

INDUSTRIAL ECONOMICS & FOREIGN TRADE



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INDUSTRIAL ECONOMICS & FOREIGN TRADE (IE&FT)

SYLLABUS

Module 1 – Demand & Supply analysis

- Scarcity and choice - Basic economic problems- PPC
- Firms and its objectives – types of firms
- Utility – Law of diminishing marginal utility – Demand and its determinants – law of demand
- Elasticity of demand – measurement of elasticity and its applications
- Supply, law of supply and determinants of supply.
- Equilibrium – Changes in demand and supply and its effects
- Consumer surplus and producer surplus (Concepts) – Taxation and deadweight loss.

MODULE 1- Demand & Supply analysis

Economics– Definition

➤ **Adam Smith's Definition (Wealth Definition)**

Prof. Adam Smith is considered as the father of Modern Economics. According to him, **“Economics is the science of wealth- It studies how wealth is produced and consumed.”**

➤ **Scarcity Definition (Modern Definition) of Lionel Robbins**

According to **Prof. Lionel Robbins**, **“Economics** is the science which studies human behavior as a relationship between unlimited ends and scarce means which have alternative uses ”.

Basic Economic Problems



Basic Economic Problems

- The basic economic problem that arises because people have unlimited wants but resources are limited.
- The **three basic economic problems** regarding the allocation of resources are :
 - **What to produce ?**
 - **How to produce?**
 - **For whom to produce?**

Basic Economic Problems

1. What to produce : Decision regarding the quantity and range of goods to be produced.

2. How to produce : Decision regarding the techniques of production to be adopted.

The two mainly-used techniques are:

- **Labour Intensive Techniques** (LIT). This technique is used with the help of more number of labour and less involvement of capital.
- **Capital Intensive Techniques** (CIT): The Capital Intensive technique involves more capital involvement and less utilization of labour.

3. For whom to produce: Decision regarding the distribution of national product among the four factors of production namely land, labour, organization, and capital.

Factors of production

Factors of production are the inputs needed for the creation of a good or service.

- The factors of production include **land, labor, capital and entrepreneurship**.
- When **factors** are used they earn a **reward** called a **factor 'income'**.
- **Factor** incomes are: **rent, wages, interest and profit**.

Economic activity is the activity of making, providing, purchasing, or selling goods or services. One of the main aims of economic activity is to produce goods and services to make them available to consumers.

Four Economic Activities

- 1. Production** may be defined as the transformation of inputs in to outputs. It is the creation or addition of utilities to thing.
Eg. Raw cotton + Capital+ Labor= Cloth
- 2. Consumption** is the act of using up of goods and services for the satisfaction of human wants.
- 3. Exchange:** Buying and selling of goods and services.
- 4. Distribution:** The distribution of national product among the four factors of production namely land, labour, organization, and capital.

Micro and Macro Economics

- The subject matter of economics has been divided in to **two parts- Micro economics and Macro economics**.
- The term **micro economics** is derived from the Greek word '**mikros**' meaning small and the term **macro economics** is derived from the Greek word '**makros**', meaning large.
- **Micro economics** deals with the study of behaviour of individual economic units like consumer, producer, labour etc.
- **Macro economics** deals with the study of aggregates or averages covering the entire economy, such as total employment, the national income, the general price level of the economy etc.

Difference between Micro economics and Macro economics

Micro Economics	Macro Economics
It studies individual economic units.	It studies aggregate economic units.
It deals with determination of price and output in individual markets.	It deals with determination of general price level and national output in the country.
The basic parameter of micro economics is price, that is, consumers and producers take economic decision on the basis of price.	The basic parameter of macro economics is income. That is, economic decision relating to consumption, savings, investment etc. are on the basis of national income.
Eg. Individual demand, percapita income, individual prices etc.	Eg. Aggregate demand, national income, general price level etc.

Production Possibility Curve / Production Possibility Frontier (PPC/ PPF)

- Central problems of an economy can be better understood with the help of a tool called production possibility curve.
- PPC represents the various combinations of two goods which can be produced with the help of given resources.
- A production possibility curve for an economy is drawn on the basis of several assumptions.
 - ❖ There are only two commodities that can be produced with given resources in an economy.
 - ❖ The resources are fully employed.
 - ❖ The techniques of production remain constant.

Production Possibility Curve

Let us suppose that a country is producing only two goods say 'X' and 'Y'. Since resources are limited and fully employed the quantity of 'X' and 'Y' produced are limited. A decision has to be made about the quantity of each commodity to be produced. Any increase in the production of 'X' normally reduces the production of 'Y'.

Production Possibility Schedule

Production Possibilities	Output of 'X' Good	Output of 'Y' Good
A	0	10
B	1	9
C	2	7
D	3	4
E	4	0

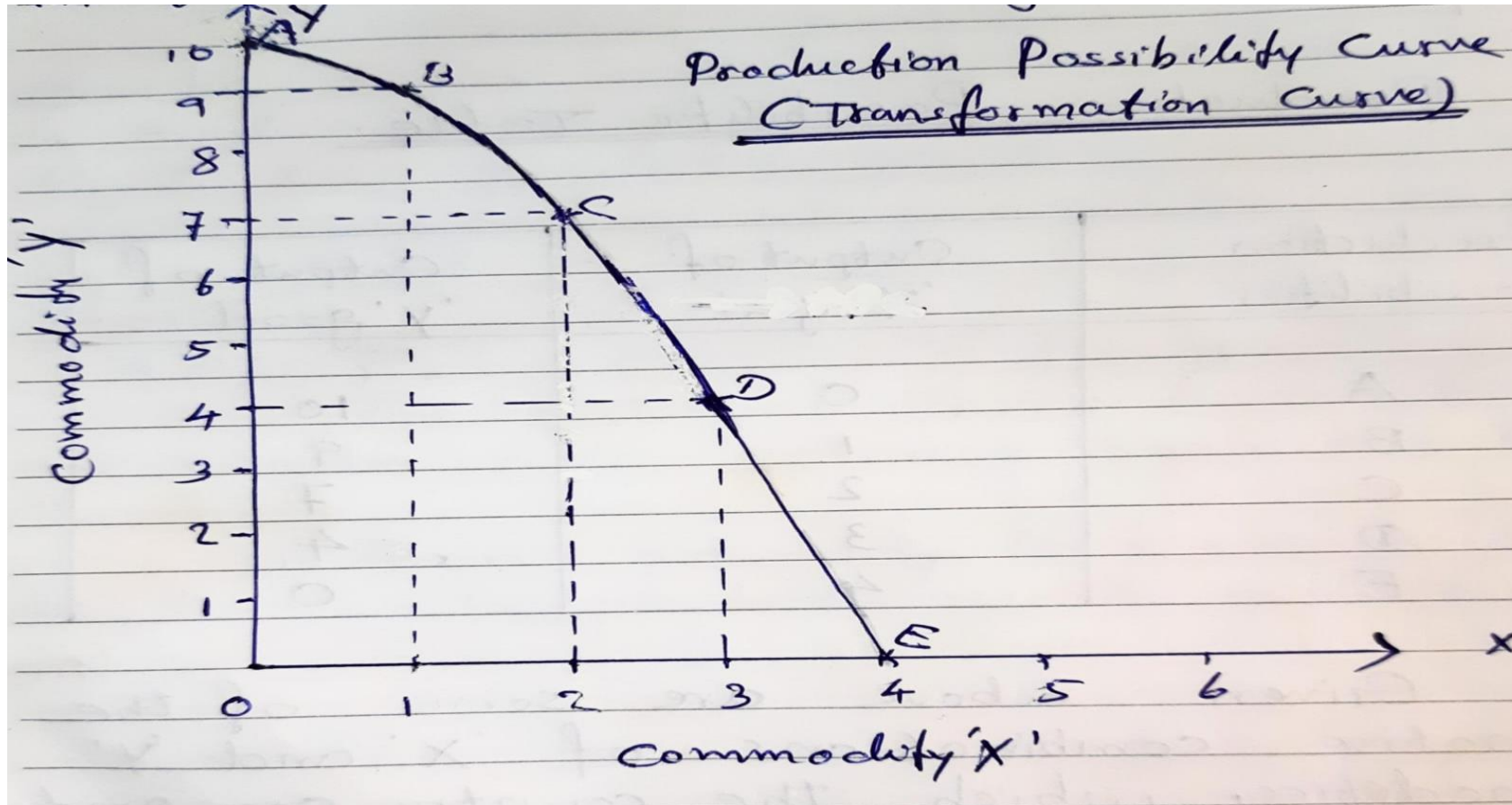
Production Possibility Curve

Given above are some of the alternative combinations of 'X' and 'Y' commodities, which the country can produce.

At possibility 'A', the country is devoting all its resources to the production of 'Y' commodity while at possibility 'E', resources are used to produce 'X' commodity only. Possibilities B, C, and D represent different combination of 'X' and 'Y' goods, which the country can produce.

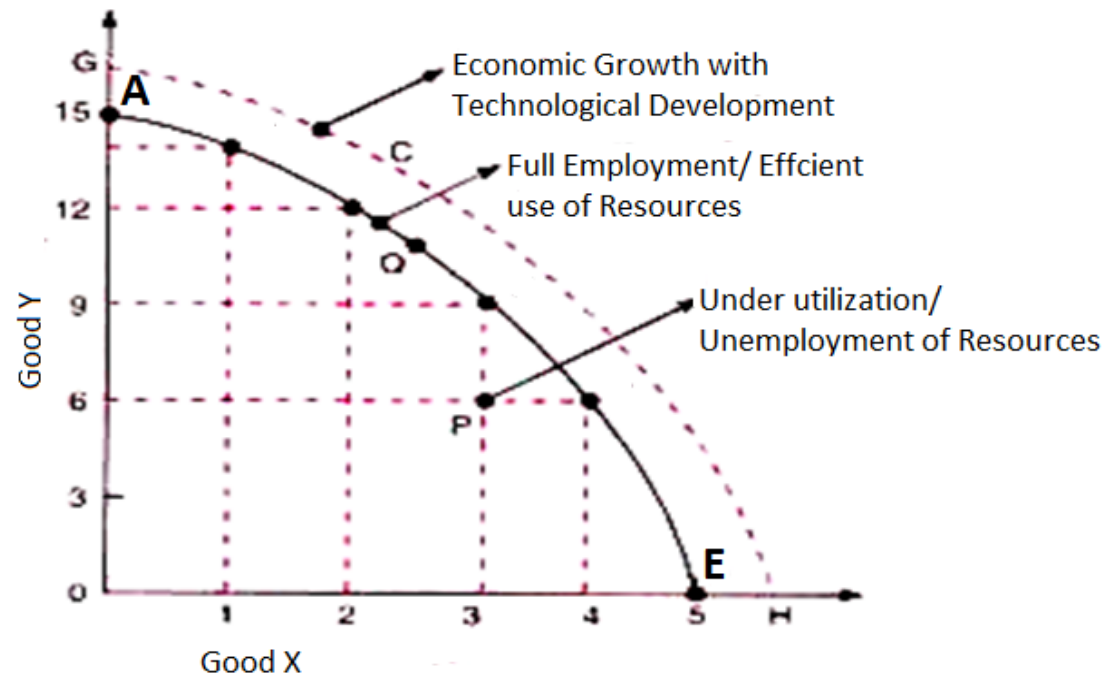
The production possibilities shown in the above table can be graphically illustrated in the following diagram.

Production Possibility Curve



Production Possibility Curve

The curve 'AE' so obtained is called production possibility curve. Any point on the PPC represents **full employment of resources**, and any point inside the PPC represents **unemployment of resources**, upward shifting of PPC shows the **economic growth** or **growth of resources**.



Opportunity cost

- **Opportunity cost is the cost expressed in terms of opportunity sacrificed.**
- In other words, **opportunity cost is defined as the next best alternative that is sacrificed.** When a resource is put to one use, its alternative uses are sacrificed. **The cost of something expressed in terms of alternatives sacrificed is called opportunity cost.**
- For example, in the above PPC schedule, the opportunity cost of 'X' is the amount of 'Y' that is sacrificed for the production of X. **By moving from point A to point B, 1 unit of Y is sacrificed for 1 unit of X.** Here the marginal opportunity cost increased as more and more of one output is produced.

Marginal Opportunity cost

- Marginal means 'additional'. **Marginal opportunity cost is defined as the additional cost in terms of a number of units of good sacrificed to produce an additional unit of the other good.**

Firms and its objectives



Firms – Types and its objectives

Firm- Meaning

- A firm is a commercial organization operating for profit. The output of a firm can be a product or service or both. For example, it can be law firm which sell services related to law or an organization which sell accounting services, consultancy services etc.
- A firm is a business organization that brings together and coordinates the factors of production for the purpose of supplying goods and services.

Types of Firms

Firms can be broadly classified as

- Private sector firms
- Public Sector firms
- Joint Sector firms

A. Private Sector Firms

- When a firm is solely owned and operated by private individuals or institutions, it will come under private sector.
- In most of the economies private sector dominate the business activities.
- The following are the important type of business organizations coming under private sector .

i) Sole Proprietorship

Sole Proprietorship is the most suitable form for small businesses. It refers to a form of business organization which is owned, managed and controlled by an individual who is entirely responsible for the results of the operations.

The word “sole” implies “only”, and “proprietor” refers to “owner”. Hence, a sole proprietor is the one who is the only owner of a business.

Advantages of sole proprietorship

- ✓ All profits are subject to the owner
- ✓ Easy to start or exit as there are no legal formalities in starting a business.
- ✓ Prompt and quick decision making is possible as there is no need to consult others.
- ✓ Sole proprietorship enables the owner to keep all the information regarding the business confidential and to maintain secrecy.

Disadvantages of sole proprietorship

- ✓ Owner is 100% liable for business debts
- ✓ Resources of a sole proprietor are limited to his personal savings and borrowings from others.
- ✓ Ownership of proprietorship is difficult to transfer
- ✓ No distinction between personal and business income
- ✓ The life of a business is limited because death, imprisonment, or bankruptcy of the owner may lead to its closure.

A. Private Sector Firms

ii. A partnership

- A partnership is a form of business in which two or more individuals decide to start a common business.
- The success of a partnership firm depends upon mutual confidence, understanding, co-operation and adjustment of the partners.
- A partnership can be formed either by oral or written agreement, but it is desirable to create a written agreement which is called *Partnership Deed or Agreement*.
- Maximum allowable number of partners is 20 and minimum is 2

Features of partnership

- i. **Liability:** The partners of a firm have unlimited liability. Personal assets may be used for repaying debts in case the business assets are insufficient.
- ii. **Sharing of profit and loss:** In a partnership, partners share profit as well as loss in the business.
- iii. **Continuity:** There is a lack of continuity of business as the death, retirement or insolvency of any partner can bring an end to the business.
- iv. **Number of partners:** The minimum number of partners needed to start a partnership firm is two. According to the Companies Act 2013, maximum number of partners in a partnership firm can be 100, subject to the number prescribed by the government.

Advantages of partnerships

- ✓ Shared resources provides more capital for the business
- ✓ Each partner shares the total profits of the company
- ✓ Risks in the business are shared by all the partners.
- ✓ Inexpensive to establish a business partnership, formal or informal

Disadvantages of Partnership

- ✓ Each partner is 100% responsible for debts and losses
- ✓ Selling the business is difficult—requires finding new partner
- ✓ Partnership ends when any partner decides to end it
- ✓ All partners suffer due to the wrong steps of one partner.

A. Private Sector Firms

iii. Joint Stock Company

- A joint stock company is a business organization that is owned jointly by all its shareholders.
- In other words, a *joint stock company* is a voluntary association of persons who generally contribute capital to carry on a particular type of business, which is established by law and can be dissolved only by law.
- The owner's capital in a joint stock company is invested in the form of shares. Therefore, the owners are its shareholders. The profit earned by the company is distributed among the shareholders in the form of dividends.

Features of joint stock companies

- i. **Independent Legal Entity:** It has a separate legal entity apart from its members. A company acts independently of its members.
- ii. **Limited Liability :** The liability of its shareholders is limited to the value of shares they have purchased.
- iii. **Transferability of shares:** The shares of a company can be transferred by its members.
- iv. **Separation of Ownership and Management:** Even though shareholders are the owners, the companies are managed by the Board of Directors.
- v. **Perpetual Existence:** The company has a permanent existence. The shareholders may come or may go but the company will go on forever.

Merits of Joint stock company

- i. **Limited Liability:** The liability of its shareholders is limited to the value of shares they have purchased.
- ii. **Perpetual Existence:** The company has a permanent existence. The shareholders may come or may go but the company will go on forever.
- iii. **Independent legal entity:** It has a separate legal entity apart from its members. A company acts independently of its members.
- iv. **Transferability of shares:** The shares of a company can be transferred by its members.
- v. **Company's life is not affected by the death of shareholders.**

Demerits of Joint stock company

- i. More legal formalities.
- ii. It is difficult to maintain secrecy.
- iii. Company is managed by big shareholders only.
- iv. People can commit frauds with the company.
- v. The team spirit with which partnership firm works is lacks in joint stock companies.

A. Private Sector Firms

iv. Co-operative organizations

- A co-operative is a voluntary association of persons, who join together with the motive of welfare of the members.
- The capital of a cooperative society is raised from its members through issue of shares. Its dealings are confined to members only.

Mainly there are two types of cooperative societies.

a) Consumer's cooperative societies: The consumer cooperative societies are formed to protect the interest of consumers. The society aims at eliminating middlemen to achieve economy in operations. It purchases goods in bulk directly from the wholesalers and sells goods to the members, thereby eliminating the middlemen.

Co-operative organizations

b) Producer's cooperative societies

These societies are set up to protect the interest of small producers.

The society aims to enhance the bargaining power of the small producers. It supplies raw materials, equipment and other inputs to the members and also buys their output for sale.

Profits among the members are generally distributed on the basis of their contributions to the total amount of goods produced or sold by the society.

Advantages of co-operative organizations

1. It sells the products at cheaper rate.
2. It offers its employees better wages and reasonable conditions of service.
3. Profits are shared equally by its members.
4. It promotes a sense of co-operation among members.
5. It benefits general public.

Disadvantages of co-operative organizations

1. As its members are mostly from the working class, its capacity to raise capital is limited.
2. Members try to make undue advantage.
3. Mostly inefficient management.

Public Sector

- Under public sector, Government is the investor or owner of a business. Generally, public utilities like public roads, education, health, police , military etc. are provided by the government.
- In India Public Sector Undertaking (PSU) is a term used to denote a government company. In such companies, government either own the entire shares of the company or majority of the shares(51 percent).
- Government starts public sector units for employment generation, balanced economic development, and for the provision of products which the private sector does not want to produce.

Advantages

1. **Balanced Economic Growth:** In certain areas private sector may hesitate to invest because of long gestation period or because of less profit. The Govt. undertake such activities and it helps in the balanced economic growth.
2. **Employment generation:** By developing large industries, more employment opportunities are generated.
3. **Profits for public welfare:** Profit earned by the public sector units are utilized by the government for the benefit of the society.

Disadvantages

1. **Evils of bureaucracy:** Public sector units suffer from the evils of bureaucracy such as corruption, delayed decision making etc.
2. **Extravagance and inefficiency :** Poor management leads to extravagance and overall inefficiency in the public sector units.

Objectives of firm

The business firms and the other business entities are guided by certain objectives. The following are the main objectives of a business firm.

1. Profit maximization

The principal objective of a business firm is profit maximization. Higher profits enable a firm to pay higher wages, more dividends to shareholders and survive an economic downturn.

Objectives of firm

2. Sales maximization

Firms often seek to increase their market share – even if it means less profit. This could occur for various reasons:

- Increased market share increases monopoly power and may enable the firm to put up prices and make more profit in the long run.
- Managers prefer to work for bigger companies as it leads to greater prestige and higher salaries.
- Increasing market share may force rivals out of business. E.g. the growth of supermarkets have lead to the demise of many local shops.

Objectives of firm

3. Growth maximization

This is similar to sales maximization and may involve mergers and takeovers.

With this objective, the firm may be willing to make lower levels of profit in order to increase in size and gain more market share.

More market share increases its monopoly power and ability to be a price setter.

Objectives of firm

4. Utility maximization

In large modern firms, shareholders and managers are two separate groups and the managers have discretionary powers to set the goals of the firm.

The shareholders always want to maximize profit. But the managers with their discretionary power try to maximize their own utility with the constraint of maintaining minimum profit to satisfy shareholders.

The utility function of managers is depend on their salary, job security, power, status, professional satisfaction etc.

Objectives of firm

5. Welfare maximization

A firm may also be concerned about the welfare of its stakeholders – suppliers, workers and customers. A co-operative is run to maximize the welfare of all stakeholders – especially workers. For example, giving training and long-term job security to its workers.

Utility

Utility is the want satisfying power of a commodity or service. In other words, the capacity of a commodity to satisfy a particular human want is called utility. Utility determines demand for a commodity.

Total Utility(TU) is defined as the total psychological satisfaction which a consumer gets from consuming a given amount of a particular good.

Marginal Utility(MU) is the utility obtained from the last unit consumed. In other words, MU is the additional utility obtained by consuming one more unit of a good or service per unit of time.

Marginal Utility(MU) = Change in TU/Change in number of units consumed

$$MU = \frac{\Delta TU}{\Delta Q}$$

Law of Diminishing Marginal Utility (Gossen's first law)

- The law of diminishing marginal utility states that, as a consumer consumes more and more units of a commodity, the marginal utility goes on diminishing.
- In other words the extra utility received from consuming each additional unit diminishes. As the law was first explained by a German Economist Hermann Heinrich Gossen, it is known as Gossen's first law.
- The law can be explained with the help of an example. Suppose a boy consumes more and more ice creams. The changes in his marginal utility and total utility is shown in the following schedule.

No of ice creams consumed	0	1	2	3	4	5	6	7
Total Utility (TU)	0	10	18	24	28	30	30	28
Marginal Utility (MU)	---	10	8	6	4	2	0	-2

Law of Diminishing Marginal Utility

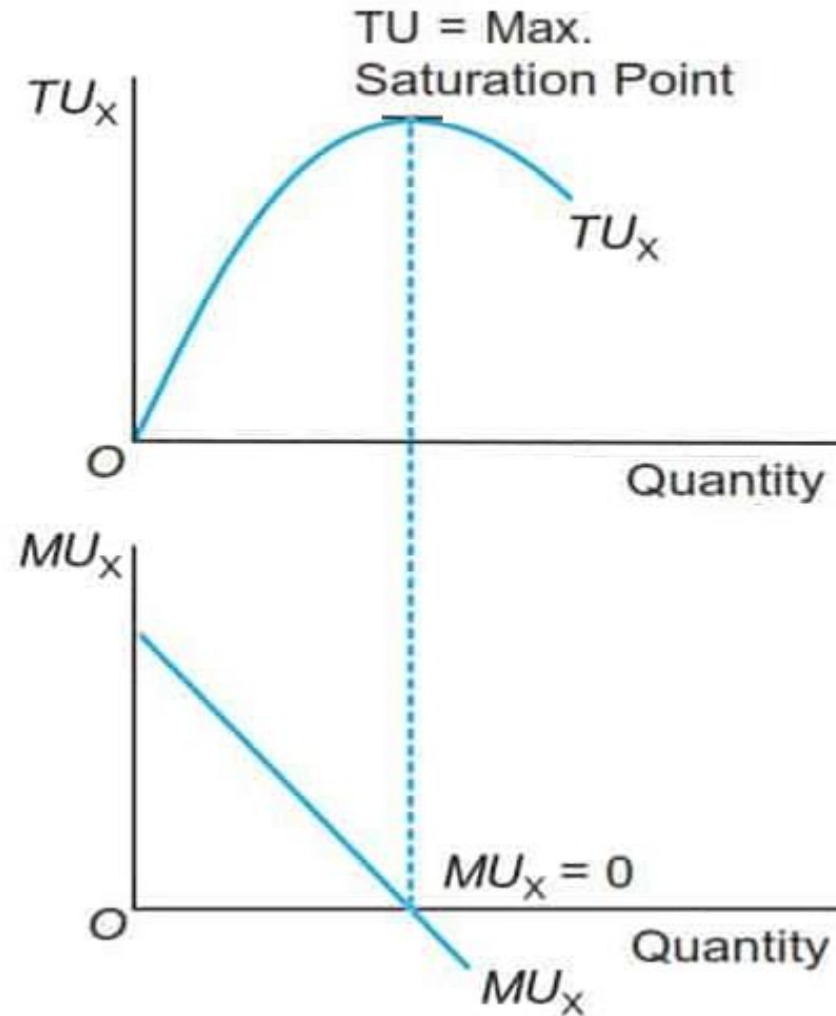
It can be seen that as the consumer consumes more and more ice creams TU increases but at diminishing rate. This is because MU is decreasing with each additional unit of consumption.

That is the consumption of second ice cream will give less satisfaction as compared to the satisfaction from the first one. When consumption is six units MU is zero. This is the point of saturation.

Further increase in consumption may cause discomfort to the consumer and hence total utility decreases. In other words MU becomes negative.

The changes in MU and TU can be understood with the help of the following diagram.

Law of Diminishing Marginal Utility



Law of Diminishing Marginal Utility

In the above diagram, consumption is measured along the X-axis and utility along the Y-axis. As consumption increases TU curve rises but MU curve comes down. When the MU curve touches the X-axis TU curve attain its maximum height. With further increase in consumption TU curve bends down because of negative MU.

Relation between MU and TU

1. When MU is positive, TU increases (but at a diminishing rate)
2. When $MU = 0$, TU is maximum
3. When MU is negative, TU decreases.

Law of Diminishing Marginal Utility

Assumptions of the Law

1. Different units of the commodity consumed are identical and in standard size.
2. There is no time gap between the consumption of different units.
3. Consumer's income remains constant.
4. Consumers taste and preferences remain constant.
5. Marginal utility of money remains constant
6. Utility can be measured.

Law of Diminishing Marginal Utility

Limitations of the Law.

Most of these assumptions are unrealistic and hence they are the limitations of the law of DMU. That is

1. Commodity consumed may not be in identical size.
2. There will be time gap between the consumption of different units.
3. Consumer's income may change
4. Consumer's taste and preference may change.
5. The law is based on the assumption that utility can be measured. But utility is subjective and it cannot be measured.

Demand and its Determinants

Demand - Meaning

Demand for a commodity is the desire for it backed by willingness and ability to pay.

If a person is willing to pay, but has no ability to pay, there is only desire and no demand. Demand for a commodity thus implies three things:

- Desire to acquire it
- Willingness to pay for it, and
- Ability to pay for it

Determinants of Demand

1. **Price of a commodity:** A change in the price will affect the demand for a commodity. Higher the price, lower will be the demand and vice-versa.
2. **Income of the consumer:** Generally higher the income of the consumer, higher will be the demand and vice-versa.
3. **Price of related commodities:** The prices of other related goods influences the demand for a particular commodity. There are two kinds of relationship between commodities – **Substitute goods and complementary goods.**

In the case of **substitutes** rise in the price of one product will raise the demand for other products and vice-versa. Eg. Tea and coffee.

In the case of **complementary goods**, if the price of one product increases, the demand for other product falls. Eg. Pen and ink, car and petrol etc. A rise in the price of petrol will reduce the demand for cars.

Determinants of Demand

4. Tastes and preferences of consumers: Tastes and preferences of the household influence the demand for a commodity. Advertisements and different marketing strategies influence the preferences and tastes of consumers and hence the demand for goods.

5. Interest Rate: If credit is available at low rates of interest, demand will increase.

6. Business condition/ Trade cycle: Demand rises during booms and declines during depressions, and recessions.

Demand function

- **Demand function** expresses the relationship between quantity demanded of a commodity and its determinants. Demand function can be expressed in the form of an equation as follows

$$D_x = f(P_x, P_r, Y, T, \dots)$$

Here,

D_x = Demand for commodity X

P_x = Price of commodity X

P_r = Price of related commodities

Y = Consumer's Income

T = Taste of the consumer

Demand schedule

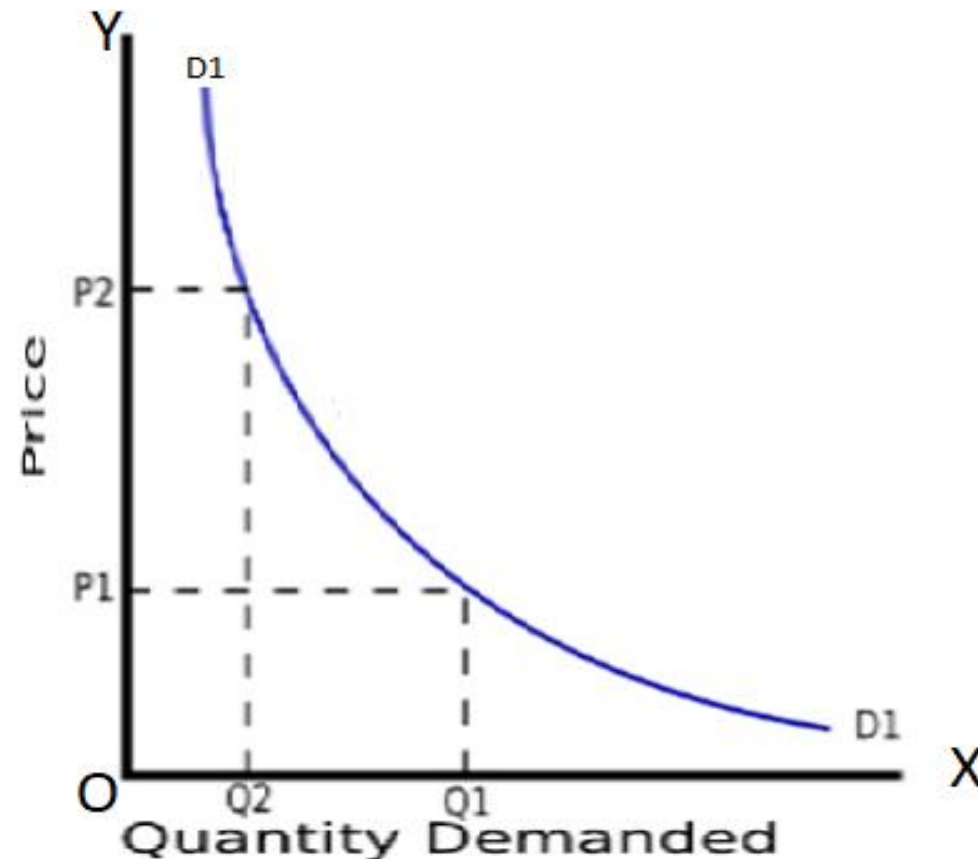
Demand schedule is a list or table showing the various prices of a commodity and the quantities demanded at those prices.

Price per Orange	Quantity demanded of Oranges
5	10
4	15
3	20
2	35
1	60

It is shown in the table that, when the price of orange is Rs. 5, a consumer purchases 10 oranges. When the price falls, quantity demanded by him goes on rising. At price Re. 1 the quantity demanded by him rises to 60 oranges.

Demand Curve

- The graphical representation of demand schedule is called demand curve. The demand curve expresses the relationship between the price of the commodity and quantity demanded for it for the given period of time.



Law of Demand

- The law of demand explains the **inverse relationship** that exists between **price and quantity demanded**. The law states that **other things remaining the same, as price of a commodity falls, its quantity demanded increases and vice-versa**. The downward sloping demand curve shows this inverse relationship.

Exceptions to the Law of Demand

There are certain exceptions to the law of demand which are as follows:

1. Giffen's goods (Inferior goods): **Giffen goods are particular type of inferior goods whose income quantity relationship is inverse and price quantity relationship is direct.** eg. Tapioca, jowar, bajra, cheap varieties of cloth etc.

Exceptions to the Law of Demand

2. Conspicuous goods (Veblen goods/ prestige goods): When the price of prestige commodity goes up their demand shall also increase. For eg, the price of diamond increases as its demand may also increase and demand decreases as price falls.

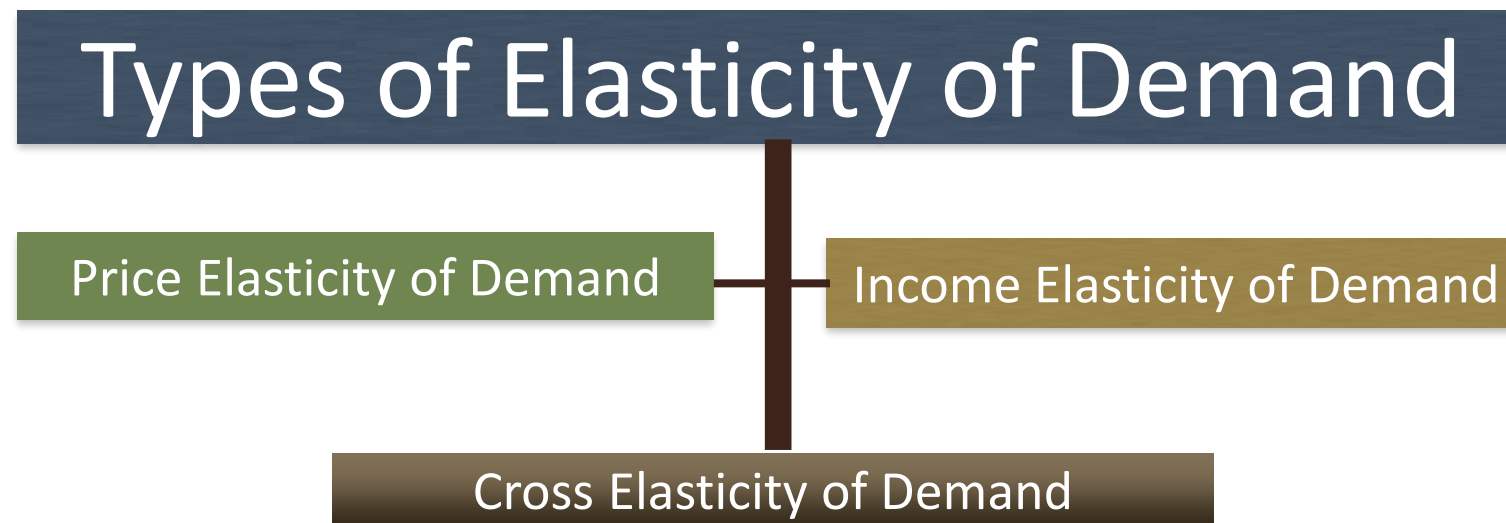
3. Necessities of life: The law cannot apply in the case of necessities of life. Changes in its price do not bring about changes in its demand.

4. Future change in price: If prices are expected to be higher in future, then people buy more of the same commodity even if its current prices are high. So the expectation of future price may invalidate the law of demand.

5. Ignorance of consumers: Sometimes, consumers buy at a higher price because they may not be aware of lower prices elsewhere. This happens in imperfect markets

Elasticity of demand

Elasticity of demand refers to the degree of responsiveness of quantity demanded of a commodity in response to change in its price, income, and price of related goods.



1. Price Elasticity of Demand

✓ *Price Elasticity of Demand is the ratio of the percentage change in demand to the percentage change in price*

✓ *In other words, price elasticity of demand means the degree of responsiveness of demand for a commodity to change in its price,*

$$\text{Price Elasticity, } E_p = \frac{\% \text{ change in demand}}{\% \text{ change in Price}}$$

$$E_p = \frac{\text{Change in quantity} / \text{Original quantity} \times 100}{\text{Change in Price} / \text{Original Price} \times 100}$$

$$E_p = \frac{\text{Change in Quantity}}{\text{Original Quantity}} \times \frac{\text{Original Price}}{\text{Change in Price}}$$

In Symbolic terms

$$E_p = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

E_p -Price Elasticity of demand, Q - Quantity, P - Price, ΔQ - Change in quantity, ΔP – Change in Price

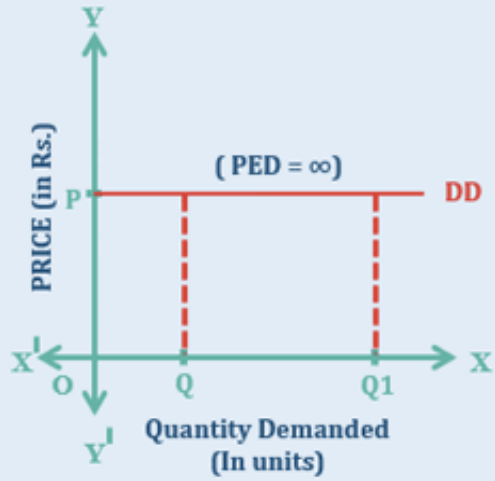
Types of Price Elasticity of Demand

- Perfectly elastic demand
- Perfectly inelastic demand
- Relatively elastic demand
- Relatively inelastic demand
- Unitary elastic demand

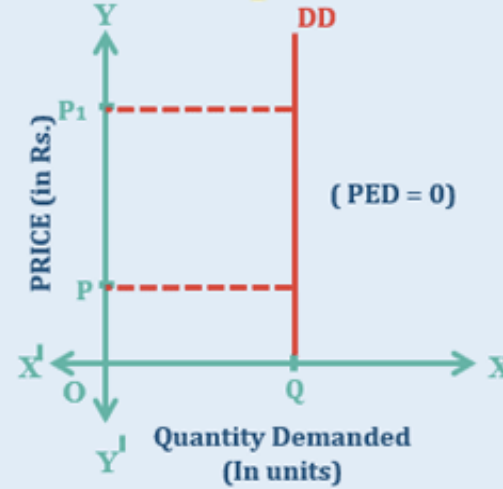
Numerical Value	Types/ Degrees of Price Elasticity of Demand	Description
$E_p = \infty$	Perfectly Elastic	Perfect elastic demand means that quantity demanded will increase to infinity when the price decreases, and quantity demanded will decrease to zero when price increases. In this case demand curve will be a horizontal straight line parallel to the X-axis.
$E_p = 0$	Perfectly Inelastic	This is a situation in which quantity demanded remains constant irrespective of the changes in price. The demand curve will be a vertical straight line parallel to the Y-axis.
$E_p > 1$	Relatively Elastic/ Elastic	Demand is relatively elastic/ elastic when a given proportionate change in price causes a more than proportionate change in quantity demanded. For eg., If price changes by 10%, quantity demanded changes by 30%. The demand curve will be a flat curve.
$E_p < 1$	Relatively Inelastic/ Inelastic	The demand for a good is said to be relatively inelastic when a given proportionate change in price causes a less than proportionate change in quantity demanded. For eg if price changes by 20% quantity demanded changes by 10%. The demand curve will be a very steep curve.
$E_p = 1$	Unitary Elastic	Demand is said to be unitary elastic when a given proportionate change in price causes an equally proportionate change in quantity demanded. For eg. If price changes by 10%, quantity demanded also changes by 10%.

Price Elasticity of Demand

1. Perfectly elastic



2. Perfectly inelastic



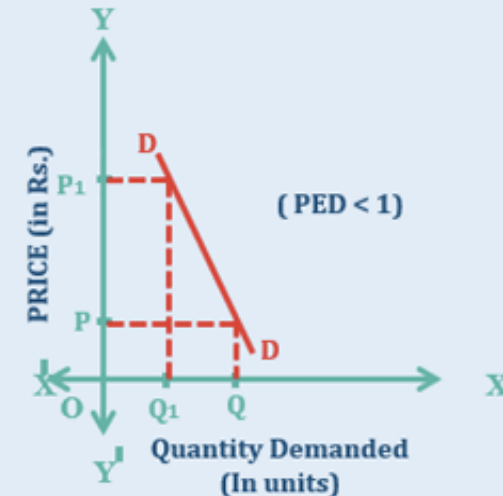
3. Unitary elastic



4. Relatively elastic



5. Relatively inelastic



Factors determining elasticity of demand

1. **Nature of the commodity:** Elasticity of demand depends on the nature of the commodity (Necessaries/ Luxuries). Necessaries are inelastic in nature and luxuries are elastic.
2. **Availability of substitutes:** Commodities having close substitutes have high elastic demand. If the commodity has no substitute, it will be less elastic.
3. **Level of income of the household:** Higher the income level of the household, lesser will be the elasticity of demand. But in the low income households, elasticity of demand would be high.
4. **Possibility of postponement:** If the consumption of a commodity can be postponed, its demand will be more elastic. On the other hand, if its consumption cannot be postponed, its demand will be less elastic.
5. **Level of prices:** High priced and low priced commodities have less elasticity of demand.
6. **Habit of consumer:** If a consumer is used to purchase a particular commodity, the demand would be inelastic.

Income Elasticity of Demand

Income Elasticity of Demand is the ratio of the percentage change in demand to the percentage change in Income

$$E_y = \frac{\% \text{ change in demand}}{\% \text{ change in Income}}$$

$$E_y = \frac{\text{Change in Quantity}}{\text{Original Quantity}} \times \frac{\text{Original Income}}{\text{Change in Income}}$$

In Symbolic terms

$$E_y = \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

E_y -Income Elasticity of demand, Q- Quantity, Y- Income, Δ - Change

Types of income elasticity

- 1. Zero income elasticity :** Here changes in income does not change the demand for a product. For eg., the change in income does not affect the demand for salt.
- 2. Negative income elasticity:** In this case an increase in income leads to a reduction in quantity demanded. These types of goods are called inferior good.
- 3. Positive income elasticity:** Income elasticity is positive for all normal goods. An increase in income results in an increase in demand.

Positive income elasticity can be of three types: (i) Unitary elastic demand ($e_y=1$) (ii) Elastic demand ($e_y>1$) and inelastic demand ($e_y<1$).

Cross Elasticity of Demand

- *Cross elasticity of demand is the degree of responsiveness of quantity demanded of a commodity to the change in the price of its substitutes and complementary goods.*
- ***Cross Elasticity of Demand (E_c) covers three types of goods; substitute goods, complementary goods, and unrelated goods. By determining the E_c , we can determine the relationship between them.***
- *The substitute goods have positive cross elasticity because the increase in the price of one product increases the demand for other goods (tea & coffee).*
- The complementary goods have negative cross elasticity because increase in the price of one type of goods decreases the demand for its complementary goods (petrol & car).

Cross Elasticity of Demand

Cross Elasticity of Demand of demand is the ratio of the percentage change in demand of one commodity to the percentage change in the price of related commodity.

$$\text{Cross Elasticity, } E_c = \frac{\% \text{ change in demand of Good } x}{\% \text{ change in Price of Good } y}$$

In Symbolic terms

$$E_c = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

E_c -Cross Elasticity, Q_x - Quantity demanded of good x , P_y - Price of good y ,
 Δ - Change

Type of Goods

Substitute goods: Positive cross elasticity coefficient,

Eg. Tea & Coffee

Complementary Goods: Negative cross elasticity coefficient

Eg. Car and Petrol

Independent Goods: No correlation

Eg. Movie ticket and Bread

Uses/ Applications of Price Elasticity of Demand

- 1. To the Government (in taxation):** It is useful to government in fixing the tax on a product. If the government wants to increase its tax revenue, the tax of those commodities which are having less elastic demand should be increased.
- 2. To Businessman (in pricing):** It is useful to the producers in fixing the price of his product. A producer can charge higher price if demand of the product is less elastic (inelastic). If demand is more elastic only a lower price can be charged.
- 3. Importance in International Trade:** If a commodity has inelastic demand in the export market, a country can export more. If a good has elastic demand in home market, it can import such goods. Thus the country gains from foreign trade.
- 4. Price Discrimination:** Price Discrimination is the practice of charging different prices for the same product in different markets or with different consumers. This can be done only when the price elasticity of demand is different with different consumers or with different markets.

SUPPLY

Supply can be defined as the quantity of a commodity offered for sale at a price during a given period of time. Supply increases with increase in price and decreases with decrease in price.

Determinants of Supply

1. **Price of the commodity:** A change in the price will affect the supply of a commodity. Higher the price, higher the quantity supplied and lower the price, lower will be the output supplied.
2. **Prices of factors of production:** Prices of factors of production have a direct effect on the cost of production and consequent change in the supply of commodity. Higher the prices of factors of production lesser the amount of commodity produced and supplied and vice-versa.
3. **Goals of the firm:** Supply of a commodity depends on the objectives of the firm. If the firm aims to maximize the sales or revenue the producer will be ready to produce larger amounts of commodities and thereby increase supply in the market.
4. **Technology:** When there is a technological improvement cost of production decreases and hence supply increases.
5. **Govt. policies:** If the govt. increases the tax on a product its supply decreases. On the other hand a subsidy may increase the supply of a product.

SUPPLY SCHEDULE

The supply schedule shows that how the quantity supplied of a good varies as its price varies. In other words, **supply schedule refers to the table which shows the relation between different levels of quantity supplied and different levels of price.**

Supply schedule of a seller for commodity 'X'

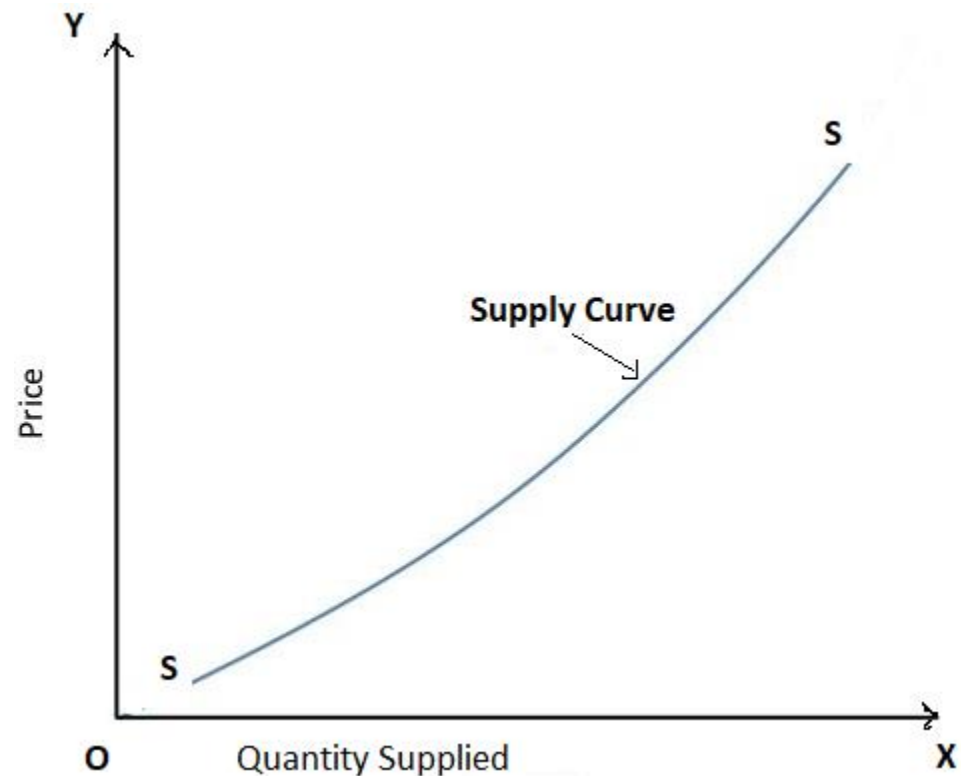
Price per unit of 'X' (in Rs.)	Quantity supplied of 'X' (in Kg)
1	5
2	10
3	15
4	20
5	25

The table shows different levels of commodity 'X' offered by the seller at different prices. He offers more at higher prices and less at lower prices.

SUPPLY CURVE

The diagrammatic representation of the supply schedule is known as supply curve. It shows the relation between different levels of quantity supplied and different levels of price.

In the figure, the X axis represents quantity supplied and the Y axis represents the price of the commodity. The supply curve SS slopes upwards from left to right showing a positive slope. The upward sloping curve shows that as price rises, quantity supplied also rises.



LAW OF SUPPLY

- The Law of Supply states that “other things remaining unchanged, an increase in the price of a product leads to an increase in the quantity supplied of it.”
- A producer increases the supply of the product when price increases. As prices rise, production becomes more remunerative and attractive.

Price elasticity of supply

Price elasticity of supply is the degree of responsiveness of quantity supplied to changes in price. It can be expressed as:

$$E_s = \frac{\text{Proportionate change in quantity supplied}}{\text{Proportionate change in price}}$$

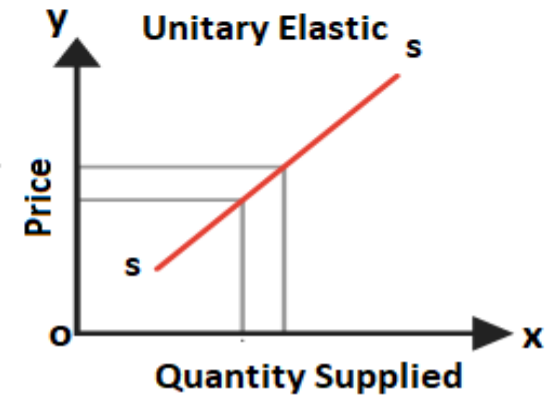
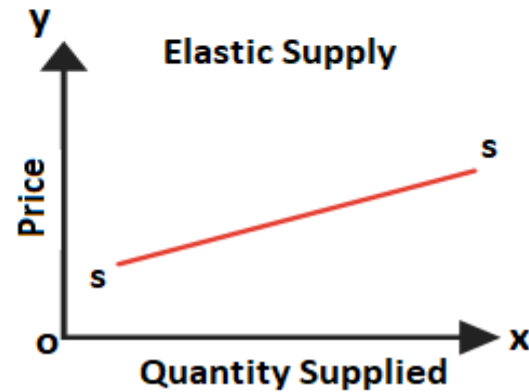
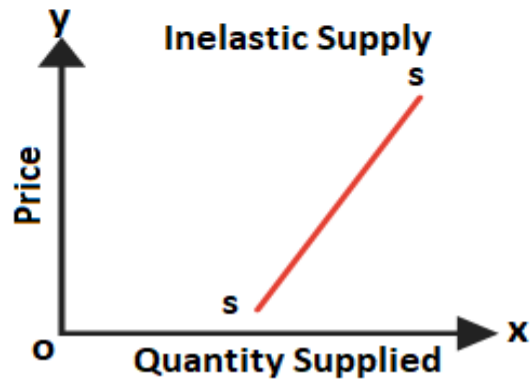
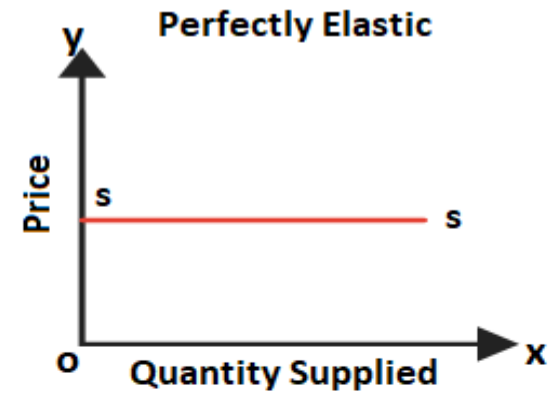
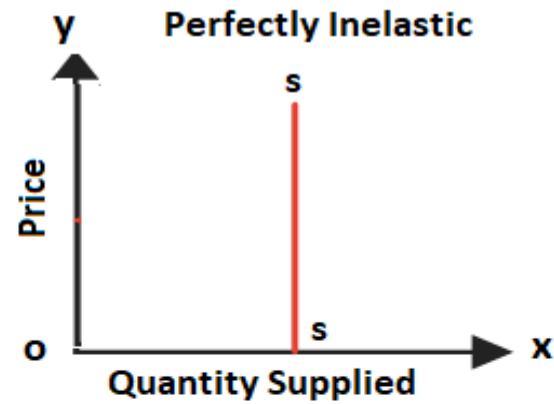
In Symbolic terms

$$E_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

E_s -Price Elasticity of supply, Q - Initial Quantity supplied, P - Initial Price, ΔQ - Change in quantity supplied, ΔP – Change in Price

Numerical Value	Types/ Degrees of Price Elasticity supply	Description
$E_s = \infty$	Perfectly Elastic supply	Supply is said to be perfectly elastic when a small change in price leads to an infinite change in the quantity supplied. Here supply curve becomes a horizontal straight line parallel to X axis and $es = \infty$
$E_s = 0$	Perfectly Inelastic supply	Perfectly inelastic supply is a situation in which price changes cause no changes in quantity supplied. Here, the supply curve will be a vertical straight line parallel to the Y-axis and $es = 0$
$E_s > 1$	Relatively Elastic supply	Relatively elastic supply is the situation where a given proportionate change in price causes a more than proportionate change in quantity supplied. Here the supply curve will be a flat but upward rising curve.
$E_s < 1$	Relatively Inelastic supply	Relatively inelastic supply is the situation where a given proportionate change in price causes a less than proportionate change in quantity supplied. Here the supply curve will be a steep upward rising curve.
$E_s = 1$	Unitary Elastic	Supply is said to be unitary elastic when a given proportionate change in price causes an equally proportionate change in quantity supplied. For eg. If price changes by 10%, quantity supplied also changes by 10%.

Price Elasticity of Supply



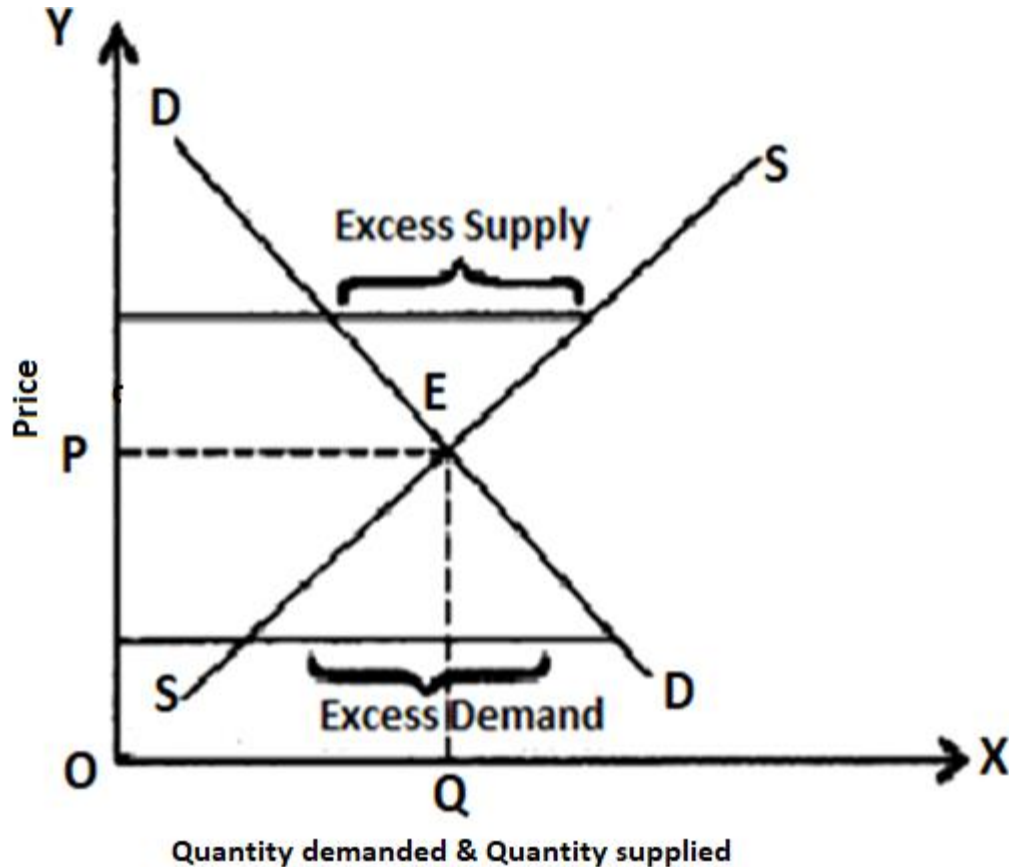
Equilibrium Price

- The price at which the market demand equals market supply is the equilibrium price, and the quantity demanded and supplied at this price is the equilibrium quantity.
- Equilibrium point is the point at which the market demand curve intersect the market supply curve.
- Equilibrium price determination can be explained with the help of a demand and supply schedule, and diagram.

Demand and Supply Schedules

Price per unit of commodity	Quantity demanded per week	Quantity Supplied per week
(Rs.)	(Units)	(Units)
50	100	500
40	200	400
30	300	300
20	400	200
10	500	100

Equilibrium Price



In our diagram, 'E' is the equilibrium point at which the market demand curve 'DD' intersect the market supply curve 'SS'. The price at which market demand equals market supply is the equilibrium price. Here 'P' is the equilibrium price and 'Q' is the equilibrium quantity.

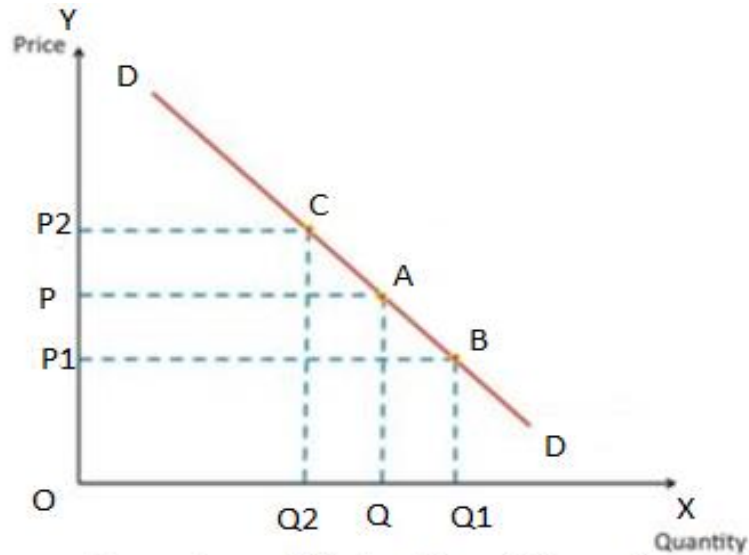
Changes in demand

Changes in demand can be in the form of;

- Expansion and Contraction of Demand
- Increase and Decrease in Demand

1. Expansion and Contraction of Demand

It is also called change in quantity demanded and it occurs due to a change in the price of a commodity. **When price falls demand rises. This is expansion of demand.** On the other hand **when price rises demand falls and this is called contraction of demand.**



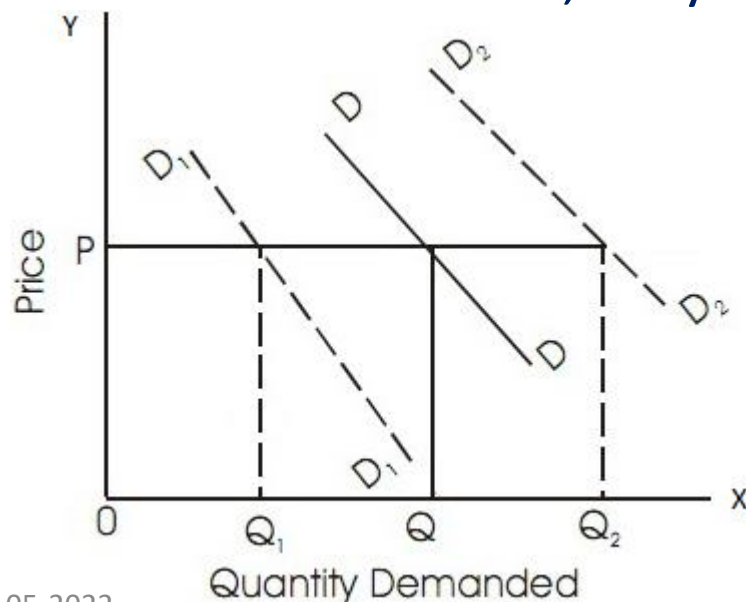
Expansion and Contraction of Demand

In the diagram when price decreases from P to P_1 demand rises from Q to Q_1 . This is due to Expansion. Movement from Q to Q_2 is contraction. When price changes consumer moves upwards or downwards along the same demand curve. Therefore, it is also called movements along a demand curve.

Changes in demand

2. Increase and Decrease in Demand

These are the changes in demand due to changes in factors determining demand other than price. For example when income increases demand also increases and vice versa. **Increase in demand means at the same price a larger quantity is demanded and decrease in demand means at the same price lesser quantity is demanded.** When demand increases demand curve shifts rightwards and when demand decreases demand curve shifts leftwards. Therefore, they are also called shifts in demand.



In the diagram the initial demand is Q . When demand increases, at the same price OP a larger quantity OQ_2 is demanded and when demand decreases, at OP price a low quantity OQ_1 is demanded.

Changes in demand

Reasons for Increase in demand

1. Increase in income of the consumer.
2. Increase in the price of substitute goods.
3. Decrease in the price of complementary goods.
4. A favourable change in the taste of the consumer.
5. Expectations of further increase in price.
6. Increase in advertisement expenditure.
7. Increase in population.

Industrial Economics and Foreign Trade

Numerical example

Demand function of a product is given as $D=50-2P$ and supply function $S=20+3P$. What will be the equilibrium price and quantity of the product? Find the excess demand of the product when price equals Rs. 3.

At the equilibrium point, Demand = supply

$$\text{That is, } 50-2P = 20+3P \text{ ie } 5P = 30$$

Therefore $P = 6$. Thus equilibrium price of the product is Rs. 6

To find equilibrium quantity substitute equilibrium price in any one of the equations.

When equilibrium price is substituted in demand function we get

$$D = 50 - 2 \cdot 6 = 38 \quad \text{Thus equilibrium quantity is } 38$$

$$\text{When } p = 3 \quad D = 50 - 2 \cdot 3 = 44 \quad S = 20 + 3 \cdot 3 = 29$$

Therefore excess demand when p equals 3 is 15 (44-29)

Consumer surplus and Producer surplus

1. Consumer Surplus

The difference between the price that consumers are willing to pay for a good and the price that they actually pay for a good is called ***consumer surplus***.

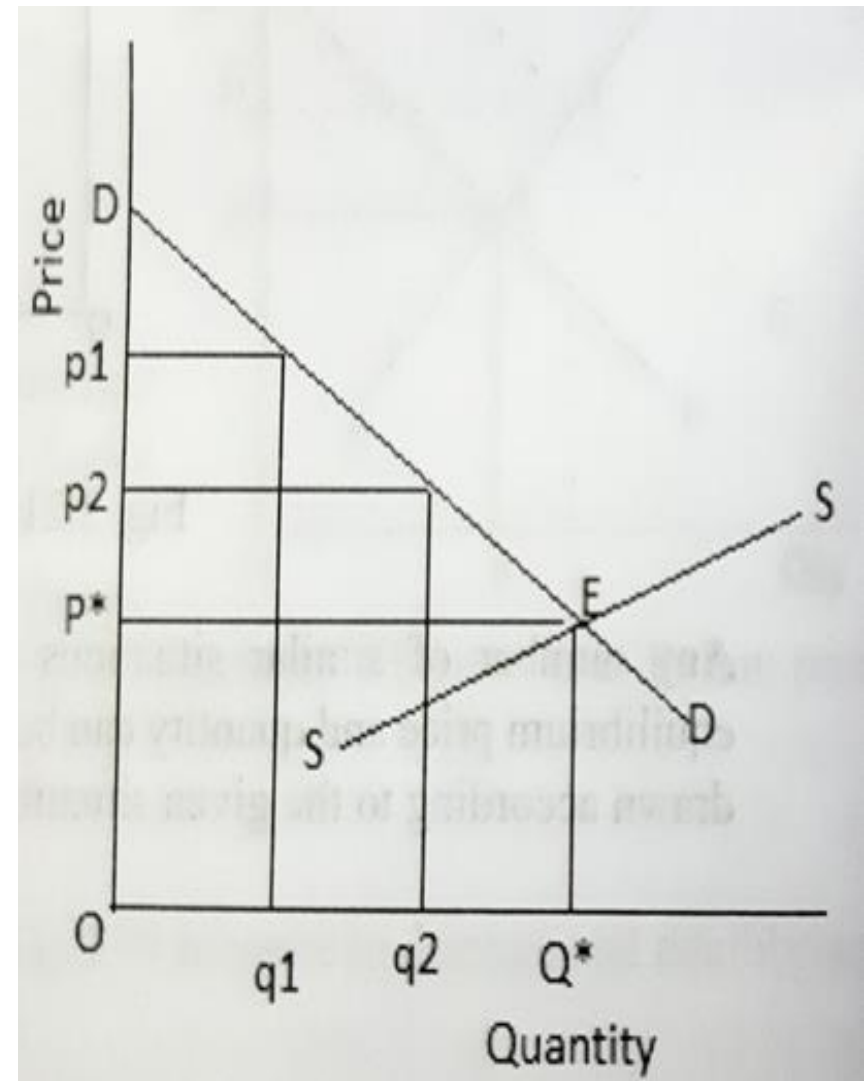
For example, suppose a person was ready to pay Rs. 1500 for a shirt. But the actual price was Rs. 1200 and hence he paid only this amount. Here the difference Rs. 300 is the consumer surplus.

The concept of consumer surplus can be explained with the help of the following diagram.

In the diagram, for the first unit q_1 , the consumer has a very high utility and hence he is ready to pay P_1 price. Similarly for the second unit he is ready to pay P_2 . But the equilibrium or market price is only P^* and hence he pays the same price P^* for the entire quantity (Q^*) he purchases.

Here, consumer is willing to pay an amount $ODEQ^*$. But the actual amount he has to pay is only OP^*EQ^* .

The difference between these two, P^*DE is the consumer surplus.



Producer Surplus

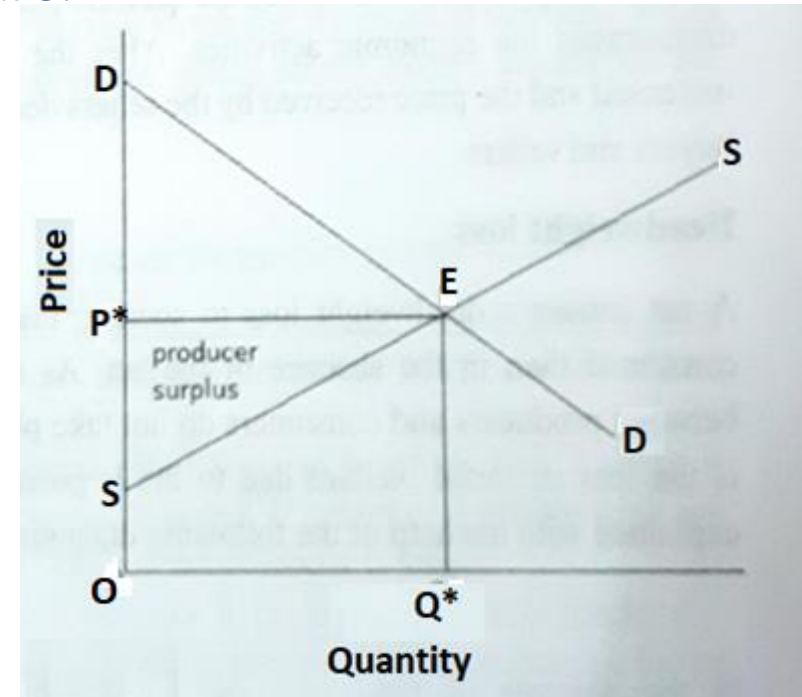
2. Producer surplus

Producer surplus is the difference between price at which producers are willing to sell a good and the price they actually receive from consumers.

Therefore, it is the difference between the supply curve and the market price. Producer surplus is a measure of producer welfare.

In the diagram the seller is ready to sell the equilibrium quantity Q^* for an amount equal to $OSEQ^*$ but he actually gets OP^*EQ^* . The difference P^*ES is the producer surplus.

The sum of consumer surplus and producer surplus is the **social surplus**. In the above diagram it is represented by the area **DES** where **DEP*** is the consumer surplus.



Deadweight loss

A tax causes a deadweight loss to society, because less of the good is produced and consumed than in the absence of the tax. **Deadweight loss due to tax is the loss in social welfare due to the imposition of the tax.**

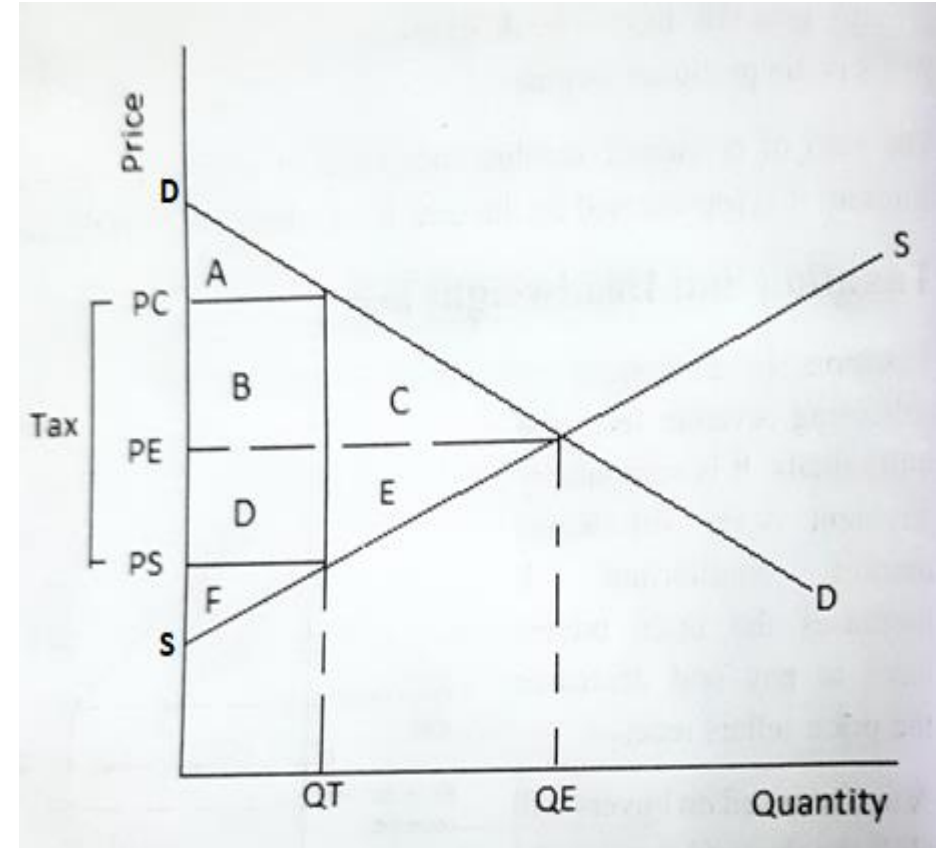
Deadweight loss can be explained with the help of the following diagram.

Deadweight loss

In the absence of tax market is in equilibrium when PE is the price and QE is the quantity traded in the market. In this situation consumer surplus is equal to $A+B+C$ and the producer surplus is equal to $D+E+F$. Here the social surplus (total surplus) equals $A+B+C+D+E+F$.

When the tax is imposed, the price that the consumers have to pay increases to PC . Therefore, the quantity traded in the market decreases to QT and the price received by the sellers decreases to PS .

Because of the tax consumer surplus decreases to A and producer surplus decreases to F . Tax revenue is $B+D$. After the tax, the total surplus is $A+B+D+F$. There is a loss in the social surplus equivalent to ' $C+E$ ' which is not appropriated by the Government, consumers or producers. Thus, the area $C+E$ is the deadweight loss due to tax.



Taxation

- Taxes are the most important source of government income. Dr. Dalton defined tax as “a compulsory contribution imposed by a public authority, irrespective of the exact amount of service rendered to the taxpayer in return.”
- According to Prof. Seligman, a tax is “a compulsory contribution from a person to the government to defray the expenses incurred in the common interest of all, without reference to special benefits conferred.”

Thus a tax is a compulsory contribution for the welfare of the community as a whole.

Taxation

Characteristics of a Tax

- It is a compulsory contribution imposed by the government on the people residing in the country. Since it is a compulsory payment, a person who refuses to pay a tax is liable to punishment.
- A tax is a payment made by the tax payers which is used by the govt. for the benefit of all the citizens.
- A tax is not levied in return for any specific service rendered by the govt. to the taxpayer.

Objectives or Aims of Taxation

The main objectives of taxation are as follows;

1. Raising public Revenue.

The most important objective for the imposition of taxes is to collect revenue for the govt. The greater the need of funds, the greater is the resort to taxation.

2. Reduction of Inequalities in Income and Wealth.

Another objective of taxation is to reduce the inequality of income and wealth. This is possible by taxing rich people heavily and less tax on the poorer.

3. Promotion of capital formation.

Another objective of taxation is the promotion of capital formation. In underdeveloped and developing countries, one of the main objectives of taxation is to make savings more dynamic and promote capital formation.

Objectives or Aims of Taxation

4. Increase in National Income.

Another objective of taxation is to increase the national income. Tax is the main source of the government income. This income is used for productive purposes and thereby overall production is increased.

5. Restriction of un necessary consumption.

Another objective of taxation is to restrict the unnecessary consumption particularly of harmful commodities, such as wine, cigarettes, liquor etc. When heavy tax is imposed on such commodities, the consumption of such commodities are automatically reduced.

Direct and Indirect Taxation

Prof. Dalton made distinction between **direct and indirect taxes as**, “A direct tax is really paid by a person on whom it is legally imposed, while an indirect tax is imposed on one person, but paid partly or wholly by another or bargaining between them”.

Thus, according to him in direct taxes the impact and incidence are on the same person where as in indirect taxes the impact is on one person and the incidence is on some other person.

According to Prof. **Shirass**, income tax, wealth tax, and corporate tax which are directly paid to the state, may be called as direct taxes. On the other hand, taxes which affect the income and property of persons through their consumption may be called as indirect taxes.

Merits of Direct Taxes

Direct taxes have the following merits.

Economy

The cost of collecting direct taxes is low as compared to indirect taxes, because the same staff who assess small incomes and properties can also assess large incomes and property.

The payment of these taxes is made direct by the tax payer to the state and therefore every single paisa is deposited in the state treasury.

Certainty

These taxes are certain for the tax payer as well as for the government. The tax payer knows fully how much he has to pay and the state also knows how much it has to receive.

Equitable

Direct taxes are equitable because they are based on the principle of progression and fall more heavily on the rich than the poor.

Reduce Inequalities

Direct taxes are usually progressive and rich people are subjected to higher rates of taxation, while the poor people are exempted from direct tax obligations. Hence these taxes help to reduce inequalities in income.

Elasticity

Direct taxes are also elastic and the government can increase its revenue simply by raising the rate of taxation.

Demerits of Direct Taxes

Following are the demerits of the direct taxes:

Unpopular

Direct taxes are generally not shifted and therefore, they are painful to the tax payer. Hence, such taxes are unpopular in nature.

Inconvenient

Direct taxes are very inconvenient to pay. Every tax-payer feels the pinch. The tax has to be paid in lump sum; the filling of returns is a complicated affair; and there is a lot of harassment.

Possibility of Evasion

Direct taxes have been believed to be a tax on honesty but generally it has been observed that the tax payers are not cent percent honest and they strive to evade the tax through various undesirable methods.

Possibility of Injustice

In practice, it is very difficult to assess the income of all classes accurately. Hence, the direct taxes may not put equal burden on all classes.

Arbitrary

The direct taxes are arbitrary in the sense that the rates of taxes are fixed arbitrarily by the govt. and not strictly according to the ability of the tax payers to pay.

Indirect Taxes

According to **Prof. Dalton**” an Indirect tax is imposed on one person, but paid partly or wholly by another or bargaining between them”. In the case of indirect taxes the impact is on one person and the incidence is on some other person.

Merits of Indirect Taxes

Indirect taxes possess the following merits;

Convenient

An indirect tax is convenient. They are paid only when a commodity or a service is bought. So they are paid in small amounts rather than in lump sum. Since these taxes are included in the prices of commodities, buyers do not feel the burden of these taxes.

No Evasion

It is very difficult to evade an indirect tax, because it is mixed up with the price of the commodity one purchases.

Equitable

Indirect taxes can also be made more equitable by being imposed on articles generally consumed by the rich. That is why, luxuries are generally taxed at a higher rate.

Elastic

Indirect taxes can be elastic, that is, the revenue from them can be increased whenever, the govt. may desire to do so.

Wide Coverage

Through indirect taxes, every member of the community can be taxed, so that everyone may provide something to the government to finance the services of public utilities.

Demerits of Indirect Taxes

The following are the demerits of indirect taxes.

Uncertain

The income from indirect taxes is uncertain, because the taxing authority cannot accurately estimate the total yield from different taxes.

Regressive

Indirect taxes are generally regressive in nature as they fall more heavily up on the poor than up on the rich.

No Civic Consciousness

Indirect taxes do not develop any civic consciousness in the taxpayer, because nobody feels that he is paying a tax as it is concealed in price.

Demerits of Indirect Taxes

Uneconomical

The administrative cost of collecting such taxes is generally heavy, because they have to be collected from millions of individuals in small amounts. Therefore, they may be uneconomical.

Discourage Savings

Indirect taxes are included in the price and therefore, people have to spend more on essential commodities. Hence they discourage savings.

Impact and Incidence of Taxation

The money burden of a tax does not always lie on the person from whom it is collected. In many cases it is borne by other people also.

Meaning of Impact

The impact of a tax is on the person on whom the tax is imposed in the first instance. In other words, impact of a tax refers to the immediate burden of the tax and not to the ultimate burden of the tax.

Meaning of Shifting

Shifting of a tax refers to the process by which the money burden of a tax is transferred from one person to another.

Meaning of Incidence

Incidence of a tax refers to the money burden of a tax on the person who ultimately bears it.

Distinction between Impact and Incidence

- The impact refers to the initial burden of the tax while incidence refers to the ultimate burden of the tax.
- Impact is felt by the tax payer at the point of imposition of the tax, while incidence is felt by the tax payer at the point of settlement or rest of the tax.
- The impact of the tax is felt by the person from whom the tax is collected, while the incidence is felt by the person who actually bears the burden of the tax.
- Impact of a tax can be shifted, but the incidence of a tax cannot be shifted.

Canons of Taxation

There are certain rules and principles that should be strictly followed by the taxing authorities when imposing taxes upon the people. These rules and regulations are called **canons of taxation**.

Adam Smith has enumerated the following four canons of taxation which are accepted universally;

Canon of Equality

It is the duty of the taxing authority to impose taxes upon the public, according to their ability to pay. It is also the duty of the citizens of the citizens to pay taxes to the public authority.

Canon of certainty

According to this canon, the tax payer should know in advance how much tax he has to pay, the time of payment, the manner of payment etc. If the tax is certain, the tax officials cannot exploit the tax payers in any manner.

Canons of Taxation

Canon of convenience

According to this canon, taxes should be levied and collected in such a manner that it provides the maximum of convenience to the tax-payers. The reason is that the tax payer makes a sacrifice at the time of payment of the tax.

Canon of Economy

This canon implies that minimum possible money should be spent in the collection of taxes. The maximum part of the collected amount should be deposited in the government treasury.

The above mentioned canons of taxation are most significant and have an important place in every financial structure.

Canons of Taxation

Canon of productivity

According to this canon, the tax should yield sufficient income to the government for the maintenance of administration. If a tax yields poor income, it cannot be considered as a productive tax.

Canon of Elasticity

According to this canon, the tax structure in a country should be elastic in nature. It means that the revenue from taxes should be increased or decreased according to the requirements of the country.

Canon of Simplicity

According to this canon, every tax should be simple. So that the tax payer can understand its implications without the help of experts.

These principles or canons are considered to be the essential requirements of a good taxation policy.

Numerical example

1. (a) A mobile manufacturing company sells its mobile phones at a price of Rs. 4500 per unit and in a year the company sells 10000 hand sets. When they decrease the price to Rs. 4000 sales increase to 12000 units. What is the price elasticity of demand for this mobile phone?

$$E_p = \frac{p}{q} * \frac{\Delta q}{\Delta p}$$

$$P=4500 \quad q=10000 \quad \Delta q = 12000-10000=2000 \quad \Delta p = 4000-4500=-500$$

Therefore $E_p = \frac{4500}{10000} * \frac{2000}{-500} = -1.8$ Since $ep > 1$ the product has more elastic demand

1. (b) Suppose this company wants to increase its sales by 50%. To what percentage its price is to be reduced?

It is estimated that $ep = 1.8$ Percentage increase in demand needed = 50

$E_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$

Percentage change in price

$$1.8 = \frac{50}{\% \text{ change in price}} \quad \text{Therefore, } \% \text{ change in price} = 50/1.8 = 27.78$$

Example: 1

The demand for a commodity was 100 units when the price was Rs. 10. The demand for it increased to 120 units when the price was reduced to Rs. 9. How would you measure the elasticity of demand?

Solution

$$e_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where

$$P = \text{Rs. } 10$$

$$Q = 100 \text{ units}$$

$$\Delta Q = 120 - 100 = 20 \text{ units}$$

$$\Delta P = \text{Rs. } 9 - \text{Rs. } 10 = \text{Rs. } -1$$

$$e_p = \frac{20}{-1} \times \frac{10}{100} = \frac{2}{-1} = \underline{\underline{-2}}$$

price elasticity of demand = -2

1% change in price thus results in 2% change in demand.

Note: $\Delta P = \text{New Price} - \text{Original Price}$
 $\Delta Q = \text{New quantity} - \text{Original quantity}$

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Numerical example

Suppose a consumer purchases 10 units of a commodity when his monthly income is Rs.20000. When his monthly income increases to Rs.25000 he purchases 12 units of it. Estimate income elasticity of demand and interpret the result.

$$Y = 20000, Q = 10, \Delta Y = 25000 - 20000 = 5000, \Delta Q = 12 - 10 = 2$$

$e_y = 20000 \cdot 2 / 10 \cdot 5000 = 0.8$ As e_y is 0.8 it is less income elastic demand. As the sign of income elasticity is positive, it is a normal good.

Numerical example

A consumer purchases 50 units of commodity X when its price is Rs.8/- per unit. In the next month he purchased 60 units at the same price. This was due to an increase in the price of another commodity Y from Rs.10 to 12. Calculate cross elasticity of demand and interpret the result.

$$P_y=10, Q_x=50, \Delta Q_x = 60 - 50 = 10, \Delta P_y = 12 - 10 = 2$$

$e_c=10*10/50*2 = 1$ Since $e_c=1$ it is unit cross elastic demand. As the sign is positive X and Y are substitute goods.

KTU Exam

Define cross elasticity of demand. A tea manufacturing company was able to sell 8000 kg of tea when the price of coffee was Rs.70 per kg. Later they were able to sell 9000 kg when the price of coffee became Rs.80 per kg. Calculate the cross elasticity of demand for tea. Are the two commodities substitutes or complements? Give reason.

Answer

$$\begin{aligned}\text{Cross elasticity of demand, } ec &= \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x} \\ &= \frac{1000}{10} \times \frac{70}{8000} \\ &= 100 \times 0.00875 \\ &= 0.875\end{aligned}$$

Goods are substitutes since ec is positive

KTU Exam

Define price elasticity of demand. A company producing soft drink is selling its product for Rs. 22. It sells 1000 units, and then increases the price to Rs.24. Now sales fall to 900 units. What is the price elasticity of soft drink? Is the demand elastic or inelastic? Why?

Answer

$$\begin{aligned}\text{Price elasticity of demand, } e_p &= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \\ &= \frac{100}{2} \times \frac{22}{1000} \\ &= 50 \times 0.022 \\ &= 1.1\end{aligned}$$

Demand is elastic since the value of price elasticity is greater than 1

Thank You