= Marginal rate of substitution of good X for Y for individual B.

Keywords

Rybozynski theorem: Rybozynski theorem indicates that a rise in the supply of one of the factors used in production, while the other factors remain constant, results in the rise in output of the good which uses the factor intensively in production and the output of the other good declines in real quantities, given that commodity and prices of the factor remain unchanged.

Stolper-Samuelson theory: The Stolper-Samuelson theory indicates that free international trade results in a decrease in the real income of the comparatively scarce factor of the nation and increases the real income of the comparatively abundant factor of the nation.

General equilibrium: When all markets are considered altogether and there is simultaneous determination of price and output in all the markets, this is the scenario of general equilibrium.

Self Assessment

1. Euler's'sf changes in factors supply in Closed Economy is given by
A. Rybozynski Theorem
B. Euler's Theorem
C. Keynes Theorem
D. Pareto Theorem

2. Which one is not an assumption of the Rybozynski Theorem?
A. The trade takes place between two countries.
B. The given country is labour-abundant and capital-scarce.
C. This country produces two commodities— cloth and steel.
D. All of these

3. According to the Rybozynski theorem, in a labour-surplus country, the supply of labour gets increases. It will lead to an increased output of
A. The capital-intensive commodity
B. The labour-intensive commodity
C. Both the commodities.
D. None of the commodities.

4. According to the Rybozynski theorem, the factor and commodity prices are assumed to be
A. Increasing
B. Decreasing

C. Constant

D. None of these

5. Regarding the Rybozynski theorem, the terms of trade are likely to become worse for the country in which

A. One factor has been expanding

B. Both the factor has been expanding

C. None of the factors has been expanding

D. All the above

6. The relationship between relative commodity and factor prices is analyzed by

A. Rybozynski Theorem

B. Euler's Theorem

C. Stolper - Samuelson Theorem

D. None of these

7. The Stolper-Samuelson theorem postulates that free international trade

A. Increases the real income of the nation's relatively scarce factor and increases the real income of the nation's relatively abundant factor.

B. Reduces the real income of the nation's relatively scarce factor and increases the real income of the nation's relatively abundant factor.

C. Have no effects on the real income of the nation's relatively scarce factor and increases the real income of the nation's relatively abundant factor.

D. None of the above

8. Find out the wrong assumption of the Stolper-Samuelson theorem

A. The two factors of production are fixed in supply.

B. The conditions of perfect competition exist both in the product and factor markets.

C. The given country is labour-abundant and capital-scarce.

D. Both labour and capital are underemployed.

9. Stolper-Samuelson theorem describes the relationship between

A. Relative prices of output and relative factor rewards

B. Relative prices of inputs and relative factor rewards

C. Absolute prices of output and relative factor rewards

D. Absolute prices of inputs and relative factor rewards

10. Stolper–Samuelson theorem relates to

A. Rybozynski Theorem

B. Euler's Theorem

C. Heckscher–Ohlin trade theory

D. All the above

11. Find out which is not the assumption of the general equilibrium analysis

A. Free, capitalistic market.

B. Perfect competition in the product market, product prices are given

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C. Static, no growth.

D. Increasing returns.

12. Find out the correct statement.

A. There is interring connection between product and factor markets.

B. Partial equilibrium in individual markets, can lead to general equilibrium.

C. Both are correct

D. Both are wrong

13. Consumption efficiency indicates

A. Maximum utility for all consumers

B. Maximum efficiency for all producers

C. Minimum utility for all consumers

D. Minimum efficiency for all producers

14. Production efficiency indicates

A. Maximum utility for all consumers

B. Maximum efficiency for all producers

C. Maximum possible output with the given resources

D. Minimum possible output with the given resources

15. Product mix efficiency means

A. Optimum mix of commodities.

B. Maximum possible output with the given resources.

C. Minimum mix of commodities.

D. All the above

Answers for Self Assessment

1.	A	2.	D	3.	B	4.	C	5.	A
6.	C	7.	B	8.	D	9.	A	10.	C
11.	D	12.	C	13.	C	14.	C	15.	B

Review Questions

1. What is a closed economy?

2. What is an open economy?

3. What is the Rybozynski theorem?

4. How does the effect of change in factor price observed in a closed economy according to Rybonzynski?

5. Show the effect of factor price change in international trade.

6. Show how Stolper-Samuelson showed the relationship between relative commodity price and factor price.

7. What is Pareto Optimality?

8. Show the case of general equilibrium in consumption.
9. Show the case of general equilibrium in production.
10. Show the case of simultaneous general equilibrium in both consumption and production.

Further Readings

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2. Microeconomics—Dominik Salvatore, Oxford University Press, New York, 2003.
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Web Links

https://www.economicsdiscussion.net/theorems/the-rybczynski-theorem-rt-with-diagram-economics/26965

https://www.economicsdiscussion.net/the-stopler-samuelson-theorem/the-stopler-samuelson-theorem-international-trade-economics/30821

https://www.princeton.edu/~dixitak/Teaching/EconomicsOfUncertainty/Slides&Notes/Slides11.pdf

Unit 13:Decision Making Under Uncertainty

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Objectives

After this chapter, you will be able to

- learn about the concept ofexpected utility,
- learn about the relation between expected utility and income.
- learn the applicability of expected utility.
- learn about the expected value of the different outcome,
- learn about the outcome of different lotteries,
- learn about expected value and variability,
- learn about the different types of persons regarding the accumulation of risk,
- learn how the relationship between the indifference curve and the risk aversion.
- learn about the profit variability of the different investment projects,
- learn how the projects are chosen based on profit variability.
- learn how adverse selection and moral hazards may impact the insurance market.

Introduction

In this chapter, we will be discussing some of the core issues of choices under uncertainty. Expected utility is the utility of an action or event over some time for an uncertain event.

The expected utility is the sum of the products of possible outcomes with the probability of occurrence of the events. Money lottery is a typical problem that can be solved by using the concept of the expected utility theorem. The expectedvalue is associated with an uncertain situation. The expected value is the weighted average of all the outcomes (payoffs) or values related to all the possible outcomes.The probabilities of each of the outcomes are used as their weights. Hence, the EV measures the value that we would expect on average.Variability is the extent to which the possible outcomes of an uncertain situation differ or deviated. There are different categories of

persons who exist in this world according to their attitude toward risks. These are risk-averse, risk-neutral, and risk lovers. Furthermore, we will be comparing the risk from certain and uncertain prospects. Finally, the insurance market equilibrium is found based on the demand for and supply of insurance which depends on several factors.

13.1 The Expected Utility Theorem

Expected utility is the utility of an action or event over some time for an uncertain event. The expected utility is the sum of the products of possible outcomes with the probability of occurrence of the events.

It is measured by considering the weighted average of the probable results under particular situations. While analyzing uncertain situations, objects may or may not pick the action with the highest value of expected utility, depending, however on their risk aversion.

If we have two different uncertain outcomes, viz, X1 and X2 with a probability of occurrence P1 and P2, the expected utility will be -

$$EU=P1X1+P2X2$$

Hence, this is clear that the expected utility at any particular point in time is the weighted average of all potential utility levels of an individual or entity who is expected to face any situation.

The expected utility may, similarly, be observed to be related to the concept of marginal utility. The expected utility of a benefit or wealth falls when a person becomes rich or has sufficient wealth. In such cases, a person may prefer the safer side as opposed to a riskier one.

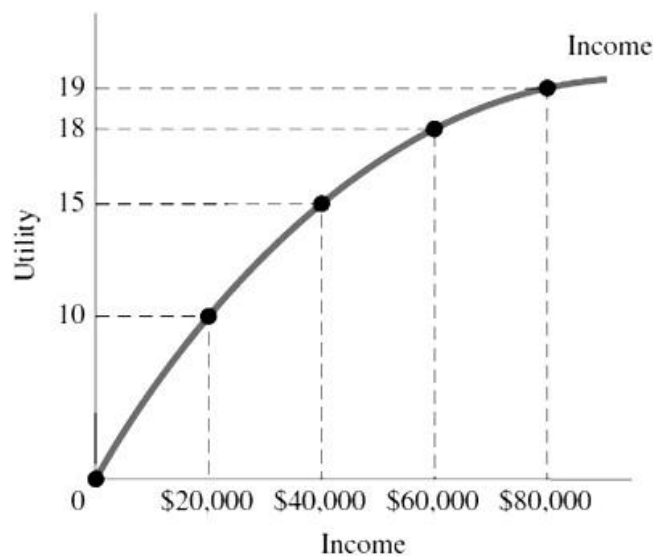To explain this, let us assume the total utility of a typical consumer, let X, as a function of his income.

Fig. 13.1: Expected utility function.

In the figure, the income level is measured on the horizontal axis and the utility of the individual is measured on the vertical axis. The shape of the utility curve tells us that consumer X has diminishing marginal utility from income.

The utility is measured here in utils. For the first $20,000 of his income, he gets utility 10 utils. But as income increases to $40,000, $60,000 and $80,000, his utility level increases to 15, 18 and 19. Utility increases with income but at a decreasing rate: the curve gets flattered as the income level of the consumer increases. This notion is quite similar to the law of diminishing marginal utility.

Now, let us take a different view. The expected utility of an uncertain income, which will be either $10,000 with a probability of 0.5 or $30,000 with a probability of 0.5, is less than the utility associated with a certain income of $20,000. Most people in the world do not like to face the

situation of uncertainty. Hence, they prefer less income with certainty rather than more income with uncertainty. The case is explained in figure 13. 2.
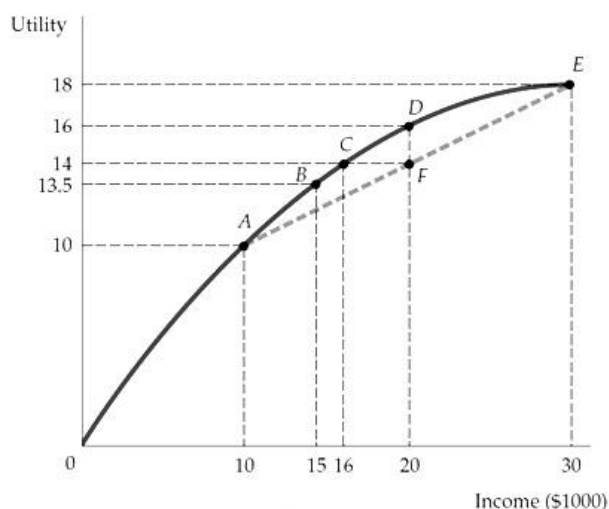

Fig. 13.2: Expected utility function.

Numerically,

E(u) = .5u($10,000) + .5u($30,000)

= .5(10) + .5(18)

= 14 < u($20,000) = 16

This means most of the people in this world are risk-averse.

However, for risk lovers, it's higher and for risk-neutral it's equal.

Applications of Expected Utility:

Public and Economics Policy: The expected utility theory explains that the social orderliness and arrangement that optimizes the total welfare across society, is the most socially right order or arrangement.The expected utility concept is also used to guide health policies relating to the requirement, usability, and applicability of medical staff and healthcare workers. Thesale and purchase of insurance policies also,usethe expected utility theory to calculate risks.

Ethics: The outcome of any action determines whether or not the right action is taken. In such cases, the act having the highest expected return or moral value should be considered the right act.Thus, the expected utility theory may help make decisions where the outcomes of the actions become uncertain.

13.2 Money Lotteries

Money lottery is a typical problem that can be solved by using the concept of the expected utility theorem.

To explain this example, let us consider a lottery ticket that pays the out player worth $10 with a given probability of 0.5 and worth $0 otherwise or a lottery ticket that pays the out player worth $3 with a given probability of 1. (With certainty)

Also, there is a lottery ticket that pays out the player worth $100,000,000 with a given probability of 0.5 and worth $0 otherwise, or a lottery ticket that pays out the player worth $30,000,000 with a probability of 1. (With certainty)

Usually, in such cases, people do not simply go by expected value.

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The expectation of an outcome is assumed to be given, say X, more dispersion, in that case, indicates that the outcome is "riskier" — it eventually has both the upside and downside possibility (gain or loss).

Now let us consider four gambles:

1. $0.50 for sure. V (L1) = 0.

2. If there exist heads, you receive $1.00, tails you receive 0. So,

$$V (L2) = 1 \times [0.5 \times (1 − .5) + 0.50 \times (0 − .5)] = 0.25$$

3. There are four independent tosses of a coin, you receive $0.25 on each occurrence of head. So,

$$V (L3) = 4 \times 1/2 (0.25 − 0.125) + 1/2 \times (0 − 0.125)) = 0.0625$$

4. There are a hundred independent flips of a coin, you receive $0.01 on each occurrence of head. So,

$$V (L4) = 100 \times 1/2 (0.01 − 0.005) + 1 (0 − 0.005) = 0.0025$$

All these four "lotteries" mentioned above have the same expected value (i.e., 50 cents), but they do have different levels of risk in each of the lotteries.

Considering these situations, we can observe that an agent is risk-neutral if he cares to consider only the expected value of the lottery tickets.

An agent is risk-averse or risks averter if he always prefers to consider the expected value of the lottery ticket to the lottery tickets (Most people in this world are risk-averse).

An agent is risk-loving if he always cares to prefer the lottery ticket to the expected value of the lottery tickets.

Generally, at some point, having an extra dollar does not make sense in making people much happier when there arise the conditions of risk. (i.e., decreasing marginal utility function). This can be drawn with the help of the decreasing expected utility function in the diagram below-
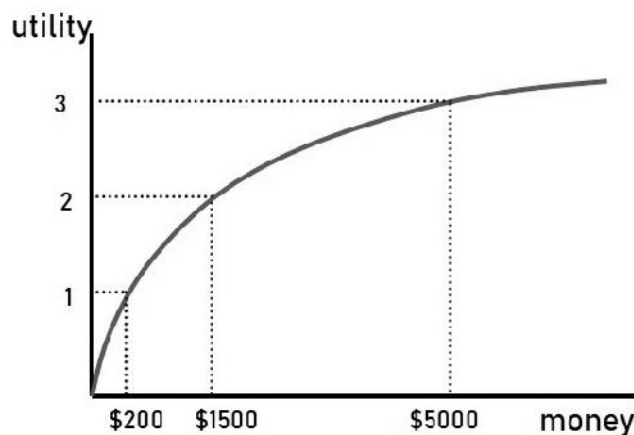

Fig. 13.3: Common expected utility function.

Now, analyzing the above scenarios, we get,

Lottery 1: The player can get $1500 with probability 1, here the expected utility 2 (certain prospect).

Lottery 2: The player can get $5000 with probability .4, $200 otherwise, here the expected utility ,

$$EU = 0.4*3 + 0.6*1 = 1.8$$

$$= 0.4*\$5000 + 0.6*\$200 = \$2120 > \$1500$$

Summarising the results from the above discussions, we get,

The decreasing marginal utility → risk-averse

The constant marginal utility → risk-neutral

The increasing marginal utility → risk-seeking
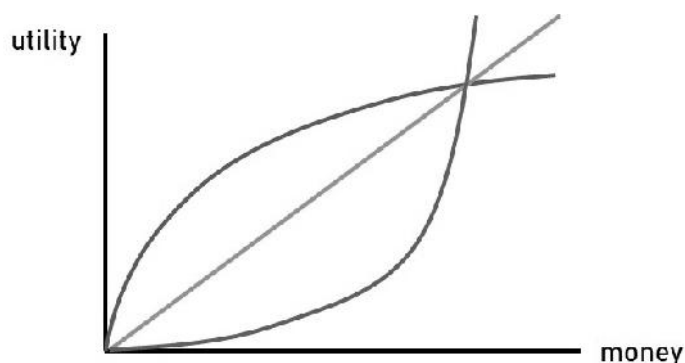
This is drawn below-

Fig. 13.4: Expected utility functions of different categories of individuals

Now let us map the comparison of two different lottery tickets. For lottery tickets, say, L and L1, let pL + (1-p) L1 are the two "compound" lottery tickets where the ticket L, is assigned with probability p, and the lottery ticket L1 is assigned with probability 1-p. Here, we get-
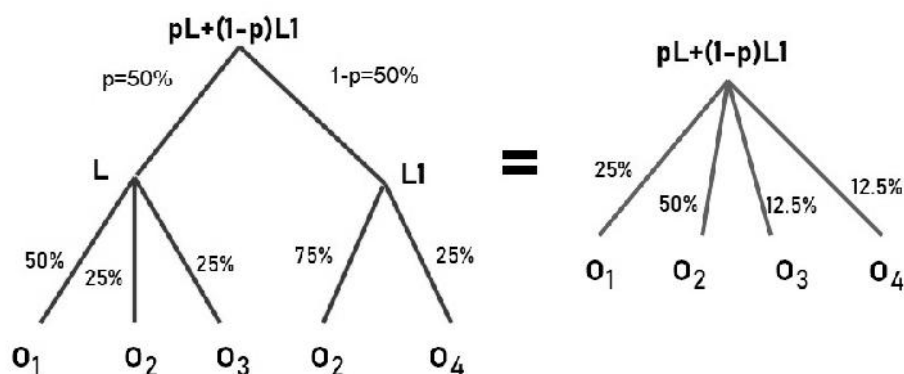

Fig. 13.5: Compound effect of two lottery tickets.

13.3 Measure of Risk Aversion

Before measuring the risk aversion, let us first know the basic concept of probability.

Probability means the likelihood or the chances of happening or possibility of occurrence of a given outcome. For example, the possibility of an oil exploration project being successful might have a chance of 25% (=0.25 or 1/4) and the probability that the project will be unsuccessful might be 75% (=0.25 or 3/4).

The type of probability may be divided into two different categories i.e., objective probability and subjective probability.

Objective Probability: In some cases, the interpretation of probability depends on the frequency with which a particular event tends to occur.Suppose,out of the last 100offshore oil searches, only 40 have been successful and the rest 60 are unsuccessful.Here, the probability of success of 2/5 (failure=3/5)) is said to be objective as it is dependent directly on the frequency of happening or non-happening of similar other experiences.

Subjective probability: It relates to the perception of an occurrence of an outcome. It is based on a personal judgment or experience, but not on the frequency of happening or non-happening of similar other experiences in the past.

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In such cases, different people may attach different probabilities to different outcomes and therebymake different choices.There are two important measures of calculation of such probability that help us describe and compare risky choices.

One of the measures tells us the expected value and the other, in turn, tells the variability of the possible outcomes.

Expected Value: It is associated with an uncertain situation. The expected value is the weighted average of all the outcomes (payoffs) or values related to all the possible outcomes.The probabilities of each of the outcomes are used as their weights. Hence, the EV measures the value that we would expect on average.

Relating to the earlier example of 100 offshore oil explorations, the probability of success = 2/5, failure= 3/5.

Suppose, every successful oil search yields a payoff worth $40 per share, an unsuccessful search generates a payoff worth $20 per share. Here, the Expected value is defined as,

Pr(success)($40/share) + Pr(failure)($20/share)

= (2/5) ($40/share) + (3/5)($20/share) = $28/share

Suppose,there are two possible outcomes with payoffs X1 and X2 and if the probabilities of each outcome are given as P1 and P2, then the expected value is

E(X) = P1X1 + P2X2

When there are n possible outcomes, the expected value is defined as,

E(X) = P1X1 + P2X2 + ……………+ PnXn

Variability: Variability is the extent to which the possible outcomes of an uncertain situation differ or deviated.For example, let us consider the Crypto-currency market,we consider two types of cryptocurrencies; A and B.Probability distribution, as well as an expected profit of two currencies,are given in the table below-

Table A: Expected earnings from Crypto A

Crypto – conditions	Probability of occurrence	Outcome of investment	Expected Value	
Rising Price	0.25	$ 600	$150	
Stable Price	0.50	$500	$250	$500
Falling Price	0.25	$400	$100	

Table B: Expected earnings from CryptoB

Crypto – conditions	Probability of occurrence	Outcome of investment	Expected Value	
Rising Price	0.25	$ 800	$200	
Stable Price	0.50	$500	$250	$500
Falling Price	0.25	$200	$50	

The tables above describe the variability of two different types of cryptocurrencies. In crypto A, there are three different prospects - rising price, stable price, and falling price with the probability of occurrence of 0.25, 0.50, and 0.25 respectively and the outcome of an investment is $600, $500, and $400 with their expected values $150, $250 and $100 and thus the total expected value equals to $500. This is shown in figure 13.6 corresponding to table A above.
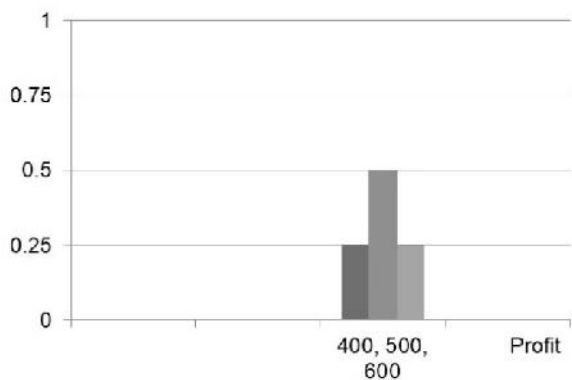
Fig: 13.6: Expected earnings from Crypto A

Similarly, in crypto B, there are three different prospects - rising price, stable price, and falling price with the probability of occurrence of 0.25, 0.50, and 0.25 respectively and the outcome of an investment is $800, $500, and $200 with their expected values $200, $250 and $100 and thus the total expected value equals to $500. This is shown in figure 13.6 corresponding to table B above. The variance of income here is minimum as shown in fig. 13.6.
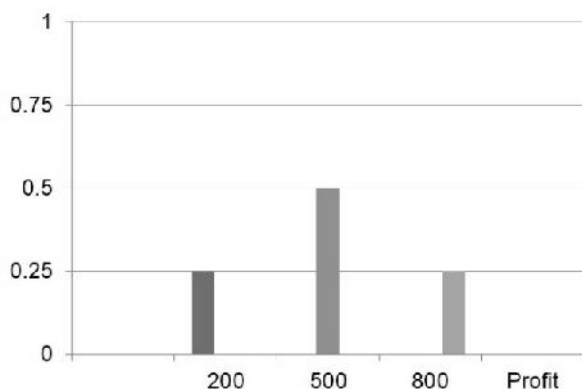
Fig: 13.7: Expected earnings from CryptoB

Although the expected earnings from the different prospects in Crypto A and B from different levels of income are shown to be equal there are variations between both types of crypto. To examine this, let us consider tables C and D. The variance of income here is high as shown in fig. 13.7.

Table C: Expected earnings from Crypto A

Deviation from EV	Deviation Squared	Probability	DS * Prob.	
$600–$500=$100	$10,000	.25	$2500	
500–500 = 0	0	.50	0	$5000
400–500=-100	10,000	.25	$2500	SD=$70.71

Table C: Expected earnings from Crypto B

Deviation from EV	Deviation Squared	Probability	DS * Prob.
$800-$500=$300	$90,000	.25	$22, 500
500-500 = 0	0	.50	0
200-500=-300	90,000	.25	$22, 500

$45000

SD=$212.13

Table C above describes the deviations from the expected values from the three different prospects $100, 0, and $100. When the deviations are squared it becomes $10,000, 0 and $10000 with respective probabilities 0.25, 0.50 and 0.25. Thus, the deviation squared multiplied by the respective probabilities becomes $2500, 0, and $ 2500 and the total is $5000 with a standard deviation of $ 70.71.

Similarly, table D above describes the deviations from the expected values from the three different prospects $300, 0, and $300. When the deviations are squared it becomes $90,000, 0, and $90000 with respective probabilities of 0.25, 0.50, and 0.25. Thus, the deviation squared multiplied by the respective probabilities becomes $22500, 0, and $ 22500 and the total is $45000 with a standard deviation of $212.13.

Thus, tables A and B are showing the extent of the expected values from different uncertain prospects while tables C and D show the variability of different uncertain prospects. This is how the concept of expected value and variability can be best explained.

13.4 Comparing Risk Aversion

There are different categories of persons who exist in this world according to their attitude toward risks. They are category wise described below-

Risk-averse: This is the condition of preferring a certain income to an uncertain income (i.e., a risky income) with the same expected value based on probability.

Before comparing risk aversion let us knowthe types of people relating to measuring risk.

A risk-averse individual prefers a certain given income to an uncertain income (risky income) with the same expected value.This type of person has a diminishing marginal utility of income.Risk aversion is the most common Phenomenon.

Risk averter's utility function is based on diminishing marginal utility of income is given below in fig. 13.8 where the function is increasing at a diminishing rate.
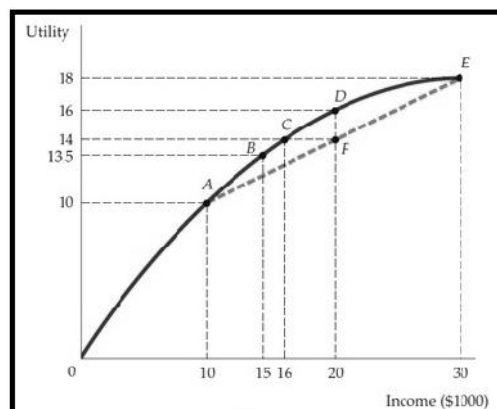

Fig: 13.8: Expected utility function of a risk averse person

The expected utility of an uncertain income, which may be either worth $10,000 with probability 0.5 or worth $30,000 with probability 0.5, is less than the utility assigned to a certain income of worth $20,000. Numerically,

E(u) = .5u ($10,000) + .5u ($30,000)

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$$= .5(10) + .5(18)$$

$$= 14 < u\ (\$20,000) = 16$$

Risk neutral: -This is the condition of being indifferent between a certain prospect (i.e., income) and an uncertain prospect (i.e., income) with the same expected value based on probability.

The marginal utility of income is constant for a risk-neutral person.

In Figure 13.9, the utility assigned to a particular prospect of an income of either $10,000 or $30,000 with equal probability is 12, as is the utility of getting a certain income of $20,000.
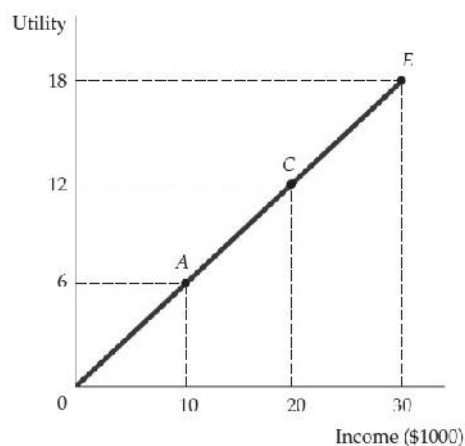
Fig: 13.9: Expected utility function of a risk-neutral person

So, E(u) = .5u ($10,000) + .5u ($30,000)

$$= .5(6) + .5(18) = 12$$

$$= u\ (\$20,000) = 8$$

i.e., The person is indifferent of taking risk.

Risk loving: This is the condition of preferring an uncertain income (a risky income) to a certain income with the same expected value based on probabilities. A risk lover always experiences an increasing marginal utility of income.Risk lover's utility function is based on increasing the marginal utility of income
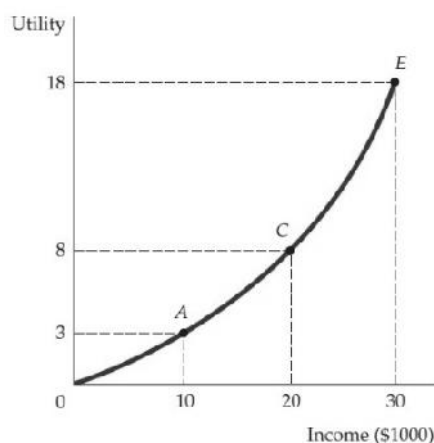
Fig: 13.10: Expected utility function of a risk-loving person

The expected utility of an uncertain income, which is either $10,000 with a probability of 0.5 or $30,000 with a probability of 0.5, is higher than that of the utility assigned to a certain income worth $20,000.

Numerically,

E(u) = .5u ($10,000) + .5u ($30,000)

$$= .5(3) + .5(18)$$

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= 10.5 > u ($20,000) = 8

Risk premium: The risk premium indicates the amount that covers the risk. It is the maximum amount of money that a risk-averse person is willing to pay to cover his risk to avoid risk. Generally, the scale of the risk premium relies on the uncertain income prospect or risky alternatives that the person faces.

The risk premium, CF, as indicated in the diagram, measures the amount of income that an individual would sacrifice to be indifferent between an uncertain (risky choice) and a certain one.
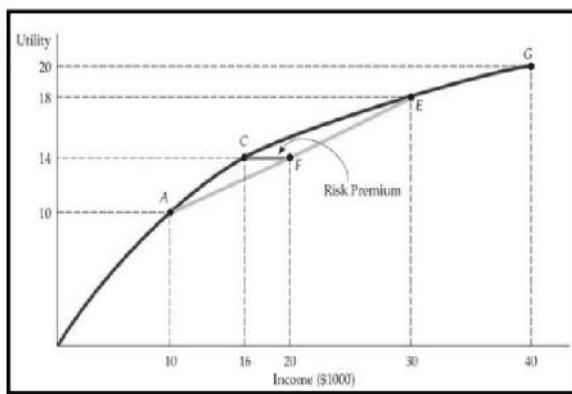
Fig: 13.11: Risk premium

Risk aversion and income: The extent of an individual's risk aversion is dependent on the nature of the risk and the person's income. Other things remaining the same, a risk-averse person prefers a smaller variability of outcomes. That means he always prefers a certain prospect of income to an uncertain prospect.

The linkage between risk aversion and Indifference curves is shown in the diagram below-:
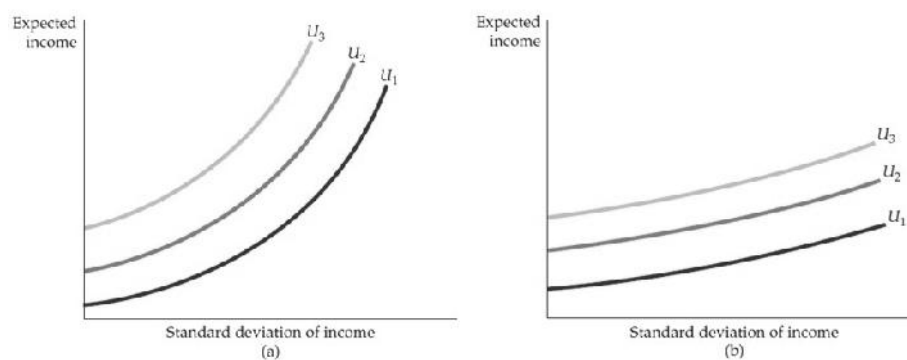
Fig: 13.12: Risk aversion and income

Part (a) in diagram 13.12 applies to a highly risk-averse person. An increase in the standard deviation of income of the individual requires a large increase in expected income if the person concerned is to be remaining equally well off.

Part (b)in the diagramapplies to a slightly risk-averse person. An increase in the standard deviation of income of the individual requires only a small increase in expected income if the person concerned is to be remaining equally well off.

13.5 Comparison of Risky Alternatives

To compare the two risky alternatives, let us consider two investment projects, i.e, investment in Crypto A and investment in crypto B as mentioned in tables A and B in the above example. with three different prospects-

Rising price - Probability value=0.25 ; Outcome = $600

Stable price - Probability value=0.50 ; Outcome = $500

Falling price-Probability value=0.25; Outcome = $400

Let us inspect the EV and SD and as defined we got these values as defined in table C and D.

In such a case the decision for considering the project will be to compare the standard deviation (degree variability) of the projects. (Consider tables A, B, C, and D)

> SD in Project A = 70.71
>
> SD in project B = 212.13
>
> SD in Project B > SD in Project A
>
> 212.13 > 70.71

Now, let us take another example of two jobs with the possibility of a different outcome. This is explained with the help of table E.

Table E: Two jobs with a different outcomes

	INCOMES FROM SALES JOBS—MODIFIED ($)					
	OUTCOME 1	DEVIATION SQUARED	OUTCOME 2	DEVIATION SQUARED	EXPECTED INCOME	STANDARD DEVIATION
Job 1	2100	250,000	1100	250,000	1600	500
Job 2	1510	100	510	980,100	1500	99.50

The two jobs can now be described as follows:

Job 1: Expected Income (EI) = $1600 and the standard deviation (SD) = $500

Job 2: Expected Income (EI) = $1500 and the standard deviation (SD) = $99.50

Thus, it is observed that job 1 offers a higher expected income but at the same time, it is much riskier than job 2.

In this case, it depends on the individual which job is to be preferred by him. If the entrepreneur is an aggressive one who doesn't mind taking risks, he might choose job 1, with the expected income being high and a higher standard deviation. But a more conservative personmight, with certainty, choose the second job.

However, the risk taken by a person depends on the type of person having a different attitude towards risk-Risk lover, risk averter, risk-neutral

A risk averter rejects a fair gamble, but a risk lover accepts while the risk-neutral is indifferent.

13.6 Insurance

It is the risk-averse person who always wishes to pay to avoid risk. If the cost of insurance and the expected loss are equal, a risk-averse person buys insurance to cover his risk from any financial losses he might face. Buying insurance assures a person of having the same income whether or not

there is a loss.Because the insurance cost and the expected loss are equal, so, certain income is equal to the expected income from an uncertain situation.

For a risk-averse person, the assurance of a similar income irrespective of the result creates more utility than the situation the person had a high income if there is no loss and a low income ifthe loss occurred.

Let's consider, that a homeowner faces a 10-per cent likelihood that he will face an uncertain prospectof his house being burglarized and he will suffer a loss of $10,000.

Let's also assume that he has $50,000 worth of his property.

We can show this in two situations—with insurance having the costworth $1000 and without insurance.

Table F: Prospects of insurance

INSURANCE	THE DECISION TO INSURE ($)			
	BURGLARY (PR = .1)	NO BURGLARY (PR = .9)	EXPECTED WEALTH	STANDARD DEVIATION
No	40,000	50,000	49,000	3000
Yes	49,000	49,000	49,000	0

The expected income is the same ($49,000) in both situations. The variability, however, is quite different; when there is no insurance, the standard deviation of wealth is $3000; but with insurance, it is 0.

If there is no burglary, the man who does not insure can gain $1000 relative to the man who is insured. But with burglary, the uninsured one loses worth $9000 as compared to the insured homeowner. In such a case, a risk-averse homeowner will enjoy higher utility by getting his house insurance.

The demand for insurance: The demand for insurance is the solution to the problem which maximizes a utility function subject to a given budget constraint.

This utility function here is carried from the theory of choice under uncertainty which is also known as theexpected utility theory.

Besides this, some important elements play an important role in the theory of demand for insurance. Let us highlight these.

An asset is something that provides the flow of money to its owner. Hence, a capital gain is an increase in the value of an asset and a capital loss is a decrease in the value of an asset.

An asset may be risky or riskless. A risky asset provides an uncertain flow of money to its owner. A riskless (or risk-free) asset provides a flow of money that is known with certainty.

Similarly, the return on an asset means the total money flow it generates—comprising of capital gains or losses which is a fraction of its price. Real return is the simple (or nominal) return on an asset, deducting the rate of inflation.Expected return, on the other hand, is the return that an asset should earn on average. Similarly, an actual return is a return that an asset earns.

Supply of insurance: The insurance companies supply insurance. It depends on the technology of insurance. The technology of insurance depends on bodily producing insurance such as stock of existing contracts,estimating loss probabilities, processing claims, administering the overall business, and calculating premiums. All these again depend on transactions costs.

The supply of insurance also depends on the pooling and spreading of risk.Risk pooling is the sharing of risks consistently among a large group of people such that the unpredictable risks become predictable. In this situation,the insurance companies evenly spread out financial risk among their contributors.

Risk spreading means the spreading of the risk among multiple sub insurers. Thus, the selling of insurance to multiple policyholdersin multiple areas minimizes the risk that all policyholders will face losses simultaneously.

A deductible is an amount paid for medical services before coinsurance kicks in.Coinsurance is the percentage of costs paidthe deductible. Out-of-pocket expenses mean the medical expenses paid by someone.

Adverse selection is the situation when one partyhas more information and that causes the other party to go for the wrong selection, or vice versa, about some product quality. For example, a seller may also have better information than a buyer about any products putting the buyer at a disadvantage in the transaction. viz, in the market for used cars.

A moral hazard is a situation when one party covered by risk will behave otherwise than if they didn't have that shield.In the insurance market, a moral hazard arises when insured parties face more risks and know insurers will protect them against losses.

Given these demand and supply conditions, the price of insurance is determined similar to an ordinary commodity where the demand theorem is used. After reaching the equilibrium conditions the demand, supply, and price are determined.

Summary

Expected utility is the utility of an action or event over some time for an uncertain event.The expected utility is the sum of the products of possible outcomes with the probability of occurrence of the events.

It is measured by considering the weighted average of the probable results under particular situations. While analyzing uncertain situations, objects may or may not pick the action with the highest value of expected utility, depending, however on their risk aversion.

If we have two different uncertain outcomes, viz, X1 and X2 with a probability of occurrence P1 and P2, the expected utility will be -

$$EU = P1X1 + P2X2$$

Hence, this is clear that the expected utilityat anyparticular pointin time is the weighted average of all potential utility levels of an individual or entity who is expected to faceany situation.

The application of the expected utility theorem is as follows-

The expected utility theory explains that the social orderliness and arrangement that optimizes the total welfare across society, is the most socially right order or arrangement.The expected utility concept is also used to guide health policies relating to the requirement, usability, and applicability of medical staff and healthcare workers. Thesale and purchase of insurance policies also,usethe expected utility theory to calculate risks.

The outcome of any action determines whether or not the right action is taken. In such cases, the act having the highest expected return or moral value should be considered the right act.Thus, the expected utility theory may help make decisions where the outcomes of the actions become uncertain.

Money lottery is a typical problem that can be solved by using the concept of the expected utility theorem.

To explain this example, let us consider a lottery ticket that pays the out player worth $10 with a given probability of 0.5 and worth $0 otherwise or a lottery ticket that pays the out player worth $3 with a given probability of 1. (With certainty)

Also, there is a lottery ticket that pays out the player worth $100,000,000 with a given probability of 0.5 and worth $0 otherwise, or a lottery ticket that pays out the player worth $30,000,000 with a probability of 1. (With certainty)

Usually, in such cases, people do not simply go by expected value.

The expectation of an outcome is assumed to be given, say X, more dispersion, in that case, indicates that the outcome is "riskier"—it eventually has both the upside and downside possibility (gain or loss).

Expected Value: It is associated with an uncertain situation. The expected value is the weighted average of all the outcomes (payoffs) or values related to all the possible outcomes.The probabilities

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of each of the outcomes are used as their weights. Hence, the EV measures the value that we would expect on average.

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Pr(success)($40/share) + Pr(failure)($20/share)

= (2/5) ($40/share) + (3/5)($20/share) = $28/share

Suppose,there are two possible outcomes with payoffs X1 and X2 and if the probabilities of each outcome are given as P1 and P2, then the expected value is

E(X) = P1X1 + P2X2

When there are n possible outcomes, the expected value is defined as,

E(X) = P1X1 + P2X2 + ………………+ PnXn

Variability: Variability is the extent to which the possible outcomes of an uncertain situation differ or deviated.

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Risk loving: This is the condition of preferring an uncertain income (a risky income) to a certain income with the same expected value based on probabilities. A risk lover always experiences an increasing marginal utility of income.Risk lover's utility function is based on increasing the marginal utility of income

Risk premium: The risk premium indicates the amount that covers the risk. It is the maximum amount of money that a risk-averse person is willing to pay to cover his risk to avoid risk. Generally, the scale of the risk premium relies on the uncertain income prospect or risky alternatives that the person faces.

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SD in Project A = 70.71

SD in project B = 212.13

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SD in Project B > SD in Project A

212.13 > 70.71

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Keywords

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Risk loving: This is the condition of preferring an uncertain income (a risky income) to a certain income with the same expected value based on probabilities.

Risk Premium: It is the maximum amount of money that a risk-averse person is willing to pay to cover his risk to avoid risk.

Self Assessment

1. For two different uncertain outcomes X1 and X2 with a probability of occurrence P1 and P2, the expected utility will be -

A. EU=P1X1+P2X2

B. EU=P1X1 / P2X2

C. EU=P1X1-P2X2

D. All the above

2. Expected utility is also related to the concept of

A. Total utility

B. Marginal utility

C. Total revenue

D. Marginal revenue

3. The concept of expected utility is useful in

A. Health policies

B. Socially right arrangement

C. Insurance

D. All the above

4. In a money lottery an agent is risk-neutral if he only cares about

A. The expected value of the lottery ticket

B. The expected value of the lottery ticket to the lottery ticket

C. The lottery ticket to the expected value of the lottery ticket.

D. All the above

5. In a money lottery an agent is risk-averse if he only cares about

A. The expected value of the lottery ticket

B. The expected value of the lottery ticket to the lottery ticket

C. The lottery ticket to the expected value of the lottery ticket.

D. All the above

6. In a money lottery an agent is risk-lover if he only cares about

A. The expected value of the lottery ticket

B. The expected value of the lottery ticket to the lottery ticket

C. The lottery ticket to the expected value of the lottery ticket.

D. None of the above

7. In comparing the comparing risky choice which of the following is the important measure?

A. The expected value

B. Variability

C. Both of these

D. None of these

8. When the interpretation of probability relies on the frequency with which certain events tend to occur, it is the type of

A. Subjective Probability

B. Objective Probability

C. Random Probability

D. Fixed Probability

9. When the interpretation of probability relies on the personal judgments or experience with which certain events tend to occur, it is the type of

A. Objective Probability

B. Random Probability

C. Subjective Probability

D. Fixed Probability

10. In An individual who is risk-averse

A. prefers a certain given income to a risky income with the same expected value.

B. avoids a certain given income to a risky income with the same expected value.

C. is neutral of a certain given income to a risky income with the same expected value.

D. none of the above

11. The marginal utility of income for a risk-neutral person is

A. increasing

B. decreasing

C. constant

D. all of the above

12. A risk lover always experiences

A. a decreasing marginal utility of income

B. a constant marginal utility of income

C. an increasing marginal utility of income

D. None of these

13. Higher is the variability of expected income from a project as compared to other means

A. Lower is the risk

B. Higher is the risk

C. No changes in the risk

D. None of the above

14. A risk averter will always …………….. a fair gamble

A. accepts

B. rejects

C. be indifferent

D. neutral

15. A lower expected income is associated to

A. lower risk

B. higher risk

C. no risk

D. all the above

Answers for Self Assessment

1.	A	2.	B	3.	D	4.	A	5.	B
6.	C	7.	C	8.	B	9.	C	10.	A
11.	C	12.	C	13.	B	14.	B	15.	A

Review Questions

1. What is expected utility?
2. What is the expected value?
3. What is variability?
4. Define the concept of risk-averse, risk-neutral, and risk-loving.
5. What is a money lottery?
6. What are the factors of demand for insurance?
7. What are the factors supply of insurance?
8. How can you compare different risk alternatives?
9. Define and compare the functions of risk-averse and risk lovers.
10. Determine how the equilibrium in the insurance market is determined.

Further Readings

1. Microeconomics - A Koutsoyiannis, Macmillan Press, London, 1979

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Web Links

http://www.columbia.edu/~md3405/Choice_MA_Risk_1_17.pdf

https://corporatefinanceinstitute.com/resources/knowledge/other/adverse-selection/

https://en.wikipedia.org/wiki/Moral_hazard

https://en.wikipedia.org/wiki/Lottery_(probability)

Unit 14:Market Structure

Objectives

After this chapter, you will be able to

- learn about the concept and determinants of market,
- learn the structure of market.
- learn about sellers' and buyers 'concentration in market,
- learn about the concept,elements and typesproducts differentiation,
- learn about the different entry conditions and barriers of firms,
- learn about the factors determining the barriers to entry.
- learn about concepts and types of economies of scale,
- learn about the different sources of economies of scale.
- learn about the market structure,
- learn about the concept of innovation,
- learn how innovation is relating to different forms of markets.

Introduction

In common parlance, a market refers to a particular place where goods are purchased and sold. But in economics, the term "market" does not mean merely a particular place but an actual or virtual area where sellers and buyers communicate to carry out successful transactions and trade activities. In this, we cannot particularly name a particular place to define the market. Instead, we may define the commodities to define a market. In this chapter, we will discuss the meaning and the determinant of the market.

Market concentration is an important measure to find out the share of the market by the number of firms present in the market. It is a situation where a small number of firms can have a larger control of the market. It measures the magnitude of domination in sales by one or a few firms in a

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particular market. The market concentration ratio is determined with the help of the measure of the concentration ratio. In this chapter, we will learn something about market concentration.

Similarly, product differentiation is a process generally opted by theproducers or the business to make a product distinct from other similar productsthat exist in the market.This is done to promote businesses and develop an advantage in the competition. The differentiators of products can include improved quality of the products as well as someadded features and advantages.In this chapter, we will learn something about product differentiation.

The conditions reflect the conditions that a firm makes its entry into the industry. It depends on the easiness or flexibility of the process with which it can enter. The conditions of entry determine the number of firms in the market and the degree of seller concentration. Hence, the entry conditions will also be discussed in this chapter.

Economies of scale mean the advantages to a firm or a business setup that can sometimes exist as a result of increasing the plant size or the size of the business. It occurs when increasing the output of a firm leads to lowerlong-run average costs. It means that as firms increase their plant size, they turn out to be more efficient.In this chapter, we will learn something about market concentration. Economies of scale are also highlighted here.

Market structures imply the various market forms and features determining thelinkagesamongthe sellers exists, sellers to buyers in the market, and so on.Market structures mainly include perfect competition,monopoly market, monopolistic competition, and oligopoly market. These various types of markets have been already explained in the former chapters. Now let us remember very briefly the major determinants of the market structure. Finally, in this chapter, we will consider the point of market structure and innovation.

14.1 Meaning and Determinants of Market

In common parlance, market refers to a particular place where goods are purchased and sold. But in economics, the term "market" does not mean merely a particular place but an actual or virtual area where sellers and buyers communicate to carry out successful transactions and trade activities. In this we cannot particularly name a particular place to define the market. Instead, we may define the commodities to define a market. For example, such markets as the Delhi market, and Chandigarh market are in vogue in economics. But the rice market, potato market, the wheat market makes sense in economics.

Determinants of the market:

There are several determinants of markets-

Number of Sellers: The number of selling firms determines the level of competition in the market. Sellers decide the supply of a product. The seller defines the nature of the market depending on the number of sellers present in the market and the levels of competition. Sellers play a dual role in the market. In the product market, sellers being suppliers of the products make available all the products. They have a very strong role in determining the market form.

Number of Buyers: Buyers decide the demand for a particular product. Like sellers, buyers also play an important role in determining the nature of the market. The price of a product is determined by the demand for the product. Demand in the market is generated by the sellers. The number of buyers present in the market also determines the magnitude of competition and accordingly the market form is decided.

Economies of Scale: The size of the firm or the level of production which is also known to be the scale of production contributes to a market structure. Economies of scale reduce cost and optimize production. Because of these extra benefits received (maybe external as well as internal) by the small firms enhances the level of competition there changing the nature of the market. There are different forms of economies of scale. External economies of scale and internal economies of scale. Both these are equally determinant of the level of competition and the nature of the market.

Nature of Product: The products offered by different sellers whether homogenous or heterogenous also determine the market forms. If the products are homogeneous, it lies in a perfect competition market but if it is unique and has no other substitute, it creates a monopoly form in the market.

Entry Barriers: The profitability of a product attracts new sellers to make their entry into the markets. The market runs on the rule that might is right and survival of the fittest.The existing sellers try to put restrictions on theprobable entrants by pursuing some aggressive pricing practices.

There are some entry restrictionsin some public utility services which run on monopoly by the government like post offices, railways, water supply, etc.

The mobility of Goods: Easy transportation of goods from the place of production to the market ensures uniform prices by different sellers. This determines the presence or absence of transportation cost and accordingly, it determines the nature of the market. For example, a competitive market has no transportation costs.

Government Intervention: Some markets are indirectly controlled by the government. The government either imposes heavy taxes or makes the business license mandatory to restrict the entry of firms. Because of government intervention, there may be the growth of monopoly and the in some cases competition may even be promoted by breaking the entry barrier.

Forms of Market Structure:

On the basis of competition, the market is classified as:

- Perfect Competition
- Monopoly
- Duopoly
- Oligopoly
- Monopolistic Competition

Perfect competition: There exists perfect competition when all the sellers sell identical or homogenous products, market share of the sellers do not influence the existing price, the new and the potential sellers are able to make their entry or exit with no barrier, both buyers and sellers have perfect or full information of the market condition.

Monopoly: When one firm produces for the entire market in which case the firm is referred to as a monopoly. Here the single firms control the entire market of large numbers of buyers thereby enjoying the power to exclusively determine the price of the commodity. Supernormal profit at the loss of consumer surplus is a common phenomenon in this type of market. Monopoly may be seen in both the private and public sectors. Discretion of owning the raw material by fewer firms, geographical barriers, limited technical know-how adopted by some specific firms, legal restrictions, and differences in elasticities are some of the reasons for the growth of monopolies.

Duopoly: A duopoly consists of two firms operating in a market. The market here is owned by two competing firms for a particular product or service they provide. Here, the consequence may be either agreement between or competition between the firms, and according to the prospect will be emerging either an equal share of the market or a leader-follower relationship.

Oligopoly: An oligopoly represents a situation when there exist more than two firms in a market but less than the many firms assumed in a perfectly competitive market. Here, there may be a collusive or non-collusive form of oligopoly. If there is a formal or informal agreement between or among the firms present in the market, this is said collusive form of oligopoly. A non-collusive oligopolist is always found to have faced competition from his counterpart.

Monopolistic competition: Monopolistic competition is a market form similar to perfect competition in which many firms offer a homogenous but differentiated product where there is advertisement expenditure. Besides, the firms under monopolistic competition work in groups, unlike the perfect competition. Barriers to entry and exit in a monopolistic market are low, and the decisions of any single firm do not directly affect its competitors.

In factor marketsalso, we get the different forms of markets such as monopsony or bilateral monopoly, etc.

Monopsony: Monopsony is a market condition in which there is only one buyer, the monopsonist. It emerges when the rights or willingness of purchasing a particular product is owned by a specific buyer. This is just the opposite of a monopoly existing in the product market.

Bilateral monopoly: Bilateral monopoly is a market with one firm/individual, a monopolist, on the supply side, and one firm/individual, a monopsonist, on the demand side. This means there is a

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direct one-to-one dealing of a good between the single buyer and the single seller. The prospect in the market here depends on the strength of bargaining power.

14.2 Sellers' and Buyers' Concentration

Market concentration is an important measure to find out the share of the market by the number of firms present in the market. It is a situation when a small number of firms are able to have a larger control of the market. It measures the magnitude of domination in sales by one or a few firms in a particular market. The market concentration ratio is determined with the help of the measure of the concentration ratio.

In regard to sellers exercising market power, either the existing market will have few sellers or there should be few firms that own a large portion of the market sales. When this happens, the market is said to have a high seller concentration.

Buyers' concentration, on the other hand, is the degree to which a small number of customers buy most of the products of a particular firm. Buyer concentration decreases the profitability primarilyin a perfectly competitive industry.

For measuring the market concentration, there are two numerical measures: a. concentration ratios and b. the Herfindahl-Hirschmann Index (HHI).

Concentration ratios: - The market concentration ratio gives the measurement of the combined market share of all the top-rated firms in the industry.For example, if we have the concentration ratio CR5, then it is the sum of the market shares of top five (largest five) firms in a market and similarly the CR10 is the sum of the top ten (largest ten) firms in terms of volume.

Suppose in a market, there are ten sellers with market shares in accordance with the order 15%, 13%, 12%, 11%, 10%, 8%, 7%, 5%, 3%, and 2%. The CR5 ratio for this market in that case would be 61 (15 + 13 + 12 + 11+ 10), and similarly, the CR10 ratio would be 86 (15 + 13 + 12 + 11+ 10 + 8 + 7 + 5 +3 +2).

Demerits of CR: In this case, the number of firms in the ratio is set arbitrarily. There is no correct justification that a concentration ratio implies the concentration potential in a better way.

Secondly, the ratio also does not meanwhether there are one or two large firms that dominate all other existing firms in the market.

Herfindahl-Hirschmann Index (HHI): This index is measured by applying the square root of the percentage of the market share of each individual firm in the industry.

For example, in a market where there are only five firms with shares of 30%, 30%, 20%, 20%, and 20%, the Herfindahl Index would be 3000 (900 + 900+ 400+ 400+400). Here, the index may increase as high as 10,000 in case the market is a monopoly. But the lower the index is, the more competitive the market becomes. The indicator could become zero for a perfectlycompetitive market.

14.3 Product Differentiation

Product differentiation is a process used by businesses to distinguish a product or service from other similar ones available in the market.

This tactic aims to help businesses develop a competitive advantage

Product differentiators can include better quality and service as well as unique features and benefits.

Did you Know?

The barrier to entry has dropped significantly in recent years.

Hence, industries have seen substantial increases in competitive products.

In such situations, differentiation is a critical prerequisite for a product's survival.

Factors of Product Differentiation:-

Quality: Product's quality, reliability, and ruggedness compare to others on the market.

Design

Service and interactions:

Features and functionalities

Customization:

Pricing:

Elements of product differentiation:-

The elements of differentiation include-

 Product design,

Marketing,

Packaging and

Pricing.

Differentiation marketing can also involve focusing on a niche market.

 For example, a small company might find it challenging to compete with a much larger competitor in the same industry. As a result, the smaller company might highlight exceptional service or a money-back guarantee.

Types of Product Differentiation:

Vertical differentiation : Vertical differentiation is when customers choose a product by ranking their options from best to the worst using an objective measurement, like price or quality.

For example, 1 meal at a restaurant may be lower in calories than another meal. To a customer who is watching their weight, the lower-calorie meal represents a "better" option. Another customer might place a higher value on price and choose the higher-calorie meal if it costs less.

Horizontal differentiation: Horizontal differentiation is when customers choose between products subjectively, because they have no objective measurement to distinguish between best or worst.

Example, there is no qualitative measurement to rank ice cream flavors. Whether one chooses chocolate, vanilla, or strawberry is entirely a matter of personal taste.

Mixed differentiation: Customers making more complex purchases tend to use a mix of vertical and horizontal differentiation when making purchase decisions.

Example-shopping for a car one uses mixed differentiation to make a decision. Objective measurements to vertically differentiate between them include gas mileage and safety ranking. Horizontal differentiation, between subjective preferences like design aesthetic and impression of the car brand, also plays a role in the decision.

Benefit:

- Consumers benefit-Variety, preference & social welfare.

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- Producers' benefit-Brand loyalty, higher price

14.4 Entry Conditions

Conditions of Entry: The entry of a new firm in an industry depends on the ease with which it can enter.

The conditions of entry determines the number of firms in the market and the degree of seller concentration.

In case of free entry, the number of sellers is large in number .

In case of restricted entry, the number of sellers tend to reduce.

In the long run the degree of competition depends on the condition of entry.

Advantages of Entry:

- Provides new goods and services,
- Changes the balance between different sectors,
- Comes with new technological and managerial techniques,
- Increases opportunities.

Factors Determining Entry Conditions:

Legal barriers - Patent law, regulation passed by govt.

Initial capital cost – Initial capital requirement is high, the market is dominated by a few firms.

Vertical integration– Here, the existing producer produces raw material along with the final product.

Factors Determining Entry Conditions:

New entrants will find that their capital requirements are high and hence it will not be easy for them to enter the market.

Optimum scale of production – Long run average cost of production is minimum for a firm.

Product differentiation– High degree of differentiation restricts the new entrants.

Entry barriers- A barrier to entry exists when new firms cannot enter a market. Types-

Natural barriers: It happens when the long run average cost curve of a firm decreases due to economies of scale over a large range of output.

It causes the existence of natural monopoly.

Examples-Power generation, Aircraft manufacturers, Railways, etc.

Reasons for natural barriers:

- Economies of large scale production
- Network effects
- Ownership or control of a key scarce resource.
- High set-up costs (sunk cost).
- High R&D costs

Legal barriers: legal restriction, example-patents.

Strategic barriers: To bar or restrict the entry of a new entrant, an established firm may change price lower than the short-run profit-maximizing price. This strategy is known as entry limit pricing.

Predatory pricing- A firm may deliberately lower price to try to force rivals out of the market.

Limit pricing - Limit pricing means the incumbent firm sets a low price, and a high output, so than entrants cannot make a profit at that price.

Advertising - Advertising is another sunk cost – the more that is spent by incumbent firms the greater the deterrent to new entrants.

A strong brand - This creates loyalty, 'locks in' existing customers and deters entry.

Exclusive contracts, patents and licenses

Vertical integration – Entry is difficult when a manufacturer having its own retail outlets.

14.5 Economies of Scale

The term "economies of scale" refers to the advantages that can sometimes occur as a result of increasing the size of a business.

Economies of scale occur when increasing output leads to lower long-run average costs. It means that as firms increase in size, they become more efficient.

For example, a business might enjoy an economy of scale with respect to its bulk purchasing and it could negotiate a lower price per unit than its competitors.

LRAC is the long run average cost curve.

The downward sloping portion of the curve is economy of scale, the average cost rises proportionately less to output.
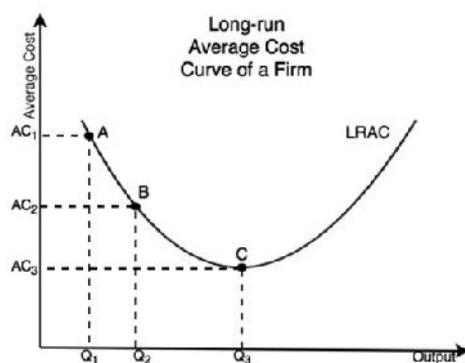
At point C the average cost rises proportionately to output, this is constant economy of scale.

The upward slopping portion of the curve is called a diseconomy of scale because the average cost rises proportionately faster than output.

Sources of Economies of Scale:

Purchasing - Firms might be able to lower average costs by buying the inputs in bulk from special wholesalers.

Managerial - Firms might be able to lower average costs by improving the management structure within the firm.

Sources of Economies of Scale:

Technological - A technological advancement might drastically change the production process

An innovation of a new method of production may reduces the cost of production .

Specialization and division of labour:

 Technical- Some production processes require high fixed costs e.g. building a large factory.

Bulk buying

Spreading overheads - If a firm merged, it could rationalise its operational centres.

Risk-bearing economies – more risk more returns

Marketing economies of scale - advertising , campaign.

The container principle - To increase capacity eight-fold, it is necessary to increase surface area only fourfold.

Financial economies - A bigger firm can get a better rate of interest than small firms.

Economies of scale can be achieved in two ways.

Internal economies - a company can realize internal economies of scale by reorganizing the way their resources.

Example-a firm may hold a patent over a mass production machine, which allows it to lower its average cost of production more than other firms in the industry.

- Internal economies of scale can be because of
- Technical improvements,
- Managerial efficiency,
- Financial ability,
- Monopsony power, or access to large networks.

External economies - a company can realize external economies of scale by growing in size relative to their competitors using that increased scale to engage in competitive practices.

External economies are ones where companies can influence economic priorities, often leading to preferential treatment by governments.

- **Economies of scope**
- **Diseconomies of scale.**

14.6 Market Structure and Innovation

Market structures refer to the different market characteristics that determine relations between sellers to each another, of sellers to buyers and more.

Market structures mainly include perfect competition, oligopoly market, monopoly market, and monopolistic competition.

Major determinants of the market structure:

The number of sellers operating in the market.

The number of buyers in the market.

The nature of goods and services offered by the firms.

The concentration ratio of the company.

The entry and exit barriers.

The economies of scale.

The degree of vertical integration.

The level of product and service differentiation.

The customer turnover, i.e. the network effect.

The word "innovation" is derived from the Latin verb innovare, which means to renew.

Innovation is a process by which a domain, a product, is renewed and brought up to date by applying new processes, introducing new techniques, or establishing successful ideas to create new value.

Types of innovation

Product development: The development of innovative products or product features.

Process improvement: The improvement of processes through continuous improvement and the development of new solutions.

Service innovation: The creation and introduction of new services for customers and partners.

Business Model Innovation: The development of innovative business models and new revenue streams.

Prof. Schumpeter used the concept of innovation in market and innovation has a significant role in the development of product as well as the market.

According to Schumpeter the surplus profit of the firms can be reinvested in research and development to generate profit.

Schumpeter asserted that innovations have been carried out primarily by very large firms.

The work of William Baumol (2002) provides support for oligopoly as market structure best suited for innovative behaviour. Innovation is perceived as being "mandatory" for businesses that need to establish a cost-advantage or a significant lead in product quality over their rivals.

Economists like Galbraith, Kaplan, Lilienthal, and Villard have also focused on the significance of innovation.

They mainly came up with three arguments.

First, the costs of innovating are so great that only large firms can become involved.

Second, projects must be carried out on a large enough scale so that successes and failures can in some sense balance out.

Third, for innovation to be worthwhile, a firm must have sufficient control over the market to reap the rewards.

Entrepreneurs can strive for price leadership or develop a strategy of differentiation.

Firms that choose price leadership must secure their long-term competitiveness by developing innovative, highly efficient processes.

Firms that strive for a differentiation strategy need innovation to develop unique distinguishing features to their competitors.

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Many start-ups launch their activities by developing an innovative product or service.

Continuous innovation is crucial for all companies.

The main difference is in the focus of the innovation strategy, which varies considerably from company to company.

Innovation in competitive market-normal profit; low scope of innovation; Low R&D expenditure.

Innovation in Monopoly- supernormal profit; high scope of innovation-high R&D expenses.

Oligopoly/duopoly-high degree of competition; innovation gives a firm monopoly right.

Dissipation effect, replacement effect.

Example- two firms with vaccination.

Summary

In common parlance, a market refers to a particular place where goods are purchased and sold. But in economics, the term "market" does not mean merely a particular place but an actual or virtual area where sellers and buyers communicate to carry out successful transactions and trade activities. In this, we cannot particularly name a particular place to define the market. Instead, we may define the commodities to define a market. For example, such markets as the Delhi market, and Chandigarh market are in vogue in economics. But the rice market, potato market, the wheat market makes sense in economics.

There are several determinants of markets-

- Number of Sellers
- Number of Buyers
- Economies of Scale
- Nature of Product
- Entry Barriers

There are some entry restrictionsin some public utility services which run on monopoly by the government like post offices, railways, water supply, etc.

The mobility of Goods: Easy transportation of goods from the place of production to the market ensures uniform prices by different sellers. This determines the presence or absence of transportation cost and accordingly, it determines the nature of the market. For example, a competitive market has no transportation costs.

Government Intervention: Some markets are indirectly controlled by the government. The government either imposes heavy taxes or makes the business license mandatory to restrict the entry of firms. Because of government intervention, there may be the growth of monopoly, and in some cases, competition may even be promoted by breaking the entry barrier.

Forms of Market Structure:

Based on competition, the market is classified as:

- Perfect Competition
- Monopoly
- Duopoly
- Oligopoly
- Monopolistic Competition

Market concentration is an important measure to find out the share of the market by the number of firms present in the market. It is a situation where a small number of firms can have a larger control of the market. It measures the magnitude of domination in sales by one or a few firms in a particular market. The market concentration ratio is determined with the help of the measure of the concentration ratio.

Regarding sellers exercising market power, either the existing market will have few sellers or there should be few firms that own a large portion of the market sales. When this happens, the market is said to have a high seller concentration.

Buyers' concentration, on the other hand, is the degree to which a small number of customers buy most of the products of a particular firm. Buyer concentration decreases the profitability primarilyin a perfectly competitive industry.

For measuring the market concentration, there are two numerical measures: a. concentration ratios and b. the Herfindahl-Hirschmann Index (HHI).

Concentration ratios: - The market concentration ratio gives the measurement of the combined market share of all the top-rated firms in the industry.For example, if we have the concentration ratio CR5, then it is the sum of the market shares of the top five (largest five) firms in a market and similarly, the CR10 is the sum of the top ten (largest ten) firms in terms of volume.

Herfindahl-Hirschmann Index (HHI): This index is measured by applying the square root of the percentage of the market share of each firm in the industry.

Product differentiation is a process generally opted by theproducers or the business to make a product distinct from other similar productsthat exist in the market.This is done to promote businesses and develop an advantage in the competition. The differentiators of products can include improved quality of the products as well as someadded features and advantages.

If one observed the recent development in world trade, commerce, and business activities, it becomes clear that the barrier to entry has fallen remarkably in the recent few years. Hence, industries have substantially increasedtheir competitive products. In such situations, differentiation is a critical precondition for the survival of a product in the market in the face of competition.

The conditions reflect the conditions that a firm makes its entry into the industry. It depends on the easiness or flexibility of the process with which it can enter.

The conditions of entry determine the number of firms in the market and the degree of seller concentration. Regarding the entry of firms, the following points are to be noted.

- In the case of free entry, the number of sellers is large.
- In the case of restricted entry, the number of sellers tends to reduce.
- In the long run the degree of competition depends on the condition of entry.

Entry barriers- An entry barrier exists when new firms cannot make their entry into a new market. There are different types of entry barriers-

Natural barriers: It is observed when a firm's long-run average cost curve continues to decrease because of economies of scale for a large range of products.It results in the existence of natural monopoly, for example, Power generation, Railways,Aircraft manufacturers, etc.

Reasons for natural barriers:

- Economies of large-scale production.
- Network effects.
- Ownership or control of a key scarce resource.
- High set-up costs (i.e., sunk cost).
- High costs in research and development.

Economies of scale mean the advantages to a firm or a business setup that can sometimes exist as a result of increasing the plant size or the size of the business. It occurs when increasing the output of a firm leads to lowerlong-run average costs. It means that as firms increase their plant size, they turn out to be more efficient.

Economies of scale can be achieved in two ways-both internally and externally. Let us define them-

Internal economies –A given company can achieve internal economies by rearranging or reorganizing the way they are using resources. To cite an example, if a firm gets a patent over a mass production machine it has, it allows the firm to lower its average cost as compared to the other existing firms in the industry.

Internal economies of scale can be because for certain reasons-

- Technical improvements,
- Managerial efficiency,
- Financial ability,
- Monopsony power, or access to large networks.

External economies -A given company can achieve external economies by growing or enlarging in size as compared to their rival firms using that enlarged scale to involve in competitive practices. Here, companies can easily impact economic priorities whichin many cases, leads to preferential action by the governments.

Economies of the scope-The economy of scope indicatethe scenario when the production of one particularcommoditydecreases the production cost of another related commodity.

It occurs when producing a broader diversity of goods is highlycost-efficient for a firm as compared tothat of the production of less of a variety, or each of goods produced independently. It suggests that the average total cost of production of a firm falls when an increasing variety of commodities are produced. An example of the economy of scope is the mergers and acquisitions where the newly revealed practices of resources byproducts, say, crude petroleum-two producers share the same factors in their production.

Market structures imply the various market forms and features determining thelinkagesamongthe sellers exists, sellers to buyers in the market, and so on.Market structures mainly include perfect competition,monopoly market, monopolistic competition, and oligopoly market. These various types of markets have been already explained in the former chapters. Now let us remember very briefly the major determinants of the market structure:

- The number of sellers working in the market.
- The number of buyers present in the market.
- The nature or type of goods and services presented by the firms.
- The concentration ratio.
- The magnitude of exit and entry barriers prevails in the market.
- The economies of scale in the market.
- The degree of vertical integration in the market.
- The level of product differentiation.
- The customer turnover, or as said, the network effect.

Now, let us define innovation. The word, "innovation" has been derived from the Latin word'innovare', and the meaning of the word is to renew. It is a process by which a domain or a product, is brought up and renewed to date by applying to introduce new techniques, new processes, or establishing successful ideas to create new value.

Keywords

Expected utility: Expected utility is the utility of an action or event over some time for an uncertain event.

The expected: The expected value is the weighted average of all the outcomes (payoffs) or values related to all the possible outcomes.

Variability: Variability is the extent to which the possible outcomes of an uncertain situation differ or deviated

Risk-averse: This is the condition of preferring a certain income to an uncertain income (i.e., a risky income) with the same expected value based on probability.

Risk neutral: -This is the condition of being indifferent between a certain prospect (i.e., income) and an uncertain prospect (i.e., income) with the same expected value based on probability.

Risk loving: This is the condition of preferring an uncertain income (a risky income) to a certain income with the same expected value based on probabilities.

Risk Premium: It is the maximum amount of money that a risk-averse person is willing to pay to cover his risk to avoid risk.

Self Assessment

1. For two different uncertain outcomes X1 and X2 with a probability of occurrence P1 and P2, the expected utility will be -

   A. EU=P1X1+P2X2
   B. EU=P1X1 / P2X2
   C. EU=P1X1-P2X2
   D. All the above

2. Expected utility is also related to the concept of

   A. Total utility
   B. Marginal utility
   C. Total revenue
   D. Marginal revenue

3. The concept of expected utility is useful in

   A. Health policies
   B. Socially right arrangement
   C. Insurance
   D. All the above

4. In a money lottery an agent is risk-neutral if he only cares about

   A. The expected value of the lottery ticket
   B. The expected value of the lottery ticket to the lottery ticket
   C. The lottery ticket to the expected value of the lottery ticket.
   D. All the above

5. In a money lottery an agent is risk-averse if he only cares about

   A. The expected value of the lottery ticket
   B. The expected value of the lottery ticket to the lottery ticket
   C. The lottery ticket to the expected value of the lottery ticket.
   D. All the above

6. In a money lottery an agent is risk-lover if he only cares about

   A. The expected value of the lottery ticket
   B. The expected value of the lottery ticket to the lottery ticket
   C. The lottery ticket to the expected value of the lottery ticket.
   D. None of the above

7. In comparing the comparing risky choice which of the following is the important measure?

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A. The expected value

B. Variability

C. Both of these

D. None of these

8. When the interpretation of probability relies on the frequency with which certain events tend to occur, it is the type of

A. Subjective Probability

B. Objective Probability

C. Random Probability

D. Fixed Probability

9. When the interpretation of probability relies on the personal judgments or experience with which certain events tend to occur, it is the type of

A. Objective Probability

B. Random Probability

C. Subjective Probability

D. Fixed Probability

10. In An individual who is risk-averse

A. prefers a certain given income to a risky income with the same expected value.

B. avoids a certain given income to a risky income with the same expected value.

C. is neutral of a certain given income to a risky income with the same expected value.

D. none of the above

11. The marginal utility of income for a risk-neutral person is

A. increasing

B. decreasing

C. constant

D. all of the above

12. A risk lover always experiences

A. a decreasing marginal utility of income

B. a constant marginal utility of income

C. an increasing marginal utility of income

D. None of these

13. Higher is the variability of expected income from a project as compared to other means

A. Lower is the risk

B. Higher is the risk

C. No changes in the risk

D. None of the above

14. A risk averter will always …………….. a fair gamble

A. accepts
B. rejects
C. be indifferent
D. neutral

15. A lower expected income is associated to

A. lower risk
B. higher risk
C. no risk
D. all the above

Answers for Self Assessment

l.	A	2.	B	3.	D	4.	A	5.	B
6.	C	7.	C	8.	B	9.	C	10.	A
11.	C	12.	C	13.	B	14.	B	15.	A

Review Questions

1. What is expected utility?
2. What is the expected value?
3. What is variability?
4. Define the concept of risk-averse, risk-neutral, and risk-loving.
5. What is a money lottery?
6. What are the factors of demand for insurance?
7. What are the factors supply of insurance?
8. How can you compare different risk alternatives?
9. Define and compare the functions of risk-averse and risk lovers.
10. Determine how the equilibrium in the insurance market is determined.

Further Readings

1. Microeconomics - A Koutsoyiannis, Macmillan Press, London, 1979
2. Microeconomics — Dominik Salvatore, Oxford University Press, New York, 2003.
3. Microeconomics — Jeffrey m. Perloff, University of California, Berkeley, Addison-Wesley, 2012.
4. Principles of microeconomics - Karl E. Case, Ray C. Fair, Sharon M. Oster,Pearson, 2017
5. Microeconomics — N. Gregory Mankiw, Harvard University, USA, 2016.

Web Links

http://www.columbia.edu/~md3405/Choice_MA_Risk_1_17.pdf

https://corporatefinanceinstitute.com/resources/knowledge/other/adverse-selection/

https://en.wikipedia.org/wiki/Moral_hazard

https://en.wikipedia.org/wiki/Lottery_(probability)