

Chapter Two

Theory of Demand and Supply

Chapter objectives After covering this chapter, you will be able to:

- o understand the concept of demand and the factors affecting it;
- o explain the supply side of a market and the determinants of supply;
- o understand how the market reaches equilibrium condition, and the possible factors that could cause a change in equilibrium and
- o explain the elasticity of demand and supply

2.1 Theory of demand

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*).

Law of demand: This is the principle of demand, which states that , price of a commodity and its quantity demanded are inversely related i.e., as price of a commodity increases (decreases) quantity demanded for that commodity decreases (increases) *ceteris paribus*.

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.

- **A demand schedule** is a table that shows the relationship between price and quantity demanded.

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

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.

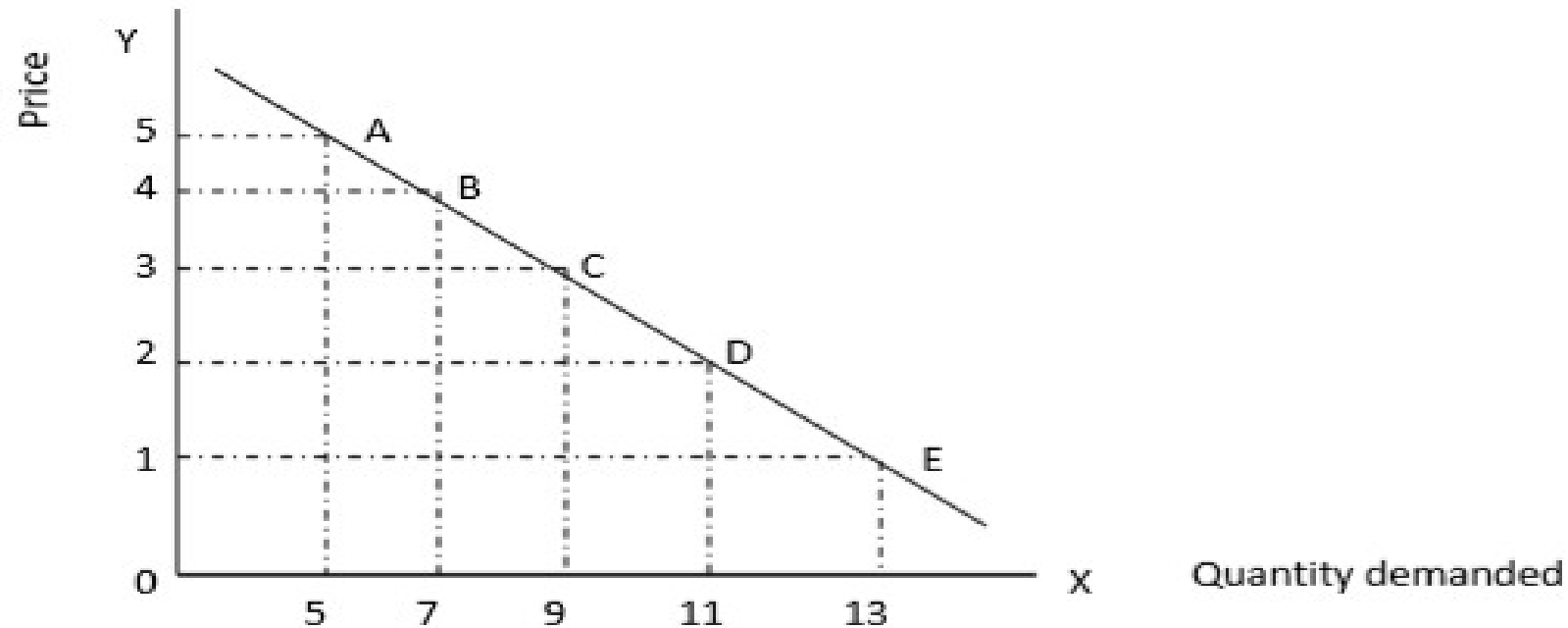


Figure 2.1: Individual demand curve

Demand function is a mathematical relationship between price and quantity demanded, all other things remaining the same. A typical demand function is given by:

$$Q_d=f(P)$$

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

Example: Let the demand function be $Q = a + bP$

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

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

$Q = a - 2P$, to find a , substitute price either at 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

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

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

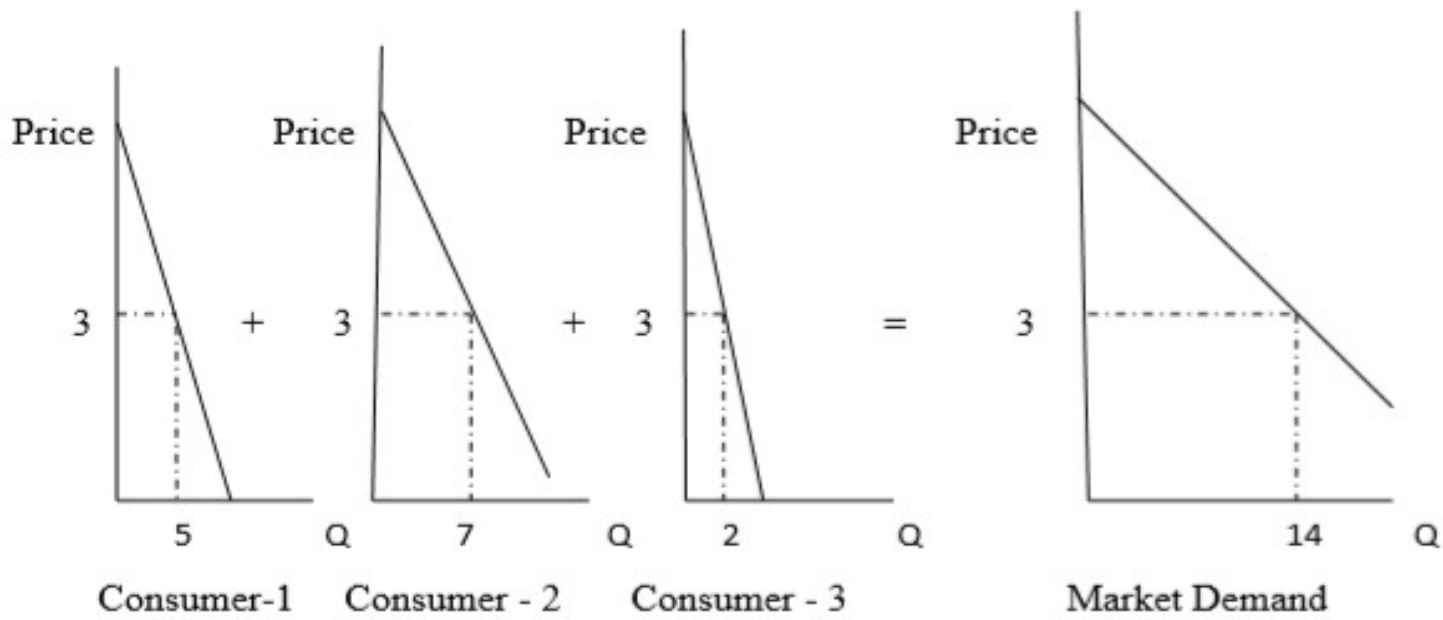


Figure 2.2: Individual and Market demand curve

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:

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

2.1.2 Determinants of demand

Changes in Quantity Demand vs. Changes in Demand

- Changes in Quantity Demand -is represented by a movement along a given demand curve
 - => This is caused by the change in the price of the good
 - *Downward movement along the demand curve is called extension of demand, while the upward movement as contraction of demand.*
- Changes in Demand-is represented by a shift of the demand curve
 - => This is caused by the change in the determinants of demand other than price of the product
 - *Rightward shift in the demand curve indicates increase in demand while the leftward shift indicates decrease in 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
- v. Consumers expectation of price
- vi. Number of buyers in the market

i. Income

■ Normal Good – the higher your income the more you consume

Examples: *Sports Tickets, Cars, and Luxury Goods*

↑ Income

=> consume more at each P

=> ↑ D

■ Inferior Good – as income rises you consume less

Examples: *Shiro wot, Cabbage*

↑ Income

=> consume other products

=> ↓ D

ii. Price of Related Goods

■▶ Substitute Goods - two goods in which a consumer will consume one good or the other

Examples: *Pepsi or Coke, Rent Movie or Go to Theater*

↑ Price of Pepsi

=> drink less Pepsi

=> purchase more Coke

=> ↑ D

■▶ Complementary Goods - two goods consumed together

Examples: *gasoil and car, DVD Player and Movie, sugar and tea*

↑ Price of sugar

=> consume less tea

=> consume less sugar and tea

=> ↓ D

iii. Tastes / Preference

New tastes for the product

=> Consume more

=> $\uparrow D$

iv. Expectations

$\uparrow$ Price tomorrow

=> buy today instead of tomorrow

=> $\uparrow D$

v. Number of buyers

$\uparrow$ number of buyers

=> More of the good is consumed

=> $\uparrow D$

2.1.3 Elasticity of demand

Elasticity is a measure of responsiveness of a dependent variable to changes in an independent variable.

Elasticity of demand 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 price elasticity.

Price Elasticity of Demand

- Price elasticity of demand means degree of responsiveness of quantity demanded to change in

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

Point Price Elasticity of Demand

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

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

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

- E_p is unit free because it is a ratio of percentage change
- E_p is usually a negative number because of the law of demand i.e. negative relationship between price and quantity demanded. So, we can take the absolute value of E_p .
- E_p varies between zero and negative infinity i.e. $[-\infty < E_p \leq 0]$ or $[0 \leq E_p < \infty]$

Example: If 5% increase in price leads to a 20% decrease in quantity demanded, what will be the price elasticity of demand?

- | | |
|--------------------------|-------------------------------------|
| • Given | solution |
| • $\% \Delta Q_d = 20\%$ | $E_p = \% \Delta Q_d / \% \Delta P$ |
| • $\% \Delta P = 5\%$ | $= 20\% / 5\%$ |
| • $E_p = ?$ | $= 4$ |
- Since $E_p = 4 > 1$, therefore demand is elastic
 - *Interpretation:* - This means that a 1% change in price leads a 4% change in quantity demand, implies that the consumer is more sensitive to changes in price.

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.
- 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 Demand (E_I)

- Income elasticity of demand shows the degree of responsiveness of quantity demanded of a good to a change in the income of consumers.

$$E_I = \frac{\% \Delta Q_d}{\% \Delta I} = \left(\frac{Q_1 - Q_0}{I_1 - I_0} \right) \left(\frac{I_0}{Q_0} \right) = \frac{\Delta Q_d}{\Delta I} \star \frac{I_0}{Q_0}$$

- Normal Goods ($E_I > 0$): Consumption of the goods varies directly (positively) with income i.e. when income increases consumption of these goods also

- Necessities E_I – between zero and one
- Luxury $E_I > 1$
- ✓ Inferior goods ($E_I < 0$, Negative): Consumption of these goods varies inversely (negatively) with income i.e. when income of consumer increase consumption decrease and vice Versa. E.g. cabbage.
- ✓ $E_I = 0$, means consumption of the good does not vary with income, e.g. salt

Example: consumer income rise from 16,000 Br to 20,000 Br, as a result his purchase of good 'X' increases from 15 to 18 units, then find E_I and what type of commodity is it?

iii. Cross price Elasticity of Demand

Measures how much the demand for a product is affected by a change in price of another good.

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

- i) The cross – price elasticity of demand for substitute goods is **positive**.
- ii) The cross – price elasticity of demand for complementary goods is **negative**.
- iii) The cross – price elasticity of demand for unrelated goods is **zero**.

Example: If price of 'X' rises from 55 Br to 60 Br per unit, and as a result demand of 'y' increase from 40 to 50 units, then find E_{yx} and what type of goods are these?

$2.75 > 0$, they are substitute goods (X&Y)

Example: If price of 'Y' increases from 10 to 20 Birr per unit as a result demand of "x" declines from 40 to 35 units, then find E_{xy} & what type of commodities are these?

$-0.125 < 0$, x and y are complements

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.

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.

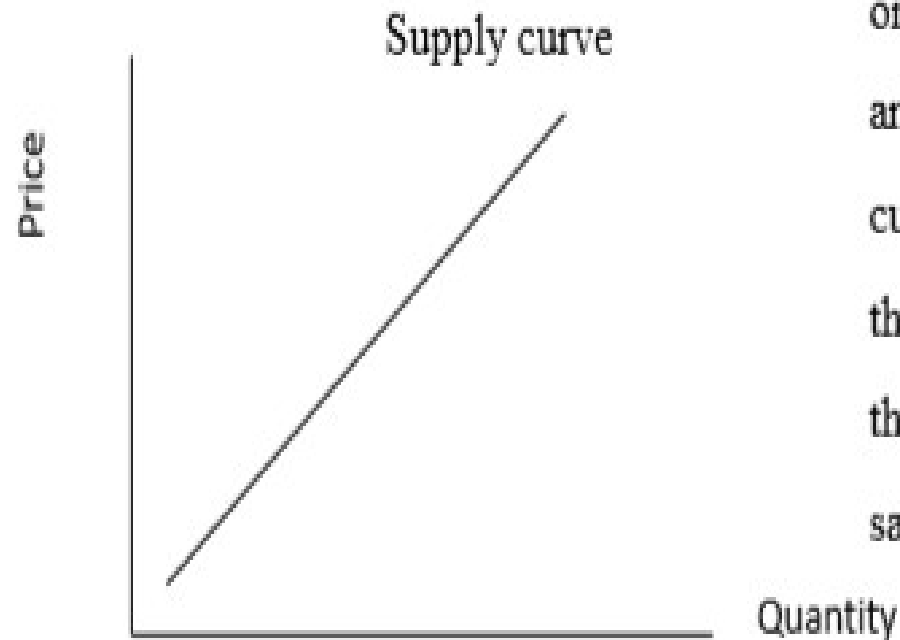
2.2.1 Supply schedule, supply curve and supply function

A supply schedule is a tabular statement that states the different quantities supplied at different prices.

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 conveys the same information as a supply schedule. But it shows the information graphically rather than



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

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

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

Changes in Quantity Supply vs. Changes in Supply

■ Changes in Quantity Supply -is represented by a movement along a given Supply curve

=> This is caused by the change in the price of the good

■ Changes in Supply-is represented by a shift of the Supply curve

=> This is caused by the change in the determinants of Supply other than price of the product

2.2.2 Determinants of supply

Supply of a particular product is determined by:

- i. price of inputs (cost of inputs)
- ii. technology

- i. prices of related goods
- ii. sellers' expectation of price of the product
- iii. taxes & subsidies
- iv. number of sellers in the market
- v. weather, etc

1. **Cost of production**

a. Prices of inputs

↑ Price of labor

=> hire less people

=> produce less at current P

=> ↓ S

b. Technologies used in production

New technology

=> produce more at current P

=> $\uparrow S$

2. Price of Related Products

Examples: *wheat Vs teff, leather Jacket Vs leather shoe*

$\uparrow$ Price of leather Jacket

=> produce less leather shoe

=> Produce more leather Jacket

=> $\downarrow S$ of leather shoe

3. Number of sellers

$\uparrow$ number of sellers

=> More of the good is produced

=> $\uparrow S$

4. Expectations

↑ Price tomorrow

=> Sell tomorrow instead of today

=> ↓ S

5. Taxes and subsidies

↑ tax

=> Less of the good is produced

=> ↓ S

↑ ***subsidy***

=> more of the good is produced

=> ↑ S

6. Weather condition(Agricultural Products)

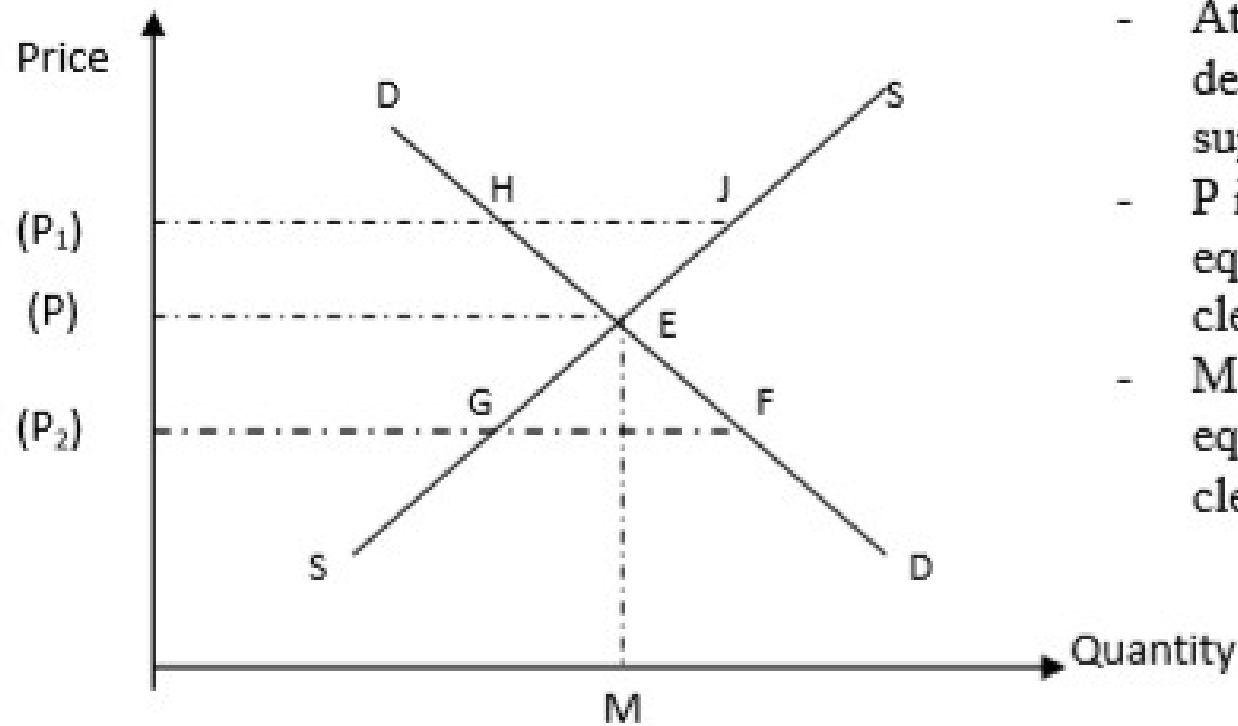
Good Weather condition

=> ↑ production of the good

=> ↑ S

2.3 Market equilibrium

- 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.

Figure 2.7: market equilibrium

- If price of the commodity increases, consumers demand less of the product.
- If price of increases, producers supply more of the good.
- If price increases to P_1 the market will have a surplus of HJ.
- If the price decreases to P_2 buyers demand to buy more and

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

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

Solution:

a) At equilibrium, $Q_d = Q_s$

$$100 - 2P = 2P - 20$$

$$4P = 120$$

$$\underline{\underline{\bar{P} = 30}}, \text{ and } \underline{\underline{\bar{Q} = 40}}$$

b) $Q_d(\text{at } P = 25) = 100 - 2(25) = 50$ and $Q_s(\text{at } P = 25) = 2(25) - 20 = 30$

Therefore, there is a shortage of: $50 - 30 = \underline{\underline{20}}$ units

$Q_d(\text{ at } P=35) = 100 - 2(35) = 30$ and $Q_s(\text{ at } p = 35) = 2(35) - 20 = 50$, a surplus of **20 units**

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.

When demand changes and supply remains constant

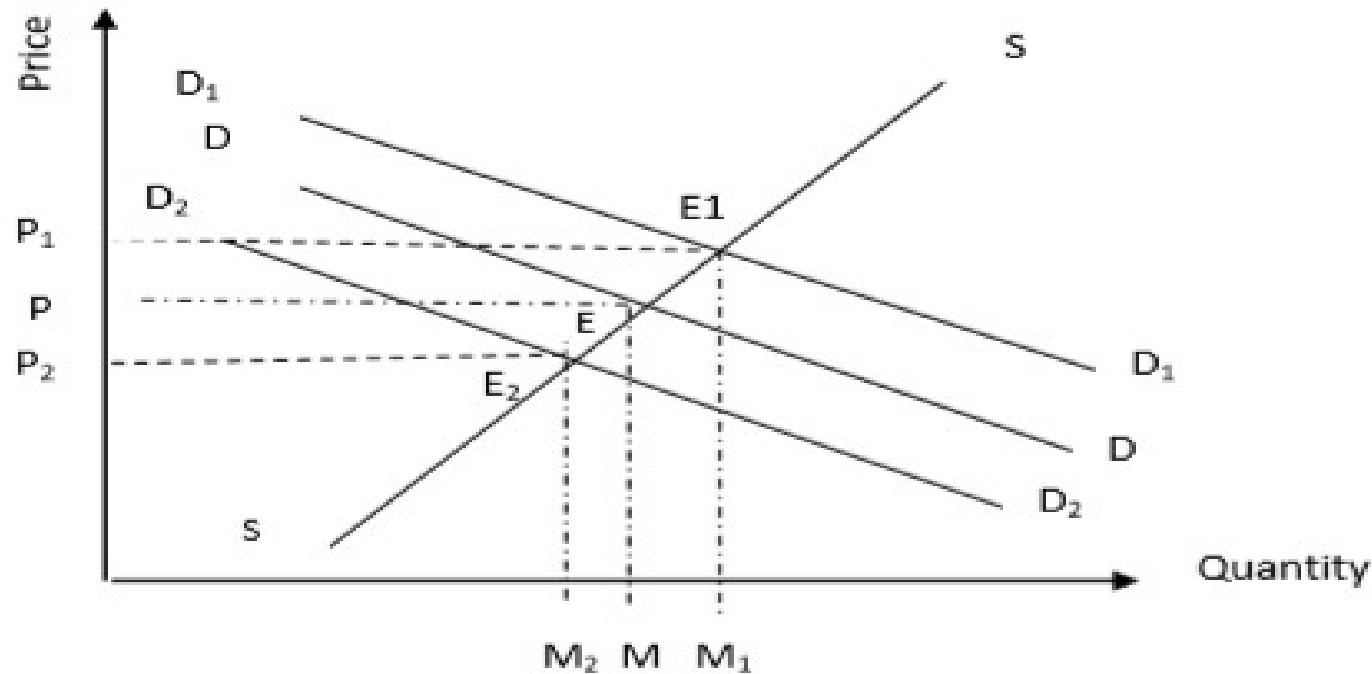


Figure 2.8: The effect of change in demand on market equilibrium

When supply changes and demand remains constant

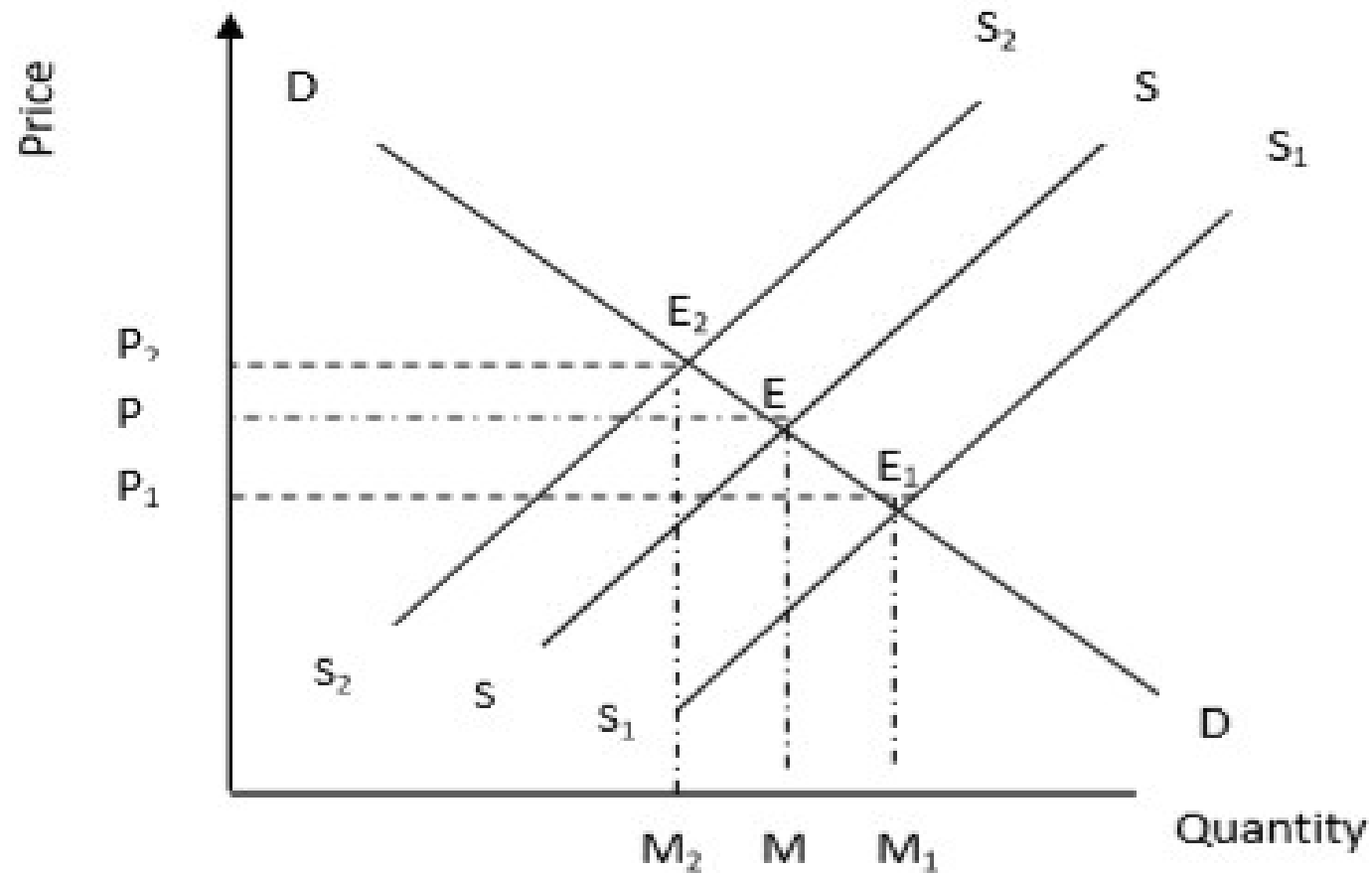


Figure 2.9: The effect of change in supply on market equilibrium