

Chapter Two: Theory of Demand and Supply

□ *Chapter outline*

❖ *Theory of demand*

- ✓ DD schedule (table), DD curve and DD function
- ✓ *Determinants of demand*
- ✓ *Elasticity of demand*

❖ *Theory of supply*

- ✓ Supply schedule, supply curve and supply function
- ✓ *Determinants of supply*
- ✓ Elasticity of supply
- ❖ *Market equilibrium*

2.1 Theory of demand

- **DD** is one of the forces **determining prices**.
- The purpose of the **theory of demand** is to **determine the various factors that affect DD**.
- In **our day-to-day life** we use the word ‘demand’ in a **loose sense** to mean a **desire of a person to purchase a commodity or service**.
- But, in economics it **has a specific meaning**, which is **different** from what we use **it in our day to day activities**.

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- **Demand** implies more than a **mere desire to purchase a commodity**.
- It states that the **consumer must be willing and able to purchase the commodity**, which he/she desires.
- His/her desire should be **backed by his/her purchasing power**.
- A **poor person** is **willing to buy a car**; it has no significance, since he/she has **no ability to pay for it**.

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- On the other hand, if his/her desire to buy the car is **backed by the purchasing power** then this constitutes demand.
- **DD**, thus, means the **desire of the consumer** for a **commodity backed by purchasing power**.
- These **two factors** are **essential**.
- If a consumer is **willing to buy** but is **not able to pay**, his/her desire will **not** become dd.

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- Similarly, if the consumer has the **ability to pay** but is **not willing to pay**, his/her desire will **not be called demand**.
- 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).

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- The **quantity DD** of a particular commodity depends on the **price of that commodity**.
- ❑ **Law of demand:** This is the principle of **DD**, which states that, **price of a commodity** and its **quantity demanded** are **inversely** related.

2.1.1 DD schedule (table), DD curve and DD function

- The **r/nship** that exists b/n **price** and **the amount of a commodity purchased** can be represented by a **table (schedule)** or a **curve** or an **equation**.

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- **DD schedule** can be constructed for any commodity if the list of **prices** and **quantities purchased** at those prices are **known**.
- An **individual DD schedule** is a list of the various quantities of a commodity, which an individual consumer purchases at various **levels of prices in the market**.

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- A **demand schedule** states the relationship b/n **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 demand/week	5	7	9	11	13

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

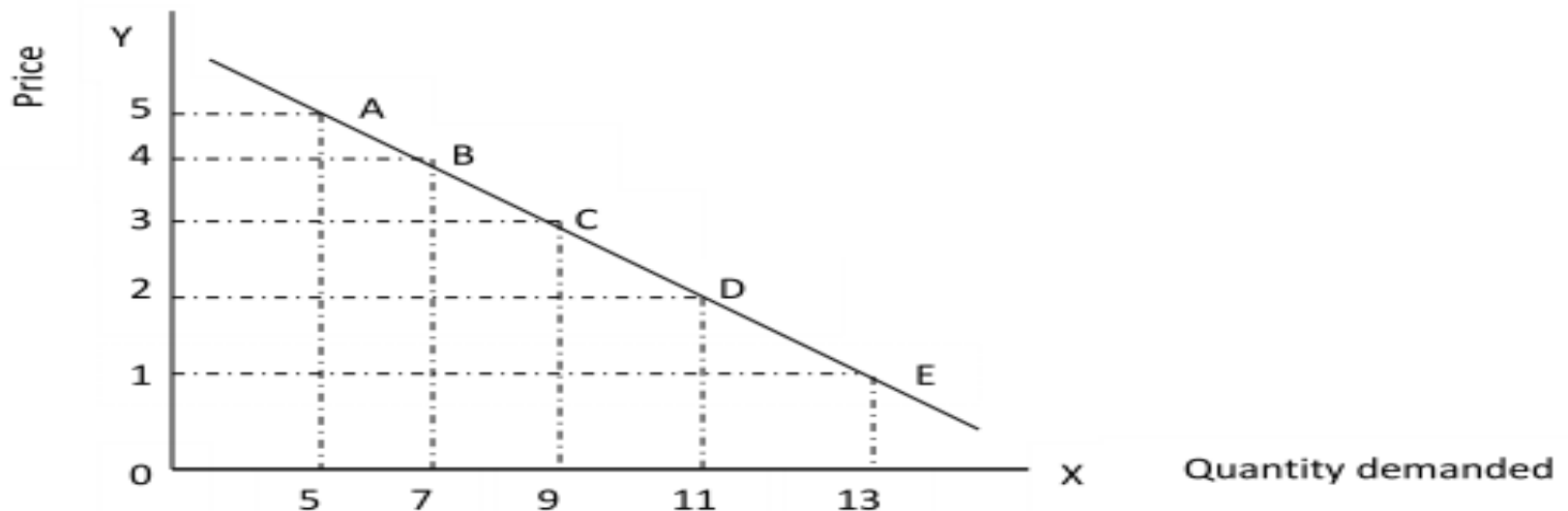


Figure 2.1: Individual demand curve

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- **Demand function** is a mathematical relationship between **price** and **quantity demanded**, all other things remaining the **same**.
- A typical **DD function** is given by: $Q_d = f(P)$ where **Q_d** is quantity demanded and **P** is price of the commodity, in our case price of orange.

...cont'd.

- **Example:** Let the **DD function** be **$Q = a + bP$**

$$b = \frac{\Delta Q}{\Delta P} \quad (\text{e.g. moving from point A to B})$$

on figure 2.1 above),

$$b = \frac{7-5}{4-5} = -2 \quad \text{where } b \text{ is the slope of the } \mathbf{dd \text{ curve}}$$

$Q = a - 2P$, to find **a**, substitute
price either t point **A** or **B**.

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

Thus, **$Q = 15 - 2P$** is the **dd function** for **orange** in the above **numerical example**.

...cont'd.

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

Table 2.2: Individual and market demand for a commodity

Price	Individual demand			Market demand
	Consumer-1	Consumer-2	Consumer-3	
8	0	0	0	0
5	3	5	1	9
3	5	7	2	14
0	7	9	4	20

...cont'd.

- ▶ The following graph depicts **market demand** curve at price equal to 3



Figure 2.2: Individual and Market demand curve

...cont'd.

- **Example:** Suppose the individual **DD function** of a product is given by: $P = 10 - Q/2$ and there are about **100 identical buyers** in the market.

- Then the market **dd function** is given by:

$$P = 10 - Q/2 \leftrightarrow Q/2 = 10 - P \leftrightarrow Q = 20 - 2P$$

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

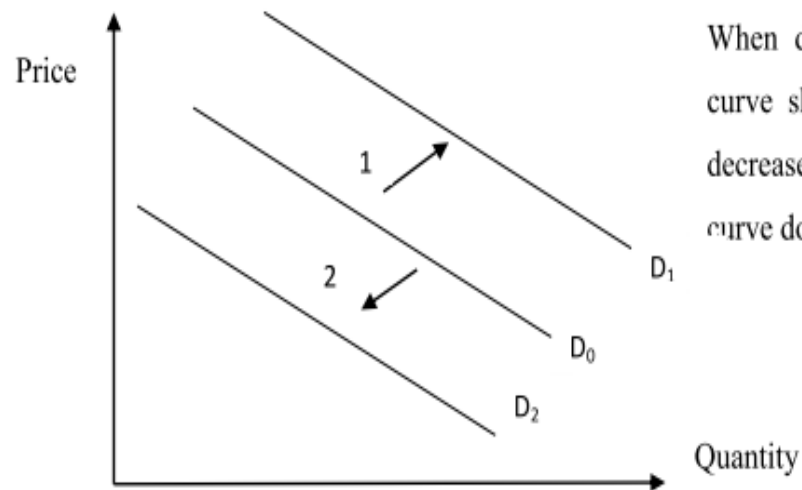
Thank you!!!

2.1.2 Determinants of demand

- The **dd** 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
 - v. Consumers expectation of price
 - vi. Number of buyers in the market

...cont'd.

- A change in any of the above listed factors except the **price of the good** will change the **dd**, while a *change in the price*, other factors remain constant will bring **change in quantity demanded**.



When demand increases, demand curve shifts upward (D_1) while a decrease in demand shifts demand curve downwards (D_2).

Figure 2.3: Shift in demand curve

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- Goods are classified into two categories depending on how a change in income affects their dd.
- a. **Inferior goods:** are poor quality goods with relatively lower price.
- ▶ There is inverse relationship between **income** and **quantity demand of inferior goods**.

...cont'd.

b. Normal goods: there is positive relationship
b/n normal goods and income.

However, the classification of goods into **normal** and **inferior** is **subjective** and it is usually dependent on the **socio-economic development** of the nation.

- There are **two types** of related goods.

...cont'd.

- ❖ **Substitute goods:** are goods which satisfy the **same desire of the consumer.**
- If two goods are substitutes, then price of one and the dd for the other are directly related.
- ❖ **Complimentary goods:** are those goods which **are jointly consumed.**
- E.g, **car** and **fuel** or **tea** and **sugar** are considered as compliments.
- If two goods are complements, then price of one and the dd for the other are **inversely related.**

2.1.3 *Elasticity of demand*

- In economics, the concept of **elasticity is very crucial** and is used to analyze the **quantitative** relationship b/n **price** and **quantity purchased or sold**.
- **Elasticity** is a measure of responsiveness of a dependent variable to changes in an independent variable.

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- **Elasticity of dd:** refers to the degree of responsiveness of **quantity demanded** of a good to a **change in any of its determinants**.
- **Commonly**, there are three kinds of elasticity of demand: **price elasticity**, **income elasticity**, and **cross elasticity**.

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i. Price Elasticity of Demand

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

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- It can be computed as the **percentage change in quantity demanded** divided by the **percentage change in price**. Price elasticity of 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.

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$$E_d^P = \frac{\text{Percentage change in quantity demanded}}{\text{percentage change in price}} = \frac{\% \Delta Q_d}{\% \Delta P}$$

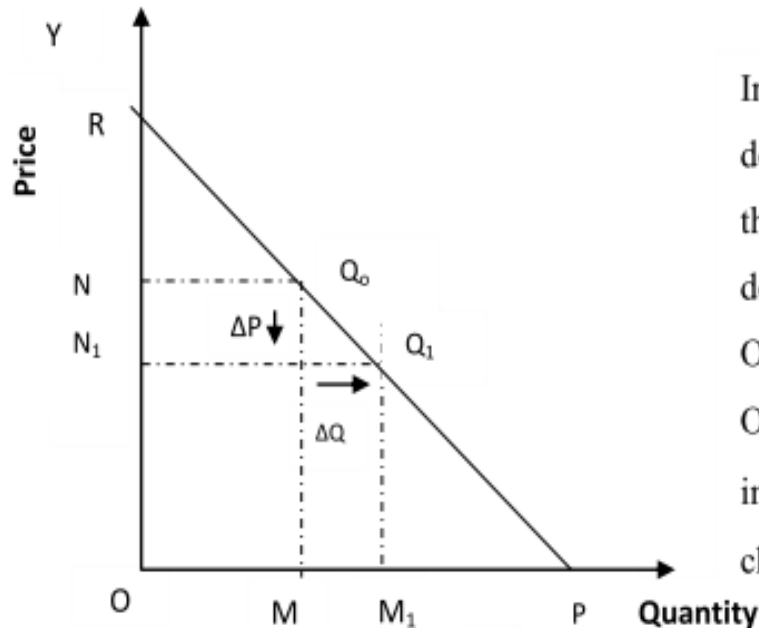
where $\% \Delta Q_d = \frac{Q_1 - Q_0}{Q_0} \times 100$ and

$$\% \Delta P = \frac{P_1 - P_0}{P_0} \times 100$$

$$\text{Thus, } E_d^P = \frac{\frac{Q_1 - Q_0}{Q_0} \times 100}{\frac{P_1 - P_0}{P_0} \times 100} = \frac{Q_1 - Q_0}{P_1 - P_0} \cdot \frac{P_0}{Q_0} = \frac{\Delta Q}{\Delta P} \cdot \frac{P_0}{Q_0}$$

...cont'd.

- In this method, we take a straight-line demand curve joining the two axes, and measure the elasticity between two points Q_0 and Q_1 which are assumed to be intimately close to each other.



In the diagram 'RP' is the straight-line demand curve, which connects both axes. In the beginning at the price ON the quantity demanded is OM. Then the price changes to ON₁ and the new quantity demanded will be OM₁. The symbol 'ΔP' represents the change in price while the symbol 'ΔQ' shows the change in quantity demanded.

Figure 2.4: Point elasticity of demand

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b. Arc price elasticity of demand

- Is an alternative method of elasticity measurement.
- In arc price elasticity of dd, the midpoints of the old and the new values of both price and quantity demanded are used.
- It measures a portion or a segment of the dd curve b/n the two points.

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- The formula for measuring **arc elasticity** is given below.

$$E_d = \frac{\text{Change in quantity demanded}}{\text{Original quantity plus new quantity demanded}} \div \frac{\text{Change in price}}{\text{Original price plus new price}}$$

Symbolically, the formula may be expressed thus:

$$E_d = \frac{Q_1 - Q_0}{Q_0 + Q_1} \div \frac{P_1 - P_0}{P_0 + P_1}$$

...cont'd.

Numerical example

- **Suppose** that the price of a commodity is **Br. 5** and the quantity **dd** at that **price is 100 units of a commodity**.
- Now assume that the **price of the commodity falls to Br. 4** and the **quantity dded rises to 110 units**.
- Then, the value of the arc elasticity will be

$$E_d = \frac{110 - 100}{100 + 110} \div \frac{4 - 5}{4 + 5} = \frac{10}{210} \div \frac{-1}{9} = -\frac{9}{21} = -\frac{3}{7}$$

...cont'd.

- Note that:
 - ❖ Elasticity of dd is unit free because it is a ratio of **percentage change**.
 - ❖ Elasticity of dd is usually a **negative** number because of the **law of dd** .
- i. If $|\varepsilon| > 1$, dd is said to be **elastic** and the product is **luxury product**.
- ii. If $0 \leq |\varepsilon| < 1$, dd is inelastic and the product is **necessity**.
- iii. If $|\varepsilon| = 1$, dd is unitary elastic.
- iv. If $|\varepsilon| = 0$, dd is said to be **perfectly inelastic**.
- v. If $|\varepsilon| = \infty$, dd is said to be **perfectly elastic**.

Determinants of price Elasticity of Demand

- 1. The availability of substitutes:* the more substitutes available for a product, the more elastic will be the price elasticity of dd.
- 2. Time:* In the long - run, price elasticity of dd tends to be elastic. Because:
 - ✓ More substitute goods could be produced.
 - ✓ People tend to adjust their consumption pattern.

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- 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.
- 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.

...cont'd.

ii. Income Elasticity of Demand

- It is a measure of responsiveness of **dd** to **change in income**.

$$\varepsilon_d^I = \frac{\% \Delta Q_d}{\% \Delta I} = \frac{\Delta Q}{\Delta I} \cdot \frac{I}{Q}$$

□ Income elasticity of demand:

- i) If $\varepsilon_d^I > 1$, the good is **luxury** good.
- ii) If $\varepsilon_d^I < 1$ (and positive), the good is **necessity** good,
- iii) If $\varepsilon_d^I < 0$, (negative), the good is **inferior** good.

iii. Cross price Elasticity of Demand

- It measures how much the dd for a product is affected by a **change in price of another good**.

$$\epsilon_{xy} = \frac{\% \Delta Q_x}{\% \Delta P_y} = \frac{Q_{x_1} - Q_{x_0}}{P_{y_1} - P_{y_0}} \cdot \frac{P_{y_0}}{Q_{x_0}}$$

- The **cross – price elasticity of dd** for substitute goods is **positive**.
- The **cross – price elasticity of dd** for complementary goods is **negative**.

...cont'd.

iii) The cross – price elasticity of dd for unrelated goods is zero.

e.g., : Consider the following data which shows the changes in quantity demanded of good **X** in response to changes in the price of good **Y**.

Unit price of Y	Quantity demanded of X
10	1500
15	1000

...cont'd.

- Calculate the **cross –price elasticity** of dd b/n the **two goods**.
- What can you say about the **two goods**?

$$\varepsilon_{xy} = \frac{\Delta Q_x}{\Delta P_y} * \frac{P_{y_o}}{Q_{x_o}} = \left(\frac{1000 - 1500}{15 - 10} \right) * \frac{10}{1500} = \frac{-500}{5} * \frac{10}{1500} = -0.67$$

- **Therefore, the two goods are complements.**

2.2 Theory of supply

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

...cont'd.

- It tells us there is a **positive** r/nship b/n **price** and **quantity supplied**.

2.2.1 Supply schedule, supply curve and supply function

- A **supply schedule** is a **tabular statement** that states the **d/t quantities** of a commodity offered for sale at **d/t prices**.

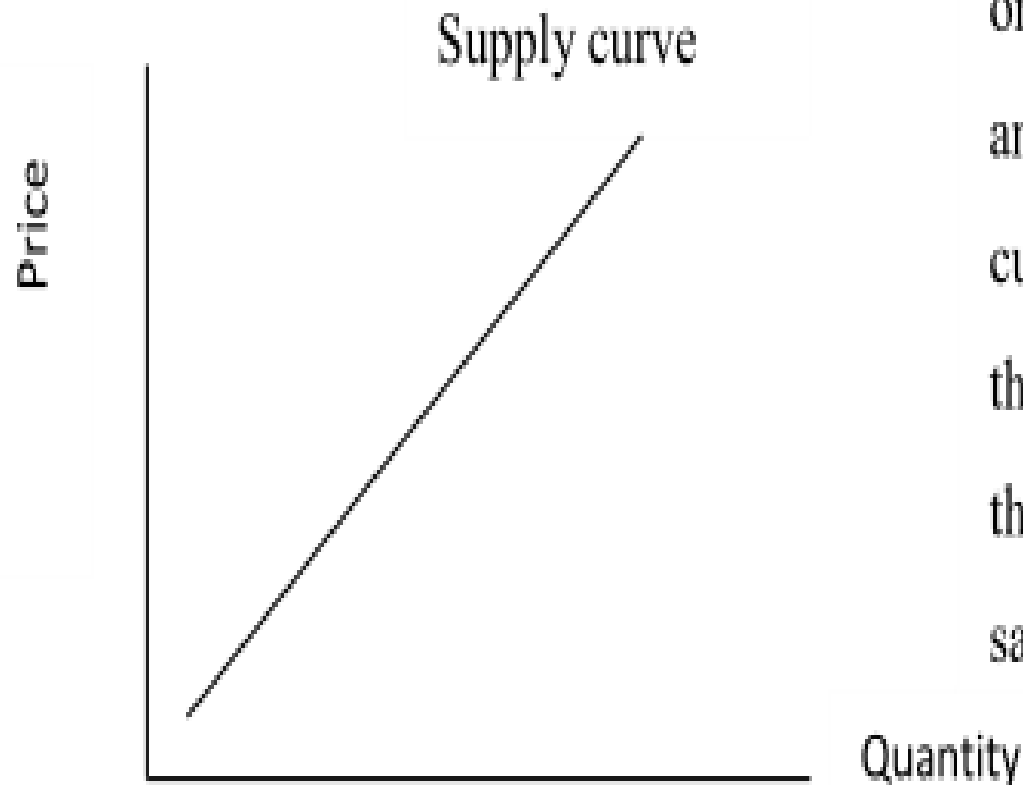
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Table 2.3: an individual seller's supply schedule for butter

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

- A **supply curve** shows the **relationship b/n price and quantity supply graphically rather than in a tabular form.**

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In this diagram the quantities of oranges are measured along X axis and prices along Y axis. The supply curve slopes upward as we go from the left to the right. This means, as the price rises, more is offered for sale and vice-versa.

Figure 2.5 supply curve

...cont'd.

- The **supply of a commodity** can be briefly expressed in the following **functional relationship**:

$$\mathbf{S} = \mathbf{f}(\mathbf{P}),$$

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**.

...cont'd.

Table 2.4: Derivation of the market supply of good X

Price per unit	Quantity supplied by seller 1	Quantity supplied by seller 2	Quantity supplied by seller 3	Market supply per 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

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:
 1. **Effect of change in input price**
 2. **Effect of change in Technology**
 3. *Effect of change in weather condition*

2.2.3 Elasticity of supply

- It is the degree of responsiveness of the **SS** to **change in price**.
- It may be defined as the **percentage change in quantity supplied** divided by the **percentage change in price**.
- we can also measure the **price elasticity of SS** using **point** and **arc elasticity** methods.

...cont'd.

- **However**, a simple and most commonly used method is **point method** and it can be calculated as the **ratio of proportionate change in quantity supplied of a commodity** to a given **proportionate change in its price**.
- **Thus**, the formula for measuring the **price elasticity of supply** is:

$$E_s = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{\Delta P} * \frac{P}{Q}$$

...cont'd.

- Elasticity of SS can be **elastic, inelastic, unitary elastic, perfectly elastic or perfectly inelastic.**
- The **SS is elastic** when a **small change on price** leads to **great change in SS.**
- It is **inelastic or less elastic** when a **great change in price** induces only a **slight change in SS.**
- If the **supply is perfectly inelastic**, it will be represented by a **vertical line** shown as below.

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- If **SS** is **perfectly elastic** it will be represented by a **horizontal straight line** as in second diagram.

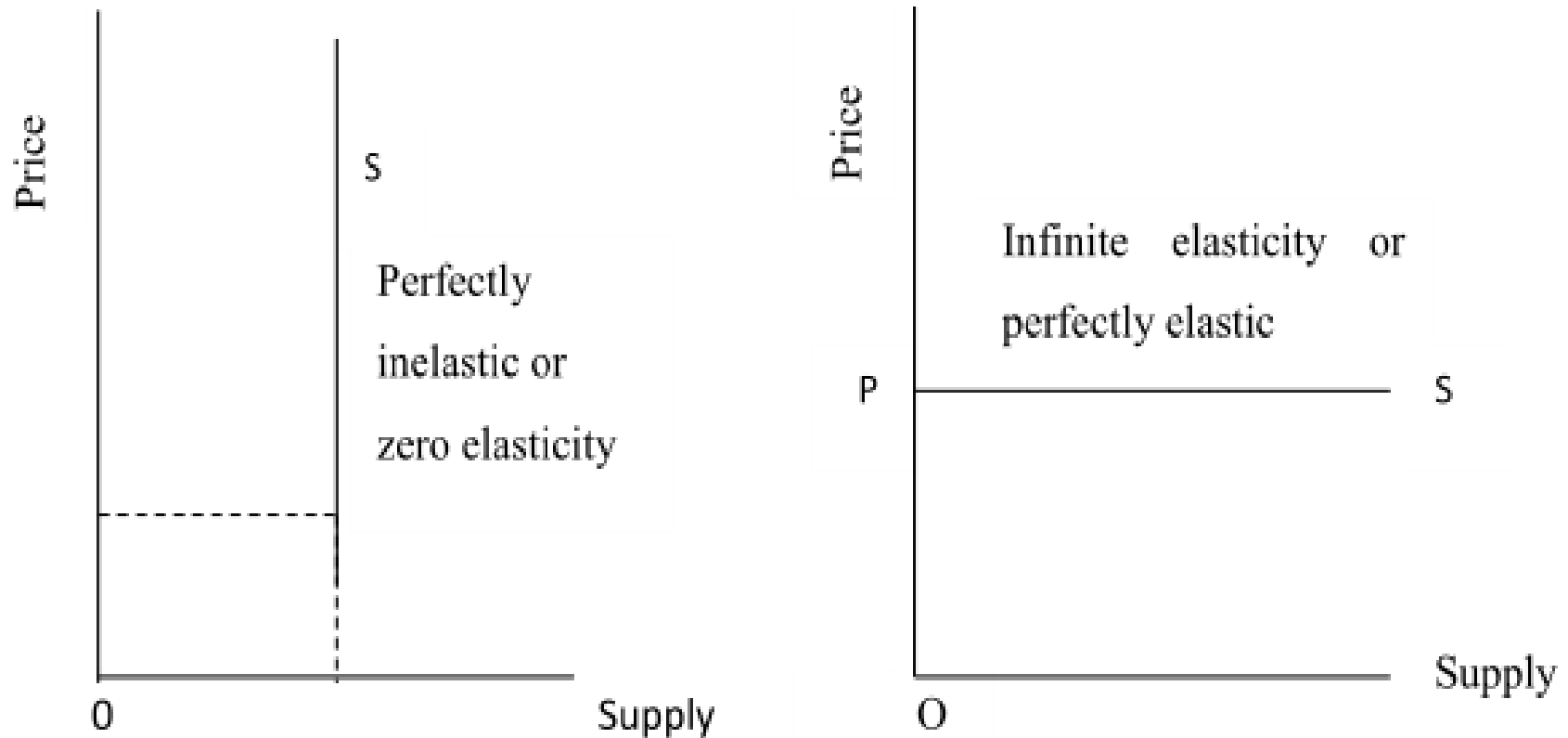
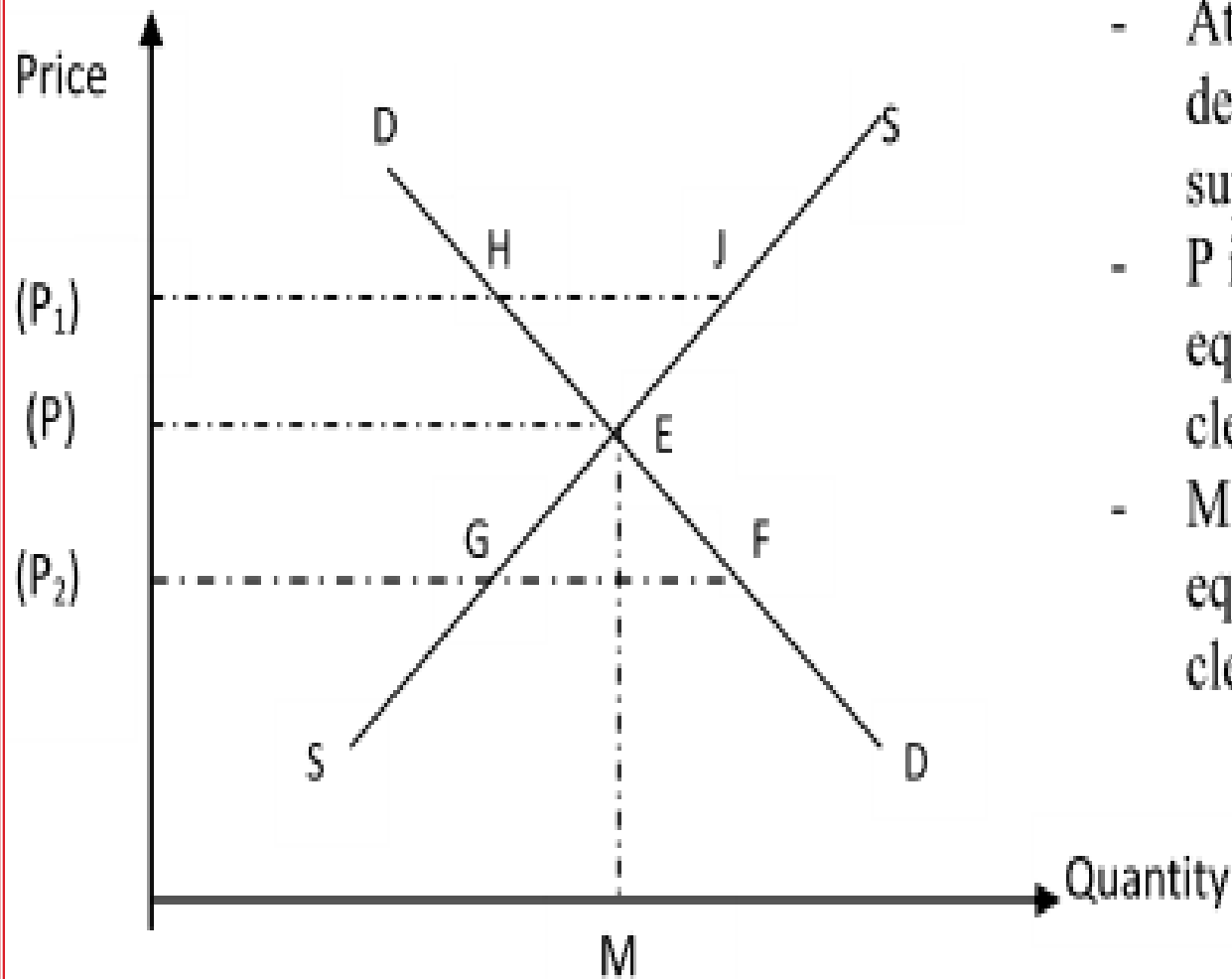


Figure 2.6: Perfectly inelastic and perfectly elastic supply curves

2.3 Market equilibrium

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

...cont'd.



- 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.

Figure 2.7: market equilibrium

...cont'd.

- 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 P_1 the market will have a **surplus of HJ**.

...cont'd.

- If the **price decreases** to **P2** buyers **dd** to buy **more** and **suppliers** prefer to **decrease** their **SS** leading to **shortage in the market** which is **equal** to **GF**.
- E.g: Given market dd: $Q_d = 100 - 2P$, and market SS: $P_s = (Q_s / 2) + 10$
 - a) Calculate the market **equilibrium price** and **quantity**
 - b) Determine, whether there is **surplus** or **shortage** at **P = 25** and **P = 35**.

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Solution:

a) At equilibrium, $Q_d = Q_s$, $100 - 2P = 2P - 20$
 $4P = 120$, $P = 30$ and $Q = 40$

b) Q_d (at $P = 25$) = $100 - 2(25) = 50$ and

Q_s (at $P = 25$) = $2(25) - 20 = 30$

• Thus, there is a **shortage** of: $50 - 30 = 20$ units

Q_d (at $P = 35$) = $100 - 2(35) = 30$ and

Q_s (at $p = 35$) = $2(35) - 20 = 50$, a **surplus** of 20 units

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❑ **Effects of shift in DD and SS on equilibrium**

- Changes in **DD** and **SS** bring about changes in the **equilibrium price level** and the **equilibrium quantity**.

i) **when DD changes and SS remains constant .**

- Factors such as changes in **income, tastes**, and **prices** of related goods will lead to a **change in dd**.

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- The figure below shows the effects of a change in **dd** and the resultant equilibrium price and quantity.
- **DD** is the **dd** curve and **ss** is the **supply** curve.

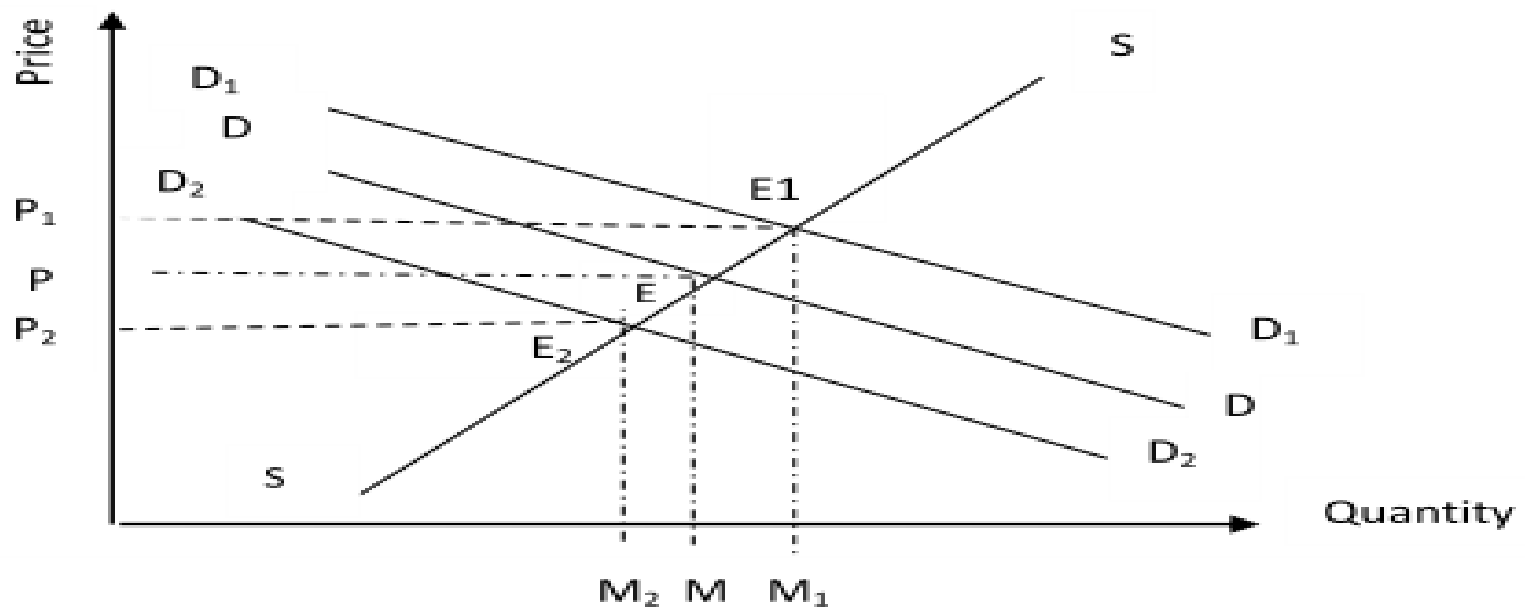


Figure 2.8: The effect of change in demand on market equilibrium

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- Given the **ss**, if the **dd** increases the **dd curve** will shift **upward to the right** and **vice versa** .
- This leads to change in **equilibrium point**.

ii. When SS changes and DD remains constant

- Changes in **SS** are brought by changes in technical knowledge and factor prices.

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- The following graph explains the effects of changes in supply.

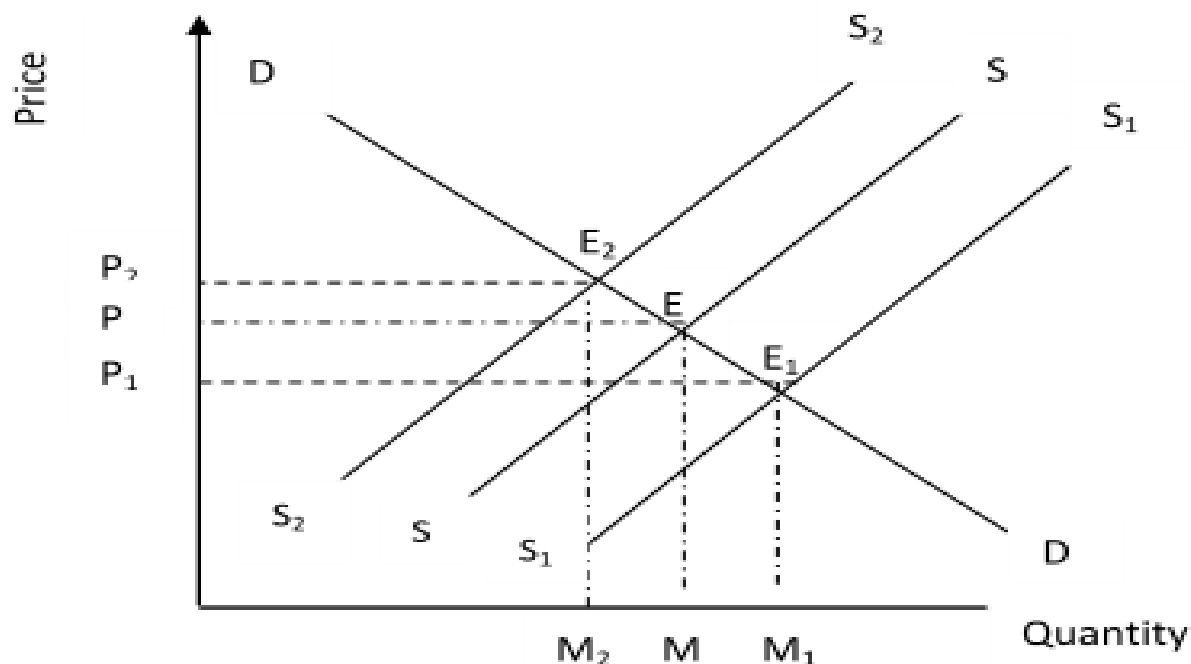


Figure 2.9: The effect of change in supply on market equilibrium

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- Given the **dd**, if the **ss** increases, the supply curve **shifts to the right** (S_1S_1) and **vice versa**.
- Thus, this also affect equilibrium point

III. Effects of combined changes in DD and SS

- When both **dd** and **ss** increase, the **quantity of the product will increase definitely**.
- But it is not certain whether the **price** will **rise** or **fall**.
- If an increase in **dd** is more than an **increase in ss**, then the **price goes up**.

...cont'd.

- On the other hand, if an increase in **ss** is more than an increase in **dd**, the **price falls** but the **quantity increases**.
- If the increase in **dd** and **ss** is **same**, then the **price remains the same**.
- When **dd** and **ss decline**, the **quantity decreases**.
- **But**, the **change in price** will depend upon the relative **fall** in **dd** and **ss**.

...cont'd.

- When the fall in **DD is more** than the **fall in SS**, the **price will decrease**.
- On the other hand, when the **fall in ss** is more than the **fall in dd**, the **price will rise**.
- If both **dd** and **ss decline** in the same ratio, there is **no change in the equilibrium price**, but **the quantity decreases**.

The end!!

Thank you!!