Chapters 1 & 2

# Basic economic concepts and the economic problem

Dr. Oussama Zaghdoud

# Definition of Economics

Economics is the social science that studies the human behavior, by looking for the optimum or full utilization of **scarce economic resources**, in order to satisfy **all our needs (unlimited goods and services)** at the lowest possible costs.

# Branches of Economics

- **Microeconomics:**

Microeconomics studies the behavior of the economic units **individually** (like an individual firm or an individual consumer).

**For example**: microeconomics studies the influence of supply and demand on the price of cars (one product).

## Macroeconomics:

Macroeconomics studies the behavior of **aggregates** of the economy as a **whole**, it deals with the problems faced by the economy as a whole, and not just by an individual unit.

**For example:** Inflation and unemployment rates, GDP.

# Economic resources

Economic resources are the resources (whether natural or human) that businesses use to produce goods and services.

- **conditions**:
  1. Scarcity or relative limitation.
  2. Price

  they are grouped into four categories:
  - Land
  - Labor
  - Capital
  - Entrepreneurship

# Economic resources

- Land: including forests and natural resources (water, petroleum and minerals. The price of the land is the **rent.**
- Labor: the muscular and mental effort of the worker, skills, and experiences. The price of the labor is the **wage.**
- Capital: it consists of any goods which were produced (tools, instruments, machines, buildings) are used as inputs in the production of further goods and services. The price of the capital is the **interest.**
- Entrepreneurship: the human resource (entrepreneur) that organizes land, labor, and capital to produce goods and services. The price of the Entrepreneurship is the **profit**.

# Economic Problem

- Scarcity of (limited) economic resources available in scociety.

**Versus**

- Unlimited human needs of goods and services.

**Scarcity is the central problem of the economics**

# What is the solution to the economic problem?

make a **choice** between goods and service

The result of any process of choosing is the **sacrifice**

There is always cost to pay called: **the opportunity cost**

***the opportunity cost*** *is the most desired goods and services that are foregone in order to obtain something else.*

# Production Possibilities Curve (*PPC*)

Production possibilities curve: it is a graph that shows some combinations of goods, that could be produced in the economy, in a given time with available resources and technology.

## Objectives:

- Reintroduce the economic problem and understanding how the tradeoff between the different alternatives of goods is made.
- Show the impact of the choice process (*Opportunity cost*).

## Assumptions:

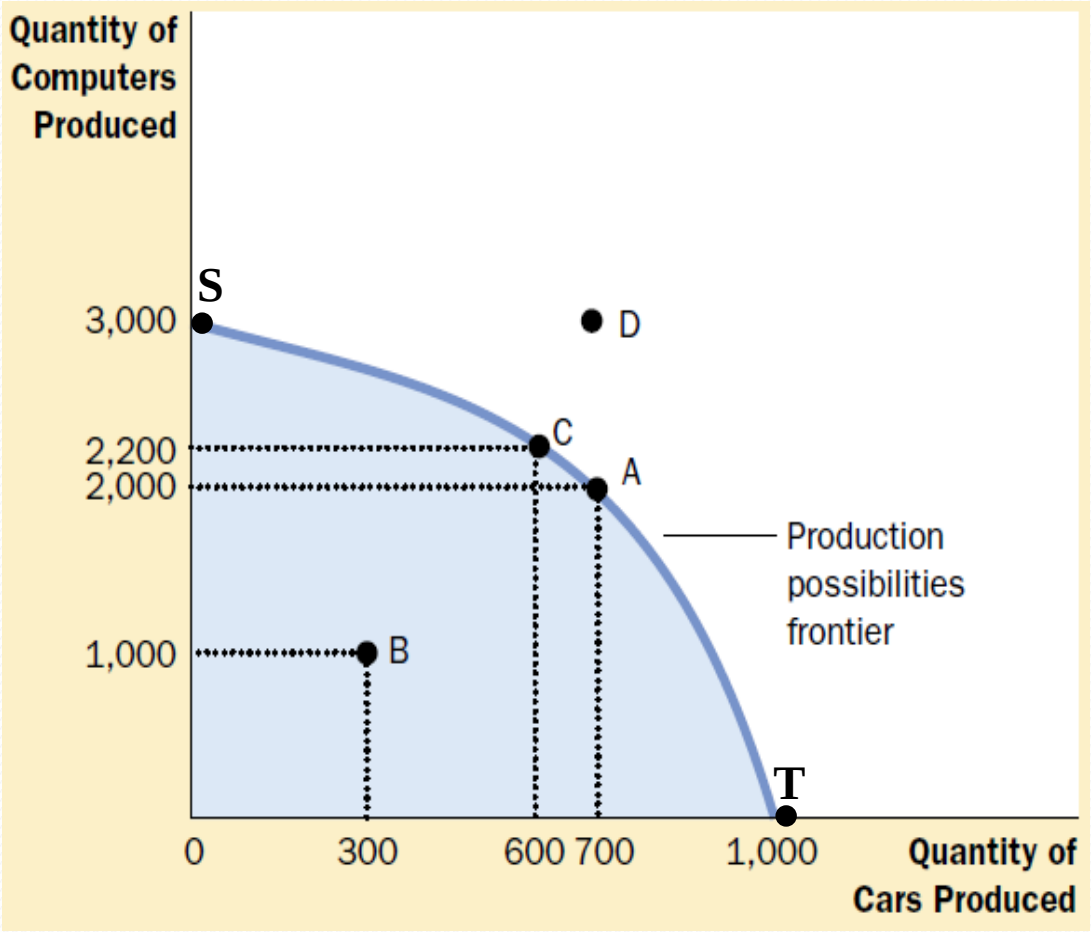
- The economy produces only two goods (computers and cars)
- Full employment: all the economic resources are used by the economy.

# Production Possibilities Curve

## Assumptions:

- Fixed resources : the economy uses the same quantity and quality of the factors of production to produce the two goods.
- Fixed technology: the economy uses the same technology to produce the two goods.

# Production Possibilities Curve

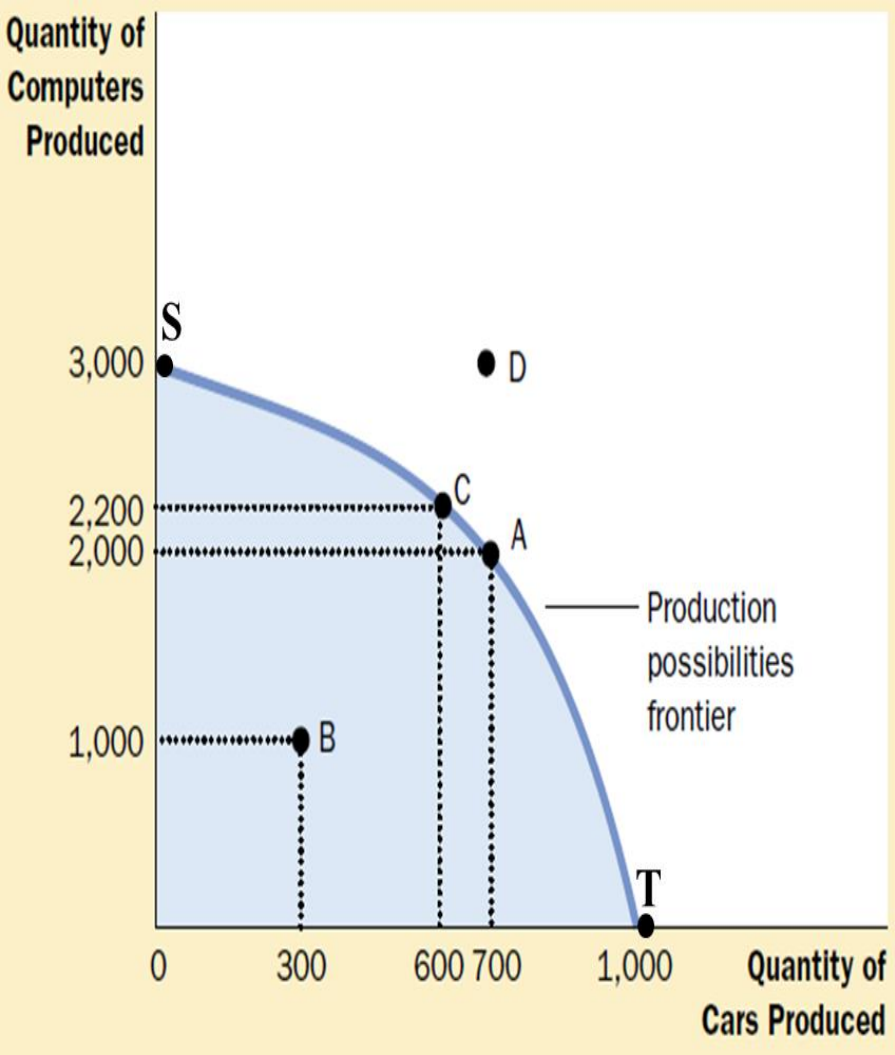



- Points **inside** and **on the frontier** (or the curve), such as points *S*, *C*, *B*, *A*, and *T* **are attainable**. For example:
  **Point A:** the economy produces 700 cars and 2000 computers.
  **Point B:** the economy produces 300 cars and 1000 computers

- Points **outside** the frontier (or the curve), such as D, **are unattainable**, which means that economy can not produce at this level with the available resources (resources are scarce)

**Figure 1. shows the PPC (or PPF) for cars and computers.**

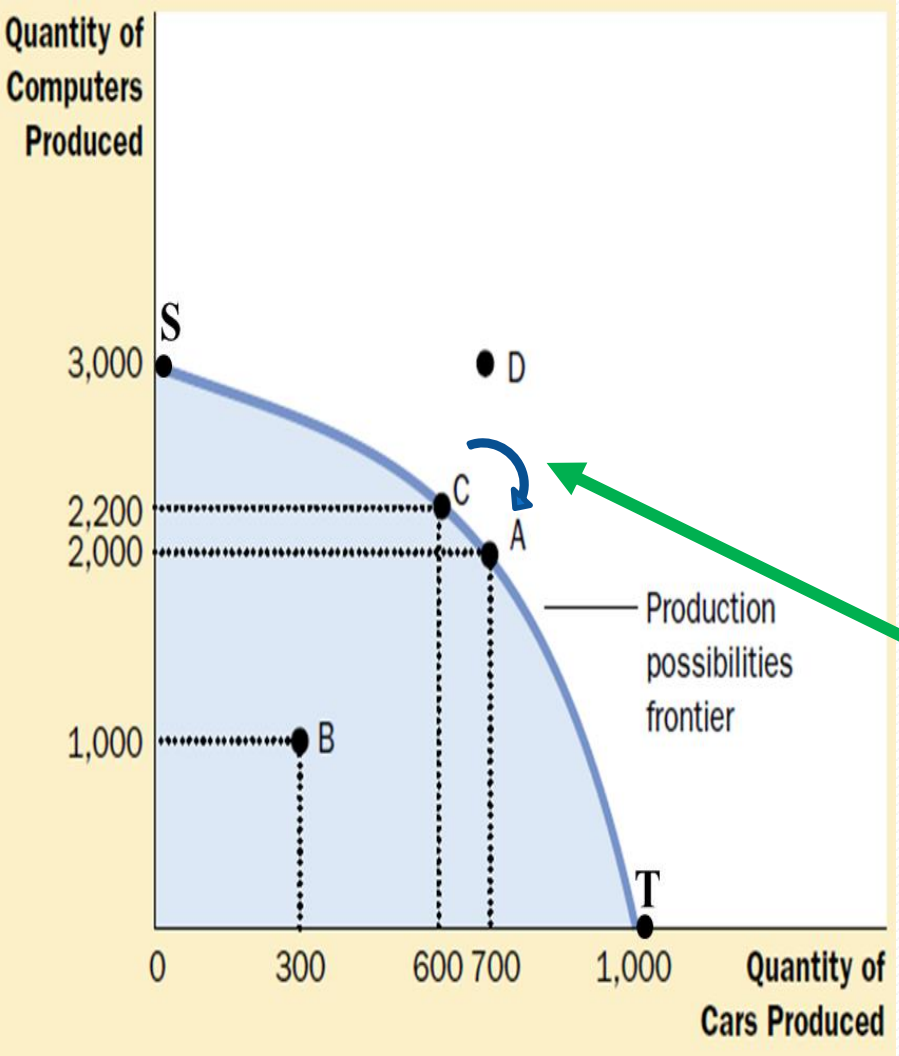
# Production Possibilities Curve




- What is the difference between the points **inside** the curve, such as **B** and the points **on the curve,** such as **A**. ??

- At the point **A**: the economy **produces with efficiency,** which means that economy uses all the available resources (full employment). So, if the economy increases the production of cars, it will be obliged to decrease the production of computers (to give up or to sacrifice), and vice versa.
- At the point **B:** the economy **produces without efficiency (inefficiency),** because at this point, the economy can increase the production for cars without decreases the other product (computers), which means that economy doesn't use all the available resources.

# Production Possibilities Curve

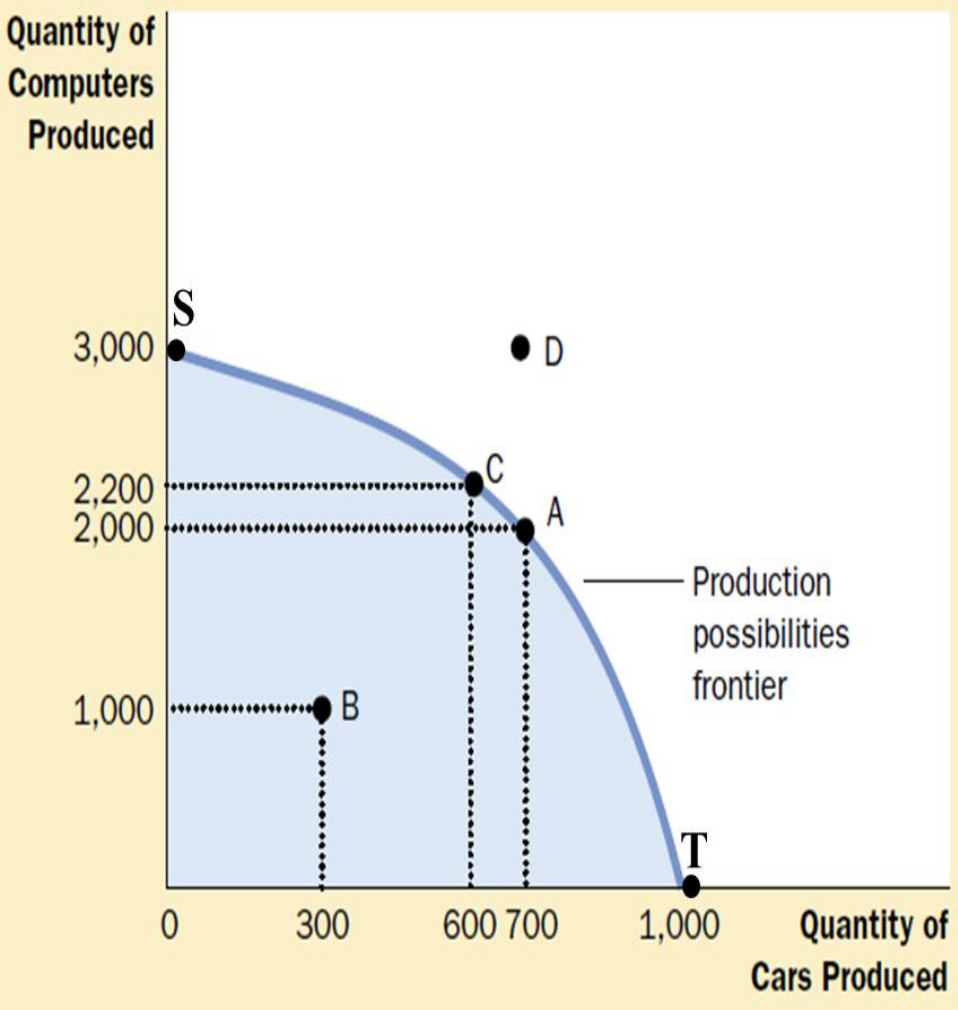



## Tradeoff along the *PPC*

- Every choice along the *PPC* involves a tradeoff.
- On this *PPC,* we must give up some computers to get more cars or give up some cars to get more computers.

**Example:** when we move from the **C** to **A,** we must give up **200** (2000 - 2200) computers to get **100** (700 -600) additional cars

# Production Possibilities Curve



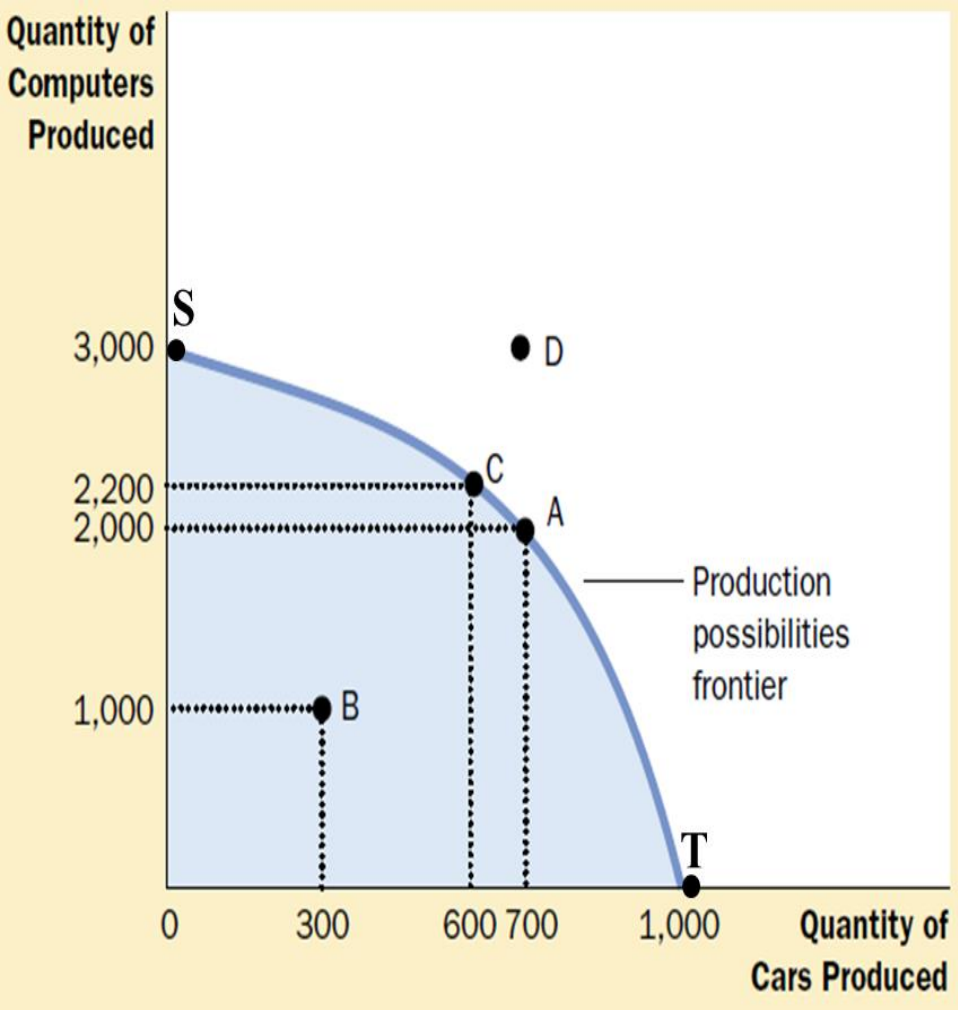

## Opportunity cost

- The PPC makes the concept of opportunity cost more precise

**Example 1:** When we move from the C to A, the production of cars increases by **100** (700 - 600) and computers decreases by **200** (2000 - 2200).

The opportunity cost of 100 cars is 200 computers. So, 1 additional car costs 2 computers.

# Production Possibilities Curve




## Opportunity cost

**Example 2:** When we move from the A to C, the production of computers increases by **200** (2200-2000) and cars decreases by **100** (600 - 700).

The opportunity cost of 200 computers is 100 cars. So, 1 additional computer costs 1/2 car.

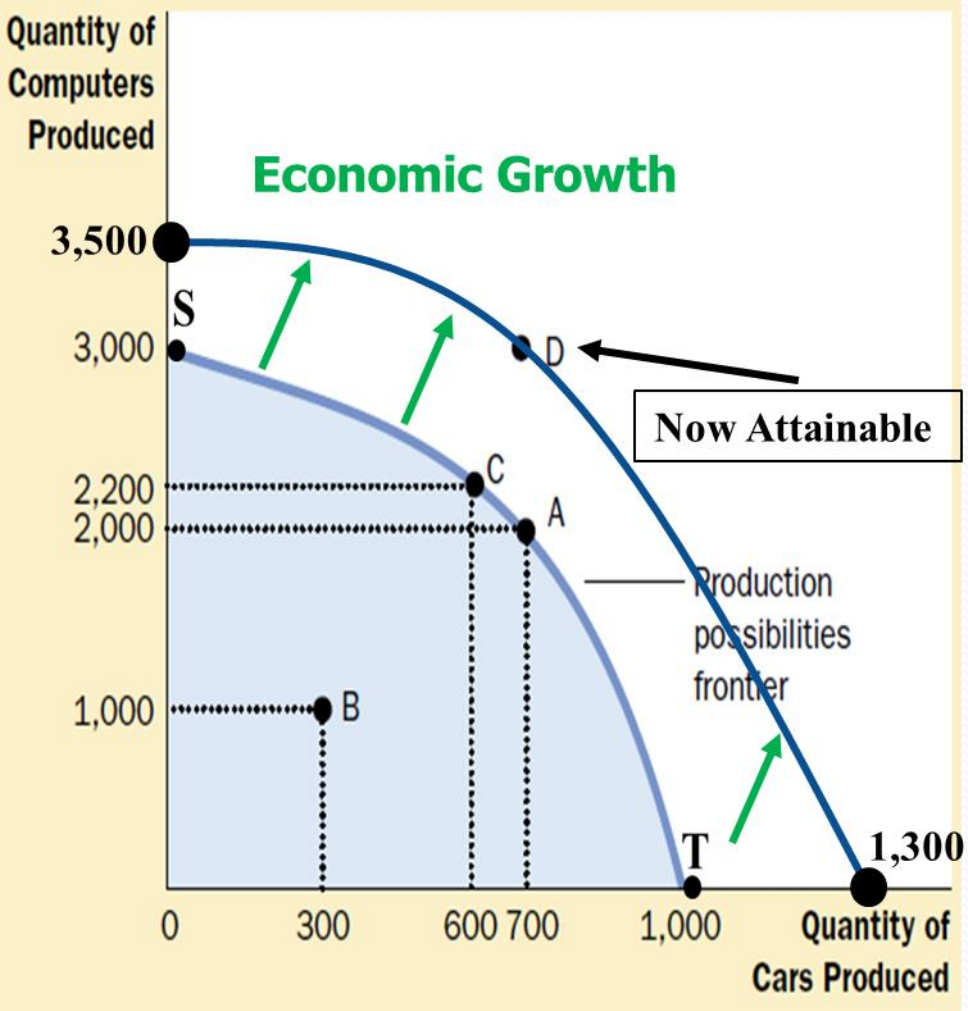
*Note that the opportunity cost of computer **is the inverse** of the opportunity cost of car.*

# Economic growth and *PPC*

- The production possibilities curve can be used to illustrate economic growth.
- Economic growth is defined as an increase in production volume. Economic growth takes place through:

1. **Technological change**, which is the development of new technologies and better ways of producing goods and services
2. **Capital accumulation**, which is the growth of capital resources, including *human capital*.

# Economic growth and *PPC*



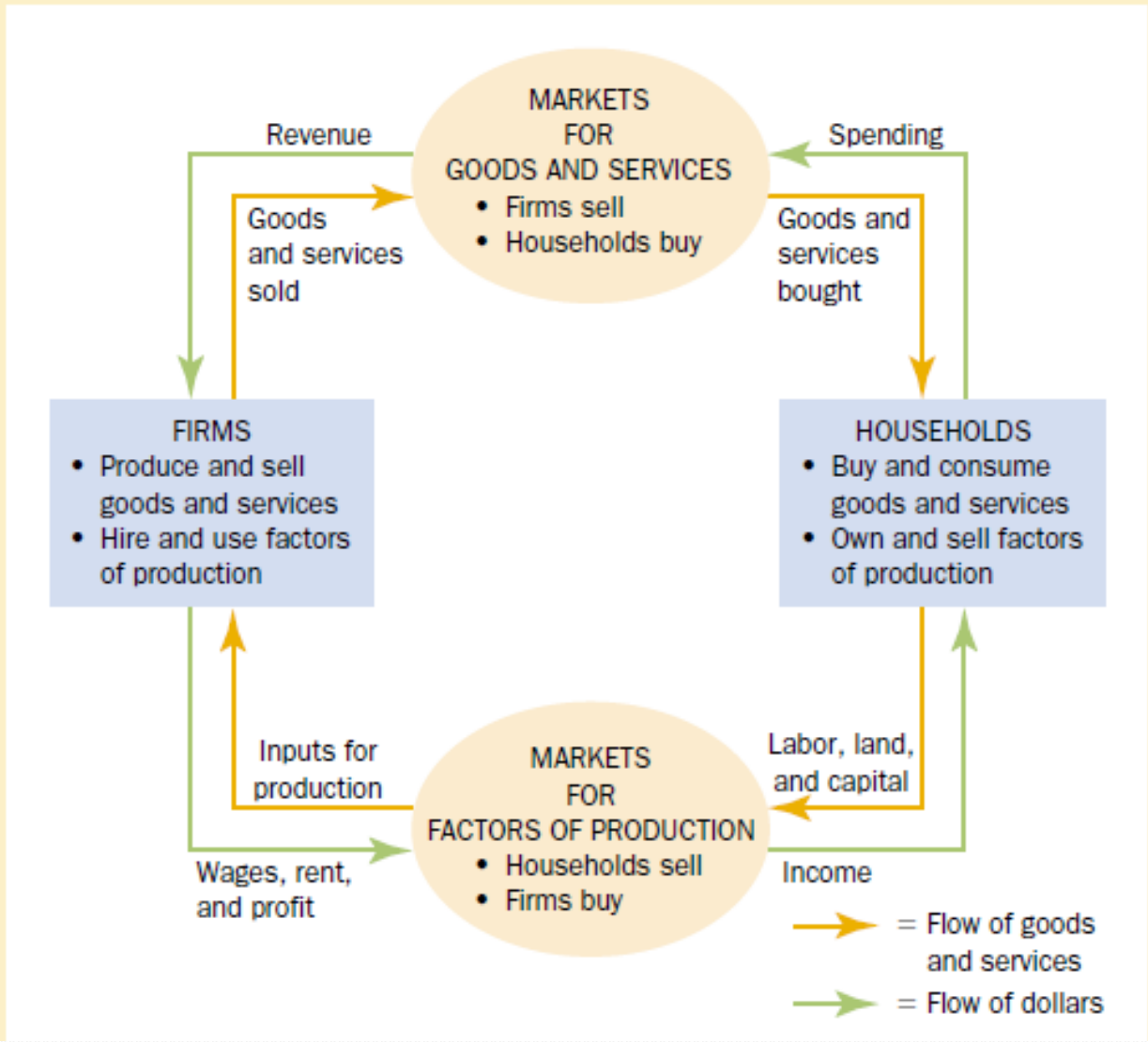

**Note:**

1. As we have economic growth, the maximum quantity of computers increases from 3000 to 3500 cars and at the same time, the maximum quantity of cars increases from 1000 to 1300 cars.
2. The new PPC crosses the point D, which means that this level of production is **attainable.**

# Circular-flow diagram

The economy consists of millions of people engaged in many activities—buying, selling, working, hiring, manufacturing, and so on. We need a model that explains, in general terms, how the economy is organized and how participants in the economy interact with one another.

# Circular-flow diagram



# Circular-flow diagram

This diagram is a schematic representation of the organization of the economy. Decisions are made by households and firms.

**Households and firms interact**

- In the markets for goods and services: **households are buyers and firms are sellers**.
- In the markets for the factors of production: **firms are buyers and households are sellers**.

# Circular-flow diagram

***The households spend money to buy goods and services from the firms. The firms use some of the revenue from these sales to pay for the factors of production, such as the wages of their workers. What's left is the profit of the firms.***

Chapter 3

# Demand, Supply, and Market Equilibrium

Dr. Oussama Zaghdoud

# Market

- The market is any place where sellers and buyers meet to determine the prices and quantities of goods and services exchanged. (Interaction between buyers and sellers.)
- With the technological development in the field of communications, the market has become virtual, and therefore, the convergence of buyers with the sellers has become unrestricted in a certain place.

# Demand

Demand is the **ability** and **willingness** to buy specific quantities of a good at alternatives prices in a given time period, *ceteris paribus*. (while the other factors affecting the demand remain intact.)

# Law of Demand

When the price of a product increases, the quantity demanded of that product decreases, and when the price decreases, the quantity demanded of that product increases, *ceteris paribus*.

Exist an **inverse relationship (or negative)** between the price and the quantity demanded.

# Law of Demand

The law of demand results from two effects:

- ***Substitution effect*:** when the relative price of a goods rises, people seek substitutes for it, so the quantity demanded decreases.
- ***Income effect*:** when the price of a goods rises relative to income, the purchasing power of the income will decrease, so the quantity demanded will decrease, too.

# Law of Demand

The law of demand can be explained and studied through:

- Demand Schedule
- Demand Curve
- Demand Function (see the Appendix)

# Law of Demand

## 1. Demand Schedule

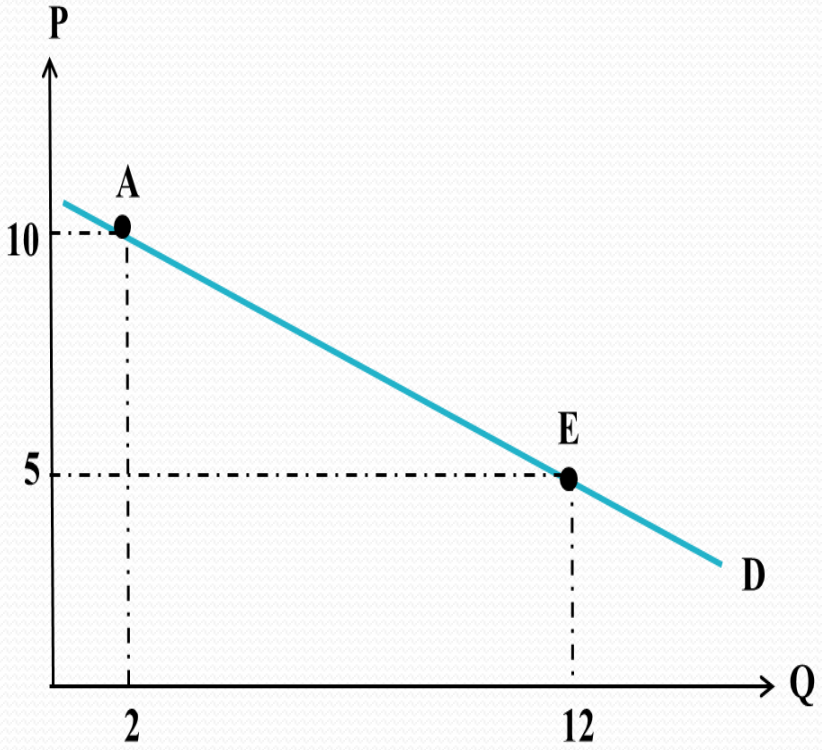
Demand schedule is a table showing the quantities demanded of a product by the consumer at alternative prices.

| Levels (Points) | Price (SR per Kg) | Quantity demanded (Kg) |
|---|---|---|
| A | 10 | 2 |
| B | 9 | 4 |
| C | 8 | 6 |
| D | 7 | 8 |
| E | 6 | 10 |

# Law of Demand

## 2. Demand Curve

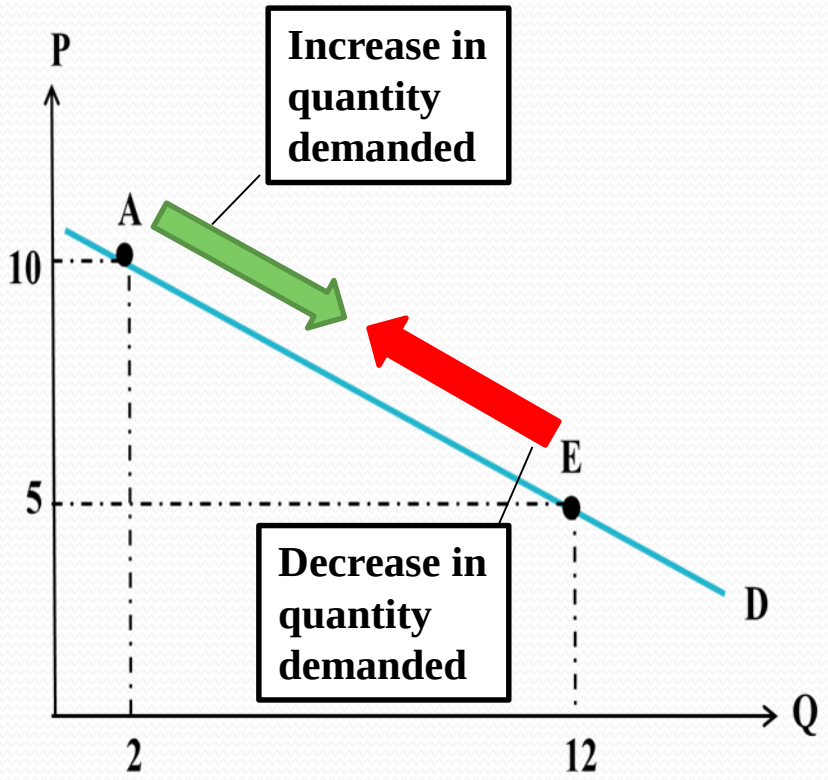
The demand curve is a line connecting the different points, which represent the various quantity demanded at each price.



# The Change in quantity demanded Versus Change in demand

**A. Change in quantity demanded:**

The change in quantity demanded of a good is due to the change in the price of that good, which means that the movement along the curve from one point to another is on the same demand curve.



# Change in quantity demanded Versus Change in demand

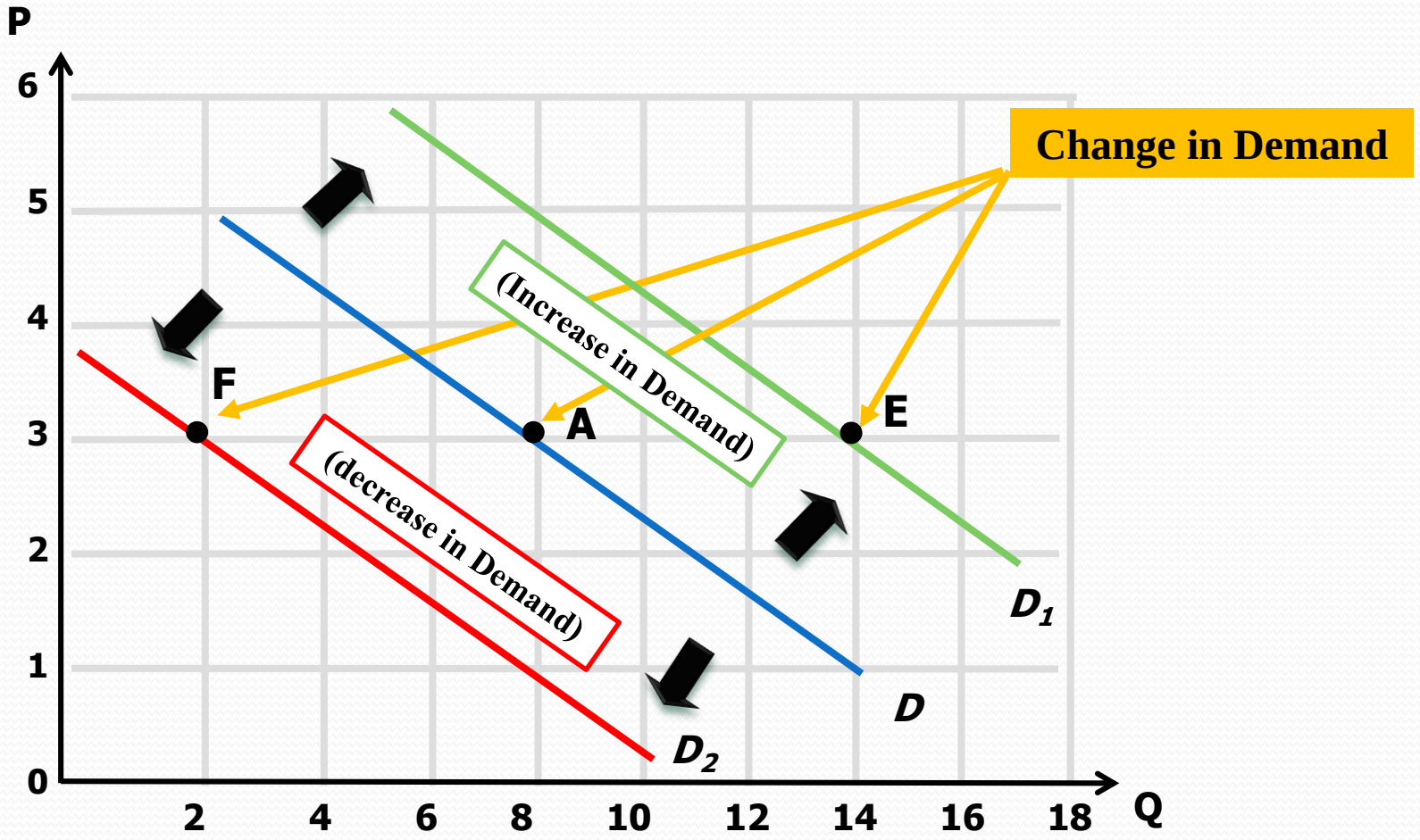
## B. Change in demand:

The change in demand means that the entire demand curve shifts to the right side (increase in demand) or to the left side (decrease in demand).

This change in demand is due to a change in the following five factors:

1. Consumer tastes and preferences.
2. Number of consumers.
3. Consumer income.
4. Prices of substitutes and complements goods.
5. Consumer expectations.

# Change in quantity demanded Versus Change in demand

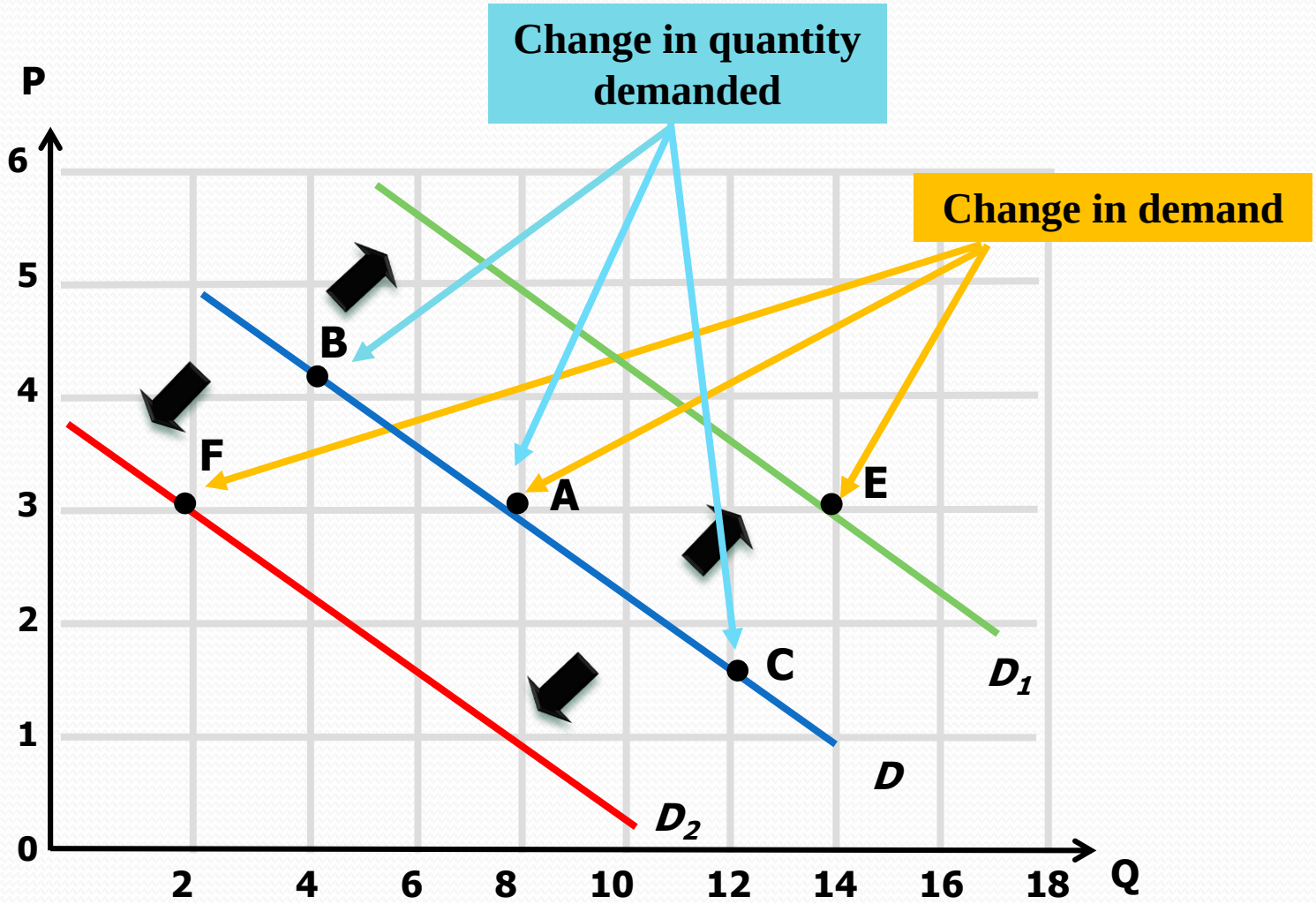


# Change in quantity demanded Versus Change in demand

## B. Change in demand:

| Determinants of Demand: Factors that shift the Demand curve | |
|---|---|
| **Determinant** | **Examples** |
| Change in consumer tastes and preferences | If the consumers' tastes change positively towards a specific goods, demand increases and vice versa.(Physical fitness rises in popularity, increasing the demand for jogging shoes and bicycles), and vice versa. |
| Change in the number of consumers | The larger the number of consumers, the greater is the demand for all goods. , and vice versa. |
| Change in income | When the income increases, the demand for normal goods increases (such as famous and new brand of clothes), but the demand for inferior goods decreases (such as used clothes, or cheap clothes with unknown brand) , and vice versa. |
| Change in the prices of substitutes and complements goods | ▪ A substitute is a product that can be used in a place of another product (such as Pepsi and Coca). When the price of Coca increases, the demand of Pepsi increases) , and vice versa.<br>▪ A complement is a product that is used in conjunction with another product (Fuel and Car). When the price of fuel increases the demand of cars decreases, and vice versa. |
| Change in consumer expectations | If the price of a product is expected to rise in the future, current demand increases, and vice versa. |

# Change in quantity demanded Versus Change in demand



# Supply

Supply is the ability and willingness to sell (produce) specific quantities of a good at alternative prices in a given time period, ceteris paribus. (while the other factors affecting the supply remain intact.)

# Law of Supply

When the price of a good increases, the quantity supplied of that good increases, and when the price decreases, the quantity supplied of that good decreases, *ceteris paribus*.

Exist a **direct relationship (positive)** between the price and the quantity supplied.

# Law of Supply

The law of supply can be explained and studied through:

- Supply Schedule
- Supply Curve
- Supply Function (see the Appendix)

# Law of Supply

## 1. Supply Schedule

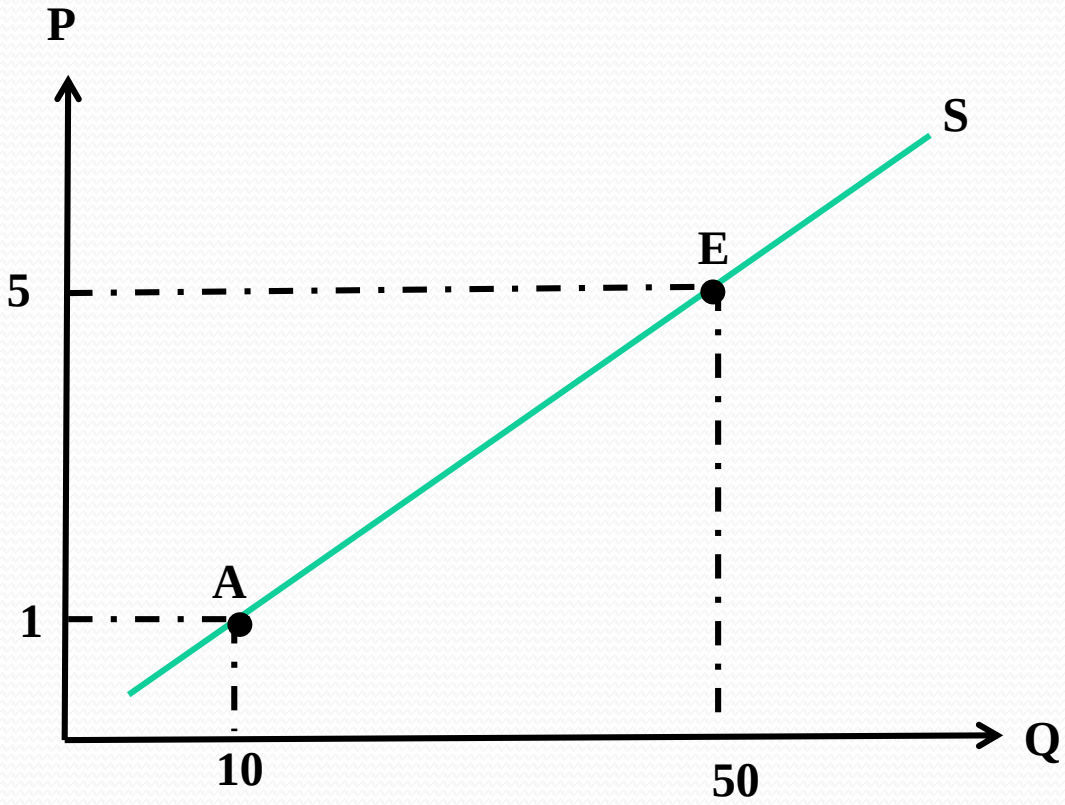
Supply schedule is a table showing the quantities supplied of a good by the producer at alternative prices.

| Levels (Points) | Price (SR per Kg) | Quantity supplied (Kg) |
|---|---|---|
| A | 1 | 10 |
| B | 2 | 20 |
| C | 3 | 30 |
| D | 4 | 40 |
| E | 5 | 50 |

# Law of Supply

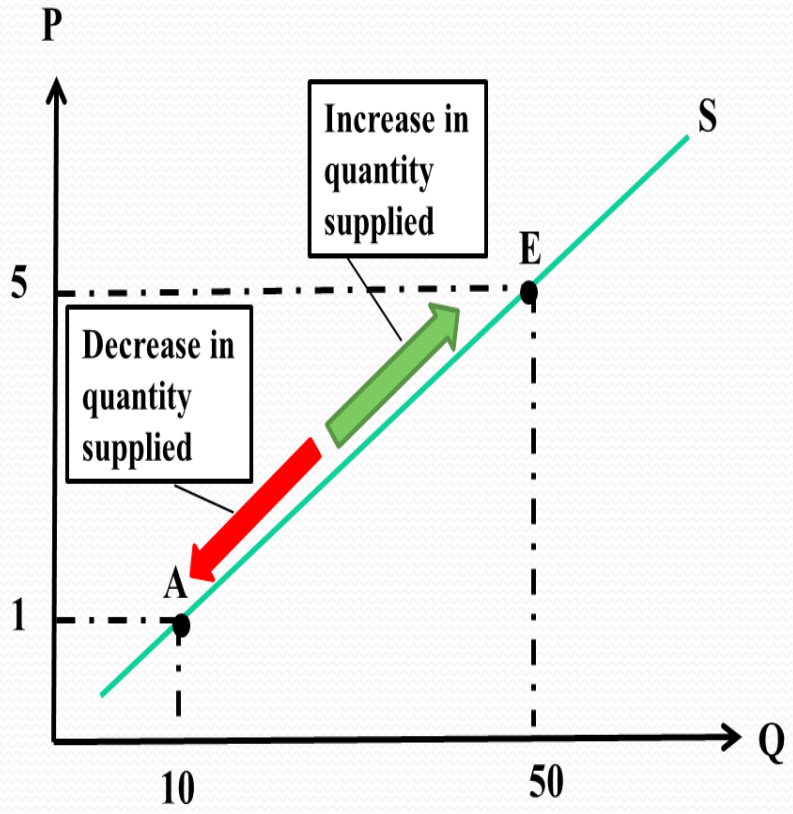
## 2. Supply Curve

The supply curve is a line connecting the different points, which represent the various quantity supplied at each price.



# The Change in quantity supplied Versus Change in supply

**A. Change in quantity supplied:** The change in quantity supplied of a good is due to the change in the price of that good, which means that the movement along the curve from one point to another is on the same supply curve.



# The Change in quantity supplied Versus Change in supply

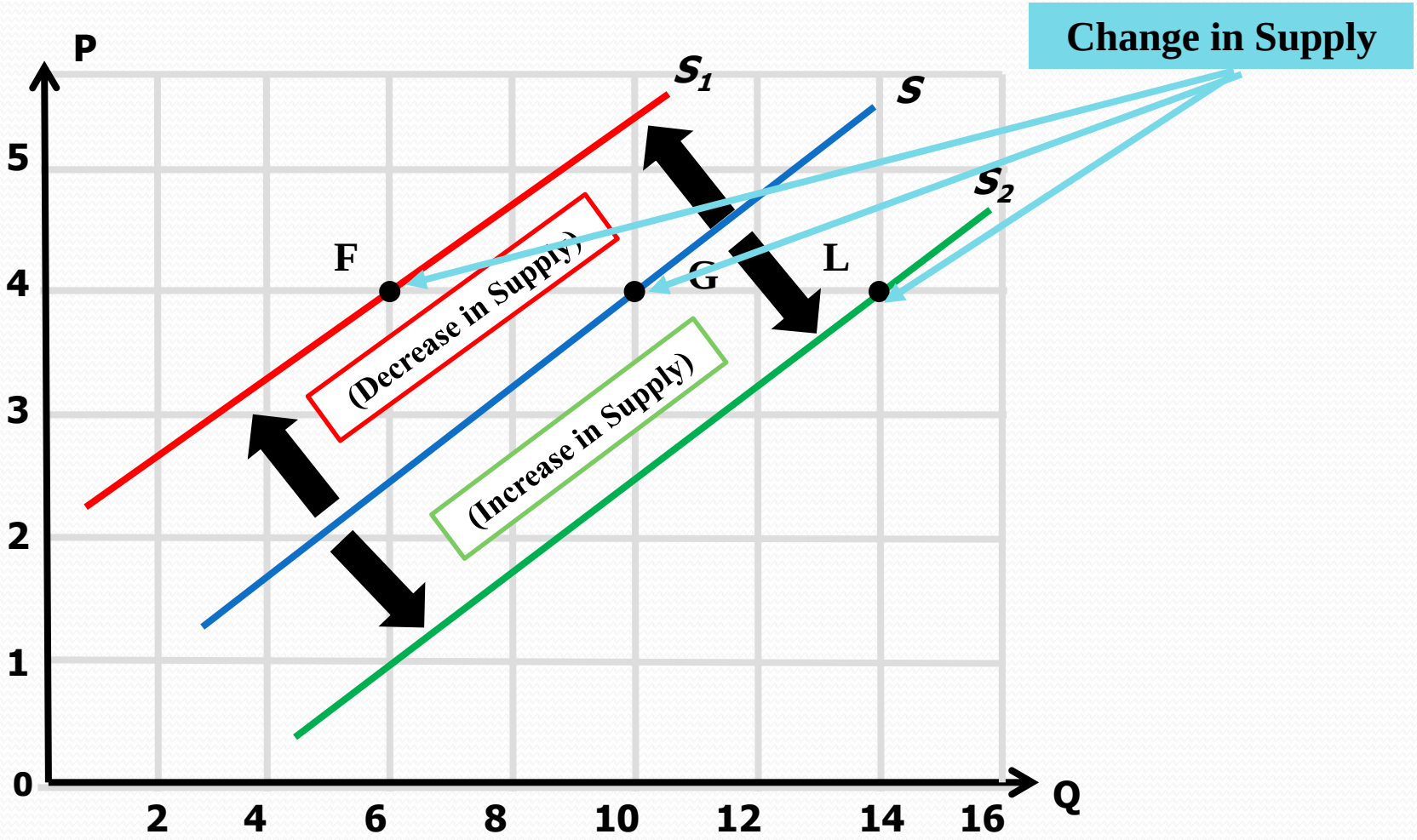
## B. Change in supply:

The change in supply means that the entire supply curve shifts to the right side (increase in supply) or to the left side (decrease in supply).

This change in supply is due to a change in the following five factors:

1. Prices of production factors.
2. Technical progress.
3. Prices of other goods.
4. Producer expectations.
5. Number of producers.

# The Change in quantity supplied Versus Change in supply



# The Change in quantity supplied Versus Change in supply

## B. Change in supply:

| Determinants of Supply: Factors that shift the Supply curve | |
|---|---|
| **Determinant** | **Examples** |
| Change in the prices of production factors | If the price of factors used to produce a good rises, the total cost of that good rises. So a rise in the price of production factors decreases supply and shifts the supply curve to the left side, and vice versa. |
| Change in technical progress | Advances in technology create new products which contributes to reduce the cost of production, so they increase supply and shift the supply curve to the right side, and vice versa. |
| Change in the prices of substitutes and complements goods produced | ▪ A substitute good in production is another good that can be produced using the same resources (such as wheat and barley). When the price of wheat increases, the supply of barley decreases.<br>▪ A complement goods in production are the goods that must be produced together (such as Natural gas and Petroleum). An increase in the price of petroleum causes an increase in supply for the natural gas. |
| Change in producer expectations | If the price of a good is expected to fall in the future, current supply increases and the supply curve shifts to the right side, and vice versa. |
| Change in the | The larger the number of producers, the greater is the supply for good. An increase |

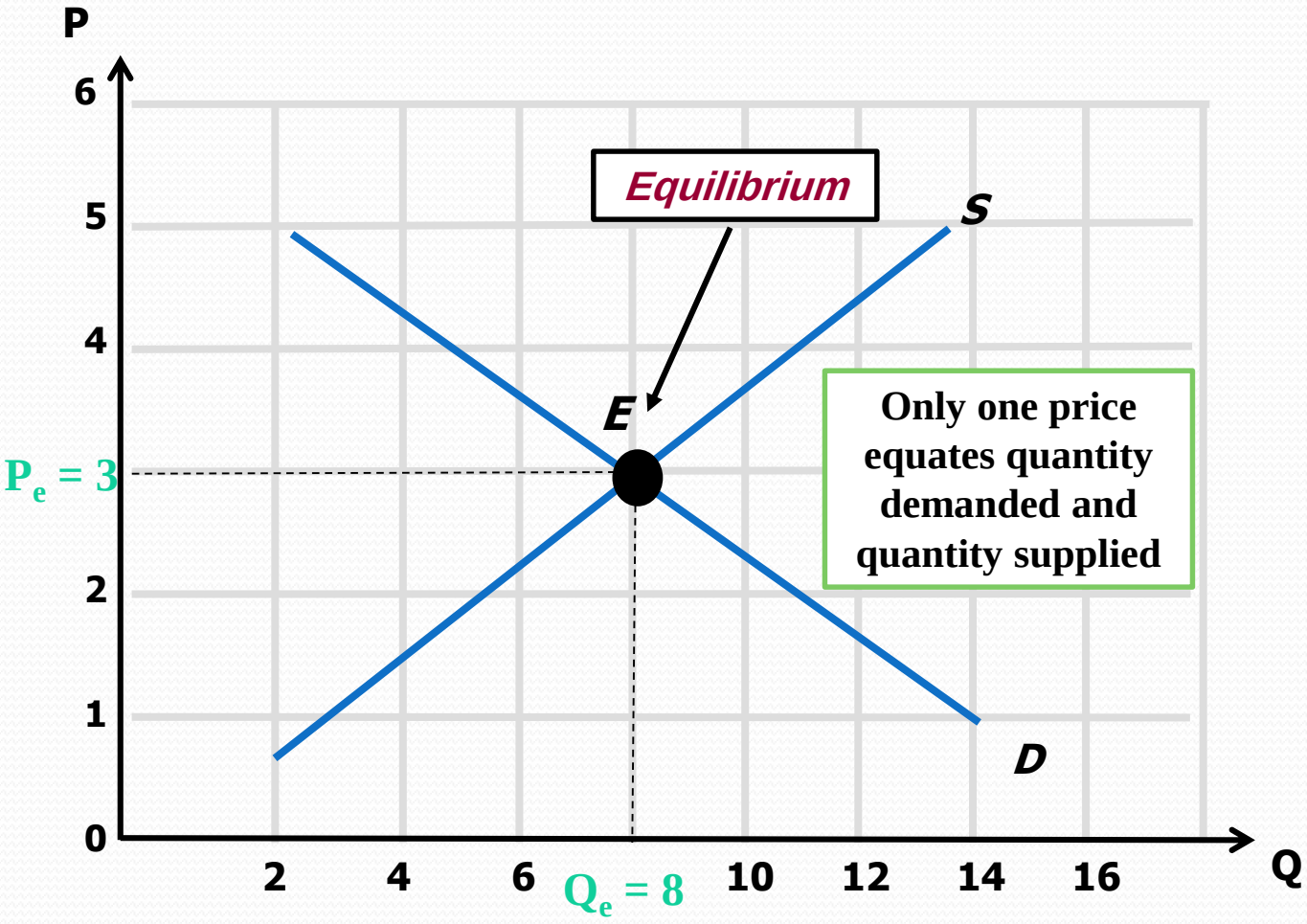
# Market Equilibium

*Equilibrium* is a situation in which opposing forces balance each other.

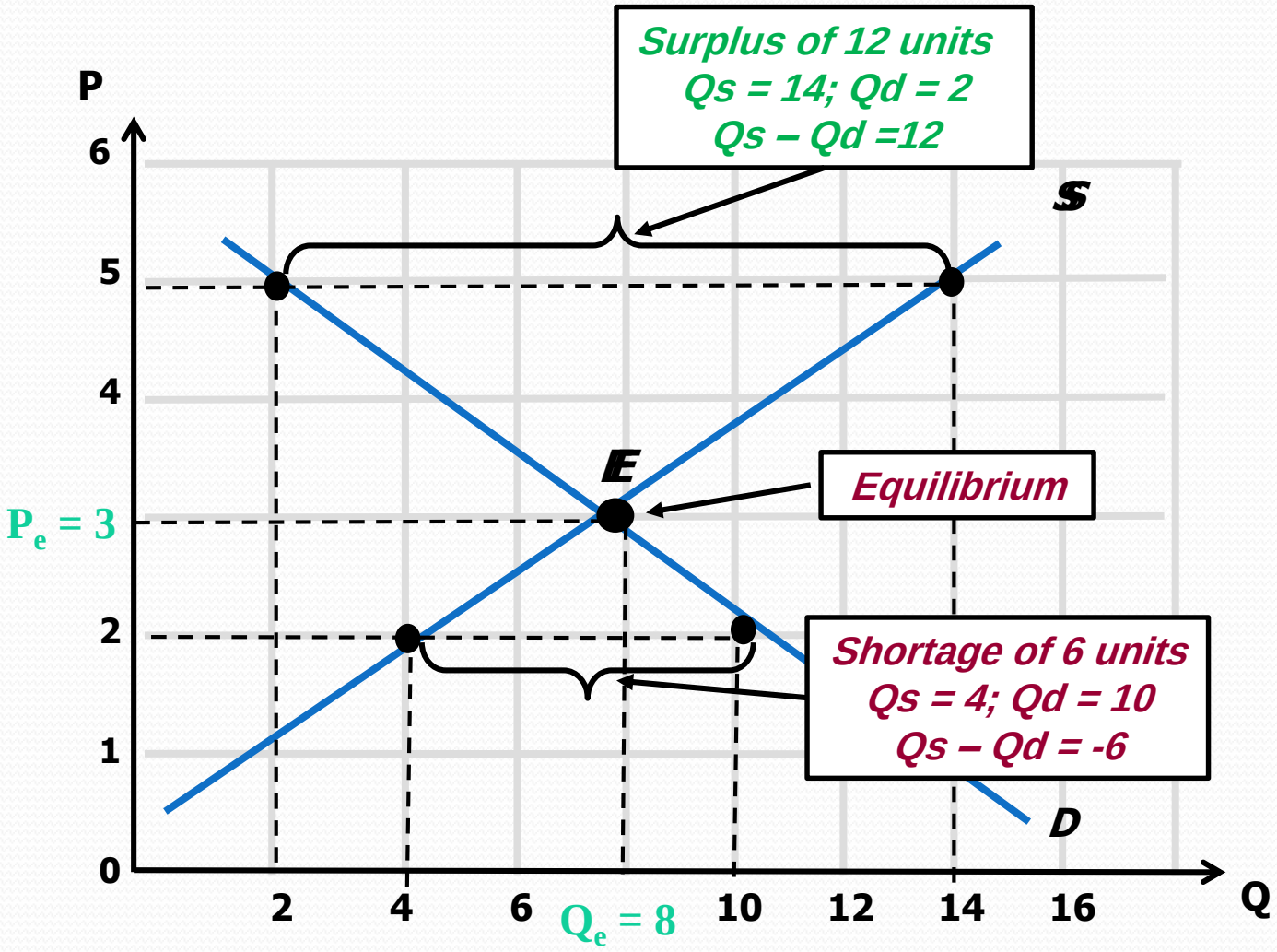
Equilibrium in a market occurs at the interaction of supply and demand curves.

- The **equilibrium price** is the price at which the quantity demanded equals the quantity supplied.
- The **equilibrium quantity** is the quantity bought and sold at the equilibrium price.

# Market Equilibium



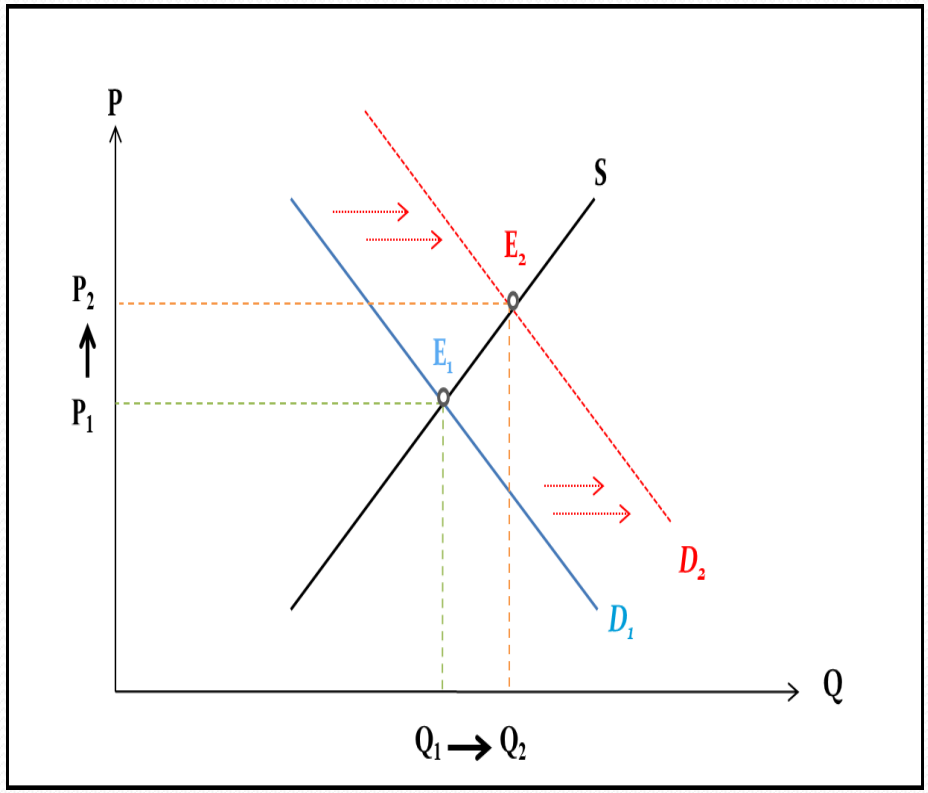
# Market Equilibium



# Predicting Changes in Price and Quantity

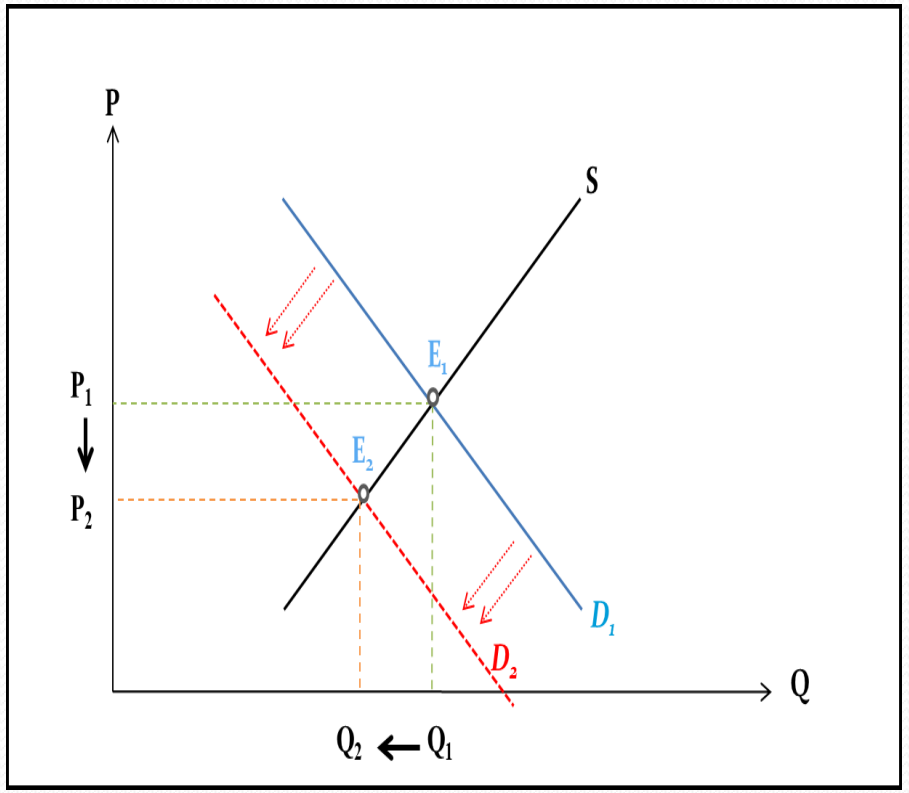
## 1. Change in Demand:

**D ↑ :**
**P↑, Q↑**




Increase in demand

**D ↓ :**
**P↓, Q↓**

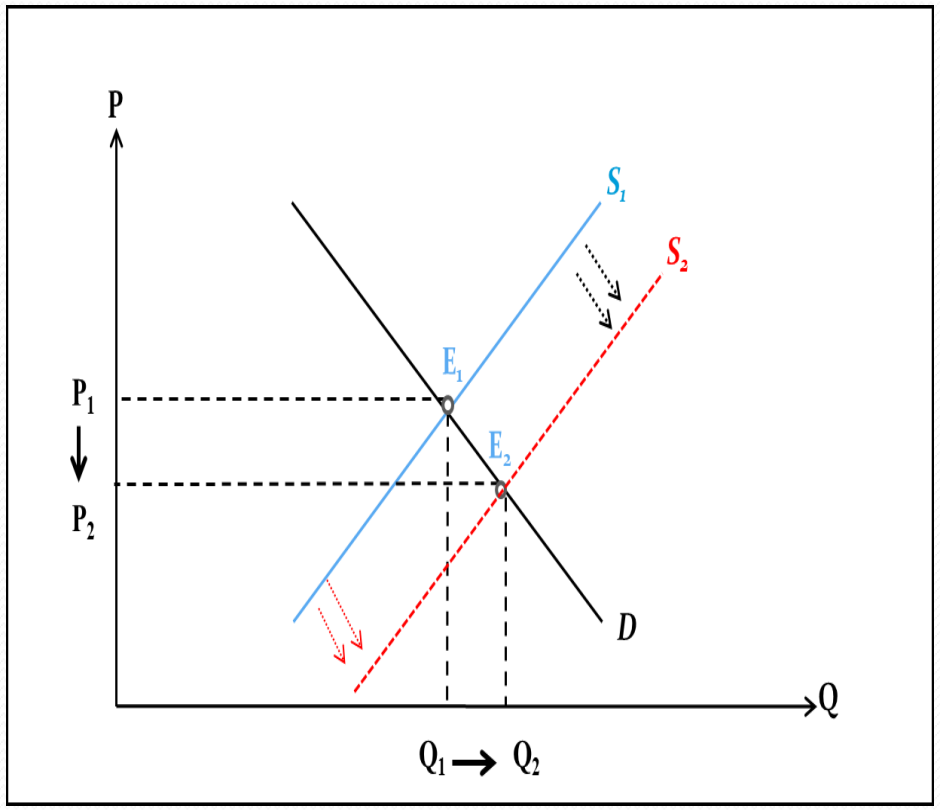



Decrease in demand

# Predicting Changes in Price and Quantity

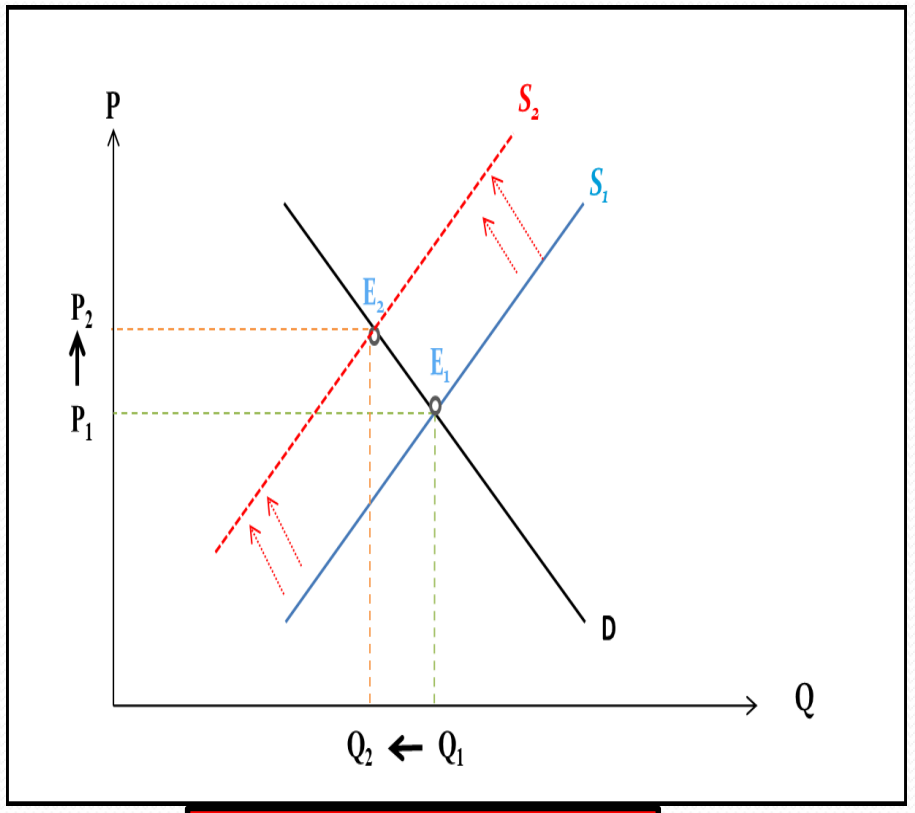
## 2. Change in Supply:

**S ↑ :**
**P↓, Q↑**




Increase in ssupply

**S ↓ :**
**P↑, Q↓**




Decrease in Supply

# Predicting Changes in Price and Quantity

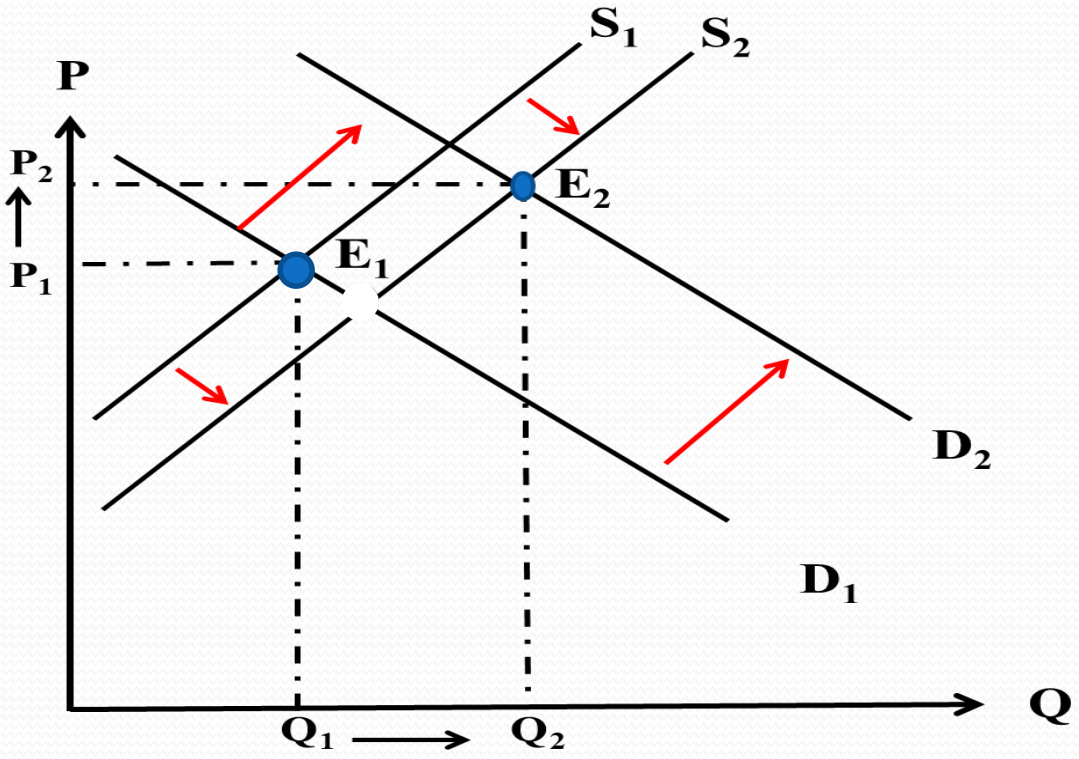
## 3. A Change in Both Demand and Supply

| Effects of Changes in Both Supply and Demand | | | |
|---|---|---|---|
| **Change in Supply** | **Change in Demand** | **Effect on Equilibrium Price** | **Effect on Equilibrium Quantity** |
| 1. Increase | Decrease | Decrease | Indeterminate |
| 2. Decrease | Increase | Increase | Indeterminate |
| 3. Increase | Increase | Indeterminate | Increase |
| 4. Decrease | Decrease | Indeterminate | Decrease |

# Predicting Changes in Price and Quantity

## 3.1 An increase in both Demand and Supply

### Case 1: $\Delta D > \Delta S$

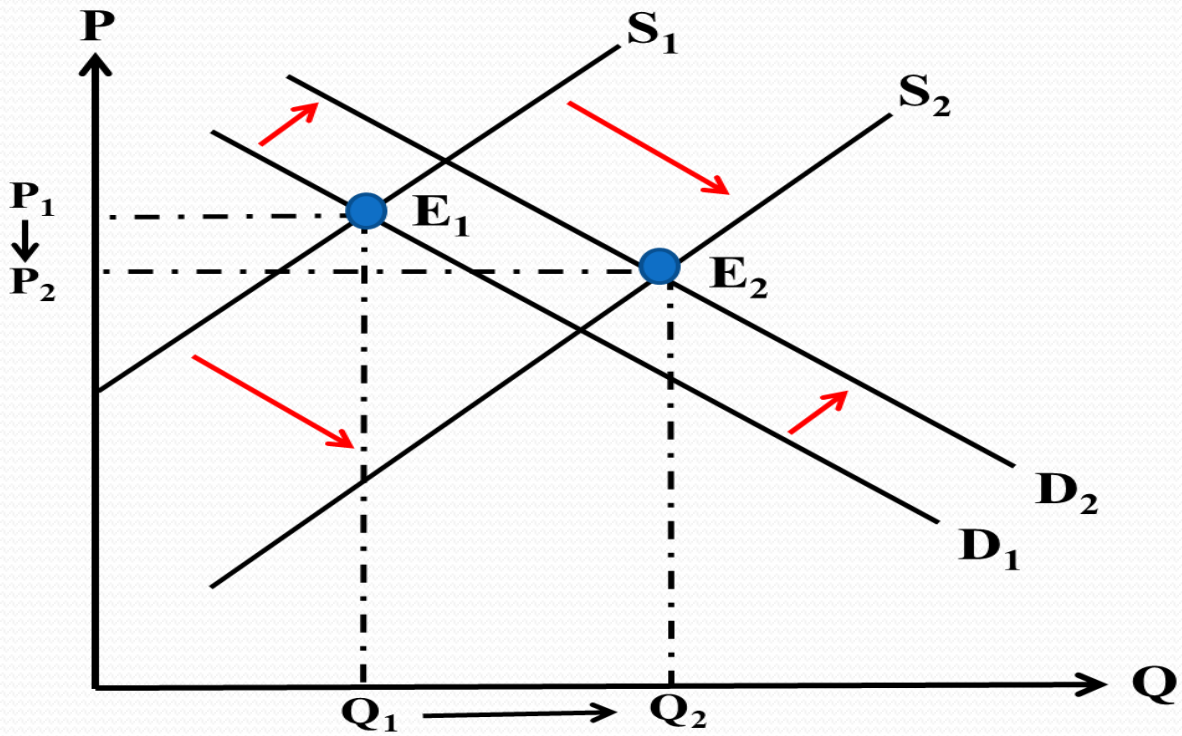



If the increase in demand ($\Delta D$ ) is **greater than** the increase in supply ($\Delta S$ ) this leads to an increase in the equilibrium quantity and also an increase in equilibrium price.

# Predicting Changes in Price and Quantity

## 3.1 An increase in both Demand and Supply

### Case 2: $\Delta S > \Delta D$

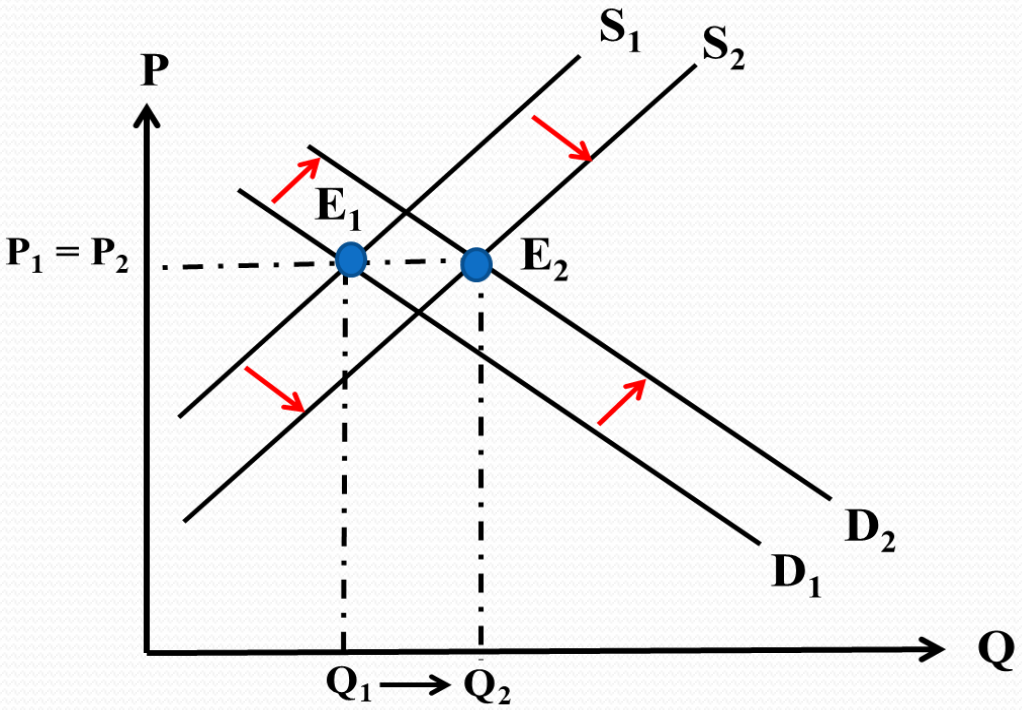



If the increase in supply ($\Delta S$ ) is **greater than** the increase in demand ($\Delta S$ ) this leads to an increase in the equilibrium quantity but a decrease in equilibrium price.

# Predicting Changes in Price and Quantity

## 3.1 An increase in both Demand and Supply

### Case 3: $\Delta S = \Delta D$




If the increase in supply ($\Delta S$ ) is **equal to**the increase in demand ($\Delta S$ ) this leads to an increase in the equilibrium quantity but the equilibrium price remains unchanged

# Appendix

## Mathematical solution to the Market Equilibrium

Demand and supply curves can be represented by a simple linear regression equation, as follows:

$Qd = 20 - 4p$

$Qs = 2 + 5p$

Where Qd and Qs represent respectively the quantity demanded and the quantity supplied and P the price.

Using these equations, answer the two following questions:

1. What is the equilibrium Price?
2. What is the equilibrium Quantity?
3. If the price in this market were 3, does the market has a shortage or surplus? What is the size of the shortage or surplus?

# Appendix

## Mathematical solution to the Market Equilibrium

Solution:

1. At the equilibrium, we have always: $\mathbf{Q_D = Q_S}$

**So, 20 – 4P = 2 + 5P**

**9P = 18 ; P = 18/9 = 2**

**$P_E$ = 2 (the equilibrium price)**

**2.** We replace the value of (**P = 2**) in the equation of demand or supply:

**$Q_D$ = 20 – 4(2) = 12**

**$Q_S$= 2 + 5(2) = 12**

**$Q_E$ = 12 (the equilibrium quantity)**

# Appendix

## Mathematical solution to the Market Equilibrium

If the price in this market were 3, we will have a surplus because

**(The new price 3 is greater than the equilibrium price 2)**

So, with a price **equal to 3**, we will have:

**$Q_d$ = 20- 4(3) = 20 - 12 = 8**

**$Q_s$= 2 + 5(3) = 2 + 15 = 17**

**As Qs > Qd we have a surplus**

**The size of this surplus is equal to = $Q_s$ - $Q_d$ = 17-8 = 9**

# Chapter 4

# Elasticities of Demand and supply

Dr. Oussama Zaghdoud

# Introduction

The law of demand and supply is unable to determine the degree of the change in the quantity demanded or supplied of a good, when the price of that good changes or when the consumer income changes or when the price of the other goods changes.

# 1. Elasticity of Demand

The elasticity of demand measures the responsiveness (sensitivity) of the quantity demanded of a good to a change in its price or to a change in the consumer income or to a change in the prices of other goods (substitutes and complements).

Thus we can distinguish between three types of demand elasticities:

1. Price Elasticity of Demand
2. Income Elasticity of Demand
3. Cross Elasticity of Demand

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

The price elasticity of demand measures the responsiveness of the quantity demanded of a good to a change in **its price**.

The price elasticity of demand is calculated by using the formula:

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

$$E_P = \frac{\%\Delta Q}{\%\Delta P}$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

There are two methods to calculate the price elasticity of demand:

**A. The Point Price Elasticity of Demand:**

We measure the elasticity at a specific point on the demand curve, by using the following equation:

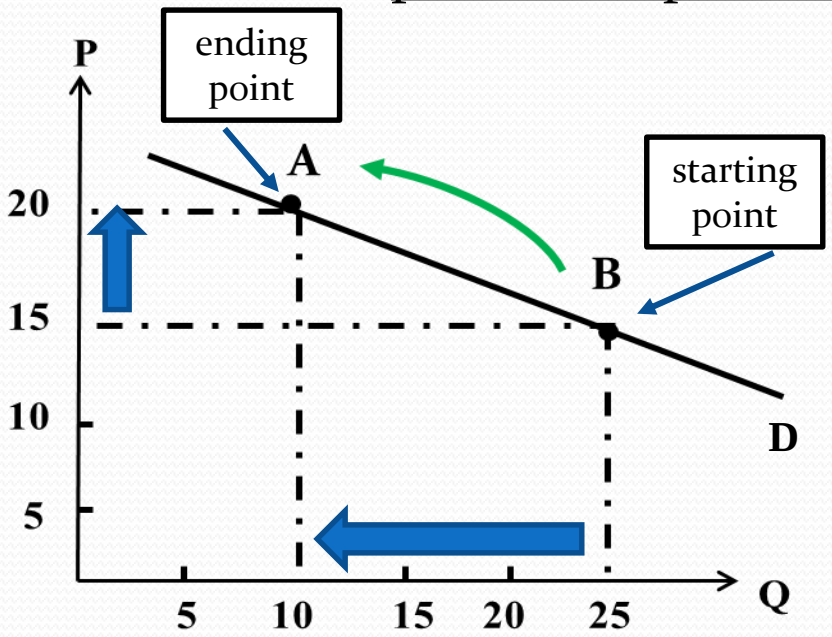
$$E_p = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{\Delta Q}{Q_1}}{\frac{\Delta P}{P_1}} = \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1}{Q_1}$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### A. The Point Price Elasticity of Demand:

**Example 1:** If the price of apples rises from 15 $ to 20 $, the quantity demanded falls from 25 kg to 10 kg. Calculate the price elasticity of demand from point **B** to point **A**.




**Solution**

$$E_P = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{10-25}{25}}{\frac{20-15}{15}} = \frac{10-25}{20-15} \times \frac{15}{25}$$

$$E_P = \frac{-15}{5} \times \frac{15}{25}$$

$$E_P = -3 \times 0.6 = -1.8$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

**A. The Point Price Elasticity of Demand:**

**Solution**

$$E_P = -3 \times 0.6 = -1.8$$

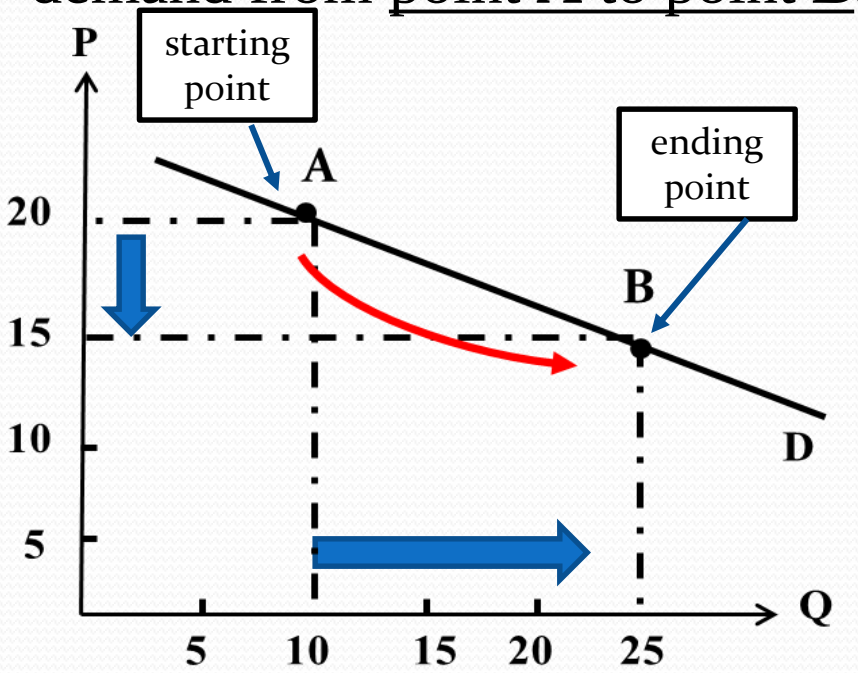
**If the price rises by 1%, the quantity demanded will fall by 1.8%, and vice versa**

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### A. The Point Price Elasticity of Demand:

**Example 2:** If the price of apples falls from 20 $ to 15 $, the quantity demanded rises from 10 kg to 25 kg. Calculate the price elasticity of demand from point **A** to point **B**.




**Solution**

$$E_P = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{25-10}{10}}{\frac{15-20}{20}} = \frac{25-10}{15-20} \times \frac{20}{10}$$

$$E_P = \frac{15}{-5} \times \frac{20}{10}$$

$$E_P = -3 \times 2 = -6$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### A. The Point Price Elasticity of Demand:

**Solution**

$$E_P = -3 \times 2 = -6$$

**If the price rises by 1%, the quantity demanded will fall by 6%, and vice versa**

**Remark:**

Using the first method we get different values of the price elasticity of demand between the two points (**A** and **B)** on the same demand curve. To overcome this problem, economists use other method: **The Arc Price Elasticity of Demand (Midpoint).**

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### B. The Arc Price Elasticity of Demand :

The Arc method measures elasticity at the midpoint between two selected points on the demand curve by using the average of the initial price and the new price, and the average of the initial quantity demanded and the new quantity demanded.

The arc price elasticity of demand can be calculated as:

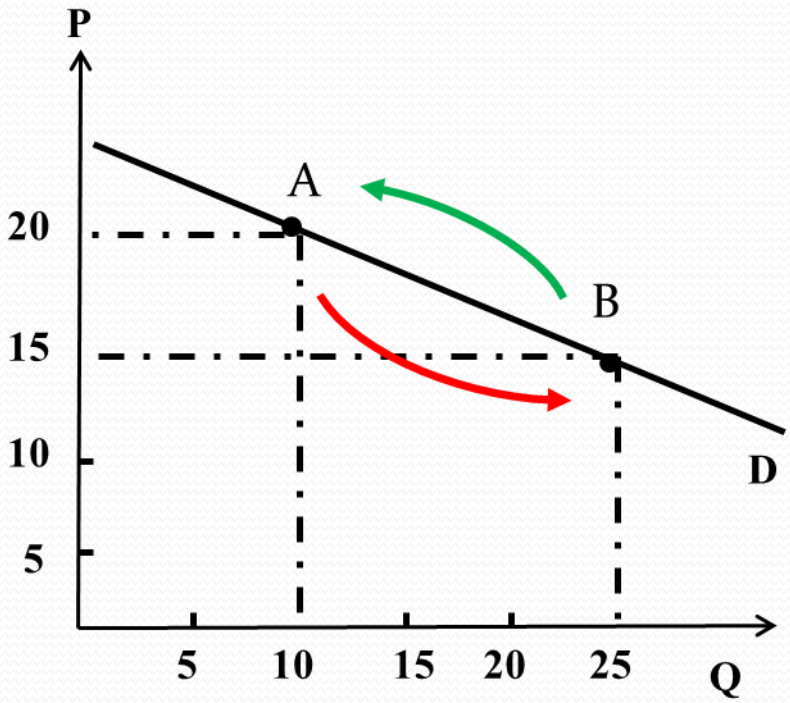
$$E_P = \frac{\frac{Q_2 - Q_1}{(Q_2 + Q_1)} \times 100}{\frac{P_2 - P_1}{(P_2 + P_1)} \times 100} = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{P_2 - P_1}{P_2 + P_1}} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1 + P_2}{Q_2 + Q_1}$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### B. The Arc Price Elasticity of Demand :

**Example 3:** Calculate the price elasticity of demand between point **A** and **B**




**Solution:**

➢ **From B to A**

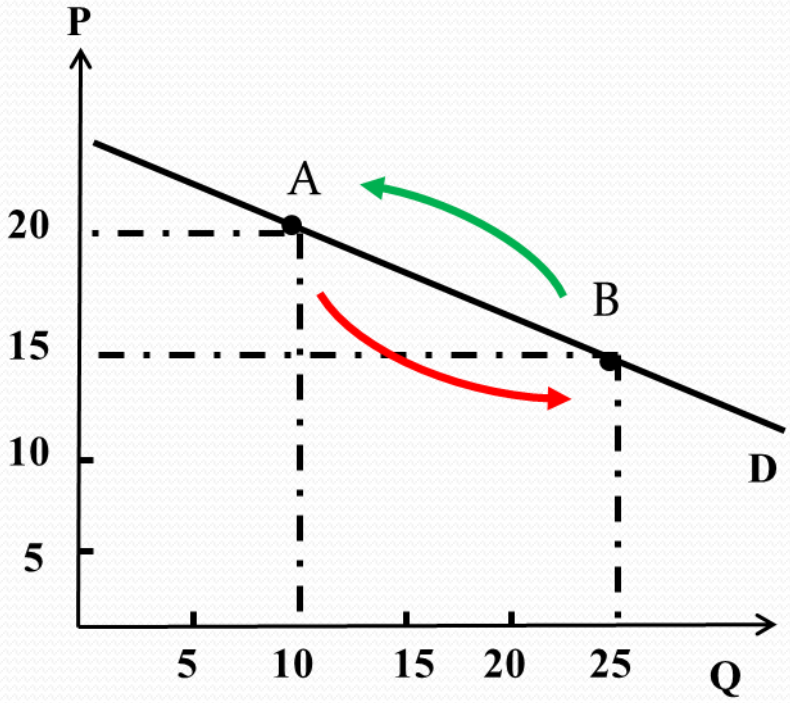
$$E_P = = \frac{\frac{10-25}{10+25}}{\frac{20-15}{20+15}} = \frac{\frac{-15}{35}}{\frac{5}{35}} = \frac{-15}{35} \times \frac{35}{5} = \frac{-15}{5} = -3$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### B. The Arc Price Elasticity of Demand :

**Example 3:** Calculate the price elasticity of demand between point **A** and **B**




**Solution:**

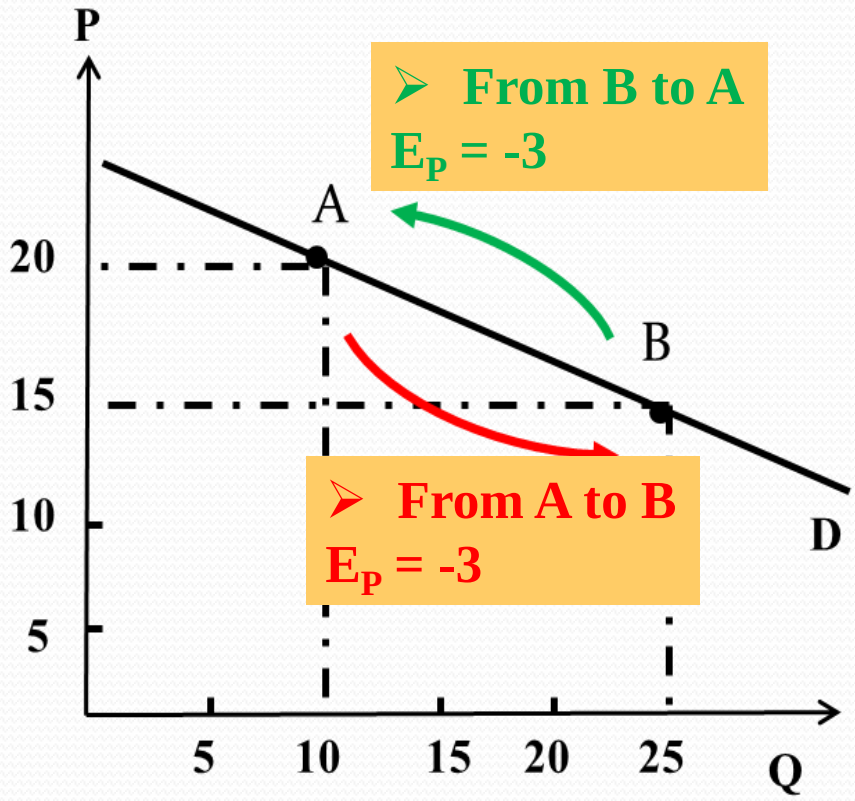
➢ **From A to B**

$$E_P = = \frac{\frac{25-10}{25+10}}{\frac{15-20}{15+20}} = \frac{\frac{15}{35}}{\frac{-5}{35}} = \frac{15}{35} \times \frac{35}{-5} = \frac{15}{-5} = -3$$

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### B. The Arc Price Elasticity of Demand :




**Remark:**

When we use the arc elasticity method we do not need to worry about which point is the starting point and which point is the ending point, since the arc elasticity gives **the same value for elasticity** ($E_P$ = -3) whether prices rise or fall.

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### General remarks:

- The sign of the price elasticity of demand is always negative due to the law of demand (negative relationship between the price and the quantity demanded). However, we ignore the minus sign and use the absolute values (positive sign), in order to compare the percentage change in the price and the percentage change in the quantity demanded.
- The price elasticity is units-free, because it is a ratio of two percentage changes and the percentages cancel out.

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

**The degree of the elasticity**: The degree of the consumer response to any change in the quantity demand of a good, depends largely on the importance of this good. So, the consumer response to the high prices of water or medicine, for example differ from the consumer response to the high prices of juices or mobile phones. So we can have 5 possible cases:

1. Elsatic Demand
2. Inalstic Demand
3. Unit Elastic Demand
4. Perfectly Elastic Demand
5. Perfectly Inelastic Demand

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

1. **Elastic Demand:** the demand is elastic if the percentage change in the quantity demanded is greater than the percentage change in price.($E_p > 1$).
2. **Inelastic Demand:** the demand is inelastic if the percentage change in the quantity demanded is less than the percentage change in price. ($E_p < 1$).
3. **Unit Elastic Demand:** the demand is unit elastic if the percentage change in the quantity demanded equals the percentage change in price. ($E_p = 1$).
4. **Perfectly Elastic Demand:** the demand is perfectly elastic if the quantity demanded changes by a very large percentage (infinite) when the price changes even if with very small percentage. ($E_p = \infty$).
5. **Perfectly inelastic Demand:** the demand is perfectly inelastic, when the quantity demanded remains constant as the price changes. ($E_p = 0$).

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

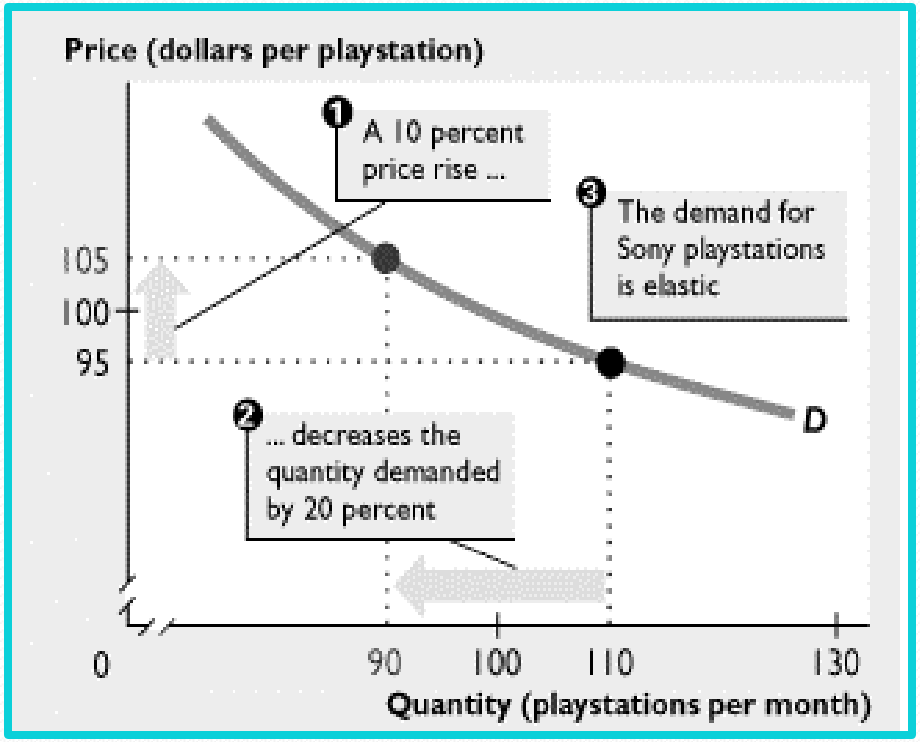



**Figure 1 shows an elastic demand.**

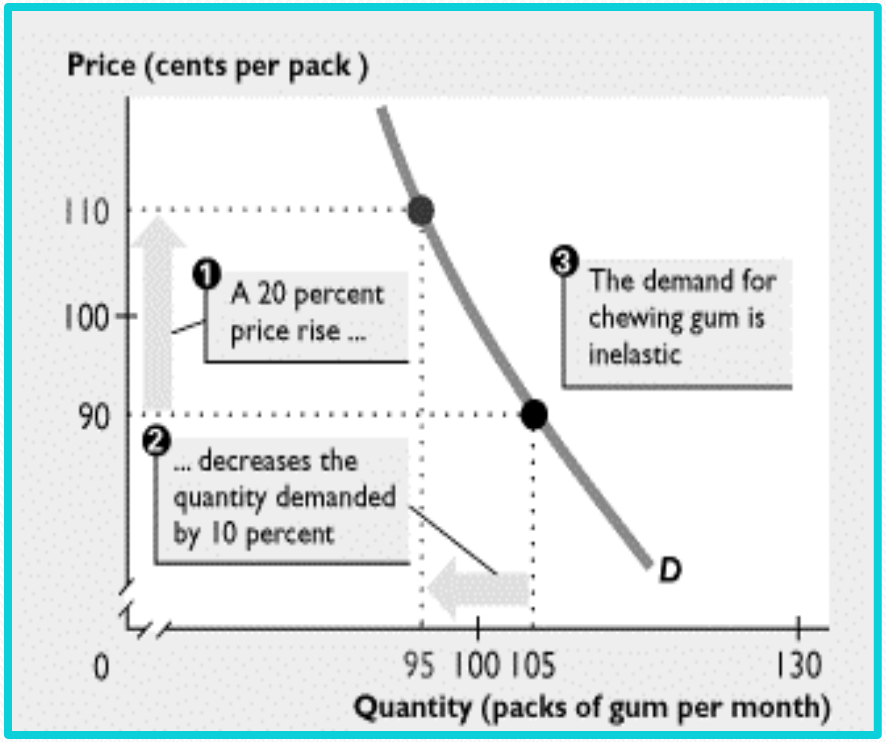



**Figure 2 shows an inelastic demand.**

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

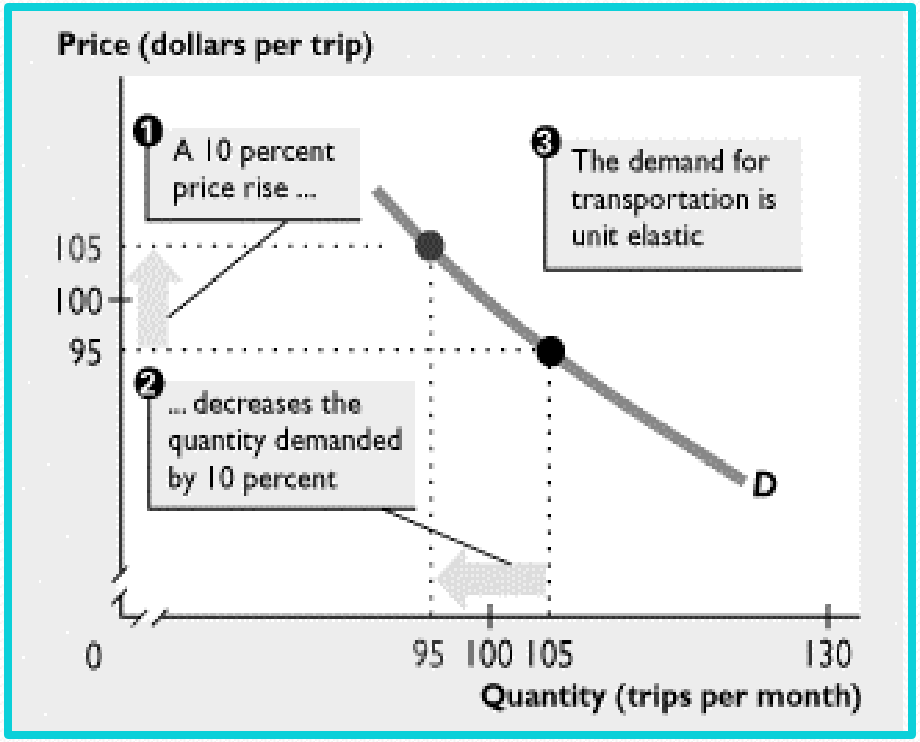



**Figure 3 shows an unit elastic demand.**

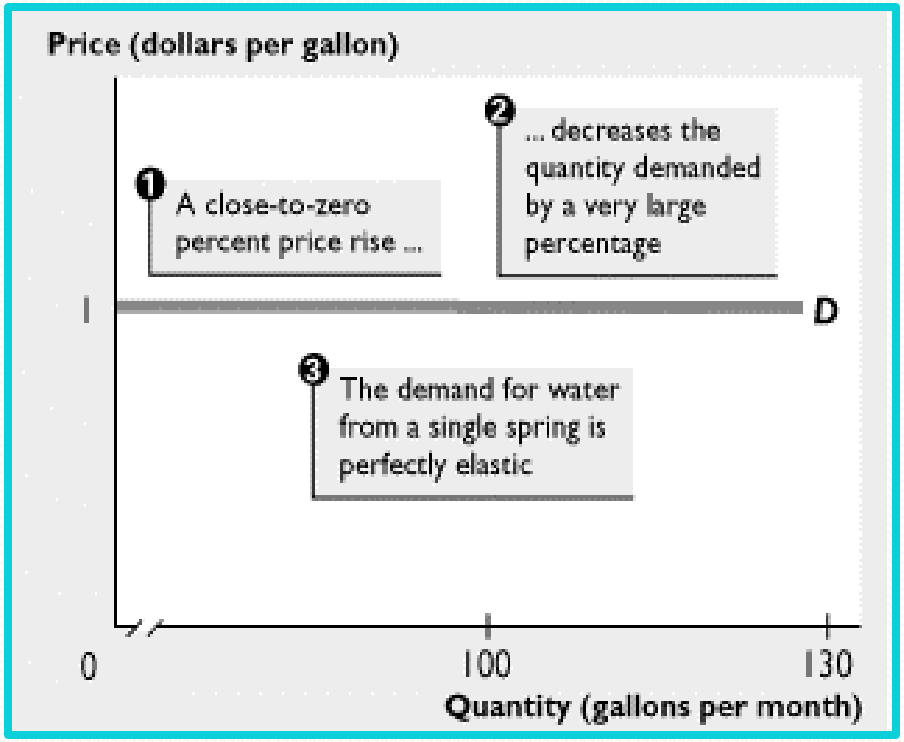



**Figure 4 shows a perfectly elastic demand.**

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

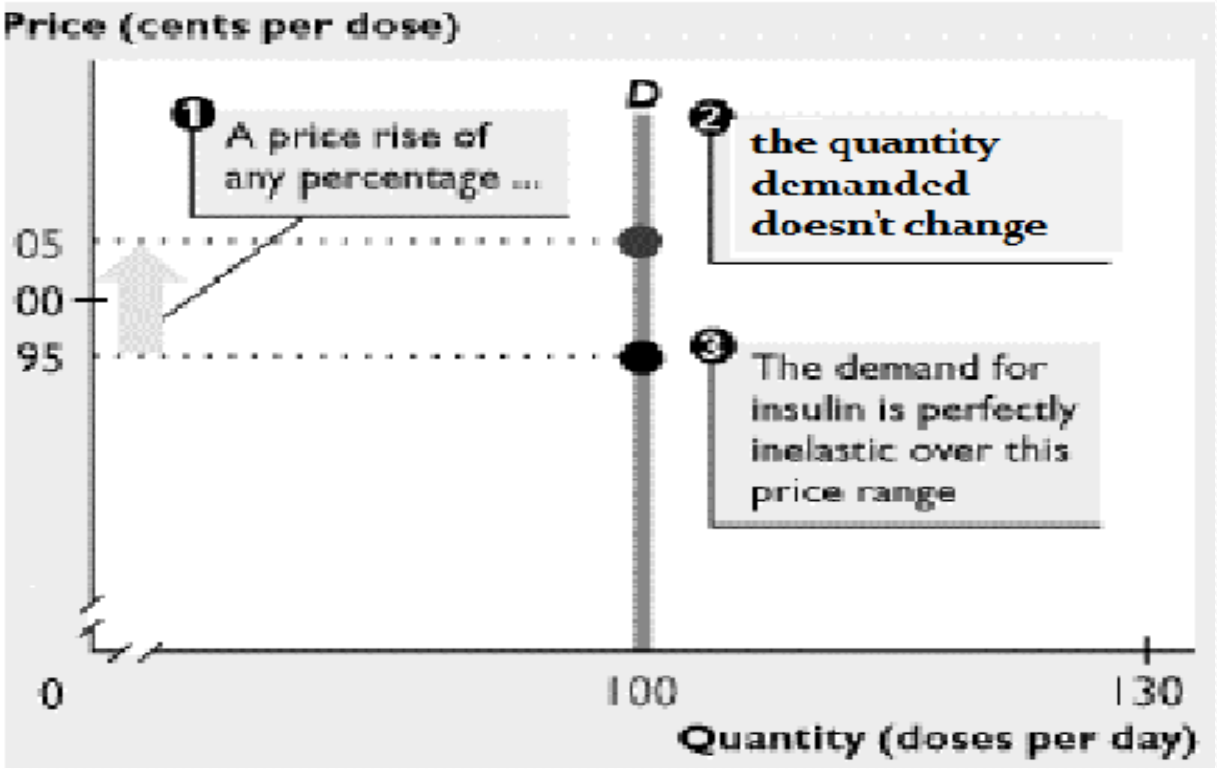



**Figure 5 shows an perfectly inlastic demand.**

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

**Determinants of price elasticity of demand:**

The factors that can influence the price elasticity of demand, are:

- **Substitution effect**

The demand for a good is elastic if a substitute for it is easy to find, and vice versa. (*e.g. Pepsi versus Coca-cola*).

- **Income effect**

The greater the proportion of income spent on a good, the more elastic is the demand for the good, and vice versa. (*e.g. the airplane ticket versus sugar*)

- **Time Effect**

The more time consumers have to adjust to a price change, the more elastic is the demand for that good, and vice versa. (*e.g. impose taxes on cigarettes*)

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

### ❑ Total Revenue and Price Elasticity of Demand

The total revenue is the amount **spent** (by the consumers) on a good and **received** by its **sellers** and equals the **price** of the good **multiplied by the quantity** of the good sold.

**Total Revenue = Price× Quantity**

**TR = P × Q**

### ❑ Total revenue test

A method of estimating the price elasticity of demand by observing the change in total revenue that results from a price change.

# 1. Elasticity of Demand

- **Total revenue test**

| Price Elasticity of Demand for Movie Tickets as Measured by the Elasticity Coefficient and the Total-Revenue Test | | | | |
|---|---|---|---|---|
| **Quantity of Tickets Demanded (Q)** | **Price per Ticket (P) $** | **Elasticity Coefficient ($E_p$)** | **Total Revenue (P X Q) $** | **Total Revenue Test** |
| 1 | 8 | --- | 8 | --- |
| 2 | 7 | -5.00 | 14 | Elastic |
| 3 | 6 | -2.60 | 18 | Elastic |
| 4 | 5 | -1.57 | 20 | Elastic |
| 5 | 4 | -1.00 | 20 | Unit Elastic |
| 6 | 3 | -0.64 | 18 | Inelastic |
| 7 | 2 | -0.38 | 14 | Inelastic |
| 8 | 1 | -0.20 | 8 | Inelastic |

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

- **Total revenue test**

1. **Demand is elastic:**

A given percentage **rise in price** brings a ***larger* percentage decrease** in the quantity demanded, and total revenue ***decreases***, and vice versa.

2. **Demand is inelastic:**

A given percentage **rise in price** brings a ***smaller* percentage decrease in the quantity demanded**, and total revenue ***increases***, and vice versa.

3. **Demand is unit elastic:**

A given percentage **rise in price** brings an ***equally percentage decrease*** in the quantity demanded, and total revenue ***remains constant***, and vice versa.

# 1. Elasticity of Demand

## 1.1 Price Elasticity of Demand

- **Total revenue test**

1. If price and total revenue change in the **opposite directions**, ***demand is elastic***.
2. If price and total revenue change in the **same direction**, ***demand is inelastic.***
3. If a price change leaves total revenue **unchanged**, ***demand is unit elastic.***

# Summary of Price Elasticity of Demand

| Price Elasticity of Demand: A Summary | | | | |
|---|---|---|---|---|
| **Absolute Value of Elasticity Coefficient** | **Demand Is:** | **Description** | **Impact on Total Revenue of a:** | |
| | | | **Price Increase** | **Price Decrease** |
| Greater than 1 ($E_P > 1$) | Elastic | $Q_d$ changes by a larger percentage than does price | Total Revenue decreases | Total Revenue increases |
| Less than 1 (EP < 1) | Inelastic | $Q_d$ changes by a smaller percentage than does price | Total revenue increases | Total revenue decreases |
| Equal to 1 ($E_P = 1$) | Unit or elastic | $Q_d$ changes by the same percentage as does price | Total revenue is unchanged | Total revenue is unchanged |

# 1. Elasticity of Demand

## 1.2 Income Elasticity of Demand

The income elasticity of demand measures the responsiveness of the quantity demanded of a good to a change in income.

The income elasticity of demand is calculated by using the formula:

$$E_I = \frac{\textbf{Percentage change in quantity demanded}}{\textbf{Percentage change in income}}$$

$$E_I = \frac{\%\Delta Q}{\%\Delta I}$$

# 1. Elasticity of Demand

## 1.2 Income Elasticity of Demand

There are two methods to calculate the income elasticity of demand (as for the price elasticity of demand):

**A. The Point Income Elasticity of Demand:**

We measure the elasticity at a specific point on the demand curve, by using the following equation:

$$E_I = \frac{\%\Delta Q}{\%\Delta I} = \frac{\frac{\Delta Q}{Q_1}}{\frac{\Delta I}{I_1}} = \frac{\Delta Q}{\Delta I} \times \frac{I_1}{Q_1} = \frac{Q_2 - Q_1}{I_2 - I_1} \times \frac{I_1}{Q_1}$$

# 1. Elasticity of Demand

## 1.1 Income Elasticity of Demand

**B. The Arc Income Elasticity of Demand :**

The arc income elasticity of demand can be calculated as:

$$E_I = \frac{\frac{Q_2 - Q_1}{(Q_2 + Q_1)} \times 100}{\frac{I_2 - I_1}{(I_2 + I_1)} \times 100} = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{I_2 - I_1}{I_2 + I_1}} = \frac{Q_2 - Q_1}{I_2 - I_1} \times \frac{I_1 + I_2}{Q_2 + Q_1}$$

# 1. Elasticity of Demand

## 1.2 Income Elasticity of Demand

The income elasticity may be positive or negative (we should not use the absolute values).

- If the income elasticity of demand is greater than 0 ($E_I > 0$), the good is a ***normal good***.

(Quantity demanded of the product changes in same direction as change in income)

- If the income elasticity of demand is less than 0 ($E_I < 0$), the good is an ***inferior good.*** (Quantity demanded of the product changes in opposite direction as change in income)

# 1. Elasticity of Demand

## 1.2 Income Elasticity of Demand

**Example:**

A consumer's weekly income is $300 and the consumer buys 5 bars of chocolate per week. When income increases to $330, the consumer buys 6 bars per week. By using the **Arc method**, calculate the income elasticity of demand for chocolate.

**Solution:**

$$E_I = \frac{\frac{6-5}{6+5}}{\frac{330-300}{630}} = \frac{\frac{1}{11}}{\frac{30}{630}} = \frac{1}{11} \times \frac{630}{30} = \frac{1}{11} \times 21 = \frac{21}{11} = 1.9$$

$E_I = 1.9 > 0$ **Chocolate** is a ***normal good***

# 1. Elasticity of Demand

## 1.3 Cross Elasticity of Demand

The cross elasticity of demand measures the responsiveness of the quantity demanded of a good (***X***) to a change in the price of another good (***Y***)

The cross elasticity of demand is calculated by using the formula:

$$E_{X,Y} = \frac{\textbf{Percentage change in quantity demanded of good } X}{\textbf{Percentage change in price of good } Y}$$

$$E_{X,Y} = \frac{\%\Delta Q_X}{\%\Delta P_Y}$$

# 1. Elasticity of Demand

## 1.3 Cross Elasticity of Demand

There are two methods to calculate the cross elasticity of demand (as for the price elasticity of demand):

### A. The Point Cross Elasticity of Demand:

We measure the elasticity at a specific point on the demand curve, by using the following equation:

$$E_{X,Y} = \frac{\%\Delta Q_X}{\%\Delta P_Y} = \frac{\frac{\Delta Q_X}{Q_{1X}}}{\frac{\Delta P_Y}{P_{1Y}}} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_{1Y}}{Q_{1X}} = \frac{Q_{2X} - Q_{1X}}{P_{2Y} - P_{1Y}} \times \frac{P_{1Y}}{Q_{1X}}$$

# 1. Elasticity of Demand

## 1.3 Cross Elasticity of Demand

### B. The Arc Cross Elasticity of Demand :

The arc cross elasticity of demand can be calculated as:

$$E_{X,Y} = \frac{\frac{Q_{2X} - Q_{1X}}{(Q_{2X} + Q_{1X})} \times 100}{\frac{P_{2Y} - P_{1Y}}{(P_{2Y} + P_{1Y})} \times 100} = \frac{\frac{Q_{2X} - Q_{1X}}{Q_{2X} + Q_{1X}}}{\frac{P_{2Y} - P_{1Y}}{P_{2Y} + P_{1Y}}} = \frac{Q_{2X} - Q_{1X}}{P_{2Y} - P_{1Y}} \times \frac{P_{1Y} + P_{2Y}}{Q_{2X} + Q_{1X}}$$

The cross elasticity may be positive or negative (we should not use the absolute values).

# 1. Elasticity of Demand

## 1.3 Cross Elasticity of Demand

- If the cross elasticity of demand is greater than 0 ($\mathbf{E_{X,Y} > 0}$), the two goods (X and Y) are ***substitutes***. (e.g. tea and coffee).
- If the cross elasticity of demand is less than 0 ($\mathbf{E_{X,Y} < 0}$ ), the two goods (***X*** and ***Y***) are ***complements***: (e.g. car and gasoline).
- If the cross elasticity of demand is equal to 0 ($\mathbf{E_{X,Y} = 0}$ ), the two goods (***X*** and ***Y***) are ***independents***.

# 1. Elasticity of Demand

## 1.3 Cross Elasticity of Demand

**Example:**

The quantity demanded of apples increases from 5 kg to 7 kg per week when the price of oranges increases from 2$ to 4$. Calculate the cross elasticity of demand and tell whether apples and oranges are substitute or complement goods.

**Solution:**

$$E_{Ap,or} = \frac{\frac{7-5}{7+5}}{\frac{4-2}{2+4}} = \frac{\frac{2}{12}}{\frac{2}{6}} = \frac{2}{12} \times \frac{6}{2} = \frac{6}{12} = \frac{1}{2} = 0.5$$

$E_{Ap,or} = 0.5 > 0$ .Since the cross elasticity of demand is positive, product A and B are substitute goods

# 2. Elasticity of Supply

## 1.1 Price Elasticity of Supply

The price elasticity of supply measures the responsiveness of the quantity supplied of a good to a change in its price.

The price elasticity of supply is calculated by using the formula:

$$E_p = \frac{\textbf{Percentage change in quantity supplied}}{\textbf{Percentage change in price}}$$

$$E_P = \frac{\%\Delta QS}{\%\Delta P}$$

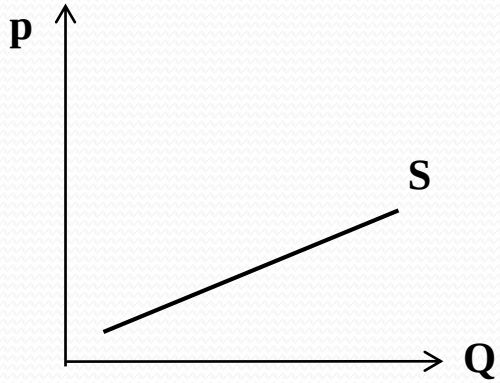
# 2. Elasticity of Supply

## 2.1 Price Elasticity of Supply

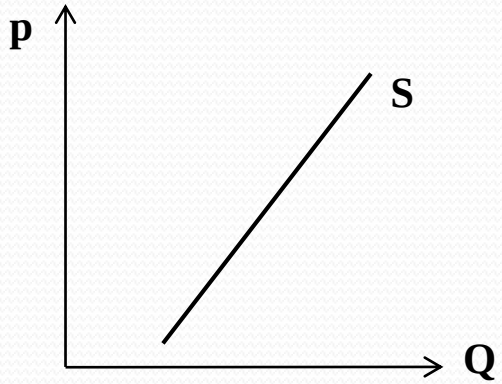
1. **Elastic Supply:** the supply is elastic if the percentage change in the quantity supplied is greater than the percentage change in price.($E_p > 1$).
2. **Inelastic Supply :** the supply is inelastic if the percentage change in the quantity supplied is less than the percentage change in price. ($E_p < 1$).
3. **Unit Elastic Supply :** the supply is unit elastic if the percentage change in the quantity supplied equals the percentage change in price. ($E_p = 1$).
4. **Perfectly Elastic Supply :** the supply is perfectly elastic if the quantity supplied changes by a very large percentage (infinite) when the price changes even if with very small percentage. ($E_p = \infty$).
5. **Perfectly inelastic Supply :** the supply is perfectly inelastic, when the quantity supplied remains constant as the price changes. ($E_p = 0$).

# 2. Elasticity of Supply

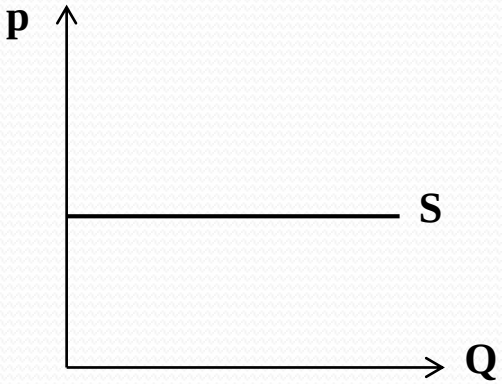
## 2.1 Price Elasticity of Supply



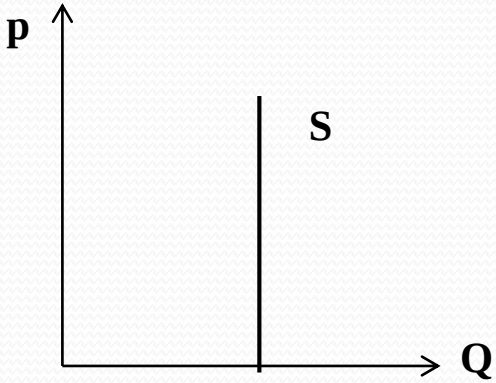

Elastic Supply



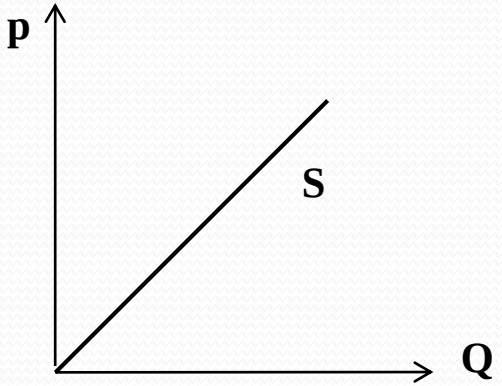

Inelastic Supply




Perfectly Elastic Supply




Perfectly inelastic Supply




Unit Elastic Supply

# Chapter 5

# Consumer Behavior

Dr. Oussama Zaghdoud

# Introduction

- How do consumers allocate income to the purchase of different goods and services?
- How do consumers with limited income decide what to buy?

In order to answer these questions, we will study in this chapter ***the consumer behavior.***

To study and analyze consumer behavior there are two basic theories:

1. Utility Theory
2. Indifference Curve Theory

# 1. Consumption possibilities and budget line

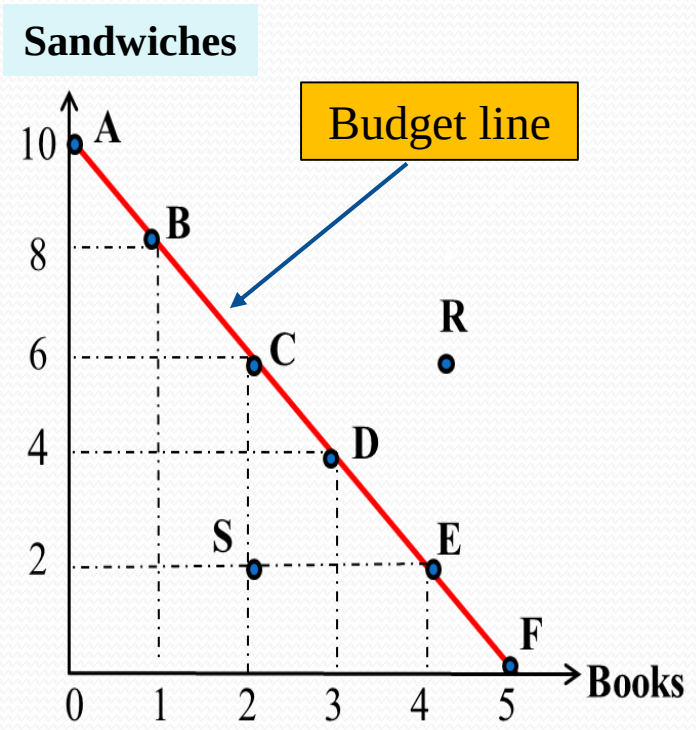
The consumption possibilities for a consumer are constrained by his income and the prices of the goods and services in the market.

Thus, ***the budget line*** describes the limits to consumption choices and depends on the consumer's budget and the prices of goods and services.

# 1. Consumption possibilities and budget line

Example: Ahmed spends all his income of 30$ per day on the purchase of only two items: Sandwiches at 3$ per unit and Books at 6$ per unit.

| Possibilities | Books (6$) | | Sandwiches (3$) | |
|---|---|---|---|---|
| | Qauntity | Spending | Qauntity | Spending |
| A | 0 | 0 | 10 | 30 |
| B | 1 | 6 | 8 | 24 |
| C | 2 | 12 | 6 | 18 |
| D | 3 | 18 | 4 | 12 |
| E | 4 | 24 | 2 | 6 |
| F | 5 | 30 | 0 | 0 |



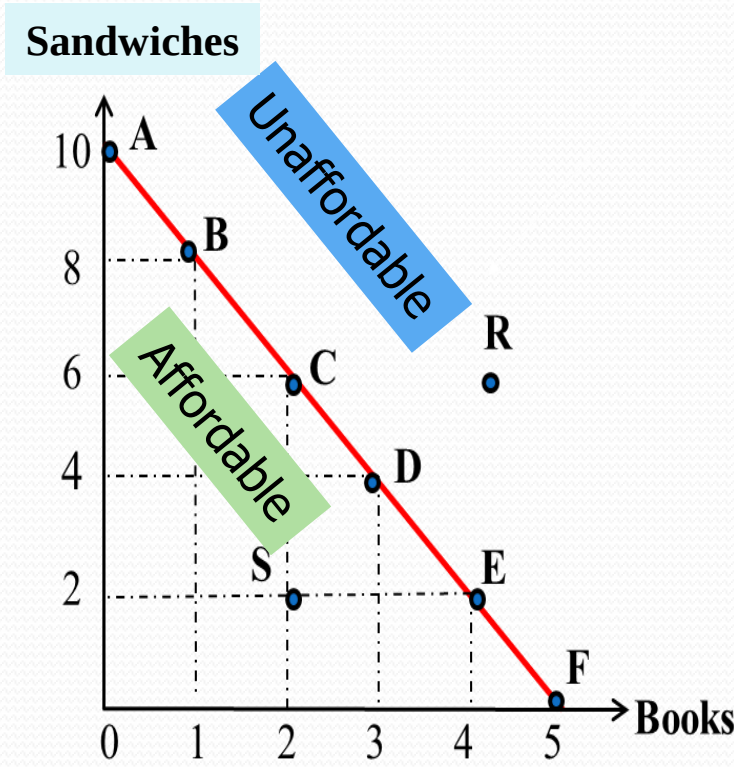
# 1. Consumption possibilities and budget line

- Ahmed can afford all the points <u>on</u> or <u>below</u> the <u>budget line</u>.

**<u>Example 1</u>**: At point B (1; 8), the total amount spent by Ahmed is equal to : 1×6 + 8×3 = 30 which equals his income (30$).

- Ahmed cannot afford the points <u>beyond</u> the <u>budget line</u>.

**<u>Example 2</u>**: At point R (4; 6), the total amount spent by Ahmed equal to : 4×6 + 6×3 = 42 which exceeds his income (30$).

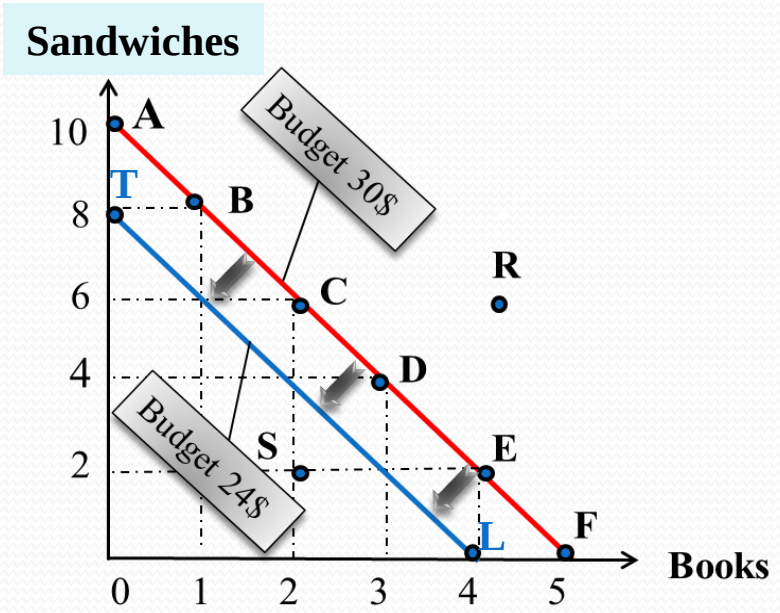



***The budget line separates the combinations that are affordable from those that are unaffordable.***

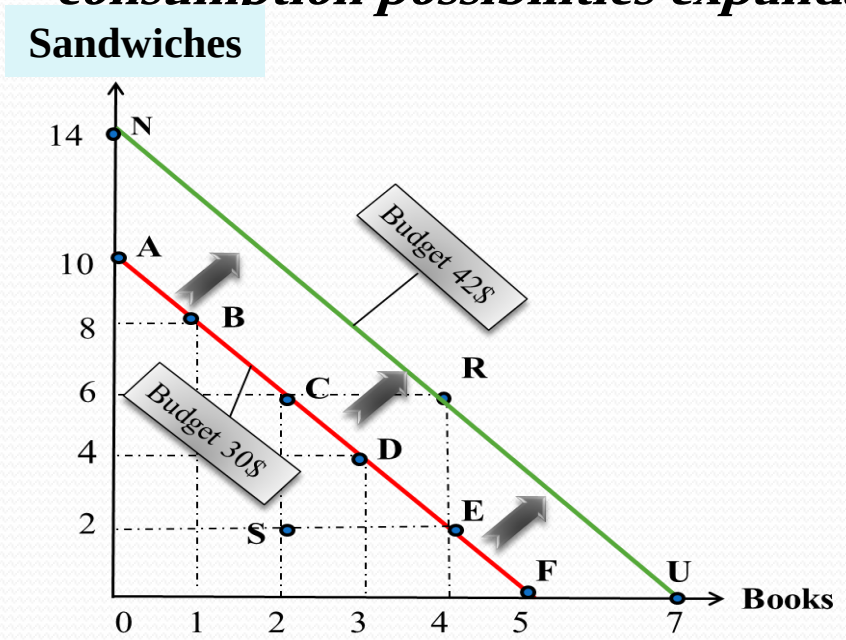
# 1. Consumption possibilities and budget line

## 1.1 A change in the budget line

1. A decrease in the budget shifts the budget line leftward so, ***consumption possibilities shrink.***




2. An increase in the budget shifts the budget line rightward so, ***consumption possibilities expand.***



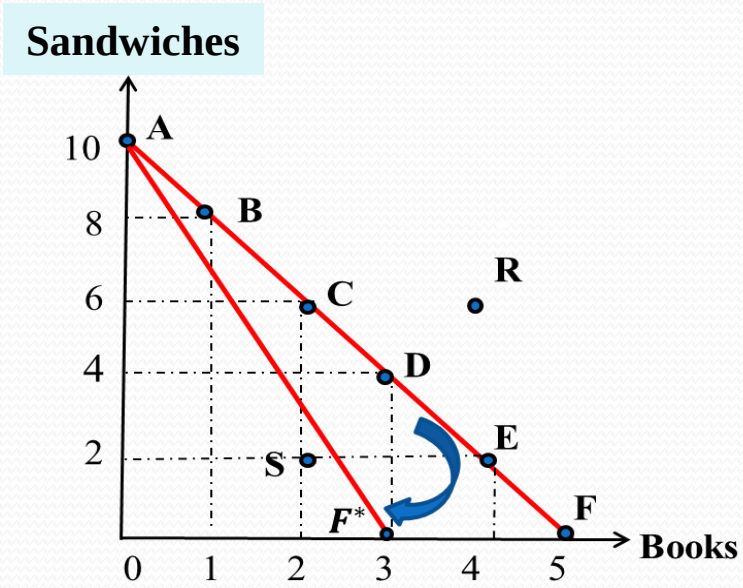

**In the two graphs, the slope of the budget line doesn't change because prices have not been changed.**

# 1. Consumption possibilities and budget line

## 1.1 A change in the price

A. If the price of one good rises and the prices of other goods and the budget remain the same, ***consumption possibilities shrink***.

**Example 1**: When the price of books rises from \$6 to \$10 per book, the budget line rotates inward and becomes ***steeper***.

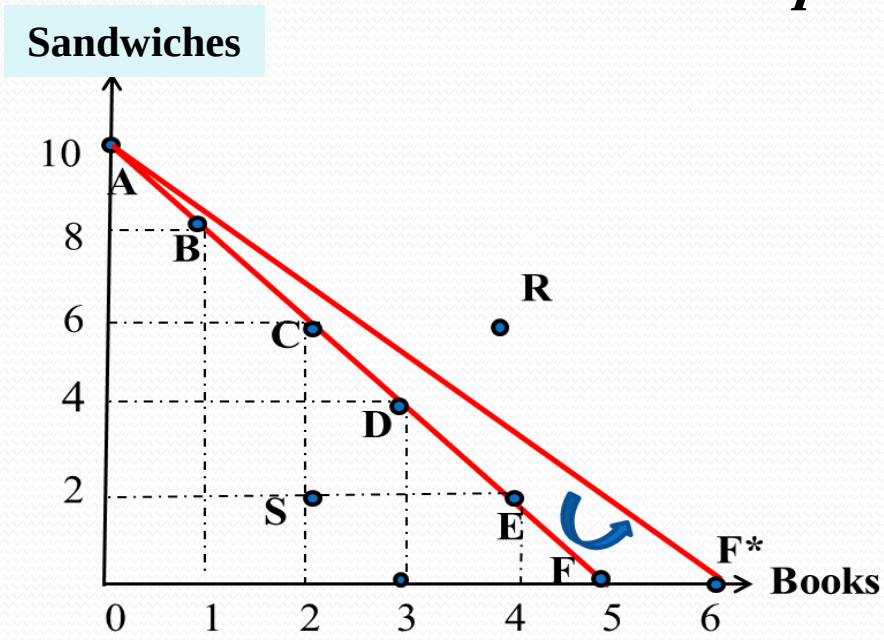


# 1. Consumption possibilities and budget line

## 1.1 A change in the price

B. If the price of one good falls and the prices of other goods and the budget remain the same, ***consumption possibilities expand.***

**Example 1**: When the price of books falls from \$6 to \$5 per book, the budget line rotates outward and becomes ***less steep***.



# 2. Consumer preferences

In the previous slides we studied several combinations available to the consumer, but how and what combination of goods that should the consumer choose?. The answer to this question depends on consumer preferences (what does the consumer like and what he does not? ).

To study consumer preferences (ie, study consumer behavior) some economists rely on the Utility Theory.

# 2. Consumer preferences

## 2.1 Utility

Utility is the ***benefit*** or ***satisfaction*** that a person gets from the consumption of a good or service.

- **Some Features of the Utility:**
  - ***Subjective Concept***: It means that utility differs from one person to an other depending on their tastes and preferences. (e.g. A book may have a utility for a literate person but has a minimum utility for an illiterate.)
  - ***Relative Concept:*** It means that utility differs from time to time and place to place. A good may have a utility at a particular time or place and may have no utility at another point of time or place. (e.g. Mobile phones have utility at homes, but have limited utility inside a classroom).

# 2. Consumer preferences

## 2.1 Utility

- ***Different from Usefulness:*** Utility is different from usefulness in the sense that a good having utility may even be harmful or useless. (e.g. Cigarettes give utility to a smoker but are harmful to his health).

## 2.2 Total Utility (*TU*)

Total Utility is the ***total benefit*** or ***total satisfaction*** that a person gets from the consumption of a good or service.

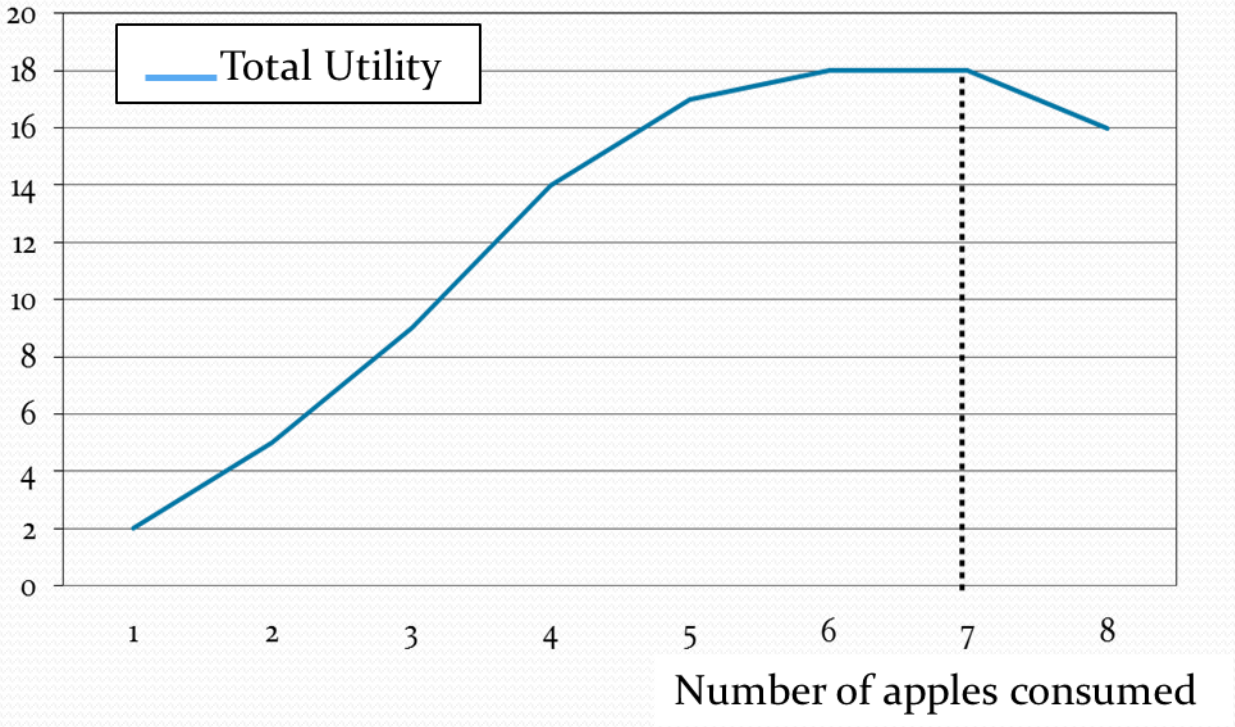
As more of one particular product is consumed, total utility **increases** but with a ***decreasing rate*** until it reaches a ***maximum***, and then begins ***to decline.***

# 2. Consumer preferences

## 2.2 Total Utility (*TU*)

**Example:**

| Apples Consumed Per Meal | Total Utility |
|---|---|
| 1 | 2 |
| 2 | 5 |
| 3 | 9 |
| 4 | 14 |
| 5 | 17 |
| 6 | 18 |
| 7 | 18 |
| 8 | 16 |



# 2. Consumer preferences

## 2.3 Marginal Utility (*MU*) (Additional Utility)

Marginal utility is ***the change*** in ***total utility*** that results from a ***one-unit increase*** in the quantity of a good consumed. The MU is measured by the following relationship:

$$MU = \frac{\Delta TU}{\Delta Q} = \frac{TU_2 - TU_1}{Q_2 - Q_1}$$

Also, ***MU*** represents the extra (or additional) satisfaction from consuming one additional unit of a good.

# 2. Consumer preferences

## 2.3 Marginal Utility (*MU*)

**Example:**

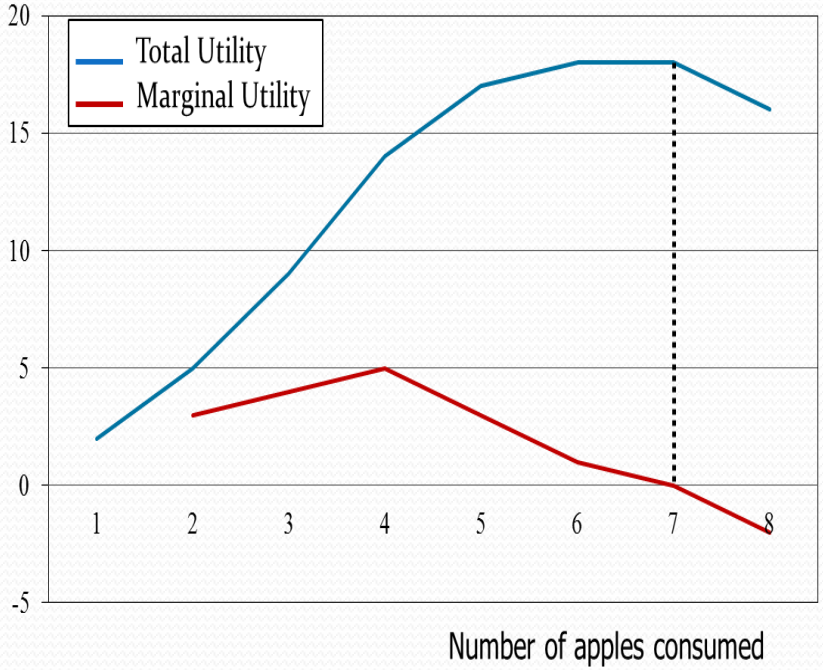
| Apples Consumed Per Meal | Total Utility | Marginal Utility |
|---|---|---|
| 1 | 2 | --- |
| 2 | 5 | 3 |
| 3 | 9 | 4 |
| 4 | 14 | 5 |
| 5 | 17 | 3 |
| 6 | 18 | 1 |
| 7 | 18 | 0 |
| 8 | 16 | -2 |

We can notice that, as the quantity consumed of apples increases, the marginal utility increases, then it begins to decrease from the fifth apple until becomes zero at the seventh apple, and finally tends to be negative at the eighth apple . We call this decrease in the marginal utility: the principle of ***diminishing marginal utility.***

# 2. Consumer preferences

The principle of ***diminishing marginal utility*** states that as more of a good is consumed, the ***additional utility*** of the consumer will be ***smaller and smaller***

## 2.4 Relationship between Marginal Utility and Total Utility




- When marginal utility increases, total utility rises with an increasing rate
- When marginal utility decreases, total utility still rises, but with a decreasing rate
- When marginal utility reaches zero , total utility is at maximum
- When marginal utility is negative, total utility begins to decrease

# 2.5 Consumer Equilibrium

The situation in which the consumer chooses the consumption combination of goods that ***maximizes his total utility*** given the constraints of income and prices.

There are two necessary conditions to attain the consumer equilibrium:

1. The marginal utility per price is equal for all goods: $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$
2. Spend all the available income: $P_X \times Q_X + P_Y \times Q_Y = I$

**where:**

$MU_X$: is the marginal utility of good $X$

$MU_Y$: is the marginal utility of good $Y$

$P_X$ and $P_Y$: are the prices of goods $X$ and $Y$, respectively.

$Q_X$ and $Q_Y$: are the quantities of goods $X$ and $Y$, respectively.

$I$: the income

# 2.5 Consumer Equilibrium

**Example 2:**

Given a budget of \$15, how many steak and hamburger meals should Ahmed buy per month to *maximize his total utility* (to be in equilibrium situation)?

| Hamburger (Y) ($P_Y$ =\$1) | | | | Steak (X) ($P_X$ =\$2) | | | |
|---|---|---|---|---|---|---|---|
| $MU_Y/P_Y$ | $MU_Y$ | $TU_Y$ | $Q_Y$ | $MU_x/P_x$ | $MU_x$ | $TU_x$ | $Q_x$ |
| --- | --- | 30 | 1 | --- | --- | 50 | 1 |
| 28 | 28 | 58 | 2 | 22 | 44 | 94 | 2 |
| 26 | 26 | 84 | 3 | 19 | 38 | 132 | 3 |
| 24 | 24 | 108 | 4 | 16 | 32 | 164 | 4 |
| 22 | 22 | 130 | 5 | 11 | 22 | 186 | 5 |
| 20 | 20 | 150 | 6 | 10 | 20 | 206 | 6 |
| 16 | 16 | 166 | 7 | 6 | 12 | 218 | 7 |
| 12 | 12 | 178 | 8 | 2 | 4 | 222 | 8 |

# 2.5 Consumer Equilibrium

According to the last table:

1. the first condition $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$ is realized for the two following combinations:

$\frac{\mathrm{MU_X}}{\mathrm{P_X}} = \frac{32}{2} = \frac{\mathrm{MU_Y}}{\mathrm{P_Y}} = \frac{16}{1} = 16$ for the combination: $(Q_X = 4; Q_Y = 7)$

$\frac{\mathrm{MU_X}}{\mathrm{P_X}} = \frac{44}{2} = \frac{\mathrm{MU_Y}}{\mathrm{P_Y}} = \frac{22}{1} = 22$ for the combination: $(Q_X = 2; Q_Y = 5)$

2. but the second condition $P_X \times Q_X + P_Y \times Q_Y = I$ is only realized only for the first combination $(Q_X = 4; Q_Y = 7)$

   $(2\times4 + 1\times7 = 15)$

So, in order to ***maximize his total utility*** (or to be in equilibrium situation), Ahmed should consume 4 steaks and 7 hamburgers

# Chapter 6

# Production Theory

Dr. Oussama Zaghdoud

# Introduction

The mainstream economic theory assumes that ***firms seek to maximize profits***. In this context, production theory tries to determine what combination of inputs (factors of production) should the firms allocate in order to produce the quantity of output that realizes maximum profit.

## 1. Production:

Production is a process of transformation the inputs (labor, land and capital) into output (goods and services) which has a value and contributes to the utility of individuals.

In this production process, the producer is concerned with ***efficiency*** in the use of the inputs.

We have two kinds of efficiency: - Technological Efficiency

- Economic Efficiency

## 2. Productive Efficiency:

- ***Technological efficiency:*** obtaining the maximum possible production of goods and services from available resources (inputs). In other words, resources shall not be wasted during the production process.
- ***Economic Efficiency:*** to produce a certain level of production of goods and services at the lowest possible costs.

## 3. Production Function:

A production function defines the relationship between inputs and the maximum amount of output that can be produced within a given time period and technology.

## 3. Production Function (continued) :

- Mathematically, the production function can be expressed as:

$$Q=F(X_1,X_2,...,X_k)$$

Where:

- Q: is the level of output
- $X_1,X_2,...,X_k$: are the inputs used in the production process.

For simplicity we will often consider a production function of two inputs labor (L) and capital (K):

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

When we discuss production, it is important to distinguish between two time frames: short run and long run

## 3. Production Function (continued) :

**A. Short Run Production:** the short run is a time frame in which the quantity of one or more inputs (factors of production) used in production **is fixed**, typically capital (K) is fixed in the short run. The other resources used by the firm (such as labor) can be changed in the short run.

The short run production function : $Q = F(L, \overline{K})$

Thus, in the short run firms can increase production only by increasing labor, since the capital is fixed.

## 3. Production Function (continued) :

**B. Long Run Production:** the long run is a time frame in which the quantities of all inputs (factors of production) used in production can be ***varied***.

The long run production function : Q = F ( L,K )

Thus, in the long run firms can increase production by increasing both labor and capital.

## 4. Production in the Short Run:

To increase the output in the short run, the firm must increase the amount of labor.

Thus, three important concepts describe the relationship between output and the quantity of labor:

- Total product
- Average product
- Marginal product

## 4. Production in the Short Run (continued) :

- **Total Product (TP):** is the total quantity of output that is produced by using a variable input (Labor), assuming that the other input (K) is fixed.

- **Average Product (AP)** of Labor**:** is equal to total product divided by the quantity (units) of labor employed.

$$\text{Average Product} = \frac{\text{Total Product}}{\text{Units of Labor}} = \frac{TP}{L}$$

**AP** tells us, on average, how many units of output are produced per unit of input used (per worker).

## 4. Production in the Short Run (continued) :

- **Marginal Product (MP)** of Labor**:** is the change in total product resulting from one additional unit of the labor. The **MP** can be calculated as:

$$\text{Marginal Product} = \frac{\text{Change in Total Product}}{\text{Change in Labor Input}} = \frac{\Delta TP}{\Delta L}$$

# 4. Production in the Short Run (continued) :

| Units of Inputs | | Total Product (TP or Q) | Average Product (AP=TP/L) | Marginal Product (MP=$\Delta TP/\Delta L$) | Stages of production |
|---|---|---|---|---|---|
| Labor (L) | Capital (fixed) (e.g. machine) (M) | | | | |
| 0 | 5 | 0 | --- | --- | **Increasing Marginal Returns (IMR)** |
| 1 | 5 | 50 | 50 | 50 | |
| **2** | 5 | 120 | 60 | **70** | |
| **3** | 5 | 180 | **60** | **60** | **Diminishing marginal Returns (DMR)** |
| 4 | 5 | 220 | 55 | 40 | |
| 5 | 5 | 250 | 50 | 30 | |
| 6 | 5 | 270 | 45 | 20 | |
| 7 | 5 | 280 | 40 | 10 | |
| **8** | 5 | **280** | 35 | **0** | |
| 9 | 5 | 270 | 30 | -10 | **Negative Marginal Returns (NMR)** |
| 10 | 5 | 250 | 25 | -20 | |

## 4. Production in the Short Run (continued) :

### A. Relationship between MP and TP

From the last table, we can notice that:

- When the marginal product (MP) rises, the total product (TP) rises too and with increasing rate. This is called ***increasing marginal returns***
- When the marginal product (MP) begins to decline until it reaches zero, the total product (TP) continues rising, but with a decreased decreasing rate until it reaches its maximum level. This is called ***diminishing marginal returns***
- When the marginal product (MP) becomes negative, the total product (TP) begins to decline. This is called ***negative marginal returns***.

## 4. Production in the Short Run (continued) :

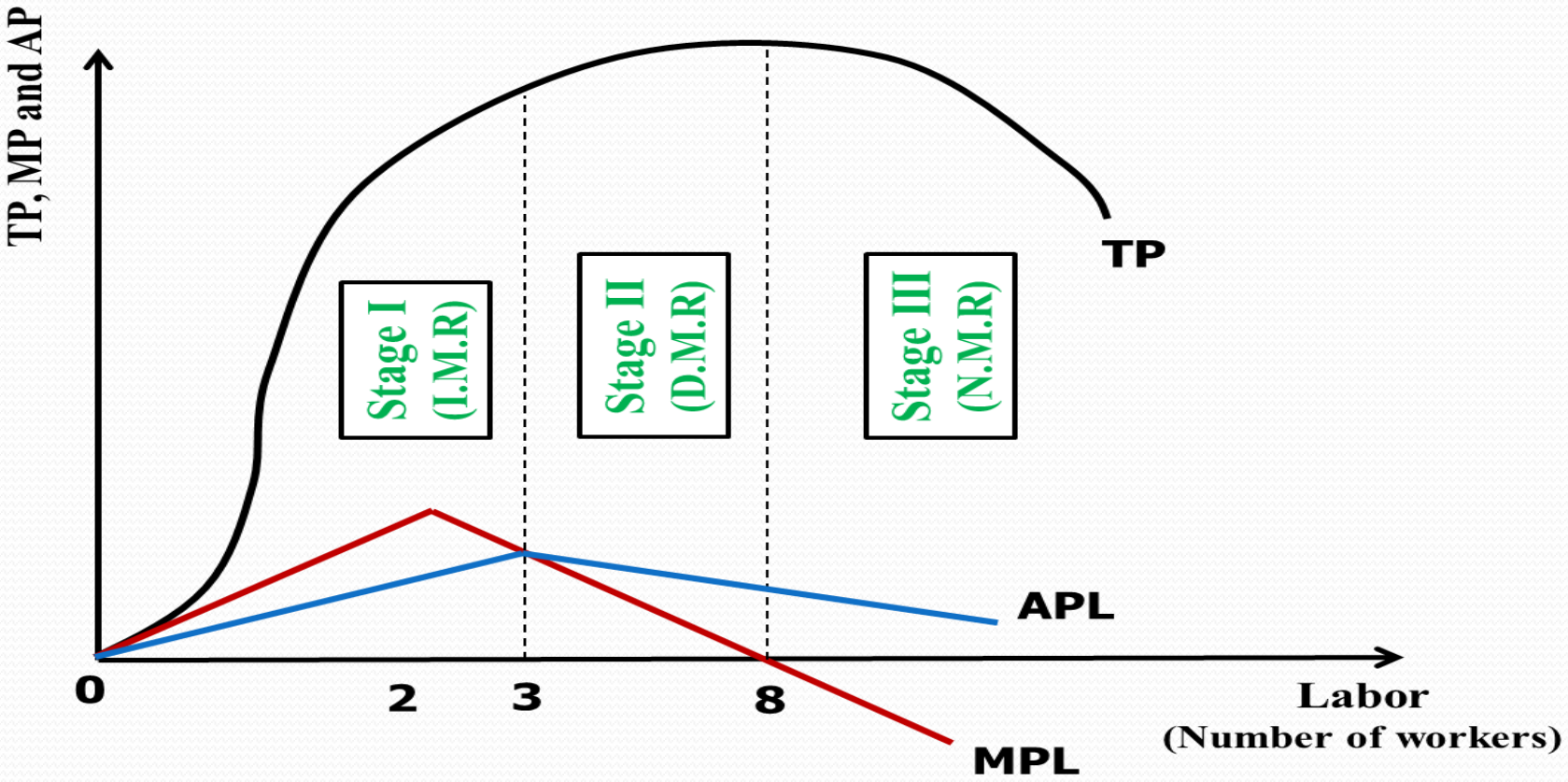
### B. Relationship between MP and AP

From the last table, we can notice that:

- If MP > AP , then AP is rising.
- If MP = AP , means that AP is at the maximum level
- If MP < AP , then AP is declining.

# 4. Production in the Short Run (continued) :

From the previous Table we can draw the TP MP and AP curves in one figure and study the different stages of production



# 4. Production in the Short Run (continued)

## Stage I

starts from zero and ends when the AP reaches its maximum, during this stage:
- TP rises with increasing rate.
- MP rises
- AP rises and reaches its maximum (AP = MP)

## Stage II

starts from the end of stage I and ends when TP reaches its maximum which means that MP is equal to 0 , during this stage:
- TP increases with decreasing rate until it reaches its maximum level at the end of stage II, which means MP = 0.
- MP begins to decline until it reaches 0
- AP begins to decline

## Stage III

starts from the end of stage II, during this stage:
- TP begins to decline
- MP becomes negative
- AP continues to decline

## 4. Production in the Short Run (continued) :

- **Law of Diminishing Returns**

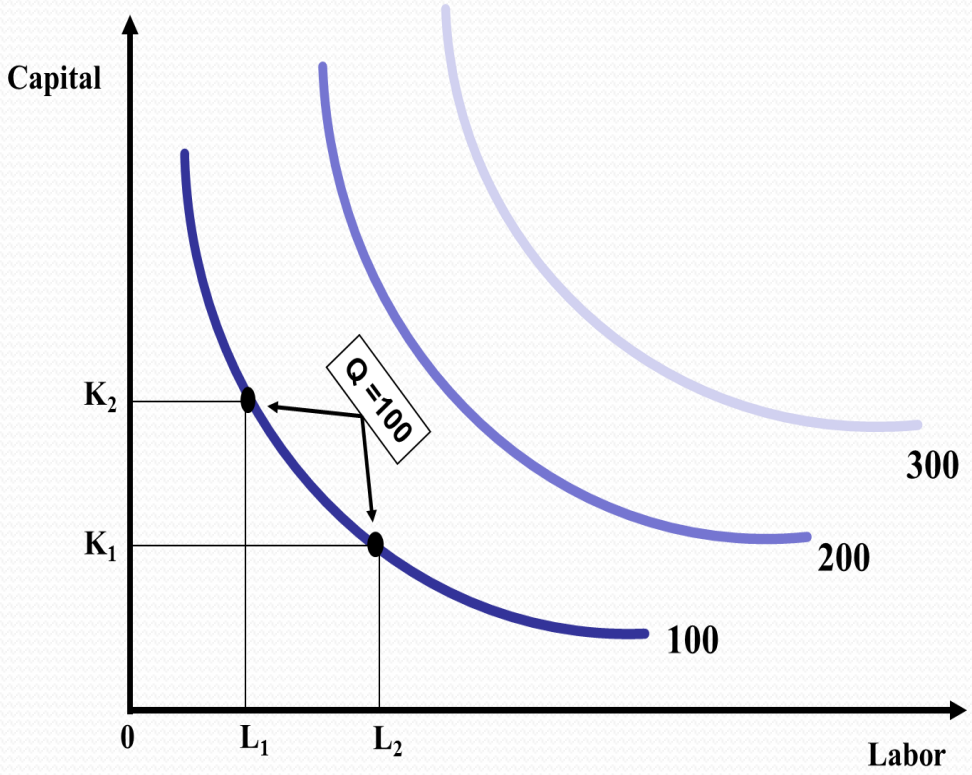
The law of diminishing returns states that as a firm uses more of a variable input (e.g. Labor) with a given quantity of fixed inputs (e.g. Capital or Machine), the marginal product of the variable input eventually decreases.

The reduction in marginal output is due to:

The increase of workers is not accompanied (joined) by an increase in machines (the fixed factor). Each added worker has fewer machines and then his **productivity starts to decrease.**

## 5. Production in the Long Run:

- In the long run, all inputs (both L and K in our case) are **variable**.
- To study the relationship between production and inputs in the long run, we use the production isoquants as shown in the following diagram:




Isoquant is a curve showing all possible combinations of inputs (L and K) that are capable of producing a certain quantity of output (Q).

**Iso** + **quant**

**same** **quantity**

## 5. Production in the Long Run:

- **Properties of Isoquants:**
  - Isoquants have a negative slope.
  - Isoquants are convex to the origin.
  - Isoquants cannot intersect or be tangent to each other.
  - Upper Isoquants represents higher level of output

## 5. Production in the Long Run:

- **Marginal Rate of Technical Substitution MRTS**

The MRTS is the rate at which one input can be substituted for another input, if output remains constant. (the MRTS represents the slope of the isoquant.)

Given the function production in long run is: Q = F(L, K)

$$\mathbf{MRTS = \Delta K/\Delta L}$$

(which means, in this MRTS some of K is removed from the production and substituted by L to maintain the same level of output)

## 5. Production in the Long Run:

- **Law of Returns to Scale**

If the firm increases the amount of all inputs by the same proportion, there are three technical possibilities :

1. **Increasing returns** means that output increases by a larger proportion than the increase in inputs.
2. **Decreasing returns** means that output increases by a smaller proportion than the increase in inputs.
3. **Constant returns** means that output increases by the same proportion than the increase in inputs.

# Chapter 7

# Cost Theory

Dr. Oussama Zaghdoud

# Introduction

As the maximization of profits is the main objective of producer, the study of production theory alone is insufficient to analyze the producer behavior. Therefore, the study of the costs resulting from the use of the inputs in the production process should be taken into consideration.

When we study the cost theory, we should distinguish between the two different kinds of costs: *accounting costs and economic costs.*

# 1. Accounting costs and Economic costs

- **Accounting costs:** they are also known as the ***explicit costs***, and represent the costs of inputs that are directly paid by the producer to their owners (direct payment of money), such as the wages of workers, the rental charges, the cost of raw materials and the bills of electricity and telephone.
- **Economic costs:** are the sum of ***explicit*** and ***implicit costs.*** ***Implicit costs*** are the costs of inputs that are not directly paid by the producer. The implicit costs represent *the opportunity costs* of using resources owned by the producer. For example, if the producer owns the factory building, he will certainly not pay the rent to anyone, but in reality he misses up the opportunity to earn rental payments, which he would have had if he rented the building to another person.

# 1. Accounting costs and Economic costs (continued)

**Accounting Costs = Explicit Costs**

**Economic Costs = Explicit costs + Implicit costs**

As there are accounting and economic costs, there are also two types of profits: ***the accounting profits and economic profits.***

**Accounting Profit = Total Revenue - Explicit Costs**

**Economic Profit = Total Revenue - Economic Costs**

**Economic Profit = Total Revenue - Explicit costs - Implicit costs**

**Economic Profit = Accounting Profit - Implicit costs**

**Where: Total Revenue = Quantity (Q)× Price (P)**

## 2. Short-Run Production Costs

The production in the short run is characterized by a fixed input (capital) and a variable input (labor). Therefore, the total costs of production in the short term are divided into two types: *total fixed costs and total variable costs.*

- **Total Fixed Cost (TFC):** represents costs that ***do not vary*** with the quantity of output produced and must be paid even if output is zero, such as the rental payments, fire insurance and interest on loans.
- **Total Variable Cost (TVC):** represents costs that ***vary*** with the quantity of output produced. These costs are related to the costs of variable inputs, such the wages of workers, prices of electricity, fuel and raw materials. As a firm uses more input to produce output, its total variable costs increase.

## 2. Short-Run Production Costs (continued)

- **Total Cost:**
  - Total Fixed Cost (TFC)
  - Total Variable Cost (TVC)
  - Total Cost (TC)
  - $TC = TFC + TVC$

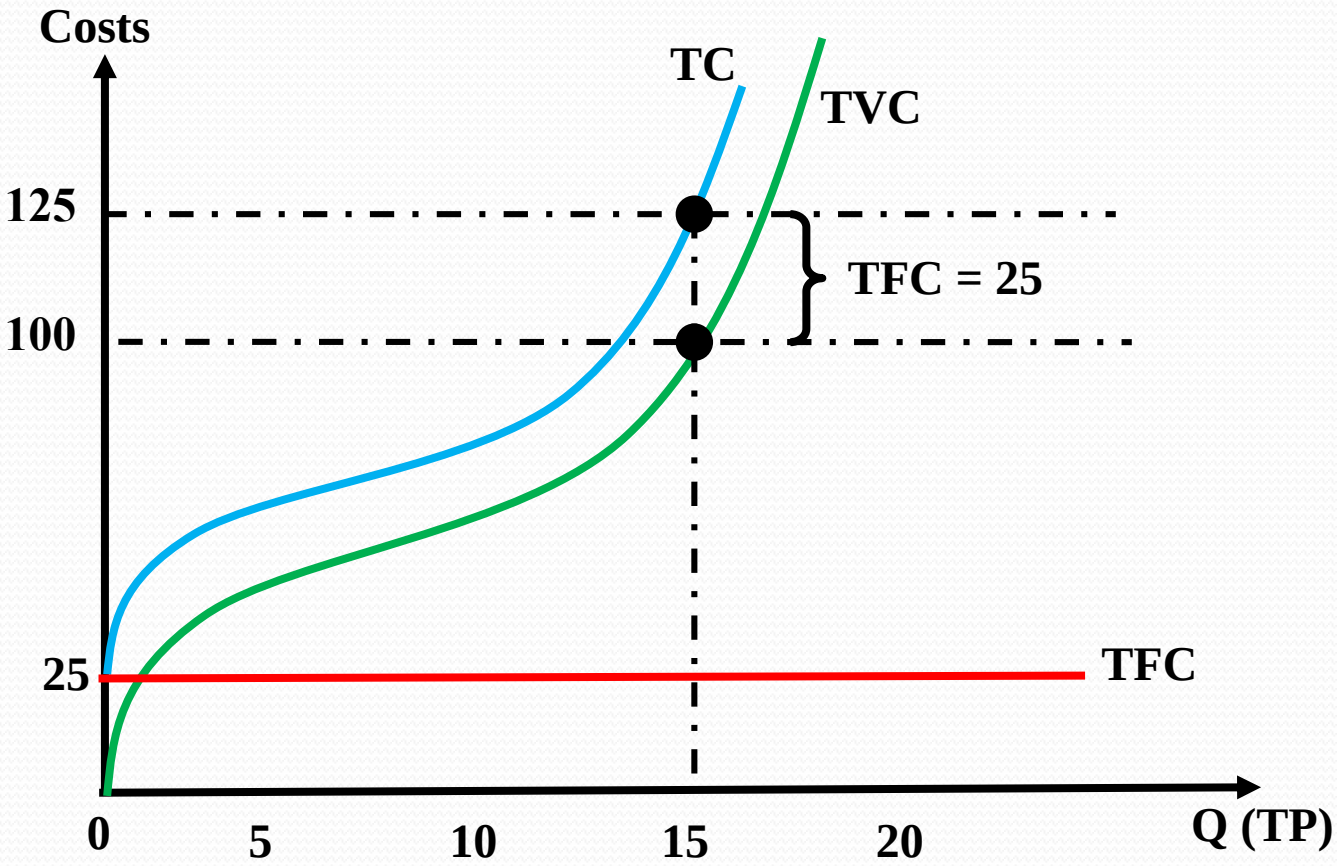
# 2. Short-Run Production Costs (continued)

- **Example 1:** The below table shows the total fixed cost (TFC), the total variable cost (TVC) and the total cost (TC) of a given set of production levels.

| Total Product (Q or TP) | Total Fixed Cost (TFC) | Total Variable Cost (TVC) | Total Cost (TC) |
|---|---|---|---|
| 0 | 25 | 0 | 25 |
| 4 | 25 | 25 | 50 |
| 10 | 25 | 50 | 75 |
| 13 | 25 | 75 | 100 |
| 15 | 25 | 100 | 125 |
| 16 | 25 | 125 | 150 |

# 2. Short-Run Production Costs (continued)

According to the previous Table we can draw the TFC, TVC and TC curves as the follows:



## 2. Short-Run Production Costs (continued)

In addition to TC (TFC + TVC), firms are interested in the *Average Cost and Marginal Cost.*

- **Average Fixed Cost (AFC):** Average fixed cost is total fixed cost divided by the total product. Written as a formula:

$$AFC = \frac{TFC}{Q}$$

***Remark:*** As the TFC remains constant (does not vary with the production level), AFC always **falls as output increases**

- **Average Variable Cost (AVC):** Average variable cost is total variable cost divided by the total product. Written as a formula:

$$AVC = \frac{TVC}{Q}$$

## 2. Short-Run Production Costs (continued)

- **Average Total Costs (ATC):** Average total cost is total costs divided by the total product. Written as a formula:

$$ATC = \frac{TC}{Q} = AFC + AVC$$

- **Marginal Cost (MC):** Marginal Cost represents the change in total cost resulting from one additional unit of output. Thus, (MC) measures the increase in total cost that arises from an extra unit of production. Written as a formula:

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta TFC}{\Delta Q} + \frac{\Delta TVC}{\Delta Q} = \frac{\Delta TVC}{\Delta Q}$$

# 2. Short-Run Production Costs (continued)

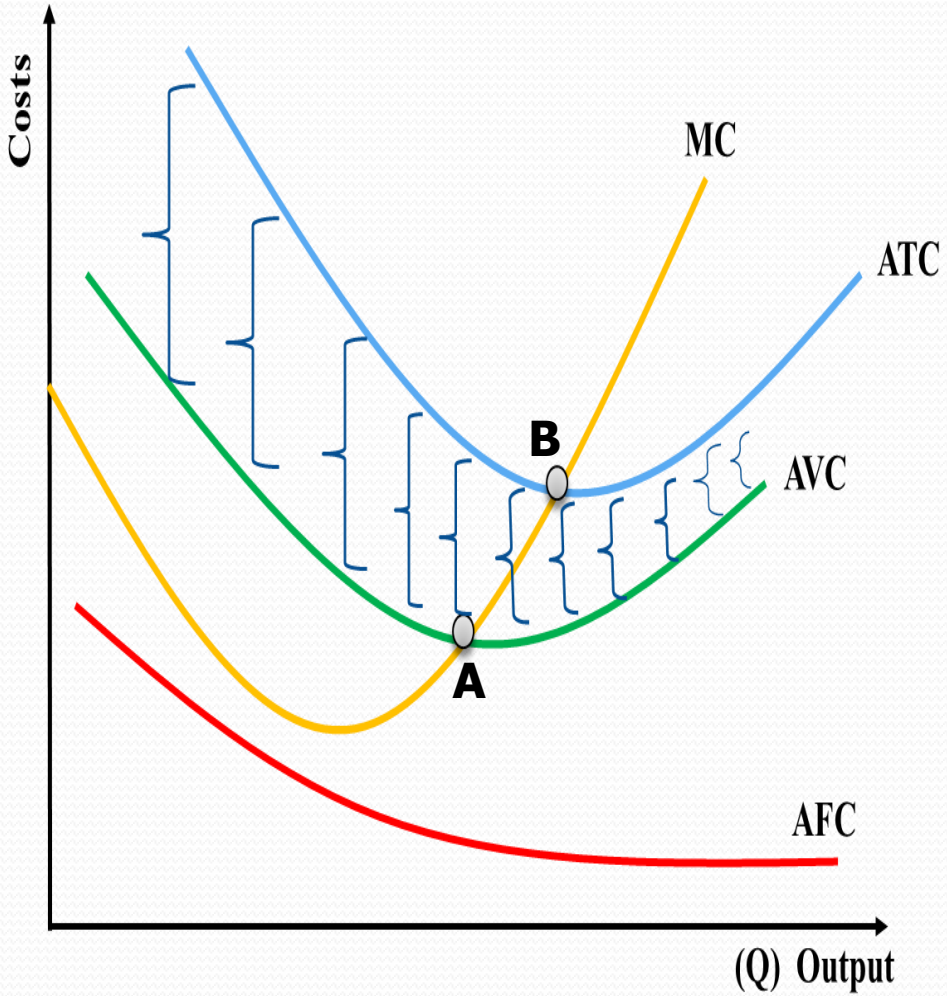
## A. Relationship between MC, AVC, AFC, and ATC

**Example 2:** The below table shows the relationship between Marginal cost and Average Costs (AVC, AFC, and ATC).

| Total Product (Q or TP) | Total Fixed Cost (TFC) | Total Variable Cost (TVC) | Total Cost (TC) | Average Fixed Cost (AFC) | Average Variable Cost (AVC) | Average Total Cost (ATC) | Marginal Cost (MC) |
|---|---|---|---|---|---|---|---|
| 0 | 25 | 0 | 25 | ----- | ------- | ------- | -------- |
| 4 | 25 | 25 | 50 | 6.25 | 6.25 | 12.5 | 6.25 |
| 10 | 25 | 50 | 75 | 2.5 | 5 | 7.5 | 4.17 |
| 13 | 25 | 75 | 100 | 1.92 | 5.77 | 7.69 | 8.33 |
| 15 | 25 | 100 | 125 | 1.67 | 6.67 | 8.33 | 12.5 |
| 16 | 25 | 125 | 150 | 1.56 | 7.81 | 9.38 | 25 |

# 2. Short-Run Production Costs (continued)

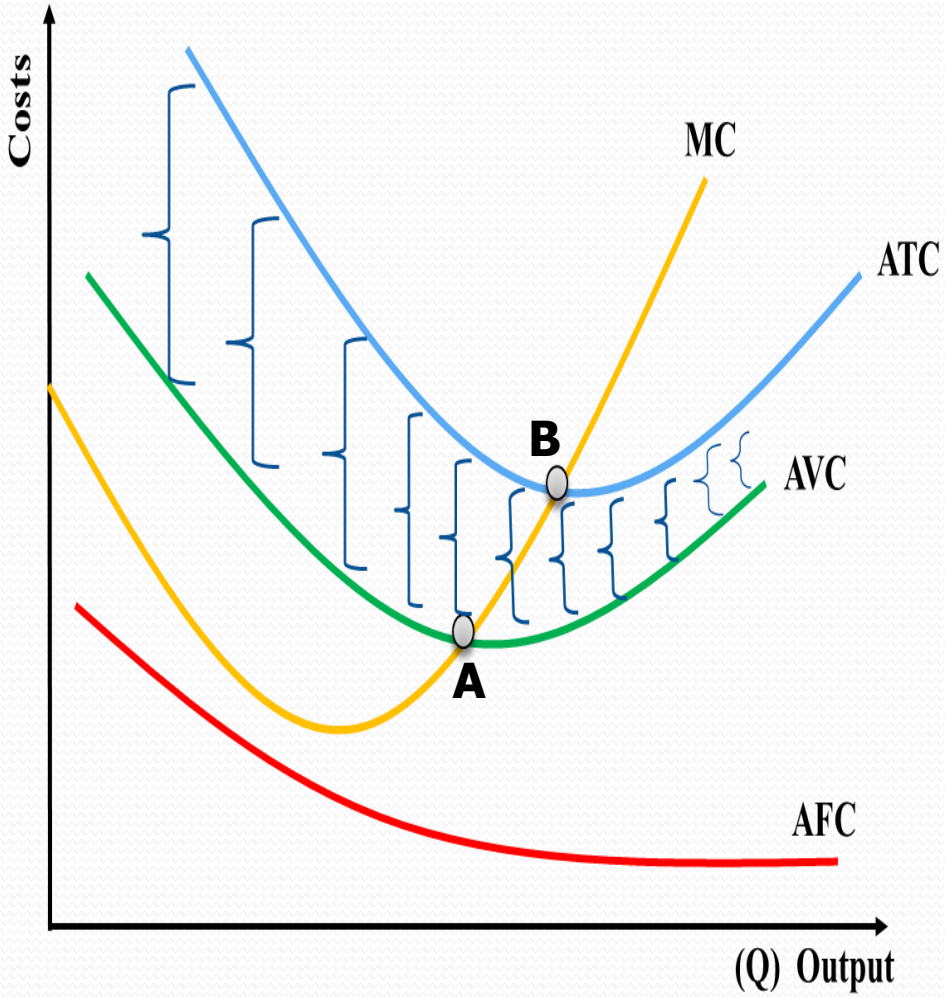
## A. Relationship between MC, AVC, AFC, and ATC




- The *MC* curve decreases at first, then reaches a minimum, and then increases as output increases.
- The *MC* curve intersects both the *AVC* curve and the *ATC* curve at the **minimum point** on each of these cost curves (**A** and **B**).
- The *AFC* curve continues to decline as output increases. *So, the vertical distance between ATC and AVC (which equals to AFC), decreases too.*

# 2. Short-Run Production Costs (continued)

## A. Relationship between MC, AVC, AFC, and ATC




**The Marginal-Average Rule:** this rule states that:

1. When MC is below (or less than) AVC, the AVC is falling.
2. When MC is above (or greater than) AVC, the AVC is rising.
3. When MC = AVC (at point **A**), the AVC is at the minimum level.
4. When MC is below (or less than) ATC, the ATC is falling.
5. When MC is above (or greater than) ATC, the ATC is rising.
6. When MC = ATC (at point **B**), the ATC is at the minimum level

## 2. Short-Run Production Costs (continued)

### A. Relationship between MC, AVC, AFC, and ATC

Why the ATC, AVC and MC are *U-Shaped* ?

To answer this question we need to calculate the AVC and MC.

The short run production function : Q = F ( L,$\overline{K}$ ) which means that labor (L) is the variable input and capital (K) is the fixed input. So,

TVC= W×L

W = represents the wage of the workers (supposed constant)

L = number of workers

$$AVC = \frac{TVC}{Q} = \frac{W \times L}{Q} = W \times \frac{L}{Q} = W \times \frac{1}{AP}$$

$$AVC = \frac{W}{AP}$$

***So, there is an inverse relationship between the AVC and AP (average product).***

## 2. Short-Run Production Costs (continued)

### A. Relationship between MC, AVC, AFC, and ATC

In the same context, the relationship between the marginal costs (MC) and the MPL can be studied, which can be expressed as follows:

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta(TVC+TFC)}{\Delta Q} = \frac{\Delta TVC}{\Delta Q} + \frac{\Delta TFC}{\Delta Q} = \frac{\Delta TVC}{\Delta Q}$$

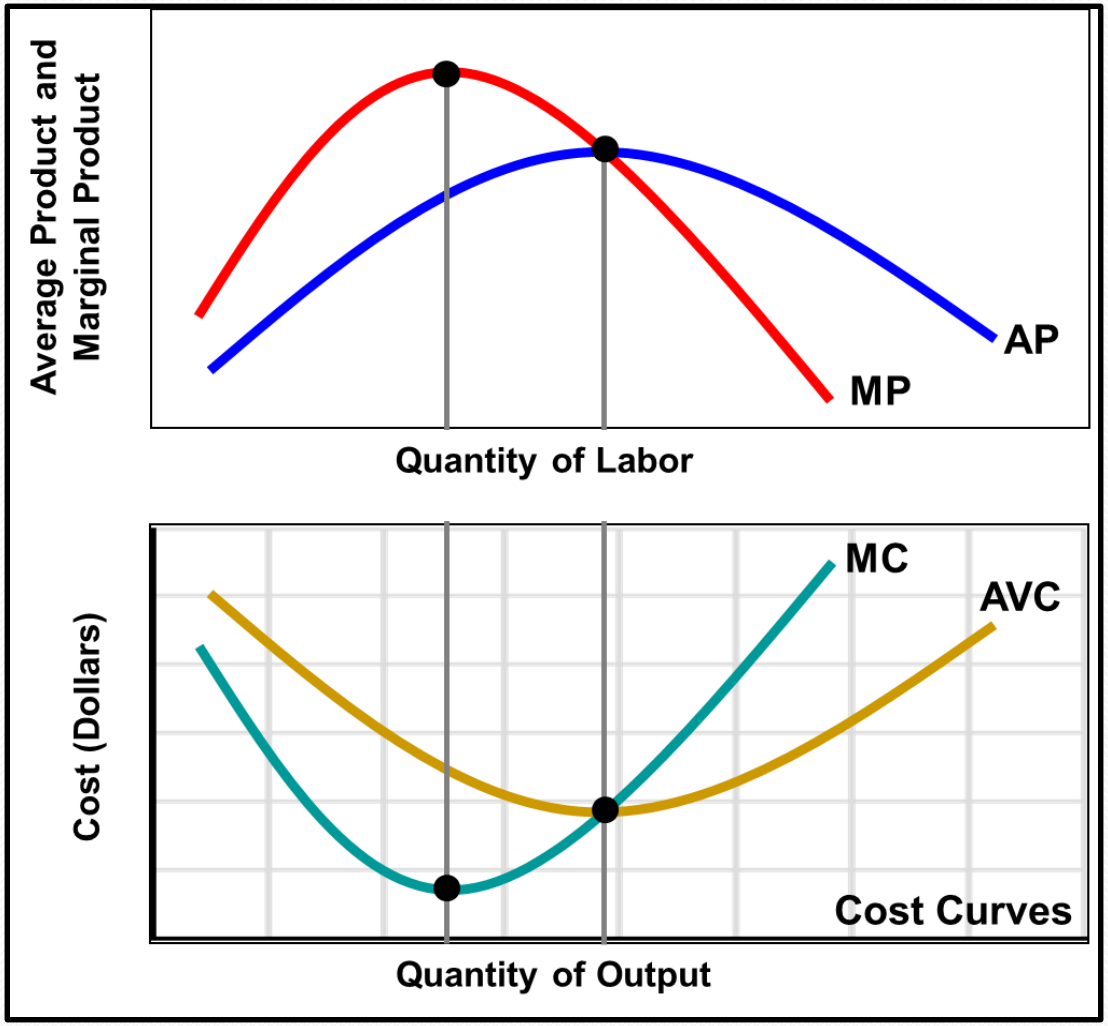
$$MC = \frac{\Delta TVC}{\Delta Q} = \frac{\Delta(W \times L)}{\Delta Q} = W \times \frac{\Delta L}{\Delta Q} = W \times \frac{1}{MP}$$

$$MC = \frac{W}{MP}$$

***So, there is an inverse relationship between the MC and MP (marginal product)***

# 2. Short-Run Production Costs (continued)

## A. Relationship between MC, AVC, AFC, and ATC




When the MP reaches its maximum level, the marginal cost (MC) is at its minimum level, and when the average output (AP) reaches maximum level, the AVC is minimum level.

# 3. Long-Run Production Costs

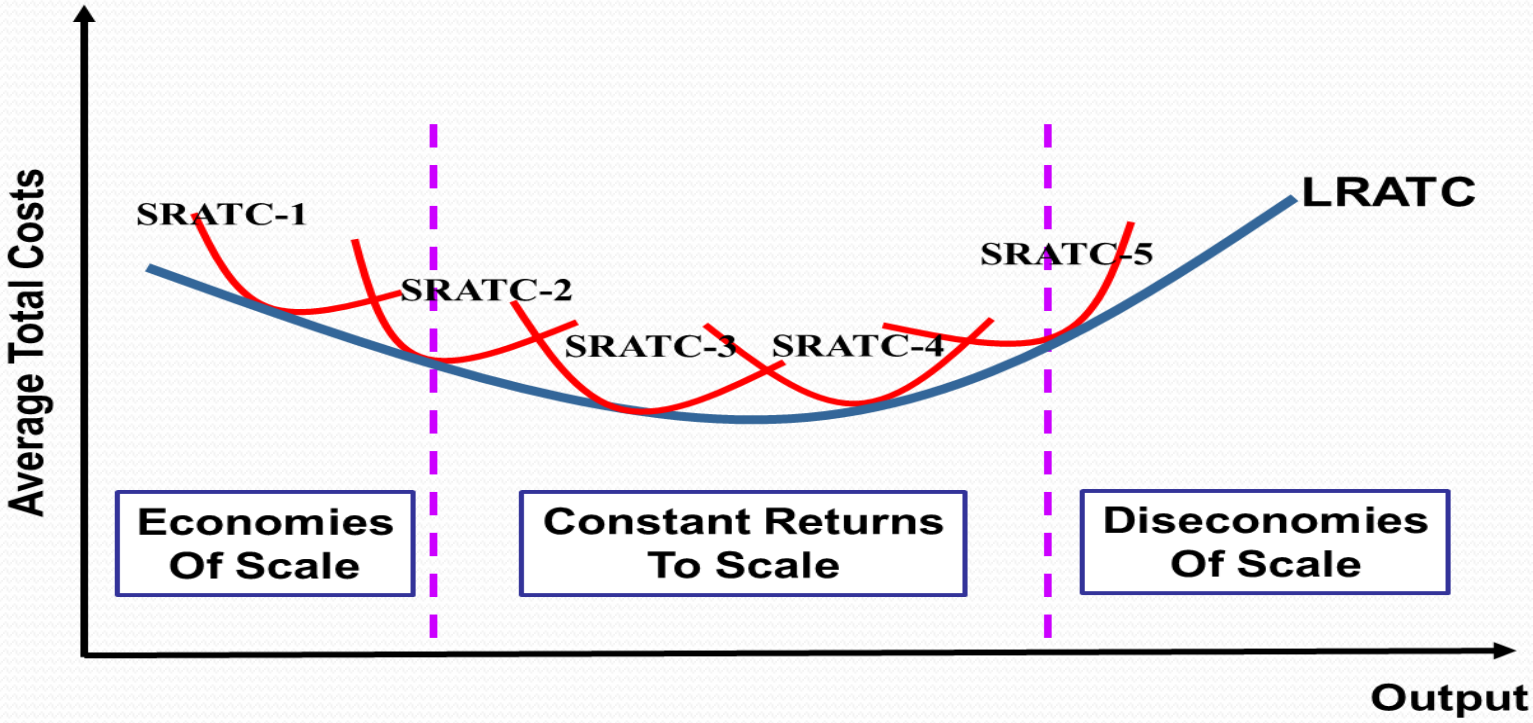
As we explained in the last chapter, the long run is a time period in which all inputs are variable, and therefore, the production costs in the long-run are all variable and there are no fixed costs.

- ***Long-Run Total Cost (LRTC):*** as the firm produces in the long run, there is no fixed cost, the long-run total cost (LRTC) can be defined as the total cost of producing a certain quantity of output.
- ***Long-Run Average Cost (LRATC):*** the long-run average total cost is the long-term total cost divided by the total product. Written as a formula:

$$LRATC = \frac{LRTC}{Q}$$

# 3. Long-Run Production Costs

The LRATC curve is made up of segments of the SRATC curves (ATC-1, ATC-2, etc.) of the various-size plants from which the firm might choose. In the following figure, the LRATC curve traces the SRATC curves at their lowest levels



# 3. Long-Run Production Costs

## Economies and Diseconomies of Scale

- *Economies of scale* : A situation in which the long-run average cost declines as the firm increases output.
- *Constant returns to scale* : A situation in which the long-run average cost remains constant as the firm increases output.
- *Diseconomies of scale:* A situation in which the long-run average cost rises as the firm increases output

# Appendix Chapter 7

**Exercise : Complete the missing data in the table**

| Total Product (Q or TP) | Total Fixed Cost (TFC) | Total Variable Cost (TVC) | Total Cost (TC) | Average Fixed Cost (AFC) = TFC/Q | Average Variable Cost (AVC) = TVC/Q | Average Total Cost (ATC) = AFC+AVC | Marginal Cost (MC) = $\frac{\Delta TC}{\Delta Q} = \frac{\Delta TVC}{\Delta Q}$ |
|---|---|---|---|---|---|---|---|
| 0 | 14 | 0 | 14 | --- | --- | --- | --- |
| 1 | 14 | 2 | 14+2 =16 | 14/1 =14 | 2/1 = 2 | 14+2=16 | 16-14/1-0 = 2/1 =2 |
| 2 | 14 | 8 | 14+8 =22 | 14/2 = 7 | 8/2 = 4 | 7+4=11 | 6 |
| 3 | 14 | 13 | 14 +13 =27 | 14/3 = 4.6 | 14/3= 4.3 | 4.6+4.3=8.9 | 5 |
| 4 | 14 | 18 = 32 -14 | 32 | 14/4 = 3.5 | 18/4= 4.5 | 3.5+4.5=8 | 5 |
| 5 | 14 | 21 = 35 -14 | 35 | 14/5 = 2.8 | 21/5=4.2 | 2.8+4.2=7 | 3 |
| 6 | 14 | 42 | 14+42 = 56 | 14/6 = 2.3 | 42/6=7 | 2.3+7=9.3 | 56-35/6-5 = 21/1=21 |

# Chapter 8

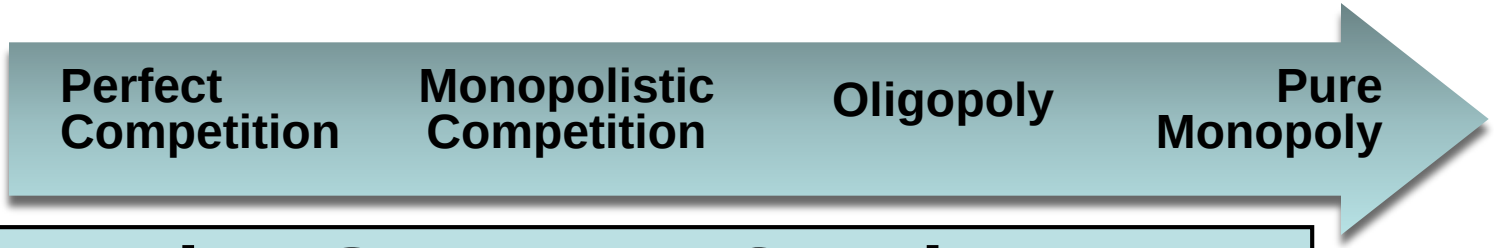
# Perfect Competition

# Pure competition

## Market Models

Economists identify four market types:

- Perfect competition
- Monopolistic competition
- Oligopoly
- Pure Monopoly




**Market Structure Continuum**

# Pure competition

**Perfect competition** is a market structure with:

- Many firms
- Each sells an identical product
- Many buyers
- No restrictions for new firms to enter to the market
- Both firms and buyers are all well-informed of the prices and products of all firms in the market

# Perfect competition

## Price Takers

In perfect competition, each firm is **a price taker** (not price maker)

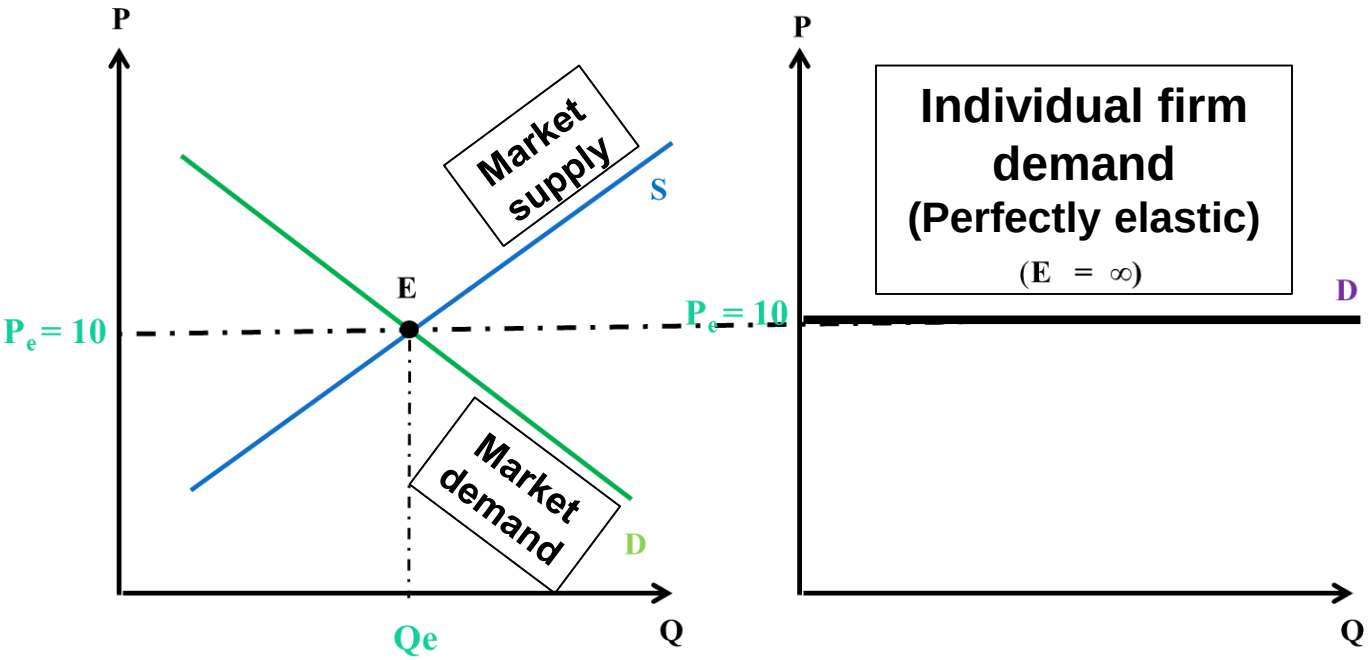
A **price taker** is a firm that **cannot influence** the price of a good or service.

No single firm can influence the price—it must "take" the equilibrium market price.

Each firm's output is a *perfect substitute* for the output of the other firms, so **the demand** for **each firm's output** is ***perfectly elastic*.**

Individual firm demand

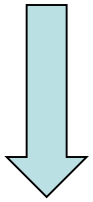
# Pure competition



# Competition

## Economic Profit and Revenue

As firm has no control over price, so what should the firm do to increase its profit?



The firm makes only one decision: what **quantity of output** to produce that **maximizes profit**, which equals *total revenue (TR)* minus *total cost (TC)*.

There are two profit maximization methods that determine the output level for a competitive firm: ***TR-TC*** method and ***MR-MC*** method.

# Competition

## Short-Run Profit Maximization

**1.Total revenue-Total cost**: The TR-TC method is based on the comparison between total revenue (TR) and total cost (TC). The firm continues to produce until the difference between total revenue and total cost reaches the highest level, which means that the profit is at the maximum level.

**Average Revenue**: is the total revenue divided by the total product

$$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P$$

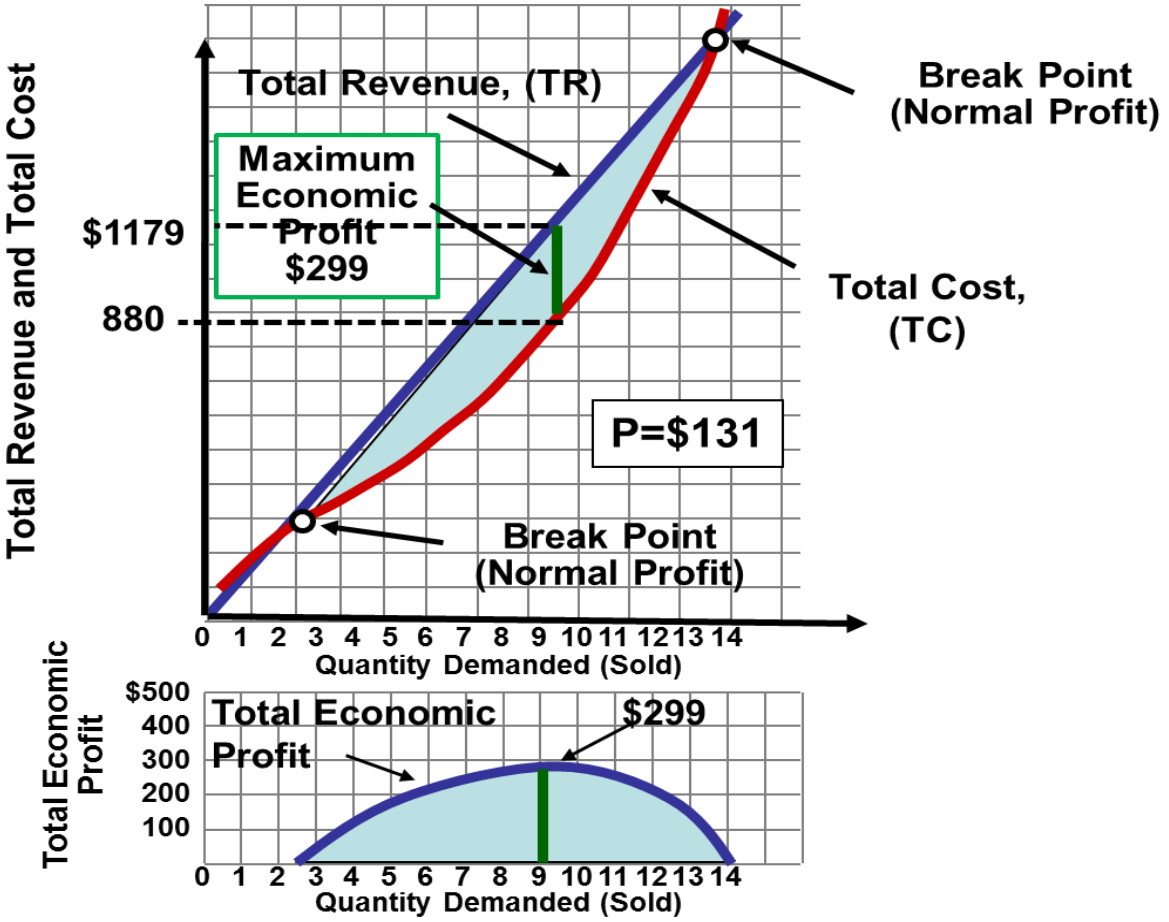
# Competition

| Total Revenue – Total Cost Approach (Price = $131) | | | | | |
|---|---|---|---|---|---|
| (1) Total Product (Output) (Q) | (2) Total Fixed Cost (TFC) | (3) Total Variable Costs (TVC) | (4) Total Cost (TC) | (5) Total Revenue (TR) | (6) Profit (+) or Loss (-) |
| 0 | $100 | $0 | $100 | $0 | $-100 |
| 1 | 100 | 90 | 190 | 131 | -59 |
| 2 | 100 | 170 | 270 | 262 | -8 |
| 3 | 100 | 240 | 340 | 393 | +53 |
| 4 | 100 | 300 | 400 | 524 | +124 |
| 5 | 100 | 370 | 470 | 655 | +185 |
| 6 | 100 | 450 | 550 | 786 | +236 |
| 7 | 100 | 540 | 640 | 917 | +277 |
| 8 | 100 | 650 | 750 | 1048 | +298 |
| **9** | 100 | 780 | **880** | **1179** | **+299** |
| 10 | 100 | 930 | 1030 | 1310 | +280 |

# Competition

## Short-Run Profit Maximization

### 1.Total revenue-Total cost:



# Competition

**Short-Run Profit Maximization**

**2.Marginal Revenue**

The firm can use marginal analysis to determine the profit-maximizing output.

Because marginal revenue is constant and marginal cost eventually increases as output increases, profit is maximized by producing the output at which marginal revenue, *MR*, equals marginal cost, *MC*.

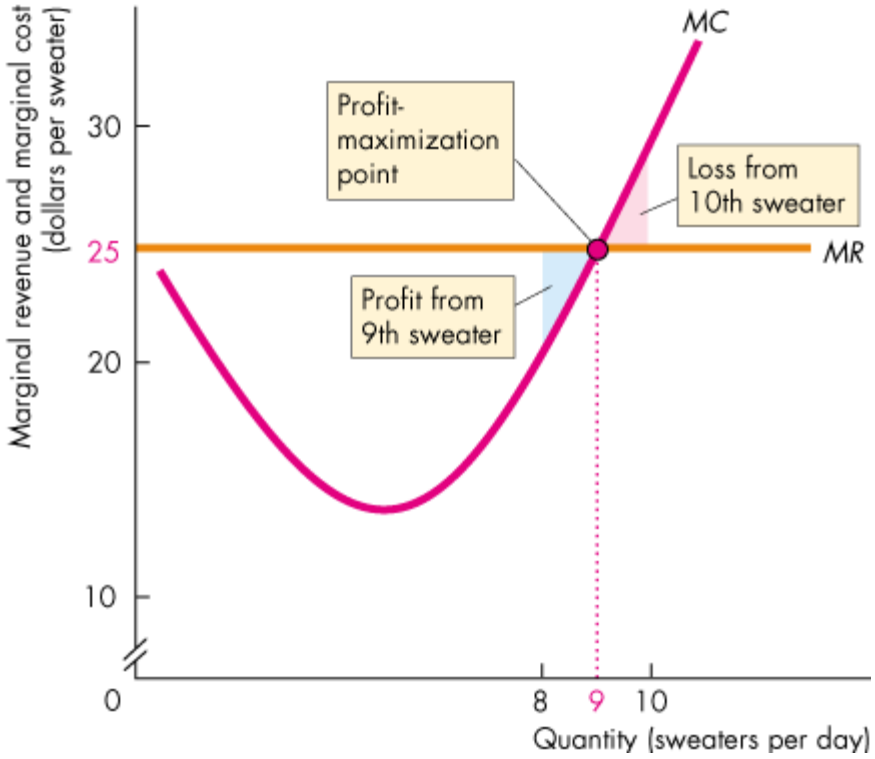
Figure 11.3 on the next slide shows the marginal analysis that determines the profit-maximizing output.

# Competition

If *MR* > *MC*, economic profit increases if output increases.

If *MR* < *MC*, economic profit decreases if output increases.

If *MR* = *MC*, economic profit decreases if output changes in either direction, so economic profit is maximized.



# Competition

## Profits and Losses in the Short Run

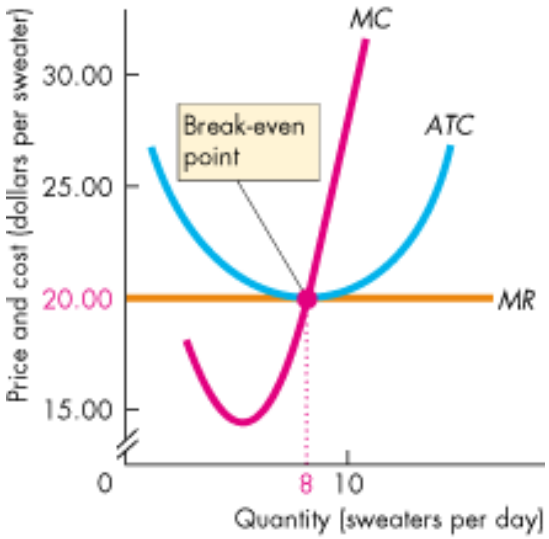
Maximum profit is not always a positive economic profit.

To determine whether a firm is earning an economic profit or incurring an economic loss, we compare the firm's average total cost, *ATC*, at the profit-maximizing output with the market price.

Figure 11.4 on the next slide shows the three possible profit outcomes.

# Competition

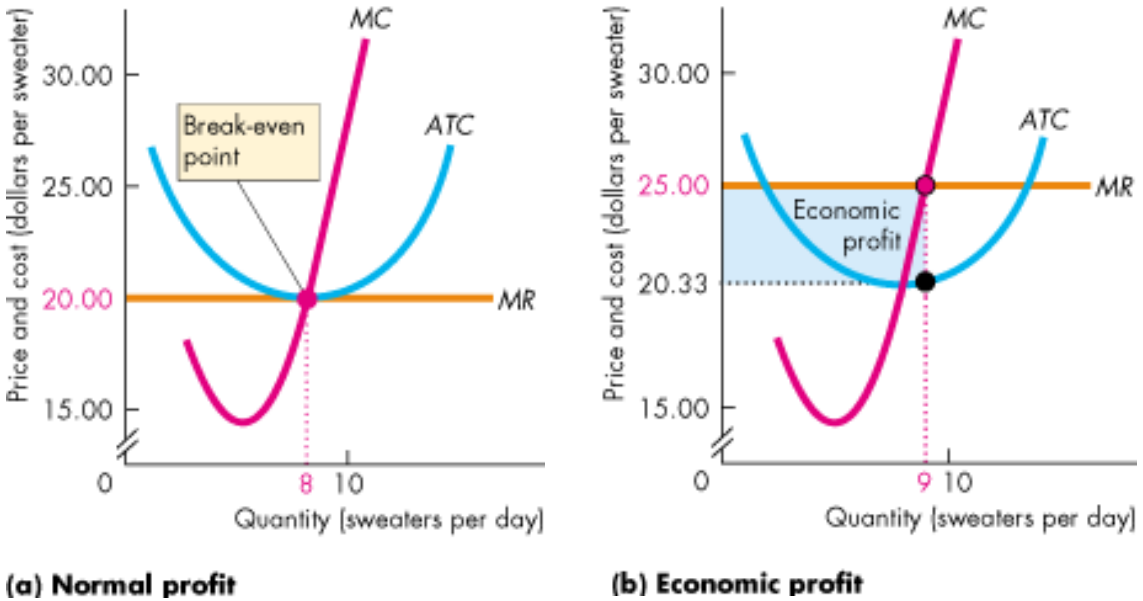
In part (a) price equals *ATC* and the firm earns zero economic profit (normal profit).




**(a) Normal profit**

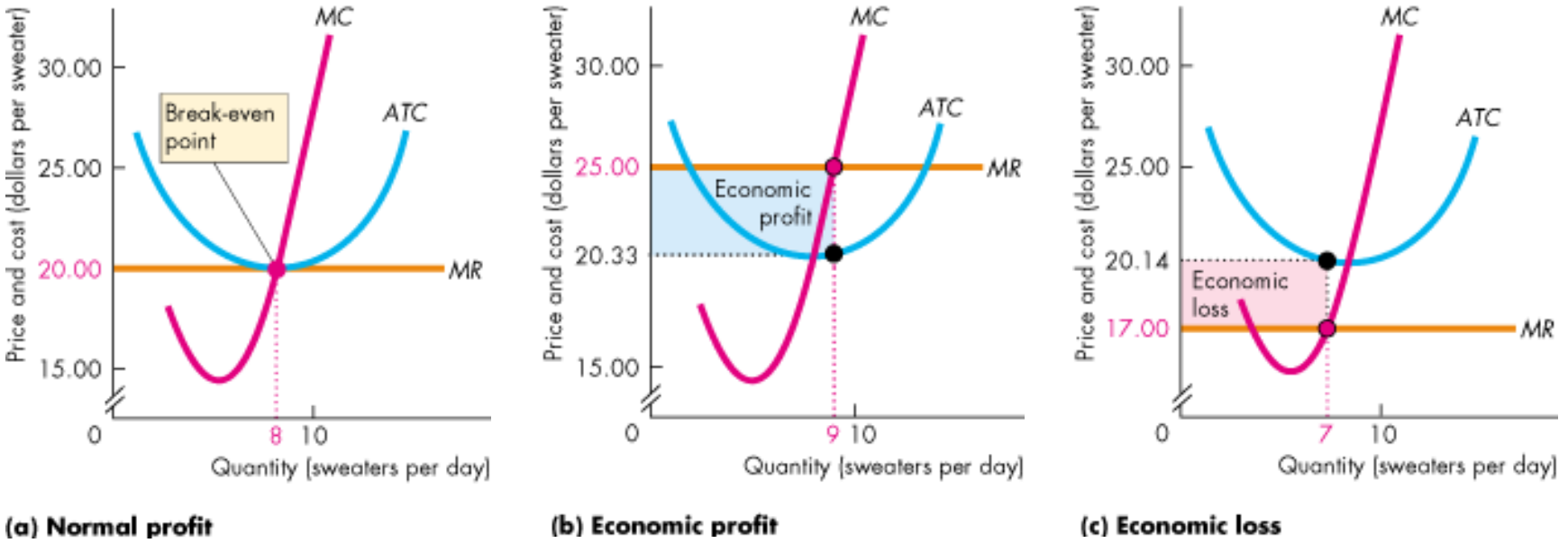
# Competition

In part (b), price exceeds *ATC* and the firm earns a positive economic profit.



# Competition

In part (c) price is less than *ATC* and the firm incurs an economic loss—economic profit is negative and the firm does not even earn normal profit.



# Competition

## The Firm's Short-Run Supply Curve

A perfectly competitive firm's short-run supply curve shows how the firm's profit-maximizing output varies as the market price varies, other things remaining the same.

Because the firm produces the output at which marginal cost equals marginal revenue, and because marginal revenue equals price, the firm's supply curve is linked to its marginal cost curve.

But there is a price below which the firm produces nothing and shuts down temporarily.

# Competition

## Temporary Plant Shutdown

If the price is less than the minimum average variable cost, the firm shuts down temporarily and incurs a loss equal to total fixed cost.

This loss is the largest that the firm must bear.

If the firm were to produce just 1 unit of output at a price below average variable cost, it would incur an additional (and avoidable) loss.

# Competition

The shutdown point is the output and price at which the firm just covers its total variable cost.

This point is where average variable cost is at its minimum.

It is also the point at which the marginal cost curve crosses the average variable cost curve.

At the shutdown point, the firm is indifferent between producing and shutting down temporarily.

It incurs a loss equal to total fixed cost from either action.

# Competition

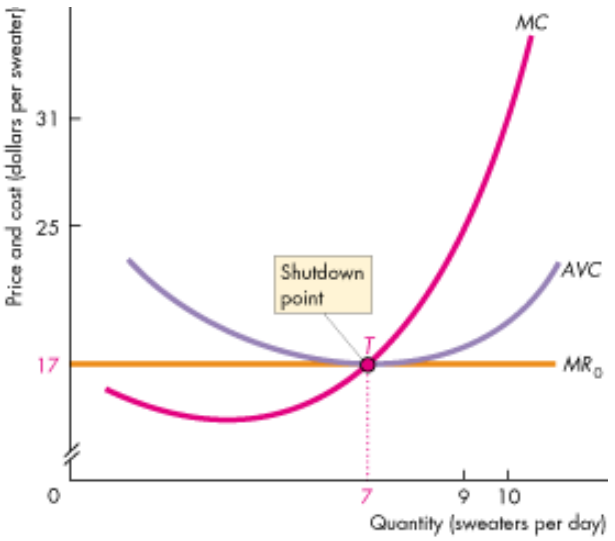
If the price exceeds minimum average variable cost, the firm produces the quantity at which marginal cost equals price.

Price exceeds average variable cost, and the firm covers all its variable cost and at least part of its fixed cost.

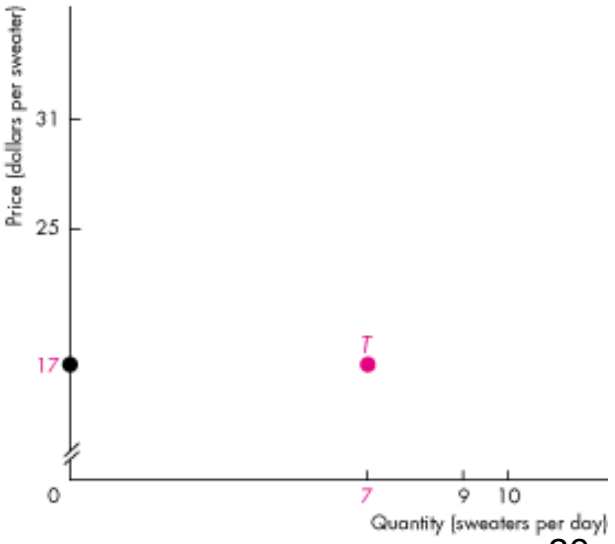
# Competition

Figure 11.5 shows how the firm's short-run supply curve is constructed.

If price equals minimum average variable cost, $17 in this example, the firm is indifferent between producing nothing and producing at the shutdown point, *T*.




(a) Marginal cost and average variable cost



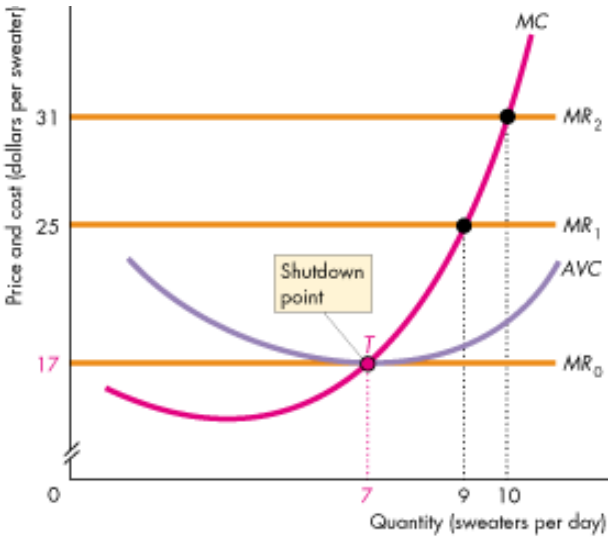

(b) Cindy's short-run supply curve

# Competition

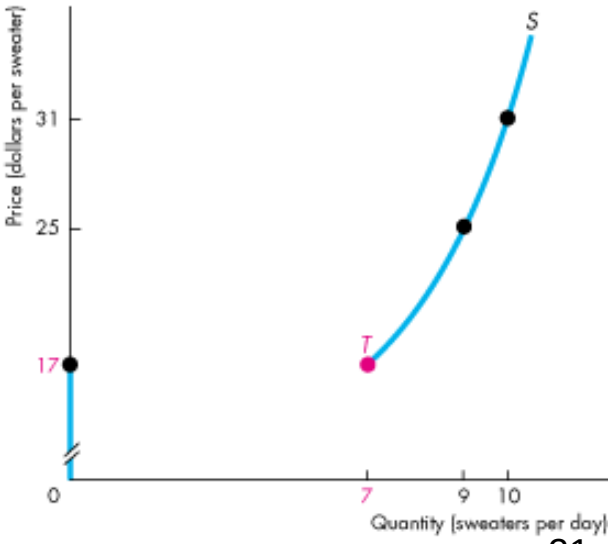
If the price is $25, the firm produces 9 sweaters a day, the quantity at which $P = MC$.

If the price is $31, the firm produces 10 sweaters a day, the quantity at which $P = MC$.

The blue curve in part (b) traces the firm's short-run supply curve.




(a) Marginal cost and average variable cost




(b) Cindy's short-run supply curve