

CHAPTER TWO

2. THEORY OF DEMAND AND SUPPLY

2.1. Theory of Demand

- **The theory of demand** is related to the economic activities of consumers-consumption. Hence, the purpose of the theory of demand is **to determine the various factors that affect demand**.
- It explains the factors affecting the **consumer demand** for a particular commodity.
- **Are demand and desire similar?**
- The answer is **no**. Because a mere desire doesn't imply demand. A person said to have a demand if he has a **desire (willingness to buy) and the purchasing power**.

1

- If a poor person desire to buy a **car**, this desire cannot be called demand **unless** it is backed by the **ability** to pay for it.
- **Demand**, thus, means the **desire** of the consumer for a commodity backed by **purchasing power**.
- More specifically, **demand** refers to various quantities of a commodity or service that a consumer would purchase at a given time in a market at various prices, given other things unchanged (**ceteris paribus**).

• What is the law of demand?

It is a law which states that the price of a commodity and its quantity demanded is inversely related, **ceteris paribus**. i.e. as the price of a commodity increases, the quantity demanded for that commodity decreases, and vice-versa, **ceteris paribus**.

2

2.1.1. Demand Schedule (table), Demand Curve, and Demand Function

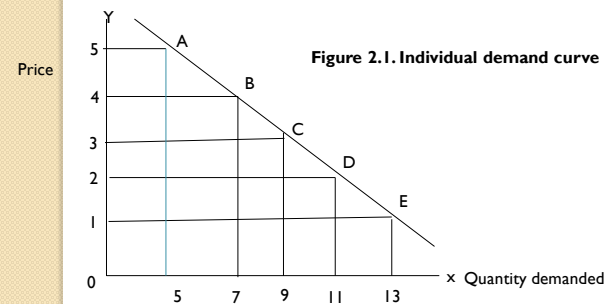
- The relationship that exists between price and the amount of a commodity purchased can be represented by a table (schedule) or a curve or an equation.
- **An individual demand schedule** a list of the various quantities of a commodity, which an individual consumer purchases at various levels of prices in the market. A demand schedule states the relationship between price and quantity demanded in a table form.

Table 2.1. Individual household demand for orange per week

Combinations	A	B	C	D	E
Price per kg	5	4	3	2	1
Quantity dd/week	5	7	9	11	13

3

- **Demand curve** is a graphical representation of the relationship between different quantities of a commodity demanded by an individual at different prices per time period.



4

- From the above figure you may notice that as the price declines quantity demanded increases and vice-versa.

- Demand function** is a mathematical relationship between price and quantity demanded, all other things remaining the same. A typical demand function is given by: $Q_d = (P)$,

Where, Q_d is quantity demanded and P is the price of the commodity, in our case the price of orange.

Example: let the demand function be $Q_d = a + bP$,

$b = \frac{\Delta Q}{\Delta P}$ (e.g. moving from point A to B on figure 2.1 above).

$b = \frac{7-5}{4-5} = -2$, where b is the slope of demand curve

$$Q = a - 2P$$

5

Thus, to find a , substitute price either point A or B.

$$7 = a - 2(4), \quad a = 15$$

Therefore, $Q = 15 - 2P$ is the demand function for orange in the above numerical example.

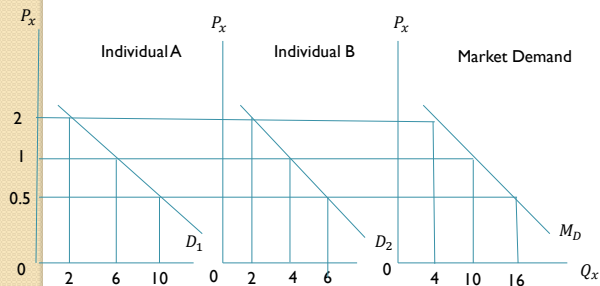
Market Demand: The market demand schedule, curve or function is derived by horizontally **adding the quantity demanded for the product by all buyers at each price.**

Assume that there are two consumers in the market for a particular commodity X (say hamburger) and their demand at each price is given using table as follows:

Price (\$)	Q _x dded by A	Q _x dded by B	Market demand
2	2	2	4
1	6	4	10
0.5	10	6	16

6

Graphically the market demand can be derived as follows:



Thus, the market demand for a commodity shows the various quantities of the commodity demanded in the market per unit of time at various alternative price of the commodity while holding every thing else constant.

7

Numerical Example:

Suppose the individual demand function of a product is given by:

$P = 10 - Q/2$ and there are about 100 identical buyers in the market. Then the market demand

function is given by:

$$P = 10 - Q/2 \leftrightarrow Q/2 = 10 - P \leftrightarrow Q = 20 - 2P \text{ and } Q_m = (20 - 2P) 100 = 2000 - 200P$$

2.1.2. The Determinants of Demand

The demand for a product is influenced by many factors.

Some of these factors are:

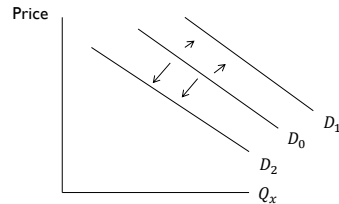
- I. Price of the product
- II. Taste or preference of consumers
- III. Income of the consumers
- IV. Price of related goods

8

V. Consumers expectation of income and price

VI. Number of buyers in the market

Those factors listed above other than price are called **demand shifters**. A change in **own price** is only a **movement along** the same demand curve.



When demand increases, demand curve shifts upward (D1) while a decrease in demand shifts demand curve downwards (D2).

9

Now let us examine how each factor affect demand.

1. Tastes and Preferences

When the taste of a consumer changes in favor of a good, her/his demand will increase and the opposite is true.

2. The income of the consumer

Here we have two types of goods according to the income effect on the goods:

- **Normal goods** are goods whose demand increase as a result of the rise in income.
- **Inferior goods** are goods whose demand decreases with a rise in income.

10

3. Price of related goods

Two goods are said to be related if a change in the price of one good affects the demand for another good. There are **two types of related goods**. These are **substitute and complimentary goods**.

Substitute goods: are goods which satisfy the same desire of the consumer. For example, tea and coffee or coca and Pepsi two goods are substitutes, then price of one and the demand for the other are **directly related**. And coffee or Pepsi and Coca-Cola are **substitute goods**.

Complimentary goods: on the other hand, are those goods which are jointly consumed. For example, car and fuel or tea and sugar are considered as **compliments**. If two goods are complements, then price of one and the demand for the other are **inversely related**.

11

4. Consumer expectation of income and price

Higher price expectation will increase demand while a lower future price expectation will decrease the demand for the good.

5. Number of buyer in the market

Since market demand is the horizontal sum of individual demand, an increase in the number of buyers will increase demand while a decrease in the number of buyers will decrease demand.

2.1.3. Elasticity of Demand

It refers to the degree of responsiveness of quantity demanded of a good to a change in its price, or change in income, or change in prices of related goods.

Commonly, there are three kinds of demand elasticity: **price elasticity**, **income elasticity**, and **cross elasticity**.

12

i. Price Elasticity of Demand

It is a measure of how much the quantity demanded of a good responds to a change in the price of that good. It indicates how consumers react to changes in price.

Price elasticity demand can be measured in two ways. These are **point** and **arc** elasticity.

a. Point Price Elasticity of Demand

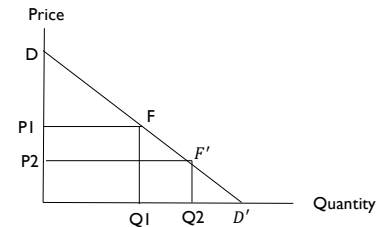
This is calculated to find elasticity at a **given point**. The price elasticity of demand can be determined by the following formula.

$$e_p = \frac{\frac{dQ}{Q}}{\frac{dP}{P}} = \frac{dQ}{dP} \times \frac{P}{Q}$$

13

If the demand is linear $Q = b_0 - b_1P$, its slope is $dQ/dP = -b_1$. Substituting in the formula we obtain,
 $e_p = -b_1 \cdot P/Q$.

Graphically, the point elasticity of a linear demand curve is shown by **the ratio of the segments of the line to the right and to the left of the particular point**. For example, in the figure below the elasticity at point **F** is the ratio: $e_p = FD'/FD$



14

B. Arc Price Elasticity Of Demand

The formula of point price elasticity is applicable if and only if there is a very small change in the price. But if the price changes appreciably, we often use the alternative measure of price elasticity called **Arc price elasticity**.

It measures the elasticity at the mid-point of the two points A and B on the demand curve defined by the initial and the new price levels.

The arc method formula is:

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{(P_0 + P_1)/2}{(Q_0 + Q_1)/2} = \frac{Q_1 - Q_0}{P_1 - P_0} \times \frac{P_0 + P_1}{Q_0 + Q_1}$$

15

Here, Q_0 = Original quantity demanded

Q_1 = New quantity demanded

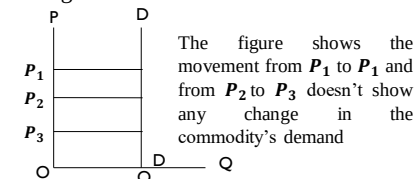
P_0 = Original price

P_1 = New price

The range of values of the elasticity is $0 \leq e_p \leq \infty$.

A. If $e_p = 0$, then the demand is perfectly inelastic

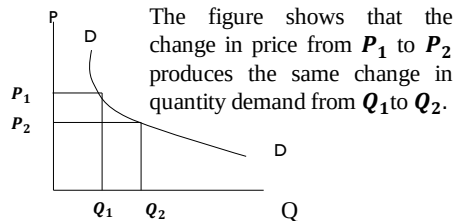
It is when there is no change in the demand of a commodity with the change in its price. In the case of perfectly inelastic demand, demand curve is represented as a straight vertical line:



16

B. If $ep = 1$, then the demand is unitary elastic

When the proportionate change in demand produces the same change in the price of the product. The demand curve for unitary elastic demand is represented as rectangular hyperbola as shown it is shown in the figure below:

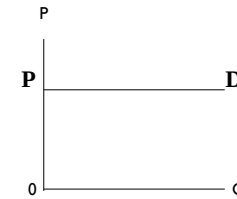


17

C. If $ep = \infty$, then the demand is perfectly elastic

It happens when a small change in price of a product causes a major change in its demand. For instance, a small rise in price results in fall in demand to zero, while a small fall in price causes increase in demand to infinity. In perfectly elastic demand, the demand curve is represented by a **horizontal straight line**:

The figure can be interpreted as at price P consumers are ready to buy infinite product as they want. However, a small rise in price would resist consumers to buy the product.

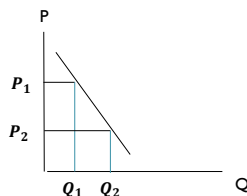


18

D. If $0 < ep < 1$, then the demand is relatively inelastic

It happens when the percentage change in quantity demand is less than that of the percentage change in the price that product. For instance, if the price of a product increases by 30% and the quantity demand decreases only by 10%, then the demand would be called **relatively inelastic**. The demand curve of relatively inelastic demand is **rapidly sloping**.

The figure shows that the proportionate change in demand (from Q_1 to Q_2) is relatively smaller than the proportionate change in price (P_1 to P_2).

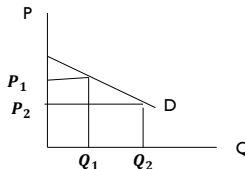


19

E. If $1 < ep < \infty$, then the demand is relatively elastic

It happens when the proportionate change in demand is greater than the proportionate change in price of a product. For example, if the price of a product increases by 20% and the quantity demand of the product decreases by 25%, then the demand would be called **relatively elastic**. The demand curve of relatively elastic demand is **gradually sloping** as it can be shown in the figure below:

The figure shows that the change in quantity demand (from Q_1 to Q_2) is relatively larger than that of the proportionate change in price (from P_1 to P_2).



20

Determinants of price Elasticity of Demand

The following factors make price elasticity of demand elastic or inelastic other than **changes in the price of the product**.

i) The availability of substitutes: the more substitutes available for a product, the more *elastic* will be the price elasticity of demand.

ii) Time: In the long- run, price elasticity of demand tends to be elastic. Because:

- More substitute goods could be produced.
- People tend to adjust their consumption pattern.

iii) The proportion of income consumers spend for a product: the smaller the proportion of income spent for a good, the less price elastic will be.

21

iv) The importance of the commodity in the consumers' budget :

- Luxury goods □ tend to be more **elastic**, example: gold.
- Necessity goods □ tend to be **less elastic** example: Salt.

ii. Income Elasticity Of Demand

The income elasticity is defined as the proportionate change in the quantity demanded resulting from a proportionate change in income:

$$E_y = \frac{dQ/Q}{dY/Y} = \frac{dQ}{dY} \times \frac{Y}{Q}$$

If $e_y > 0$, then the commodity is **normal**

If $e_y < 0$, then the commodity is **inferior**

If $e_y > 1$, then the commodity is **luxury**

If $0 < e_y < 1$, then the commodity is **necessity**

22

iii. The Cross- Elasticity Of Demand

The cross elasticity of demand is defined as the proportionate change in quantity demand of X resulting from a proportionate change in the price of Y.

$$E_{xy} = \frac{dQ_x/Q_x}{dP_y/P_y} = \frac{dQ_x}{dP_y} \times \frac{P_y}{Q_x}$$

If $E_{xy} < 0$, then X & Y are complementary goods

If $E_{xy} > 0$, then X & Y are substitute goods

If $E_{xy} = 0$, then X & Y are non-related goods

2.2. Theory of Supply

Supply indicates various quantities of a product that sellers (producers) are willing and able to provide at different prices in a given period of time, other things remaining unchanged.

23

The law of supply: states that, *ceteris paribus*, as price of a product increase, quantity supplied of the product increases, and as price decreases, quantity supplied decreases. It tells us there is a **positive** relationship between price and quantity supplied.

2.2.1 Supply schedule, supply curve and supply function

Supply schedule

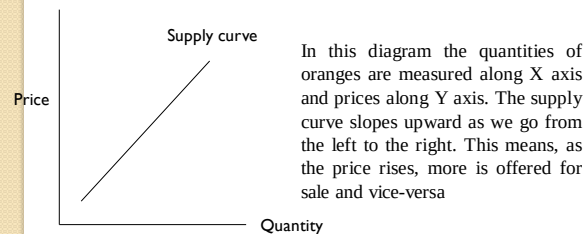
A supply schedule is a tabular statement that states the different quantities of a commodity offered for sale at different prices. **Table 2.3: an individual seller's supply schedule for butter**

Price (birr /kg)	30	25	20	15	10
Quantity SS kg/week	100	90	80	70	60

24

Supply Curve

A supply curve conveys the same information as a supply schedule. But it shows the information graphically rather than in a tabular form.



25

The supply of a commodity can be briefly expressed in the following functional relationship: $S = f(P)$, where S is quantity supplied and P is price of the commodity.

Market supply: It is derived by horizontally adding the quantity supplied of the product by all sellers at each price.

Price/unit	Quantity ss by A	Quantity ss by B	Quantity ss by C	Market ss/week
5	11	15	8	34
4	10.5	13	7	30.5
3	8	11.5	5.5	25
2	6	8.5	4	18.5
1	4	6	2	12

26

2.2.2 Determinants of supply

Apart from the change in price which causes a change in quantity demanded, the supply of a particular product is determined by:

- i) price of inputs (cost of inputs)
- ii) technology
- iii) prices of related goods
- iv) sellers' expectation of price of the product
- v) taxes & subsidies
- vi) number of sellers in the market
- vii) weather, etc.

27

2.2.3. Elasticity of Supply

It is the degree of responsiveness of the supply to change in price. As the case with price elasticity of demand, we can measure the **price elasticity of supply** using **point and arc elasticity methods**. However, a simple and most commonly used method is point method:

$es_p = \frac{\frac{dQ}{Q}}{\frac{dP}{P}} = \frac{dQ_s}{dP} \times \frac{P_i}{Q_{si}}$, where Q_s is quantity supply Q_{si} is initial quantity supply, P is price, and P_i is initial price.

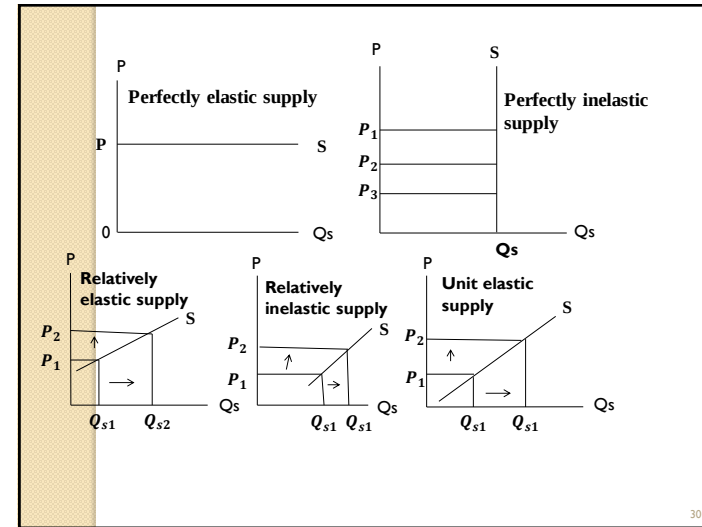
Like price elasticity of demand, price elasticity of supply can be **elastic, inelastic, unitary elastic, perfectly elastic or perfectly inelastic**.

28

The following table and graphs briefly explain about these types of price elasticity of supply.

Values of Elasticity of supply (ES)	Types of price elasticity of supply	Description
$ES=0$	Perfectly Inelastic	Change in price does not affect supply at all
$ES<1$	Relatively inelastic	% change in supply is less than % change in price
$ES=1$	Unitary elastic	% change in supply is equal to % change in price
$ES>1$	Relatively elastic	% change in supply is more than % change in price
$ES=\infty$	Perfectly elastic	Supply changes infinitely

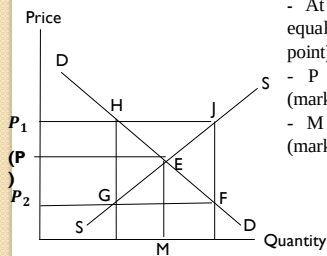
29



30

2.3. Market Equilibrium

Having **seen the demand and supply side** of the market, now let's bring demand and supply together so as to see how the market price of a product is determined. **Market equilibrium** occurs when market demand equals market supply.



- At point 'E' market demand equals market supply (equilibrium point)
- P is the market equilibrium (market clearing) price.
- M is the market equilibrium (market clearing) quantity.

31

In the above graph, any price greater than **P** will lead to **market surplus**. As the price of the commodity increases, consumers demand **less** of the product. On the other hand, as the price increases, producers supply **more** of the good.

Therefore, if price increases to **P₁** the market will have a **surplus of HJ**. If the price decreases to **P₂** buyers demand to buy more and suppliers prefer to decrease their supply leading to **shortage** in the market which is equal to **GF**.

Numerical example: Given market demand: $Q_d = 100 - 2P$, and market supply: $P = (Q_s / 2) + 10$

- Calculate the market equilibrium price and quantity
- Determine, whether there is surplus or shortage at $P = 25$ and $P = 35$.

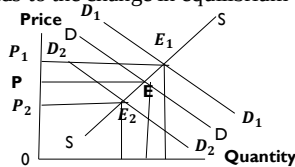
32

Effects of shift in demand and supply on equilibrium

Changes in demand and supply bring about changes in the equilibrium price level and the equilibrium quantity. Here we have **three scenarios**:

1) When demand changes and supply remains constant

Factors such as changes in income, tastes, and prices of related goods will lead to a change in demand. This leads to the change in equilibrium price and quantity:



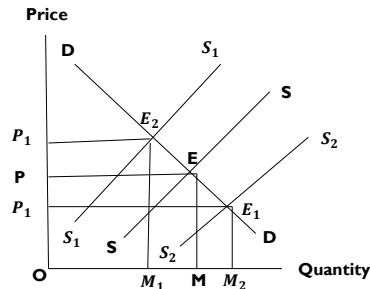
33

Given the supply, if the demand increases the demand curve will shift upward to the right and the equilibrium point will be moved from E to E_1 . **On the other hand**, if demand falls, the demand curve shifts downwards to the left and the equilibrium point will be moved from E to E_2 . **Supply being given**, a decrease in demand reduces both the equilibrium price and the quantity and **vice versa**.

2) When supply changes and demand remains constant

Changes in supply are brought by changes in technical knowledge and factor prices. The following graph explains the effects of changes in supply.

34



Given the demand, if the supply increases, the supply curve shifts to the right (S_2S_1) and the equilibrium point will be moved from E to E_1 . **On the contrary**, when the supply falls, the supply curve moves to the left (On the contrary, when the supply falls, the supply curve moves to the left (S_1S_1) and the equilibrium point will be moved from E to E_2 .

35

In this scenario, **increases in the supply** reduce the equilibrium price and increases the equilibrium quantity. Whereas **decreases in the supply** increases the **equilibrium price** and decreases the **equilibrium quantity**.

3) Effects of combined changes in demand and supply

When both demand and supply increase, the quantity of the product will increase definitely. But it is not certain whether the price will rise or fall. Here it depends on which one of them dominates the other. If the increase in demand and supply is same, then the price remains the same.

36

When demand and supply decline, the quantity decreases. But the change in price will depend upon the relative fall in demand and supply. If both demand and supply decline in the same ratio, there is no change in the equilibrium price, but the quantity decreases.