Microeconomics

(ECON- 101)

Dr. Md. Izhar Alam
Assistant Professor of Economics
College of Business Administration
King Saud University, Muzahimiyah

Contents

KING SAUD UNIVERSITY
COLLEGE OF BUSINESS ADMINISTRATION
COURSE SPECIFICATION: MICROECONOMICS (ECON- 101)

Subject Coordinator: Dr. Md. Izhar Alam			
Instructor:	Dr. Md. Izhar Alam Dr. Mohd. Imran	**Instructor title:**	Asstt. Professor
Office:	F 091 F092	**Phone:**	1195; 1171
Teaching Hours:	53	**Email:**	mialam@ksu.edu.sa myunus@ksu.edu.sa

This course introduces microeconomic concepts and analysis, supply and demand theories, firm and individual behavior theories, competition and monopoly, and welfare economics. Students will also be introduced to the use of microeconomic applications to address problems in current economic policy throughout the semester. It is an introduction to the functions of individual decision-makers, both consumers and producers, within the larger economic system. This course encompasses all the materials needed to understand the key concepts. Multiple-choice quizzes, true/false statements, conceptual questions and numerical questions will be given in examination to assess the understandings of the students. Problem sets with solution keys will be used to test the students' ability to apply the concepts covered in the lectures. A set of exams, including review material and practice exams, will help them to better understand the subject. Keeping these things in mind the following topics have been included for this course.

Required Topics	**Credit hrs**	**Week**
1. Introduction to Economics: ✓ Basic facts of economics; ✓ Definitions: Adam Smith, Marshall & Robbins; ✓ Basic Economic Problems; Subject Matter & Scope of Economics ✓ Differences and Scope of Microeconomics & Macroeconomics; ✓ Positive economics & Normative economics; ✓ Partial equilibrium & General equilibrium; ✓ Review Questions & Internal Assessment	**2**	**1**
2. Demand Analysis: ✓ Meaning and features of demand; ✓ Factors affecting/determining demand; ✓ Demand Function;	**5**	**2**

✓ Law of Demand; ✓ Reasons behind downward slope of demand curve; ✓ Exceptions to the Law of Demand; ✓ Complementary goods & Substitute goods; ✓ Demand and Income of the Consumers; ✓ Demand and Consumer Taste; ✓ Change in Quantity Demanded (Movement) Vs Change in Demand (Shift) Curve; ✓ Review Questions & Internal Assessment		
3. Supply Analysis: ✓ Meaning; ✓ Law of Supply; ✓ Reasons behind Upward Sloping Supply Curve; ✓ Factors determining Supply; ✓ Supply Function; Change in Quantity Supplied (Movement) Vs Change in Supply (Shift); **Appendix- Market Equilibrium:** Market equilibrium through different situations of demand and supply. ✓ Review Questions & Internal Assessment	**3**	**1**
4. Elasticity of Demand: ✓ Meaning of elasticity; ✓ Formula; ✓ Determinants; ✓ Different types of e_d; ✓ Measurement methods- Outlay or Expenditure Method; Percentage Method, & Geometric Method; ✓ Point elasticity Vs Arc elasticity; ✓ Applications of elasticity; ✓ Relationship between Price elasticity of demand and Revenue; Importance of Price elasticity of demand; ✓ Income elasticity; ✓ Cross elasticity; ✓ Review Questions & Internal Assessment	**6**	**2**
5. Elasticity of Supply: ✓ Meaning; ✓ Formula; ✓ Determinants ✓ Different types of e_s; ✓ Measurement Methods- *Percentage Method, & Geometric/diagrammatic Method;* ✓ Review Questions & Internal Assessment	**3**	**1**
First Mid- Term Exam (Chapter 1 to 5)	**20 marks**	
6. Consumer Theory: Utility Analysis: ➢ Cardinal Utility Analysis- ✓ Meaning, Law of Diminishing Marginal Utility;	**10**	**3**

✓ Law of Equi Marginal Utility; and ✓ Consumer Equilibrium. ➢ Ordinal Utility Analysis- *Indifference Curve Analysis- I:* ✓ Meaning of Indifference Curve; ✓ Assumptions; ✓ Nature of Consumer Preference; ✓ Marginal Rate of Substitution; ✓ Budget Line; ✓ Consumer Equilibrium; ✓ Review Question. *Indifference Curve Analysis II:* ✓ Price Effect; ✓ Income Effect; ✓ Substitution Effect- Hicksian & Slustky Substitution effect; Price Consumption curve; ✓ Consumer Surplus; Revealed Preference Theory; ✓ Review Questions & Internal Assessment		
7. Theory of Production: ✓ Production function- Production in the short- run- TP, AP, MP curves & relationships; ✓ Law of Variable Proportion- DMR; ✓ Production Function in Long Run- Two variable inputs- Isoquants; ✓ Features of isoquants; ✓ Iso- cost Line; ✓ Producer's Equilibrium; ✓ Expansion Path; ✓ Elasticity of substitution; ✓ Returns to Scale- Economies and Diseconomies of Scale; ✓ Review Questions & Internal Assessment	**8**	**3**
8. Theory of Cost: ✓ Cost function; ✓ Different cost concepts; ✓ Cost in the short- run; ✓ Relationships among different costs; ✓ Cost in the long- run; ✓ Relationship between production and cost curves; ✓ Review Questions & Internal Assessment	**6**	**2**
Second Mid- Term Exam (Chapter 6, 7 & 8)	**20 marks**	
9. Forms of Market & Price Determination: *Forms of Market/ Competition:* ✓ Perfect competition; ✓ Monopoly: Price discrimination; ✓ Monopolistic competition; ✓ Oligopoly;	**7**	**2**

Price determination under: ✓ Perfect compt., ✓ Monopoly & oligopoly; ✓ Review Questions & Internal Assessment		
10. Welfare Economics: ✓ Criteria of social welfare: GNP; Bentham's criterion; cardinal criterion; ✓ Pareto- optimality; ✓ Kaldor- Hicks compensation criterion; ✓ Bergson's criterion of social welfare function; ✓ Scitovsky Paradox; ✓ Review Questions & Internal Assessment	**3**	**1**
Final Exam.	**40 marks**	
Internal Assessment	**20 marks**	

Distribution of Marks:

S. No.	Examinations	Marks
1.	First Exam	20 marks
2.	Second Exam	20 marks
3.	Internal Assessment	20 marks
4.	Final Exam	40 marks
5.	**Total**	**100 marks**

Suggested Study Materials:

- Lecture Notes Prepared by the Instructor (*Dr. Md. Izhar Alam*);
- *Microeconomics*, 5 th Edition By Robert S. Pindyck & Daniel L. Rubinfeld
- *Fundamentals of Microeconomics* by Christopher Snyder & Walter Nicholson, Cengage Learning
- *Intermediate Microeconomics*: *A Modern Approach*, 8 th Edition, Hal R. Varian.
- *Microeconomics* by McConnell Brue Flynn, Global Edition, McGraw Hill Publication;

Note:

- Students are advised to visit the Instructor's website and look at announcements and download the study materials and always be updated.
- The above mentioned books (of softcopy) are more than 2 MB space and that's why these books cannot be uploaded at the website. Therefore, students are advised to take these books in their USB flash memory to their Instructions.

Dr. Md. Izhar Alam
(Course- Coordinator)

Chapter- 1

Introduction to Microeconomics

Outline of this Chapter:

- Introduction to economics- points to be remembered;
- Basic definitions of economics;
- Basic reasons to exist the economy;
- Basic problems in an economy;
- Meaning of microeconomics and macroeconomics;
- Scope of microeconomics and macroeconomics;
- Questions for Review with answer.

Learning Objectives:

After studying this chapter, you will be able to understand:

- ✓ The fundamental principles of economics,
- ✓ Meaning of economy, economics, microeconomics, macroeconomics, positive and normative economics, partial and general equilibrium analysis,
- ✓ Differences between microeconomics and macroeconomics, and
- ✓ Scope of microeconomics and macroeconomics.

Points to be remembered:

- **Economy:** A system of providing living to people.
- **Microeconomics:** Study of the behavior of individual, small, isolated and disaggregated units.
- **Macroeconomics:** Study of groups and broad aggregates of the economy.
- **Firm:** An individual producing unit.
- **Industry:** A group of firms producing identical or closely related goods.
- The term *microeconomics* and *macroeconomics* were first given by **Ragner Frisch** in 1933.
- **Adam Smith** wrote the book- "*An Enquire into the Nature and Causes of Wealth of Nations*" or in short "*Wealth of Nations*" in 1776.
- **Adam Smith** is known as father of modern economics.
- *Positive economics* deals with describing relationships of cause and effect. It deals with explanation and prediction.

- ***Normative economics*** deals with what ought to be or what should be. It is related to value judgments.
- ***Partial equilibrium analysis*** is the study of the behavior of individual decision- making units and working of individual markets in isolation.
- ***General equilibrium analysis*** is the study of the behavior of all individual decision-making units and all individual markets simultaneously.
- *Partial equilibrium analysis* is developed by **Marshall** whereas *general equilibrium analysis* is developed by **Walras**.

The basic definition of economics:

- "*Economics enquire into the nature and causes of wealth of nations*" (**Adam Smith)**
- "*Economics is a study of mankind in the ordinary business of life and examines that part of individual and social action which is connected with material requisites of well-being.*" **(Marshall)**
- "*Economics is a science which studies human behavior as a relationship between ends and scares resources which have alternative uses*." **(L. Robbins)**

An economy exists because of two basic facts:

1. Human wants for goods and services are unlimited; and
2. Productive resources with which to produce goods and services are limited.

- Thus a society is faced with the problem of choice – choice among unlimited wants/desires that are to be satisfied with limited resources.

The basic problems/questions in an economy:

- ✓ What goods are produced and in what quantities by the productive resources;
- ✓ How to produced, that is what production methods are employed for production of various goods and services;
- ✓ How to distribute, that is how is the total production of goods and services is distributed among its people;
- ✓ Are the uses of production resources economically efficient?
- ✓ Whether all available productive resources with a society are being fully utilized?
- ✓ Is the economy's productive capacity increasing, declining or remaining constant over time?

- Economics has been divided into two parts by **Ragnar Frisch** (*First Nobel Prize winner in Economics*):
    - ✓ Microeconomics; and
    - ✓ Macroeconomics
- Micro means small and macro means large.
- ***Microeconomics*** deals with the analysis of small individual units of the economy such as individual consumers, individual firms and small aggregates or groups of individual units such as various industries and markets.
- ***Macroeconomics*** deals with the analysis of the economy as a whole and its large aggregates such as total national output and income, total employment, total consumption, aggregate investment, etc.

Differences between Microeconomics and Macroeconomics:

Differences based on	Microeconomics	Macroeconomics
1. Subject- matter:	Small segments such as individual household, individual firm, individual price, etc.	Large aggregates such as aggregate demand, aggregate supply, national income, general price level, etc.
2. Use of techniques:	Partial equilibrium analysis	General equilibrium analysis
3. Assumptions:	Full employment in the economy	Underemployment of resources.
4. Core differences:	Price is the main determinant of microeconomics.	Income is the main determinant of macroeconomics.

Scope of Microeconomics and Macroeconomics:

Microeconomics

- Product pricing
    - Theory of demand
    - Theory of production & costs
- Factor pricing
    - Wages
    - Rent
    - Interest
    - Profits
- Theory of economic welfare

Macroeconomics

- Theory of income & employment
    - Theory of consumption function
        - Theory of flactuations or business cycles
    - Theory of investment
- Theory of General Price Level & Inflation
- Theory of Economic Growth
- Macro Theory of Distribution

REVIEW QUESTIONS

Objective Type Questions:

1. Who is known as father of modern economics?
   a. Ragnar Frisch b. Adam Smith c. Marshall d. None of these.
2. Who was the first person who got Nobel Prize in economics?
   a. Ragnar Frisch b. Adam Smith c. Marshall d. None of these.
3. Who wrote the book *Wealth of Nations*
   a. Ragnar Frisch b. Adam Smith c. Marshall d. Robbins.
4. Wealth of Nations was published in---
   a. 1976 b. 1876 c. 1776 d. 1676.
5. Microeconomics and Macroeconomics was first coined by ----
   a. Ragnar Frisch b. Adam Smith c. Marshall d. Robbins.
6. The study of the behavior of individual decision- making units and working of individual markets in isolation is known as-----
   a. General equilibrium analysis b. Partial equilibrium analysis.

Answer:

1	2	3	4	5	6
b	a	b	c	a	b

True and false statements:

1. Microeconomics is the study of the behavior of individual, small, isolated and disaggregated units.
2. Partial equilibrium analysis is developed by Walras.
3. The term *microeconomics* and *macroeconomics* were first given by Adam Smith in 1933.
4. Product pricing, factor pricing and theory of economic welfare are the scope of microeconomics.
5. General equilibrium analysis is used in microeconomics.

Ques.	1	2	3	4	5
Ans.	T	F	F	T	F

QUESTIONS WITH ANSWER

Ques: Why does economy exist in the world?

Ans: An economy exists because of two basic facts:

1. Human wants for goods and services are unlimited; and
2. Productive resources with which to produce goods and services are limited.

Ques: What are the main definitions of economics?

Ans: The main definitions of economics are given by Adam Smith, Marshall and Robbins.

According to **Adam Smith**, "Economics enquire into the nature and causes of wealth of nations."

Marshall defines "Economics is a study of mankind in the ordinary business of life and examines that part of individual and social action which is connected with material requisites of well being."

Robbins defines, "Economics is a science which studies human behavior as a relationship between ends and scares resources which have alternative uses."

Ques: Who has written the book- "An Enquire into the Nature and Causes of Wealth of Nations?"

Ans: Adam Smith has written this book in 1776.

Ques: Who is known as known as father of modern economics?

Ans: Adam Smith

Ques: What are the basic problems/questions in economy?

Ans: The basic problems/questions in an economy are:

1. What to produce;
2. How to produce; and
3. For whom to produce?

Ques: Who divided economics into two parts as microeconomics and macroeconomics?

Ans: Ragnar Frisch (First Nobel Prize winner in Economics).

Ques: What is microeconomics?

Ans: Microeconomics deals with the analysis of small individual units of the economy such as individual consumers, individual firms and small aggregates or groups of individual units such as various industries and markets.

Ques: What is macroeconomics?

Ans: Macroeconomics deals with the analysis of the economy as a whole and its large aggregates such as total national output and income, total employment, total consumption, aggregate investment, etc.

Ques: What is positive economics?

Ans: Positive economics deals with describing relationships of cause and effect. It deals with explanation and prediction.

Ques: What is normative economics?

Ans: Normative economics deals with what ought to be or what should be. It is related to value judgments.

Ques: What do you understand by partial equilibrium?

Ans: Partial equilibrium analysis is the study of the behavior of individual decision- making units and working of individual markets in isolation.

Ques: What is general equilibrium analysis?

Ans: General equilibrium analysis is the study of the behavior of all individual decision- making units and all individual markets simultaneously.

Ques: Who developed partial and general equilibrium analysis?

Ans: Marshall developed partial equilibrium analysis and Walras developed general equilibrium analysis.

Chapter- 2

Demand Analysis

Chapter Scan

In chapter 2 we deal with demand analysis as a one part of price determination in free market. The other part of market mechanism is supply analysis which will be discussed in the next chapter. In a free market mechanism, the demand and supply curves interact to determine the price and quantity of a good or services. The analysis of demand and supply is essential to understand price and output movement in a market.

Chapter Outline:

- Meaning of Demand
- Characteristics or Features of Demand
- Factors Affecting Individual Demand
- Demand Function
- Law of Demand
- Individual Demand & Market Demand
- Change in Quantity Demanded Vs Change in Demand

Learning Objectives: After studying this chapter you will be able to-

- Understand the meaning of demand and features or characteristics of demand;
- Factors affecting individual demand;
- Demand function and law of demand; and
- The basic differences between change in demand and change in quantity demanded.

Basics:

- In a market mechanism, the demand and supply curves interact to determine the price and quantity of a good or services.
- The analysis of demand and supply is essential to understand price and output movement in a market.
- Demand is the behaviour of potential buyers in a market.
- Demand is defined as the entire relationship between price and quantity.
- Quantity demanded of a commodity is defined as the quantity of that commodity demanded at a certain price during any particular period of time.

Meaning of Demand:

Demand is the behaviour of potential buyers in a market. It is defined as the entire relationship between price and quantity. It shows the amount of a good or service that buyer wish to purchase at various prices during some time period. So, quantity demanded of a commodity is defined as the quantity of that commodity demanded at a certain price during any particular period of time.

Features of Demand:

- ✓ It depends on the utility of the commodity;
- ✓ It always means effective demand. Always backed by purchasing power and willingness or ability to spend it;
- ✓ It is a flow concept;
- ✓ It refers to demand for final consumer goods;
- ✓ It is always related to certain price;
- ✓ It is a desired quantity. It shows consumers wish or need to buy the commodity;
- ✓ It does not refer to quantity actually bought.

Factors Affecting/ Determining Demand:

Main factors:	***Other factors:***
Own price;	Income distribution;
Prices of other goods;	Past levels of demand and income;
Consumers' income;	Population growth;
Weather conditions	Government policy;
Consumers' tastes and preferences	Wealth of the consumers.

Demand Function:

Functional relationship between demand for a commodity and its determinants is known as demand function.

$$Dx = f(Px, Py, Y, T);$$

Where; Dx = Demand for commodity x;
Px = Price of commodity x;
Py = Price of other commodity y;
Y = Consumers' incomes
T = Consumers' tastes and preference.

Law of Demand:

The relationship between quantity of a good that consumers are willing to buy and the price of the good that shows opposite relationship between price and quantity demanded is known as law of demand. In other words, *higher the price, lower the demand and lower the price, higher the demand*, if other things remains same. That is, the quantity demanded is negatively related to the price of the good.

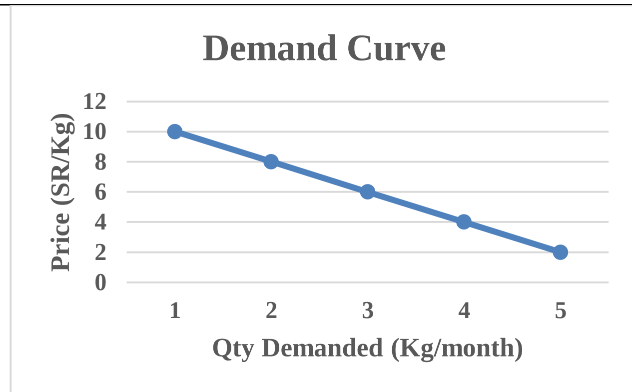
$$D_x = f(P_x)$$
$$D_x = a - bP_x$$

Where, D_x = Demand of commodity, x
P_x = Price of commodity, x

f = functional relationship
a = Vertical Intercept of the demand curve; and
b = slope of the demand curve.

Example: Demand Schedule for Sugar

Price (SR/Kg)	Quantity Demanded (Kg/month)	Reference points
1	10	A
2	8	B
3	6	C
4	4	D
5	2	E



The demand curve slopes downwards to the right (or negatively sloped) indicating that the quantity demanded is inversely related to the price of the good.

Reasons behind downward slope of demand curve

Or, why demand curve slopes downwards to the right?

- Law of diminishing marginal utility;
- Substitution effect
- Income effect
- New consumers

Exceptions to the law of demand:

- Giffen goods;
- Veblen good;
- Exception of a price rise in future;
- Bandwagon effect;
- Emergency;
- Good with uncertain product quality;
- Snob appeal;
- Brand loyalty.

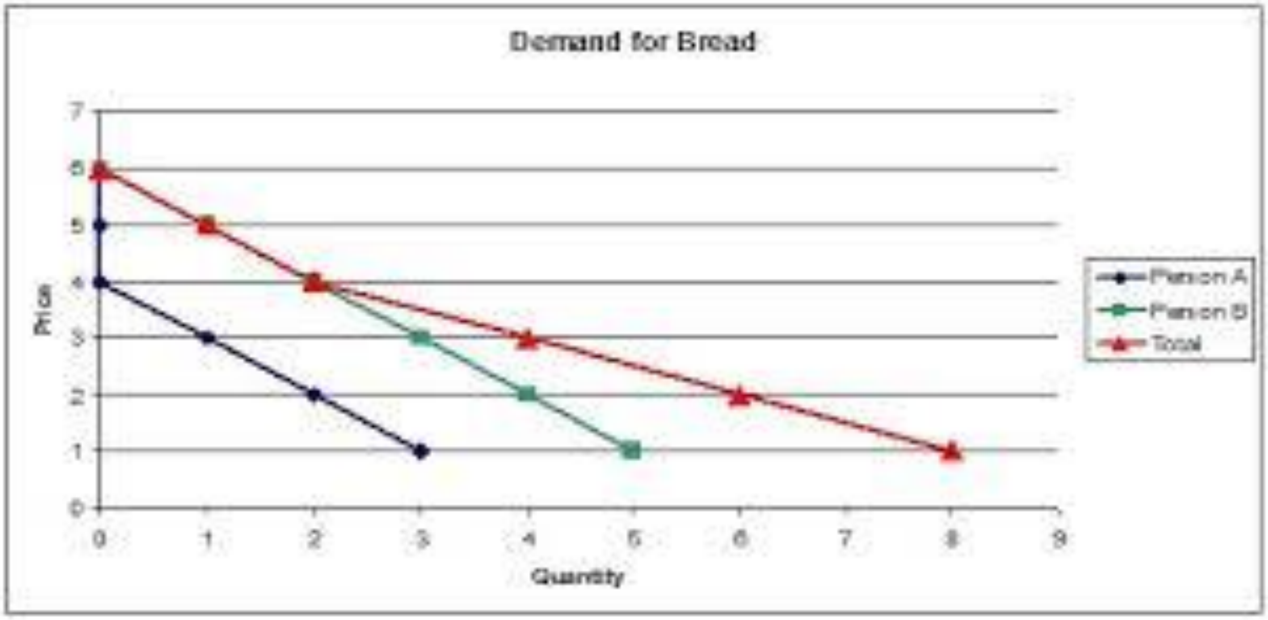
Individual Demand and Market Demand:

An individual demand curve is the demand for a good on the part of an individual consumer.

Market demand is the demand for a good on the part of all the consumers taken together.

Example: Individual Demands and Market Demand for Sugar

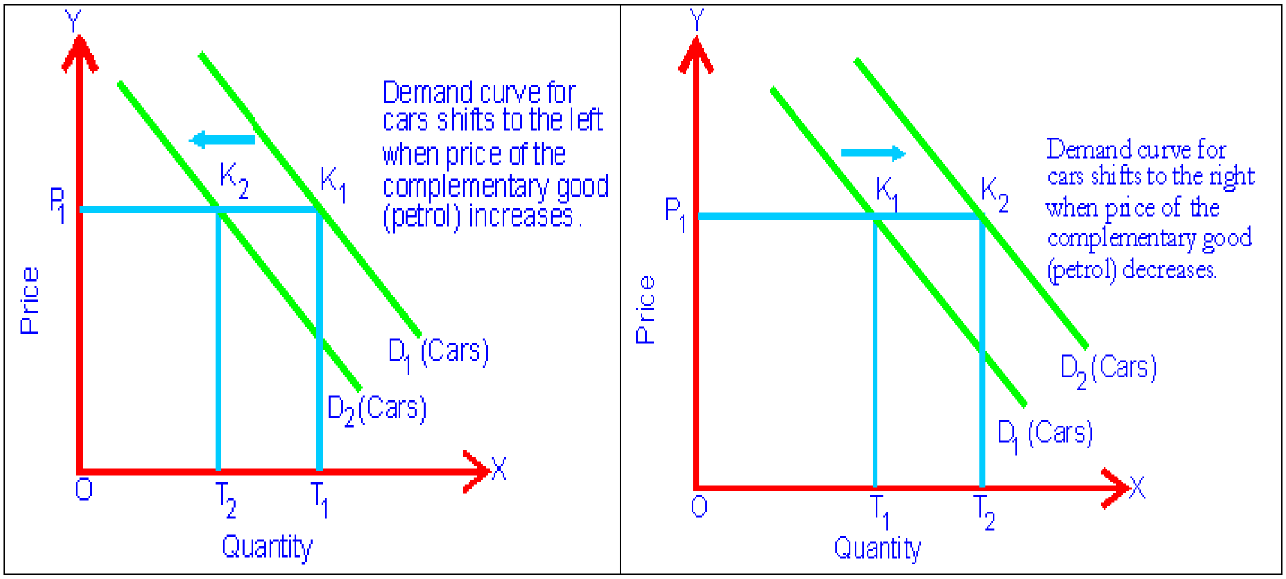
Price (SR/Kg)	Quantity Demanded by Individual "A"	Quantity Demanded by Individual "B"	Quantity Demanded by "A+B" (Market Demand)
1	5	4	5+4=9
2	4	3	4+3=7
3	3	2	3+2=5
4	2	1	2+1=3
5	1	0	1+0=1



Complementary goods:

Two goods are said to be complements if an increase in the price of one good leads to a fall in the quantity demanded of other.

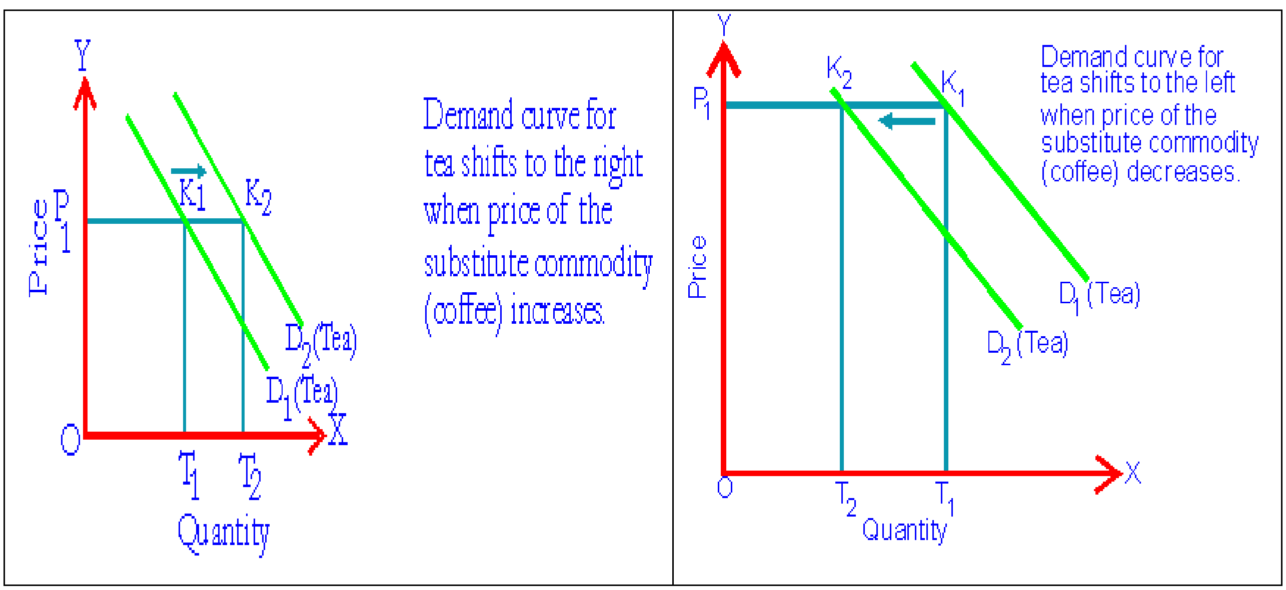
Example: Car and Petrol



Substitute goods:

Two goods are said to be substitute if an increase in the price of one leads to an increase in the quantity demanded of the other.

Example: Tea and Coffee

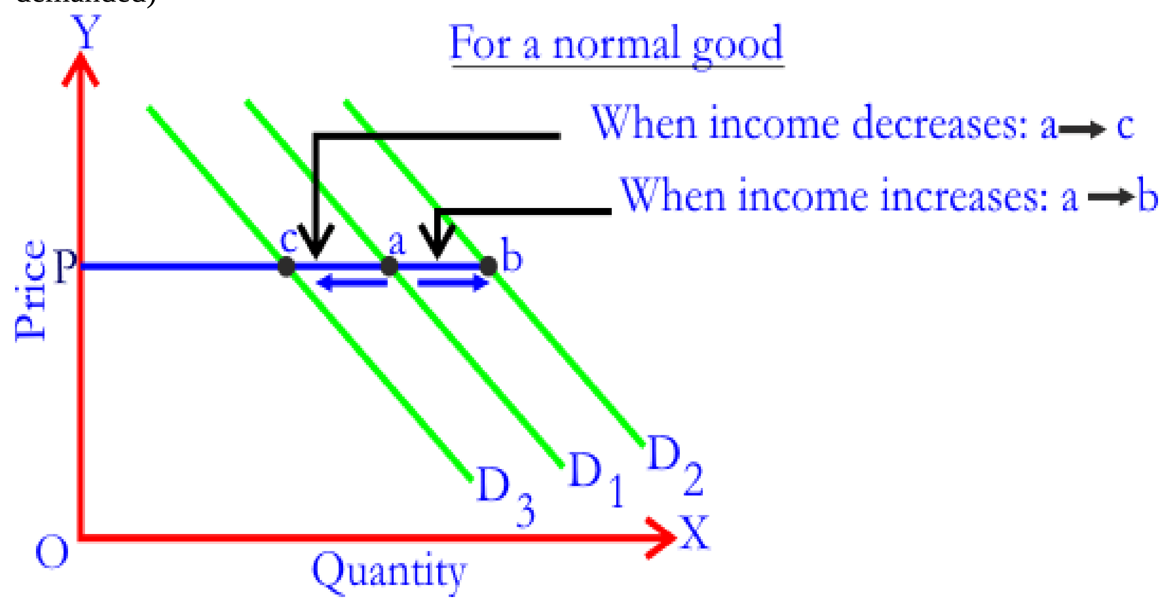


Demand and Income of the Consumer:

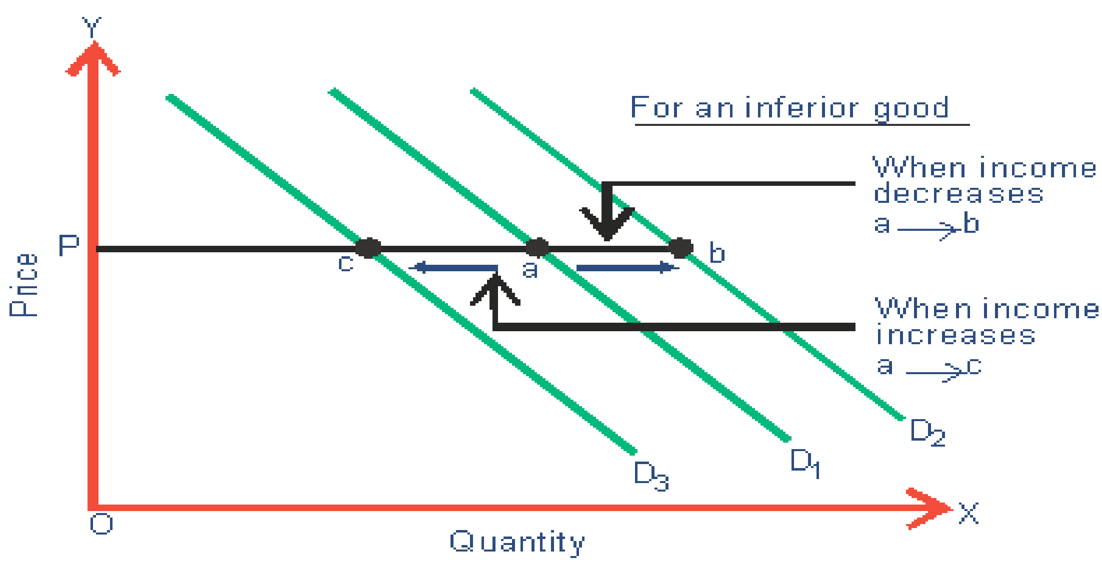
Dx = f (Y), ceteris paribus

How a change in the income will affect the demand for a good depends upon the type of the good:

- Normal good => Y↑↓ => Dx ↑↓ (Direct relationship between income and quantity demanded)



- Inferior good => Y↑↓ => Dx ↓↑ (Inverse relationship between income and quantity demanded)



Demand and Consumer Tastes:

$$Dx = f(T), \text{ ceteris paribus}$$

Change in Quantity Demanded (Movement) Vs Change in Demand (Shift) of Demand Curve:

Change in Quantity Demanded (Movement: Expansion or Contraction):

- A movement along the demand curve is caused by a change in the price of the good only, other things remaining the same.
- It is also called change in quantity demanded of the commodity.
- Movement is always along the same demand curve, i.e., no new demand curve is drawn.
- Movement along a demand curve can be of two types:
  Expansion or extension of demand curve; and
  Contraction of demand curve
- Expansion or extension of demand refers to rise in demand due to fall in the price of the good.
- Contraction of demand refers to fall in demand due to rise in the price of the good.

Change in Demand (Shift: Increase or Decrease in Demand Curve):

- A shift of the demand curve is caused by changes in factors other than price of the good. These other factors are:
  - ✓ Consumer's income;
  - ✓ Price of other goods;
  - ✓ Consumers' tastes and preferences, etc
- A change in any of these factors causes shift of the demand curve. It is also called change in demand curve.
- Shift in demand curve means a new demand curve is drawn.
- A shift of the demand curve (or change in demand curve) can be of two types:
  Increase in demand; and
  Decrease in demand.
- Increase in demand refers to more demand at a given price or same demand at a higher price. This is due to-
  - ✓ Increase in the income of the consumers;
  - ✓ Increase in the price of substitute goods;
  - ✓ Fall in the price of complementary goods;
  - ✓ Consumers taste becoming stronger in favour of the good.
- Decrease in demand refers to less demand at the given price or same demand at a lesser price. This is due to-
  - ✓ Fall in the income of the consumers;

- ✓ Fall in the price of substitute goods;
- ✓ Rise in the price of complementary goods;
- ✓ Consumers’ taste becoming unfavourable towards the goods.

REVIEW QUESTIONS

I. Objective Type/Multiple Choice Questions:

1. Which is/are the determinants of demand-
   a. Price b. Income c. Taste and preference d. All of these.
2. Price of the good is fixed in a market by-
   a. Demand, b. Supply, c. Both, d. None of these.
3. The reasons for the downward slope of demand curve are-
   a. The law of diminishing marginal utility
   b. Substitution effect;
   c. Income effect;
   d. All of the above.
4. In case of change in demand-
   a. No new demand curve is drawn;
   b. New demand curve is drawn;
   c. Both can be possible;
   d. None of these possible.
5. If an increase in the price of one leads to an increase in the quantity demanded of the other then these goods are-
   a. Substitute goods; b. Complementary goods;
   b. c. Normal goods; d. None.
6. Demand curve slopes upward in case of-
   a. Veblen goods; b. Giffen goods
   c. Snob appeal; d. all of the above.
7. Which one is **not** the reason for change in demand -
   a. Price of the good;
   b. Price of other goods;
   c. Income of the consumer;
   d. Consumers’ taste and preferences
8. Which one is ***not*** correctly matched-
   a. Giffen goods……………………a superior or high quality goods.
   b. Substitute goods………………..tea and coffee.
   c. Complementary goods…………car and petrol.
   d. Veblen goods…………a prestigious goods with status symbol.

Ques:	1	2	3	4	5	6	7	8
Ans:	d	c	d	b	a	d	a	a

II. Write T for True and F False against the following questions:

1. In case of Giffen goods and Veblen goods, law of demand does not work.
2. In case of change in quantity demanded, new demand curve is drawn.
3. If an increase in the price of one good leads to a fall in the quantity demanded of other then these goods are complementary goods.
4. In case of normal goods, as income increases, demand for these goods also increases.
5. Law of demand states that higher the price, lower the demand and lower the price higher the demand, other things remaining the same.

Ques:	1	2	3	4	5
Ans:	T	F	T	T	T

III. Matching Test:

Match- I	**Match- II**
A. Change in demand will take place	a. On the same demand curve
B. Change in quantity demanded will take place	b. On new demand curve
C. Increase in demand	c. Rightward shift in demand curve
D. Decrease in demand	d. Leftward shift in demand curve

Match- I	A	B	C	D
Match- II	b	a	c	d

Match- I	**Match- II**
A. Demand curve slopes	a. Decrease in price of the good only
B. In case of Giffen goods, demand curve slopes	b. Decrease in other than the price of good
C. Expansion of demand curve is due to	c. Upward to the right.
D. Increase in demand curve is due to	d. Downward to the right.

Match- I	A	B	C	D
Match- II	d	c	a	b

IV. Questions with Answer

Ques: What is demand?

Ans: Demand is defined as the entire relationship between price and quantity. Quantity demanded of a commodity is defined as the quantity of that commodity demanded at a certain price during any particular period of time.

Ques: What are the factors affecting individual demand?

Ans: Followings are the factors that affect individual demand:

Main factors:	***Other factors:***
• Own price; • Prices of other goods; • Consumers' income; • Weather conditions • Consumers' tastes and preferences	• Income distribution; • Past levels of demand and income; • Population growth; • Government policy; • Wealth of the consumers.

Ques: What is law of demand? Explain it with suitable example.

Ans: The relationship between quantity of a good that consumers are willing to buy and the price of the good that shows opposite relationship between price and quantity demanded is known as law of demand. In other words, higher the price, lower the demand and lower the price, higher the demand. That is, the quantity demanded is negatively related to the price of the good.

$$Dx = f\ (Px) = a - bPx$$

Where, Dx = Demand of commodity, x
Px = Price of commodity, x
a = Intercept of Demand curve
b = Slope of demand curve
f = functional relationship

Example: Demand Schedule for Sugar

Price (SR/Kg)	Quantity Demanded (Kg/month)	Reference points
1	10	A
2	8	B
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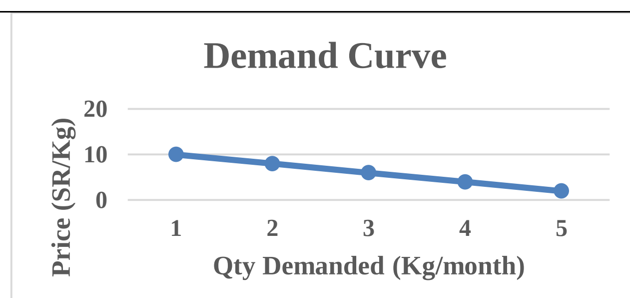


The demand curve slopes downwards to the right (or negatively sloped) indicating that the quantity demanded is inversely related to the price of the good.

Ques: What are substitute goods?

Ans: Two goods are said to be substitute if an increase in the price of one leads to an increase in the quantity demanded of the other.

Example: Tea and Coffee

Ques: What are complementary goods?

Ans: Two goods are said to be complements if an increase in the price of one good leads to a fall in the quantity demanded of other.

Example: Car and Petrol

Ques: What are normal and inferior goods?

Ans: **Normal Good:** That good when income increases, quantity demanded also increases is called normal good.

Inferior Good: That good when income increases, quantity demanded decreases is called inferior good.

Ques: What are the reasons behind the downward slope of demand curve?

Ans: The reasons for downward sloping demand curve are:

1. Law of diminishing marginal utility;
2. Substitution effect
3. Income effect
4. New consumers

Ques: What are the exceptions to the law of demand curve?

Ans: The exceptions to the law of demand curve are:

- Giffen goods;
- Veblen good;
- Exception of a price rise in future;
- Bandwagon effect;
- Emergency;
- Good with uncertain product quality;
- Snob appeal;
- Brand loyalty.

Ques: What are the differences between expansion in demand and increase in demand curve?

Ans:

Expansion in demand	**Increase in demand**
1. Expansion or extension of demand refers to rise in demand due to fall in the price of the good.	1. Increase in demand refers to more demand at a given price or same demand at a higher price.
2. This occurs on the same demand curve.	2. It occurs on the new demand curve.
3. The reason of extension or expansion in demand is decrease in price of the good only.	3. The reasons for increase in demand are other than the price of good.

Ques: What happens when quantity demanded is related to-

a. **Income of the consumers**
b. **Tastes and preferences of the consumers.**

Ans: a. Income of the consumers and Demand for goods:

$$Dx = f(Y), \text{ ceteris paribus}$$

How a change in the income will affect the demand for a good depends upon the type of the good:

Normal good => Y↑↓ => Dx ↑↓ (Direct relationship between income and quantity demanded)
Inferior good => Y↑↓ => Dx ↓↑ (Inverse relationship between income and quantity demanded)

b. Tastes and preferences of the consumers and demand for good:

Taste and preference of the consumer also affect demand for goods.

Ques: What are Giffen goods?

Ans: Giffen goods are those inferior goods which do not follow law of demand. In other words, as price of that commodity decreases, quantity demanded of that commodity also decreases and vice versa. In case of Giffen goods, law of demand fails.

Ques: What is Snob and Bandwagon effect?

Ans: **Bandwagon Effect:** It refers to desire or demand for a good by a person who wants to be in style because possession of a good is in fashion and therefore many others have it. It is an example of positive network externality. Bandwagon effect makes the demand curve elastic.

Snob Effect: It refers to the desire to possess a unique commodity having a prestige value. It works quite contrary to the bandwagon effect. It is an example of negative network externality. Snob effect makes the demand curve less elastic (inelastic).

Chapter- 3

Supply Analysis

Chapter Scan

In chapter 2 we dealt with demand analysis as a one part of price determination in free market. The other part of market mechanism is supply analysis which will be discussed in this chapter. In a free market mechanism, the demand and supply curves interact to determine the price and quantity of a good or services. The analysis of demand and supply is essential to understand price and output movement in a market.

Chapter Outline:

- Meaning of Supply;
- Supply Function & Law of Supply;
- Individual Supply & Market Supply;
- Factors Determining Supply curve; and
- Change in Quantity Supplied Vs Change in Supply.

Learning Objectives: After studying this chapter you will be able to-

- Understand the meaning of supply and related concepts;
- Factors affecting supply;
- Supply function and law of supply; and
- The basic differences between change in supply and change in quantity supplied.

Meaning of Supply:

Supply of a commodity means quantity of the commodity which is actually offered for sale at a given price during some particular time. It is the quantity of a commodity that a seller is prepared (or willing) to sell in the market at a given price and at a given period of time. Supply refers to a schedule showing various quantities of a commodity that the producers are willing to sell at different possible prices of that commodity at a given time.

Like demand, supply definition is complete when it has the following elements:

- ✓ Quantity of a commodity that the producer is willing to offer for sale;
- ✓ Price of the commodity;
- ✓ Time during which commodity is offered for sale.

Supply is Different from Stock:

- Supply and stock are different from each other.
- Stock of a commodity refers to the quantity of commodity available with the seller at a point of time.
- Supply is that part of the stock which is offered for sale corresponding to different possible prices of the commodity.

Supply Function:

It shows the relationship between quantity supplied and its determinants. That is,

$$Sx = f\,(Px, Py, T, C, Gp)$$

Where Sx = Supply of commodity x;

F = function of

Px = Price of commodity x;

Py = Price of commodity y;

T = Technological changes

C = Cost of production or price of inputs;

Gp = Government policy or excise tax rate.

Factors Determining Supply:

- **Price of the Commodity:** Price is the prime determinant of supply. As stated earlier, higher the price, higher the quantity supplied and lower the price, lower the quantity supplied.
- **Price of Related Goods:** Supply of a commodity is also affected by price of related goods. An increase in the price of a related good induces a firm to adjust its supplies. **Example:** If price of cars rises, supply of 2-wheeler is expected to be restricted. Implying that the firms will now sell 2-wheelers only at a higher price.
- **Number of Firms:** Larger the number of firms, greater the quantity supplied and vice versa. Thus, under conditions of perfect competition, supply of a commodity is generally higher than under monopoly.
- **Goal of the Firm:** Supply of a good also depends upon goal of the firm. Generally, a sales maximizing firm offers a higher quantity of the good for sale than a profit-maximizing firm.
- **Price of Factor Inputs:** The price of inputs (such as labour, raw material) determines the cost of production. If input price rises, cost of production increases and profits are reduced. This will cause supply to fall at the given price.
- **Technology:** Technological improvement reduces cost of production. It induces the producers to produce more and increase the supply of a commodity. More is offered for sale at a given price.

- **Government Policy:** Changes in taxation and subsidy policy of the government also affects the market supply of a commodity. Higher tax burden on the firms restricts the supply, while subsidies are an inducement to increase the supply of a commodity.
- **Producers' Expectations:** Generally, supply is restricted if the producers expect that price of a commodity to rise in the near future, and vice versa.

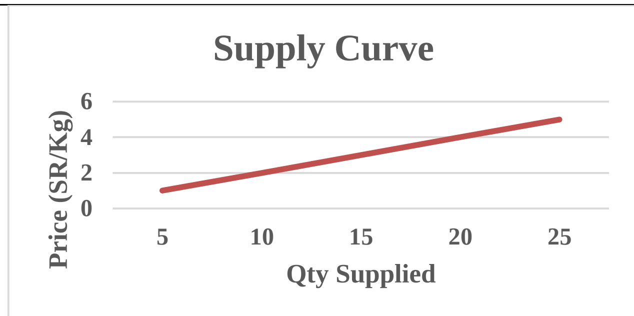
Law of Supply:

Other things remaining the same, quantity supplied of a commodity is directly related to the price of the commodity. When price of a commodity increases, its quantity supplied increases and when the price falls, quantity supplied also falls.

$$S_x = f(P_x), \text{ ceteris peribus}$$
$$S_x = a + bP_x$$

Example: Supply of Sugar and its Price

Price (SR/Kg)	Qty Supplied (Kg)	Ref. points
1	5	A
2	10	B
3	15	C
4	20	D
5	25	E



- Supply curve shows graphically the relationship between quantity supplied of a commodity to its price.
- Supply curve slopes upwards from left to right.

Individual Supply

- It refers to supply of a commodity by an individual firm in the market.

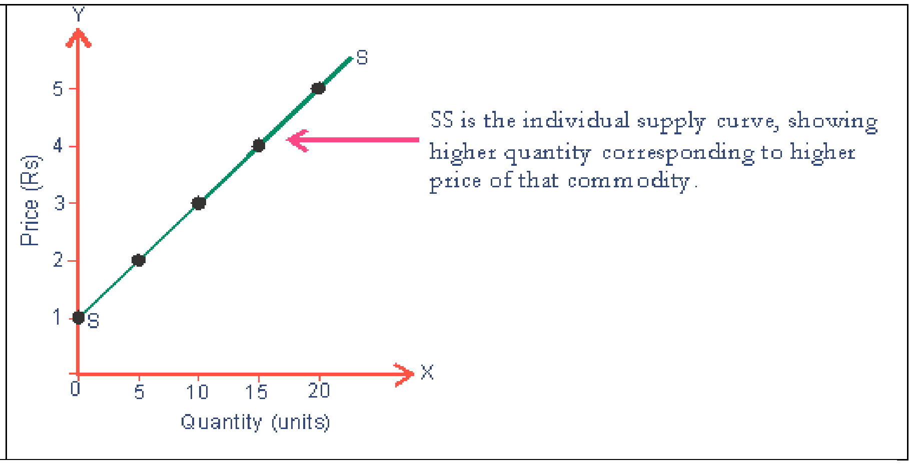
Market Supply

- It refers to supply of a commodity by all the firms in the market. If there are only two firms in the market and one of them is selling 50 units and the other is selling 70 units at a given price, the market supply at this given price will be 120 units.

Individual Supply Curve

- Supply curve is a graphic presentation of supply schedule showing positive relationship between price of a commodity and its quantity supplied.

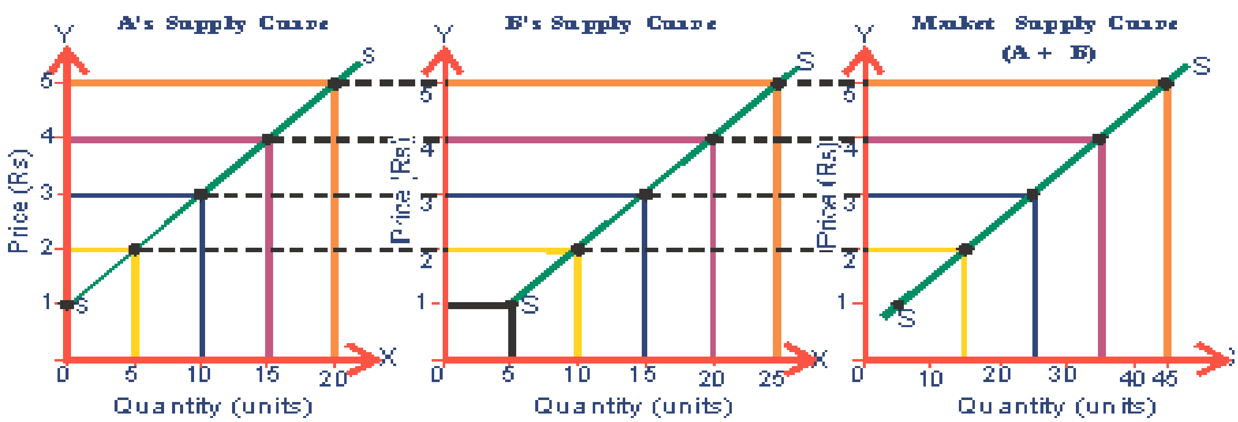
Price (SR)	Quantity Supplied (Units)
1	0
2	5
3	10
4	15
5	20



Market Supply Schedule

- Market supply schedule is the supply schedule of all the firms in the market producing a particular commodity.

Price (SR)	Quantity supplied by Firm A (in Units)	Quantity supplied by Firm B (in Units)	Market Supply
1	0	5	5
2	5	10	15
3	10	15	25
4	15	20	35
5	20	25	45



- **Note the Difference between Supply and Quantity Supplied:**
  Supply refers to the entire supply schedule showing various quantities of a commodity offered for sale corresponding to different possible prices of that commodity, at a given time. On the other hand, quantity supplied refers to a specific quantity (like 15 units) offered for sale against a specific price (SR 4).

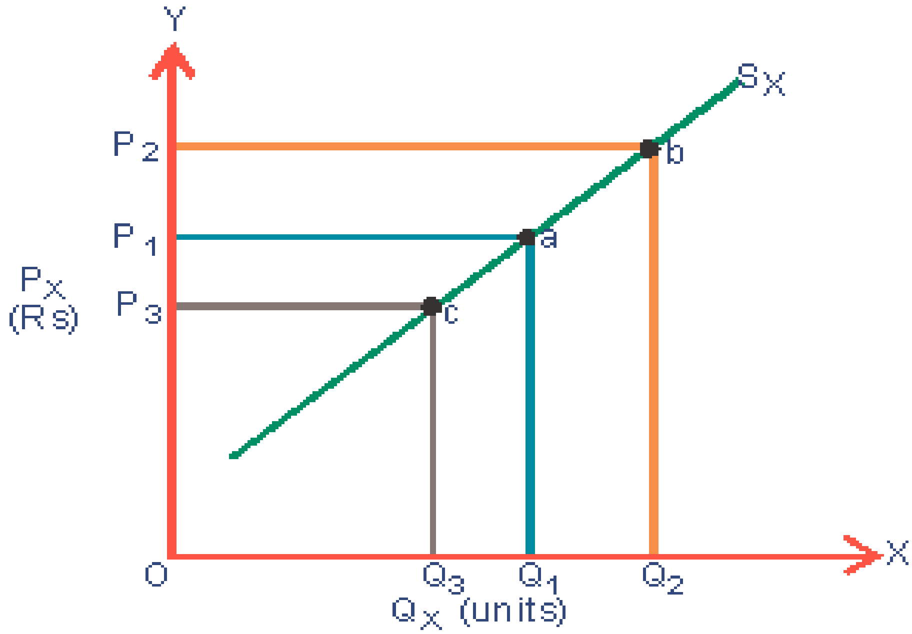
Reasons behind Upward Sloping Supply Curve:

- Law of diminishing marginal productivity;
- Goals of profit maximization.

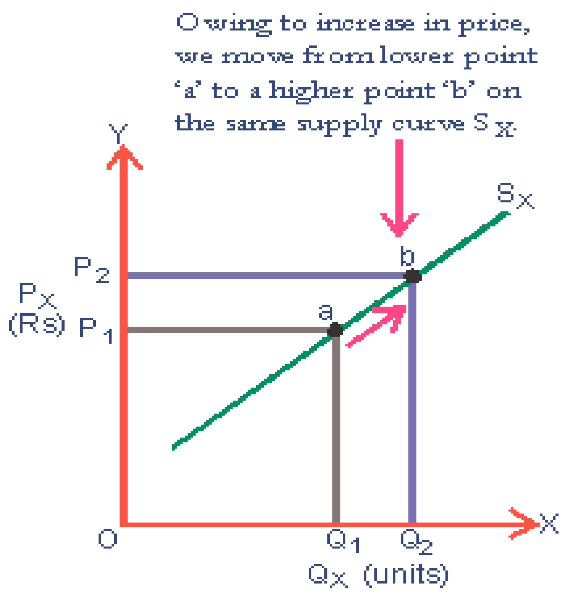
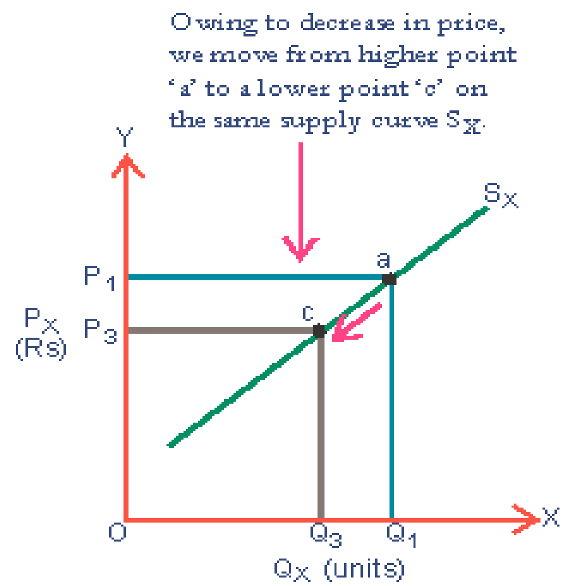
Change in Quantity Supplied (Movement) Vs Change in Supply (Shift):

Change in quantity supplied (movement- expansion or contraction):

- A movement along the supply curve is caused by changes in the price of the good, other things remaining constant.
- It is also called change in quantity supplied of the commodity.
- In a movement, no new supply curve is drawn.
- Movement along the supply curve can be of two types:
    a. Expansion or extension of supply; and
    b. Contraction of supply.
- Expansion or extension of supply refers to rise in supply due to rise in price of the good.
- Contraction of supply refers to fall in supply due to fall in the price of good.

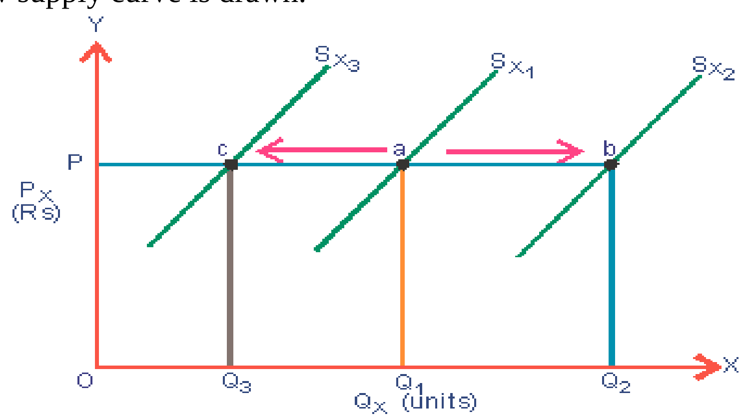


Moving from point a to b shows increase in quantity supplied from Q_1 to Q_2 in response to increase in price (from P_1 to P_2) It is called **extension of supply.** Likewise, moving from point a to c shows decrease in quantity supplied (from Q_1 to Q_3) in response to decrease in price (from P_1 to P_3) It is called **contraction of supply**.

Extension of Supply	Contraction of Supply
	

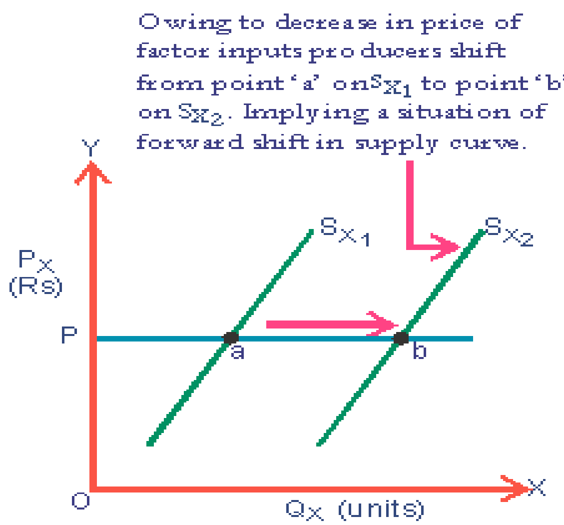
Change in Supply (Shift- Increase or Decrease):

- A shift in supply curve is caused by changes in factors other than the price of the good. These factors are-
  - ✓ Price of the other commodity;
  - ✓ State of technology;
  - ✓ Cost of production;
  - ✓ Government policy, etc.
- A change in any of these above factors causes shift in the supply curve. It is also called change in supply.
- In a shift, a new supply curve is drawn.



- A shift of the supply curve can be of two types:
  a. Increase in supply; and
  b. Decrease in supply.

- **Increase in supply:** when supply of a commodity rises due to favourable changes in factors other than price of the commodity, it is called increase in supply. This is due to-
  - ✓ Improvement in technique of production;
  - ✓ Fall in the price of related goods;
  - ✓ Fall in the cost of production;
  - ✓ Fall in excise tax.
- Increase means more supply at the same price, or same supply at a lower price.
- **Decrease in supply:** when supply of a commodity falls due to unfavorable changes in factors other than its price, it is called decrease in supply. The main reasons of decrease in supply are-
  - ✓ Obsolete technique of production;
  - ✓ Increase in the price of related goods;
  - ✓ Increase in the cost of production;
  - ✓ Rise in excise tax.
- Decrease means same quantity supplied at higher price or less quantity supplied at the same price.

<table>
<tr><td colspan="2">Shift in Supply Curve
It is a situation when quantity supplied of a commodity (Q_x) increases or decreases, due to change in any other determinant of supply, other than price of that commodity.</td></tr>
<tr><td>Forward Shift in Supply Curve
- It is a situation when more is supplied at the existing price, owing to change in other determinants of supply, other than price (P_x).
- It is also known as increase in supply.

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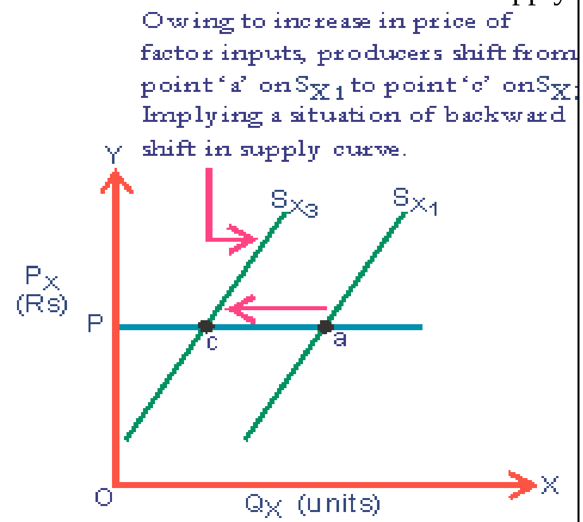
<td>Backward Shift in Supply Curve
- It is a situation when less is supplied at the existing price, owing to change in other determinants of supply, other than price (P_x).
- It is also known as decrease in supply.

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Review Questions

I. Multiple Choice Questions:

1. The relationship between quantity supplied and its price is-

a. directly related | b. inversely related
c. no relation | d. none is correct.

2. The supply curve slopes-

a. downward to the right | b. upward to the right
c. horizontal straight line | d. vertical straight line

3. What is/are the following reason/ reasons for upward sloping supply curve?

a. Law of diminishing marginal productivity | b. Goals of profit maximization
c. (a+b) both is the reason. | d. none is the reason.

4. Factors that determine supply of a commodity-

a. Price of the commodity; | b. New technology;
c. Price of substitutes; | d. Discoveries;
e. Changes in input supply | f. All

5. Change in quantity supplied takes place-

a. same supply curve; | b. new supply curve;
c. both may be possible; | d. none is possible.

6. Change in supply takes place-

a. on the same supply curve; | b. on new supply curve;
c. both may be possible; | d. none is possible.

Ques:	1	2	3	4	5	6
Ans:	a	b	c	f	a	b

II. True/ False Statement:

1. In case of change in quantity supplied, new supply curve is drawn.

2. Law of supply states that higher the price lower the quantity supplied and lower the price higher the quantity supplied, other things remaining the same.

Ques:	1	2
Ans:	F	F

III. Match the following:

Match- I	Match- II
A. Change in supply will take place	a. On the same supply curve
B. Change in quantity supplied will take place	b. On new supply curve
C. Increase in supply	c. Rightward shift in supply curve
D. Decrease in supply	d. Leftward shift in supply curve

Match- I	A	B	C	D
Match- II	b	a	c	d

IV. **Questions with Answer:**

Ques: What is law of supply?

Ans: Other things remaining the same, quantity supplied of a commodity is directly related to the price of the commodity. When price of a commodity increases, its quantity supplied increases and when the price falls, quantity supplied also falls.

Sx = f (Px), ceteris peribus

Example: Supply of Sugar and its Price

Price (SR/Kg)	Qty Supplied (Kg)	Ref. points
1	5	A
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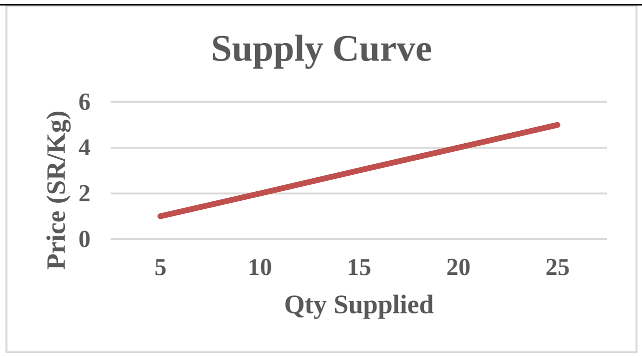


Supply curve shows graphically the relationship between quantities supplied of a commodity to its price. Supply curve slopes upwards from left to right.

Ques: What are the reasons behind Upward Sloping Supply Curve?

Ans: There are two following reasons:

1. Law of diminishing marginal productivity;

2. Goals of profit maximization.

Ques: What are the factors that determine supply of a commodity?

Ans: The factors that determine supply of a commodity:-

- Price of the commodity;
- Discoveries;
- New technology;
- Weather conditions;
- Price of substitutes;
- Changes in input supply, etc.

Ques: What do you understand by the term extension of supply and contraction of supply?

Ans: Expansion or extension of supply refers to rise in supply due to rise in price of the good.

Contraction of supply refers to fall in supply due to fall in the price of good.

Ques: What do you mean by increase in supply and decrease in supply?

Ans: Increase in supply: when supply of a commodity rises due to favourable changes in factors other than price of the commodity, it is called increase in supply.

Decrease in supply: when supply of a commodity falls due to unfavorable changes in factors other than its price, it is called decrease in supply.

Ques: What are the main differences between expansion in supply and increase in supply curve?

Ans:

Expansion in supply	Increase in supply
1. Expansion or extension of supply refers to rise in supply due to rise in the price of the good.	1. Increase in supply refers to more supply at a given price or same supply at a higher price.
2. This occurs on the same supply curve.	2. It occurs on the new supply curve.
3. The reason of extension or expansion in supply is decrease in price of the good only.	3. The reasons for increase in supply are other than the price of good.

Appendix- Market Mechanism: Interaction between Demand and Supply

In chapter 2 and 3 we dealt with demand and supply analysis separately. In this chapter we will discuss how demand and supply is used to determine the price of a product in a free market. In a free market mechanism, the demand and supply curves interact to determine the price and quantity of a good or services. The analysis of demand and supply is essential to understand price and output movement in a market.

Chapter Outline:

- Market Mechanism: Interaction of Demand & Supply;
- Equilibrium in the Market;
- Changes in Market Equilibrium;
- Equilibrium price and quantity in the Market with Example.

Learning Objectives: After studying this chapter you will be able to-

- Understand how market works;
- Understand how equilibrium in the market can be reached;
- Understand how market equilibrium will change as demand or supply of both changes; and
- Understand how price is determined in the market when supply and demand is given.

The Market Mechanism: Interaction of Demand and Supply

The next step is to put the supply curve and the demand curve together. We have done this in the following figure. In this figure the vertical axis shows the price of a good, P which sellers receive for a given quantity supplied, and the price that buyers will pay for a given quantity demanded. The horizontal axis shows the total quantity demanded and supplied, Q.

CHART 1

CHART 2

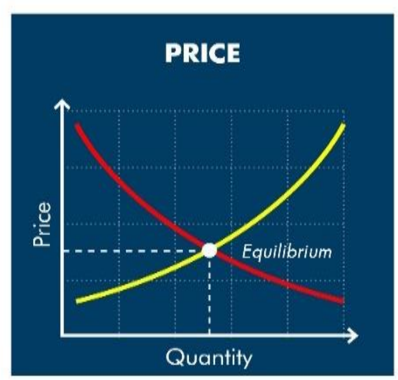
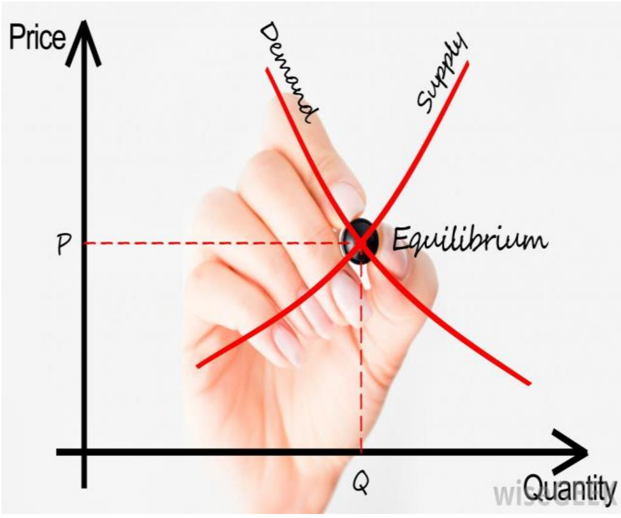
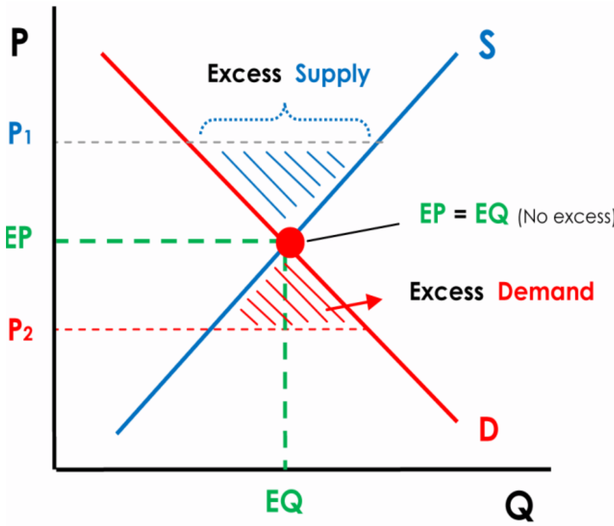


CHART 3

Equilibrium: The two curves intersect at the equilibrium point (EP) or market- clearing price and quantity. At this price (EP), the quantity demanded and the quantity supplied are just equal (EQ) as can be seen in the following figure.

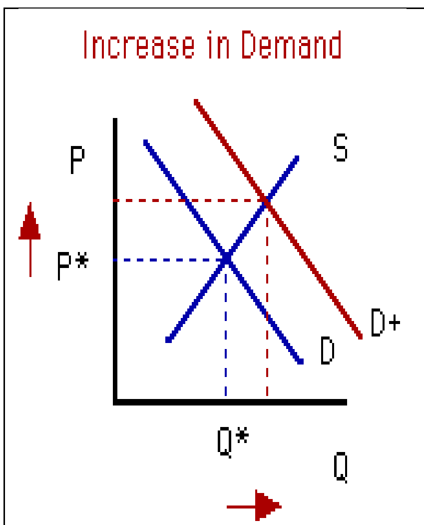


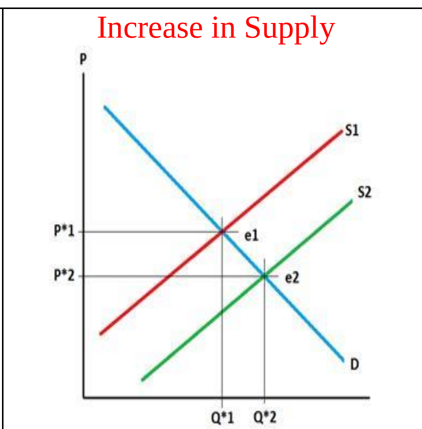


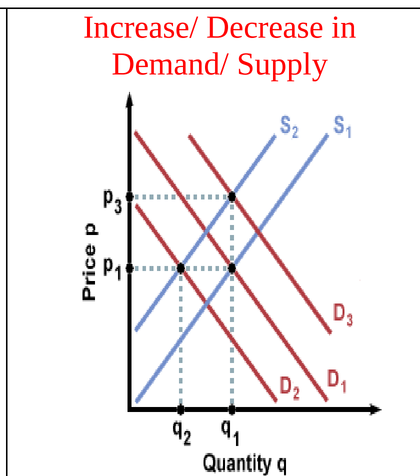
Changes in Market Equilibrium:

We have seen how supply and demand curves shift in response to changes in such variables as wage rates, capital costs, and income. We have also seen above how the market mechanism results in an equilibrium in which the quantity supplied equals the quantity demanded. Now we will see how that equilibrium changes in response to shifts in the supply and demand curves. We can summarize it as below in table and it is also shown in the following figure:

Increase/ Decrease in Demand/ Supply	Impact on Price
• Increase in demand	• Prices tend to rise
• Fall in demand	• Prices eventually fall
• Increase in supply	• Prices tend to fall
• Fall in supply	• Prices tend to rise







Example:

The supply curve for sugar is given as
Supply: $Qs = 1800 + 240P$ and demand for sugar is given as
Demand: $Ds = 3550 – 266P$; *where P is price in SR per kg.*
What will be the equilibrium price and equilibrium quantity in the free market?

Solution: The equilibrium price of sugar and equilibrium quantity of sugar in the free market will be there where quantity demanded is equal to quantity supplied in the market. That is,

Supply: Qs = **Demand:** Ds

$$1800 + 240P = 3550 – 266P$$

$$240P + 266P = 3550 - 1800$$

$$506P = 1750$$

$$P = \frac{1750}{506} = 3.46$$

So, the price of sugar will be SR 3.46 per kg.

To find out the market- clearing quantity (equilibrium quantity), substitute this price of SR 3.46 into either the supply curve equation or the demand curve equation. Substituting into the supply curve equation, we get;

Supply: $Qs = 1800 + 240P$

$$Qs = 1800 + 240*3.46 = 2630 \text{ Kg.}$$

So, equilibrium price is SR 3.46 per kg and equilibrium quantity of supply is 2630 kg.

Chapter- 4

Elasticity of Demand

Outline of this Chapter:

- Elasticity of Demand
  - ✓ Meaning/ Definition of Price Elasticity of Demand; and
  - ✓ Determinants of Elasticity of Demand.
- Different Types of Elasticity of Demand
- Measurement of Elasticity of Demand
  - ✓ Outlay or expenditure Method;
  - ✓ Percentage Method (Point Vs Arc Elasticity); and
  - ✓ Diagrammatic Method.
- Elasticity on a Linear Demand Curve
- Applications of Elasticity of Demand
- Relationship between Price Elasticity and Revenue
- Importance of Price Elasticity of Demand
- Income Elasticity of Demand
  - ✓ Types of Income Elasticity of Demand
  - ✓ Importance of Income Elasticity of Demand
- Cross- price Elasticity of Demand
  - ✓ Types of Cross-price Elasticity
- Questions for Review.

Introduction:

- The law of demand states the inverse relationship between the price of a good and its quantity demanded. But it does not tell about how much change will be occurred or take place when the price will change.
- The elasticity of demand tells us about this change. How much will be changed in quantity demanded when price is changed.
- Percentage change in one variable due to one percent change in another variable is called *elasticity*.
- Elasticity is of three types:
  - ✓ Price elasticity of demand;
  - ✓ Income elasticity of demand; and
  - ✓ Cross- price elasticity of demand.

Price Elasticity of Demand:

- It measures the responsiveness of demand of a good to a change in its price.
- Alfred Marshall was the first economist to formulate the concept of this as ratio of a relative change in quantity demanded to a relative change in price.

- Thus, price elasticity of demand can be defined as percentage change in quantity demanded divided by percentage change in price.

Numerically, price elasticity of demand, E_d or e_d or e is calculated as:

$$E_d = (-)\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

$$= (-)\frac{\Delta Q/Q}{\Delta P/P}$$

$$= (-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$$

Where

E_d = Coefficient of elasticity of demand. The higher the numerical value of E_d, the larger is the effect of price change on quantity demanded;

ΔQ = Change in quantity demanded;
Q = original quantity demanded;
ΔP = Change in price;
P = Original price.

Determinants of Price Elasticity of Demand:

- ✓ Availability and closeness of substitutes;
- ✓ Adjustment time and availability of substitutes;
- ✓ Luxuries versus necessities;
- ✓ Cost relative to total income;
- ✓ Number of uses of the purchased good;
- ✓ Price level; etc.

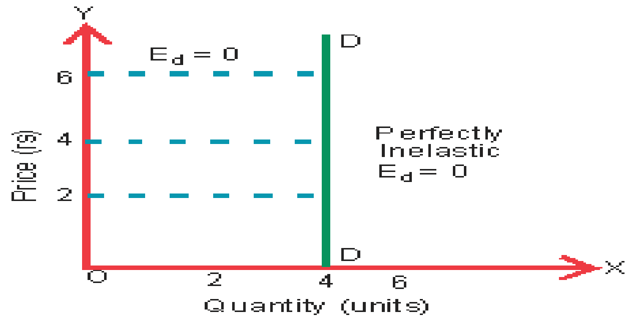
Types of Elasticity of Demand:

- ✓ The absolute value of the coefficient of elasticity of demand ranges from zero to infinity ($0 \le E_d \le \infty$).
- ✓ The five different magnitudes of elasticity of demand are:
  1. Perfectly Inelastic Demand ($E_d = 0$);
  2. Inelastic Demand ($0 < E_d < 1$);
  3. Unitary Elastic Demand ($E_d = 1$);
  4. Elastic Demand ($1 < E_d < \infty$);
  5. Perfectly Elastic Demand ($E_d = \infty$)

Perfectly Inelastic Demand (E_d = 0):

In this case if price rises or falls, people consume same quantity of the good. In this case, demand curve will be vertical.

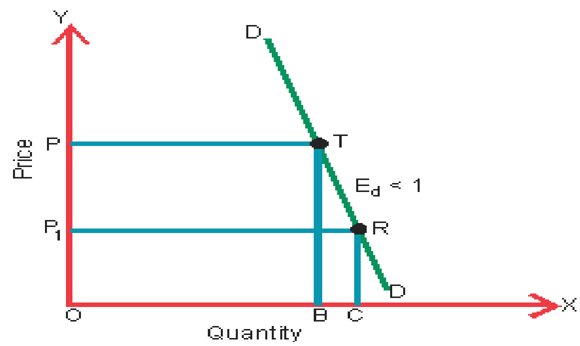
Example: essentials like life- saving drugs.



Inelastic Demand (0 < E_d < 1):

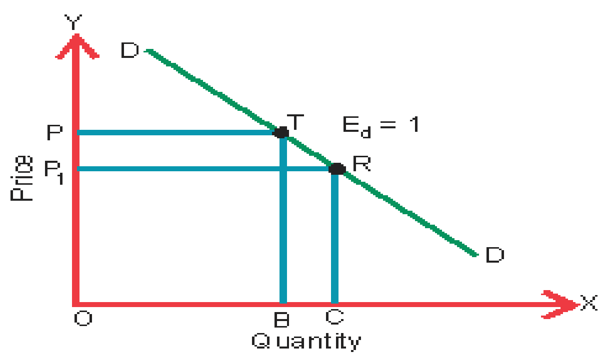
This occurs when percentage change in quantity demanded is less than percentage change in price. In this case, demand curve is steeper.

Example: necessities like food, medicines, fuel, etc.



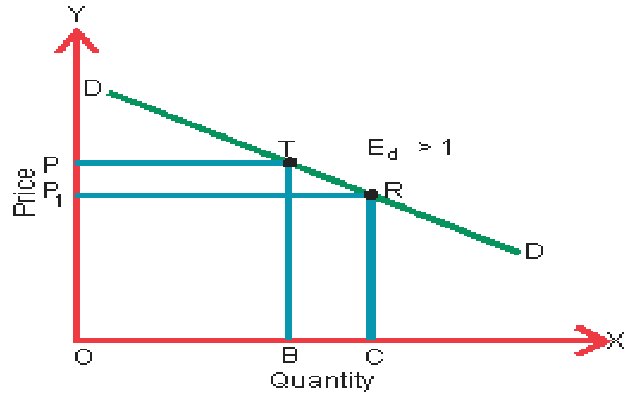
Unitary Elastic Demand (E_d = 1):

This occurs when percentage change in quantity demanded is exactly equal to the percentage change in price. In this case, demand curve will be rectangular hyperbola having coefficient of elasticity equal to one at every point on the demand curve. This occurs in case of normal goods.



Elastic Demand (1< E_d < ∞):

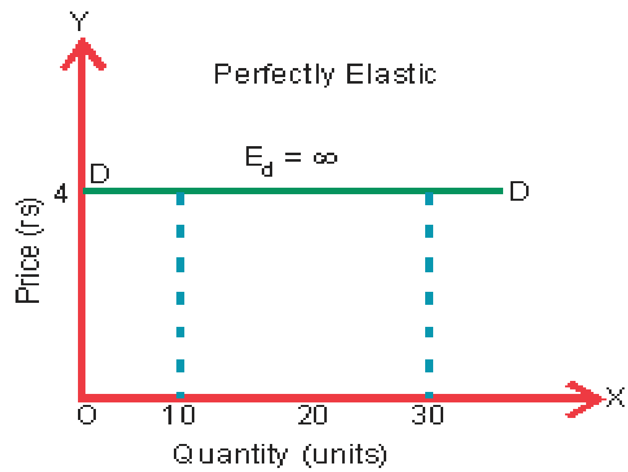
This occurs when percentage change in quantity demanded is greater than the percentage change in price. In this case, demand curve will be flatter.



Example: luxury goods.

Perfectly Elastic Demand (E_d = ∞):

This is a situation where percentage change in quantity demanded is infinity. For any higher price the demand falls to zero and any lower price the demand rises without limit. In this case, demand curve will be horizontal.



Measurement of Price Elasticity of Demand:

1. Outlay or Expenditure Method;
2. Percentage Method; and
3. Geometric Method

1. <u>Outlay or Expenditure Method:</u>

- When price of a good changes, three situations can take place. If the price of a good falls, the total outlay or expenditure of consumers on the good rises when e > 1, remains constant when e = 1 or falls when e < 1.

Different Situations of Outlay/Expenditure Method

S. N.	If price falls	Description	Value of Ed	Term Used
1.	Expenditure increases	Quantity demanded rises in a greater proportion	$E_d > 1$	Elastic demand
2.	Expenditure remains constant	Quantity demanded rises in the same proportion	$E_d = 1$	Unitary elastic demand
3.	Expenditure falls	Quantity demanded rises in a lesser proportion	$E_d < 1$	Inelastic demand

- In symbolic form:
  P↓↑ => TE↑↓ => $E_d > 1$ (opposite relationship between P and TE, i.e., $E_d > 1$)
  P↓↑ => TE remains constant => $E_d = 1$ (No relationship between P and TE, i.e., $E_d = 1$)
  P↓↑ => TE↓↑ => $E_d < 1$ (Direct relationship between P and TE, i.e., $E_d < 1$).

Example:

Given two demand schedules, determine their elasticity of demand using the total outlay or expenditure method:

P	5	4	3	2	1
Q_X	200	210	230	255	300
Q_Y	200	260	370	600	1300

Solution:

Calculating total expenditure for good X and good Y, we get:

P	Q_X	Total Expenditure on X =(P.Q_X)	Q_Y	Total Expenditure on Y =(P.Q_Y)
5	200	5×200= 1000	200	5×200= 1000
4	210	4×210= 840	260	4×260= 1040
3	230	3×230= 690	370	3×370= 1110
2	255	2×255= 510	600	2×600= 1200
1	300	1×300= 300	1300	1×1300= 1300

Therefore, good X has inelastic demand ($E_d < 1$) as expenditure falls with the fall in price. Good Y has elastic demand ($E_d > 1$) as expenditure rises with fall in price.

2. **<u>Percentage Method:</u>**

- According to the percentage method, Ed is calculated by this formula:

$$E_d = (-)\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

$$= (-)\frac{\Delta Q/Q}{\Delta P/P} = (-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$$

- The absolute value of the coefficient of elasticity of demand ranges from zero to infinity ($0 \leq E_d \leq \infty$).

Point Elasticity Vs Arc Elasticity:

- The percentage formula applies only in case of point elasticity.
- Point elasticity relates to price elasticity at a single point on a demand curve.
- If there are finite change in price and quantity demanded, such that it relates to a stretch over the demand curve, then the percentage formula is modified and it is called arc elasticity.
- Arc elasticity of demand is the price elasticity of demand between two points on a demand curve.
- The value of elasticity depends upon the direction in which elasticity is measured.
- The formula for arc elasticity is:

$$E_d = (-)\frac{\Delta Q}{\Delta P}.\frac{(P1+P2)/2}{(Q1+Q2)/2}$$

$$= (-)\frac{\Delta Q}{\Delta P}.\frac{(P1+P2)}{(Q1+Q2)}$$

Example:

Calculate price elasticity of demand from A to B, from B to A and at midway between points A and B from the following table:

Point	**Px (in SR)**	**Qx (in Kg.)**
A	6	10
B	4	15

Solution:

E_d from A to B $=(-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$

$$=\frac{5}{2}.\frac{6}{10}=\frac{3}{2}= 1.5$$

E_d from B to A $=(-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$

$$=\frac{5}{2}.\frac{4}{15}=\frac{2}{3}= 0.67$$

E_d between A and B $=(-)\frac{\Delta Q}{\Delta P}.\frac{P1+P2}{Q1+Q2}$

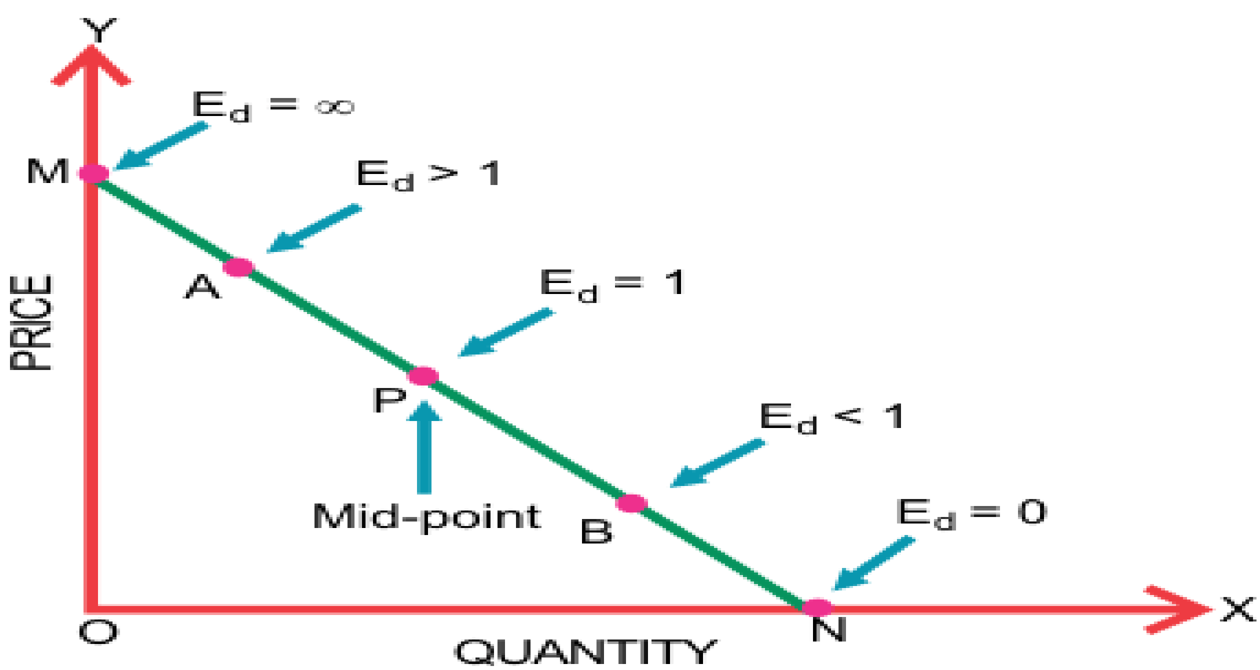
$$=\frac{5}{2}.\frac{6+4}{10+15}=\frac{5}{2}.\frac{10}{25} = 1$$

3. **<u>Geometric Method:</u>**

- This method is used to find the point elasticity of demand.
- The value of elasticity is the ratio between the lower segment to the upper segment of the demand curve and the price axis.
- The value of elasticity on the quantity axis is the ratio between right- hand side segment to the left- hand side segment.
- Thus price elasticity of demand, Ed = RB/AR = OP/AP = QB/OQ

Elasticity on a Linear Demand Curve:

- On a linear downward sloping demand curve the value of elasticity is different at every point on the curve. It can be proved as follows:
- DD1 has constant slope, i.e., $\frac{\Delta P}{\Delta Q}$ ratio is the same. Thus, $\frac{1}{Slope}$ or $\frac{\Delta Q}{\Delta P}$ ratio must also be constant.
- On comparing second part of the elasticity formula, i.e., P/Q at each point, following result is obtained:
  - ✓ At the price axis, point D, Q=0. Thus, P/Q is undefined. In other words, as quantity approaches zero, the ratio P/Q approaches infinity.
  - ✓ But as we move down on the demand curve, price falls and quantity rises thus P/Q ratio falls steadily.
  - ✓ At the quantity axis, point D1, P=0. Thus, P/Q= 0, i.e., elasticity is
  - ✓ zero. It is graphically shown in the following figure:



Applications of Elasticity of Demand:

- ***Case- I:*** Two linear parallel demand curves have same slope but different elasticities at a given price.
- ***Case- II:*** Two linear parallel demand curves have same slope but different elasticities at a given quantity.
  (Remark: *The demand curve nearer to the origin has less elasticity and the one away from the origin has greater elasticity at a given quantity. In terms of slope, both have same slope).*
- ***Case- III:*** Two linear intersecting demand curves have different elasticity at the price corresponding to point of intersection.
- ***Case- IV:*** A straight line from the origin shows equal elasticities at the point of intersection of the two linear parallel demand curves.
  (Remark: *A ray from the origin indicates equal elasticities at the point of intersection of two linear, parallel demand curves. In terms of slope, both the demand curves have same slope).*

Relationship between Price Elasticity and Revenue:

$$MR = AR\left(1 - \frac{1}{e}\right)$$

$$\text{Or, } e = \frac{AR}{AR - MR}$$

Where

MR = Marginal Revenue;
AR = Average Revenue; and
e = Elasticity of Demand

Importance of Price Elasticity of Demand:

- Pricing Decisions of Business Firms or of Government Agencies;
- Financial Policy of the Government
- International Trade;
- Paradox of Plenty; etc.

Income Elasticity of Demand:

- It is a quantitative measure of the degree to which quantity demanded responds to a change in income, *ceteris paribus*.
- The income elasticity of demand (e_y) is calculated as the percentage change in quantity demanded due to percentage change in income. That is,

$$e_y = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ income} = \frac{\Delta Q}{\Delta Y} . \frac{Y}{Q}$$

Where

e_y = Coefficient of Income Elasticity of Demand
Y = Initial Income;
Q = Initial Quantity Demanded;
ΔQ = Change in Quantity demanded; and
ΔY = Change in Income;

Types of Income Elasticity of Demand:

- Income elasticity can be positive or negative.
- Income elasticity can take five different values:
  1. *Greater than one ($e_y > 1$):*
     - ✓ This occurs when the percentage change in quantity demanded is greater than the percentage change in income.
     - ✓ It is also called high income elasticity.
     - ✓ It takes place in case of luxury goods.
  2. *Equal to one ($e_y = 1$):*
     - ✓ This occurs when percentage change in quantity demanded is equal to the percentage change in income.
     - ✓ It is called unitary income elasticity.
     - ✓ It holds for those normal goods which fall between the category of necessities and luxuries.
  3. *Less than one ($e_y < 1$):*
     - ✓ This occurs when the percentage change in quantity demanded is less than the percentage change in income.
     - ✓ It is called low income elasticity.
     - ✓ It takes place in case of necessities.
  4. *Equal to zero ($e_y = 0$):*
     - ✓ This occurs when there is no change in quantity demanded with change in income.
     - ✓ It is called zero income elasticity.
     - ✓ It is difficult to specify the good but the good varies between a necessity and an inferior good.
  5. *Less than zero ($e_y < 0$):*
     - ✓ This occurs when the percentage change in quantity demanded is negative with change in income.
     - ✓ It is called negative income elasticity.
     - ✓ It holds in case of inferior or Giffen goods.

Importance of Income Elasticity of Demand:

- Demand forecasting;
- Classification of goods.

Cross- price Elasticity of Demand:

- The cross-price elasticity of demand (e_{xy}) is a quantitative measure of the effect on the quantity demanded of a good (x) due to change in the price of other good (y).
- This is calculated as:

$$e_{xy} = \frac{\%\ change\ in\ quantity\ demanded\ of\ x}{\%\ change\ in\ price\ of\ y} = \frac{\Delta Qx}{\Delta Py} \cdot \frac{Py}{Qx}$$

Where

e_{xy} = Coefficient of Cross-price Elasticity of Demand;
P_Y = Initial Price of good Y;
Q_X = Initial Quantity Demanded of good X;
ΔQx = Change in Quantity demanded of good X; and
ΔP_Y = Change in price of good Y.

Types of Cross-price Elasticity:

- The value of cross- price elasticity ranges from minus infinity to plus infinity ($-\infty \leq e_{xy} \leq +\infty$).
- It can take five different values:
  1. Equal to plus infinity ($e_{xy} = +\infty$)
     - ✓ If $e_{xy} = +\infty$, then x and z are perfect substitutes. Example: pair of socks.
  2. Greater than zero ($e_{xy} > 0$)
     - ✓ This occurs when the two goods x and y are substitutes.
     - ✓ The higher the numerical value of e_{xy}, the greater the degree of substitutability.
     - ✓ The positive sign on the e_{xy} explains the positive relationship between the price of a good and the quantity demanded of its substitute.
  3. Equal to zero ($e_{xy} = 0$)
     - ✓ This occurs when the two goods are unrelated. That means, a change in the price of one good does not affect the quantity demanded of the other good.
  4. Less than zero ($e_{xy} < 0$)
     - ✓ This occurs when the two goods are complements.

- ✓ The lower the numerical value of e_{xy}, the greater the degree of complementarity.

5. Equal to plus infinity ($e_{xy} = -\infty$)
   - ✓ If $e_{xy} = -\infty$, then x and z are perfect complements. Example: pair of shoes.

QUESTIONS FOR REVIEW

Objective type questions:

1. The concept of elasticity of demand was developed by-
   a. Alfred Marshall,
   b. Adam Smith,
   c. L. Robbins,
   d. None of these.

2. The responsiveness (or percentage change) of quantity demanded of a commodity to one percentage change in its price is known as-
   a. Elasticity of demand,
   b. Elasticity of supply,
   c. Law of demand,
   d. Law of supply.

3. The formula for calculation of price elasticity of demand, e_d is-
   a. $E_d = (-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$
   b. $E_d = (+)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$
   c. $E_d = (-)\frac{\Delta P}{\Delta Q}.\frac{Q}{P}$
   d. $E_d = (+)\frac{\Delta P}{\Delta Q}.\frac{Q}{P}$
4. The coefficient of elasticity of demand ranges from-
   a. Zero to one,
   b. Zero to infinity,
   c. One to infinity,
   d. None
5. If the price of a good falls, the total outlay or expenditure of consumers on the good rises when
   a. $E_d = 1$,
   b. $E_d > 1$,
   c. $E_d < 1$,
   d. $E_d = 0$.
6. The price elasticity of demand between two points on a demand curve is known as –
   a. Point elasticity of demand,
   b. Arc elasticity of demand,
   c. Cross price elasticity
   d. Income elasticity of demand.
7. The formula for arc elasticity is:
   a. $(-)\frac{\Delta Q}{\Delta P}.\frac{(P1+P2)}{(Q1+Q2)}$
   b. $(-)\frac{\Delta Q}{\Delta P}.\frac{(Q1+Q2)}{(P1+P2)}$
   c. $(-)\frac{\Delta Q}{\Delta P}.\frac{(P1-P2)}{(Q1-Q2)}$
   d. None of these.
8. Geometric method is used to find out the –
   a. Point elasticity of demand,
   b. Arc elasticity of demand,
   c. Cross price elasticity,
   d. Income elasticity of demand.
9. The relationship between price elasticity and revenue is –

a. $e = \frac{AR}{AR-MR}$ b. $e = \frac{AR}{AR+MR}$

c. $e = \frac{AR-MR}{AR}$ d. $e = \frac{MR}{AR-MR}$

10. The percentage change in quantity demanded due to percentage change in income is known as –
    a. Point elasticity of demand, b. Income elasticity of demand,
    c. Cross price elasticity, d. Arc elasticity of demand.
11. A quantitative measure of the effect on the quantity demanded of a good (x) due to change in the price of other good (y) is known as-
    a. Point elasticity of demand, b. Income elasticity of demand,
    c. Cross price elasticity, d. Arc elasticity of demand.

12. Which one is **not** correctly matched:

Term used	**Coefficient of elasticity of demand**
a. Perfectly inelastic demand:	I. $E_d = 0$
b. Perfectly elastic demand:	II. $E_d > 1$
c. Elastic demand:	III. $E_d > 1$
d. Inelastic demand:	IV. $E_d < 1$

Ques.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	a	a	a	b	b	b	a	a	a	b	c	b

Questions with Answer:

Ques: What is price elasticity of demand?

Ans: Price elasticity of demand can be defined as percentage change in quantity demanded divided by percentage change in price.

Ques: What is the formula to calculate price elasticity of demand?

Ans: Price elasticity of demand, E_d or e_d or e is calculated as:

$$E_d = (-)\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

$$= (-)\frac{\Delta Q/Q}{\Delta P/P}$$

$$= (-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$$

Ques: What is income elasticity of demand?

Ans: It is a quantitative measure of the degree to which quantity demanded responds to a change in income, *ceteris paribus*. The income elasticity of demand (e_y) is calculated as the percentage change in quantity demanded due to percentage change in income.

Ques: What is the formula to calculate income elasticity of demand?

Ans: The income elasticity of demand (e_y) is calculated as the percentage change in quantity demanded due to percentage change in income. That is,

$$e_y = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ income} = \frac{\Delta Q}{\Delta Y}.\frac{Y}{Q}$$

Where

e_y = Coefficient of Income Elasticity of Demand
Y = Initial Income;
Q = Initial Quantity Demanded;
ΔQ = Change in Quantity demanded; and
ΔY = Change in Income;

Ques: What is cross price elasticity of demand?

Ans: The cross-price elasticity of demand (e_{xy}) is a quantitative measure of the effect on the quantity demanded of a good (x) due to change in the price of other good (y).

Ques: What is the formula to calculate cross price elasticity of demand?

Ans: This is calculated as:

$$e_{xy} = \frac{\%\ change\ in\ quantity\ demanded\ of\ x}{\%\ change\ in\ price\ of\ y} = \frac{\Delta Qx}{\Delta Py}.\frac{Py}{Qx}$$

Where

e_{xy} = Coefficient of Cross-price Elasticity of Demand;
P_Y = Initial Price of good Y;
Q_X = Initial Quantity Demanded of good X;
ΔQx = Change in Quantity demanded of good X; and
ΔP_Y = Change in price of good Y.

Ques: What do you understand by perfectly elastic demand?

Ans: This is a situation where percentage change in quantity demanded is infinity. For any higher price the demand falls to zero and any lower price the demand rises without limit. In this case, demand curve will be horizontal straight line.

Ques: What is perfectly inelastic demand?

Ans: In this case if price rises or falls, people consume same quantity of the good. In this case, demand curve will be vertical.

Example: essentials like life- saving drugs.

Ques: What is elastic demand?

Ans: This occurs when percentage change in quantity demanded is greater than the percentage change in price. In this case, demand curve will be flatter.

Example: luxury goods.

Ques: What is the relationship between price elasticity of demand, price and revenue?

Ans: $$MR = AR\ (1- \frac{1}{e})$$

$$\text{Or, } e = \frac{AR}{AR-MR}$$

Where

MR = Marginal Revenue;
AR = Average Revenue; and
e = Elasticity of Demand

Chapter- 5

Elasticity of Supply

Outline of this Chapter:

- Elasticity of Supply
  - ✓ Meaning/ Definition of Elasticity of Supply; and
  - ✓ Determinants of Elasticity of Supply.
- Different Types of Elasticity of Supply
- Measurement of Elasticity of Supply
  - ✓ Percentage Method (Point Vs Arc Elasticity); and
  - ✓ Diagrammatic Method.
- Questions for Review.

Meaning of Elasticity of Supply:

- Alfred Marshall developed the concept of elasticity of supply.
- Elasticity of supply is defined as the responsiveness (or percentage change) of quantity supplied of a commodity to one percentage change in its price.
- It is calculated as:

$$E_s \text{ or } e_s = \frac{Percentage\ change\ in\ quantity\ supplied}{Percentage\ change\ in\ price} = (+)\,\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$$

Where

E_s or e_s = Coefficient of price elasticity of supply;

P = Initial price of the good;

Q = Initial quantity supplied;

Δq = Change in quantity supplied; and

Δp = Change in price

- The positive sign indicates that price and quantity supplied of a good are positively or directly related (follows law of supply), that means, greater units of the good will be placed in the market only at higher prices and vice versa.

Determinants of Elasticity of Supply:

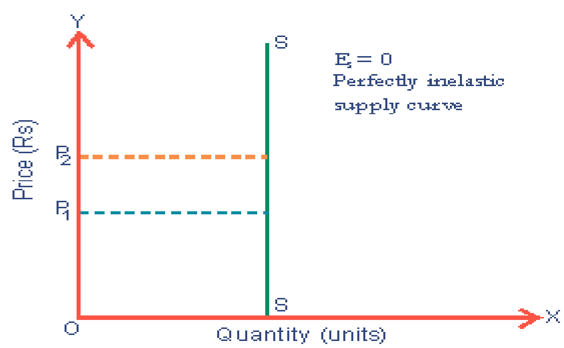
- **Time factor:** the longer the time period, the more elastic is the supply curve.
- **Nature of the good:** inelastic supply in case of perishable goods.
- **Production capacity:** if unlimited production capacity exists, then there is elastic supply.
- **Production methods and techniques:** if complicated, then supply of good produced will be relatively inelastic.
- **Stage of laws of return:** if the law of diminishing return is applied on the production of a good, elasticity of supply of good will be inelastic.

- **Future price expectation:** if the producers expect that the price will rise in future then they will supply less quantity in the market presently. Thus, supply will become inelastic.
- **Number of products being produced by an industry:** if an industry is producing many products, supply is elastic as the producers can switch over to the production of other goods and vice versa.

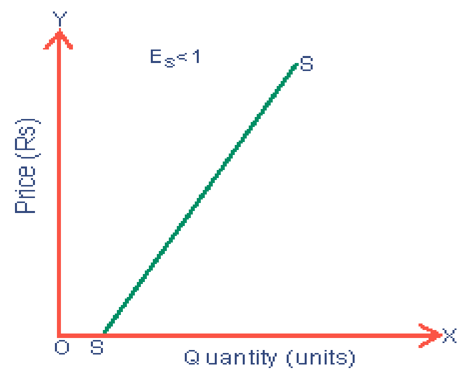
Different types of Elasticity of Supply:

- There are five degrees or types of elasticity of supply:
  - ✓ Perfectly inelastic supply ($e_s = 0$);
  - ✓ Inelastic supply ($0 < e_s < 1$);
  - ✓ Unitary elastic supply (es = 1);
  - ✓ Elastic supply ($1 < e_s < \infty$); and
  - ✓ Perfectly elastic supply ($e_s = \infty$).

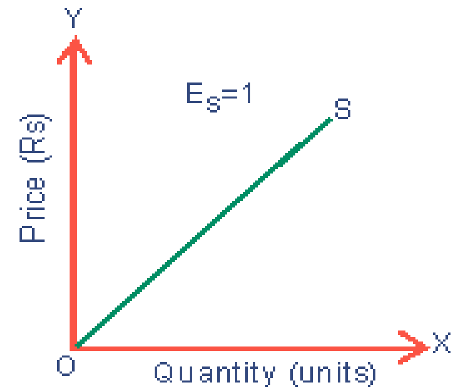
Perfectly inelastic supply ($e_s = 0$): When supply of a commodity does not change irrespective of any change in its price, it is called perfectly inelastic supply. In this case $e_s = 0$ and supply curve will be a vertical line, parallel to y- axis.



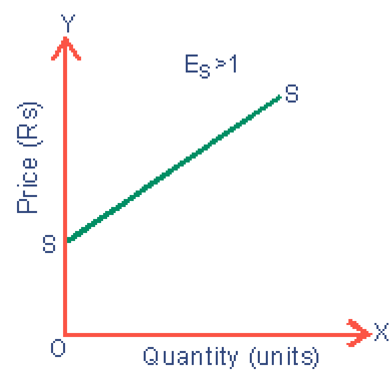
Inelastic or less than unit elastic supply ($0 < e_s < 1$): When percentage change in quantity supplied is less than percentage change in price, it is called inelastic or less than unit elastic supply. In this case coefficient of elasticity of supply will be greater than zero but less than one ($0 < e_s < 1$). The inelastic supply curve is upward sloping originating from the x- axis.



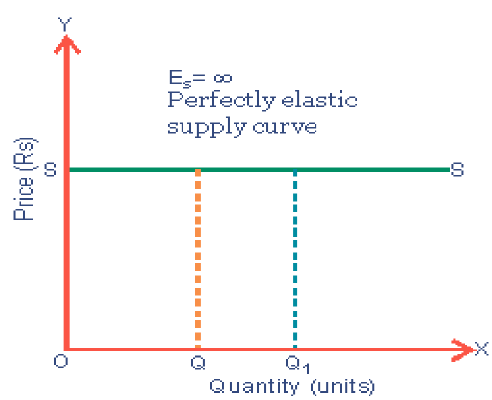
Unit elastic supply (e_s = 1): When percentage change in quantity supplied is equal to percentage change in price, it is called unit elastic supply. In this case e_s= 0. The unit elastic supply curve is upward sloping originating from the origin.



Elastic or more than unit elastic supply (1 < e_s < ∞): When percentage change in quantity supplied is greater than percentage change in price, it is called elastic or more than unit elastic supply. In this case coefficient of elasticity of supply will be greater than one but less than infinity (1 < e_s < ∞). The elastic supply curve is upward sloping originating from the y- axis.



Perfectly elastic supply (e_s = ∞): Supply of commodity is said to be perfectly elastic when its supply expands (rise) or contracts (falls) to any extent without any change in the price. The coefficient of e_s = ∞. The perfectly elastic supply curve is a horizontal line, parallel to x- axis.



Measurement of Elasticity of Supply:

There are two methods of measuring price elasticity of supply:

I. Proportionate or Percentage Method
II. Geometric Method

I. **Proportionate or Percentage Method**: According to this method, price elasticity of supply is measured as under:

Elasticity of supply can be measured by this formula:

$$E_s \text{ or } e_s = \frac{\textit{Percentage change in quantity supplied}}{\textit{Percentage change in price}} = (+)\, \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Where

E_s or e_s = Coefficient of price elasticity of supply;
P = Initial price of the good;
Q = Initial quantity supplied;
Δq = Change in quantity supplied; and
Δp = Change in price

The coefficient/ value of elasticity of supply ranges from zero to infinity.

- ✓ If the value of $e_s > 1$ => Supply is elastic.
- ✓ If the value of $e_s = 1$ => Supply is unitary elastic.
- ✓ If the value of $e_s < 1$ => Supply is inelastic.
- ✓ If the value of $e_s = 0$ => Supply is perfectly inelastic.
- ✓ If the value of $e_s = \infty$ => Supply is perfectly elastic.

Example: When price of a commodity increases from Rs 6 to Rs 8, its quantity supplied increases from 20 units to 25 units. The price elasticity of supply is:

Solution: Since $\Delta P = 8 - 6 = 2$; $\Delta Q = 25 - 20 = 5$;

$$\text{Hence, } e_s = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = \frac{5}{2} \times \frac{6}{20} = 0.75$$

Point Vs Arc Elasticity of Supply:

- Point elasticity of supply relates to a situation where the two price and quantity situations are very close to each other.
- The formula for calculating e_s remains the same as $e_s = (+)\, \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$
- Arc elasticity of supply relates to a situation where the two prices and quantity situations are far from each other, such that they relate to an arc over the supply curve.
- In this case formula for calculating e_s is modified as follows:

$$e_s = \frac{q1-q2}{q1+q2} \cdot \frac{p1+p2}{p1-p2}$$

Question: Find arc elasticity of supply if price of rice rises from SR 5 to SR 10 per kg and supply increases from 10 kg to 15 kg in a month.

Solution: Arc elasticity of supply, $e_s = \frac{\Delta Q}{\Delta P}.\frac{P1+P2}{Q1+Q2} = = \frac{5}{5}.\frac{15}{25} = \frac{3}{5}$ = 0.6 Ans.

Question: **Find arc elasticity of supply if price of rice rises from SR 10 to SR 15 per kg and supply increases from 100 kg to 150 kg in a month.**

Solution: Arc elasticity of supply, $e_s = \frac{\Delta Q}{\Delta P}.\frac{P1+P2}{Q1+Q2} = \frac{50}{5}.\frac{10+15}{100+150}$ = 1 Ans.

II. Geometric or diagrammatic method to calculate elasticity of supply:

Answer: The diagrammatic method to calculate elasticity of supply is-

$$E_s \text{ (at point C)} = e_s = \frac{\textit{Distance betweenthe point where supply curve meets the } x\textit{−axis and the output corresponding to point } C.}{\textit{Distance between origin and the output corresponding to point } C.}$$

- Any straight line supply curve passing through the origin has value of elasticity equal to one.
- If straight line supply curve goes through the quantity axis (x- axis), it is inelastic.
- If a straight line supply curve goes through the price axis (y- axis), it is elastic.
- ***Thus,*** *if the tangent to the supply curve passes through the point of origin, e_s at that point is equal to unity; if the tangent intercepts the x-axis, e_s at that point is less than unity; and if tangent intercepts the y-axis, e_s at that point is greater than unity.*

Questions for Review

Objective type questions:

1. The concept of elasticity of supply was developed by-
   a. Alfred Marshall,
   b. Adam Smith,
   c. L. Robbins,
   d. None of these.

2. The responsiveness (or percentage change) of quantity supplied of a commodity to one percentage change in its price is known as-
   a. Elasticity of demand,
   b. Elasticity of supply,
   c. Law of demand,
   d. Law of supply.

3. The formula for calculation of elasticity of supply is-
   a. $e_s = (-)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$
   b. $e_s = (+)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$
   c. $e_s = (-)\frac{\Delta P}{\Delta Q}.\frac{Q}{P}$
   d. $e_s = (+)\frac{\Delta P}{\Delta Q}.\frac{Q}{P}$

4. The coefficient of elasticity of supply ranges from-
   a. Zero to one,
   b. Zero to infinity,
   c. One to infinity,
   d. None

5. Any straight line supply curve passing through the origin has value of elasticity -
   a. Equal to one,
   b. Equal to infinity,
   c. Greater than one,
   d. Less than one.

6. The elasticity of supply relates to a situation where the two prices and quantity situations are far from each other is known as-
   a. Point elasticity of supply,
   b. Arc elasticity of supply,
   c. Elasticity of supply,
   d. None.

7. Which of the following is ***not*** correctly matched-
   a. If the value of $e_s = 1$ => Supply is unitary elastic.
   b. If the value of $e_s < 1$ => Supply is inelastic.
   c. If the value of $e_s = \infty$ => Supply is perfectly elastic.
   d. If the value of $e_s > 1$ => Supply is perfectly inelastic.
   e. If the value of $e_s = 0$ => Supply is perfectly inelastic.

8. Match the following-

I. Any straight line supply curve passing through the origin	a. Inelastic supply
II. If straight line supply curve goes through the quantity axis (x- axis)	b. Elastic supply
III. If a straight line supply curve goes through the price axis (y- axis)	c. Unitary elastic supply

Ans: I ↔ c; II ↔ a; III ↔ b

9. Find arc elasticity of supply if price of sugar rises from SR 2 to SR 4 per kg and supply increases from 10 kg to 15 kg in a month.
   a. 0.6
   b. -15
   c. 0.06
   d. 0.17

10. In case of arc elasticity of supply, the formula for calculating e_s is modified as-
   a. $e_s = \frac{q1-q2}{q1+q2} . \frac{p1+p2}{p1-p2}$
   b. $e_s = \frac{q1+q2}{q1-q2} . \frac{p1+p2}{p1-p2}$
   c. $e_s = \frac{q1-q2}{q1+q2} . \frac{p1-p2}{p1+p2}$
   d. $e_s = \frac{q1+q2}{q1-q2} . \frac{p1-p2}{p1+p2}$

Ques:	1	2	3	4	5	6	7	8	9	10
Ans:	a	b	b	b	a	b	d		a	a

Question with answer:

Question: What is elasticity of supply?

Answer: Elasticity of supply is defined as the responsiveness (or percentage change) of quantity supplied of a commodity to one percentage change in its price.It is calculated as:

$$E_s \text{ or } e_s = \frac{Percentagechangeinquantitysupplied}{Percentagechangeinprice} = (+) \frac{\Delta Q}{\Delta P} . \frac{P}{Q}$$

Question: Who developed the concept of elasticity of supply?

Answer: Alfred Marshall developed the concept of elasticity of supply.

Question: What is the formula to calculate elasticity of supply?

Answer: The formula to calculate elasticity of supply is-

$$E_s \text{ or } e_s = \frac{Percentagechangeinquantitysupplied}{Percentagechangeinprice} = (+) \frac{\Delta Q}{\Delta P} . \frac{P}{Q}$$

Question: What are the main determinants of elasticity of supply?

Answer: Time factor, nature of good, production capacity, production methods and techniques, stages of laws of return, future price expectation and number of products being produced by an industry are the main determinants of elasticity of supply.

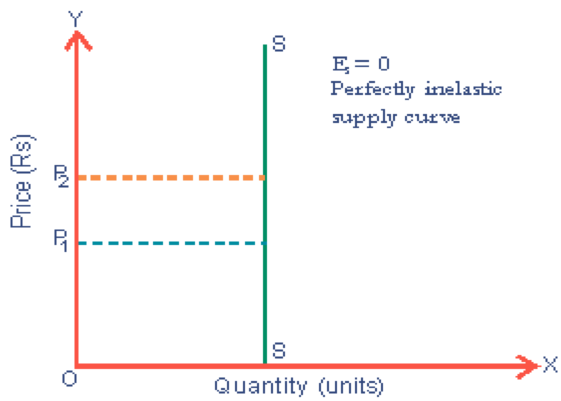
Question: How many types (degree) of elasticity of supply are there?

Answer: There are five degrees or types of elasticity of supply:

1. Perfectly inelastic supply ($e_s = 0$);
2. Inelastic supply ($0 < e_s < 1$);
3. Unitary elastic supply (es = 1);
4. Elastic supply ($1 < e_s < \infty$); and
5. Perfectly elastic supply ($e_s = \infty$).

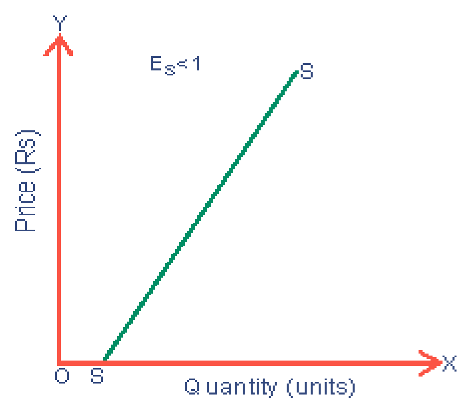
Question: What is perfectly inelastic supply ($e_s = 0$)?

Answer: When supply of a commodity does not change irrespective of any change in its price, it is called perfectly inelastic supply.In this case $e_s = 0$ and supply curve will be a vertical line, parallel to y- axis.



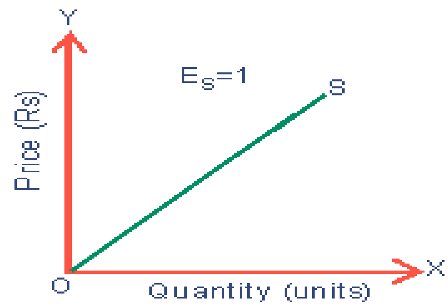
Question: What is inelastic or less than unit elastic supply ($0 < e_s < 1$)?

Answer: When percentage change in quantity supplied is less than percentage change in price, it is called inelastic or less than unit elastic supply.In this case coefficient of elasticity of supply will be greater than zero but less than one ($0 < e_s < 1$).The inelastic supply curve is upward sloping originating from the x- axis.



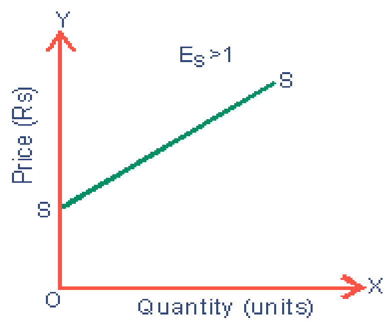
Question: What is unit elastic supply (e_s = 1)?

Answer: When percentage change in quantity supplied is equal to percentage change in price, it is called unit elastic supply. In this case e_s= 0.The unit elastic supply curve is upward sloping originating from the origin.



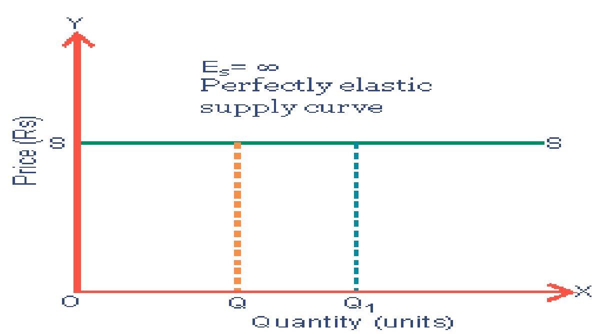
Question: What is elastic or more than unit elastic supply (1 <e_s< ∞)?

Answer: When percentage change in quantity supplied is greater than percentage change in price, it is called elastic or more than unit elastic supply.In this case coefficient of elasticity of supply will be greater than one but less than infinity (1 <e_s< ∞).The elastic supply curve is upward sloping originating from the y- axis.



Question: What is perfectly elastic supply (e_s = ∞)?

Answer: Supply of commodity is said to be perfectly elastic when its supply expands (rise) or contracts (falls) to any extent without any change in the price. The coefficient of e_s = ∞.The perfectly elastic supply curve is a horizontal line, parallel to x- axis.



Question: What is the percentage method to measure elasticity of supply?

Answer: Elasticity of supply can be measured by this formula:

$$E_s \text{ or } e_s = \frac{Percentage change in quantity supplied}{Percentage change in price} = (+)\frac{\Delta Q}{\Delta P}.\frac{P}{Q}$$

Where

E_s or e_s= Coefficient of price elasticity of supply;
P = Initial price of the good;
Q = Initial quantity supplied;
Δq = Change in quantity supplied; and
Δp = Change in price

Question: What are the rages of coefficient of elasticity of supply?

Answer: The coefficient/ value of elasticity of supply ranges from zero to infinity.

- ✓ If the value of $e_s > 1$ => Supply is elastic.
- ✓ If the value of $e_s = 1$ => Supply is unitary elastic.
- ✓ If the value of $e_s < 1$ => Supply is inelastic.

Question: What are the main differences between point elasticity and the arc elasticity of supply?

Answer:

Point elasticity of supply	Arc elasticity of supply
1. Point elasticity of supply relates to a situation where the two price and quantity situations are very close to each other.	1. Arc elasticity of supply relates to a situation where the two prices and quantity situations are far from each other.
2. The formula for calculating point e_s is, $e_s = (+)\ \frac{\Delta Q}{\Delta P}.\frac{P}{Q}$	2. In this case formula for calculating arc e_s is modified as follows: e_s=. (+) $\frac{\Delta Q}{\Delta P}.\frac{P1+P2}{Q1+Q2}$

Question: Find arc elasticity of supply if price of rice rises from SR 5 to SR 10 per kg and supply increases from 10 kg to 15 kg in a month.

Solution: Arc elasticity of supply, $e_s = \frac{\Delta Q}{\Delta P}.\frac{P1+P2}{Q1+Q2} = = \frac{5}{5}.\frac{15}{25} = \frac{3}{5}$ = 0.6 Ans.

Question: **Find arc elasticity of supply if price of rice rises from SR 10 to SR 15 per kg and supply increases from 100 kg to 150 kg in a month.**

Solution: Arc elasticity of supply,$e_s = \frac{\Delta Q}{\Delta P} . \frac{P1+P2}{Q1+Q2} = \frac{50}{5} . \frac{10+15}{100+150}$ = 1 Ans.

Question: What is the diagrammatic method to calculate elasticity of supply?

Answer: The diagrammatic method to calculate elasticity of supply is-

E_s (at point C) = $e_s = \frac{\begin{array}{c} Distance between the point where supply curve meets \\ the x-axis and the output corresponding to point C. \end{array}}{\begin{array}{c} Distance between origin and the output corresponding \\ to point C. \end{array}}$

Chapter- 6

Theory of Consumer: Consumer Behaviour

Introduction:

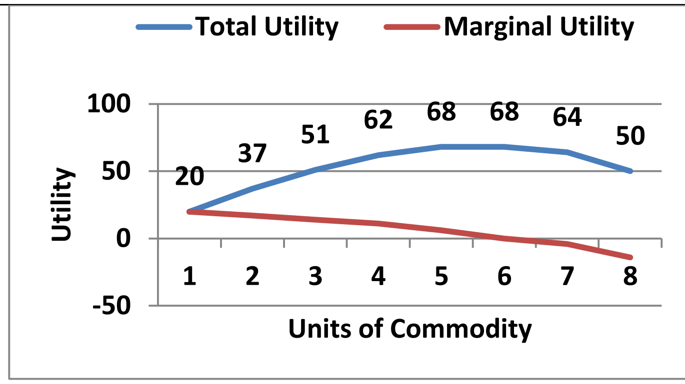
- *Demand* is determined by *many factors* (own price, consumers' income, prices of other commodities, consumers' tastes, income distribution, total population, consumers' wealth, credit availability, government policy, past level of demand, and past level of income, etc) simultaneously.
- The traditional theory of demand examines only the *final consumers' demand for durables and non- durables*. It does not deal with the demand for investment goods, nor with the demand for intermediate products.
- *Total demand* includes *final demand* and *intermediate demand*.
- *Final demand* is subdivided into *consumers' demand* and *demand for investment goods.*
- Traditional theory of demand deals only with *consumers' demand*, which is only a fraction of the total demand in the economy as a whole.

Meaning of Utility and Marginal Utility:

- **Utility:** Utility means want satisfying power of a commodity.
- **Types of utility**: Total utility and marginal utility
- **Total utility:** The sum of total satisfaction which a consumer receives by consuming various units of the same commodity.
- **Marginal Utility:** It refers as utility of every additional unit of the consumed or it can be can be defined as a change in total utility resulting from a one unit change in the consumption of a commodity at particular point of time.
- Total utility is the sum of marginal utility.
- $MU_n = TU_n – TU_{n-1}$

Example of Total Utility and Marginal Utility

Units of a Commodity	Total Utility	Marginal Utility
1	20	20
2	37	17
3	51	14
4	62	11
5	68	6
6	68	0
7	64	-4
8	50	-14



Relationship between Total Utility and Marginal Utility:

Total Utility	Marginal Utility
As we consume more goods total utility increases but diminishing rate.	As we consume more goods marginal utility diminishes.
When total utility reaches at maximum	Marginal utility becomes zero.
When total utility declines	Marginal utility becomes negative.

Theory of Consumer Behaviour:

- Consumer is assumed to be rational. Given his income and the market prices of the various commodities, he plans the spending of his income so as to attain the highest possible satisfaction or utility. This is the *axiom of utility maximization*.
- In the traditional theory it is assumed that the consumer has full knowledge of all the available commodities.
- There are two basic approaches to the problem of comparison of utilities: the *cardinalist approach* and the *ordinalist approach*.

Cardinalist Approach:

- The ***cardinalist school*** postulated that utility can be measured.
- *The concept of subjective, measurable utility is attributed to Gossen (1854), Jevons (1871) and Walras (1874). Marshall (1890) also assumed independent and additive utilities, but his position on utility is not clear in several aspects.*

- Some economists have suggested that utility can be measured in monetary units, by the amount of money the consumer is willing to sacrifice for another unit of a commodity.
- Others suggested the measurement of utility in subjective units, called *utils* (Walras has introduced).
- The main cardinal theories are law of diminishing marginal utility (Gossen's first law); and the law of equi- marginal utility (Gossen's second law).

Ordinal Approach:

- The ***ordinalist school*** postulated that utility is not measurable, but is an ordinal magnitude. The consumer can give *rank* the various baskets of goods according to the satisfaction that each bundle gives him. He must be able to determine his *order of preference* among the different bundles of goods.
- The main economists of ordinal approach are Pareto, W. E. Johnson, E. E. Slutsky, J. R. Hicks and R.G.D. Allen.
- The main ordinal theories are the *indifference curves approach* and the *revealed preference hypothesis*.

The Cardinal Utility Approach

Assumptions:

- Rationality;
- Cardinal utility;
- Constant marginal utility of money; and
- Diminishing marginal utility.

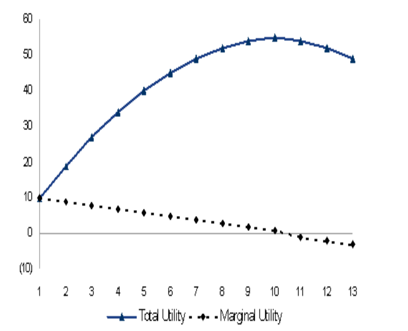
Laws of Cardinal Marginal Utility Analysis:

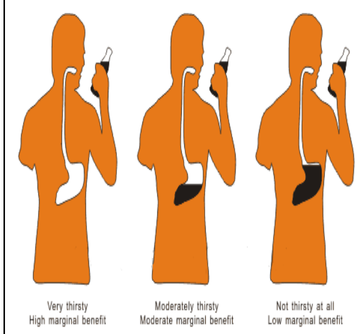
1. **Law of Diminishing Marginal Utility (Gossen's First Law); and**
2. **Principle of Equi- Marginal Utility (Gossen's Second Law).**

Law of Diminishing Marginal Utility:

The Law of diminishing marginal utility states that as the consumer consumes more of a commodity, the utility of every additional unit (MU) consumed diminishes.

Rides	Total Utility (util)	Marginal Utility (util)
0	0	
1	11	11
2	20	9
3	27	7
4	32	5
5	35	3
6	36	1
7	35	-1
8	32	-3





Assumptions:

- Commodities are homogeneous;
- There is no gap between consumption of different units;
- Every consumer wants to maximize utility;
- The taste and preferences of the consumer are remains the same during the period of the consumption;
- Marginal utility of money remains the same.

Principle of Equi- Marginal Utility (Consumer Equilibrium):

The principle of equi- marginal utility states that the consumer will distribute his money income in such a way that the utility derived from the last *Saudi Riyal* spent on each good is equal. *In other words* the consumer is in equilibrium position when marginal utility of money spent on each good is same.

Equilibrium of the Consumer:

- ***In case of Single Commodity:*** Under the condition of *single commodity (x)* the consumer is in equilibrium when the marginal utility of good x is equal to price of x. That is,

$$MU_x = P_x$$

If $MU_x > P_x$; the consumer can increase his welfare or satisfaction by purchasing more units of x.

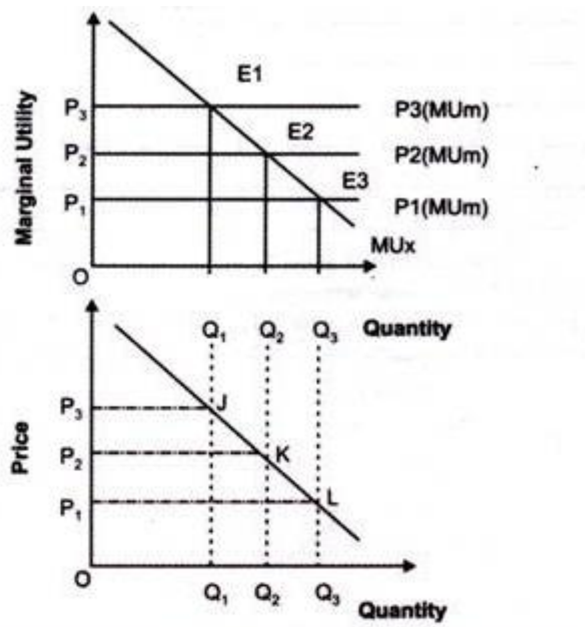
If $MU_x < P_x$; the consumer can increase his total satisfaction by cutting down the quantity of x.

- ***In case of More Commodity:*** If there are *more commodities*, the condition for equilibrium of the consumer is the equality of the ratios of the marginal utilities of the individual commodities to their prices. That is,

$$\frac{MUx}{Px} = \frac{MUy}{Py} = \ldots\ldots. = \frac{MUn}{Pn} = \lambda$$

Where λ denotes the marginal utility of the last riyal spent on each good.

Derivation of the Demand Curve:



Deriving Demand Curve through Consumer Equilibrium

Example: Let the price of goods x and y be SR 2 and SR 3 respectively and he has SR 24 to spend on the two goods. He gets marginal utilities from the two goods x and y which have been given in the following table. How much quantity of two goods the consumer has to purchase in given income so that he can get maximum satisfaction?

Units	MUX	MUY
1	20	24
2	18	21
3	16	18
4	14	15
5	12	9
6	10	3

Solution: Since P_x = SR 2; P_y = SR 3 and his Income = SR 24.

The condition for consumer's equilibrium is-

$\frac{MUx}{Px} = \frac{MUy}{Py}$ for two goods x and y. So we calculate $\frac{MUx}{Px}$ and $\frac{MUy}{Py}$ in the following table-

Units	$\frac{MUx}{Px}$	$\frac{MUy}{Py}$
1	20/2 = 10	24/3 = 8
2	18/2 = 9	21/3 = 7
3	16/2 = 8	18/3 = 6
4	14/2 = 7	15/3 = 5
5	12/2 = 6	9/3 = 3
6	10/2 = 5	3/3 = 1

By looking at the above table, it will become clear that the equilibrium condition in case of two goods ($\frac{MUx}{Px} = \frac{MUy}{Py}$) satisfied at different units. Since consumer has to spend SR 24 on the two goods. He will be in equilibrium when he will buy 6 units of X and 4 units of Y so that his total income spent (6*2+ 4*3= 24) on the two goods will exhaust and gets maximum satisfaction.

Criticism:

1. The satisfaction derived from various commodities cannot be measured objectively;
2. Constant marginal utility of money is also not constant. As income increases the marginal utility of money changes. Thus money cannot be used as measuring- rod since its own utility changes;
3. The axiom of diminishing marginal utility has been established from introspection, it is a psychological law which must be taken for granted.

Network Externalities:

- Network externalities are a special kind of externalities in which one individual's utility for a good depends on the number of other people who consume the commodity.

Bandwagon Effect:

- It refers to desire or demand for a good by a person who wants to be in style because possession of a good is in fashion and therefore many others have it. This bandwagon effect is the important objective of marketing and advertising strategies of several manufacturing companies.

- It is an example of positive network externality in which the quantity demanded of a good that an individual buys increases in response to the increase in the quantity purchased by other individuals. Bandwagon effect makes the demand curve elastic.

Snob Effect:

- It refers to the desire to possess a unique commodity having a prestige value. It works quite contrary to the bandwagon effect. It is an example of negative network externality. Snob effect makes the demand curve less elastic (inelastic).

Ordinal Utility Approach: Indifference Curve Analysis- I

- The cardinal approach has been severely criticised for its assumptions. On this background F. Y. Edgeworth (1881), Vilfredo Pareto (1906), E. E. Slutsky (1915) derived consumer's equilibrium with the help of indifference curves.
- Ultimately J. R. Hicks and R.G.D. Allen presented a scientific treatment to the consumer theory on the basis of ordinal utility, graphically represented by indifference curves.

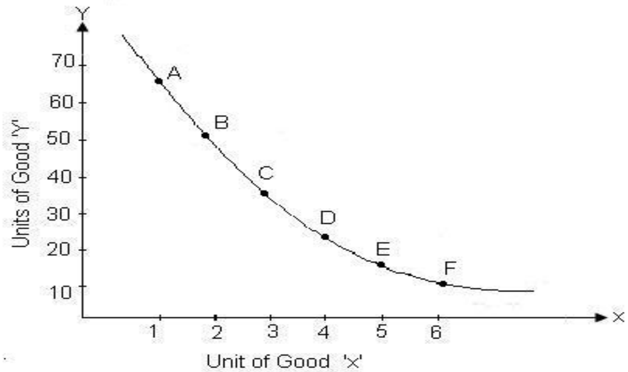
Indifference Curve:

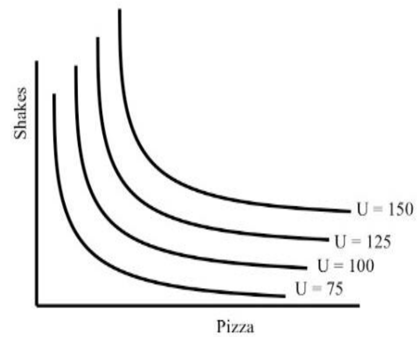
- It shows various combinations of the two goods which give equal satisfaction or utility to the consumer.
- An indifference curve is the locus of points which yield the same utility (level of satisfaction) to the consumer, so that he is indifferent as to the particular combination he consumes.
- Combinations of goods situated on an indifference curve yield the same utility.
- Combinations of goods lying on a higher indifference curve yield higher level of satisfaction and are preferred.

Indifference map:

- An indifference map shows all the indifference curves which rank the preferences of the consumer.

Indifference Curve **Indifference Map**



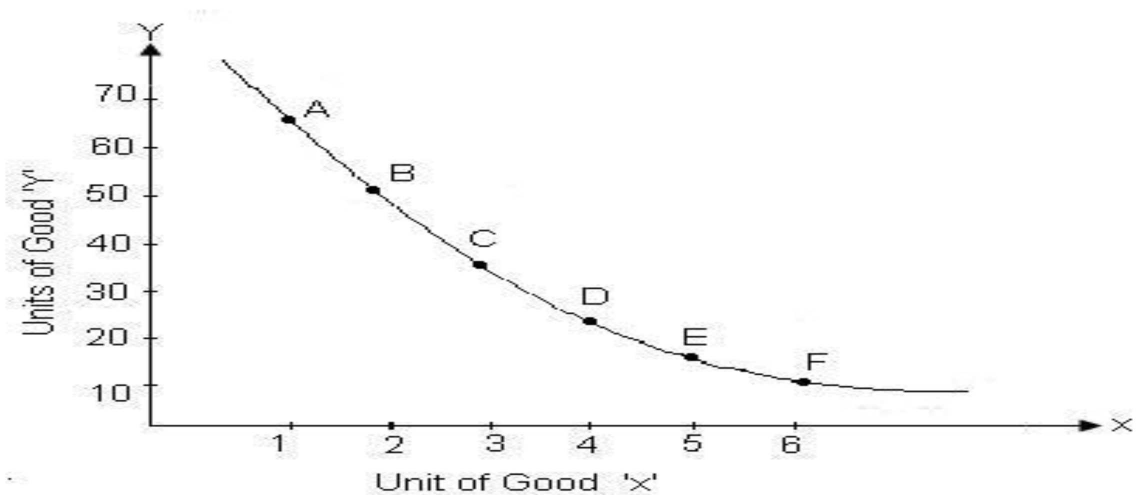


The indifference curve theory is based on these assumptions:

1. Rationality;
2. Ordinality;
3. Diminishing Marginal Rate of Substitution;
4. Consistency and transitivity of choice;

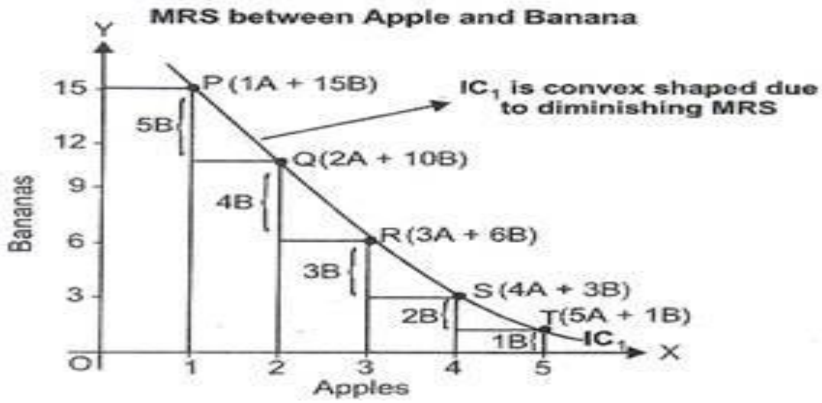
Properties/ features of the indifference curves:

1. *Downward sloping to the right* (an indifference curve has a negative slope, which denotes that if the quantity of one commodity (y) decreases, the quantity of the other (x) must increase, if the consumer is to stay on the same level of satisfaction).

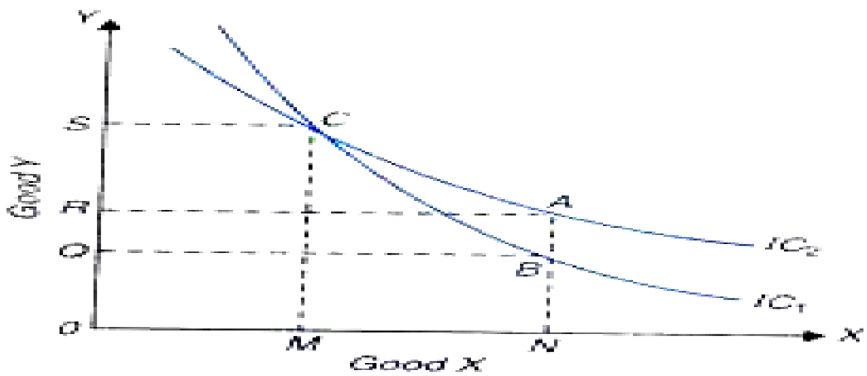


2. *Indifference curves are convex to the origin.* It means the slope of an indifference curve (marginal rate of substitution of X for Y or MRS_{XY}) decreases. This implies that the commodities can substitute one another, but are not perfect substitutes. If the

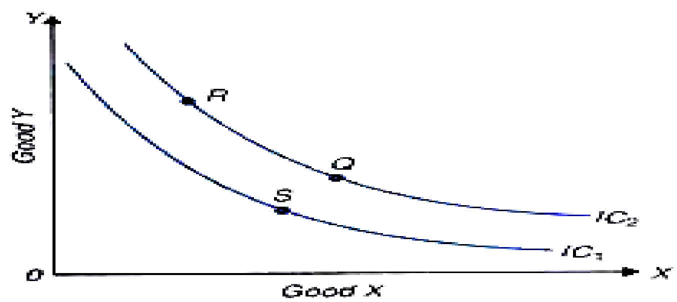
commodities are perfect substitute the indifference curve becomes a straight line with negative slope. If the commodities are complements the indifference curve takes the shape of a right angle.



3. Indifference curves *cannot intersect/cut* each other.



4. *A higher* indifference curve represents a *higher level of satisfaction*.

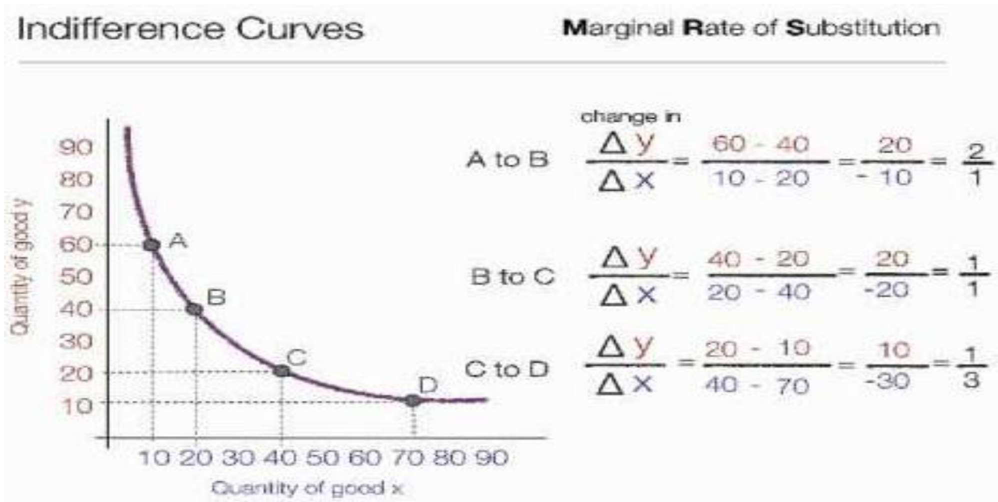


Marginal Rate of Substitution (MRS):

- The negative slope of an indifference curve at any point is called the marginal rate of substitution of the two commodities, x and y, and is given by the slope of the tangent at that point:

$$\text{Slope of indifference curve} = (-)\frac{dy}{dx} = \text{MRS}_{x,y} = \frac{MUx}{MUy}$$

- The marginal rate of substitution of x for y is defined as the number of units of commodity y that must be given up in exchange for an extra unit of commodity x so that the consumer maintains the same level of satisfaction.



Budget Line (price- income line, outlay line, expenditure line, etc):

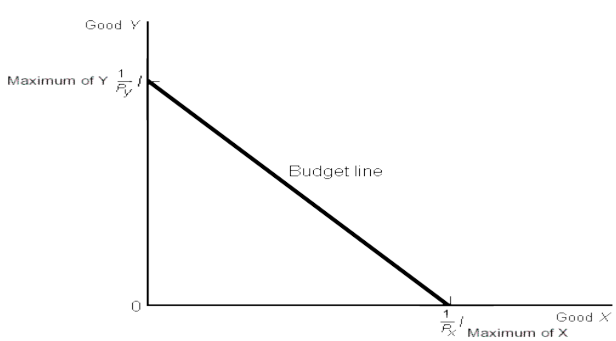
- The budget line shows all those combinations of two goods which consumer can buy by spending his money income on two goods at their given prices.

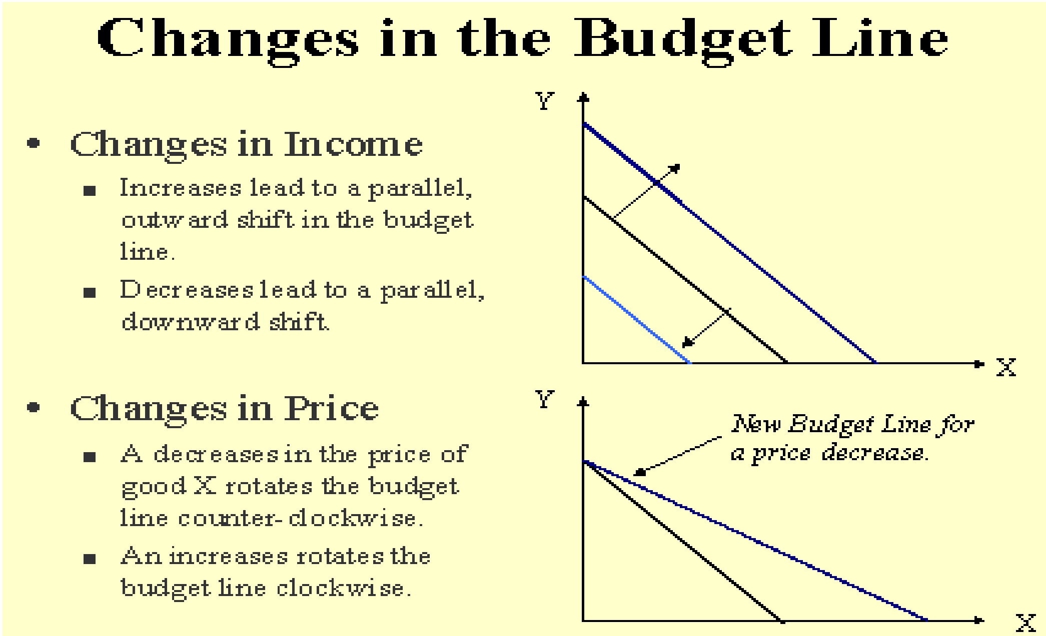
Budget line equation:

- Income = Price of X commodity × Quantity of commodity X + Price of Y commodity × Quantity of commodity Y

$$\text{Or, } Y = P_xX + P_yY$$

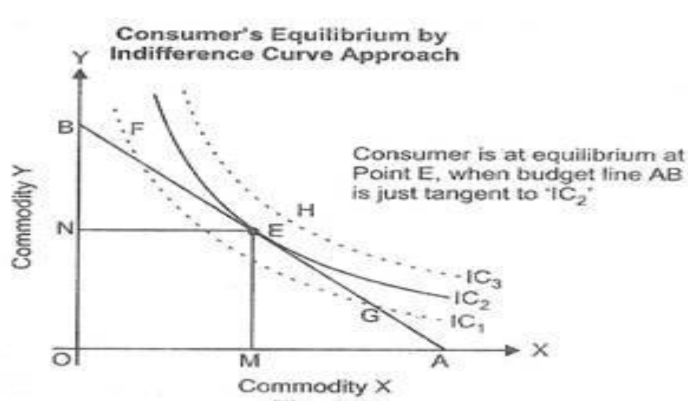
- The Slope of the Budget line = $\frac{Px}{Py}$





Equilibrium of the Consumer:

- The consumer is in equilibrium when he maximizes his utility, given his income and the market prices.
- Two conditions must be fulfilled for the consumer to be in equilibrium:
  1. A given budget line must be tangent to an indifference curve, or marginal rate of substitution of X for Y (MRS_{XY}) must be equal to the price ratio of the two goods $\frac{Px}{Py}$. That is, $MRS_{XY} = \frac{MUx}{MUy} = \frac{Px}{Py}$ (necessary condition).
  2. The indifference curve must be convex to the origin at the point of tangency or marginal rate of substitution of X for Y must be diminishing (sufficient condition).



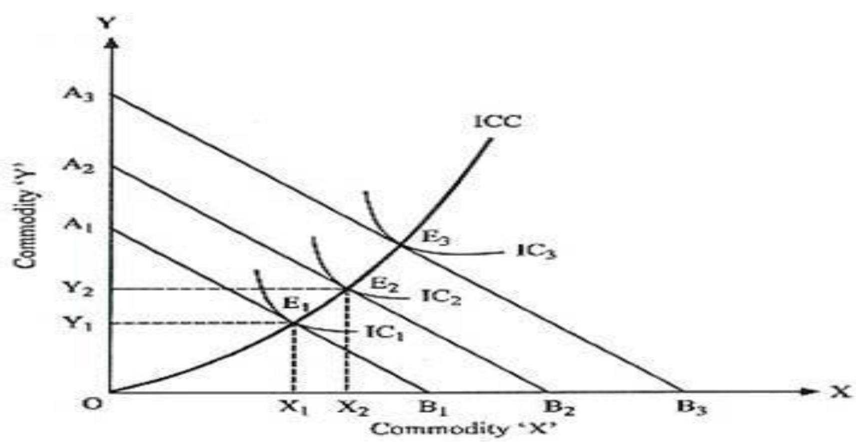
Elasticity of Substitution (e_s):

- The ease with which one good can be substituted for the other is called elasticity of substitution. It is defined as the proportionate change in the ratio between the two goods divided by the proportionate change in their MRS. That is:

$$e_s = \frac{\%\ change\ in\ Y/X}{\%\ change\ in\ MRSxy} = \frac{\Delta(Y/X)}{\Delta MRSxy} * \frac{MRSxy}{Y/X}$$

Income- Consumption Curve (ICC):

- It is defined as the locus of points of consumer's equilibrium resulting when only the income is changed. It shows the effect of a change in the money income of the consumer on the quantity of the goods bought, *ceteris paribus*.
- At each point of ICC slope of indifference curve is equal to slope of budget line.



Normal goods: Goods for which changes in consumption are positively related to changes in income are said to be *normal* or *superior* goods.

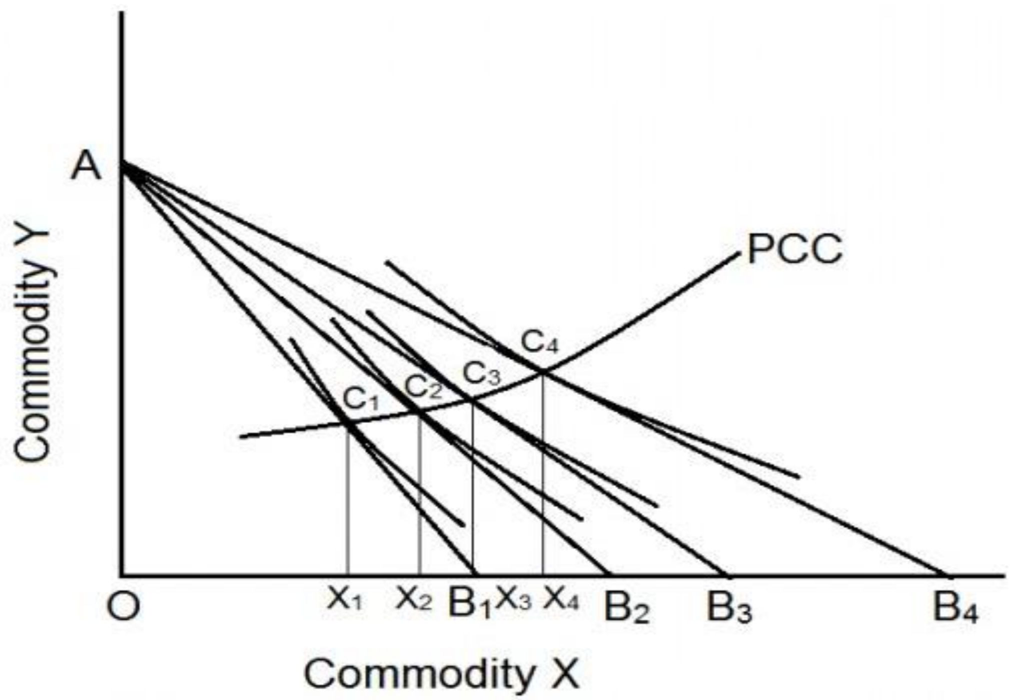
Inferior goods: In case of inferior goods, consumption falls with increase in income.

Engel's Curve:

- Engel's curve shows the amount of a commodity that the consumer will purchase per unit of time at various levels of income.
- This curve was developed by German Statistician, Christian Lorenz Ernst Engel.
- This curves are derived from income- consumption curves.

Price Consumption Curve (PCC):

- It shows the effect of a change in price of a commodity on the quantity of it bought, *ceteris paribus*.
- It is defined as the locus of points of consumer's equilibrium resulting when only the price of good X (or the price of good Y) is changed.
- At each point of the PCC slope of indifference curve is equal to slope of budget line.
- PCC shows the price effect (PE).
- Price effect (PE) is split into substitution effect (SE) and income effect (IE). That is, PE = SE + IE.
- The shape of PCC depends upon the directions of SE and IE.



Price Effect (PE):

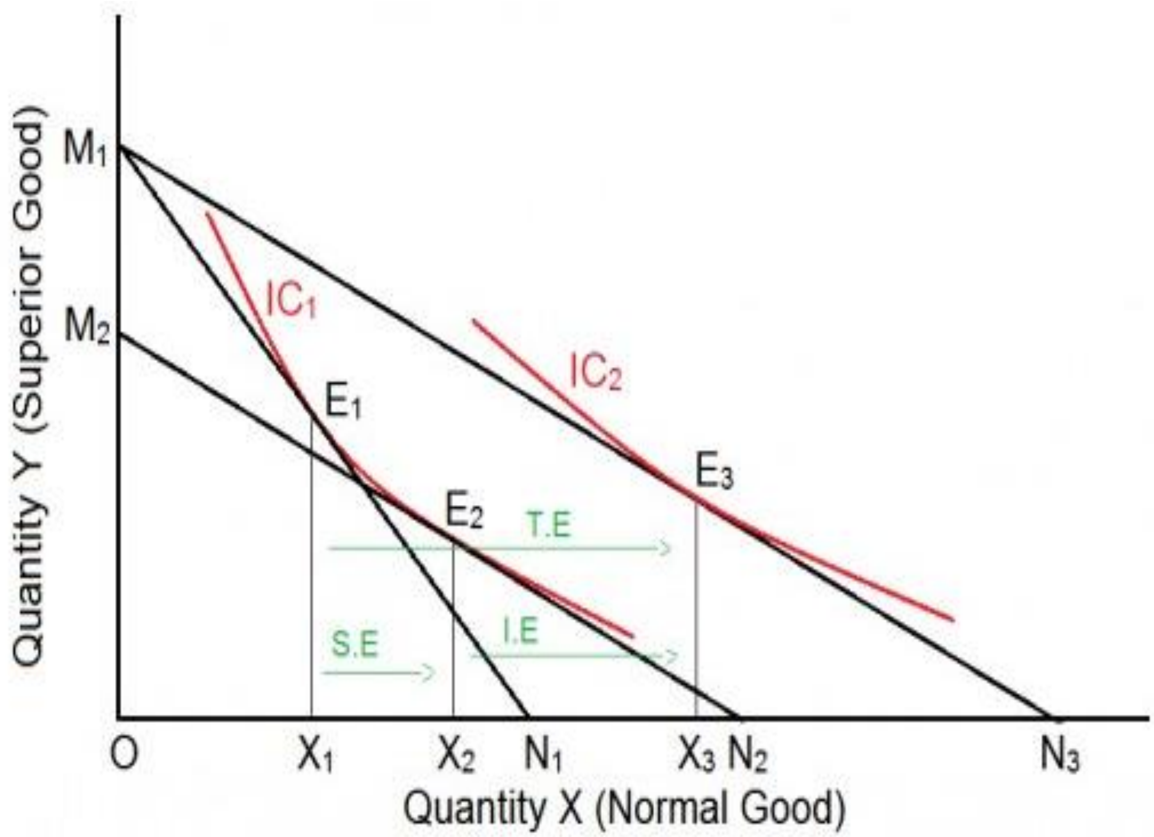
- A change in price of good X brings about a change in the quantity demanded of it, ceteris paribus. This change in the quantity demanded is called price effect.
- Price effect is split into two components:
  1. Substitution effect (SE); and
  2. Income effect (IE).

Substitution Effect (SE):

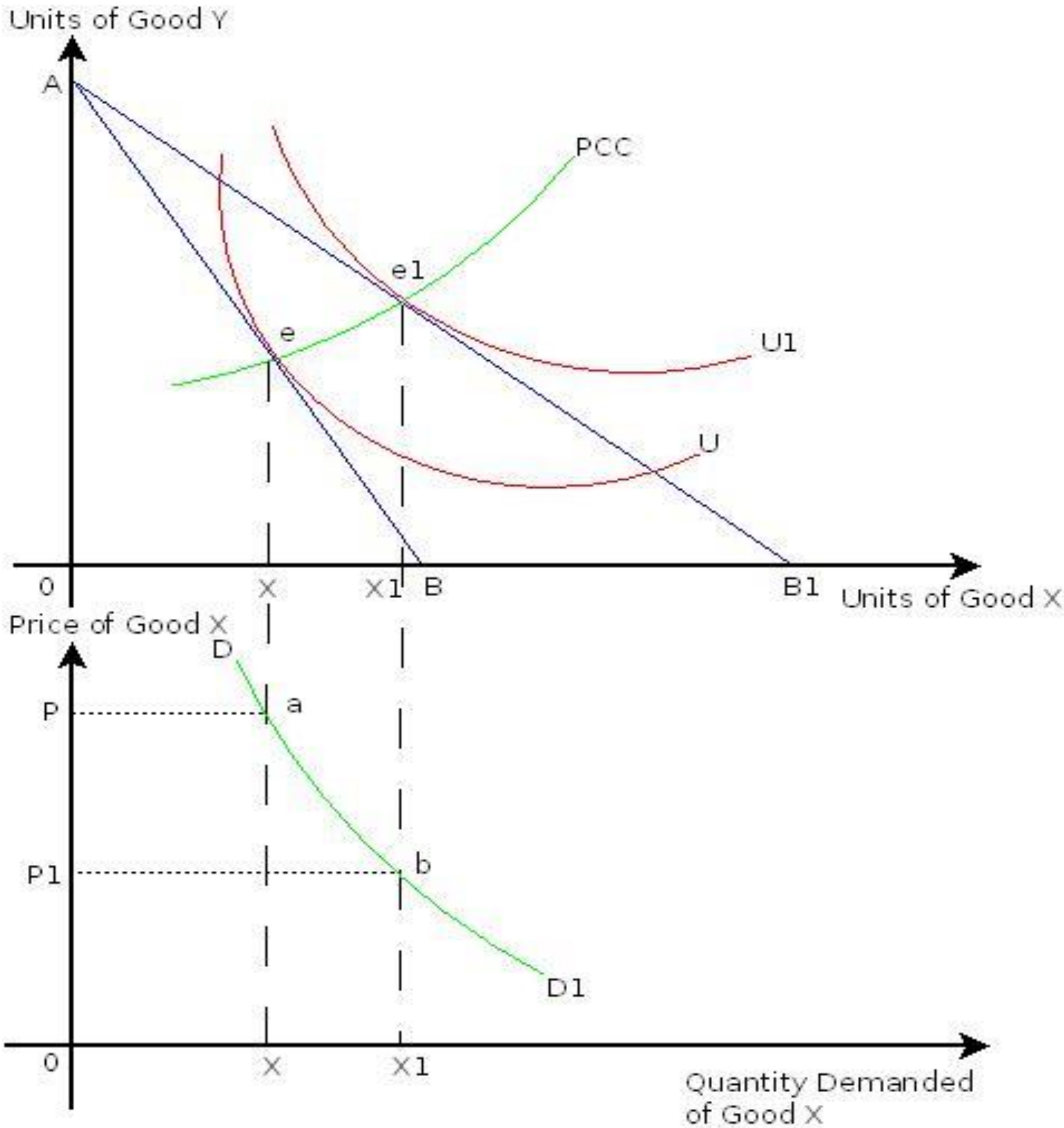
- The substitution effect is the increase in the quantity bought as the price of the commodity falls, after adjusting income so as to keep the real purchasing power of the consumer the same before.
- This adjustment in income is called compensating variation and is shown graphically by a parallel shift of the new budget line until it becomes tangent to the initial indifference curve.

Income Effect (IE):

- It states that a change in the price of a good will bring about a change in the real income (purchasing power) of the consumer, which in turn brings about a change in the quantity demanded of the good.
- The IE operates on the assumption that relative price of goods remains constant.



Derivation of the Demand Curve:

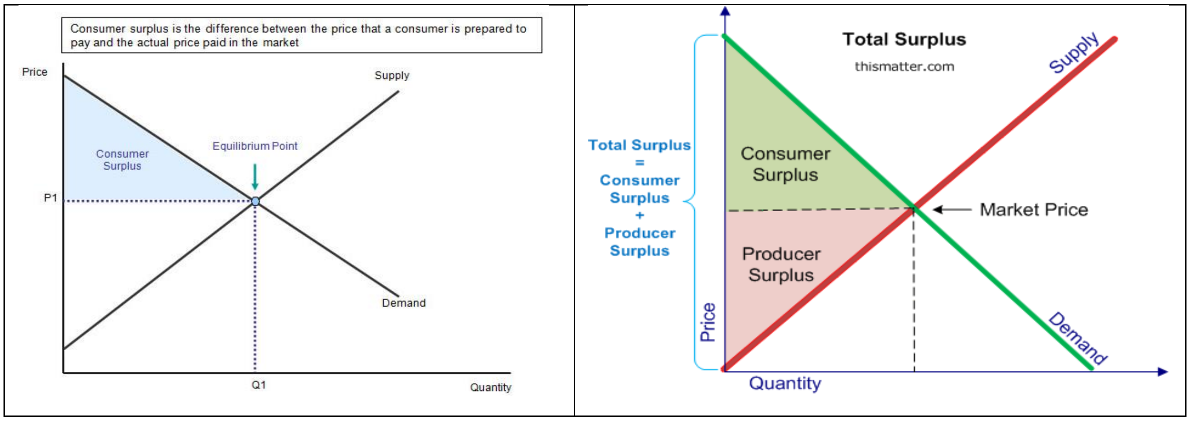


Consumer Surplus:

- The concept of consumer surplus has been given by **Marshall and Hicks**.
- Consumer surplus is defined as the net benefit or gain which a consumer enjoys by consuming one market basket instead of another.

Marshallian Consumer Surplus:

- The excess amount he was willing to pay but does not have to pay is called consumer surplus.
- It is based on the law of diminishing marginal utility.



Hicksian Consumer Surplus:

- Prof. J. R. Hicks modified the Marshallian consumer surplus which is equal to the area between the demand curve and the price line.
- Hicksian consumer surplus is equal to the vertical distance between the indifference curves.
- Hicksian consumer surplus is better as it is based on neither cardinal measurement of utility nor constant marginal utility of money.

Revealed Preference Theory

Meaning of Revealed Preference: When a consumer buys a commodity he reveals his preference for it.

- *Revealed preference theory* was developed by Paul A. Samuelson in 1938. This theory was developed as an alternative theory of demand based *on observed* market behaviour of consumers.
- Samuelson has criticised the marginal utility and indifference curve theories for studying consumers’ behaviour, by describing them as *introspective*.

- Samuelson rejected the weak ordering hypothesis given by Hicks and built up his theory on strong ordering hypothesis.
- The revealed preference theory is also known as behaviouristic- ordinalist approach.
- It is behaviouristic because it relies on actual market behaviour; and ordinalist because it assumes utility as an ordinal concept.
- This theory derives the law of demand in a direct and simple manner.
- Samuelson deduced *the fundamental theorem of consumption* which states that demand for a commodity and its price are inversely related provided income elasticity of demand is positive.
- The revealed preference theory is based on **two axiom**:
    1. It states that from any set of alternatives, the consumer makes a choice; and
    2. It states that if A is chosen from a set of alternatives that includes B (which is different from A), then any set of alternating from which B is chosen must not contain A.
- **Assumption** of Revealed Preference Theory:
    1. Rationality;
    2. Consistency;
    3. Transitivity; and
    4. Axiom of revealed preference.
- This theory divides the total effect into *quasi substitution* and *quasi income effects* in a manner different from indifference curve theory.
- This theory does not separate out a pure substitution effect and a pure income effect.

Derivation of the Demand Curve:

Criticisms of the Revealed Preference Theory:

1. The theory cannot explain Giffen paradox or upward sloping demand curve.
2. It provides a direct way to the derivation of the demand curve.
3.

Review Questions

I. Multiple Choice Questions:

1. Utility of every additional unit is called-
   a. Marginal utility
   b. Total utility
   c. Average utility
   d. None of these.

2. MU_n is equal to-
   a. $TU_n + TU_{n-1}$
   b. $TU_n - TU_{n-1}$
   c. $TU_n - TU_{n+1}$
   d. $TU_n + TU_{n+1}$

3. When total utility reaches at maximum marginal utility becomes
   a. Positive
   b. Negative
   c. Zero
   d. All may be possible.

4. The cardinalist school postulated that utility can
   a. Be measured
   b. Not be measured
   c. Both a and b may possible
   d. None.

5. The law of equi- marginal utility is also known as-
   a. Gossen's first law
   b. Gossen's second law
   c. Gossen's third law
   d. None of the above.

6. Gossen, Jevons, Walras and Marshall are related to-
   a. Cardinal school
   b. Ordinal school
   c. Both a & b
   d. None of the above.

7. The *ordinalist school* postulated that utility is
   a. Measurable
   b. Not measurable
   c. Both a & b may be possible
   d. None.

8. Pareto, W. E. Johnson, E. E. Slutsky, J. R. Hicks and R.G.D. Allen are the main economists related to-
   a. Cardinal school
   b. Ordinal school
   c. Both school
   d. None of the above.

9. As the consumer consumes more of a commodity, the utility of every additional unit (MU) consumed diminishes. This is-
   a. Law of diminishing marginal utility
   b. Equi- marginal utility

c. Indifference curve theory
d. Revealed preference theory.

10. The condition for equilibrium of the consumer is-
a. $\frac{MUx}{Px} = \frac{MUy}{Py}$
b. $\frac{MUx}{MUy} = \frac{Py}{Px}$
c. a&b
d. $MU_x = MU_y$

11. The cardinal utility approach is based on-
a. Rationality
b. Constant marginal utility of money
c. Diminishing marginal utility
d. All of the above.

12. What is/ are true for indifference curves-
a. Indifference curve slopes downward to the right;
b. Indifference curves are convex to the origin;
c. A higher indifference curve represents a higher level of satisfaction;
d. All of the above are correct.

13. The convexity of indifference curve is due to-
a. Diminishing MRS
b. Increasing MRS
c. Constant MRS
d. None.

14. The slope of indifference curve is known as-
a. Marginal Rate of Substitution;
b. Marginal Utility;
c. Elasticity of Substitution;
d. None.

15. In indifference curve analysis, the consumer will be in equilibrium when-
a. A given budget line must be tangent to an indifference curve
b. The indifference curve must be convex to the origin at the point of tangency
c. Both a & b
d. None of the above.

16. The ease with which one good can be substituted for the other is called-
a. Elasticity of substitution;
b. Marginal rate of substitution;
c. Substitution effect;
d. None of the above.

17. A change in price of good X brings about a change in the quantity demanded of it, ceteris paribus. This change in the quantity demanded is called-
a. Price effect;
b. Income effect;
c. Substitution effect;
d. None.

18. The increase in the quantity bought as the price of the commodity falls, after adjusting income so as to keep the real purchasing power of the consumer the same before is known as-
    a. Price effect;
    b. Income effect;
    c. Substitution effect;
    d. None.

19. A change in the price of a good will bring about a change in the real income (purchasing power) of the consumer, which in turn brings about a change in the quantity demanded of the good is called-
    a. Price effect;
    b. Income effect;
    c. Substitution effect;
    d. None.

20. Price effect is equal to-
    a. Substitution effect;
    b. Income effect;
    c. a+b
    d. a-b.

21. Revealed preference theory was developed by-
    a. Paul A. Samuelson
    b. J. R. Hicks
    c. Marshall
    d. Adam Smith

22. Revealed preference theory is based on-
    a. Weak ordering
    b. Strong ordering
    c. Both a & b
    d. None.

23. Indifference curve analysis is based on-
    a. Weak ordering
    b. Strong ordering
    c. Both a & b
    d. None.

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	a	b	c	a	b	a	b	b	a	c	d	d	a	a	c	a	a	c	b	c	a	b	a

II. Matching Test:

Match- I	Match- II
A. Cardinal Utility Analysis	a. P. A. Samuelson
B. Indifference Curve Analysis	b. A. Marshall
C. Concept of consumer surplus	c. Hicks & Allen
D. Revealed preference theory	d. Marshall & Hicks

Match- I	A	B	C	D
Match- II	b	c	d	a

Match- I	Match- II
A. Slope of indifference curve	a. MRS x,y = $\frac{MUx}{MUy}$
B. Slope of budget line	b. $\frac{Px}{Py}$
C. Consumer's equilibrium	c. $\frac{MUx}{MUy} = \frac{Px}{Py}$
D. MU_n	d. $TU_n - TU_{n-1}$

Match- I	A	B	C	D
Match- II	a	b	c	d

III. Write *T* for True and *F* for False against each statement:

1. Utility means want satisfying power of a commodity.
2. A change in total utility resulting from a one unit change in the consumption of a commodity at particular point of time is called marginal utility.
3. Total utility is the sum of marginal utility.
4. $MU = TU_n + TU_{n-1}$
5. When total utility reaches at maximum marginal utility becomes zero.
6. The ***cardinalist school***states that utility cannot be measured.
7. The law of diminishing marginal utility is known as Gossen's first law.
8. The law of equi- marginal utility is known as Gossen's second law.
9. The ***ordinalist school***states that utility is measurable.
10. The Law of diminishing marginal utility states that as the consumer consumes more of a commodity, the utility of every additional unit (MU) consumed diminishes.
11. The principle of equi- marginal utility states that the consumer will distribute his money income in such a way that the utility derived from the last *Saudi Riyal* spent on each good is equal. In other words the consumer is in equilibrium position when marginal utility of money spent on each good is same.
12. Bandwagon effectis an example of negative network externality.
13. Snob effect is an example of positive network externality.
14. A higher indifference curve represents a higher level of satisfaction.
15. Indifference curves are convex to the origin.
16. Price effect is split into two components- substitution effect and income effect.
17. *Revealed preference theory* was developed by J. R. Hicks in 1938.

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	T	T	T	F	T	F	T	T	F	T	T	F	F	T	T	T	F

IV. Questions with Answers:

Ques: What is utility?

Ans: want satisfying power of a commodity is called utility.

Ques: What is total utility and marginal utility?

Ans: **Total utility:** The sum of total satisfaction which a consumer receives by consuming various units of the same commodity.

Marginal Utility: It refers as utility of every additional unit of the consumed or it can be can be defined as a change in total utility resulting from a one unit change in the consumption of a commodity at particular point of time.

Ques: What are the relationships between total utility and marginal utility?

Ans: Relationship between Total Utility and Marginal Utility:

Total Utility	Marginal Utility
As we consume more goods total utility increases but diminishing rate.	As we consume more goods marginal utility diminishes.
When total utility reaches at maximum	Marginal utility becomes zero.
When total utility declines	Marginal utility becomes negative.

Ques: What is law of diminishing marginal utility?

Ans: The Law of diminishing marginal utility states that as the consumer consumes more of a commodity, the utility of every additional unit (MU) consumed diminishes.

Ques: What is the law/ principle of equi- marginal utility?

Ans: The principle of equi- marginal utility states that the consumer will distribute his money income in such a way that the utility derived from the last *Saudi Riyal* spent on each good is equal. *In other words* the consumer is in equilibrium position when marginal utility of money spent on each good is same.

Ques: What is/are the condition(s) for consumer equilibrium in cardinal approach?

Ans: *In case of Single Commodity:*

$$MU_x = P_x$$

In case of More Commodity:

$$\frac{MUx}{Px} = \frac{MUy}{Py} = \ldots\ldots\ldots = \frac{MUn}{Pn} = \lambda$$

Where λ denotes the marginal utility of the last riyal spent on each good.

Ques: What are Bandwagon and Snob effects?

Ans: **Bandwagon Effect:** It refers to desire or demand for a good by a person who wants to be in style because possession of a good is in fashion and therefore many others have it. It is an example of positive network externality. Bandwagon effect makes the demand curve elastic.

Snob Effect: It refers to the desire to possess a unique commodity having a prestige value. It works quite contrary to the bandwagon effect. It is an example of negative network externality. Snob effect makes the demand curve less elastic (inelastic).

Ques: What is indifference curve?

Ans: An indifference curve is the locus of points which yield the same utility (level of satisfaction) to the consumer, so that he is indifferent as to the particular combination he consumes. It shows various combinations of the two goods which give equal satisfaction or utility to the consumer.

Ques: What are the main features/properties of indifference curves?

Ans: The main features/properties of indifference curves are-

1. Downward sloping to the right;
2. Indifference curves are convex to the origin;
3. Indifference curves cannot intersect/cut each other; and
4. A higher indifference curve represents a higher level of satisfaction.

Ques: What do you mean by marginal rate of substitution (MRS)?

Ans: The marginal rate of substitution of x for y is defined as the number of units of commodity y that must be given up in exchange for an extra unit of commodity x so that the consumer maintains the same level of satisfaction.

The negative slope of an indifference curve at any point is called the marginal rate of substitution of the two commodities, x and y, and is given by the slope of the tangent at that point:

$$\text{Slope of indifference curve} = (-)\frac{dy}{dx} = \text{MRS}_{x,y} = \frac{MUx}{MUy}$$

Ques: What are the conditions for consumer's equilibrium in indifference curve analysis?

Ans: The consumer is in equilibrium when he maximizes his utility, given his income and the market prices. Two conditions must be fulfilled for the consumer to be in equilibrium:

1. A given budget line must be tangent to an indifference curve, or marginal rate of substitution of X for Y (MRS_{XY}) must be equal to the price ratio of the two goods $\frac{Px}{Py}$. That is, $MRS_{XY} = \frac{MUx}{MUy} = \frac{Px}{Py}$ (necessary condition).
2. The indifference curve must be convex to the origin at the point of tangency or marginal rate of substitution of X for Y must be diminishing (sufficient condition).

Ques: What is elasticity of substitution?

Ans: The ease with which one good can be substituted for the other is called elasticity of substitution. It is defined as the proportionate change in the ratio between the two goods divided by the proportionate change in their MRS. That is:

$$e_s = \frac{\%\ change\ in\ Y/X}{\%\ change\ in\ MRSxy} = \frac{\Delta(Y/X)}{\Delta MRSxy} * \frac{MRSxy}{Y/X}$$

Ques: What is income- consumption curve (ICC)?

Ans: It is defined as the locus of points of consumer's equilibrium resulting when only the income is changed. It shows the effect of a change in the money income of the consumer on the quantity of the goods bought, *ceteris paribus*. At each point of ICC slope of indifference curve is equal to slope of budget line.

Ques: What is Engel's curve?

Ans: Engel's curve shows the amount of a commodity that the consumer will purchase per unit of time at various levels of income. This curve was developed by German Statistician, Christian Lorenz Ernst Engel. This curves are derived from income-consumption curves.

Ques: What is price consumption curve (PCC)?

Ans: It is defined as the locus of points of consumer's equilibrium resulting when only the price of good X (or the price of good Y) is changed.

Ques: What is price effect?

Ans: **Price Effect (PE):** A change in price of good X brings about a change in the quantity demanded of it, ceteris paribus. This change in the quantity demanded is called price effect.

Ques: What is substitution effect?

Ans: Substitution Effect (SE): The substitution effect is the increase in the quantity bought as the price of the commodity falls, after adjusting income so as to keep the real purchasing power of the consumer the same before.

Ques: What is income effect?

Ans: **Income Effect (IE):** It states that a change in the price of a good will bring about a change in the real income (purchasing power) of the consumer, which in turn brings about a change in the quantity demanded of the good.

Ques: What do you understand by consumer surplus?

Ans: The concept of consumer surplus has been given by Marshall and Hicks. Consumer's Surplus is the simply difference between the price ***one is willing to pay the price one actually pay*****s** for particular product.

Ques: What is Marshallian consumer surplus?

Ans: The excess amount he was willing to pay but does not have to pay is called consumer surplus. It is based on the law of diminishing marginal utility.

Ques: What is Hicksian consumer surplus?

Ans: Hicksian consumer surplus is equal to the vertical distance between the indifference curves.

Ques: What is revealed preference theory?

Ans: When a consumer buys a commodity he reveals his preference for it. This theory was developed by Paul A. Samuelson in 1938. This theory was developed as an alternative theory of demand based *on observed* market behaviour of consumers. Samuelson rejected the weak ordering hypothesis given by Hicks and built up his theory on strong ordering hypothesis. The revealed preference theory is also known as behaviouristic-ordinalist approach.

Chapter- 7

Theory of Production

Price of the products depends on its cost of production. The supply of product depends upon its cost of production, which in turn depends upon- (a) the physical relationship between inputs and output (production function), and (b) the price of inputs. So, this chapter is relevant for pricing of a product.

Chapter Outline:

- Meaning of Production and Production Function;
- Production in the Short- Run- 1. Production with one variable input (Labour) - TP_L, MP_L and AP_L and 2. Relationship between TP_L, MP_L and AP_L Curves;
- Law of Variable Proportion;
- Production in the Long- Run- 1. Production with two variable inputs- the concepts of isoquants and 2. Features of isoquants
- Isocost Line;
- Producer's Equilibrium;
- Expansion Path;
- Elasticity of Substitution;
- Returns to Scale and Reasons behind Returns to Scale- Economies and Diseconomies of Scale

Learning Objectives: After studying this chapter you will be able to-

- Understand how production of a good takes place;
- Understand the concepts of production function;
- Understand the concepts of short- run and long- run production functions;
- Understand the meaning of TP_L, MP_L and AP_L and Relationship between TP_L, MP_L and AP_L Curves;
- Understand Law of Variable Proportion and Returns to Scale; and
- Understand how producer reaches at equilibrium position.
- These all are important to understand how price of a product is determined.

Meaning of Production:

Production is a process by which goods and services are made available to the consumer. Production process simply means the physical relationship between inputs (labour, materials, capital, etc) used and the resulting output.

Meaning of Production function:

The production function is a purely technical relationship between inputs and output (products). It (production function) represents the technology of a firm of an industry. The theory of production is the study of production function. The general mathematical form of the production function is-

$$Q = f(L, K, R, S, \upsilon, \gamma)$$

Where Q = output (product)
L = labour input
K = capital input
R = raw materials
S = land input
υ = return to scale
γ = efficiency parameter.
Production function can provide measurements of-

- ✓ The marginal productivity of the factors of production;
- ✓ The marginal rate of substitution and the elasticity of substitution;
- ✓ Factor intensity;
- ✓ The efficiency of production;
- ✓ The return to scale.

Types of production function:

Production function is of two types-

1. Short- run production function (Law of Variable Proportions); and
2. Long- run production function (Return to Scale).

Short- run is a period in which firms can adjust production by changing variable factors such as materials and labour but cannot change quantities of one or more fixed factors such as capital, land etc.

The ***long- run*** is a period long enough to permit changes in all the factors of production.

Production with One Variable Input: Total, Marginal and Average Products-

Total product (TP):

- TP is defined as the total quantity of goods produced by a firm during a specific period of time.
- TP can be increased by employing more and more of the variable factor labour.
- TP_L curve starts from the origin, increases at an increasing rate, then increases at decreasing rate, reaches a maximum and then starts falling.

Marginal product (MP):

- MP is defined as the change in TP resulting from the employment of an additional unit of a variable factor (labour).
- MP_L can be written as-
  - ✓ $MP_L = \frac{\text{Change in Total Output}}{\text{Change in Labour Input}} = \frac{\Delta TP}{\Delta L}$

- ✓ MP_L can be calculated as-
- ✓ MP_L for n^{th} unit = $TP_n - TP_{n-1}$

Average product (AP):

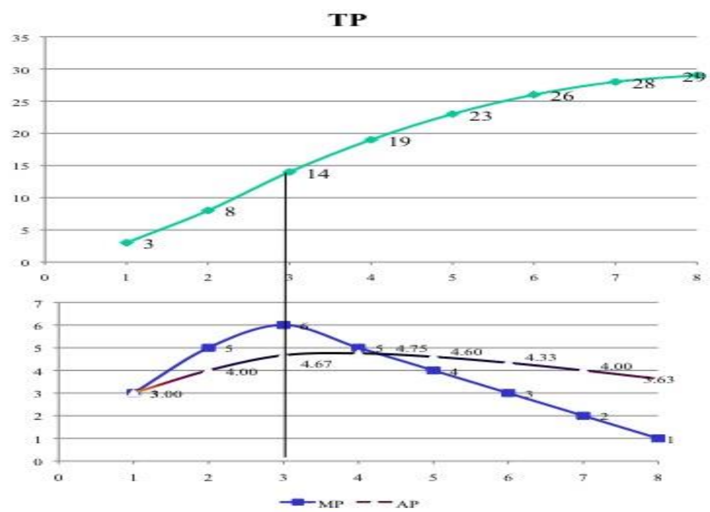
- AP is defined as the amount of output per unit of the variable factor employed, i.e.,

$$AP_L = \frac{\text{Total Output}}{\text{Labour Input}} = \frac{TP}{L}$$

Example:

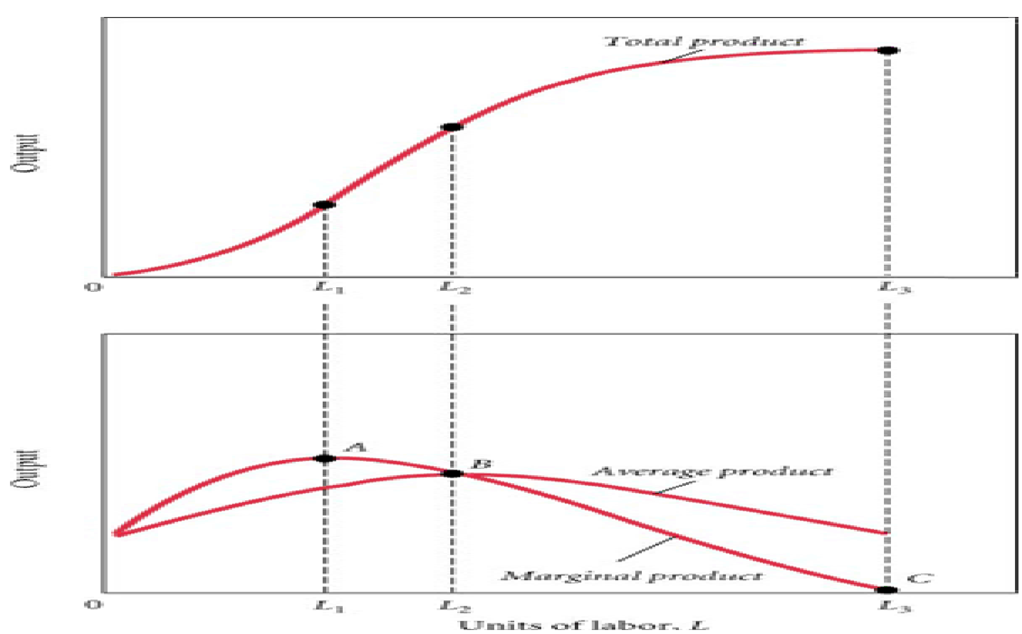
L	TP	MP	AP
0	0	***	***
1	3	3	3.00
2	8	5	4.00
3	14	6	4.67
4	19	5	4.75
5	23	4	4.60
6	26	3	4.33
7	28	2	4.00
8	29	1	3.63

Diminishing Returns



Relationship between TP_L, MP_L and AP_L Curves:

- The AP_L and MP_L curves are derived from the TP_L curve given in the figure-



Relationship between ***TP_L and AP_L Curves***

- AP_L at any point on the TP_L curve is the slope of the straight line from the origin to that point on the TP_L curve. The value of slope rises and declines thereafter.
- AP_L initially rises, reaches a maximum and then falls.
- As long as TP_L is positive, AP_L is positive.
- AP_L is inverted- U shaped.

Relationship between ***TP_L and MP_L Curves***

- MP_L at any point on the TP_L curve is the slope of the TP_L curve at that point. The slope rises then falls till TP_L is maximum. At that point slope is zero and beyond that it is negative.
- MP_L rises initially, reaches at maximum when the slope of the tangent is steepest and then declines.
- When TP_L is maximum, MP_L is zero.
- When TP_L falls, MP_L is negative.
- TP_L is the area under the MP_L curve.
- The falling portion of the MP_L curve shows the law of variable proportions.
- MP_L is positive as long as TP_L is increasing, but becomes negative when output (TP_L) is decreasing.

Relationship between ***AP_L and MP_L Curves***

The relationships between AP_L and MP_L Curves are as follows:

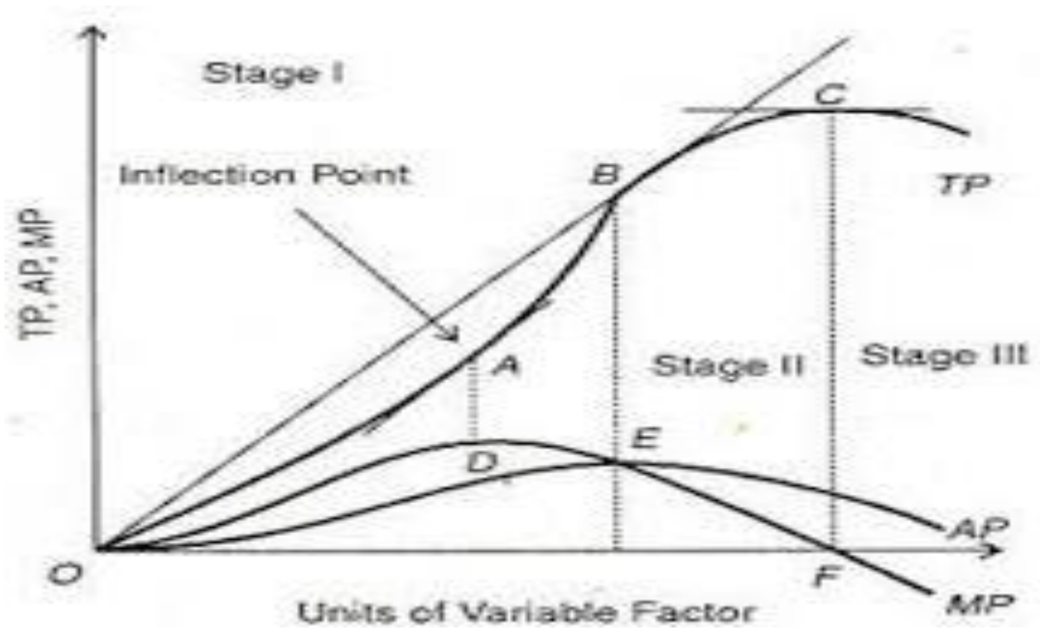
- Initially when both AP_L and MP_L curves are rising, MP_L curve rises at a faster rate than the AP_L curve. Both AP_L and MP_L curves rise till the fixed factor (L) is under-utilized.
- When both AP_L and MP_L curves are falling, MP_L curve falls at a faster rate than the AP_L curve. Both AP_L and MP_L curves start falling once the fixed factor (L) is fully utilized.
- When AP_L curve neither rising nor falling, $MP_L = AP_L$.
- There is a range where even through the MP_L curve is falling AP_L curve continues to rise.

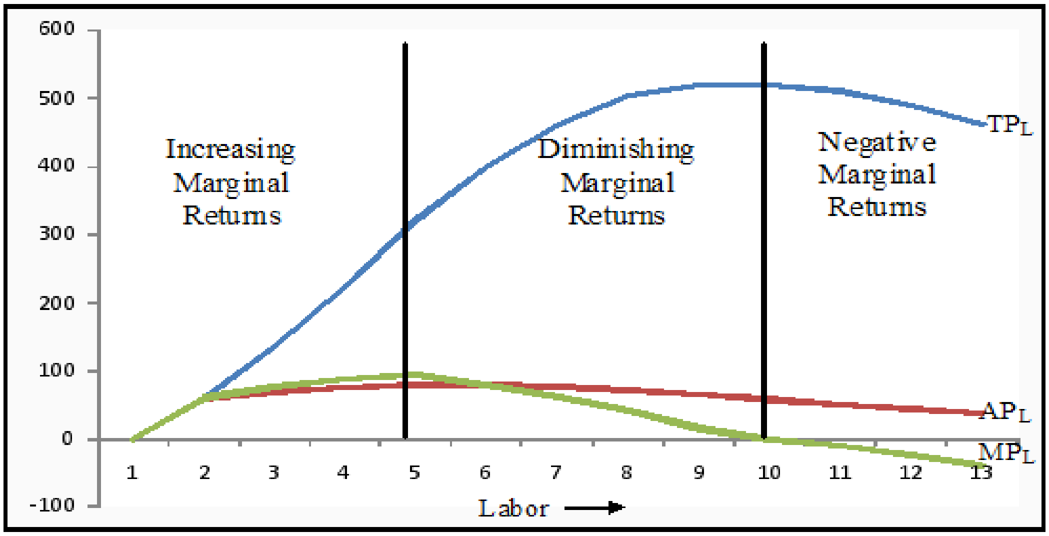
Short- Run Production Function: Law of Variable Proportions

- It is a short- run production function.
- It takes place when production is increased by using one of the variable factors while keeping all other factors fixed.
- It states that when total output or production of a commodity is increased by adding units of a variable input, while the quantities of other inputs are held constant, the increase in total production becomes, after some point, smaller and smaller.
- The law operates when both AP_L and MP_L begins to diminish.
- The law operates under these assumptions:
  - ✓ State of production or technology remains unchanged;
  - ✓ All units of variable factor, labour, are homogeneous or of same quality; and
  - ✓ There must always be some fixed input.

Stages of Production:

- The law of variable proportion can be divided into three phases/stages-
  - ✓ Stage I: Stage of increasing Returns
  - ✓ Stage II: Stage of Diminishing Returns
  - ✓ Stage III: Stage of Negative Returns





Stage I: Stage of increasing Returns

- Stage I goes from origin to the point where the AP_L is maximum (i.e., from origin to point b).
- In this stage, TP_L is initially increasing at an increasing rate and then starts increasing at decreasing rate from the point of inflexion (point c) onwards.
- AP_L rises throughout in this stage.
- MP_L rises initially and then starts falling.
- Increasing returns are due to indivisibility of factors and specialization of labour.
- A rational producer will not operate in this stage because the producer always has an incentive to expand through Stage I of labour because rising AP_L means the average cost decreases as output is increased.

Stage II: Stage of Diminishing Returns

- This stage of production ranges from the point where AP_L is maximum to the point where MP_L is zero (i.e., from point b to d).
- In this stage both AP_L and MP_L are positive but declining.
- A rational producer will always operate in this Stage because he wants to maximize efficiency of scarce factor, labour.
- The law of diminishing returns operates in this Stage II.
- It is the most fundamental law of production.

Stage III: Stage of Negative Returns

- Stage III covers the entire range over which MP_L is negative.
- A rational producer will not operate in this stage.

Long- Run Production Function: Return to Scale

- In the long- run, all factors of production are variable.
- If the firm has two inputs- labour and capital- both of which are variable then the long- run production function will be-

$$Q = f\ (L, K)$$

- The long- run production function can be represented graphically by Iso- quant or Iso- product curves.

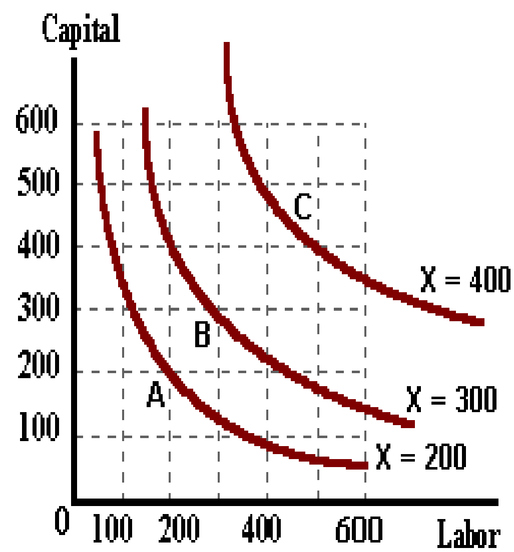
Iso- quant:

- An isoquant shows the different combinations of labour and capital with which a firm can produce a specific quantity of output.
- It is defined as the locus of all the technically efficient combinations of inputs which yield a given amount of output.

Illustration of iso-quant with the help of table and curve

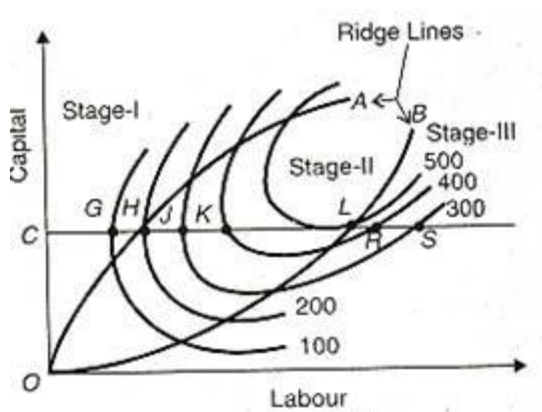
Iso-quant Schedule

Combination	Units of labour	Units of Capital	Total output (in units)
A	1	12	100
B	2	8	100
C	3	5	100
D	4	3	100
E	5	2	100



Features of Isoquants:

- **In the relevant range, isoquants are downward sloping.**
  - ✓ A downward sloping isoquant means that if a firm wants to use more of labour then it must use less of capital to produce the same level of output or remain on the same isoquant.
  - ✓ Ridge lines are loci of points on isoquants where the marginal product of the factors is zero.
  - ✓ Along the upper ridge line, $MP_K = 0$. It means capital is used to its intensive margin. The $MRTS_{LK}$ is infinite, i.e., MRTS is undefined at this point.
  - ✓ Along the lower ridge line, $MP_L = 0$. It shows intensive margin for labour. Thereby, $MRTS_{LK}$ is zero. At this point labour has been substituted for capital to the maximum extent.
  - ✓ Inside the ridge lines, the techniques of production are efficient.
  - ✓ The relevant range represents stage II of production where MP of each factor declines continuously but do not reach zero.

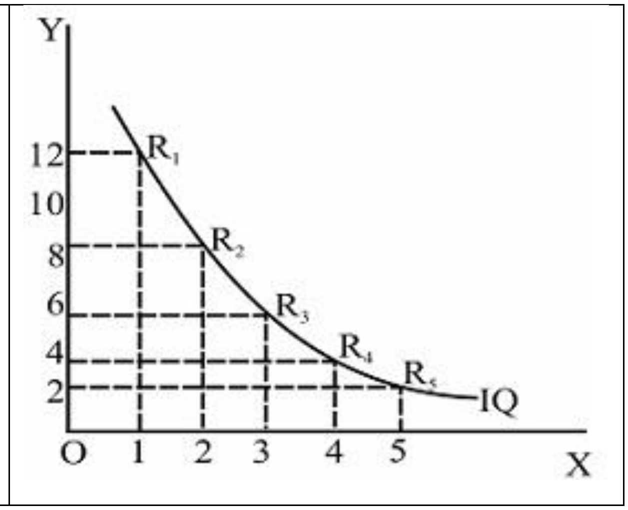


- **Isoquants are convex to the origin: Diminishing MRTS**
  - ✓ Convexity implies diminishing slope.
  - ✓ The slope of an isoquant is called marginal rate of technical substitution of labour for capital ($MRTS_{LK}$). It is the rate of trade- off of one factor for the other.
  - ✓ The slope measures the degree of substitutability of the factors.

$$\text{Slope of an isoquant} = \frac{\partial K}{\partial L} = MRTS_{LK} = \frac{MPL}{MPK}$$

- ✓ $MRTS_{LK}$ is defined as the amount of capital that the firm is willing to give up in exchange for labour, so that output remains constant.

Factor Combinations	Units of Labour (L)	Units of Capital (K)	MRTS of L for K
A	1	12	
B	2	8	4
C	3	5	3
D	4	3	2
E	5	2	1



- **Isoquants Never Cross Each Other.**

Iso- cost Line:

- An isocost line shows the different combinations of labour and capital that a firm can buy, given total outlay (TO) and the prices of the factors.
- An isocost equation is given as:

$$TO = P_L.L + P_K.K$$

$$\text{Slope of Isocost} = \frac{OA}{OB} = \frac{TO/PK}{TO/PL} = (-)\frac{PL}{PK}$$

Producer's Equilibrium:

- There are two cases of producer's equilibrium-
  - ✓ **Case I:** *Maximize Output Subject to a Cost Constraint; and*
  - ✓ **Case II:** *Minimize Cost Subject to an Output Constraint.*

Case I: *Maximize Output Subject to a Cost Constraint*

- If cost is a constraint then the producer maximizes his output subject to a single isocost line (AB). The producer's equilibrium is shown in this fig.-

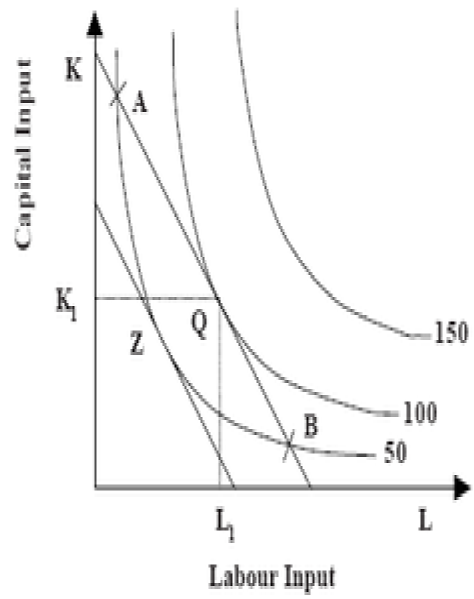
- At point Q, the isocost line is tangent to the highest possible isoquant at production level of 100.
- At the point of tangency, the absolute slope of an isoquant is equal to the absolute slope of the isocost line.
- Thus, the conditions of producer's equilibrium are-
  1. Slope of isoquant = slope of isocost line, i.e.,

  $MRTS_{LK} = P_L/P_K$

  $MP_L/MP_K = P_L/P_K$

  $MP_L/P_L = MP_K/P_K$

  2. Isoquants must be convex to the origin.



Case II: *Minimize Cost Subject to an Output Constraint*

- If output is given, then the producer will aim to minimize his cost subject to a single isoquant, I as shown in the following fig.
- ✓ Point E is the point of producer's equilibrium.
- ✓ It shows the minimum cost of producing the given output.
- ✓ At point E, the given isoquant (I) is tangent to the lowest possible isocost line.
- ✓ At this point of tangency, the absolute slope of isoquant is equal to the absolute slope of isocost line.
- Thus, the conditions of producer's equilibrium are the same-
  1. Slope of isoquant = slope of isocost line, i.e.,

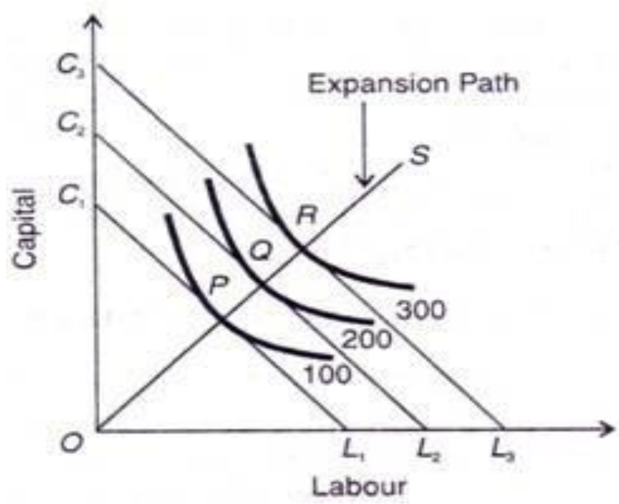
  $MRTS_{LK} = P_L/P_K$

  $MP_L/MP_K = P_L/P_K$

  $MP_L/P_L = MP_K/P_K$
- Isoquants must be convex to the origin.

Expansion Path:

- If the firm increases its total outlay, then there will be parallel outwars shifts of the isocost lines (prices of factors remain constant).
- These different isocost lines will be tangent to different isoquants, thus giving different equilibrium points.
- By joining these points of producer's equilibrium, the firm's expansion path is obtained.



Cobb- Douglas Production Function:

- Cobb- Douglas production function is a linearly homogeneous production function of the form-

$$Q = AL^{\alpha}K^{\beta}$$

Where Q = Output

L = Labour input

K = Capital input

A = Efficiency parameter, technology

α = Output elasticity of labour

β = Output elasticity of capital

- In Cobb- Douglas production function, elasticity of substitution (e_s or σ) is equal to unity.
- In Cobb- Douglas production function, the sum of its exponents measures returns to scale-

If $\alpha + \beta = 1$=> Constant Return to Scale;

If $\alpha + \beta > 1$=> Increasing Return to Scale;

If $\alpha + \beta < 1$=> Diminishing Return to Scale;

- Cobb- Douglas production function shows constant return to scale.

Elasticity of Substitution:

- Elasticity of substitution (e_s) between two factors labour and capital measures the ease with which one factor can be substituted for the other.
- It is defined as the proportionate change in the ratio between the two factors divided by the proportionate change in their MRTS. i.e.,

$$e_s = \frac{\%\ Change\ in\ K/L}{\%\ Change\ in\ MRTSLK} = \frac{\Delta K/L}{\Delta MRTSLK}.\frac{MRTSLK}{K/L}$$

- The value of e_s varies from zero to infinity.

Returns to Scale:

- In the long run output (production) may be increased by changing all factors by the same proportion, or by different proportions.
- The term *'returns to scale'* refers to the changes in output as all factors change by the same proportion.
- There are three types of returns to scale-
    1. Increasing Returns to Scale;
    2. Constant Returns to Scale; and
    3. Decreasing Returns to Scale.

Increasing Returns to Scale:

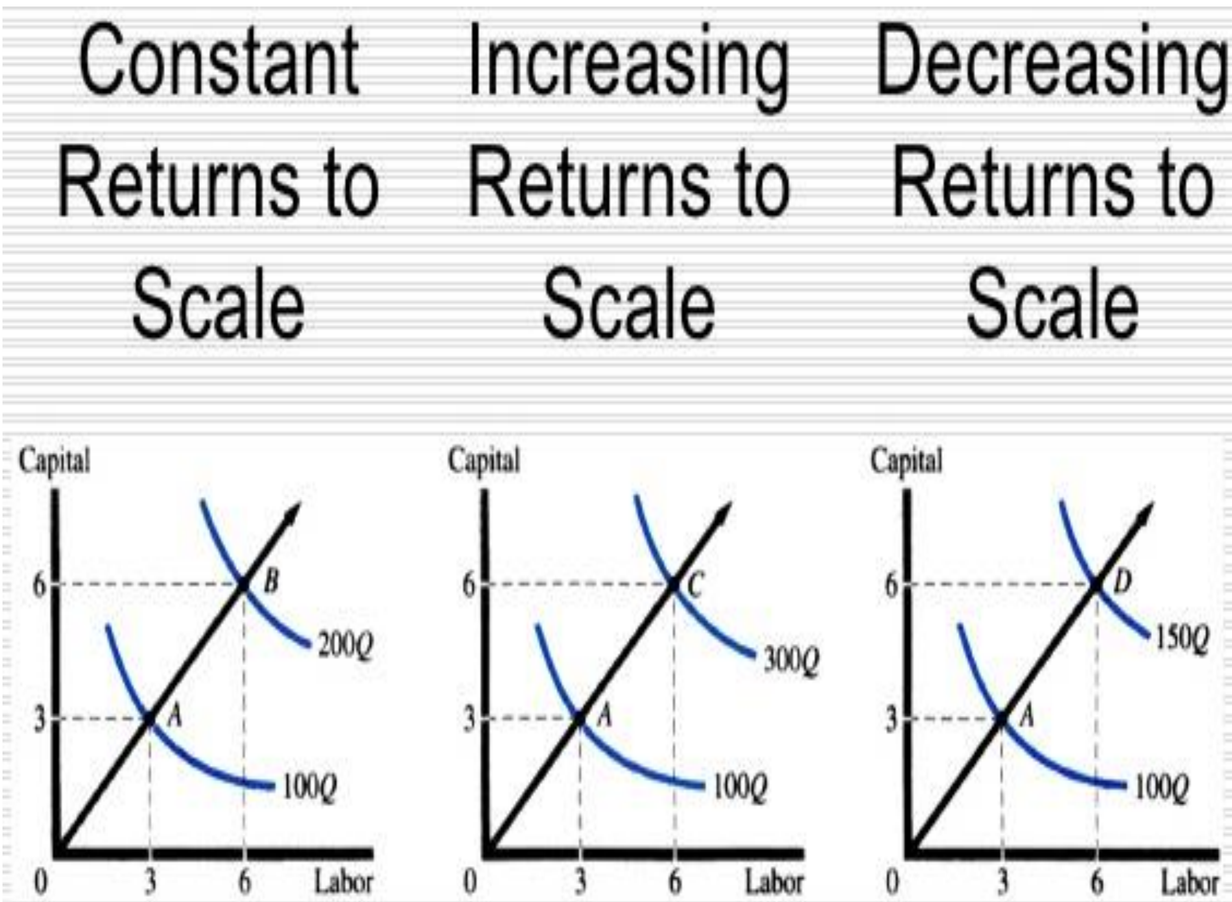
- When the increase in output is more than proportional to the increase in inputs, it is called increasing returns to scale.
- Increasing Returns to scale implies decreasing costs and decreasing costs are due to economies of large- scale production, which takes place by increasing the scale of operation.
- In terms of isoquant map, the distance between successive isoquants decreases.

Constant Returns to Scale

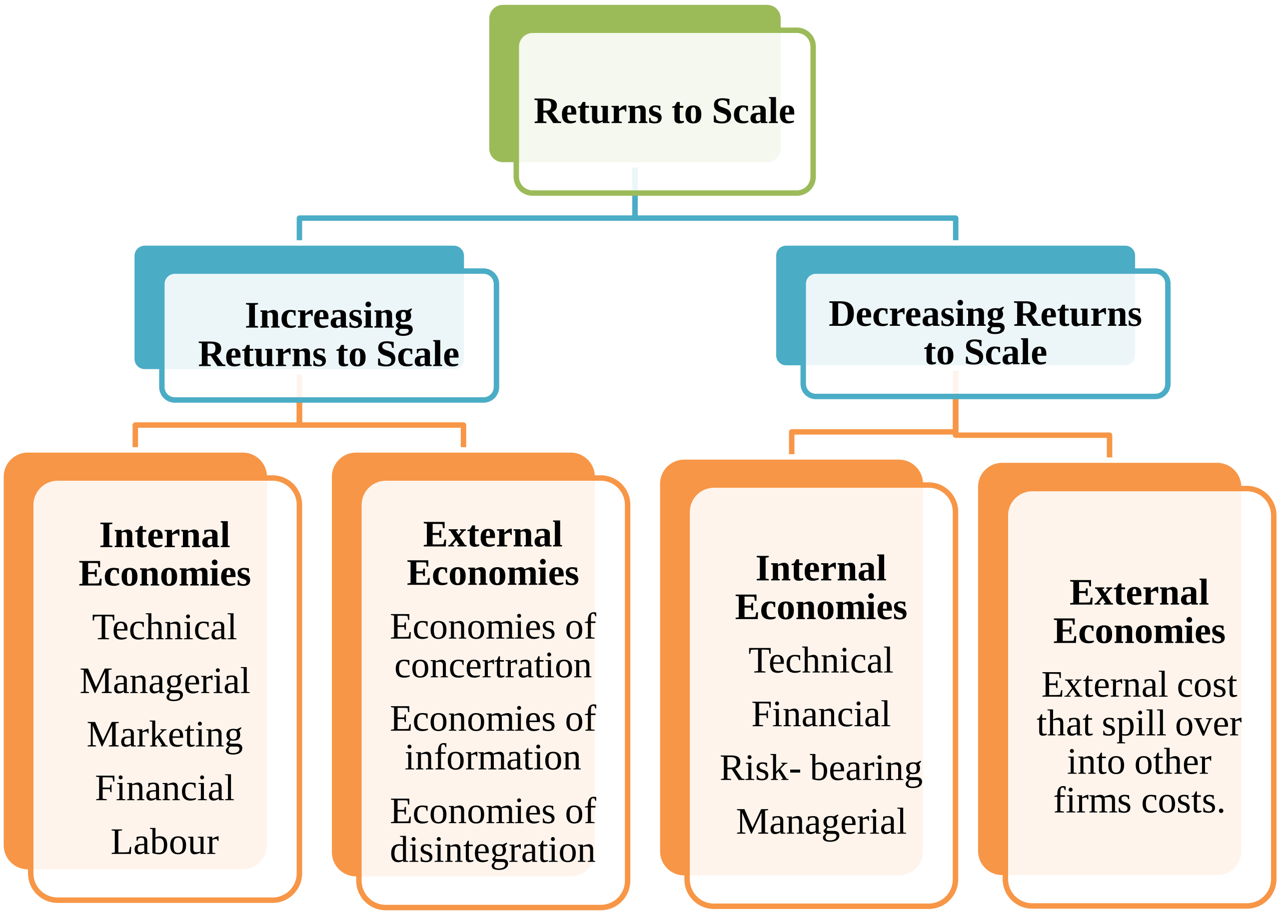
- When the increase in output is proportional to the increase in inputs, it is called constant returns to scale.
- In terms of isoquant map, the distance between successive isoquants remains the same.

Diminishing Returns to Scale

- When the increase in output is less than proportional to the increase in inputs, it is called diminishing returns to scale.
- Diminishing returns to scale implies increasing costs and increasing costs are due to diseconomies of large- scale production, which takes place by excessive increasing the scale of operation.
- In this case, there is managerial inefficiency caused by scarce supply of factors of production and imperfect substitution.
- The manager is overburdened and faces the problems of control and coordination.
- In terms of isoquant map, the distance between successive isoquants increases.



Reasons behind Returns to Scale: Economies and Diseconomies of Scale



Questions for Review

I. Write *T* for True and *F* for False against each statement:

1. Production is a process by which goods and services are made available to the consumer.
2. The production function is a purely technical relationship between inputs and output (products).
3. Short- run is a period in which firms can adjust production by changing all factors of production.
4. TP_L curve starts from the origin, increases at an increasing rate, then increases at decreasing rate, reaches a maximum and then starts falling.
5. Marginal product is defined as the change in TP resulting from the employment of an additional unit of a variable factor.
6. AP_L is U- shaped.
7. Short- run production function is also known as law of returns to scale.
8. Long- run production function is also known as law of variable proportion.
9. A rational producer will always operate in diminishing returns (Stage II).
10. Iso- quants are convex to the origin because of diminishing marginal rate of technical substitution (MRTS).

Ques	1	2	3	4	5	6	7	8	9	10
Ans	T	T	F	T	T	F	F	F	T	T

II. Matching Test:

Match- I	**Match- II**
A. Short- run production function:	a. Returns to Scale
B. Long- run production function:	b. Law of variable proportions
C. The different combinations of labour and capital with which a firm can produce a specific quantity of output is known as:	c. Iso- quant
D. The different combinations of labour and capital that a firm can buy, given total outlay (TO) and the prices of the factors.	d. Iso- cost line

I	**A**	**B**	**C**	**D**
II	**b**	**a**	**c**	**d**

III. Multiple Choice Questions:

1. Production function provides measurements of-
   a. The marginal productivity of the factors of production;
   b. The marginal rate of substitution and the elasticity of substitution;
   c. The return to scale;
   d. Factor intensity;
   e. All of the above.
2. Which is/ are true about iso- quants-
   a. It is convex to the origin;
   b. The slope of an isoquant is called marginal rate of technical substitution of labour for capital ($MRTS_{LK}$);
   c. Iso- quants never cross each other;
   d. All are true.
3. The conditions of producer's equilibrium are-
   a. Slope of isoquant = slope of iso- cost line;
   b. Iso- quants must be convex to the origin;
   c. a+ b
   d. None of these.
4. In Cobb- Douglas production function, elasticity of substitution (e_s or σ) is equal to-
   a. unity
   b. zero
   c. infinity
   d. None of these.
5. In Cobb- Douglas production function, the sum of its exponents measures-
   a. Returns to Scale;
   b. Factors intensity;
   c. Marginal productivity of factors;
   d. Elasticity of substitution
6. Slope of an iso- quant is-
   a. MRTS;
   b. Marginal productivity of factors;
   c. Elasticity of substitution;
   d. Factors intensity.

7. A rational producer will always operate in-
    a. Stage I;
    b. Stage II;
    c. Stage III
    d. None of these.
8. Which of the following stage is known as law of diminishing returns-
    a. Stage I;
    b. Stage II;
    c. Stage III
    d. None of these.
9. The most fundamental law of production is-
    a. Stage I;
    b. Stage II;
    c. Stage III
    d. None of these.
10. MP_L for n^{th} unit is equal to-
    a. $TP_n – TP_{n-1}$
    b. $TP_n – TP_{n+1}$
    c. $AP_n – AP_{n-1}$
    d. $TP_n + TP_{n-1}$

Ques	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans	**e**	**d**	**c**	**a**	**a**	**a**	**b**	**b**	**b**	**a**

IV. Very Short Questions:

Ques: What is production?

Ans: Production is a process by which goods and services are made available to the consumer.

Ques: What is production function?

Ans: The production function is a purely technical relationship between inputs and output (products). It represents the technology of a firm of an industry.

Ques: What is iso- quant?

Ans: An isoquant shows the different combinations of labour and capital with which a firm can produce a specific quantity of output. It is defined as the locus of all the technically efficient combinations of inputs which yield a given amount of output.

Ques: What do you understand by iso- cost line?

Ans: An isocost line shows the different combinations of labour and capital that a firm can buy, given total outlay (TO) and the prices of the factors.

Ques: What are the main features of iso- quants?

Ans: The main features of iso- quants are:

a. In the relevant range, isoquants are downward sloping;
b. Isoquants are convex to the origin: Diminishing MRTS;
c. Isoquants Never Cross Each Other.

Ques: How many types of production functions are there in theory of production?

Ans: There are two types of production functions:

a. Short- run production function; and
b. Long- run production function.

Ques: What is short- run production function?

Ans: Short- run production function is that production function in which firms can adjust production by changing variable factors such as materials and labour but cannot change quantities of one or more fixed factors such as capital, land etc. it is also known as law of variable proportion.

Ques: What is long- run production function?

Ans: The long- run production function is that production function in which all the factors of production can be changed. It is also known as laws of returns to scale.

Ques: Define total product, average product and marginal product.

Ans: **Total Product (TP):** It is defined as the total quantity of goods produced by a firm during a specific period of time. TP can be increased by employing more and more of the variable factor labour.

Average Product (AP): AP is defined as the amount of output per unit of the variable factor employed, i.e.,

$$AP_L = \frac{\text{Total Output}}{\text{Labour Input}} = \frac{TP}{L}$$

Marginal Product (MP): MP is defined as the change in TP resulting from the employment of an additional unit of a variable factor (labour). MP_L can be written as-

$$MP_L = \frac{\text{Change in Total Output}}{\text{Change in Labour Input}} = \frac{\Delta TP}{\Delta L}$$

MP_L can be calculated as-

$$MP_L \text{ for } n^{th} \text{ unit} = TP_n - TP_{n-1}$$

Ques: What are laws of variable proportions?

Ans: Short- run production function is known as law of variable proportions in which firms can adjust production by changing variable factors such as materials and labour but cannot change quantities of one or more fixed factors such as capital, land etc.

Ques: What are the three stages of production? Or,

Ques: How many types of laws of variable proportions are there in the short run production function?

Ans: There are three stages of production or the law of variable proportion can be divided into three phases/stages-

a. Stage I: Stage of increasing Returns;
b. Stage II: Stage of Diminishing Returns; and
c. Stage III: Stage of Negative Returns

Ques: What do you understand by first stage of product or law of increasing returns?

Ans: In the first stage, TP_L is initially increasing at an increasing rate and then starts increasing at decreasing rate from the point of inflexion onwards. AP_L rises throughout in this stage. MP_L rises initially and then starts falling. Increasing returns are due to indivisibility of factors and specialization of labour. A rational producer will not operate in this stage because the producer always has an incentive to expand through Stage I of labour because rising AP_L means the average cost decreases as output is increased.

Ques: What do you understand by second stage of product or law of diminishing returns?

Ans: The second stage of production ranges from the point where AP_L is maximum to the point where MP_L is zero. In this stage both AP_L and MP_L are positive but declining. A rational producer will always operate in this Stage because he wants to maximize efficiency of scarce factor, labour. The law of diminishing returns operates in this Stage II. It is the most fundamental law of production.

Ques: What do you understand by third stage of product or law of negative returns?

Ans: Stage III covers the entire range over which MP_L is negative. A rational producer will not operate in this stage.

Ques: What do you understand by the term returns to scale?

Ans: In the long run output (production) may be increased by changing all factors by the same proportion, or by different proportions. The term *'returns to scale'* refers to the changes in output as all factors change by the same proportion.

Ques: How many types of returns to scale are there?

Ans: There are three types of returns to scale-

1. Increasing Returns to Scale;
2. Constant Returns to Scale; and
3. Decreasing Returns to Scale.

Ques: What is increasing returns to scale?

Ans: When the increase in output is more than proportional to the increase in inputs, it is called increasing returns to scale.

Ques: What is constant returns to scale?

Ans: When the increase in output is proportional to the increase in inputs, it is called constant returns to scale.

Ques: What is diminishing returns to scale?

Ans: When the increase in output is less than proportional to the increase in inputs, it is called diminishing returns to scale.

Question: What are the relationships between TP_L and AP_L Curves?

Answer: The relationships between TP_L and AP_L Curves are as follows:

- AP_L at any point on the TP_L curve is the slope of the straight line from the origin to that point on the TP_L curve. The value of slope rises and declines thereafter.
- AP_L initially rises, reaches a maximum and then falls.
- As long as TP_L is positive, AP_L is positive.
- AP_L is inverted- U shaped.

Question: What are the relationships between TP_L and MP_L Curves?

Answer: The relationships between TP_L and MP_L Curves are as follows:

- MP_L at any point on the TP_L curve is the slope of the TP_L curve at that point. The slope rises then falls till TP_L is maximum. At that point slope is zero and beyond that it is negative.
- MP_L rises initially, reaches at maximum when the slope of the tangent is steepest and then declines.
- When TP_L is maximum, MP_L is zero.
- When TP_L falls, MP_L is negative.
- TP_L is the area under the MP_L curve.
- The falling portion of the MP_L curve shows the law of variable proportions.
- MP_L is positive as long as TP_L is increasing, but becomes negative when output (TP_L) is decreasing.

Question: What are the relationships between AP_L and MP_L Curves?

Answer: The relationships between AP_L and MP_L Curves are as follows:

- Initially when both AP_L and MP_L curves are rising, MP_L curve rises at a faster rate than the AP_L curve. Both AP_L and MP_L curves rise till the fixed factor (L) is under-utilized.
- When both AP_L and MP_L curves are falling, MP_L curve falls at a faster rate than the AP_L curve. Both AP_L and MP_L curves start falling once the fixed factor (L) is fully utilized.
- When AP_L curve neither rising nor falling, $MP_L = AP_L$.
- There is a range where even through the MP_L curve is falling AP_L curve continues to rise.

Ques: What are the conditions of producers' equilibrium?

Ans: There are two conditions for producer's equilibrium-

a. Slope of isoquant = slope of isocost line,

i.e., $MRTS_{LK} = P_L/P_K$

$MP_L/MP_K = P_L/P_K$

$MP_L/P_L = MP_K/P_K$

b. Isoquants must be convex to the origin.

Ques: What is Cobb- Douglas production function? Write down its main features.

Ans: Cobb- Douglas production function is a linearly homogeneous production function of the form-

$$Q = AL^{\alpha}K^{\beta}$$

Where Q = Output

L = Labour input

K = Capital input

A = Efficiency parameter, technology

α = Output elasticity of labour

β = Output elasticity of capital

Cobb- Douglas production function shows constant return to scale. In Cobb- Douglas production function, elasticity of substitution (e_s or σ) is equal to unity and the sum of its exponents measures returns to scale-

If $\alpha + \beta = 1$=> Constant Return to Scale;

If $\alpha + \beta > 1$=> Increasing Return to Scale;

If $\alpha + \beta < 1$=> Diminishing Return to Scale;

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Chapter- 8
Cost of Production

Introduction:

- The production function is one important determinant of cost of a commodity.
- The other determinant of cost is the price of inputs.
- Production function together with the price of inputs determines the cost of a commodity.
- The cost of a commodity with a profit margin determines the price of the commodity.
- When the supply curve interacts with demand curve, the point of intersection gives the equilibrium price and quantity.

The Cost Function:

- Cost is defined as the payment made to the factors of production used in the production of the commodity.
- Cost functions are derived from production function.
- Cost is a multivariate function, i.e., it shows relationship between total cost and its determinants.
- The long run cost function is given as:

$$C = f(Q, T, P_f)$$

- ✓ The short- run cost function is:

$$C = f(Q, T, P_f, K)$$

Where

C = Total cost

Q = Output

T = Technology

P_f = Price of factors

K = Fixed factor(s)

Different Cost Concepts:

- **Opportunity/ alternative Cost:**
  - ✓ The cost of alternative opportunity sacrificed or given up.
  - ✓ At any given time, resources can be put to only one use.
  - ✓ For example, a piece of land may be used either for building a residential flat or for constructing a hospital. If the land is used for constructing a hospital then its opportunity cost is the cost of residential flat foregone.
  - ✓ It is also known as transfer earnings.

Explicit Cost Vs Implicit Cost:

- **Explicit cost-**
  - ✓ Explicit cost, direct cost, accounting cost or money cost is the same thing.
  - ✓ The actual expenditure incurred by a firm to purchase or hire the inputs it needs in the production process is called explicit cost.
  - ✓ These include wages, rent, interest payment for power, insurance, advertising, etc.
- **Implicit cost-**
  - ✓ Implicit cost or imputed cost is the cost of inputs owned by the firm and used by the firm in its own production process.
  - ✓ It includes payment for owned premises, self- invested capital and depreciation of capital equipment.
- Total cost of producing a commodity consists of both implicit and explicit costs.

Private Cost Vs Social Cost:

- **Private Cost-**
  - ✓ Private cost is the money cost incurred by a firm in producing a commodity.
- **Social Cost-**
  - ✓ It is the cost of producing a commodity to the society as a whole.
  - ✓ It includes real cost which is cost borne by the society, directly or indirectly, due to the produced commodity.

Fixed Cost Vs Variable Cost:

- **Fixed Cost-**
  - ✓ Fixed cost, overhead cost or supplementary cost is the cost that does not change with change in output.
- **Variable Cost-**
  - ✓ Variable cost is that costs which vary/change with the quantity of output produced.
  - ✓ It is also called prime cost.

Economic Cost Vs Accounting Cost:

- **Economic Cost-**
  - ✓ Economic cost is the cost to a firm of utilizing economic resources in production, including opportunity cost.
- **Accounting Cost-**
  - ✓ Accounting cost is the actual expense plus depreciation charges for capital equipment.

Short- run Vs Long- run Cost:

- **Short- run Cost-**
  - ✓ Short- run costs are the costs over a period during which some factors are in fixed supply, like plant, machinery, etc.

- **Long- run Cost-**
  - ✓ Long- run costs are the costs over a period long enough to permit changes in all factors of production.

Sunk cost:

- ✓ Sunk cost is the expenditure that has been incurred and cannot be recovered.

Costs in the Short- Run: Total Cost, Average Cost and Marginal Cost

- **Total Cost-**
  - ✓ The total cost of production is divided into two parts- total fixed cost (TFC) and total variable cost (TVC)-

    TC = TFC + TVC

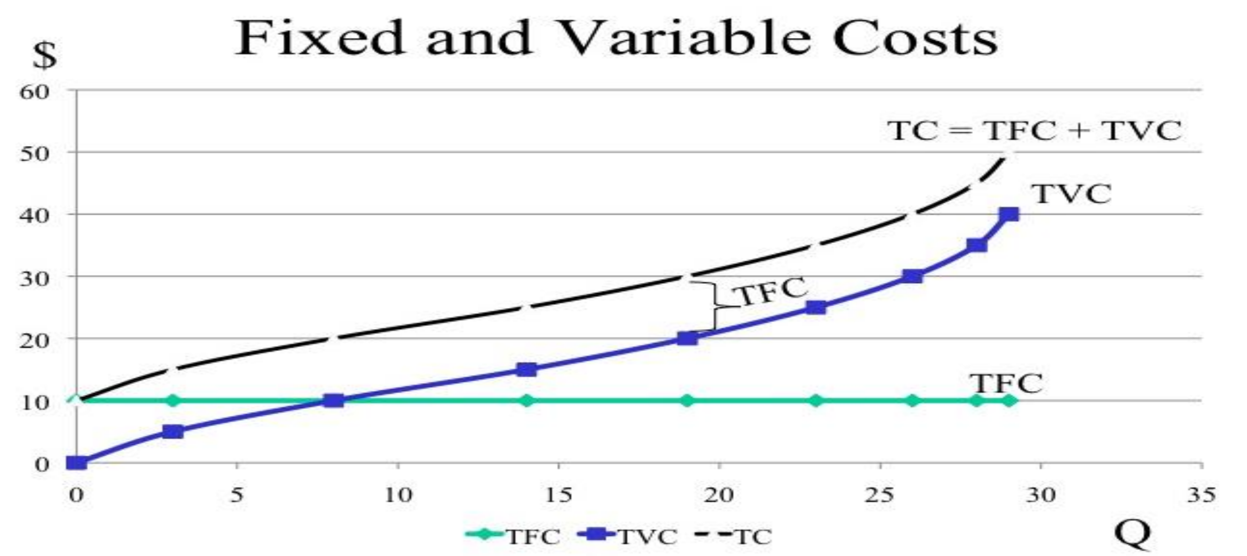
Total Fixed Cost (TFC)-

- ✓ It is defined as that cost which does not vary with the output.
- ✓ TFC curve is a straight line parallel to x- axis.

Total Variable Cost (TVC)-

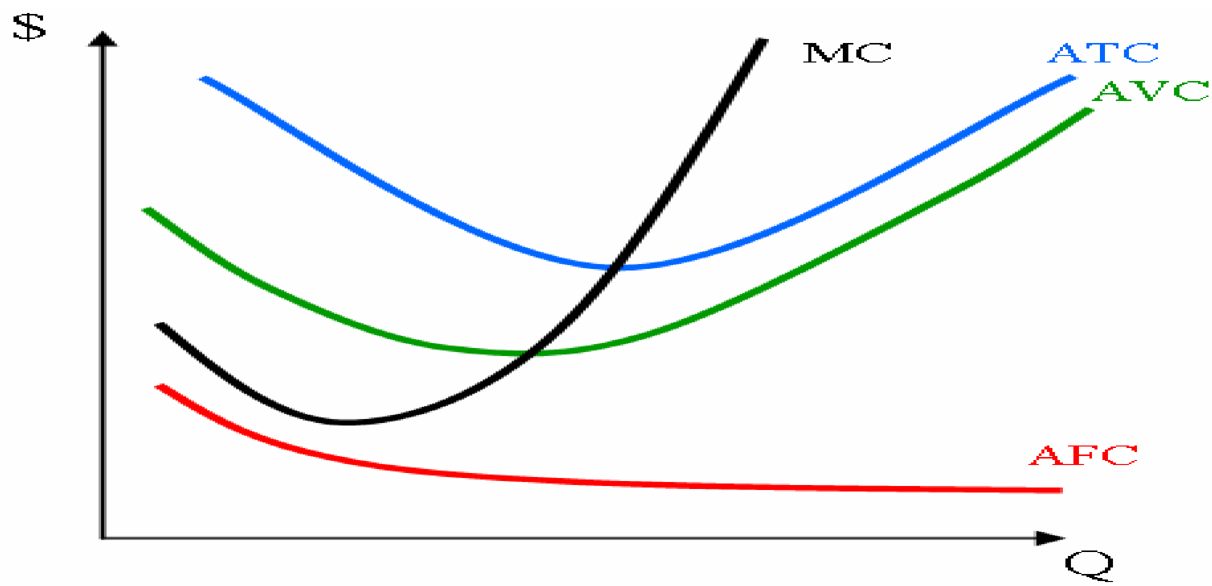
- ✓ Variable cost is the cost that varies with the quantity of output produced.
- ✓ Total variable cost (TVC) curve is inverse- S shaped starting from the origin.

Total Cost (TC) = TFC + TVC



- **Average Cost (AC):**
  - ✓ Average cost is found by dividing total cost (TC) by the level of output, i.e.,

$$TC = TFC + TVC;\ \frac{TC}{Q} = \frac{TFC}{Q} + \frac{TVC}{Q};\ AC = AFC + AVC$$



- **Relationship between TFC and AFC:**
  - ✓ AFC at any point on the TFC curve is the slope of the straight line from the origin to that point.
  - ✓ To a horizontal line of TFC, showing fixed cost, AFC is a rectangular hyperbola showing decreasing fixed cost per unit as output increases.

- **Relationship between TVC and AVC:**
  - ✓ AVC at any point on the TVC curve is the slope of the straight line from the origin to that point on the TVC curve.
  - ✓ As output expands, the value of slope falls continuously until maximum point of AP_L and beyond that the value of slope rises.
  - ✓ The reason behind the shape of both TVC and AVC curves is the law of variable proportions.
  - ✓ To an inverse – S shape of TVC curve, AVC is U- shaped.

- **Relationship between AC and AVC:**
  - ✓ AVC is part of AC given that AC = AFC + AVC.
  - ✓ Both AVC and AC are U- shaped, reflecting the law of variable proportions.
  - ✓ The minimum point of AC occurs to the right of the minimum point of the AVC.

- **Marginal Cost (MC):**
  - ✓ An addition made to the TC or TVC as output is increased by one more units, i.e.,

$$MC = \frac{\partial TC}{\partial X} = \frac{\partial TVC}{\partial X}$$

- **Relationship between TC or TVC and MC:**
  - ✓ MC at any level of output is given by the slope of either the TC or the TVC curve at that level of output.
  - ✓ As output expands the value of slope declines continuously and then rises thereafter.
  - ✓ The reason behind the shape of the MC curve is the law of variable proportions.
  - ✓ To an inverse – S shape of TC or TVC curve, MC is U- shaped.

- **Relationship between AC and MC:**
  - ✓ When MC is falling, MC is below AC.
  - ✓ When AC is rising, then MC is above AC.
  - ✓ When AC is neither falling nor rising, MC is equal to AC.
  - ✓ There is a range over which AC is falling but MC is rising.
  - ✓ MC curve cuts AC curve at its minimum point.

- **Relationship between MC and AVC:**
  - ✓ MC and AVC are the same at the first unit of output.
  - ✓ MC curve passes through the minimum point of both the AVC and the AC curves.
  - ✓ The area under the MC curve gives the TVC.

- **The Long- run Cost Curve:**
  - ✓ Long- run average cost curve is U- shaped envelope curve.
  - ✓ The reason behind the U- shape of the LAC is the laws of returns to scale.
  - ✓ The reason of the LAC curve is an envelope curve is that there is no reserve capacity. It means, each plant size can produce optimally a single level of output.
  - ✓ LAC and LTC are planning curves.
  - ✓ The LTC curve is inverse- S shaped starting from origin.
  - ✓ The LTC curve is an envelope and continuous curve.

- **Relationship between Production Functions and Cost Curves:**
  - ✓ The AVC curve is the monetized mirror image of the AP_L curve and the MC curve is the monetized mirror image of the MP_L.
  - ✓ When AP_L curve rises, AVC curve falls. When AP_L curve is maximum, AVC curve is minimum. When AP_L curve falls, AVC curve rises.
  - ✓ When MP_L curve rises, MC curve falls. When MP_L curve is maximum, MC curve is minimum. When MP_L curve falls, MC curve rises.
  - ✓ Stage II of production- the stage of diminishing returns- begins where MP_L is eventually declining and MC is rising.

- **Shifts in Cost Curves:**
  - ✓ Change in input supply; and
  - ✓ Change in technology.

- **Learning Curve:**
  - ✓ Learning curve shows that a firm learns overtime to absorb new technological information which enhances its efficiency and reduces its cost of production.
  - ✓ Both management and workers gain experience and are able to lower their cost for these reasons:-
    - Speed of workers increases with time;
    - Efficiency of managers in scheduling the production process rises with time;
    - Experience of engineers helps to make cost saving product designs;
    - Better and more specialized tools and plant organization reduces cost;
    - Effective raw material processing by supplier reduces input cost.

• Revenue Curves of the Firm

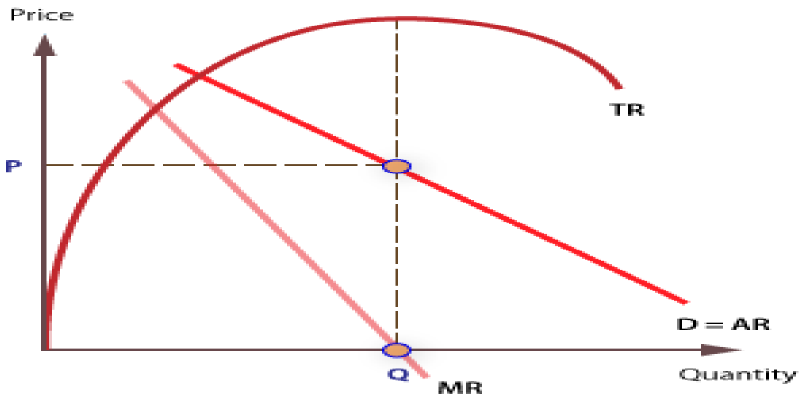
- **Total Revenue (TR):**
- It is the total receipts of a firm from the sale of some given quantities of a product. It can be calculated as the selling price (P) of the firm's product times the quantity sold (Q), i.e. total revenue = price × quantity, or TR = P × Q

- **Average Revenue (AR):**
- Average revenue (AR), is revenue *per unit*. It is found by dividing TR by the quantity sold, Q. AR is equivalent to the price of the product, where P x Q/Q = P, hence AR is also *price*.

- **Marginal Revenue (MR):**
- Marginal revenue (MR) is the revenue generated from selling one extra unit of a good or service. It can be found by finding the change in TR following an increase in output of one unit, i.e., MR = $\frac{\Delta TR}{\Delta Q}$. MR can be both positive and negative.
- **Example:**

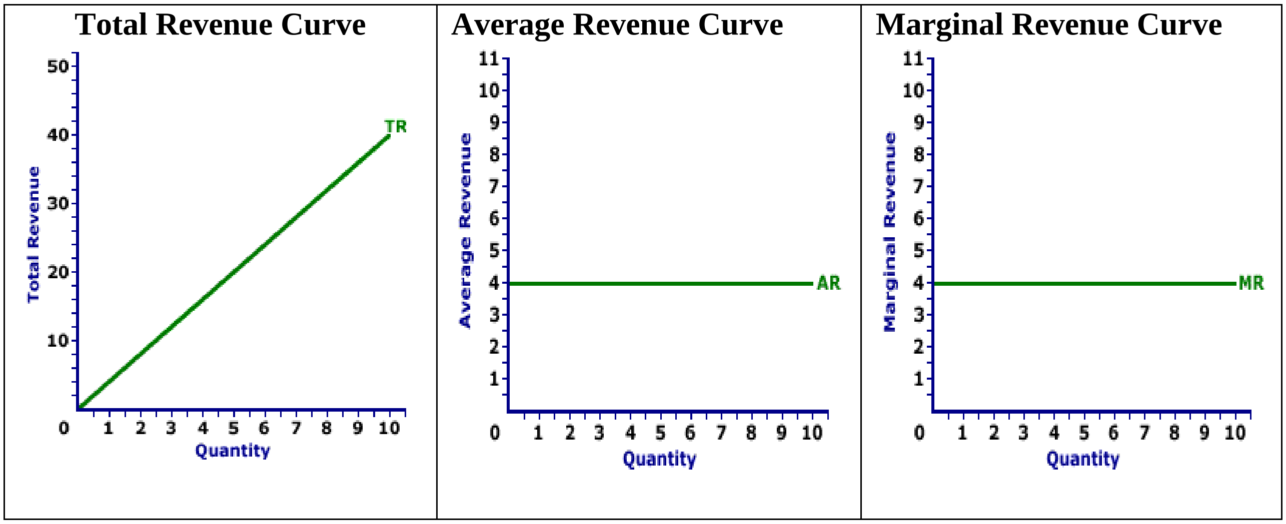
Price (P)	Quantity Sold (Q)	Total Revenue (TR = P×Q)	Average Revenue (AR = $\frac{TR}{Q} = \frac{P\times Q}{Q} =$ **P**)	Marginal Revenue (MR = $\frac{\Delta TR}{\Delta Q}$)
10	1	10	10	

9	2	18	9	8
8	3	24	8	6
7	4	28	7	4
6	5	30	6	2
5	6	30	5	0
4	7	28	4	-2
3	8	24	3	-4
2	9	18	2	-6
1	10	10	1	-8



- **Perfect Competition:**
- Perfect competition is a market structure with a large number of small firms, each selling identical goods. Perfectly competitive firms have perfect knowledge and perfect mobility into and out of the market. These conditions mean perfectly competitive firms are price takers, they have no market control and receive the going market price for all output sold. The following table summarizes the total revenue, average revenue and marginal revenue received by a hypothetical firm.
- **Revenue Curves of the Firm:**

Quantity (Q)	Price (P)	TR = P×Q	AR = $\frac{TR}{Q} = \frac{P \times Q}{Q} = \mathbf{P}$	MR = $\frac{\Delta TR}{\Delta Q}$
0	4	0	4	
1	4	4	4	4
2	4	8	4	4
3	4	12	4	4
4	4	16	4	4
5	4	20	4	4
6	4	24	4	4
7	4	28	4	4
8	4	32	4	4
9	4	36	4	4
10	4	40	4	4



- **Monopoly, Oligopoly, and Monopolistic Competition:**
- For market structures like monopoly, oligopoly, and monopolistic competition that are price makers rather than price takers, total revenue is little different. Although it is calculated as price times quantity, market control means these market structures face negatively-sloped demand curves. As such, the price received is not fixed, but depends on the quantity of output sold.
- The following table summarizes the total revenue, average revenue and marginal revenue received by another hypothetical firm.
- **Demand Curve of the firm:** Since there is a single firm in the industry, the firm's demand curve is the industry's demand curve. The demand curve is downward sloping because monopolist is a price- maker. He cannot fix both price and quantity. If he fixes a high price, less quantity of the good will be demanded. If demand curve is written as:
- P = a – bX, ceteris paribus
- Where

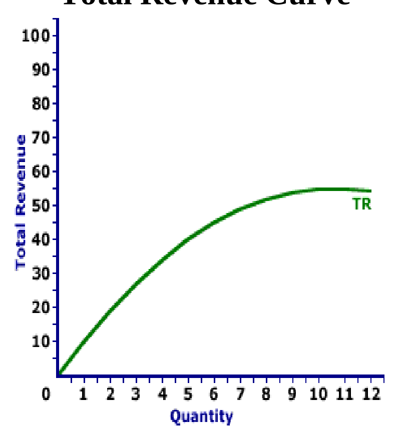
- P = Price;
- a = Intercept of demand curve with price axis;
- b = Slope of the demand curve; and
- X = Level of output
-
- **Total Revenue (TR) Curve:** Total revenue of the firm is equal to price multiplied by output sold. i.e.
- TR = PX
- TR = (a – bX)X
- TR = $aX – bX^2$
- Graphically, the TR curve of the monopolist is inverted U- shaped.

- **Average Revenue (AR) Curve:** Average revenue curve is equal to price i.e.
- $$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P = a - bX$$
- Thus, the AR curve is the demand curve of the monopolist.
- **Marginal Revenue (MR) Curve:** Marginal revenue is defined as the addition made to TR when one more unit of output is sold. That is-
  - $$MR = \frac{\partial TR}{\partial X} = \frac{\partial(aX - bX2)}{\partial X} = a - 2bX$$
- The MR curve for any straight lined AR curve is a straight line which starts at the same point on the vertical axis as the AR curve, but falls at twice the rate. A hypothetical example is shown as follows:

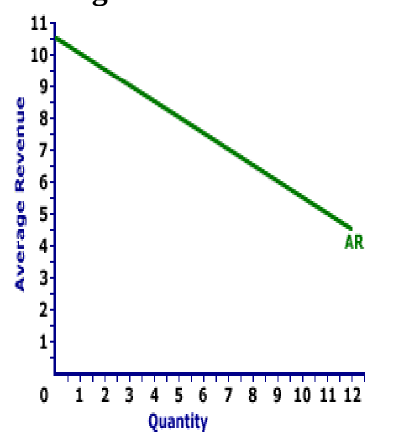
Quantity (Q)	**Price (P)**	**Total Revenue (TR = P×Q)**	**Average Revenue (AR = $\frac{TR}{Q}$ = $\frac{P\times Q}{Q}$ = P)**	**Marginal Revenue (MR = $\frac{\Delta TR}{\Delta Q}$)**
0	10.50	0	10.50	
1	10.00	10	10.00	10
2	9.50	19	9.50	9
3	9.00	27	9.00	8
4	8.50	34	8.50	7
5	8.00	40	8.00	6
6	7.50	45	7.50	5
7	7.00	49	7.00	4
8	6.50	52	6.50	3
9	6.00	54	6.00	2
10	5.50	55	5.50	1
11	5.00	55	5.00	0
12	4.50	54	4.50	-1

-

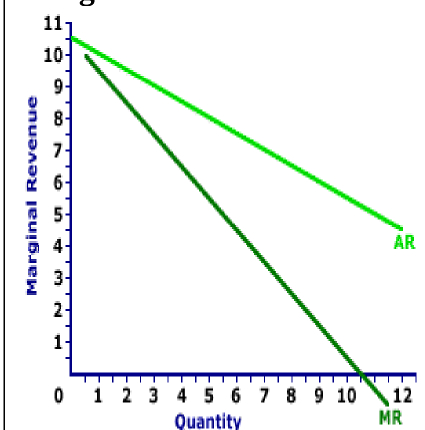
Total Revenue Curve

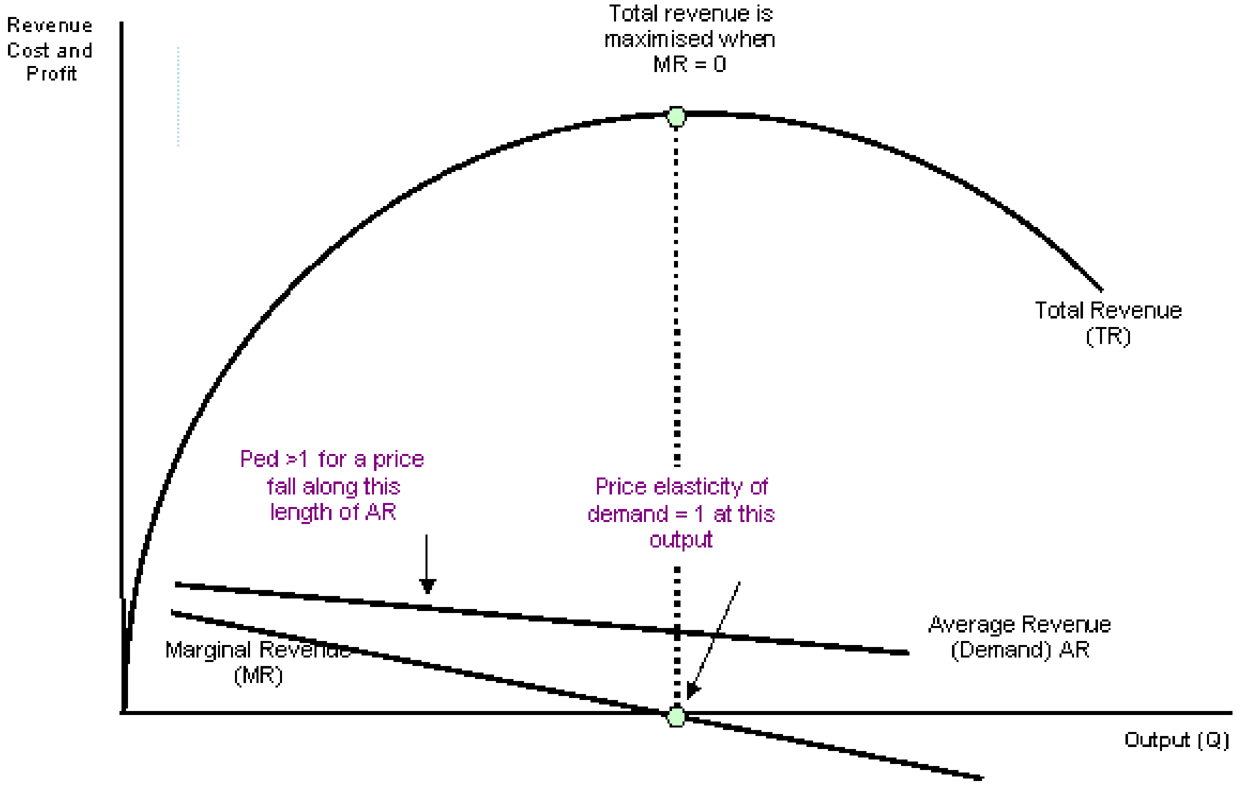


Average Revenue Curve



Marginal Revenue Curve





Revenue
Cost and
Profit
Total revenue is
maximised when
MR = 0
Total Revenue
(TR)
Ped >1 for a price
fall along this
length of AR
Price elasticity of
demand = 1 at this
output
Average Revenue
(Demand) AR
Marginal Revenue
(MR)
Output (Q)

Review Questions

I. **Write *T* for True and *F* for False against each statement:**

1. The cost of a commodity is determined by production function and the price of inputs.
2. *Cost function* shows relationship between total cost and its determinants.
3. The actual expenditure incurred by a firm to purchase or hire the inputs it needs in the production process is called *implicit cost*.
4. Sunk cost is the expenditure that has been incurred and cannot be recovered.
5. TFC curve is a straight line parallel to x- axis.
6. Total variable cost (TVC) curve is inverse- S shaped starting from the origin.
7. AFC is a rectangular hyperbola showing decreasing fixed cost per unit as output increases.
8. The minimum point of AC occurs to the left of the minimum point of the AVC.
9. MC curve cuts AC curve at its minimum point.
10. LAC and LTC are planning curves.

Ques	1	2	3	4	5	6	7	8	9	10
Ans	T	T	F	T	T	T	T	F	T	T

II. **Matching Test:**

A. The actual expenditure incurred by a firm to purchase or hire the inputs:	1. Variable cost
B. The cost of inputs owned by the firm and used by the firm in its own production process:	2. Fixed cost
C. The cost that does not change with change in output:	3. Implicit cost
D. The costs which vary/change with the quantity of output:	4. Explicit cost

I	A	B	C	D
II	4	3	2	1

III. **Multiple Choice Questions:**

1. Cost functions are derived from-
   a. Production function;
   b. Demand function;
   c. Supply function;
   d. None of these.

2. Total cost (TC) is equal to-
   a. TFC + TVC
   b. MC + AC
   c. TFC + MC
   d. TFC + AC

3. Which of the following is rectangular hyperbola-
   a. TFC
   b. TVC
   c. AFC
   d. AVC

4. An addition made to the TC or TVC as output is increased by one more units is called:
   a. AC
   b. MC
   c. AVC
   d. AFC

5. When MC is falling, MC is-
   a. Below AC
   b. Above AC
   c. Equal to AC
   d. All may be possible.

6. MC curve cuts AC curve at its-
   a. minimum point;
   b. Maximum point.
   c. Any point;
   d. Never cuts.

7. Shift in cost curves is/are due to–
   a. Change in input supply;
   b. Change in technology;
   c. a + b
   d. None of these.

Ques	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ans	**a**	**a**	**c**	**b**	**a**	**a**	**c**

IV. Questions with Answer:

Ques: What is cost?

Ans: Cost is defined as the payment made to the factors of production used in the production of the commodity.

Ques: What do you mean by opportunity cost?

Ans: The cost of alternative opportunity sacrificed or given up is known as opportunity cost. For example, a piece of land may be used either for building a residential flat or for constructing a hospital. If the land is used for constructing a hospital then its opportunity cost is the cost of residential flat foregone. It is also known as transfer earnings.

Ques: Differentiate between explicit cost and implicit cost.

Ans: The differences between these costs are as follow:

Explicit Cost	Implicit Cost
The actual expenditure incurred by a firm to purchase or hire the inputs it needs in the production process is called explicit cost.	Implicit cost or imputed cost is the cost of inputs owned by the firm and used by the firm in its own production process.
These include wages, rent, interest payment for power, insurance, advertising, etc.	It includes payment for owned premises, self-invested capital and depreciation of capital equipment.

Ques: What are fixed cost and variable cost?

Ans: **Fixed Cost-** Fixed cost, overhead cost or supplementary cost is the cost that does not change with change in output.

Variable Cost- Variable cost is that costs which vary/change with the quantity of output produced. It is also called prime cost.

Ques: What is marginal cost?

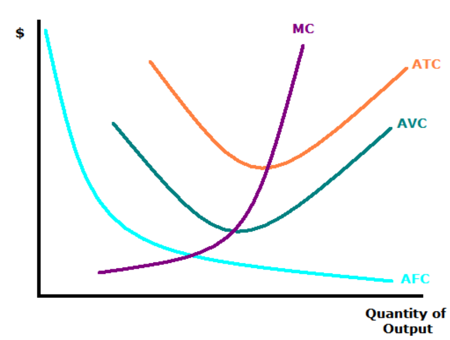
Ans: An addition made to the TC or TVC as output is increased by one more units, i.e.,

$$MC = \frac{\partial TC}{\partial X} = \frac{\partial TVC}{\partial X}$$

Ques: What are the relationships between AC and MC?

Ans: The relationships between AC and MC are as follows:

- ✓ When MC is falling, MC is below AC.
- ✓ When AC is rising, then MC is above AC.
- ✓ When AC is neither falling nor rising, MC is equal to AC.
- ✓ There is a range over which AC is falling but MC is rising.
- ✓ MC curve cuts AC curve at its minimum point.



Ques: What are the relationships between MC and AVC or ATC?

Ans: The relationships between MC and AVC or ATC are as follows:

- ✓ MC and AVC are the same at the first unit of output.
- ✓ MC curve passes through the minimum point of both the AVC and the AC curves.
- ✓ The area under the MC curve gives the TVC.

Ques: Fill up the following costs from the given table-

Units	TFC	TVC	TC	MC	AFC	AVC	ATC
1	100	50					
2						40	
3				30			
4			270				
5							70

Solution:

Units	TFC	TVC	TC	MC	AFC	AVC	ATC
1	100	50	150	----	100	50	150
2	100	80	180	30	50	40	90
3	100	110	210	30	33.3	36.6	69.9
4	100	170	270	60	25	42.5	67.5
5	100	250	350	80	20	50	70

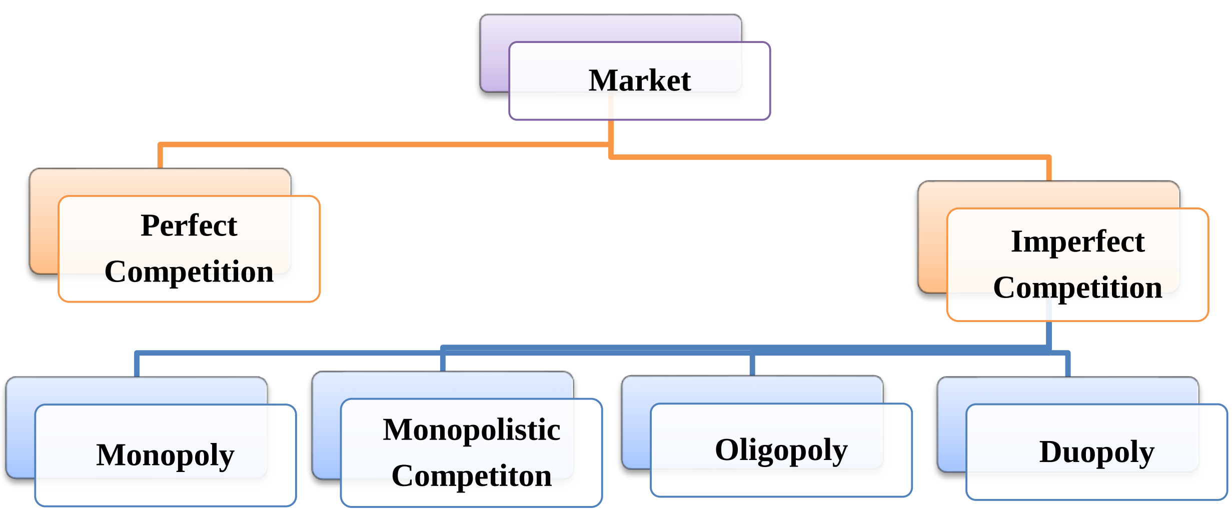
Chapter- 9

Price Determination under Different Market Structures

Definition of Market: **"***Economists understand by the term Market, not any particular market place in which things are bought and sold, but the whole of any region in which buyers and sellers are in such free intercourse with one another that the prices of the same goods tend to equality easily and quickly" (*A. Cournot*).*

Thus, the essentials of a market are: (a) a commodity which is dealt with; (b) the existence of buyers and sellers; (c) a place, be it a certain region, a country or the entire world; and (d) such intercourse between buyers and sellers that only one price should prevail for the same commodity at the same time.

Market Structures: Market structure is best defined as the organizational and other characteristics of a market. It refers to the size and design of the market. It relates to those organizational characteristics of a market which influence the nature of competition and pricing and affect the conduct of the business firms. Market structure commonly called as market is the whole set of conditions under which a commodity is marketed.



The degree of competition among buyers or sellers determines the basic structure of a market. The four most common types of market structures are based on differing numbers of competitors.

- ***Perfect Competition:*** An ideal market characterized by a large number of sellers (buyers, too), such that none is able to influence the price.
- ***Monopolistic Competition:*** A market characterized by a large number of sellers, each with a small degree of control over the price.

- ***Oligopoly:*** A market characterized by a small number of sellers, each with significant control over the price.
- ***Monopoly:*** A market characterized by a single seller that is able to dominate the supply-side of the market.

Three additional, and less well-known, market structures result from different degrees of competition on the demand-side of the market.

- ***Monopsonistic Competition:*** A market characterized by a large number of buyers, each with a small degree of control over the price.
- ***Oligopsony:*** A market characterized by a small number of buyers, each with significant control over the price.
- ***Monopsony:*** A market characterized by a single buyer that is able to dominate the demand-side of the market.

Perfect Competition

Meaning: Perfect competition is a market structure in which there are a large number of price taking firms, selling homogenous product and for whom entry and exit are free. In this market structure there is complete absence of rivalry among individual firm. Perfectly competitive firms have perfect knowledge and perfect mobility into and out of the market. These conditions mean perfectly competitive firms are price takers, they have no market control and receive the going market price for all output sold.

Features/ Characteristics/ Conditions for Perfect Competition:

1. Large number of small firms. *No single buyer or seller can influence the price.*
2. Buyers and sellers deal in *identical* products. No product differences. *(Examples: Salt, Flour, Commodity, Corn)*
3. No Barriers to Entry: Sellers are free to enter the market, conduct business and free to leave the market. (Low cost to enter)
4. Each firm is a *price-taker*.

OR,

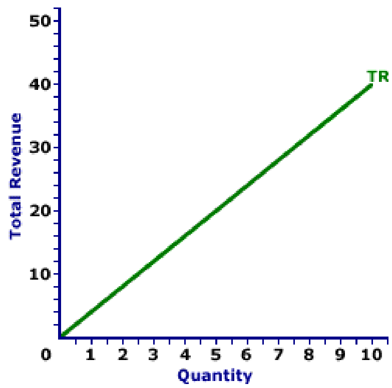
Perfect Competition	
Pure Competition	**Perfect Market**
1. Large number of buyers and sellers	1. Perfect knowledge
2. Homogeneous product	2. Unrestricted mobility of resources.
3. Free entry and exit of firms	
4. Goal is profit maximization	
5. No intervention by the government	

Revenue Curves of the Firm:

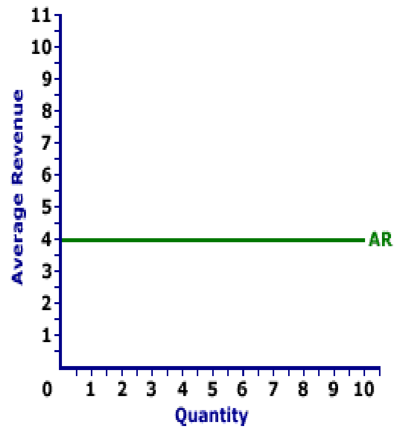
Quantity (Q)	Price (P)	TR = P×Q	AR = $\frac{TR}{Q} = \frac{P \times Q}{Q} = \mathbf{P}$	MR = $\frac{\Delta TR}{\Delta Q}$
0	4	0	4	

1	4	4	4	4
2	4	8	4	4
3	4	12	4	4
4	4	16	4	4
5	4	20	4	4
6	4	24	4	4
7	4	28	4	4
8	4	32	4	4
9	4	36	4	4
10	4	40	4	4

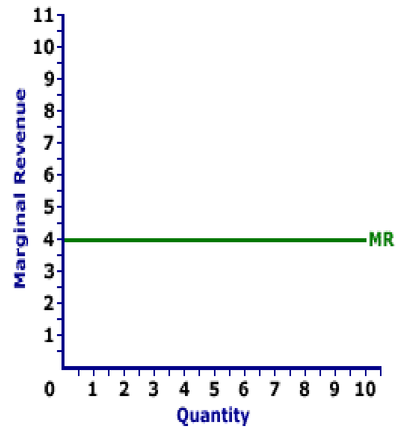
Total Revenue Curve



Average Revenue Curve



Marginal Revenue Curve



Equilibrium of the Firm in the Short- Run:

All firms aim to maximize their profits. The equilibrium of the firm can be studied under two principles:

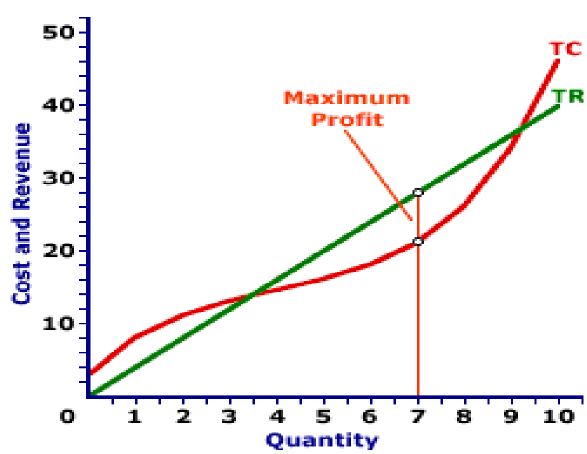
I. The Total Principle; and
II. The Marginal Principle.

The Total Principle:

The firm will be in equilibrium when it maximizes its total profits.

Profit is the difference between total revenue (TR) and total cost (TC). In other words, Profit = TR – TC

Firms will be in short- run equilibrium where they get maximum profits as shown in the figure.



The Marginal Principle:

The firms will be in equilibrium when they fulfill two marginal conditions:

i. MR = MC; and
ii. MC curve cuts the MR curve from below or the slope of MR < Slope of MC.

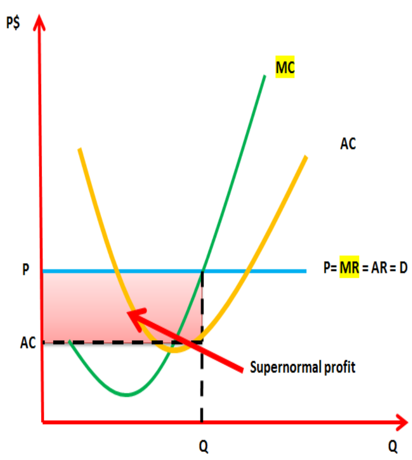
In perfect competition, since MR curve is a horizontal line its slope will be equal to zero. Hence, slope of MC > 0.

Price and Output in the Short- Run:

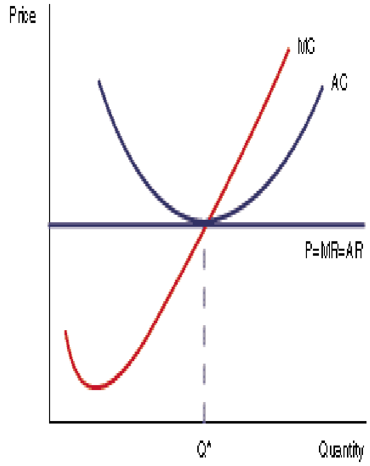
The firm under the perfect competition in short run may face supernormal profit, normal profit, losses, break- even point situation and shut- down situations. The conditions for these situations are given below:

Short- Run Situations	Conditions
1. Super Normal Profit	P = AR = MR = MC & P > AC
2. Normal Profit	P = AR = MR = MC = AC
3. Losses	P = AR = MR = MC & P < AC
4. Break- even Point Situation (No profit no loss)	TR = TC or, AR = AC, or, P = AC
5. Shut- down Point Situation	P = MC =AVC

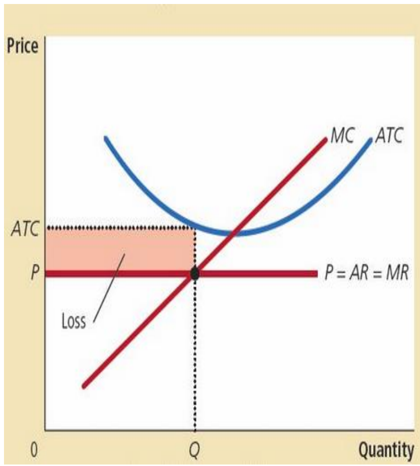
Super Normal Profit



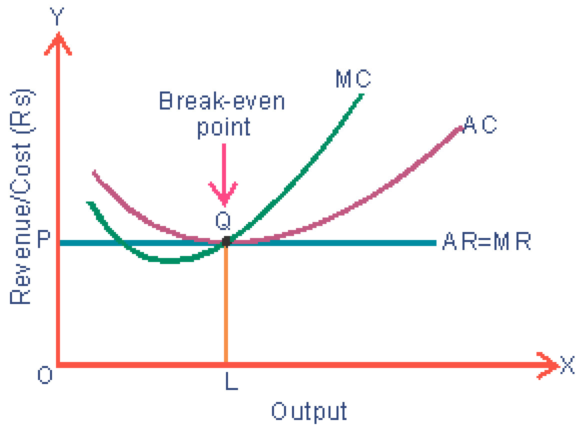
Normal Profit

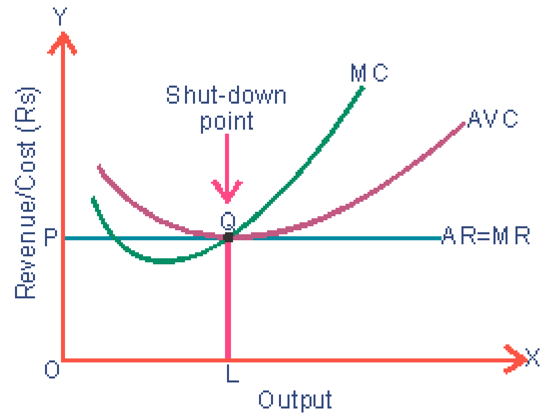


Losses



Break- even Point Situation **Shut- down Point Situation**

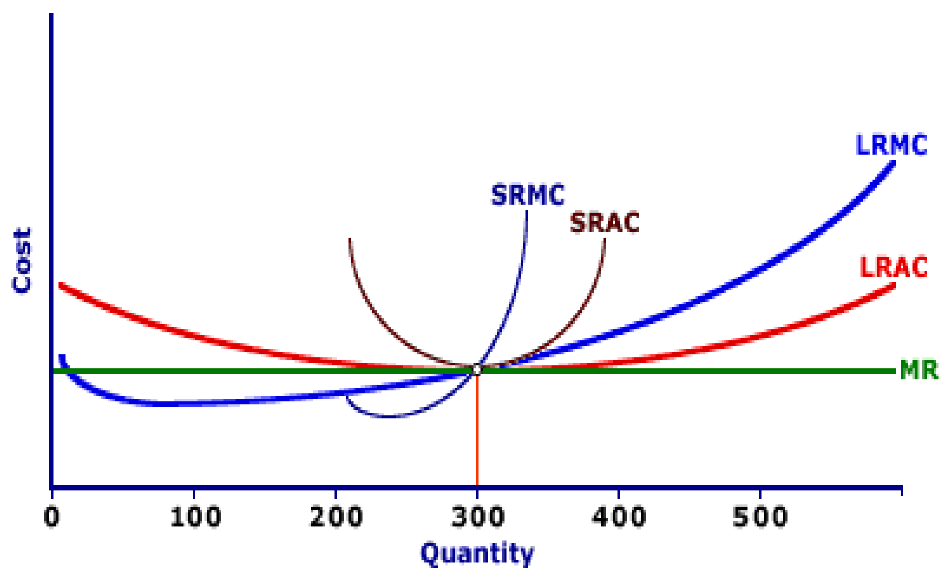




Long- Run Price and Output Determination under Perfect Competition:

The firm's long- run equilibrium conditions are:

1. P = MR = SRMC = LRMC = LRAC = SRAC and LRMC is rising or price of the product is such that quantity supplied by market equals quantity demanded by consumers;
2. All firms in the industry are maximizing profit;
3. No firm has an incentive to enter or leave the industry as all firms are earning zero economic profit.



Example: The cost equation for salt industry is $C_1 = 75Q_1 - 8Q_1^2 + Q_1^3 - 85$. It sells in a perfectly competitive market. The salt industry's demand and supply curves are Q = 360 – 2P and Q = 10 + 3P respectively. Here P and Q are the price and quantity demanded/ supplied and C1 and Q1 are the total cost and quantity supplied by the firm. Find out the:

a. Equilibrium price and quantity of salt;
b. Profit maximizing output of salt; and
c. Profit made by salt industry in the short- run.

Solution:

a. We know that in a perfectly competitive market, the point of intersection of the industry demand and supply curves determines the equilibrium price and quantity for a product.
   Given that
   Industry demand, $Q = 360 - 2P$
   Industry supply, $Q = 10 + 3P$
   Equating these industry demand and industry supply equations, we get

$$360 - 2P = 10 + 3P$$
$$5P = 350$$

   Hence, $$P = 70$$

Now, substituting this value of P in either of these two equations, we get the value of Q,

$$Q = 10 + 3P$$

$$Q = 10 + 3\times70$$

$$Q = 220$$

Thus, the equilibrium price and quantity of salt are SR 70 and 220 kg respectively.

b. For a firm in a perfectly competitive market, the price of its product has to be taken as given by the market. If P_1 is the price of salt of the Salt Industry, then
   P_1 = SR 70/kg
   Total Revenue, $TR = P_1.Q_1 = 70Q_1$
   The profit of salt industry is given by
   $\pi = TR - TC$
   $= 70Q_1 - (75Q_1 - 8Q_1^2 + Q_1^3 - 85)$

   $= 70Q_1 - 75Q_1 + 8Q_1^2 - Q_1^3 + 85$

   $= - Q_1^3 + 8Q_1^2 - 5Q_1 + 85$

The necessary condition for profit maximization is,

$$\frac{d\pi}{dQ1} = 0$$

i.e.

$$\frac{d\pi}{dQ1} \; (-\,Q_1^3 + 8Q_1^2 - 5Q_1 + 85) = 0$$

$$-3Q_1^2 + 16Q_1 - 5 = 0$$
$$3Q_1^2 - 16Q_1 + 5 = 0$$
$$3Q_1^2 - 15Q_1 - Q_1 + 5 = 0$$
$$3Q_1\,(Q_1 - 5) - 1(Q_1 - 5) = 0$$

$$Q_1 = 1/3 \text{ and } 5$$

Assuming the quantity to be an integer value

$$Q_1 = 5$$

The secondary condition of $\frac{d2\pi}{dQ12}$ < 0 is also true.

Thus the profit maximizing output is 5 kg.

c. Profit made by salt industry in the short- run is:

$$\pi = -\,Q_1^3 + 8Q_1^2 - 5Q_1 + 85$$

$$= -\,(5)^3 + 8\,(5)^2 - 5 \times 5 + 85$$

$$= -\,125 + 200 - 25 + 85$$

$$= \text{SR } 135.$$

Monopoly Market

Meaning: Monopoly is a market structure in which there is a single firm producing all the output in a particular market and there are high barriers to entry. Monopoly market is exact opposite to perfect competitive market.

Features/ Characteristics/ Conditions for Monopoly:

1. A single firm- price maker *(set their own price, without regard to supply and demand)*;
2. No close substitute goods are available;
3. High barriers to entry;
4. Goal is profit maximization;
5. Perfect knowledge

Causes of Monopoly:

1. Control of resources;
2. Control process of production;
3. Economies of scale; legal barriers.

Types of Monopoly: There are two types of monopoly:

1. *Simple monopoly:* this is a market structure where the monopolist charges a uniform price from all consumers. It is also called pure monopoly.
2. *Discriminating monopoly:* this is a market structure where the monopolist charges different prices from different consumers or charges different prices on different units sold to the same consumer.

Demand and Revenue Curves of the Firm (Monopoly):

Demand Curve of the firm: Since there is a single firm in the industry, the firm's demand curve is the industry's demand curve. The demand curve is downward sloping because monopolist is a price- maker. He cannot fix both price and quantity. If he fixes a high price, less quantity of the good will be demanded. If demand curve is written as:

P = a – bX, ceteris paribus

Where

P = Price;
a = Intercept of demand curve with price axis;
b = Slope of the demand curve; and
X = Level of output

Total Revenue (TR) Curve: Total revenue of the firm is equal to price multiplied by output sold. i.e.

$$TR = PX$$
$$TR = (a - bX)X$$
$$TR = aX - bX^2$$

Graphically, the TR curve of the monopolist is inverted U- shaped.

Average Revenue (AR) Curve: Average revenue curve is equal to price i.e.

$$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P = a - bX$$

Thus, the AR curve is the demand curve of the monopolist.

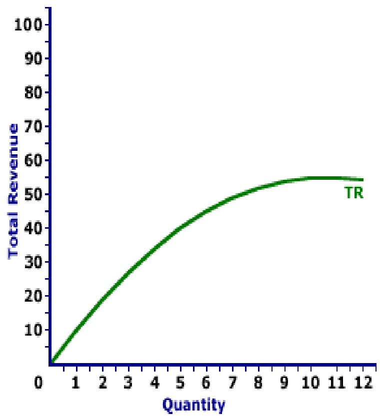
Marginal Revenue (MR) Curve: Marginal revenue is defined as the addition made to TR when one more unit of output is sold. That is-

$$MR = \frac{\partial TR}{\partial X} = \frac{\partial (aX - bX2)}{\partial X} = a - 2bX$$

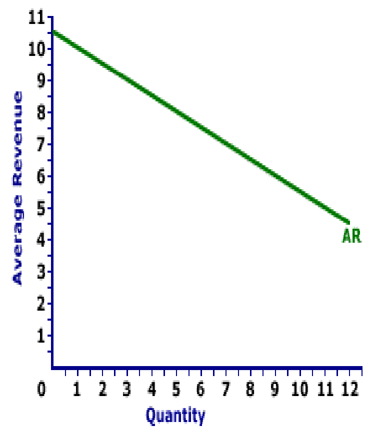
The MR curve for any straight lined AR curve is a straight line which starts at the same point on the vertical axis as the AR curve, but falls at twice the rate. A hypothetical example is shown as follows:

Quantity (Q)	**Price (P)**	**Total Revenue (TR = P×Q)**	**Average Revenue (AR = $\frac{TR}{Q}$ = $\frac{P \times Q}{Q}$ = P)**	**Marginal Revenue (MR = $\frac{\Delta TR}{\Delta Q}$)**
0	10.50	0	10.50	
1	10.00	10	10.00	10
2	9.50	19	9.50	9
3	9.00	27	9.00	8
4	8.50	34	8.50	7
5	8.00	40	8.00	6
6	7.50	45	7.50	5
7	7.00	49	7.00	4
8	6.50	52	6.50	3
9	6.00	54	6.00	2
10	5.50	55	5.50	1
11	5.00	55	5.00	0
12	4.50	54	4.50	-1

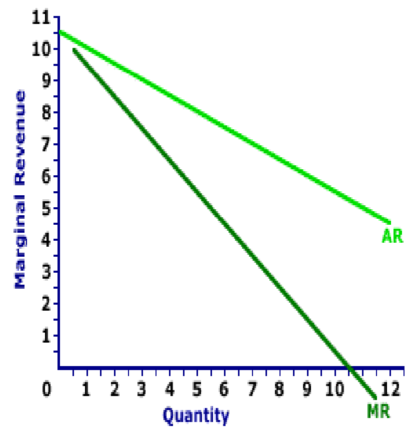
Total Revenue Curve

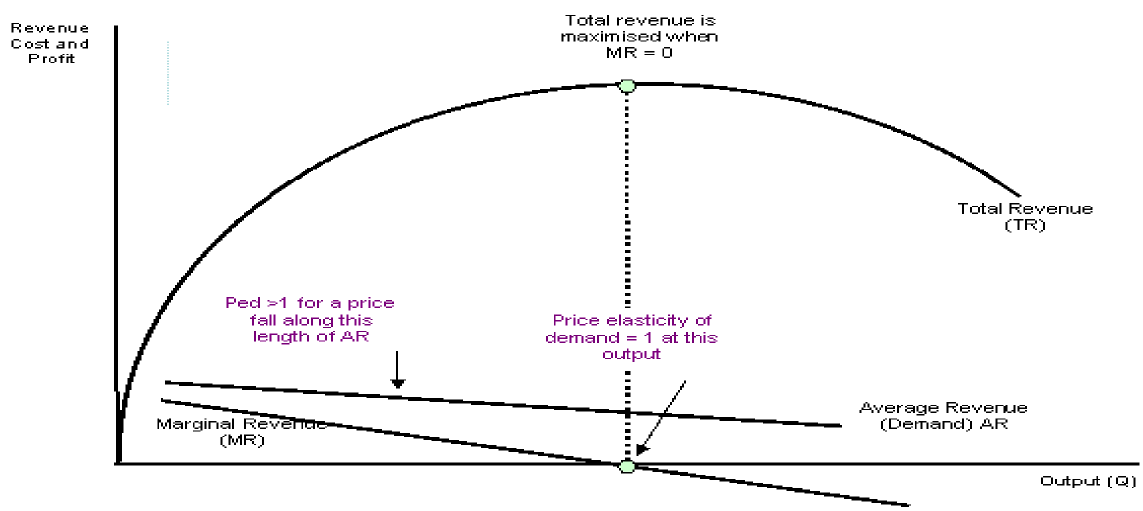


Average Revenue Curve



Marginal Revenue Curve



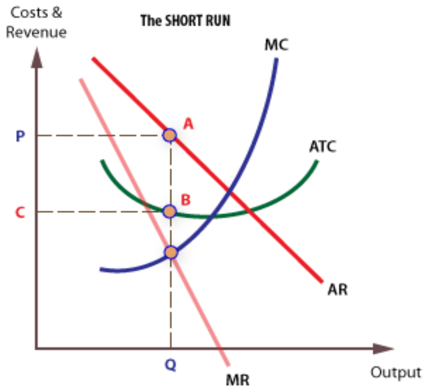


Short-Run Equilibrium in Monopoly: There are two conditions for equilibrium of the monopoly firm in the short- run:

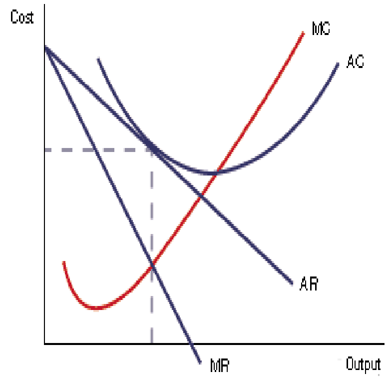
1. MR = MC; and
2. Slope of MR < Slope of MC (Or MC curve cuts MR curve from below).

Short- Run Situations	Conditions
1. Super Normal Profit	MR = MC; MC cuts MR from below & P > AC
2. Normal Profit (Break-even point)	MR = MC; MC cuts MR from below & P = AC Or, TR = TC or, AR = AC
3. Losses	MR = MC; MC cuts MR from below & P < AC

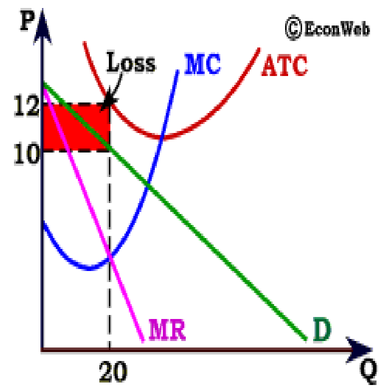
Supernormal Profit



Normal Profit- Break- even



Losses

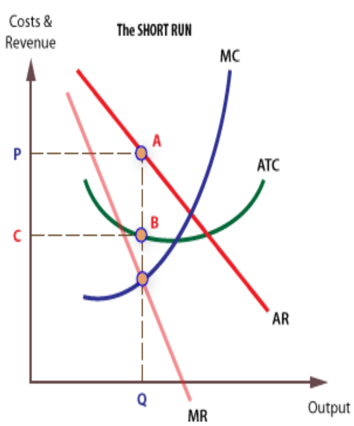


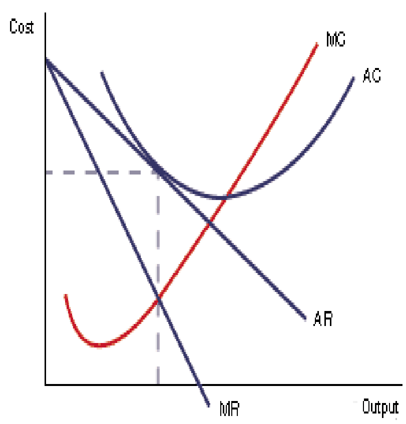
Long Run Equilibrium under Monopoly:

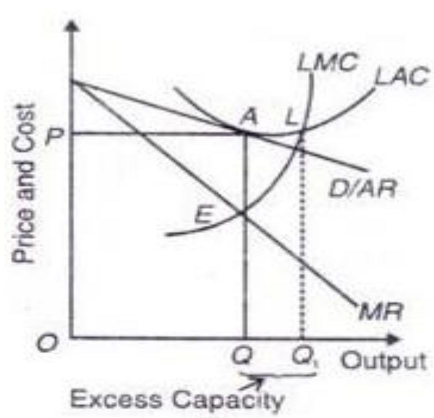
Since there are barriers to entry, new firm cannot enter the industry. Thus, monopolist can continue to earn supernormal profits or at least normal profits in the long- run. He can even increase supernormal profits through technological innovations or upgradations. He will not stay in business if he makes losses in the long- run.

The long- run equilibrium conditions are:

MR = MC
P > MC, and
P > AC







Example: *Let the cost of production of monopoly firm be given as $C = 80 + Q^2$ and demand be $P = 40 – Q$. Find the profit maximizing level of output and price.*

Solution: Since total cost is given as:

$$C = 80 + Q^2$$

$$AC = \frac{TC}{Q} = \frac{80+Q2}{Q} = \frac{80}{Q} + Q$$

And $$MC = \frac{\Delta TC}{\Delta Q} = 2Q$$

Since demand is given as:

$$P = 40 – Q$$

Hence, $$TR = P\times Q = (40- Q)\times Q = 40Q – Q^2$$

And, $$MR = \frac{\Delta TR}{\Delta Q} = 40 -2Q$$

Profit maximization situation will be there where:

$$MR = MC$$

Hence, $$40 -2Q = 2Q$$

$$\Rightarrow Q = 10$$

Thus profit maximizing level of output 10 units and profit maximizing price is P = 40 – 10 = SR 30.

Monopoly Power: Ability of a seller (monopolist) to affect the price of a commodity. There is no unique supply curve for the monopolist. It is in sharp contrast to perfect competition where there is a unique relationship between price and output supplied.

Under perfect competition at equilibrium situation:

P = Demand curve = AR =MR

And MR = MC

Therefore, P= MC

This gives a unique supply curve of a perfectly competitive firm derived from its MC curve.

Under monopoly at equilibrium point:

P = Demand curve = AR > MR

And, MR = MC

Therefore, P > MC

The difference between price and marginal cost (P - MC) is called degree of monopoly or monopoly power. It has been proposed by A. Lerner who pointed out that firm being a price-maker under monopoly, always sets a price which is higher that the marginal cost unlike perfect competition wherein price is invariably equal to marginal cost.

Larger the gap between price and marginal cost, greater is the monopoly power. Thus, according to Lerner's measure, the degree of monopoly power depends on the price elasticity of demand (e_p). i.e.

Lerner's Index of Monopoly Price, L = $\frac{P-MC}{P} = \frac{1}{ep}$

The index varies between zero and one. Lerner's monopoly power is the inverse of the price elasticity of demand. This relationship gives a rule of thumb for pricing. $(\frac{P-MC}{P})$ is the mark- up over marginal cost as a percentage of price. This equation shows that lower the elasticity of demand, greater is the degree of monopoly (monopoly power), i.e., inelasticity implies less competition from substitutes and more difference between P and MC.

Example: *Calculate price that should be charged by the monopolist when elasticity of demand is (-)2 and MC is SR 20 per unit.*

Solution: Price that should be charged by the monopolist can be calculated by Lerner's Index:

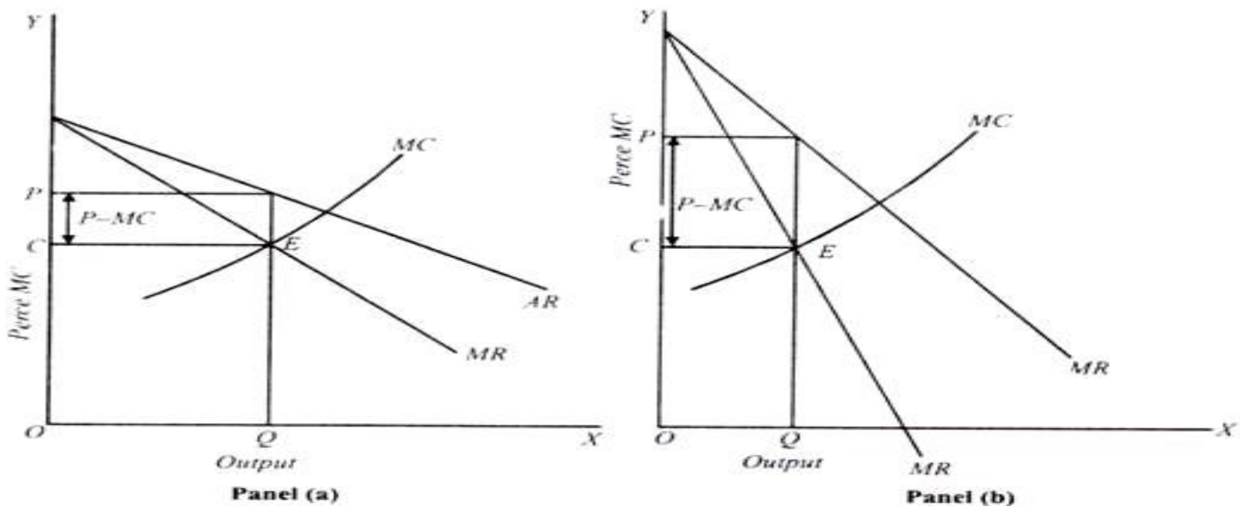
P = $\frac{MC}{1-1/ep} = \frac{20}{1-1/2}$ = SR 40 per unit.

Example: *Calculate price that should be charged by the monopolist when elasticity of demand is (-)5 and MC is SR 20 per unit.*

Solution: Price that should be charged by the monopolist can be calculated by Lerner's Index:

P = $\frac{MC}{1-1/ep} = \frac{20}{1-1/5}$ = SR 25 per unit.

From the above two examples, it is clear that when elasticity of demand is more, then price will be close to marginal cost. This is also clear from the following figure.



Differences between Perfect Competition and Monopoly:

Basis	Perfect Competition	Monopoly
Assumptions:	Large number of buyers & sellers; Homogeneous products; Free entry & exit.	Only one seller; No close substitutes; Barriers to entry.
Shape of Demand & Revenue Curves:	The perfectly competitive firm is a price- taker. So, demand curve is infinitely elastic or horizontal line. TR curve is upward straight line passing through the origin and increasing in the same proportion as sales, AR and MR curves coincide with the horizontal demand curve.	The monopoly firm is a price- maker. So, demand curve is downward sloping or generally inelastic. Total revenue curve is inverted U- shaped. AR curve is demand curve and MR curve starts from the same point as the AR curve but falls at twice the rate.
Policy Variables:	Under perfect competition, a firm is just a quantity adjuster. No advertising and other selling activities are possible.	In monopoly, the monopolist can determine either output or price but not both. Advertising and other selling activities are possible.
Equilibrium Conditions:	The firm's short- run equilibrium conditions are same under both the market- perfect competition and monopoly: **MR = MC** (*necessary condition*), and **Slope of MC > Slope of MR** (*sufficient condition*) But equilibrium condition in the long- run will be: MR = MC; P = AC; and P = MC	The firm's short- run equilibrium conditions are same under both the market- perfect competition and monopoly: **MR = MC** (*necessary condition*), and **Slope of MC > Slope of MR** (*sufficient condition*) But equilibrium condition in the long- run will be: MR = MC; P > AC; and P > MC

Profit:	No supernormal profits in the long-run.	Supernormal profits are generally earned both in the short run and the long- run. Profits are higher under monopoly than in perfect competition.
Allocation of Resources:	Optimal allocation of resources is possible as P = MC.	But since P > MC, so, allocation of the available resources is sub- optimal. Thus, there is loss of social welfare under monopoly.
Excess Capacity:	No excess capacity exist because each firm produces at the minimum point of the LAC curve.	Excess capacity may or may not exist.
Derivation of the supply curve:	There is unique supply curve derived from the MC curve.	No unique supply curve can be derived from monopolist's MC curve.
Price Discrimination:	Since demand curve is infinitely elastic so the firm charges uniform price from all the consumers.	The monopoly firm can practice price discrimination. He can sell the same commodity at different prices to different consumers.
Price and Output:	Equilibrium price is lower and output is higher than monopoly.	Equilibrium price is higher and output is lower than perfect competition.

Price Discrimination

Meaning:

Price discrimination is the practice of charging different prices from different consumers for the same good or service at the same time. When the monopoly firm practices price discrimination, it is called discriminating monopoly.

In price discrimination, the products are basically the same but the producers convince the consumers that the products are different on the basis of different brand name, different packaging, and different binding of the same product. The cost of production is either the same or it differs by a small margin.

Here we will deal with identical products, produced under same cost and sold at different prices to different consumers.

Conditions for Price Discrimination:

There are three conditions for implementation of price discrimination. These three conditions are:

1. There should be monopoly or other forms of imperfect competition in the market. Price discrimination cannot be implemented under perfect competition.
2. There should be two or more markets which can be separated and can be kept separate.

3. The elasticity of demand in these two or more markets be different. If coefficient of price elasticity of demand is same in all markets, then price discrimination cannot be implemented. *Market with higher elasticity will have lower price and vice versa.*

Degrees of Price Discrimination:

Prof. A. C. Pigou has differentiated three types of price discrimination in his book *The Economics of Welfare* (1920). The three types or three degrees of price discriminations are as follows:

First Degree Price Discrimination:

In the first degree, the monopolist behaves as if he has sold each unit of the commodity separately to consumers and charged the maximum price (*reservation price*) he could obtain for each unit.

In the first degree price discrimination, the monopolist is able to extract all of the consumer surplus from consumers. In other words, in the first degree price discrimination, consumer surplus become zero.

The discriminating monopolist negotiates individually with each consumer and charges maximum price he is willing to pay. This is "*take- it- or- leave it*" price discrimination and is, therefore, called *perfect price discrimination*.

First degree price discrimination is rare in the real world. If a monopolist wants to practice it, he must have exact knowledge of the demand curve facing his product and charge exactly the same amount, the consumer is willing to pay. Firms usually do not know the *reservation price* of every consumer.

Second Degree Price Discrimination:

In second degree, the discriminating monopolist sets a uniform price per unit for specific quantity of a commodity, a lower price per unit for a specific additional quantity of the commodity and so on.

In this case, the discriminating monopolist is able to extract a large part of the consumer surplus.

It is also called non- linear pricing since price per unit of output is changing depending on how much is bought.

Second degree price discrimination is fairly common in the real world. For example, public utilities like electricity supply and telephone company practice second degree price discrimination.

Third Degree Price Discrimination:

When the monopolist charges different prices for the same commodity in different markets or groups, it is called third degree price discrimination. To practice the third degree, the monopolist must be able to separate markets or groups and charge them different prices depending on their coefficient of price elasticity of demand.

In the third degree, the monopolist is able to extract a part of consumer surplus.

Third degree is a normal form of price discrimination which is fairly common. For example, electricity power companies charge higher rates from industrial and commercial users and lower rates from residential areas.

Example: Assume that the total demand is $Q = 50 – 0.5P$ (or $P = 100- 2Q$). Assume further that the demand functions of separated markets are:

$$Q_1 = 32 – 0.4P_1 \text{ or } P_1 = 80 – 2.5Q_1$$
$$Q_2 = 18 – 0.1P_2 \text{ or } P_2 = 180 – 10Q_2$$

(Clearly $Q_1 + Q_2 = Q$)

Finally, assume that the cost function is

$$C = 50 + 40Q = 50 + 40(Q_1 + Q_2)$$

Find out the equilibrium price, output and profit of the discriminating monopolist.

Solution:

$$TR_1 = P_1Q_1 = Q_1(80 – 2.5Q_1) = 80Q_1 – 2.5Q_1^2$$

$$MR_1 = \frac{\partial TR1}{\partial Q1} = 80 – 5Q_1$$

Similarly,

$$TR_2 = P_2Q_2 = Q_2(180 – 10Q_2) = 180Q_2 -10Q_2^2$$

$$MR_2 = \frac{\partial TR2}{\partial Q2} = 180 -20Q_2$$

Total Cost, $TC = 50 + 40Q$

$$MC = \frac{\partial TC}{\partial Q} = 40$$

Setting the MR in each market equal to the common MC, we obtain

$$80 – 5Q_1 = 40$$

$$Q_1= 8$$

$$180 -20Q_2 = 40$$

$$Q_2 = 7$$

Therefore, equilibrium level of output, $Q = Q_1 + Q_2 = 8 + 7 = 15$ units.

The prices are

$P_1 = 80 – 2.5Q_1 = 80 – 2.5×8 = 60$ and

$P_2 = 180 – 10Q_2 = 180 - 10×7 = 110$

Therefore, equilibrium prices will be SR 60 and SR 110 per unit in the two separate markets.

And, profit will be

$\Pi = TR_1 + TR_2 – TC$

$= (P_1Q_1 + P_2Q_2) – (50 + 40Q)$

$= (60×8 + 110×7) – (50 + 40×15)$

$= (480 + 770) – 650$

= SR 600

Monopolistic Competition

Introduction:

Perfect competitive market and monopoly market are two extreme market situations which are not found in real world. Economists argued that the real market situations lay between perfect competition and pure monopoly. In 1933, two books- *The Theory of Monopolistic Competition* by E. H. Chamberlin and *The Economics of Imperfect Competition* by Mrs. Joan Robinson, were published.

Meaning:

The market situation in which there is many firms who are selling closely related (substitute) but differentiated products then this form of market is called monopolistic competitive market. Here product differentiation means that a consumer can distinguish the product of one producer from that of the other producer. In monopolistic competitive market, some features/ characteristics of both- perfect competition and monopoly are found.

It is the most prevalent market organization in the manufacturing sector. In most of the manufacturing industries, firms sell differentiated products. In other words, products are neither homogeneous nor perfect substitutes but are differentiated and close substitutes. For example- cars, television sets, refrigerators, cigarettes, soaps, tooth pastes, etc.

The Characteristics of Monopolistic Competition:

1. Large number of large companies (but fewer than perfect competition). Sellers can influence the price through creating a product identity.

2. Products are not exactly identical, but very similar, so companies use product differentiation
3. *Heavy Competition:* Firms must remain aware of their competitor's actions, but they each have some ability to control their own prices.
4. *Low Barriers to Entry:* harder to get started because of the amount of competition.
5. Monopolistic competition takes its name and its structure from elements of monopoly and perfect competition.

The key idea to understanding monopolistic competition is that firms sell products that are similar, but not exactly alike. *Example:* Hand Soap, Toothpaste, Cold drink

1. Essentially, all hand soaps are the same. Yet firms can create a brand identity that separates their hand soap from their competitor's.
2. This brand identity can be formed through *packaging*, *product support*, and *especially advertising*.
3. If effective, consumers will positively identify a certain brand and purchase it even if hand soap costs more.

The point is that firms in monopolistic competition must use product differentiation & non-price competition to sell their products.

Product Differentiation:

1. The real or imagined differences between competing products in the same industry.
2. Differences may be real or imagined

Differentiation may be color, packaging, store location, store design, store decorations, delivery, and services.

Non-Price Competition:

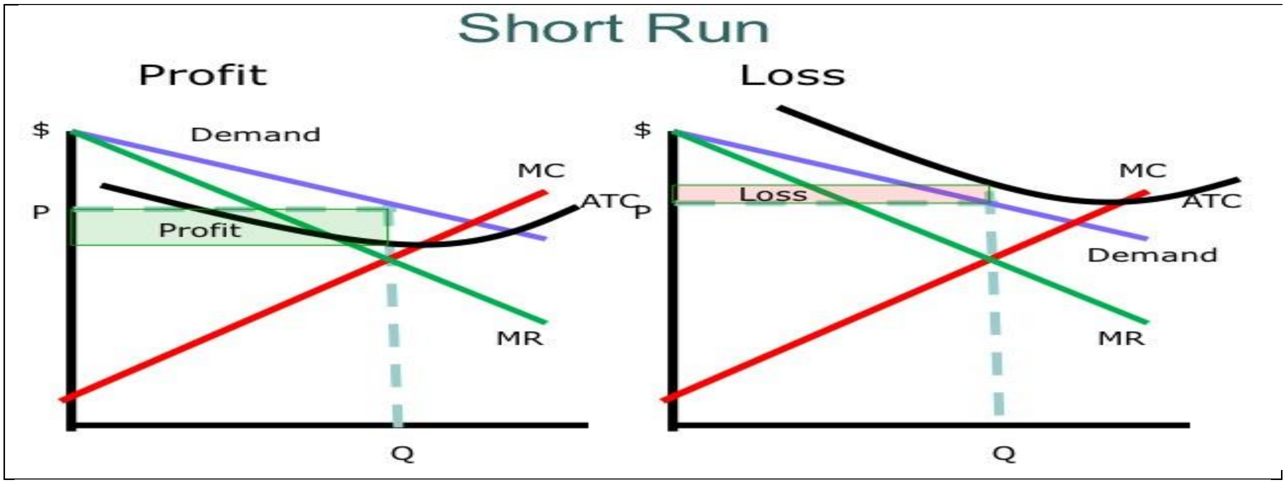
1. *Non-Price Competition* involves the advertising of a product's appearance, quality, or design*, rather than its price*.

2. Advertising to help the consumer believe that this product is different and worth more money.

Conditions of Monopolistic Competition: There are two conditions for equilibrium of the monopolistic firm in the short- run:

1. MR = MC; and
2. Slope of MR < Slope of MC (Or MC curve cuts MR curve from below).

Short- Run Equilibrium in Monopolistic Competition:



Long- Run Equilibrium in Monopolistic Competition: The long- run equilibrium conditions are-

MR = MC, and
AR = AC

Excess capacity is a long run concept. It is the difference between ideal output (least cost output corresponds to the minimum point on the LAC curve) and profit maximizing level of output (corresponds to that point where MR = MC). This excess capacity is not found in perfect competition but it always exists in monopoly and monopolistic competition.

Example: *Given the market demand curve X = 200 – 0.5P. Find out:*

a) *Proportionate demand curve when there are 5 firms in the industry.*
b) *What is the relationship between elasticity of the market demand and the elasticity of the proportionate demand?*

Solution:

Market demand curve is X = 200 – 0.5P

a) Proportionate demand curve is the curve which is obtained after all the firms in the group have made adjustments. Each firm's market share is identical. Thus, if there are 5 firms, then proportionate demand curve is obtained by dividing the group demand by the number of firms.

Hence, proportionate demand curve, $x = \frac{X}{5} = \frac{200}{5} - \frac{0.5P}{5} = 40 - 0.1P$

b)

Assumed price	**Market Demand Curve** ***X = 200 – 0.5P***	**Proportionate Demand Curve** ***x = 40 – 0.1P***
P = 10 P = 9	X = 195 X = 195.5	*x* = 39 *x* = 39.1
ΔP = 1	**Δ**X = 0.5	**Δ***x* = 0.1

Now, applying the elasticity formula, we obtain

e_p (*elasticity of the market demand*) $= \frac{\Delta X}{\Delta P} \cdot \frac{P}{X} = \frac{0.5}{1} \cdot \frac{10}{195} = 0.025$

e_p (*elasticity of the proportionate demand*) $= \frac{\Delta x}{\Delta P} \cdot \frac{P}{x} = \frac{0.1}{1} \cdot \frac{10}{39.1} = 0.025$

Thus, elasticity of market demand is equal to the elasticity of proportionate demand.

Example: *Given the market demand curve Q = 200 – 4 P.*

a. Find the proportionate demand curve when there are 20 firms in the group.
b. What is the relationship between elasticity of the market demand and the elasticity of the proportionate demand?

Solution:

Example: the long- run proportional demand curve is given as $P = 36 - 2Q$ and the firm's average cost curve as $AC = Q^2 - 22Q + 136$. Calculate:

a. Long- run equilibrium price and output for the monopolistically competitive firm.
b. Firm's profit in the long- run.

Solution:

a. In the long- run, the firm's demand curve (dd) is tangent to the LAC curve such that
   $P = LAC$
   Or, $P = Q^2 - 22Q + 136$
   The proportional demand curve (DD) also passes from the tangency between dd and the LAC curve. Thus,
   $P = 36 - 2Q = Q^2 - 22Q + 136$
   ⇨ $Q^2 - 20Q + 100 = 0$
   ⇨ $(Q - 10)^2 = 0$
   ⇨ $Q = 10$

Thus, profit maximizing output is 10 units. Profit maximizing price is;

$P = 36 - 2Q$

⇨ $P = 36 - 2 \times 10 = 16$

b. In the long- run, monopolistically competitive firm earns zero profit. It can be proved as follows:
   Profit, $\pi = TR - TC$
   $= P.Q - AC.Q$
   $= 16 \times 10 - (Q^2 - 22Q + 136).10$
   $= 160 - (10^2 - 22 \times 10 + 136).10$
   $= 160 - 160$
   $= 0$
   Thus, in the long- run profit will be zero.

Oligopoly Market

Meaning:

The market structure in which there are few sellers of the homogeneous or differentiated products is found then this market structure is called oligopoly. The number of sellers depends on the size of the market. If there are two sellers, then it is called duopoly.

Types of Oligopoly:

Oligopoly can be of two types:

1. ***Pure oligopoly:*** When few firms are producing homogeneous products such as cement, steel, chemicals, cooking gas, etc then these firms are called pure oligopoly.
2. ***Differentiated oligopoly:*** When few firms are producing differentiated products such as automobiles, refrigerators, computers, mobiles, etc, then these firms are called differentiated oligopoly.

Factors Causing Oligopoly:

1. Huge capital investment;
2. Absolute cost advantage to the existing firms;
3. Product differentiation;
4. Economies of large scale production; and
5. Mergers.

Features/ Characteristics of Oligopoly:

Few dominant firms: Oligopolists are often large firms, each producing a significant portion of total market output.

Mutual inter- dependence: Since the market is dominated by a few firms, the price and output decisions of one firm affects the profitability of the remaining firms in the market. Mutual inter-dependence is an incentive to develop alternatives to price competition in the pursuit of economic profit.

Barriers to entry: Barriers to entry limits the threat of competition and facilitates the ability of firms to earn long- run economic profits.

Homogeneous or differentiated products: The output of an oligopolistic market may be either homogeneous or differentiated.

Price and Output Indeterminateness:

In an oligopoly, since there are only few rival firms, the economic well- being and behaviour of the firm is mutually interdependent. This is the single most important characteristic of oligopoly market. Since there are few sellers in the market, the action of one influences the actions of the other. The price and output policy of a firm will affect the price and quantity sold by other firms. If an oligopoly firm reduces its price, then the demand curve faced by other oligopolists will shift down. So the other oligopolists react. There are many different reaction patterns of the other oligopolists to the actions of the firms.

It is because of this high degree of interdependency among oligopolistic firms, that we cannot define the demand curve faced by an oligopolist. Hence, the solution is indeterminate. The firms may come to collude with each other or may try to fight each other to death. The collusion may last or may break down soon. Indeterminateness of price and output therefore becomes a consequent feature of oligopolistic market. Thus, we have no general theory of oligopoly. All we have is a variety of models based on different behavioral assumptions. These models are as follows:

- Cournot's model;
- Edgeworth's model;
- Stackelberg's model;
- Bertrand's model;
- Chamberlin's model,
- Paul Sweezy's model;
- Price Leadership;
- Baumol's Sales maximization model;
- Cartels, etc.

These models based on different behavioral assumptions are classified under different categories:

Non- Collusive Oligopoly

This implies absence of explicit or implicit understanding or agreement among the firms regarding price fixation, market sharing or leadership. The main models in this category are:

1. Cournot's duopoly model;
2. Stackelberg's duopoly model; and
3. Sweezy's *kinked- demand curve* model

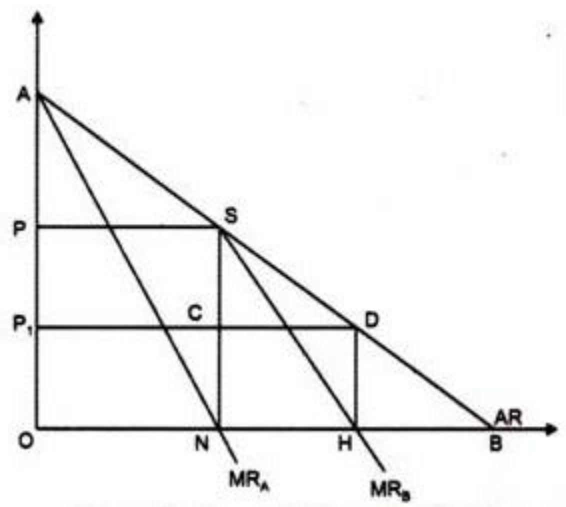
Cournot's duopoly model

Cournot duopoly model was propounded by a French economist, Augustin Cournot in 1838 for price-output determination under duopoly. Cournot model is based on the market condition in which there are only two sellers, that is duopoly. However, the model is also applicable to oligopolistic market conditions. Let us explain the model with the help of an example taken by Cournot. Suppose there are two producers, each operating two identical springs of mineral water, being produced at zero cost.

Following assumptions are taken in this model:

a. Both the producers operate at zero cost of producing water;
b. Both the producers face the same demand curve with negative slope; and
c. Both the producers assume that competitors will not react to the change in price or output.

Figure shows the Cournot's duopoly model:



In this figure, the demand curve (AR curve) faced by two organizations for mineral water is given by a straight line AB. The total output produced is equal to OB where maximum daily output of each mineral spring is ON = NB. Assume that producer A starts the business first. It implies that he/she is the monopolist and produces ON level of the output, which is the maximum level of output.

Since costs are zero, the profit will be equal to ONPS. The price charged is equal to OP. Now, suppose that the producer B enters into business and notices that producer A is producing ON amount of output. The market which is unsupplied by A is the market open for B equal to NB. B will produce output assuming that A will not change its price and output (as he is making maximum profits).

The demand curve faced by producer B is equal to SB and thus, MRB can be drawn equal to SH. At this point, price falls to OP_1 and thus output produced is equal to NH (one-fourth of the market = ½ of NB=½ of ½=¼). The total profits of producer B are equal of NHCD.
From Figure, it can be seen that with the entry of producer B, price has fallen to P_1, which has decreased the profits of A to $ONCP_1$. Thus, A would make adjustments in price and output assuming that B would not change his output and price levels. He/she would produce ½ of the (OB-NH) of the market.
OB-NH =1-¼= ¾

Thus, output produced by A is= ½(3/4) = 3/8.

Now, B will notice that his/her total profits are less than that of A. Thus, he/she will produce ½ of (OB- new output of A)

= ½(1-3/8) = 1/2 5/8= 5/16 of the market

This process of adjustments will continue until both of their market shares are equal to one third. Till that, B would continue to gain and A would continue to lose. This model concludes that under Cournot's duopoly situation, each seller ultimately supplies one- third of the market. Both the producers charge the same price and one-third of the market remains unsupplied.

Cournot's model attains the stable equilibrium; however it is criticized on the following grounds:

a. Assumes that each producer would be producing the same level of output. However, this assumption is wrong as output of the rivals does not remain fixed.
b. Assumes that the cost of production remains nil, which is not true in every kind business.

Example: *Suppose there are two firms under Cournot's model having market demand curve as P = 20 – Q where Q is the total output of the two firms 1 and 2. These firms are assumed to be producing under zero cost of production. Determine:*

a. Reaction curves of the two firms;
b. Equilibrium level of output for both the firms;
c. Equilibrium market price;

Solution:

a. Reaction curve for firm 1 is derived from the point where:

$$MR_1 = MC$$

Since, $TR_1 = PQ_1 = (20 - Q)Q_1 = [20 - (Q_1 + Q_2)]Q_1 = 20Q_1 - Q_1^2 - Q_1Q_2$

Hence, $MR_1 = \frac{\Delta TR1}{\Delta Q1} = 20 - 2Q_1\ Q_2$

Since, $MR_1 = MC = 0$

$20 - 2Q_1\ Q_2 = 0$

$Q_1 = 10 - \frac{1}{2} Q_2$ …………………….. (1)

This is firm's 1 reaction curve.

Similarly, firm's 2 reaction curve is obtained where:

$MR_2 = MC$

Since, $TR_2 = PQ_2 = (20 - Q)Q_2 = [20 - (Q_1 + Q_2)]Q_2 = 20Q_2 - Q_1Q_2 - Q_2^2$

Hence, $MR_2 = \frac{\Delta TR2}{\Delta Q2} = 20 - Q_1 - 2Q_2$

Since, $MR_2 = MC = 0$

$20 - Q_1 - 2Q_2 = 0$

$Q_2 = 10 - \frac{1}{2} Q_1$ …………………….. (2)

This is firm's 2 reaction curve.

b. Substituting (2) in (1) we can get equilibrium output as:

$Q_1 = 10 - \frac{1}{2} Q_2 = 10 - \frac{1}{2} (10 - \frac{1}{2} Q_1) = 10 - 5 + \frac{1}{4} Q_1$

$Q_1 - \frac{1}{4} Q_1 = 5$

$Q_1 = 20/3 = 6.67$ ……………………… (3)

Substituting (3) in (2), we get:

$Q_2 = 6.67$

Cournot's equilibrium:

$Q_1 = Q_2 = 6.67$

Thus, total quantity produced $Q = Q_1 + Q_2 = 6.67 + 6.67 = 13.34$

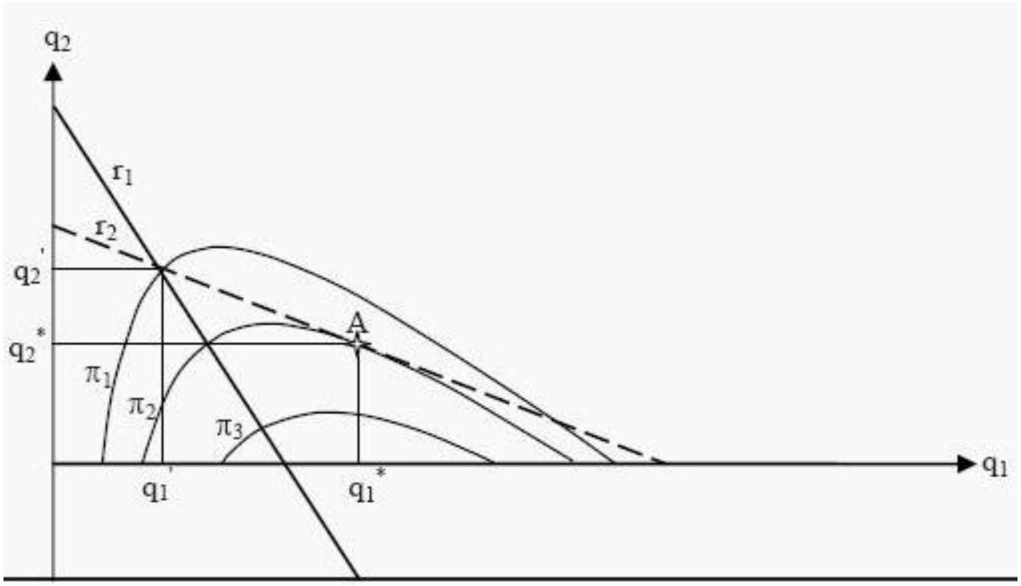
c. Equilibrium market price P is:
   $P = 20 - Q = 20 - 13.34 = 6.66$

Stackelberg's Duopoly Model:

In the Cournot model, both firms made their decisions simultaneously and without knowing the other's decision. In the Stackelberg model, they decide one after the other. We call the one that chooses first, the Leader and the other one the Follower.

a. We have two firms;
b. They set quantities (and the price is set by the market);
c. Leader first decides on her quantity, and then Follower decides on hers.

We will use the same reaction function as in the Cournot model, but the analysis will now be different since they do not choose simultaneously. Leader, who sets her quantity first, has an advantage. She knows that Follower will later set her quantity according to her reaction function. Therefore, Leader sets her quantity to maximize her own profit, given Follower's optimal response.



One way to illustrate this game is presented in the above figure. We have drawn the reaction functions, r_1 and r_2, but we have also added a few curves indicating Leader's profit, π_1, π_2, and π_3; so-called iso- profit curves. Such curves show different combinations of q_1 and q_2 that give Leader the same profit. For instance, all combinations along $\pi 1$ give Leader a profit of π_1, etc. Note that Leader's profit increases inwards, the closer to the monopoly quantity (the point where r_1 intersects the X-axis) we get. The profit at π_2 is consequently higher than at π_1, and even higher at π_3. Leader knows that Follower will choose her quantity along the reaction function r_2. Leader therefore finds an iso- profit curve that touches r_2 and that is as close to the monopoly quantity as possible. In the figure, the iso- profit curve π_2 touches r_2 in point A. Leader then chooses the quantity that corresponds to point A, i.e. q_1*. As a response, Follower later chooses the quantity q_2*. Note that every other choice of quantity for Leader, higher or lower, must result in a lower profit for her. If she, for instance, would choose the quantity q_1' instead, Follower's reaction would be to choose q_2' and Leader's profit would be π_1, which is less than π_2.

Example: *Suppose there are two firms under Cournot's model having market demand curve as P = 20 – Q where Q is the total output of the two firms 1 and 2. These firms are assumed to be producing under zero cost of production. Calculate price and output solution for the two firms under Stakelberge's model.*

Solution:

Let Firm 1 set its output first (i.e., be a leader) and Firm 2 be a follower which makes its output decision after studying Firm 1's output and assuming that firm 1's output as fixed. Cournot's reaction curve of firm 2 will decide firm 2's profit maximizing output.
The calculation of firm 2's profit maximizing output is as follows:

$$MR_2 = MC$$

Since, $TR_2 = PQ_2 = (20 – Q)Q_2 = [20 – (Q_1 + Q_2)]Q_2 = 20Q_2 – Q_1Q_2 – Q_2^2$

Hence, $MR_2 = \frac{\Delta TR2}{\Delta Q2} = 20 – Q_1 – 2Q_2$

Since, $MR_2 = MC = 0$

$20 – Q_1 – 2Q_2 = 0$

$Q_2 = 10 - \frac{1}{2} Q_1$ ………………………….. (1)

This is firm's 2 reaction curve.

The calculation of firm 1's profit maximizing output is as follows:

$$MR_1 = MC$$

Since, $TR_1 = PQ_1 = (20 – Q)Q_1 = [20 – (Q_1 + Q_2)]Q_1 = 20Q_1 – Q_1^2 – Q_1Q_2$ ……… (2)

It is clear from the above equation that total revenue earned by firm 1 upon output of firm 2. Firm 2 will choose Q_2 according to its reaction curve $Q_2 = 10 - \frac{1}{2} Q_1$

Substituting (1) in (2) we get:

$TR_1 = 20Q_1 – Q_1^2 – Q_1Q_2$

$= 20Q_1 – Q_1^2 – Q_1(10 - \frac{1}{2} Q_1)$

$= 20Q_1 – Q_1^2 – 10Q_1 + \frac{1}{2} Q_1$

$= 10Q_1 - \frac{1}{2} Q_1^2$

Hence, $MR_1 = \frac{\Delta TR1}{\Delta Q1} = 10 – Q_1$

$MR_1 = MC = 0$

$10 – Q_1 = 0$

⇨ $Q_1 = 10$

Substituting (3) in (1), we get:

$Q_2 = 10 - \frac{1}{2} Q_1 = 10 - \frac{1}{2} \times 10 = 5$

Thus, under the Stackelberg model, profit maximum output of Firm 1 is 10 and of Firm 2 is 5. Firm 1 produces twice as much as Firm 2.

Sweezy's Kinked Demand Curve Model:

The kinked demand curve of oligopoly was developed by Paul M. Sweezy in 1939. Instead of laying emphasis on price-output determination, the model explains the behavior of oligopolistic organizations. The model advocates that the behavior of oligopolistic organizations remain stable when the price and output are determined.

This implies that an oligopolistic market is characterized by a certain degree of price rigidity or stability, especially when there is a change in prices in downward direction. For example, if an organization under oligopoly reduces price of products, the competitor organizations would also follow it and neutralize the expected gain from the price reduction.

On the other hand, if the organization increases the price, the competitor organizations would also cut down their prices. In such a case, the organization that has raised its prices would lose some part of its market share.

The kinked demand curve model seeks to explain the reason of price rigidity under oligopolistic market situations. Therefore, to understand the kinked demand curve model, it is important to note the reactions of rival organizations on the price changes made by respective oligopolistic organizations.

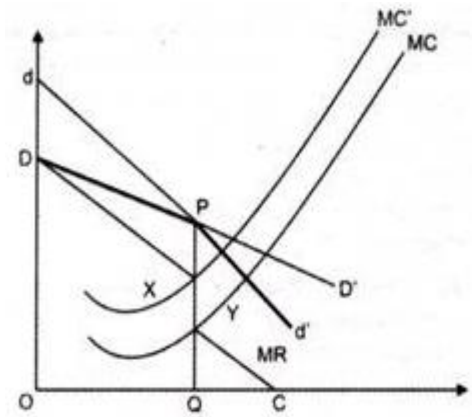
There can be two possible reactions of rival organizations when there are changes in the price of a particular oligopolistic organization. The rival organizations would either follow price cuts, but not price hikes or they may not follow changes in prices at all.

A kinked demand curve represents the behavior pattern of oligopolistic organizations in which rival organizations lower down the prices to secure their market share, but restrict an increase in the prices.

Following are the assumption of a kinked demand curve:

a. Assumes that if one oligopolistic organization reduces the prices, then other organizations would also cut their prices;
b. Assumes that if one oligopolistic organization increases the prices, then other organizations would not follow increase in prices;
c. Assumes that there is always a prevailing price

A kinked demand curve model is explained with the help of the following figure:



The slope of a kinked demand curve differs in different conditions, such as price increase and price decrease. In this model, every organization faces two demand curves. In case of high prices, an oligopolistic organization faces highly elastic demand curve, which is dd' in figure.

On the other hand, in case of low prices, the oligopolistic organization faces inelastic demand curve, which is DD' (see figure). Suppose the prevailing price of a product is PQ, as shown in figure. If one of the oligopolistic organizations makes changes in its prices, then there can be three reactions of rival organizations.

Firstly, when the oligopolistic organization would increase its prices, its demand curve would shift to dd' from DD'. In such a case, consumers would switch to rivals, which would lead to fall in the sales of the oligopolistic organization. In addition, the dP portion of dd' would be more elastic, which lies above the prevailing price.

On the other hand, if price falls, the rivals would also reduce their prices, thus, the sales of the oligopolistic organization would be less. In such a case, the demand curve faced by the oligopolistic organization is PD', which lies below the prevailing price.

Secondly, rival organizations will not react with respect to changes in the price of the oligopolistic organization. In such a case, the oligopolistic organization would face DD' demand curve.

Thirdly, the rival organizations may follow price cut, but not price hike. If the oligopolistic organization increases the price and rivals do not follow it, then consumers may switch to rivals. Thus, the rivals would gain control over the market. Thus, the oligopolistic organization would be forced from dP demand curve to DP demand curve, so that it can prevent losing its customers.

This would result in producing the kinked demand curve. On the other hand, if the oligopolistic organization reduces the price, the rival organizations would also reduce prices for securing their customers. Here, the relevant demand curve is Pd'. The two parts of the demand curve are DP and Pd', which is DPd' with a kink at point P.

Let us draw the MR curve of the oligopolistic organization. The MR curve would take the discontinuous shape, which is DXYC, where DX and YC correspond directly to DP and Pd' segments of the kinked demand curve. The equilibrium point is attained when MR = MC. In the figure, the MC curve intersects MR at point Y where at output OQ.

At point Y, the organization would achieve maximum profit. Now, if cost increases, the MC curve would move upwards to MC. In such a case, the oligopolistic organization cannot increase the prices. This is because if the organization would increase the prices, the rival organizations would decrease their prices and gain the market share. Moreover, the profits would remain same between point X and Y. Thus, there is no motivation for increasing or decreasing prices. Therefore, price and output would remain stable.

However, kinked demand curve model is criticized by various economists.

Some of the major points of criticism are as follows:

a. Lays emphasis on price rigidity, but does not explain price itself.
b. Assumes that rival organizations only follow price decrease, which does not hold true empirically.
c. Ignores non-price competition among organizations. Non-price competition can be in terms of product differentiation, advertising, and other tools used by organizations to promote their sales.
d. Ignores the application of price leadership and cartels, which account for larger share of the oligopolistic market.

Bertrand Duopoly:

The Bertrand model assumes that

a. We have two firms.
b. They set prices (and quantities are set by the market).
c. They set prices simultaneously, without knowing which price the other one sets.

The previous models produced results that were very favorable for the firms but less so for the consumers. The Bertrand model, however, puts the two firms in a Prisoner's Dilemma- type of situation, and forces them to set p = MC, i.e. they set the same price as firms would do in a perfectly competitive market. This is, of course, unfavorable for the firms, but an improvement for consumers and society. To see that the firms will set p = MC, suppose that we know that the other firm has set a high price. Which is then the best price we can set? Remember that we have homogenous (meaning identical) goods, so the consumers will not care from whom they buy it. Furthermore, they have perfect information about all prices. If we choose a price that is just below our competitor's, all customers will buy from us. This is a good situation for us, but far from optimal for the other firm. If they reason in the same way, they will want to set a price just below ours. Then we would lose all customers… and so forth. No price above MC can consequently be an equilibrium. Regardless of which price the firm has set, the other will always want to undercut it and set a price just below its competitor. The only price that can be an equilibrium is then p = MC. At that price, none of the firms can lower their price since they would then make a loss. None of them would be able to make a profit by increasing the price either, since they would then lose all customers. The surprising result is then that, since p = MC, we get the same outcome as in a perfectly competitive market, even though there are only two firms. If society is able to construct an oligopoly such that it becomes a Bertrand duopoly, there will be no loss of efficiency. One way for the firms in a Bertrand market to increase profits anyway, is to try to differentiate their products. The customers will then not be indifferent between from whom they buy and the firms become two monopolists, however with goods that are very close substitutes.

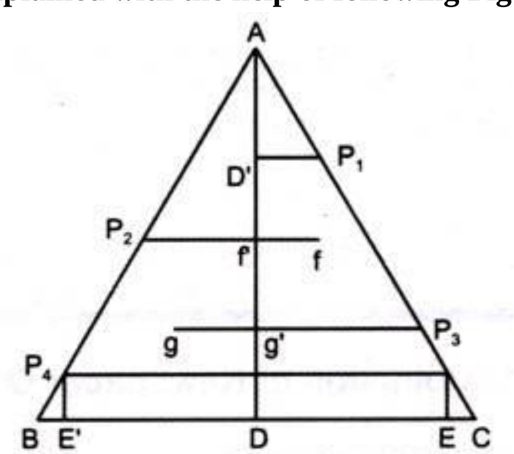
Edgeworth's model:

As discussed, in Cournot model, the output of rival organization is assumed to be constant and unchanged. In the Edge-worth model, the price of the rival organization is assumed to be unchanged.

The assumptions of this model are as follows:

a. Each organization believes that its rival organization will not change its price
b. Neither of the organizations can produce an output as large as the competitive output
c. The maximum possible output is the same for both the organizations
d. The product is homogenous, which implies there are no brand and quality variations
e. Consumers prefer to buy at the lowest price possible

The Edgeworth model is explained with the help of following Figure:

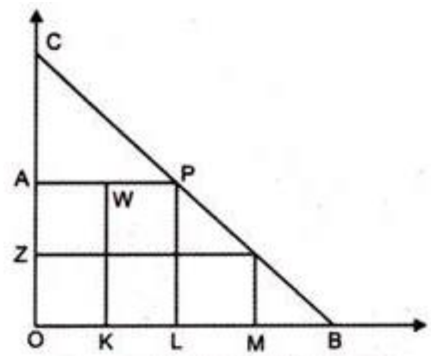


In this Figure AC is the organization A’s demand curve, whereas AB is the organization’s B’s demand curve. The maximum output that can be produced by A and B is DE and DE’, respectively. Suppose organization A is the first to enter the market and sets the price P_1 where output is D’P_1. Now, organization B enters the market and sets price lower than A that is P_2. In such a case, organization B captures the market share of A which is equal to ff’. Now, A reacts and lowers its price to P_3 and captures B’s market share equal to gg’. This process will continue until price equals P_4 and output produced by both A and B equals maximum output. At P_4, no one can snatch the market share of each other. Now, A again raises the price to P_1 considering that B has fixed its entire supply at P4. B again follows A and thus process continues between P_1 and P_4.

Chamberlin Model:

Chamberlin model is based on an assumption that both the organizations existing in the market are mutually interdependent on each other.

Let us understand Chamberlin model with the help of following Figure:



Suppose there are two organizations A and B in the market. Organization A enters the market first. In this Figure, BC is the demand curve and OL is the total output produced by A which is sold at price OA. The total profit is OLPA. Now, producer B enters the market and produce LM level of output. Thus, the total quantity produced is equal to OL + LM – OM.

Collusive Oligopoly

Collusive oligopoly refers to market structure in which few firms cooperate to establish price and output levels in a particular market. In collusive oligopoly, firms are working together to set the price and output. By collusion, firms lessen the pressure of competition and can increase economic profits. The two forms of collusion are:

I. Cartels (where collusion is explicit); and
II. Price leadership (where collusion is implicit).

The Cartel:

In oligopolistic market situations, organizations are indulged in high competition with each other, which may lead to price wars. For avoiding such type of problems, organizations enter into an agreement regarding uniform price-output policy. This agreement is known as collusion, which is opposite to competition. Under collusion, organizations are involved in collaboration with each other to take combined actions for keeping their bargaining power stronger against consumers.

Some of the popular definitions of collusion are as follows:
According to Samuelson, "Collusion denotes a situation in which two or more firms jointly set that prices or output, divide the market among them, or make other business decisions."

In the words of Thomas J. Webster, "Collusion represents a formal agreement among firms in an oligopolistic industry to restrict competition to increase industry profits."

Collusion helps oligopolistic organizations in many ways.

Some of the benefits of collusion are as follows:

a. Helps organizations to increase their performance;
b. Helps organizations in preventing uncertainties; and
c. Provides opportunities to prevent the entry of new organizations.

The agreement of collusion formed may be tacit or formal in nature. A formal agreement formed among competing organizations is known as cartel. In other words, cartel can be defined as a group of organizations that together make pricing and output decisions.

Some of the management experts have defined cartel in the following ways:

According to Leftwitch, "*the firms jointly establish a cartel organization to make price and output decisions, to establish production quotas for each firm, and to supervise market activities of the firms in the industry*."

According to Khemani and Shapiro, "*Cartels are productive structures involving multiple producers acting in unison that allow producers to exercise monopoly power*."

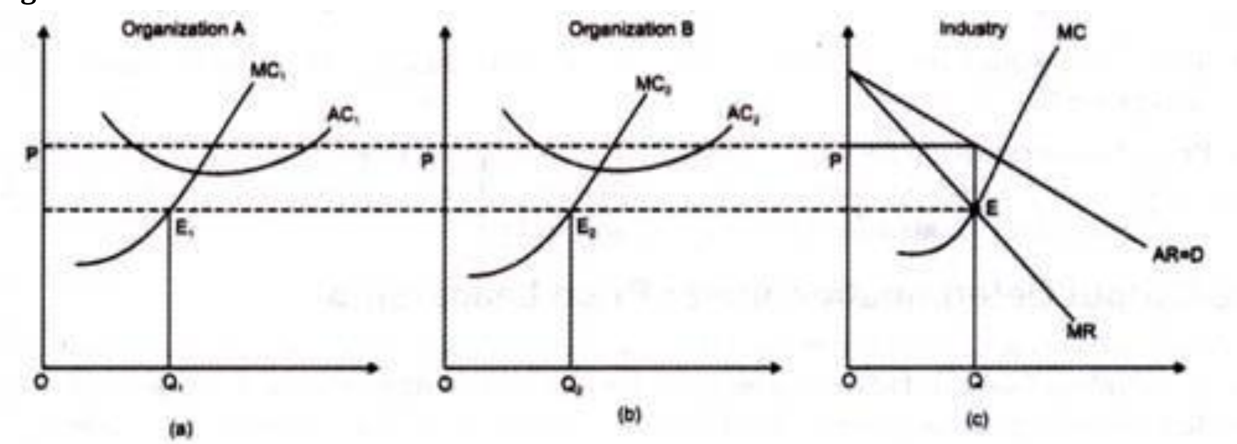
In the words of Boyce and Melvin, "*A cartel is an organization of independent firms, whose purpose is to control and limit production and maintain or increase prices and profits*."

According to Webster, "*A cartel is a formal agreement among firms in an oligopolistic industry to allocate market share and/or industry profit*."

Under cartels, the price and output determination is done by the common administrative authority, which aims at equal profit distribution among all member organizations under cartel. The total profits are distributed in proportion as decided among member organizations. The most famous example of cartel is Organization of the Petroleum Exporting Countries (OPEC), which has shared control of petroleum markets.

Let us understand price and output decisions under cartels with the help of an example. Assume that there are two organizations that have formed a cartel.

The price and output decisions of these two organizations are shown in the following figure:



In Figure- (c), AR is the aggregate demand curve of both the organizations and MC curves are the addition of MC_1 and MC_2 curves of organizations A and B, respectively. The total output of industry is determined according to MR and MC of the industry. In Figure- (c), OQ and OP are the equilibrium price and output of the industry.
Now, this output will be allocated among the organizations. This can be done by drawing a horizontal line from equilibrium point E of industry, towards MC curves of organizations A and B. The points of intersection E_1 and E_2 are the equilibrium levels of the organizations, A and B, respectively. OQ_1 is the equilibrium output of organization A and OQ_2 is the equilibrium output of organization B. Thus, $OQ_1 + OQ_2 = OQ$. These levels of outputs ensure the maximum joint profits of member organizations.

Price Leadership:

In certain situations, organizations under oligopoly are not involved in collusion. There are a number of oligopolistic organizations in the market, but one of them is dominant organization, which is called price leader. Price leadership takes place when there is only one dominant organization in the industry, which sets the price and others follow it.

Sometimes, an agreement may be developed among organizations to assign a leadership role to one of them. The dominant organization is treated as price leader because of various reasons, such as large size of the organization, large economies of scale, and advanced technology. According to the agreement, there is no formal restriction that other organizations should follow the price set by the leading organization. However, sometimes agreement is formal in nature.

Price leadership is assumed to stabilize the price and maintain price discipline.

This also helps in attaining effective price leadership, which works under the following conditions:

a. When the number of organizations is small;
b. Entry to the industry is restricted;
c. Products are homogeneous;
d. Demand is inelastic or less elastic; and
e. Organizations have similar cost curves.

Types of Price Leadership:

Price leadership helps in stabilizing prices and maintaining price discipline. There are three major types of price leadership which are as follows:

Dominant Price Leadership:

Refers to a type of leadership in which only one organization dominates the entire industry. Under dominant price leadership, other organizations in the industry cannot influence prices. The dominant organization uses its power of monopoly to maximize its profits and other organizations have to adjust their output with the set price.

The interests of other organizations are ignored by the dominant organization. Therefore, dominant price leadership is sometimes termed-as partial monopoly. Price leadership by the leading organization is most commonly seen in the industry.

Barometric Price Leadership:

Refers to a leadership in which one organization declares the change in prices at first and assumes that other organizations would accept it. The organization does not dominate others and need not to be the leader in the industry. Such type of organization is known as barometer.

This barometric organization only initiates a reaction to changing market situation, which other organizations may follow it if they find the decision in their interest. On the contrary, the leading organization has to be accurate while forecasting demand and cost conditions, so that the suggested price is accepted by other organizations.

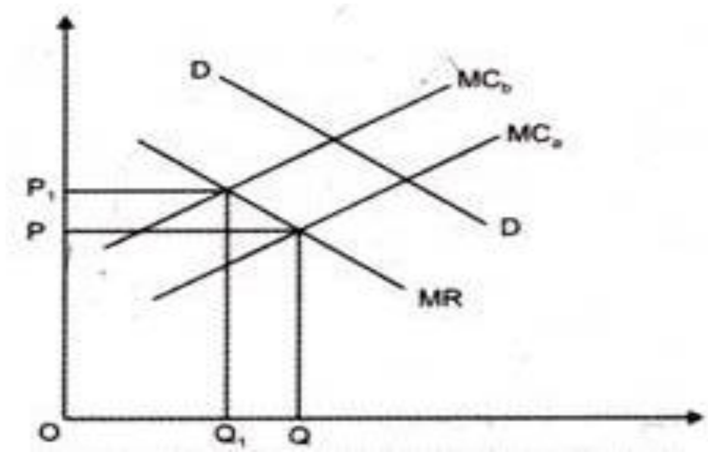
Barometric price leadership takes place due to the following reasons:

a. Lack of capacity and desire of organizations to estimate appropriate supply and demand conditions. This influences organizations to follow price changes made by the barometric organization, which has a proven ability to make correct forecasts.
b. Rivalry among the organizations may make a leader, which can be unacceptable by other organizations. Thus, most of the organizations prefer barometric price leadership.

Aggressive Price Leadership:
Implies a leadership in which one organization establishes its supremacy by threatening the organizations to follow its leadership. In other words, a dominant organization establishes leadership by following aggressive price policies and forces other/organizations to follow the prices set by it.

Price-Output Determination under Price Leadership:
Price leadership takes place when there is only one dominant organization in the industry, which sets the price and others follow it. Different economists have developed different models for determining price and output in price leadership.

Here, we would discuss a simple model for determining price and output in price leadership, which is shown in the following Figure:



Suppose there are two organizations, A and B producing identical products where organization A has a lower cost of the production than organization B. Therefore, consumers are indifferent between these two organizations due to identical products. This implies that both the organizations would face same demand curve, which further represents equal market share.

In the Figure, DD is the demand curve of both the organizations and MR is their marginal revenue. MC_a and MC_b are the marginal cost curves of organization A and B respectively. As stated earlier, the cost of production of organization A is less than B, thus, MC_a is drawn below MC_b.

Let us first start the discussion of price leadership with the case of organization A. The profits of organization A would be maximized at a point where MR intersects MC_a. At this point, the output of organization A would be OQ with the price level OP. On the other hand, the profits of organization B would be maximized at a point where MR intersects MC_b with output OQ_1 and price OP_1.
In such a case, the price of organization B is more as compared to organization A. However, both the organizations have to charge the same price as products are homogeneous. In this case, organization A is the price leader and organization B is the follower.

Thus, organization A will dictate the price to organization B. Both the organizations will follow the same output, OQ and price OP. However, the profits earned by organization B are less than A, as it has to produce at price OP which is less than its profit maximizing price, OP_1. In addition, the organization B also has high costs of production that leads to lower profits at price OP_1.

Drawbacks of Price Leadership:
The price leadership suffers from various drawbacks. These are as follows:

a. Makes it difficult for the price leader to assess the reactions of followers.
b. Leads to malpractices, such as charging lower prices by rival organizations in the form of rebates, money back guarantees, after delivery free services, and easy installment facility. The prices charged by rival organizations are comparatively less than the prices set by the price leader.
c. Leads to non-price competition by rival organizations in the form of aggressive promotion strategies.
d. Influences new organizations to enter into the industry because of price rise. These new organizations may not follow the leader of the industry.
e. Poses problems if there are differences in cost of price leaders and price followers. In case, if cost of production of price leader is less, then he/she would fix lower prices. This will lead to a loss for a price follower if his/her cost of production is more than the price leader.

Chapter- 10

Welfare Economics

Introduction:

- Welfare economics is concerned with the evaluation of alternative economic situations from the point of view of the society's well- being.
- For example, if the total welfare in a country is W, but given the factor endowments (resources) and the state of technology, suppose that this welfare could be larger, W*. The tasks of welfare economics are (i) to show that in the present state W< W*, and (ii) to suggest ways of raising W to W*.
- A central problem in welfare economics relates to whether a particular change in resource allocation will increase or decrease social welfare.
- It is difficult to measure social welfare objectively because it involves making interpersonal comparison of utilities or welfares of different individuals comprising the society.
- In order to avoid making interpersonal comparison of utility, whose scientific nature has been challenged, economists have mostly used Pareto- optimality criterion for evaluating whether social welfare increases or decreases as a result of a specific change in economic state, situation or policy.
- According to Pareto criterion of optimality or efficiency, any change that makes at least one individual better off without making any other worse off is an improvement in social welfare.
- When