# Applied Economics

## For BCA 6th Semester

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# Unit 1

- Introduction

# Syllabus

# What is Economics

- Economics is the **science of scarcity**
- Scarcity means **unable to fulfill unlimited wants due to limited resources.**
- Since we are **unable to have everything we desire**, we must make **choice** on how we will **use our resources optimally**.

**(Study of how individual and societies deal with_____?)**

**Scarcity**

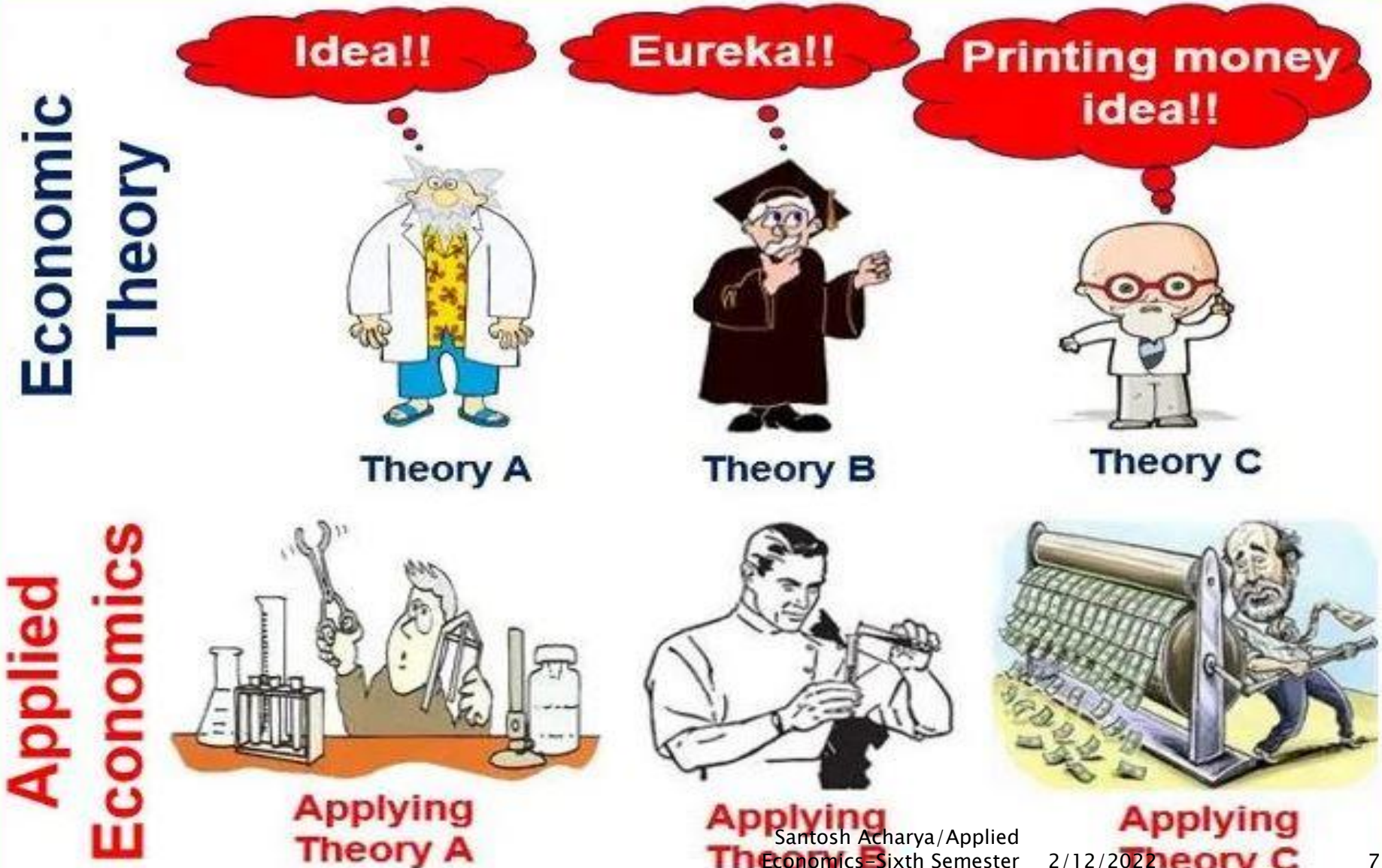
# Meaning of Economics and its type

- The study of how people makes decisions when faced with scarcity and how limited resources are allocated to **satisfy wants and needs**.
- There are two types of economics i.e.
  - **Microeconomics**
  - **Macroeconomics**.

# What is Applied Economics

- It is the study of economics in world situations as **opposed to the theory of economics.**
- It is the **application of economic principles** and theories to real situations, and trying to predict the outcomes.
- It is the study of **observing how theories work in practice.**
- Applied economics prevents making situations **appear better or worse than they are.**

# Applied Economics



# Micro and Macro economics

- Microeconomics: Focuses on the actions of **individual agents** ( consumers, household, works, & businesses ) regarding the allocation of scare resources within an economy.
- Macroeconomic: Focuses on the **broad issues such as the unemployment level,** GDP, inflation, interest rates, government deficits, monetary policy & fiscal policy.

# Microeconomics

- It is that part of economic theory, which studies the behaviour of individual unit of an economy.
- According to K. E. Boulding, "Microeconomics is the study of particular firm, particular household, individual price, wage, income, industry and particular firm, particular commodity."

# Microeconomics

- In conclusion, It is the branch of economics, which deals with **individual firms and consumers of the economy**. It **studies behaviour of individual** units of the economy rather than as a whole.

# Macroeconomics

- It is the **study of very large**, economy-wide aggregate variables like national income, money , price level, unemployment, economic growth
- It is essentially study of the **behaviour and performance of the economy as a whole.**
- According to K.E Boulding, " Macroeconomics deals not with individual quantities, but with aggregate of the these questions, not with individual but with national income, not with individual prices but with price level, not with individual output and with national output."

# Macroeconomics

- In conclusion, macroeconomics is a part of economic that **deals with aggregate behaviour and choice of the entire economy.** For example : National income, General Employment, Inflation etc.

# Distinction between Microeconomics and Macroeconomics

- Different in nature
- Difference in objectives
- Difference in basis
- Difference in assumptions
- Difference in method of study
- Area of study
- Mortal and immortal subject

# Meaning of Micro Economics and Macro Economics

| Feature | Micro Economics( Price Theory) | Macro Economics ( Theory of Income, Employment or Keynesian Theory) |
|---|---|---|
| Meaning | The word 'Micro' is derived from Greek word **'Mikros'** meaning is **very small.** | The word 'Macro' is derived from Greek word **'Makros'** meaning is **very big.** |
| Nature | It is study of **individual unit** of economy. | It is study of economics **as a whole.** |
| Areas of Study | It **studies individual economic units** like a consumer, household, a firm, a commodity etc. | It is **a studies of national aggregate** like national income, national output , general price level , level of employment, etc. |
| Sustainability | It is suitable to study of the **problems of individual** | It is suitable for **the problems of economy as a whole.** |

# Meaning of Micro Economics and Macro Economics

| Features | Micro Economics | Macro Economics |
|---|---|---|
| Study | Studies of Single Unit | Studies of Aggregate |
| Theory | Focus on Partial Theory | Focus on Income Theory |
| Equilibrium | Analyze demand and supply of goods | Analyzes aggregate demand and aggregate supply |
| Method | Slicing Method | Lumping Method |
| Price level | Deals with Individual Price Level | Deal with General Price Level |
| Orientation | Problem orientation | Policy Orientation |
| Also Called | General Price Theory | Theory of Income, Employment |

# Uses/Importance of Microeconomics

- To Provide Tools for **Economic Policies**
- To Examine the **conditions of Economic Welfare**
- Efficient **Utilization of Resources**
- Useful in **International Trade**
- Useful in Business **Decision Making**

# Scope of Microeconomics

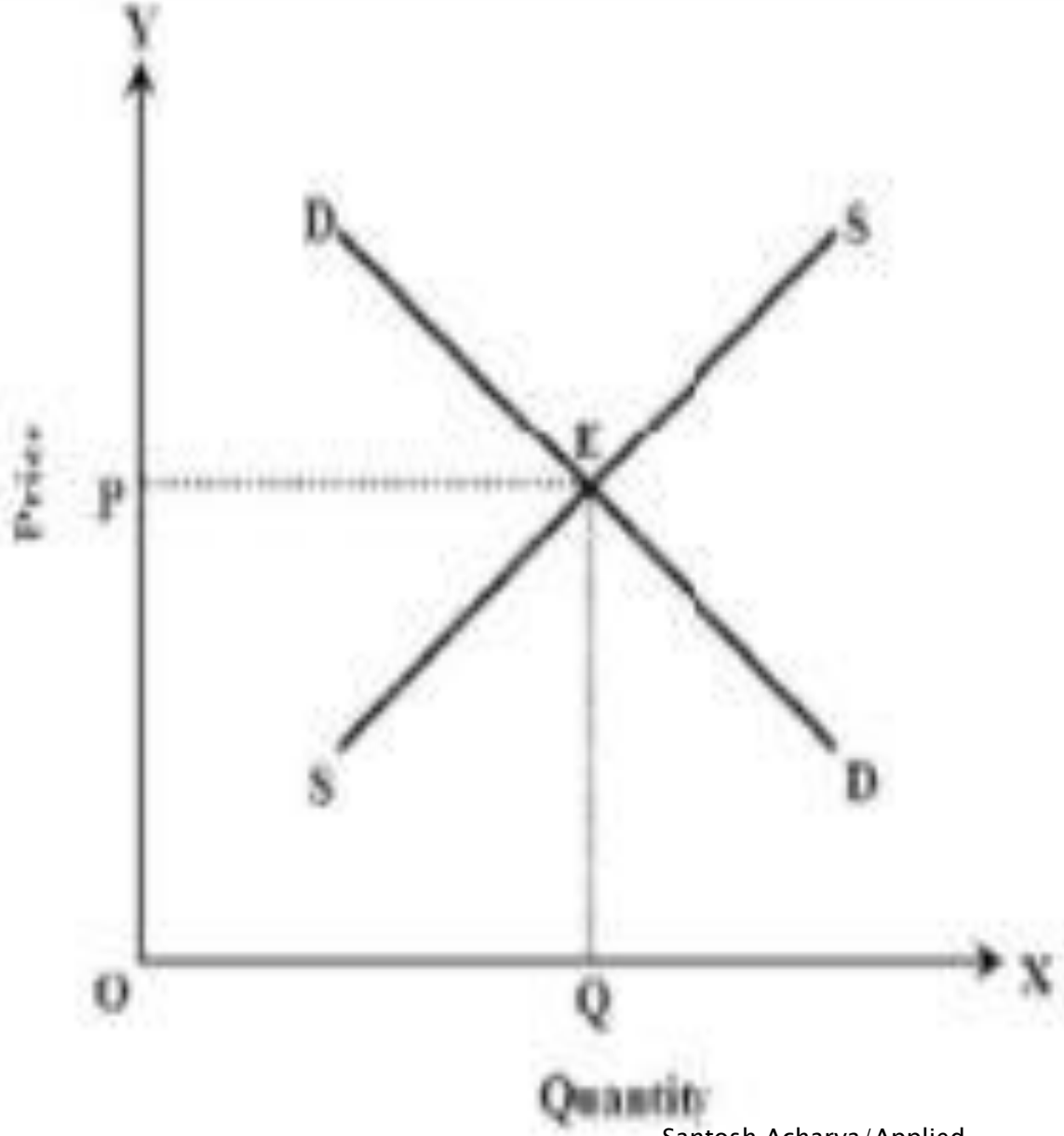
- Theory of demand
- Theory of Production
- Theory of Product Pricing
- Theory of Factor Pricing
- Theory of Economic welfare

# Types of Micro Economics

- Simple Micro-static
- Comparative Micro-static
- Micro Dynamics

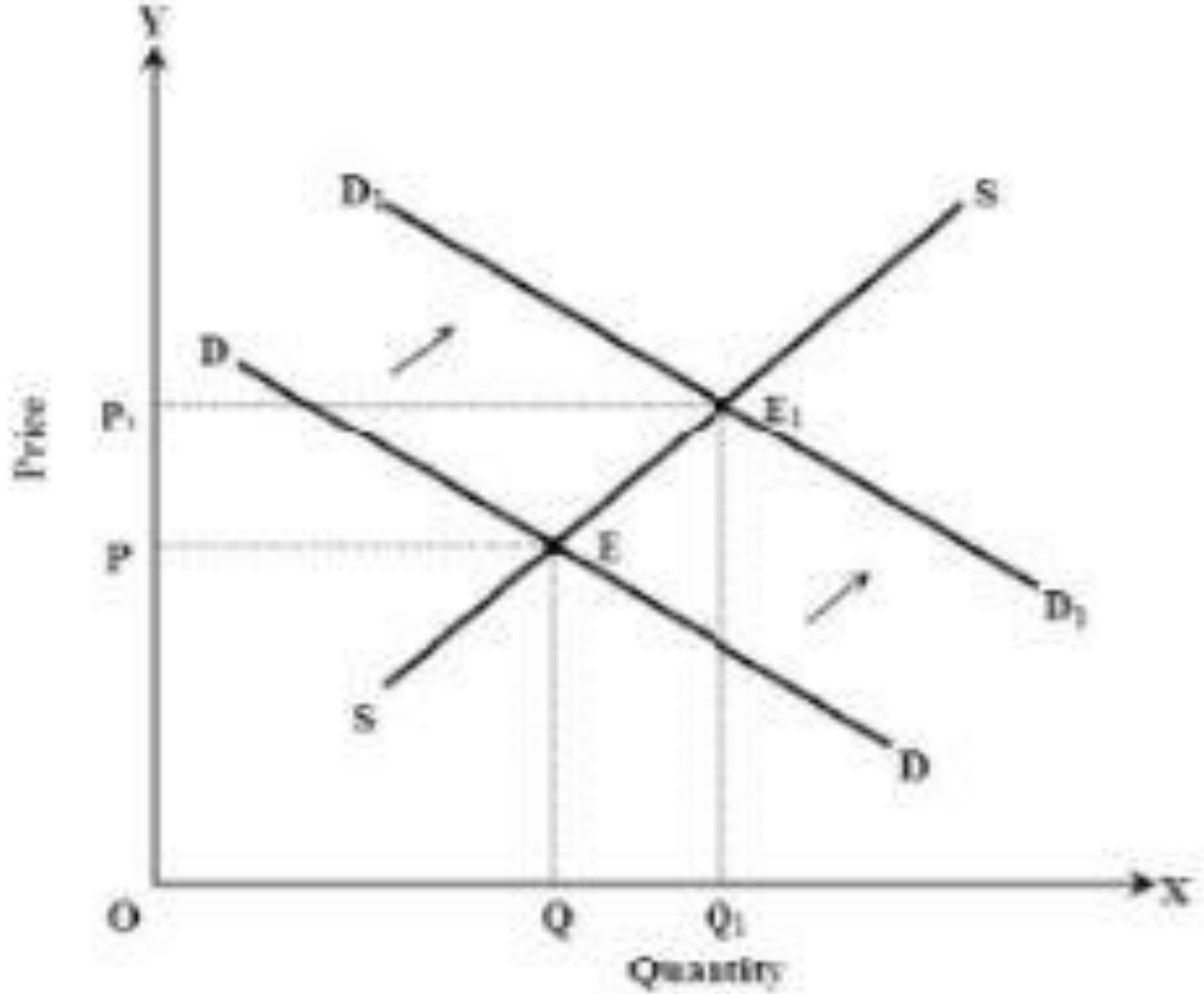
# Simple Micro-static

- It studies different **microeconomic variables and their relationships at a particular point** of time under the conditions of equilibrium.
- **No role of time period**
- It study only **equilibrium point**


Y
D
S
E
P
Price
S
D
O
Q
X
Quantity

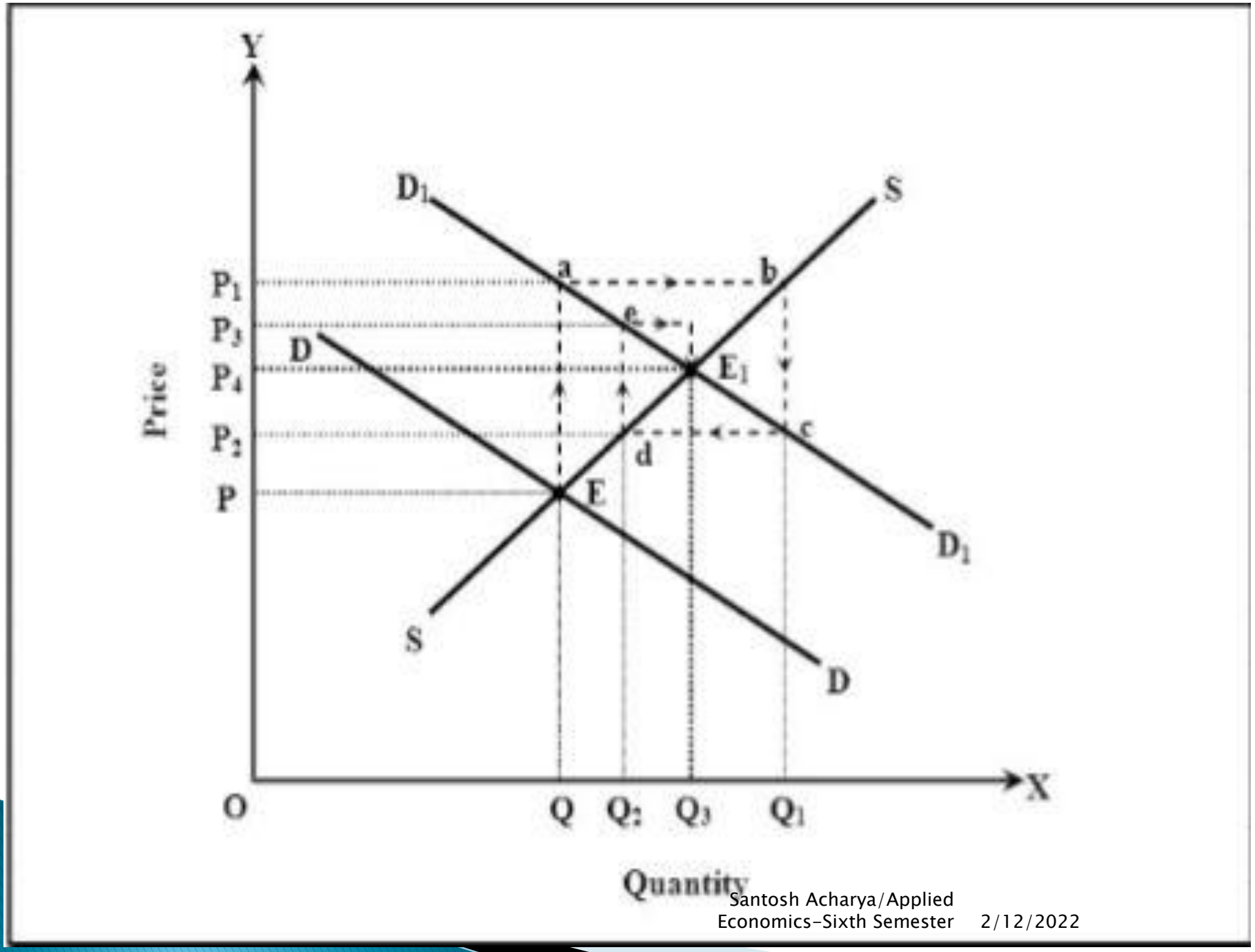
# Comparative Micro-static

- It compares the equilibrium position at **different points of time.**
- Compares **old equilibrium to new equilibrium**
- It does not study the process of **old and new equilibrium.**


Y
D1
S
D
P1
E1
Price
P
E
D1
S
D
O
Q
Q1
X
Quantity

# Micro Dynamic

- The analysis of the **process** through which the system moves from **one equilibrium to another**.
- It explains the **lagged relationship** between the microeconomic variables.
- It focus into how **old equilibrium into equilibrium.**


Y
D1
S
a
b
P1
P3
e
D
P4
E1
P2
c
d
P
E
D1
S
D
O
Q
Q2
Q3
Q1
X
Price
Quantity

# Uses or importance of Macroeconomics

- Helpful to **understand the working of the economy**
- Helpful in **formulating economic policies**
- Helpful in controlling **economic fluctuations**
- Helpful in **international comparisons**
- Evaluate **performance** of the economy
- To **develop and expand** the microeconomics
- Helpful to understand **international trade**
- Useful in business **decision making**

# Scope of Macroeconomics

- Theory of Income and Employment
- Macro Theory of Distribution
- Theories of International Trade and Business
- Theory of Money and Price Level
- Theory of Economic Growth
- Macro economic Policies

# Types of Macroeconomics

- Simple Macro-static
- Comparative Macro-static
- Macro Dynamics

# Simple Macro Static

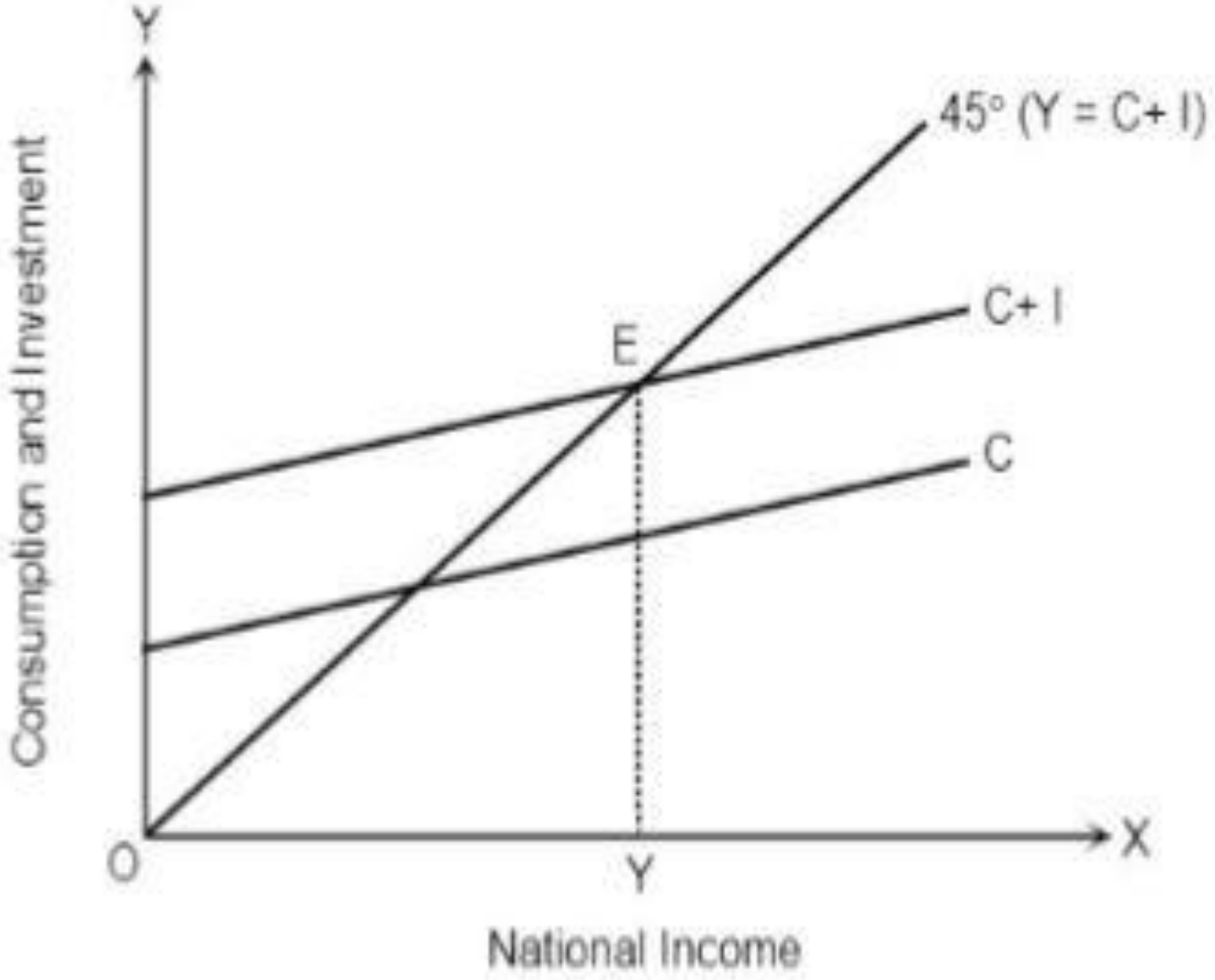
- It studies different **macroeconomic variables and their relationships at a particular point** of time under the conditions of equilibrium.
- **No role of time period**
- It also **investigates the relations between macro variables.**
- It study only **equilibrium point.**

**Y=C+I**

**Where,**

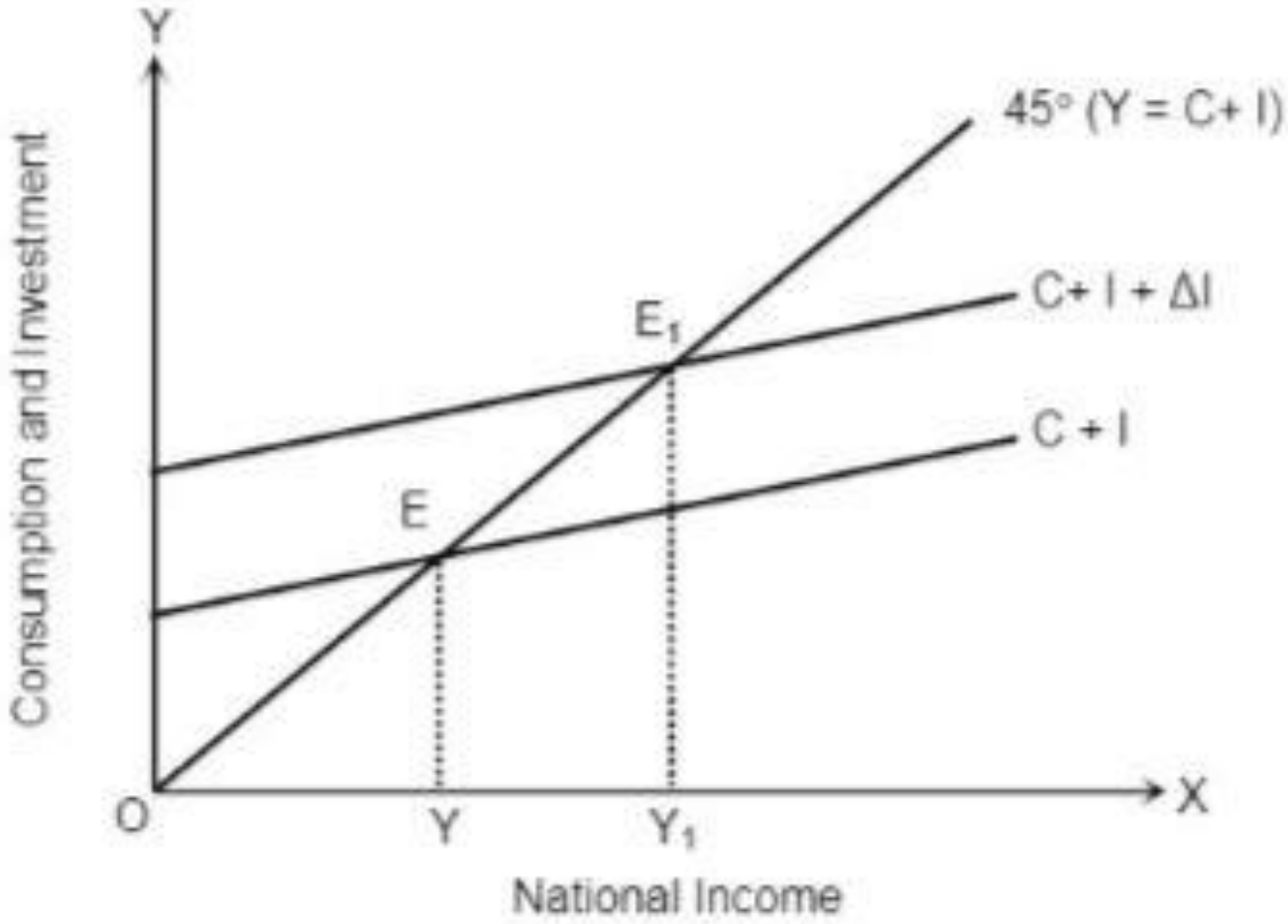
**Y=Aggregate income, C= Aggregate Consumption**

**I= Aggregate investment**


Y
Consumption and Investment
45° (Y = C+ I)
C+ I
E
C
O
Y
X
National Income

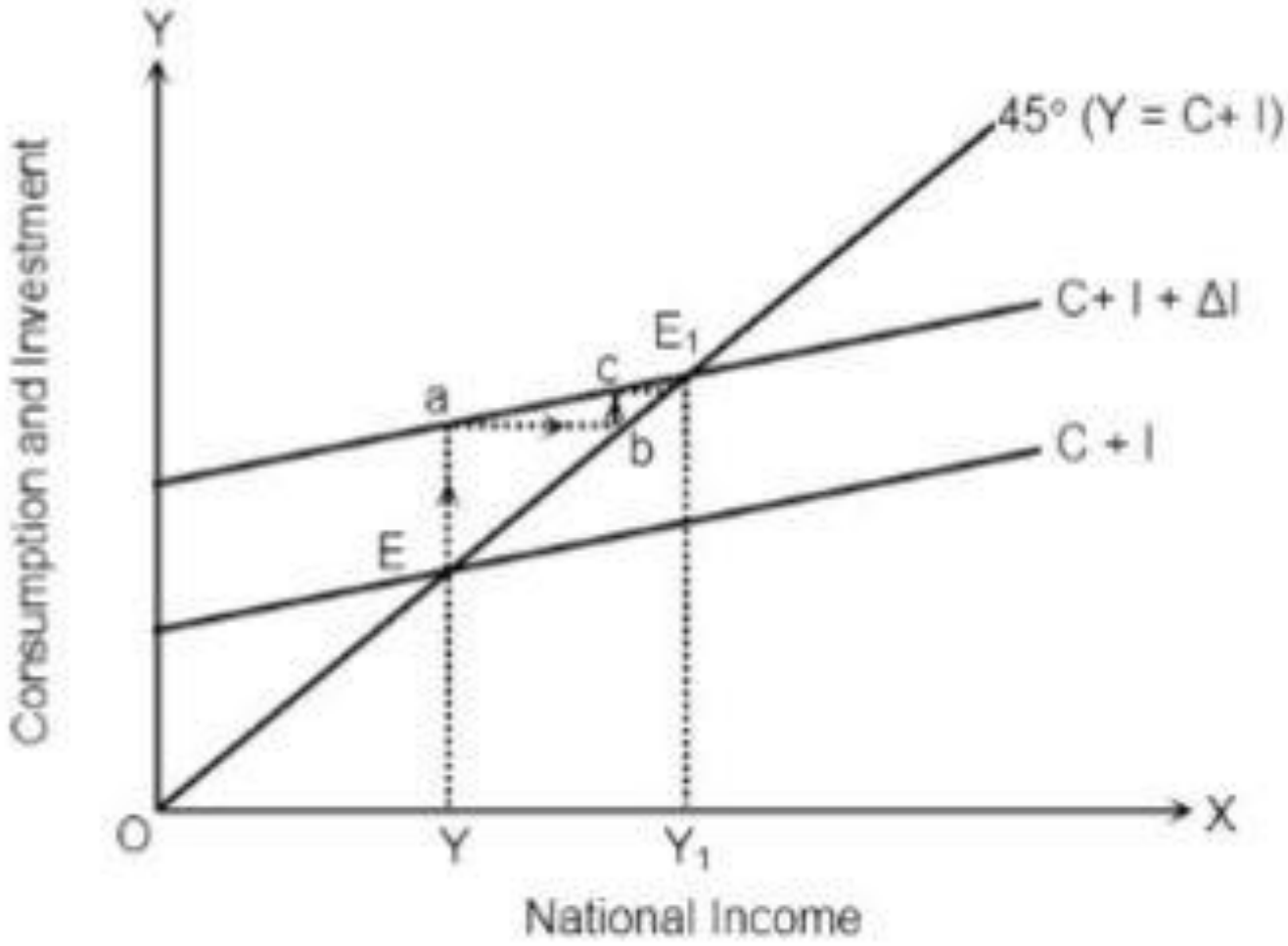
# Comparative Macro Statics

- It compares the equilibrium position at **different points of time.**
- Compares **old equilibrium to new equilibrium**
- It does not study the process of **old and new equilibrium.**


Y
45° (Y = C+ I)
C+ I + ΔI
E1
C + I
E
Consumption and Investment
O
Y
Y1
X
National Income

# Dynamic Dynamics

- The analysis of the **process** through which the system moves from **one equilibrium to another**.
- It explains the **lagged relationship** between the macroeconomic variables.
- It focus into how **old equilibrium into equilibrium.**


Y
45° (Y = C+ I)
C+ I + ΔI
E1
c
a
b
C + I
E
Consumption and Investment
O
Y
Y1
X
National Income

# Goals of Macro Economics

- Reducing the unemployment to achieve **Full Employment,**
- **Price Stability** and reducing size of economic fluctuations in short run,
- Achieving strong **Economic Growth** over the long term,
- **Equitable distribution of income,**
- **Maintaining low inflation rate,**
- **International Trade,**
- Reducing the size of the import and Enhance Export i.e**. International Trade**

# Full Employment

- The situation where all people who are available and searching for work can find a job at the prevailing remuneration rates and conditions.
- A situation when a person is able to earn his livelihood either through self-employment or by working as wage-employment.

# Price Stability

- Maintaining price stability
- Maintain the purchasing power
- Quantity of goods and services purchased will be less of inflation is high

# Economic Growth

- Economy must be operating at maximum capacity
- Measured by evaluating the full production output per capita.
- Efficiency of an economy to produce increase level of output over sustained period of time.
- It is a quantitative measure
- It means, increase in GDP over time.
- GDP means all finished good and services produced the resources located in the country during period of time.

# Equitable Distribution of Income

- The nation try to narrow the gap between the Higher Income and the lower income group
- To ensure that all people are equal in terms of the standard of living.
- More equitable distribution may help accelerate growth and promote economic development.

# International Trade

- The exchange or trade of goods and services between different nations
- The exchange of goods or service along international borders.
- Export and import equilibrium and exchange rate stability.
- . The most commonly traded commodities are television sets, clothes, machinery, capital goods, food, raw material, etc.

# Instrument of Macro Economics

- Monetary Policy
  - Contractionary Monetary Policy
  - Expansionary Monetary Policy
- Fiscal Policy
  - Contractionary Fiscal Policy
  - Expansionary Fiscal Policy
- Exchange Rate Policy
  - Fixed (Pegged) Current Policy
  - Flexible Currency policy

# Instrument of Monetary policy

- Quantitative controls
  - Bank rate policy
  - Open market operations
  - Changes in cash reserve ratios
- Qualitative controls
  - Regulation of consumer credit
  - Regulation of margin requirements
  - Credit rationing
  - Moral suasion
  - Direct action
  - Publicity

# Types of Monetary Policy

- Expansionary Monetary Policy

Ms↑⇒ R↓⇒I↑⇒Ad↑⇒P↑

- Contractionary Monetary Policy

Ms↓⇒ R↑⇒ I↓⇒Ad↓⇒ P↓

# Fiscal Policy

- Instrument of Fiscal Policy
  - Budget
    - Balanced budget policy
    - Deficit budget policy
    - Surplus budget policy
  - Public Expenditure
    - Current Expenditure and Capital Expenditure
    - Direct Expenditure and Transfer Expenditure
    - Productive and unproductive Expenditure
  - Public Revenue
  - Public Debt

# Chapter Two
# Elasticity of Demand and Supply

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# Elasticity of Demand and Supply

Learning Objectives..

- Give the concept of price, income and cross elasticity of demand.
- Explain the types of price, income and cross elasticity of demand.
- Describe the measurement of price, income and cross elasticity of demand: Total outlay method and point method.
- Explain the uses of price, income and cross elasticity of demand
- Give the concept of elasticity of supply.
- Describe the measurement of elasticity of supply
- Solve the numerical exercise

# Elasticity of Demand

- Concept of Elasticity of Demand
  - First introduced by the classical economists **A.A. Cornet and J. S. Mill.**
  - **Alfred Marshall** the neo-classical economists developed it in the scientific way on "**Principles of Economics**".
  - It shows the rate of change in **Quantity demanded** in response to the change in **the price, ceteris paribus**.
  - The responsiveness of **change in the quantity demanded** due to **change in its price** is termed as elasticity of demand, other things remaining the same.

# Types of Elasticity of Demand

- Price elasticity of demand
- Income elasticity of demand
- Cross elasticity of demand

# Price Elasticity of Demand (Ep)

- The **responsiveness of change in quantity demanded** of a commodity to the **change in its price.**
- **The ratio of percentage change in** quantity demanded to the percentage **change in price.**
- The coefficient of price elasticity is **negative** due to inversely related of **price and quantity**
- $Ep = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price}$

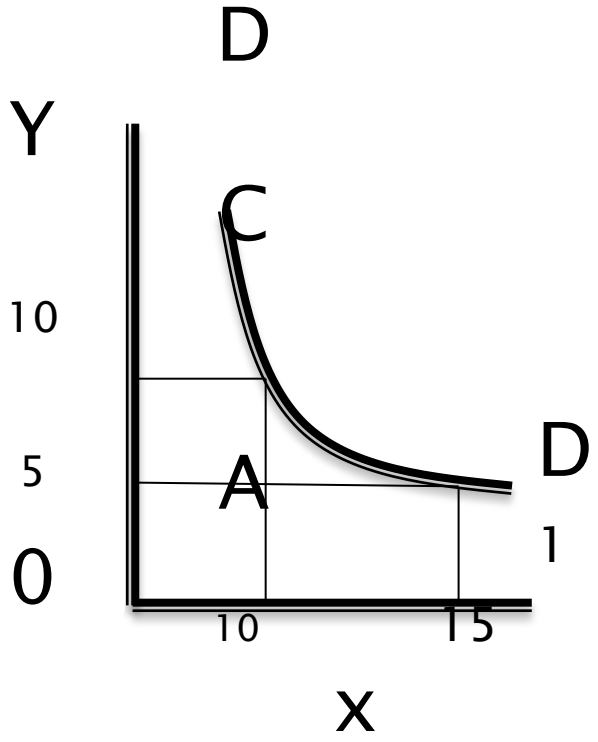
# Cont…d

$$ep = \frac{\frac{New\ quantity\ demanded - Initial\ quantity\ demanded}{Initial\ quantity\ demanded} \times 100}{\frac{New\ price - Initial\ price}{Initial\ price} \times 100}$$

$$= \frac{\frac{q_2 - q_1}{q_1} \times 100}{\frac{p_2 - p_1}{p_1} \times 100}$$

In terms of proportion,

$$ep = \frac{\frac{Change\ in\ quantity\ demanded}{Initial\ quantity\ demanded}}{\frac{Change\ in\ price}{Initial\ price}}$$



## Cont…d

$$= \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

$$e_p = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

In terms of derivative,

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

Where,

$e_p$ = Coefficient of price elasticity of demand

Q = Initial quantity demanded

P= Initial price

$\Delta$Q= Change in quantity demanded $(q_2 - q_1)$

$\Delta$P= Change in price $(P_2 - P_1)$

# In terms of Arc Elasticity

Price elasticity of demand is the average of coefficient between two points on a demand curve. It can be used while finding elasticity at two time intervals. It is computed as:

$$e_p = \frac{\frac{Change\ in\ quantity\ demanded}{\frac{Initial\ quantity\ demanded + New\ quantity\ demanded}{2}}}{\frac{Change\ price}{\frac{Initial\ Price + New\ Price}{2}}}$$

# In symbolic terms

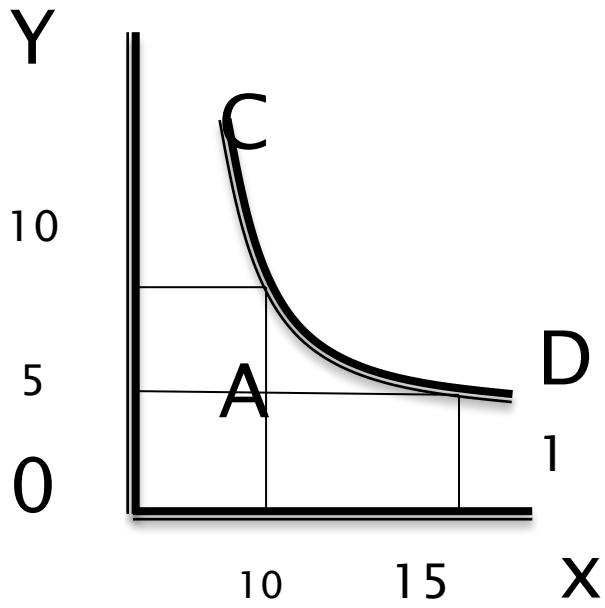
$$e_p = \frac{\frac{\Delta q}{\frac{q_1+q_2}{2}}}{\frac{\Delta p}{\frac{p_1+p_2}{2}}} = \left[\frac{\Delta q}{q_1+q_2} \cdot \frac{P_1+P_2}{\Delta p}\right] = \left[\frac{\Delta q}{\Delta p} \cdot \frac{P_1+P_2}{q_1+q_2}\right]$$

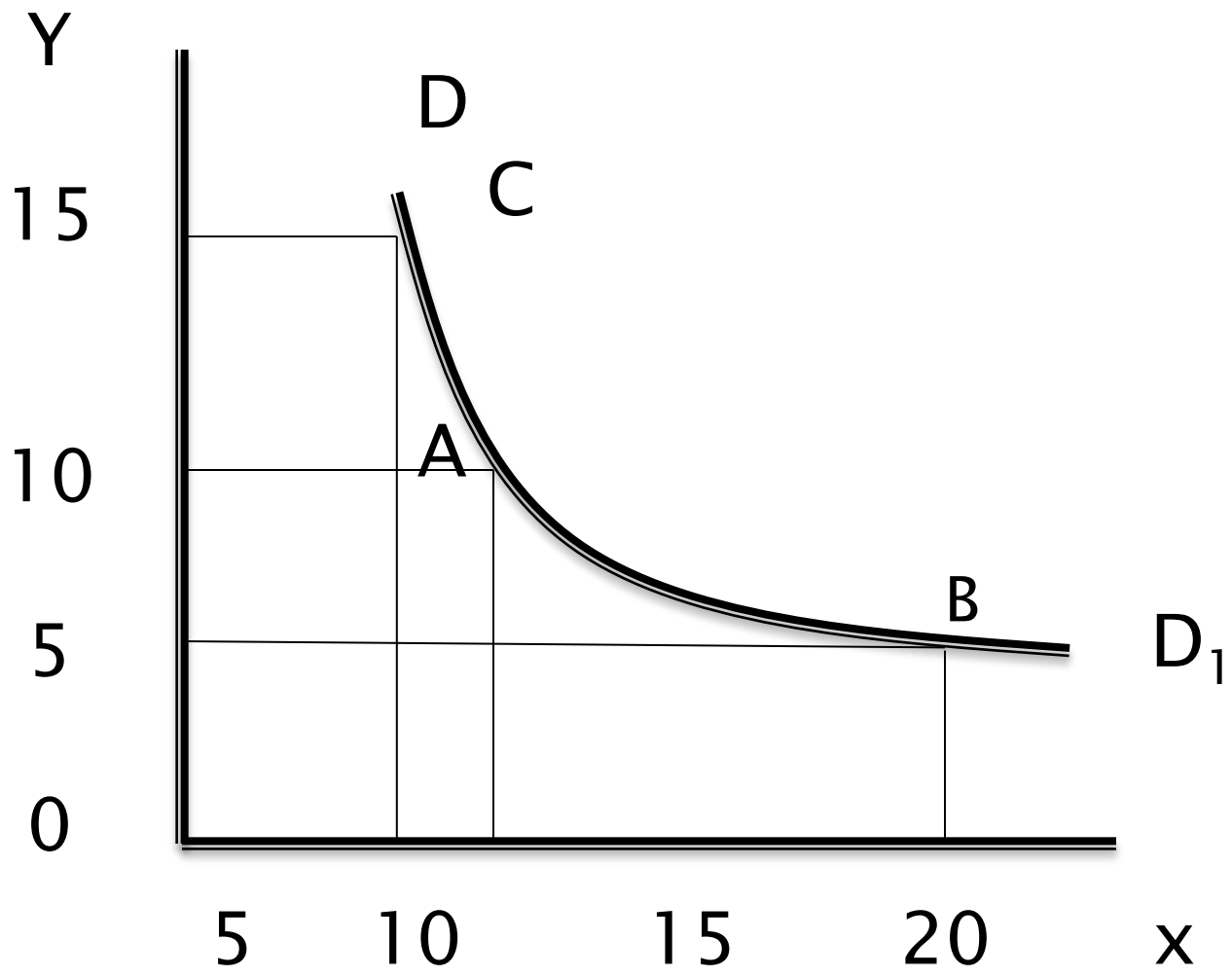
$$\therefore e_p = \left[\frac{q_2-q_1}{P_2-P_1} \cdot \frac{P_1+P_2}{q_1+q_2}\right]$$

Where,

$P_1$= Initial Price ,$P_2$ = new price

$Q_1$=Initial demand $Q_2$ = new demand




Y
D
C
15
A
10
B
5
$D_1$
0
5
10
15
20
x

In the figure A to B

$$e_p = \left[\frac{20-10}{5-10} \cdot \frac{10+5}{10+20}\right]$$

$$e_p = \left[\frac{10}{-5} \cdot \frac{15}{30}\right] = -1$$

In the figure B to A

$$e_p = \left[\frac{10-20}{10-20} \cdot \frac{5+10}{20+10}\right]$$

- $e_p = \left[\frac{-10}{10} \cdot \frac{15}{30}\right] = -1$

# Example 1: Consider the following demand schedule

| Points | A | B | C | D | E |
|---|---|---|---|---|---|
| $P_x$ : | 40 | 30 | 20 | 10 | 0 |
| $Qd_y$ : | 0 | 20 | 40 | 60 | 80 |

# Numerical example

- Lets suppose, that price of a commodity X decreases from Rs. 10 per-unit to Rs. 8 per-unit and quantity demanded of X increases from 50 units to 60 units. Then find out price elasticity of demand.
- Elasticity of Demand and Supply_Numerical 1.xlsx

# Types (Degree) of Price Elasticity of Demand

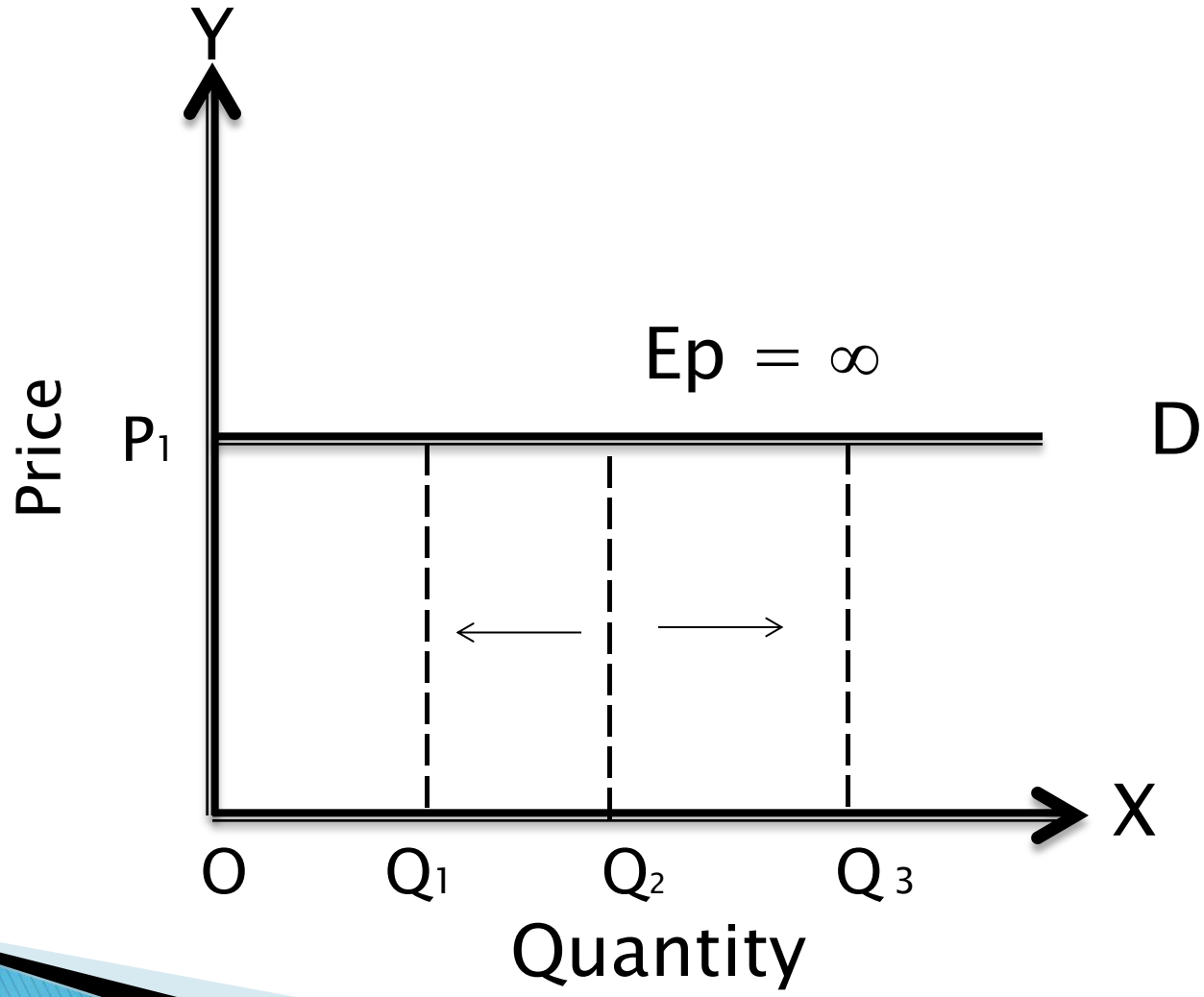
- Perfectly Elastic Demand (Ep = ∞)
- Perfectly Inelastic Demand (Ep = 0)
- Unitary Elastic Demand (Ep=1)
- Relative Elastic Demand (Ep>1)
- Relative inelastic Demand(Ep<1)

# Perfectly Elastic Demand (Ep = ∞)

- Demand is said to be perfectly elastic if **negligible change in price** leads to infinite change in the **quantity demanded.**
- Visibly, no change in **price causes an infinite change in demand.**
- Perfectly elastic demand is **theoretical concept.**

$$Ep = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price} = \frac{\infty}{0} = \infty$$

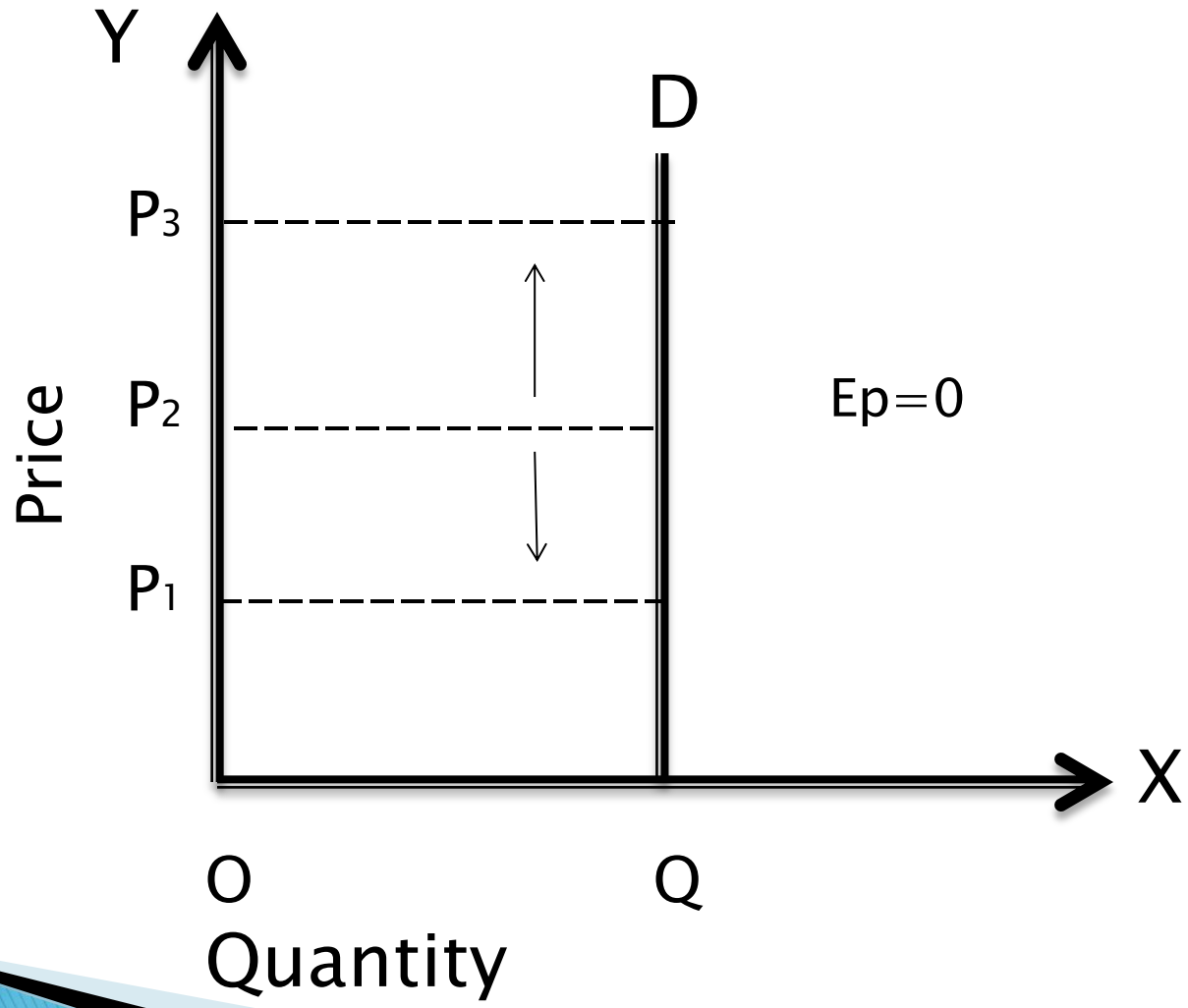
# Perfectly Elastic Demand (Ep = ∞)



# Perfectly Inelastic Demand (Ep = 0)

- When **the demand for a commodity** does not change with the change in **its price**, the demand is said to be perfectly inelastic demand.
- **Medicine and salt** have example of inelastic demand.
- $$\frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price}$$
- $$= \frac{0}{Any\ Amount} = 0$$

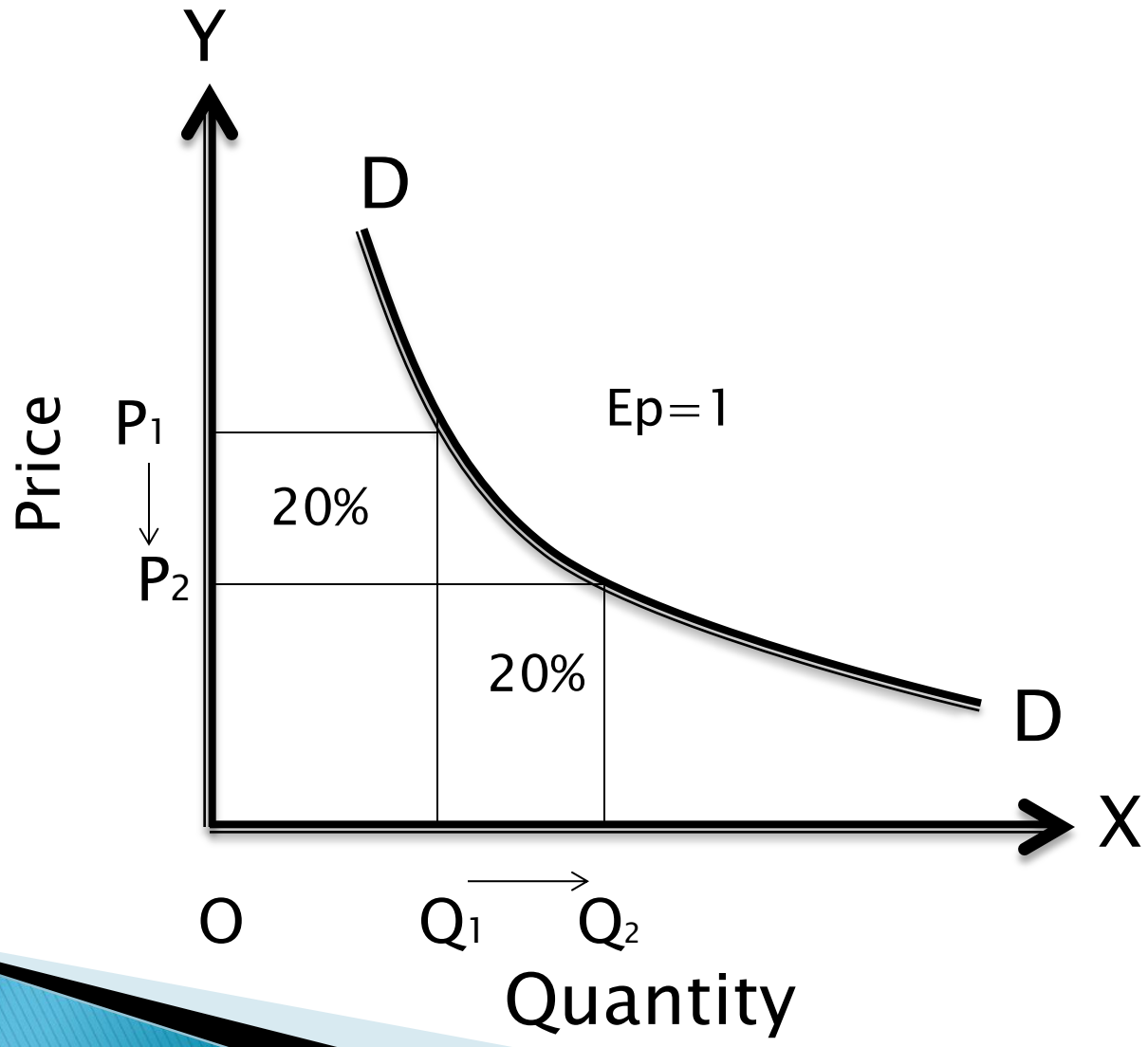
# Perfectly Inelastic Demand (Ep = 0)



# Unitary Elastic Demand (Ep=1)

- When the **percentage change in the quantity demanded** is equal to the **percentage change in price,** the demand for a commodity is said to be **unitary elastic demand**.
- For example, if **20% change in price** causes **20% change in demand**, it is the case of unitary elastic demand.
- $Ep = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price} = \frac{20\%}{20\%}$

# Unitary Elastic Demand (Ep=1)

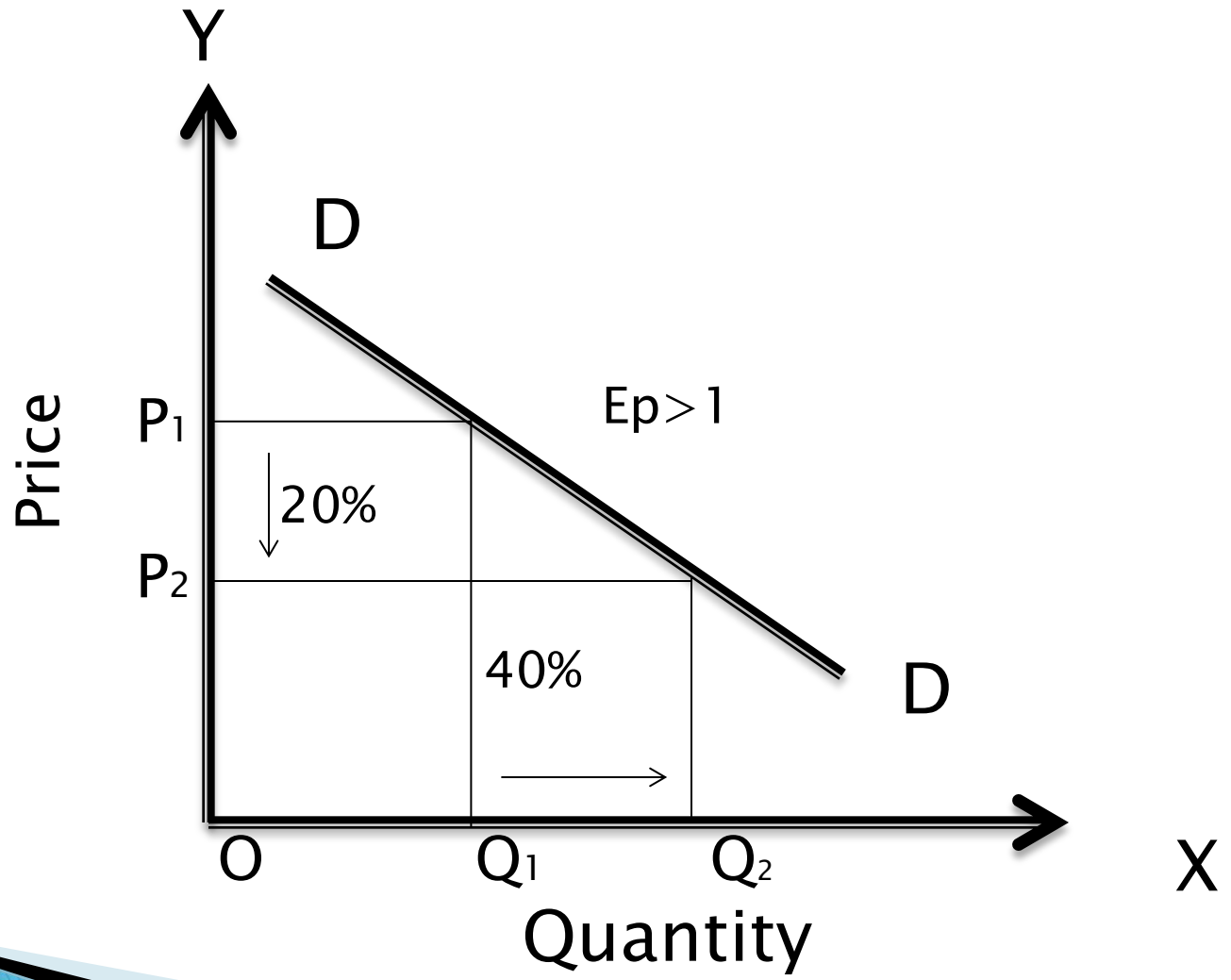


# Relative Elastic Demand (Ep>1)

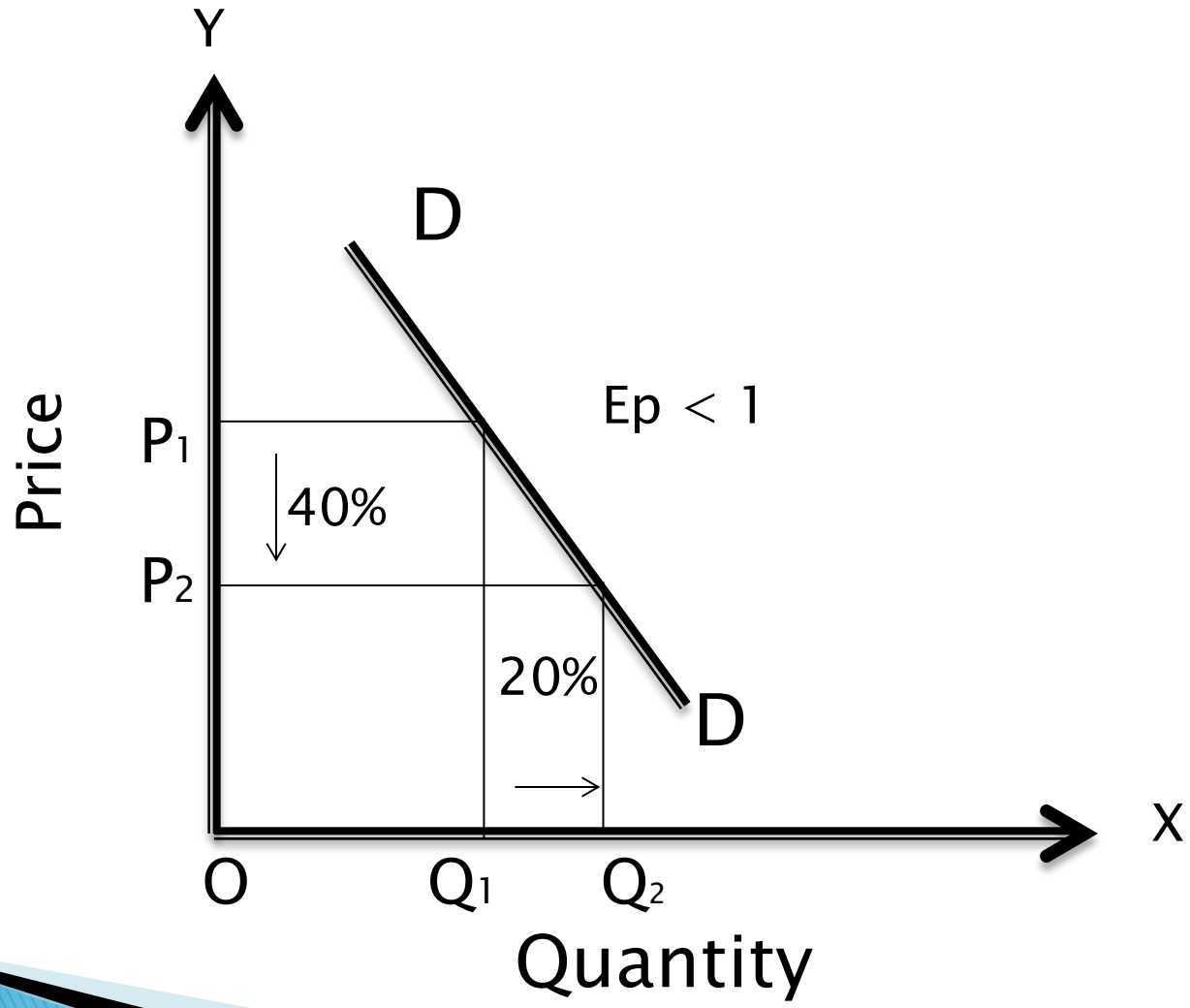
- When the **percentage change in the quantity demanded** for a commodity is **more than change in its price,** it is called relatively elastic demand.
- Such kind of elasticity of demand is found in **case of luxury goods** like refrigerator, car, Led TV etc.
- $Ep = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price} = \frac{40\%}{20\%}$

$= 2 > 1$

# Relative Elastic Demand (Ep>1)



# Relative inelastic Demand(Ep<1)



# Relative inelastic Demand(Ep<1)

- If the **percentage change in the quantity demanded** of a commodity is **less than** the **percentage change in its price**, it is called relatively inelastic demand.
- It is found in case of **necessity or basic good** like rice, vegetable, clothes, etc.
- Ep = $\frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ price} = \frac{10\%}{20\%}$

$= .5 < 1$

# Relationship betⁿ price elasticity of demand and Total outlay

- Total outlay method is also known as the total expenditure method of measuring price elasticity of demand.
- Product betⁿ price of the commodity and quantity consumed at that price.
- It is compared total outlay(Expenditure) before and after variations in price.
- TE= PxQ

TE= Total outlay

P= Price

Q=Quantity consumed

There are there types of price elasticity -

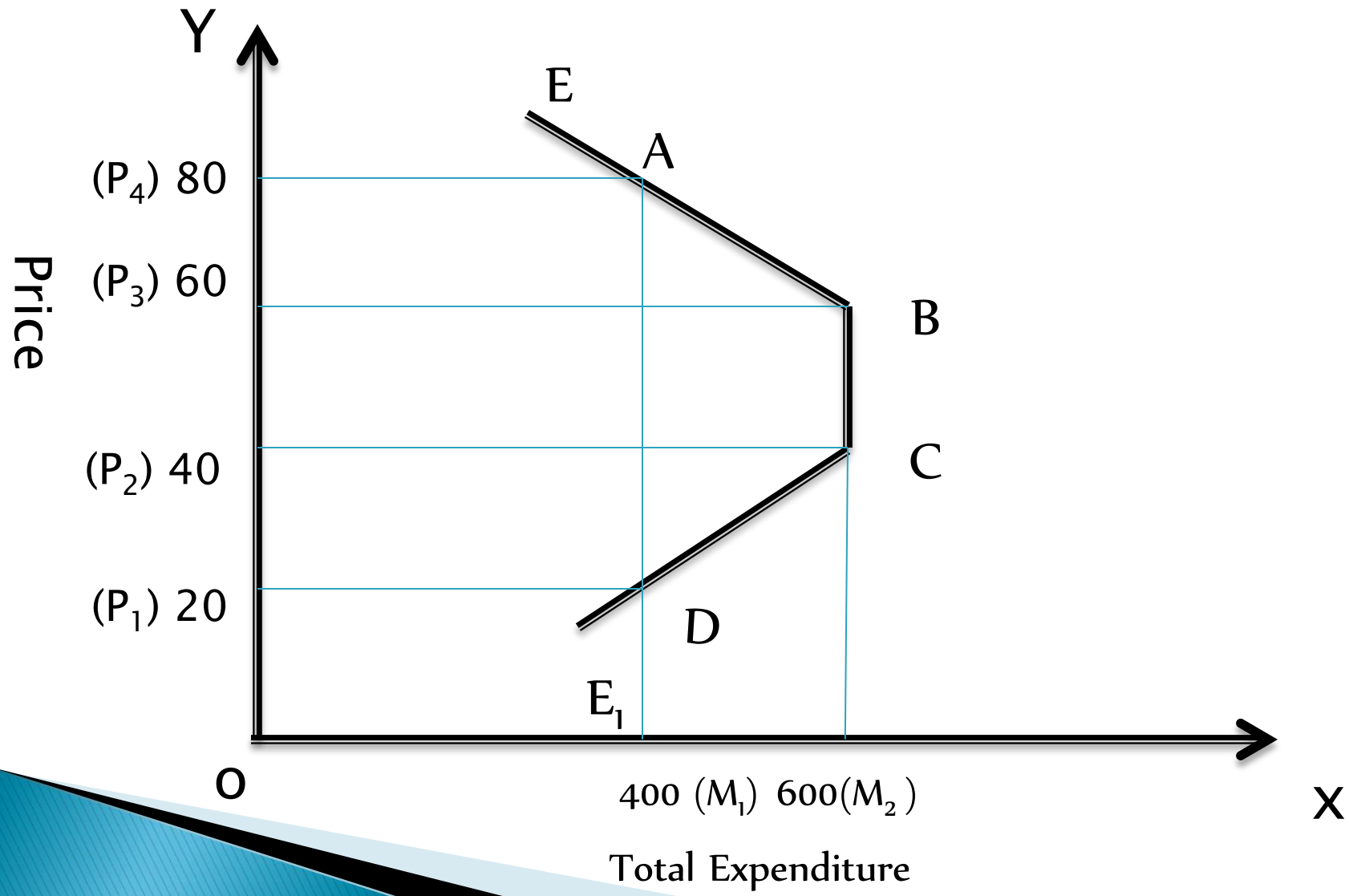
# Cont...d

- Elasticity greater than unity ($e_p$>1): When total expenditure (TE) increases with the fall in price and decreases with the rise in price. It is also called elastic demand.
- Elasticity less than unity ($e_p$<1): When total expenditure (TE) decreases with the rise in price and increases with the decrease in price. It is also called inelastic demand.
- Elasticity equal to unity ($e_p$=1): When total expenditure (TE) remains unchanged with a fall or rise in price. It is also called equal to unity

# Cont...d

| Point | Price(Rs.) | Demand) (KG) | Total Quantity (PxQ) | Degree of price Elasticity of Demand |
|---|---|---|---|---|
| A | 20 | 80 | 1600 | |
| B | 40 | 60 | 2400 | A to B $\longrightarrow$ P$\uparrow$ E$\uparrow$ $e_p<1$ |
| C | 60 | 40 | 2400 | B to C $\longrightarrow$ P $\uparrow$ E $e_p=1$ |
| D | 80 | 20 | 1600 | C to D $\longrightarrow$ P$\uparrow$ E$\downarrow$ $e_p>1$ |

# Diagram


Y
E
A
(P4) 80
(P3) 60
Price
B
(P2) 40
C
(P1) 20
D
E1
O
400 (M1) 600(M2 )
X
Total Expenditure

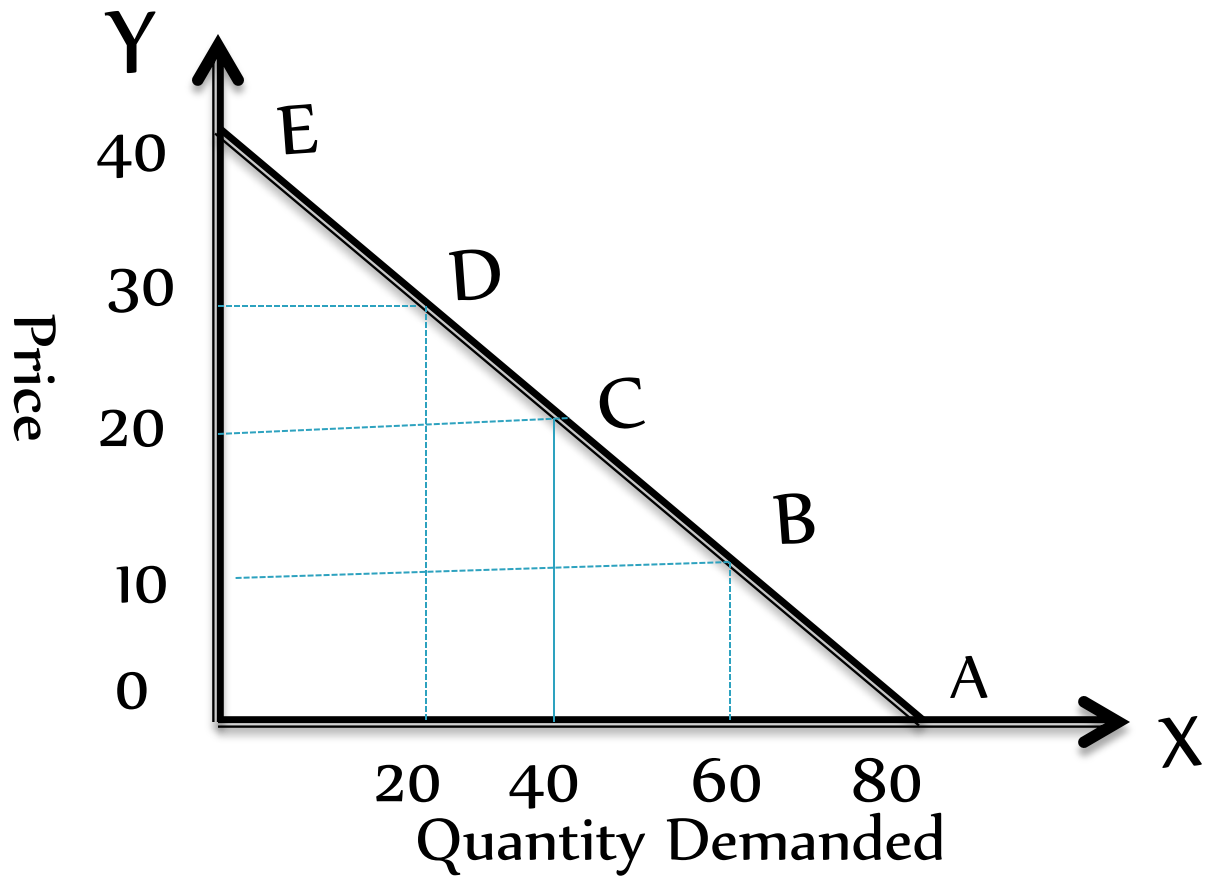
In Figure,

- total expenditure is measured on x- axis and price is measured on Y- axis. $EE_1$curve is total expenditure curve. The AB part of $EE_1$ curve represents elasticity of demand greater than unity because total expenditure increases with the fall in price.
- BC part of $EE_1$ curve represents unitary elastic demand because with the rise or fall in price, total expenditure remains same.
- CD part of $EE_1$ curve represents elasticity of demand less than unity because total expenditure decreases with the fall in price.

# Measurement of Price Elasticity of Demand by Point Method

Price elasticity of demand is the ratio between lower segment and upper segment in a particular point of price demand curve.

| Point | A | B | C | D | E |
|---|---|---|---|---|---|
| $P_x$ | 0 | 10 | 20 | 30 | 40 |
| $Q_x$ | 80 | 60 | 40 | 20 | 0 |




- In Fig, the price elasticity of demand on a linear demand curve (EA) at point C is the ratio between lower segment and upper segment, i.e.

$$e_p = \frac{CA}{CE} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(i)}$$

# cont…d

- We can compute price elasticity of demand at different points of demand at different points demand curve as follows:
- $e_p$=at point c= $\frac{CA}{CE}$ =1($\because CA = CE$)
- $e_p$=at point B= $\frac{BA}{BE}$ <1($\because BA < BE$)
- $e_p$=at point D= $\frac{DA}{DE}$ >1($\because DA > DE$)
- $e_p$=at point E= $\frac{EA}{E} = \frac{EA}{0} = \infty$
- $e_p$=at point A= $\frac{A}{AE} = \frac{0}{AE} = 0$

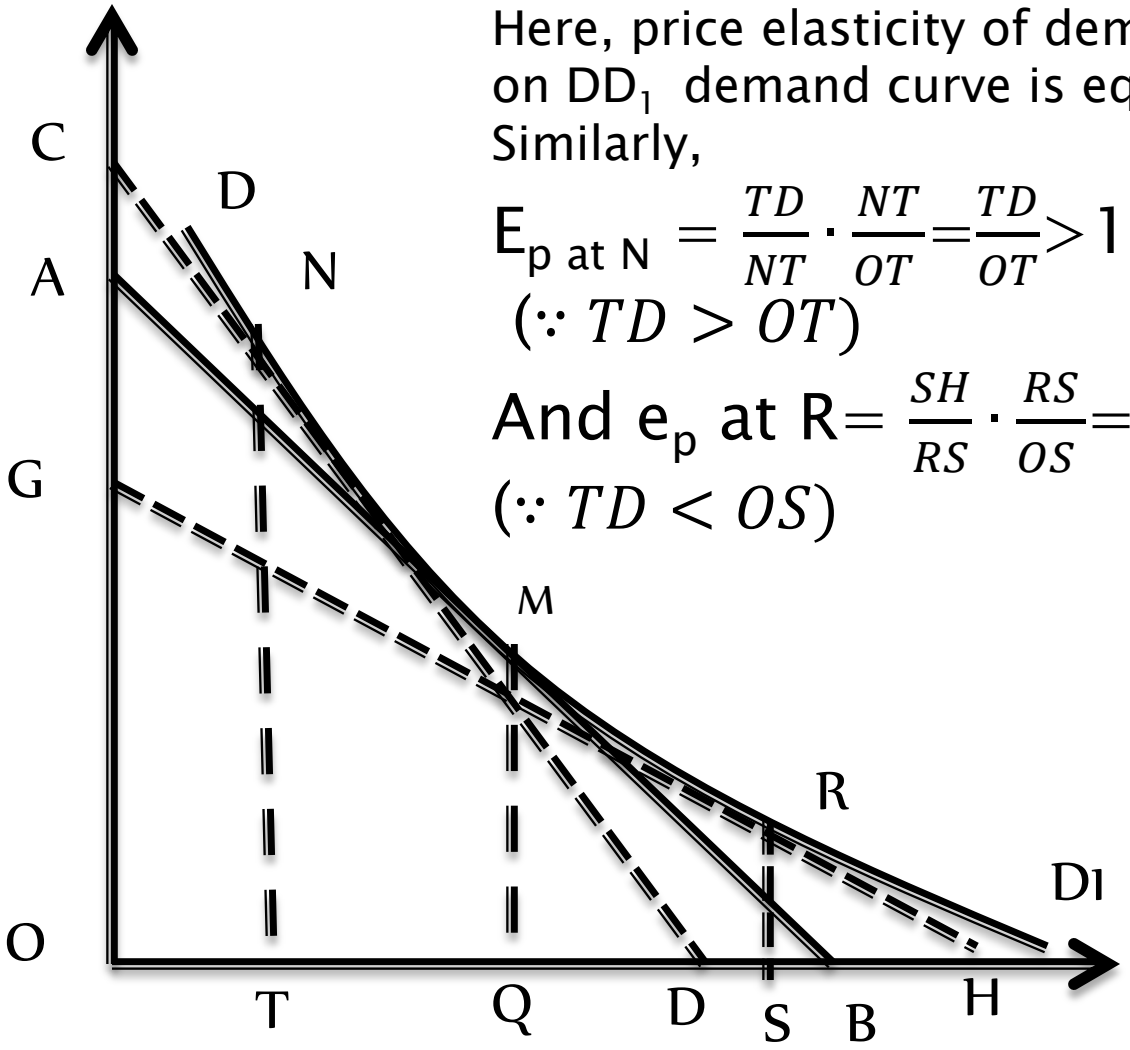
# It is also conclude that:

- At the midpoint of a linear demand curve, $e_p=1$.
- At any points lying between midpoint and x-intercept, point elasticity is less than unity $e_p<1$.
- At any points lying between midpoint and Y-intercept, point elasticity is less than unity $e_p>1$.
- At x-intercept (i.e. at point A), $e_p=0$, While, at Y-intercept (i.e. at point E), $e_p = \infty$

# On the Non-Linear Demand Curve

- If the price demand curve be non-linear instead of a straight line, then the price elasticity of demand at a point on it can be measured by drawing a tangent line to that point and then apply the price elasticity formula.

- i.e. $e_p = \frac{\Delta q}{\Delta p} \cdot \frac{P_1}{q_1}$ or $e_p$ at M Point $= \frac{QB}{OQ}$
- In Fig DD1 is price demand curve as non-linear. Price elasticity of demand at point M on it can be computed by drawing a tangent line AB to the point M. Then, price elasticity at M is $\frac{QB}{MQ} \cdot \frac{MQ}{OQ} = \frac{QB}{OQ}$




Here, QB=OQ

Here, price elasticity of demand at point M on $DD_1$ demand curve is equal to one.

Similarly,

$$E_{p \text{ at } N} = \frac{TD}{NT} \cdot \frac{NT}{OT} = \frac{TD}{OT} > 1$$

$(\because TD > OT)$

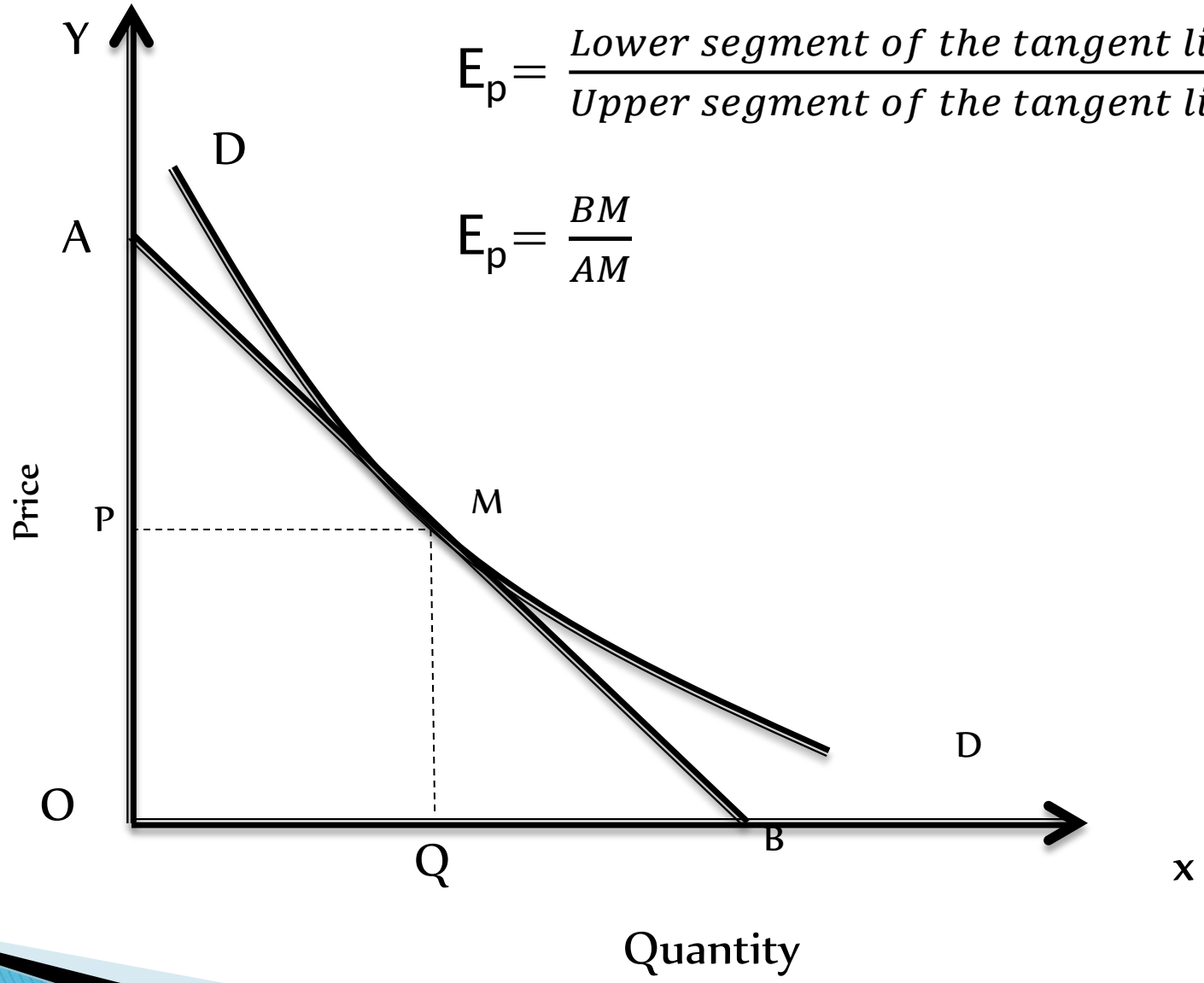
And $e_p$ at R $= \frac{SH}{RS} \cdot \frac{RS}{OS} = \frac{SH}{OS} < 1$

$(\because TD < OS)$

Quantity Demanded

$$E_p = \frac{Lower\ segment\ of\ the\ tangent\ line}{Upper\ segment\ of\ the\ tangent\ line}.$$

$$E_p = \frac{BM}{AM}$$



Calculate the price elasticity of demand using point method at price Rs. 100 for the following demand curve

$p=300-\frac{Q}{2}$

Given

$P= 300- \frac{Q}{2}$ ,Price = 100

$\frac{Q}{2}$ =300-p

Q=2 (300-p)

Q= 600-2p.....i

Differentiating the equation wrt to P, we get

$\frac{DQ}{DP}$ = -2

From the question P= Rs. 100

Putting the value of P in eq i we get

Q= 600-2p

Q= 600-2*100

Q = 400

We know that ,

Ep = $\frac{DQ}{DP} * \frac{P}{Q}$

Now putting the above values in the formula, we get

Ep =-2 * 100/400 =-.5 = 0.5

1% 0.5

Find out price elasticity of demand at price Rs. 25 when following demand function is Qx = 20+2px

# Uses of Price Elasticity of Demand

- Product Pricing
- Price discrimination
- Pricing of Input
- Pricing of Joint Products
- Demand Forecasting
- To Trade Unionists
- Discount Decision

# Income Elasticity of Demand ($E_y$)

- It is the ratio of the percentage change in demand for a good with the percentage change in income.
- Income elasticity of demand measures the degree of responsiveness of the demand for a commodity to change in the income of the consumer.

In terms of percentage,

$$e_y = \frac{\%change\ in\ quantity\ demanded}{\%\ change\ in\ income\ of\ the\ consumer}$$

$$e_y = \frac{\frac{New\ quantity\ demanded - Initial\ quantity\ demanded}{Initial\ quantity\ demanded} \times 100}{\frac{New\ price - Initial\ price}{Initial\ price} \times 100}$$

$$e_y = \frac{\frac{q_2 - q_1}{q_1} \times 100}{\frac{p_2 - p_1}{p_1} \times 100}$$

# Cont…d

In terms of proportion,

$$e_y = \frac{\frac{Change\ in\ quantity\ demanded}{Initial\ quantity\ demanded}}{\frac{Change\ in\ \ income}{Initial\ income}}$$

$$e_y = \frac{\frac{\Delta Q}{Q_1}}{\frac{\Delta Y}{Y_1}}$$

$$e_y = \frac{\Delta Q}{\Delta Y} . \frac{Y_1}{Q_1}$$

# Cont…d

*Where,*

$\Delta q = q_2 - q_1$

*q1=initial demand,*

*q2= new demand*

$\Delta Y = y_2 - y_1$

$y_1$ *=initial income*

$Y_2$ *= new income*

# In terms of Arc Elasticity

- Income elasticity of demand is the coefficient or the average between two points on an income-demand curve.

$$e_p = \frac{\frac{Change\ in\ quantity\ demanded}{\frac{Initial\ quantity\ demanded + New\ quantity\ demanded}{2}}}{\frac{Change\ in\ income}{\frac{Initial\ income + New\ income}{2}}}$$

# In symbolic term,

$$e_p = \frac{\frac{\Delta q}{\frac{q_1+q_2}{2}}}{\frac{\Delta Y}{\frac{Y_1+Y_2}{2}}} = \left[\frac{\Delta q}{q_1+q_2} \cdot \frac{Y_1+Y_2}{\Delta Y}\right] = \left[\frac{\Delta q}{\Delta Y} \cdot \frac{Y_1+Y_2}{q_1+q_2}\right]$$

$$\therefore e_p = \left[\frac{q_2-q_1}{Y_2-Y_1} \cdot \frac{Y_1+Y_2}{q_1+q_2}\right]$$

Where,

$P_1$= Initial Price ,$P_2$ = new price

$Y_1$=Initial Income $Y_2$ = new Income

# Types of Income Elasticity of Demand

- Positive Income Elasticity of Demand $(e_y)$ = +ve
  - Greater than unity $(e_y>1)$
  - Equal to unity $(e_y = 1)$
  - Less than One $(e_y<1)$
- Negative Income Elasticity of Demand $(e_y)$ = - ve
- Zero Income Elasticity of Demand $(e_y = 0)$

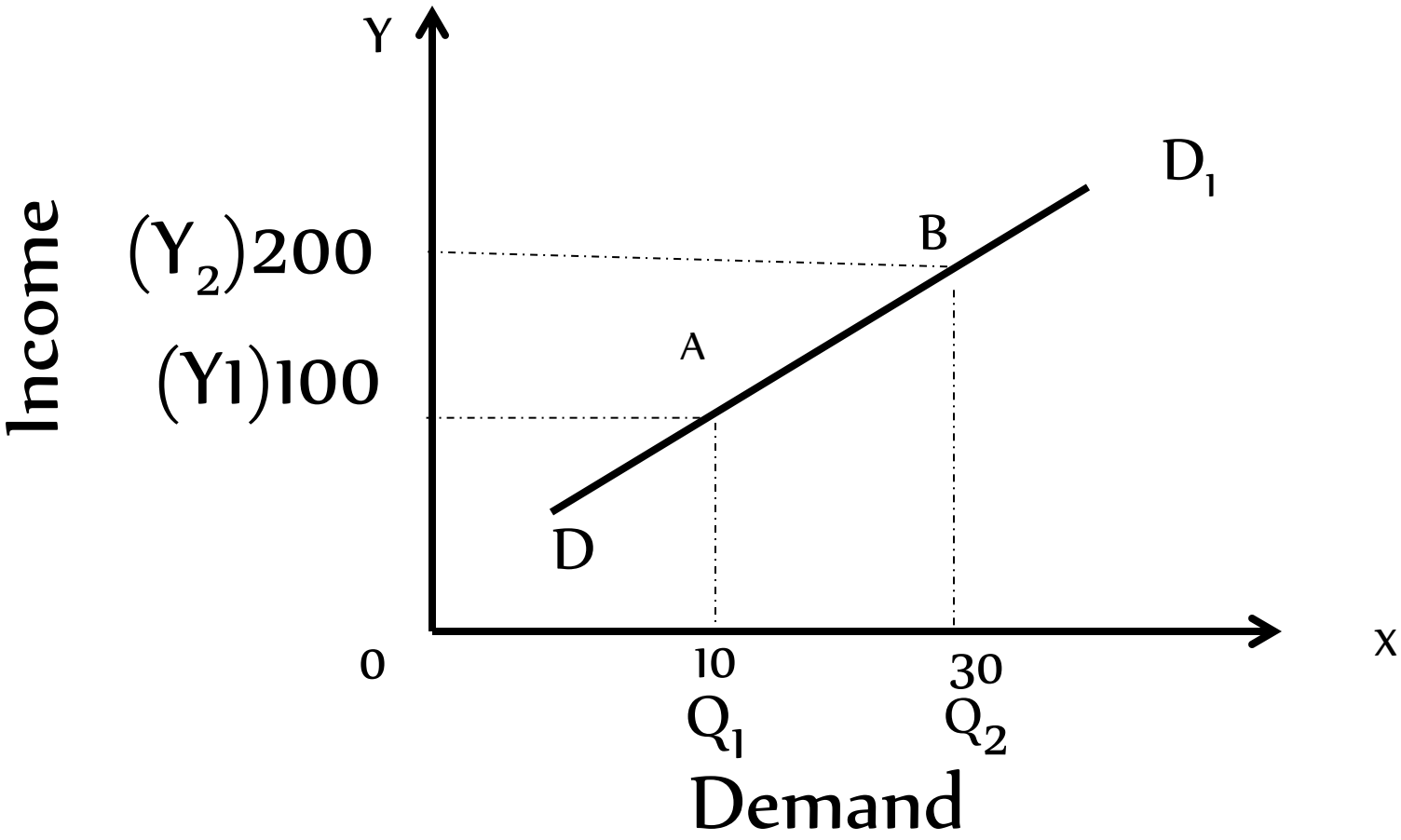
# Positive income Elasticity of Demand

- Positive elasticity of demand

  If the demand for a commodity varies positively with income, income elasticity will be positive. It is connected with normal goods. It has three degree which are described below:

  - Greater than unity ($e_y>1$)

  If the percentage or proportionate change in demand for a commodity is greater than the percentage or proportionate change in income, income elasticity will be greater than one.




Hence, income elasticity of demand is relatively elastic on demand curve ($DD_1$) which slopes upwards to the right as flatter.

Let,

Initial income ($Y_1$) = Rs. 100,

Initial demand ($Q_1$) = 10,

New income ($Y_2$) =Rs. 200,

New demand ($Q_2$) = 30

% Change in income $\frac{Y_2 - Y_1}{Y_1} \times 100 = \frac{200-100}{100} \times 100 = 100\%$

% Change in demand = $\frac{Q_2 - Q_1}{Q_1} \times 100 = \frac{30-10}{100} \times 100 = 300\%$

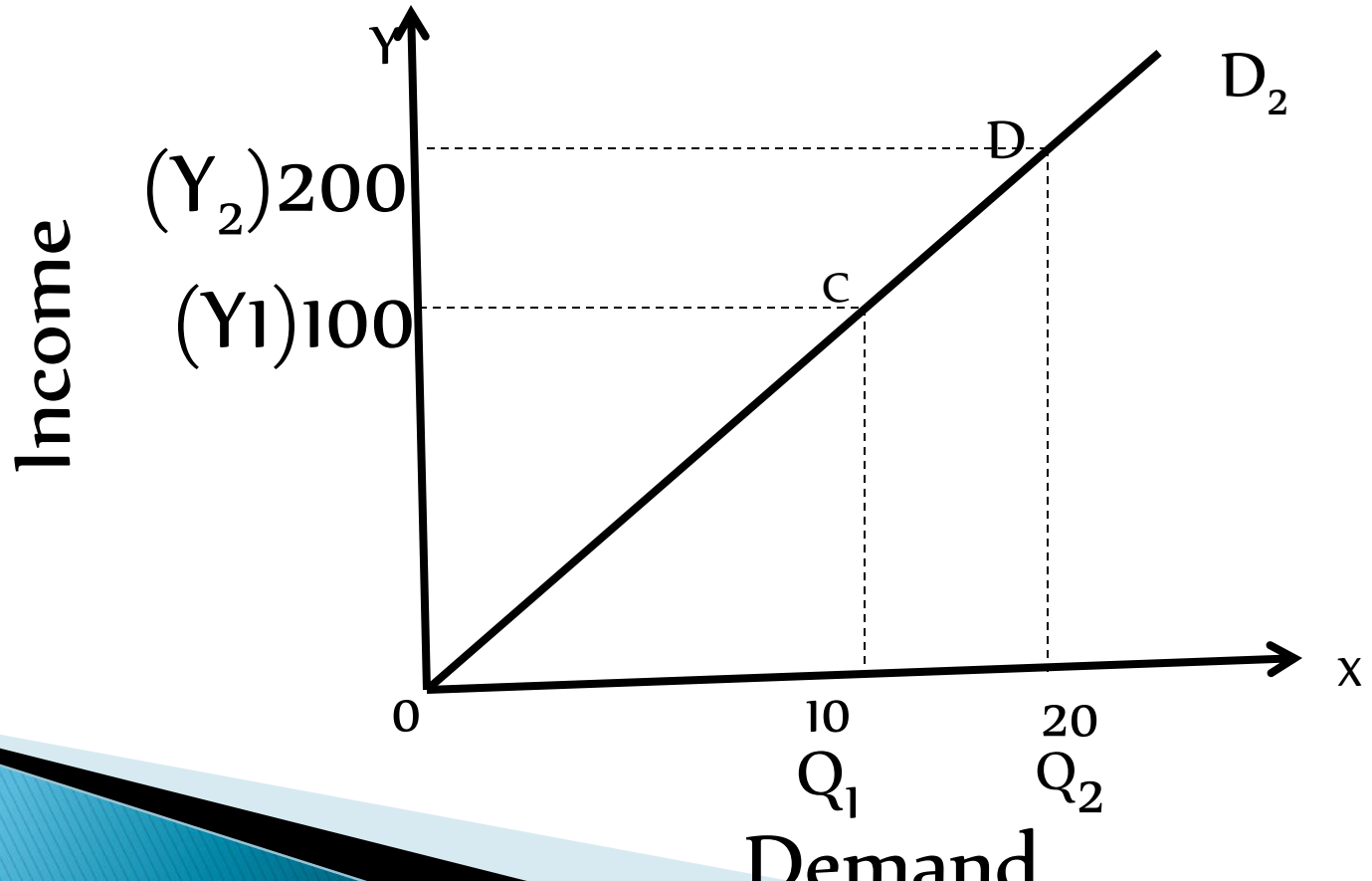
Here, $e_y = \frac{300\%}{100\%} = 2 > 1$.

Hence, $e_y$ is relatively elastic on demand curve ($DD_1$) which slope upward to the right as flatter.

# cont…d

- Equals to unity ($e_y$=1)

If the percentage or proportionate change in demand for a commodity is equals to the percentage or proportionate change in income, income elasticity will be to unity.



Let,

Initial income ($Y_1$) = Rs. 100,

Initial demand ($Q_1$) = 10,

New income ($Y_2$) =Rs. 200,

New demand ($Q_2$) = 20

% Change in income $\frac{Y_2 - Y_1}{Y_1} \times 100 = \frac{200-100}{100} \times 100 = 100\%$

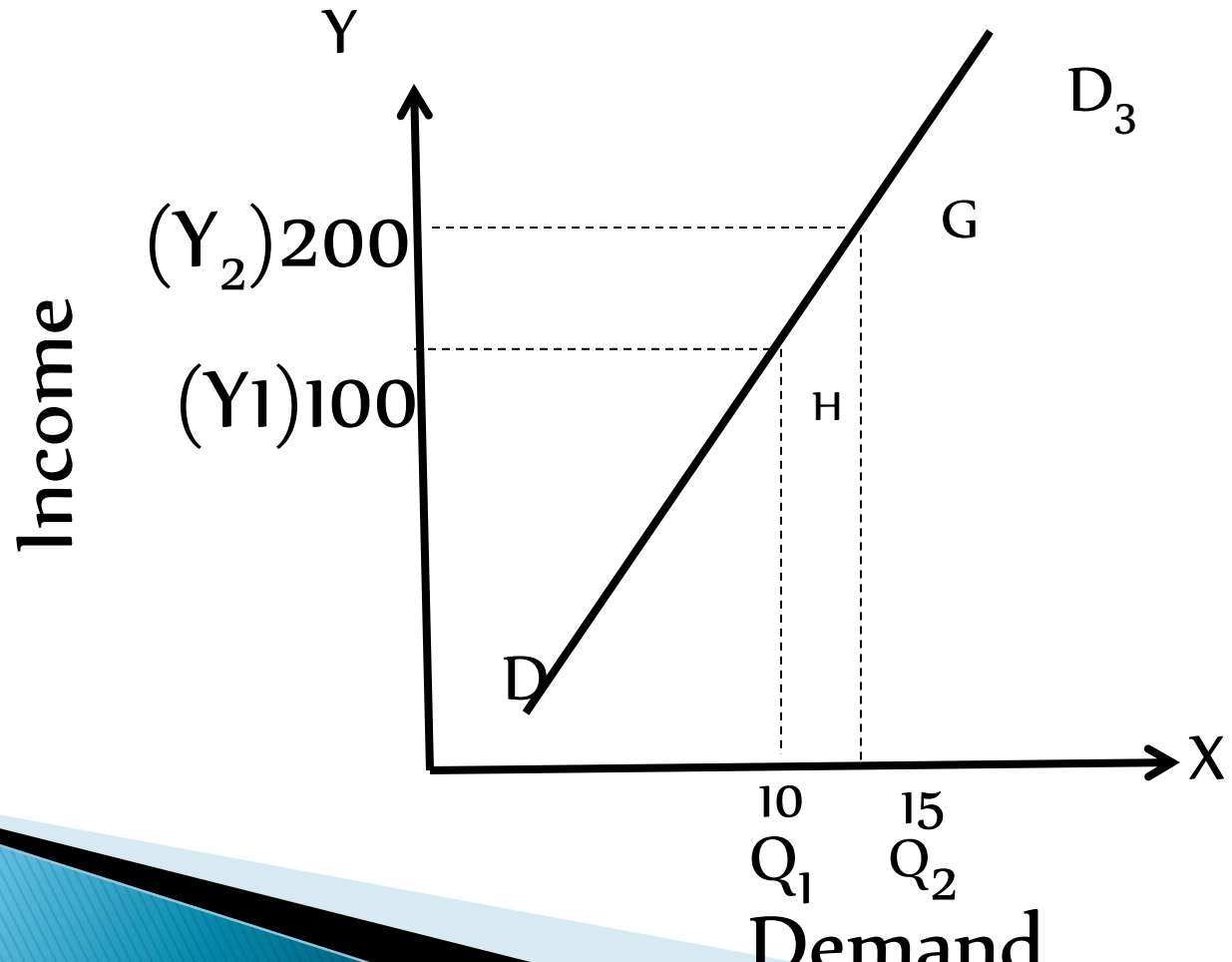
% Change in demand = $\frac{Q_2 - Q_1}{Q_1} \times 100 = \frac{20-10}{100} \times 100 = 100\%$

Here, $e_y = \frac{100\%}{100\%} = 1$

Hence, income elasticity of demand is unitary elastic on demand curve($DD_1$) which slope upward to the right at 45°.

Less than one $(e_y<1)$

If the percentage or proportionate change in demand for a commodity is less to the percentage or proportionate change in income, income elasticity will be less than one.



Let,

Initial income ($Y_1$) = Rs. 100,

Initial demand ($Q_1$) = 10,

New income ($Y_2$) =Rs. 200,

New demand ($Q_2$) = 15

% Change in income $\frac{Y_2 - Y_1}{Y_1} \times 100 = \frac{200-100}{100} \times 100\% = 100\%$

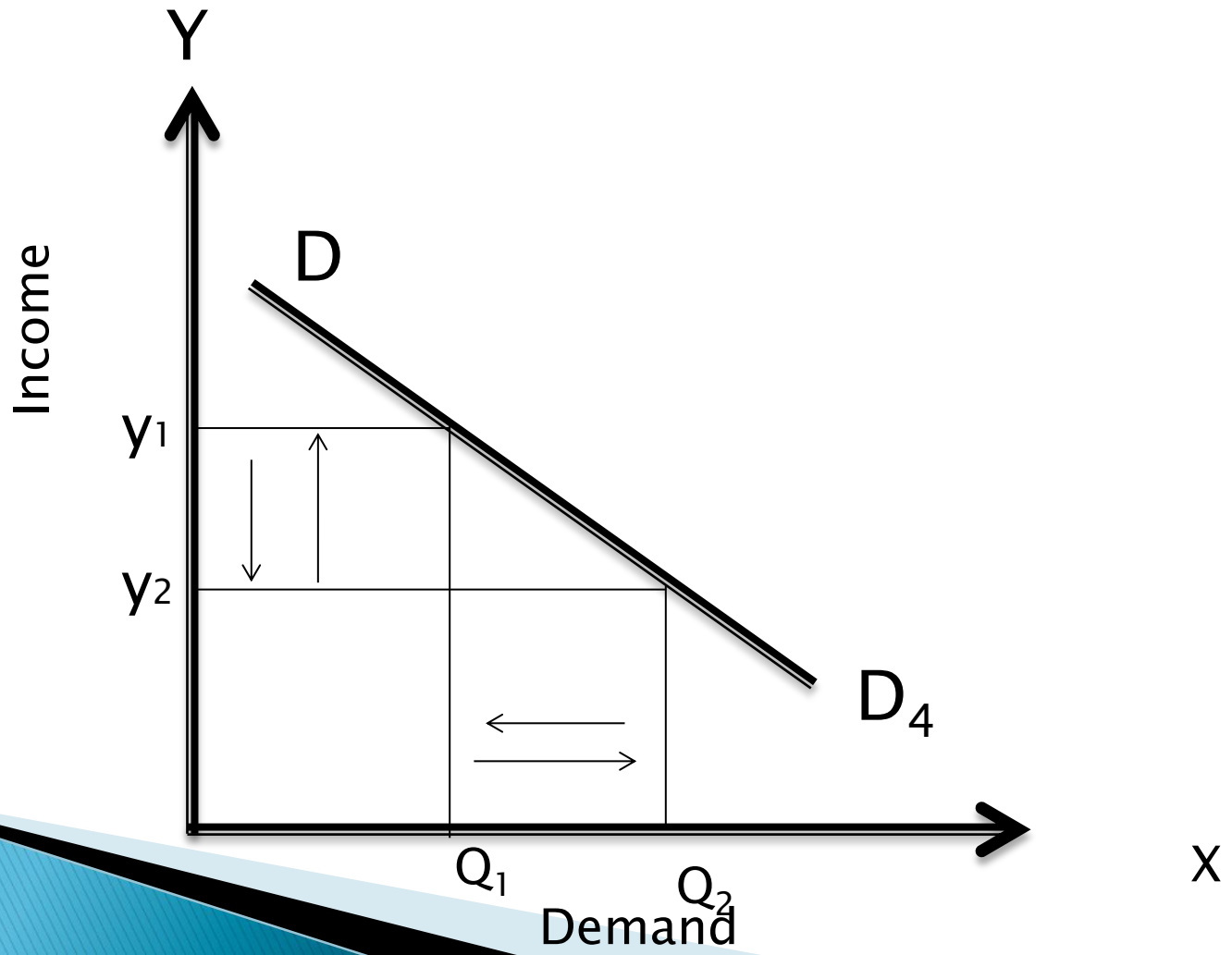
% Change in demand = $\frac{Q_2 - Q_1}{Q_1} \times 100 = \frac{15-10}{10} \times 100\% = 50\%$

Here, $e_y = \frac{100\%}{100\%} = \frac{1}{2} < 1$

Hence, $e_y$ is relatively inelastic on demand curve($DD_1$) which slope upward to the right as steeper.

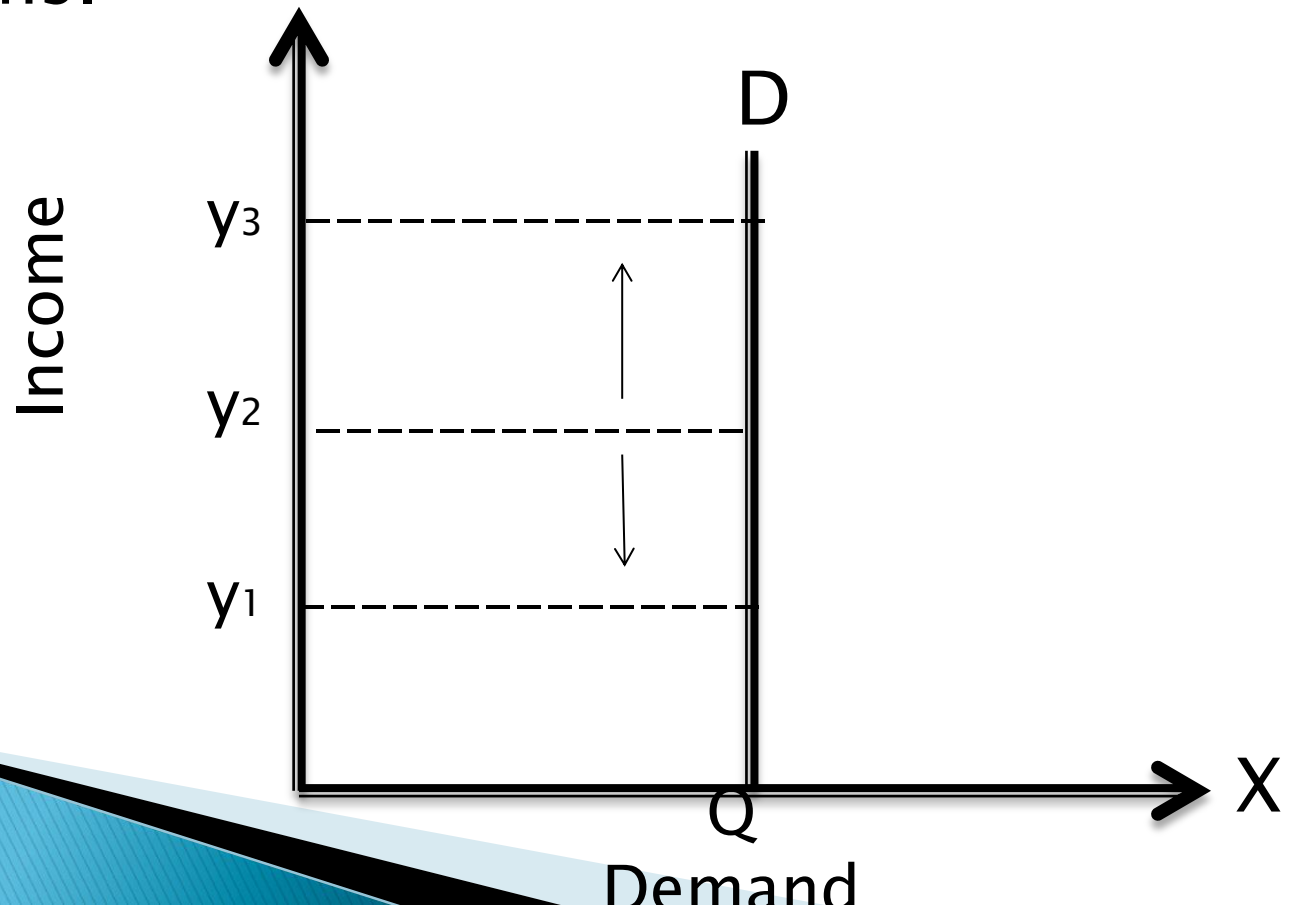
# 2. Negative Income Elasticity of Demand ($e_y$=-ve)

- If the demand varies inversely with income, elasticity will be negative. It is connected with inferior goods.



# Zero Income Elasticity of Demand ($e_y$=0)

- If there is no any response in demand due to the change in income, income elasticity will be zero. It is connected with very low priced items.



## Example 6: Consider the following statements:

a. The income of a household rise by 20%, the demand for watch rises by 25%.

b. The income of a household rises by 10%, the demand for X good also rises by 10%.

c. The income of a household rises by 10%, the demand for floor good also rises by 5%.

d. The income of a household rises by 8%, the demand for millet good also falls by 4%.

e. The income of a household rises by 2%, the demand for salt does not change at all.

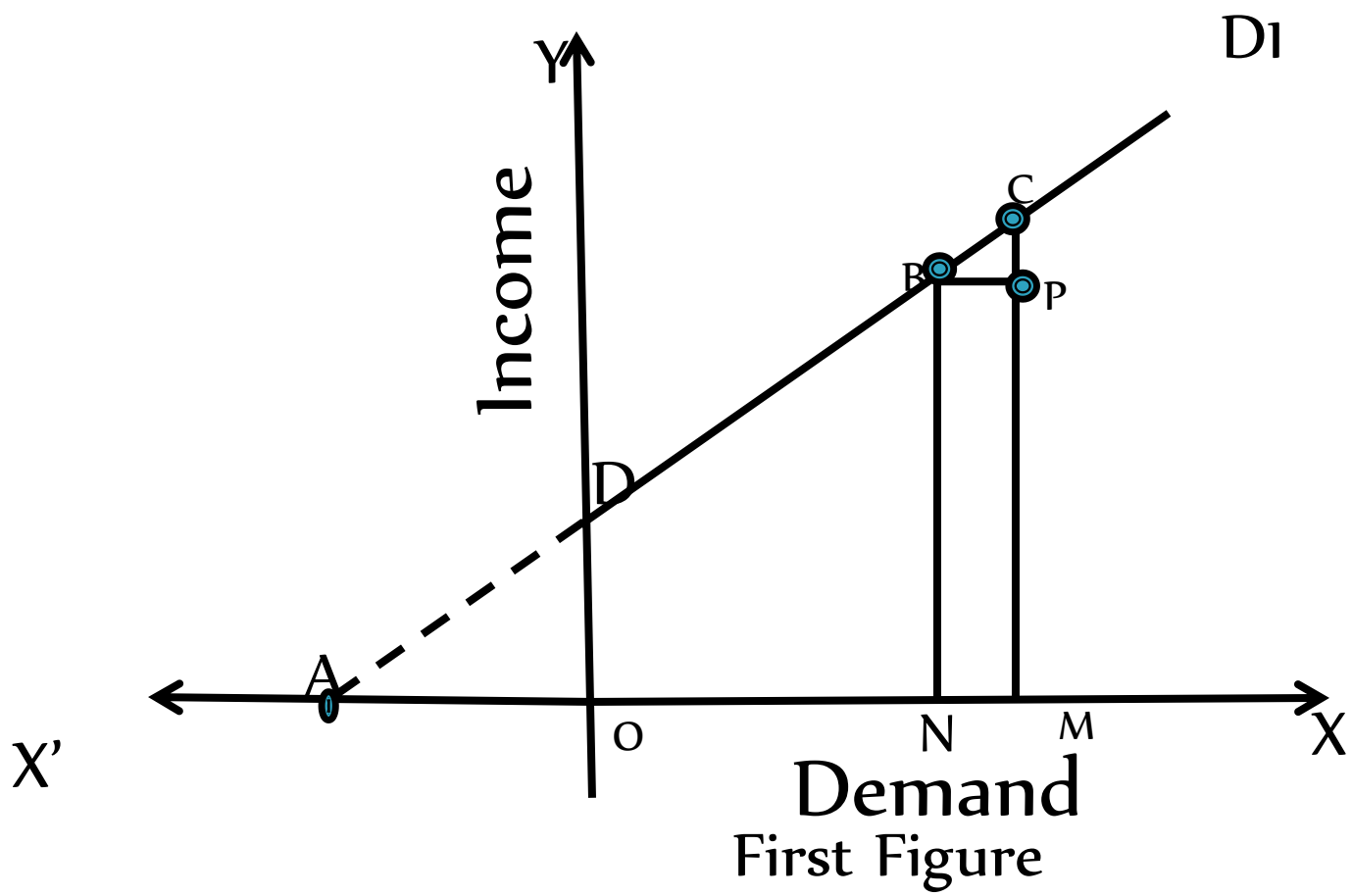
$$= \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ Income}$$

$$= \frac{\frac{Q_2 - Q_1}{Q_1} \times 100}{\frac{Y_2 - Y_1}{Y_1} \times 100}$$

# Measuring Income Elasticity of Demand at a Point on a Linear Demand Curve

- Income demand curve is a locus representing **various level of demand** at **different level of income**. It has **positive slope** (normal goods) and **negative slope** (inferior goods)
- We discard to negative slope and **only measure positive slope** of income elasticity at a point on the income demand.

Cont...d




First Figure

- $DD_1$ is the income demand curve sloping upwards to the right. It is required to measure income elasticity at point B on it.

$$e_y = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y_1}{Q_1} \quad \text{..... (i)}$$

- Here,

Initial Income $(y_1)$ =BN

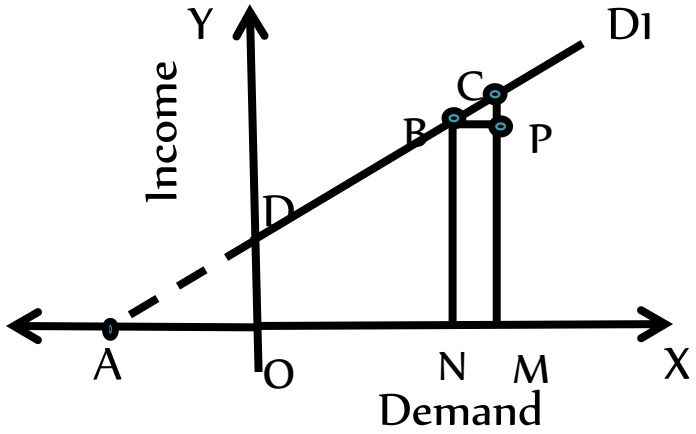
New Income $(y_2)$ = CM

Change in income $(\Delta Y)$ = PC

Initial demand $(Q_1)$ = ON

New demand $(Q_2)$ = OM

Change in demand $\Delta Q$ =NM (or BP)




$$e_y = \frac{BP}{PC} \cdot \frac{BN}{ON} \quad \text{..... (ii)}$$

$$\left\{ e_y = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y_1}{Q_1} \right\}$$

Now, extend income demand curve $DD_1$ downward so as to meet X- axis at point A.

# Cont…d

Now, in triangles BPC and BNA

$\angle CBP = \angle BAN$ (Corresponding angles)

$\angle BPC = \angle ANB$ (Right angles)

$\angle NBA = \angle PCB$ (Remaining angles)

Therefore, the triangles BPC and BNA are similar

Hence, $\frac{BP}{PC} = \frac{AN}{BN}$ ..... (iii)

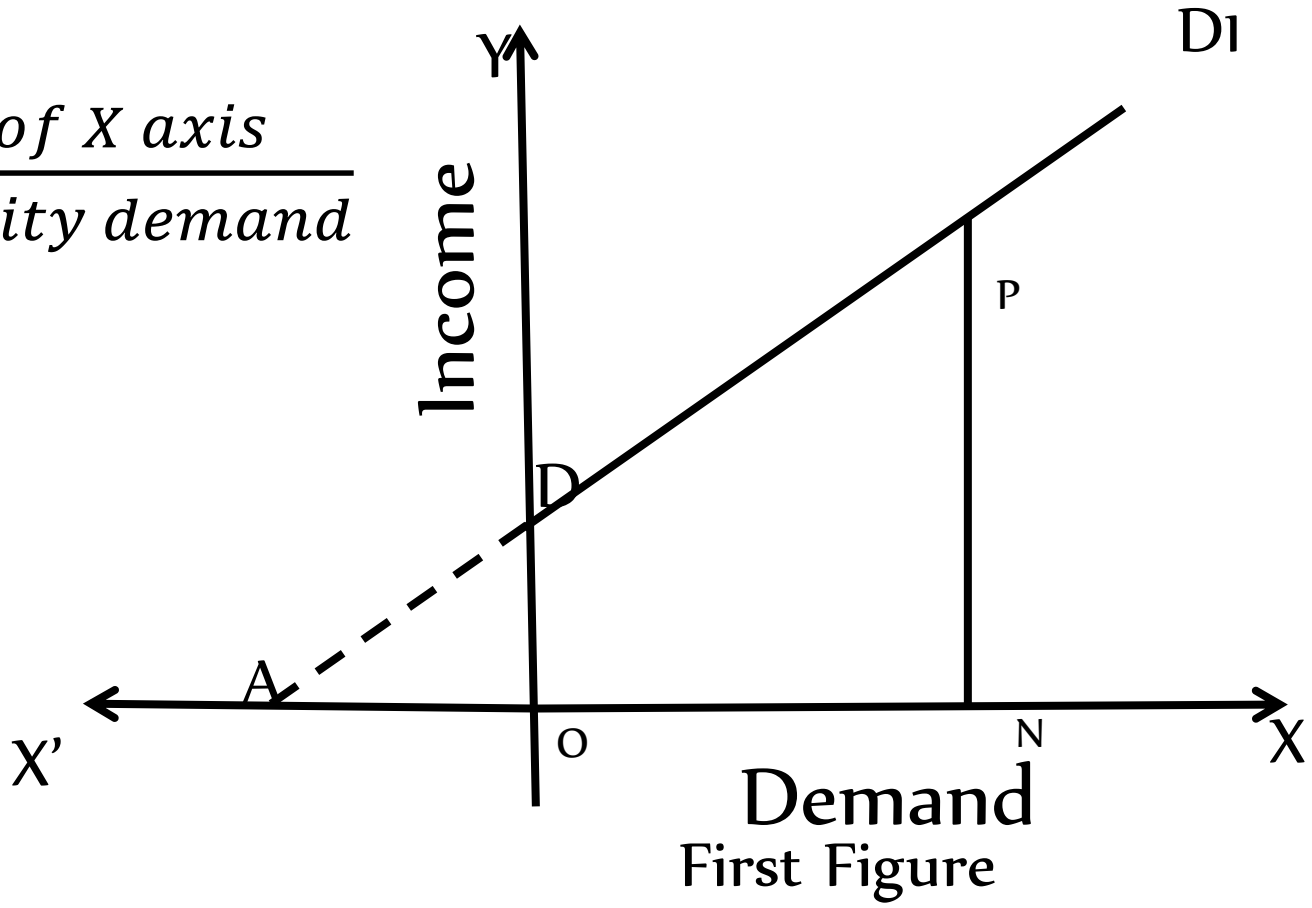
Putting $\frac{AN}{BN}$ for $\frac{BP}{PC}$ in expression (ii), we get

$e_y$= at point B = $\frac{AN}{BN} \cdot \frac{BN}{ON} = \frac{AN}{ON} > 1$

# Alternatively

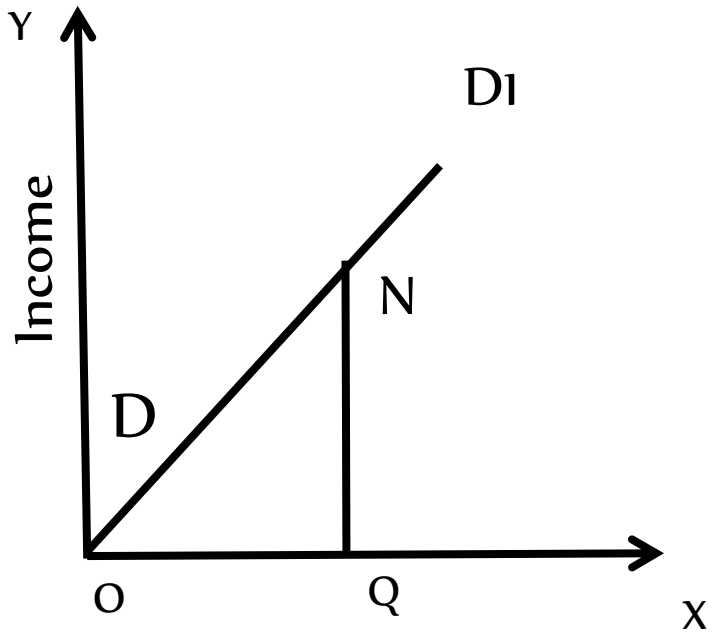
- $e_y = \frac{Intercept\ of\ X\ axis}{Initial\ quantity\ demand}$

$e_y = \frac{AN}{ON} > 1$

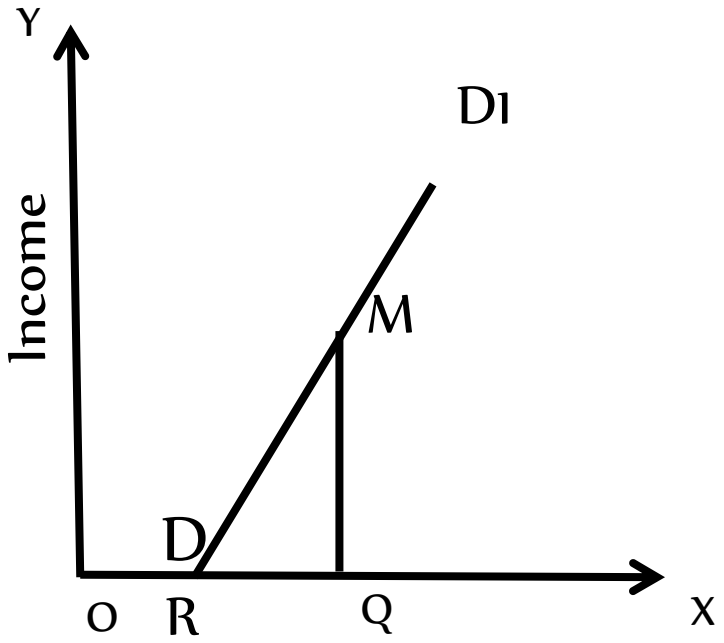



First Figure

Similarly, based on Fig, Second $e_y = \frac{OQ}{0Q} = 1$ and Fig, Third $e_y = \frac{RQ}{OQ} < 1$




Demand
Second Figure




Demand
Third Figure

# Conclusion

If an extended income demand curve **meets the X-axis** to the left of **the point of origin**, income elasticity will be **greater than one** (ey>1). [Shown First Figure.]

If an extended income demand **curve meets the X-axis** to **the point of origin**, income elasticity will be **equal to one** (ey=1). [Shown Second Figure.]

If an extended income demand curve **meets X-axis to the right** of the point of origin, income elasticity **will be less than one** (ey<1). [Shown Third Figure.]

# Point Income Elasticity of Demand at Non- Linear Demand Curve

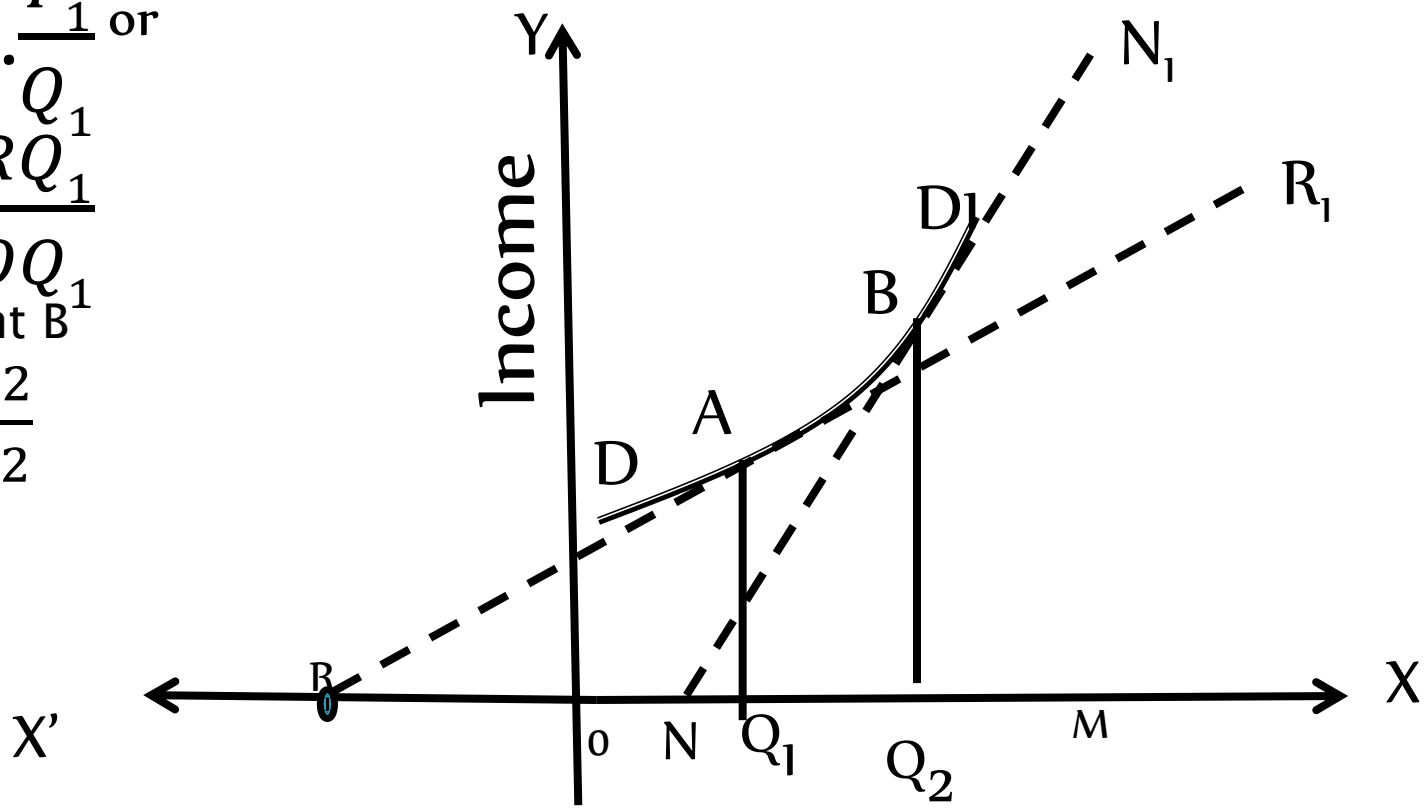
In point A

$$e_y = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y_1}{Q_1} \text{ or}$$

$$e_y = \frac{RQ_1}{OQ_1}$$

In point B

$$= \frac{NQ2}{OQ2}$$



# Cont…d

- If the income demand curve is on **non-linear** instead of a linear or straight line , then the income elasticity of demand at a point on it can be computed by **drawing a tangent line** to that point and then apply the income elasticity formula.
- In figure, $DD_1$ is income demand curve as non-linear. Income elasticity of demand at point A on it can be computed by drawing a tangent line $RR_1$ to the point A.
- Then, income **at point A is** $\frac{RQ_1}{OQ_1}$**. Since** $RQ_1$ **is, greater than** $OQ_1$, income elasticity at **A on income demand curve** $DD_1$ **greater than one**. Similarly, income elasticity at point **B is** $\frac{NQ_2}{OQ_2}$ **. Since** $NQ_2$ is here less than $OQ_2$. Income elasticity at point B on income demand curve $DD_1$ **is less than one**.

# Use of Income Elasticity of Demand

- In Business Decision Making
  - Long term business planning
  - Market Strategy
  - Housing Development Strategies
- Classification of Goods

# Cross Elasticity of Demand

- Measures the degree of responsiveness of the **demand for x good** to **the change in the price of y good,** others things remaining same.
- It is ratio of the **percentage change in the demand for one commodity (say, X good )** with **the percentage change in the price of another commodity (say, Y good).**
- cross elasticity of demand is two types: **Substitute and complements.**

- In terms of percentage,

$$e_{xy} = \frac{\textbf{Percentage change in } \boldsymbol{demand\ for\ x\ good}}{\textbf{Percentage change in } \boldsymbol{price\ of\ y\ good}}$$

$$e_{xy} = \frac{\frac{qx_2 - qx_1}{qx_1} X 100}{\frac{py_2 - py_1}{PY_1} X\ 100}$$

The cress elasticity of demand can also be expressed in terms of proportion as

$$e_{xy} = \frac{\frac{\boldsymbol{Change\ in\ demand\ for\ X\ good}}{\boldsymbol{Initial\ demand\ for\ X\ good}}}{\frac{\boldsymbol{Change\ in\ price\ of\ Y\ good}}{\boldsymbol{Initial\ price\ of\ Y\ good}}}$$

In Symbolic term,

$$e_{xy} = \frac{\frac{\Delta q_x}{qx_1}}{\frac{\Delta PY}{Py_1}} = \frac{\Delta qX}{qx_1} \cdot \frac{Py_1}{\Delta Py} = \frac{\Delta qx}{\Delta py} \cdot \frac{Py_1}{qx_1}$$

Where,

$\Delta qX = q_{X2} \_ q_{X1}$

$\Delta qy = qy_2 \_ qy_1$

$Py_2$ = new price of y good

$qx_2$ = new demand of x good

$qx_1$ = initial demand for x good

$Py_1$ = initial price of x good

*In terms of Arc Elasticity,*

According to arc method, cross elasticity of demand is the coefficient or average between two points in a cross demand curve. Thus,

$$e_{xy} = \frac{\frac{Change\ in\ quantity\ demanded}{\frac{Initial\ quantity\ demanded + New\ quantity\ demanded}{2}}}{\frac{Change\ in\ income}{\frac{Initial\ income + New\ income}{2}}}$$

$$e_{xy} = \frac{\frac{\Delta Qx}{\frac{Qx_1 + Qqx_2}{2}}}{\frac{\Delta Py}{\frac{Py_1 + Py_2}{2}}} \quad \text{OR,} \quad e_{xy} = \frac{\Delta Qx}{Qx_1 + Qqx_2} \cdot \frac{Py_1 + Py_2}{\Delta Px}$$

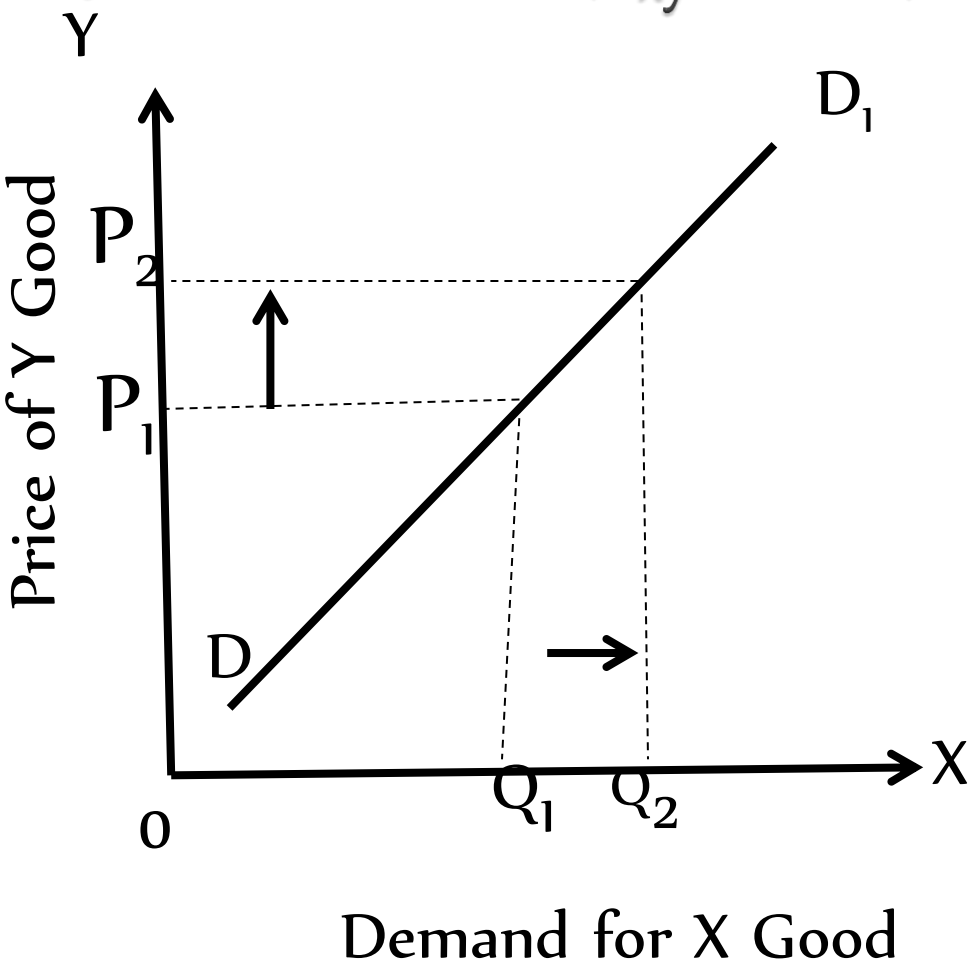
$$e_{xy} = \frac{\Delta qx}{\Delta py} \cdot \frac{py_1 + py_2}{qx_1 + qx_2} = \frac{px_2 - px_1}{qy_2 - qy_1} \cdot \frac{py_1 + py_2}{qx_1 + qx_2}$$

# Types of Cross Elasticity of Demand

- Positive Cross Elasticity of demand ($e_{xy}$ = +ve)
- Negative Cross Elasticity of Demand ($e_{xy}$ = -ve)
- Zero Cross Elasticity of Demand ($e_{xy}$ = 0)

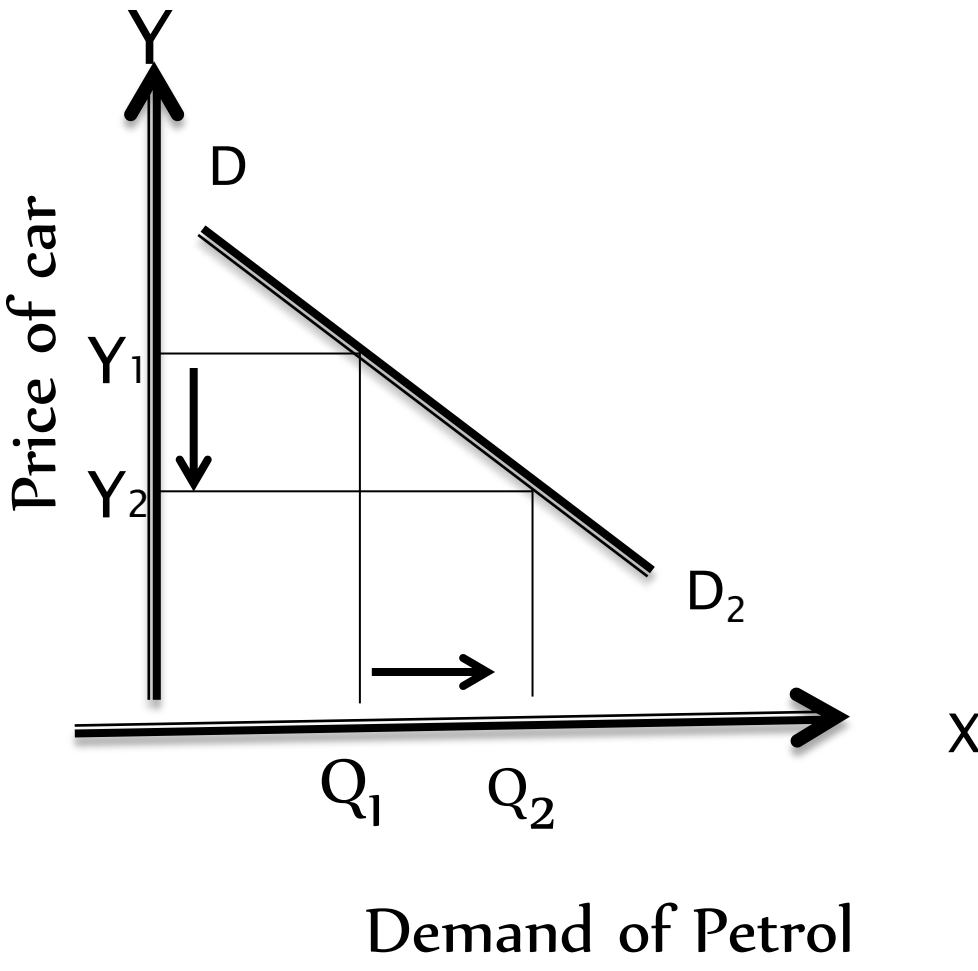
# Positive Cross Elasticity of demand ($e_{xy}$ = +ve)

- If the demand for one commodity (say, x good) varies positively with the price of another commodity (say, Y good) cross elasticity will be positive
- It is related to substitute goods and services.



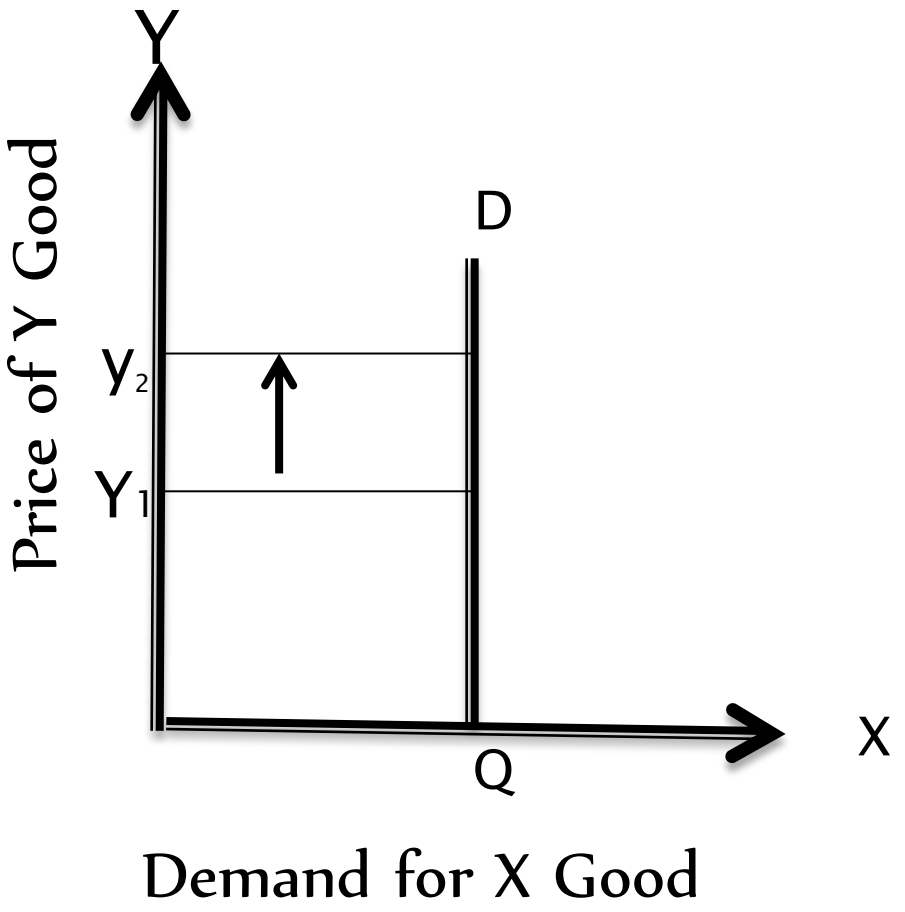
# Negative Cross Elasticity of Demand ($e_{xy}$ = -ve)

- If the demand **for one commodity** (Say, x good) varies inversely with the **price of another commodity** (say, y goods) cross elasticity will be **negative**.
- It is related to **complementary goods and services**.



# Zero Cross Elasticity of Demand ($e_{xy} = 0$)

- If there is no any response in demand for one commodity (Say, X good) due to the change in price of another commodity (say , Y good) cross elasticity will be zero.
- Zero cross elasticity of demand is based on non-related goods



# Uses of cross elasticity of demand

- To formulate business policy
- To classify goods and market
- Pricing Strategies

# Price Elasticity of Supply

- Like law of demand, law of supply is only shows direction of a commodity.
- To find out degree of relationship between price and supply we use elasticity of supply.
- Other things being equal, price elasticity of supply measures the degree of change or responsiveness in quantity supplied of a commodity in response to a relative change in its price.
- In other words, it is the ratio of the percentage change in quantity supplied with the percentage change in price, ceteris paribus.

$$e_s = \frac{\%change\ in\ quantity\ supplied}{\%change\ in\ price}$$

$$e_s = \frac{\frac{New\ quantity\ supplied - Initial\ quantity\ supplied}{Initial\ quantity\ supplied} X\ 100}{\frac{New\ Price - Initial\ price}{Initial\ price} X\ 100}$$

$$e_s = \frac{\frac{[(q_2 - q_1)]}{q_1} X100}{\frac{[(P_2 - P_1)]}{P_1} X100}$$

In terms of proportion

$$e_s = \frac{\frac{Change\ in\ quantity\ Supplied}{Initial\ quantity\ supplied}}{\frac{change\ in\ price}{Initial\ price}}$$

- In symbolic term,

$$= \frac{\frac{\Delta q}{q_1}}{\frac{\Delta p}{p_1}} = \frac{\Delta q}{\Delta p} \cdot \frac{p_1}{q_1}$$

Where,

$P_{1=}$ initial price

$P_{2=}$ new price

$q_{1=}$ Initial quantity supplied,

$q_{2=}$ new quantity supplied

$\Delta q$= change in supply $(q_2-q_1)$

$\Delta p$= change in price $(P_2-p_1)$

# In terms of Arc Elasticity

Elasticity of supply is the average of coefficient between two points on a demand curve. It can be used while finding elasticity at two time intervals. It is computed as:

$$e_p = \frac{\frac{Change\ in\ quantity\ supply}{\frac{Initial\ quantity\ supplied + New\ quantity\ supplied}{2}}}{\frac{Change\ in\ price}{\frac{Initial\ Price + New\ Price}{2}}}$$

In symbolic terms,

$$e_s = \frac{\frac{\Delta q}{\frac{q_1+q_2}{2}}}{\frac{\Delta p}{\frac{p_1+p_2}{2}}} = \left[\frac{\Delta q}{q_{1+}q_2} \cdot \frac{P_1+P_2}{\Delta p}\right] = \left[\frac{\Delta q}{\Delta p} \cdot \frac{P_1+P_2}{q_{1+}q_2}\right]$$

$$\therefore\ e_s = \left[\frac{q_2-q_1}{P_2-P_1} \cdot \frac{P_{1+}P_2}{q_{1+}q_2}\right]$$

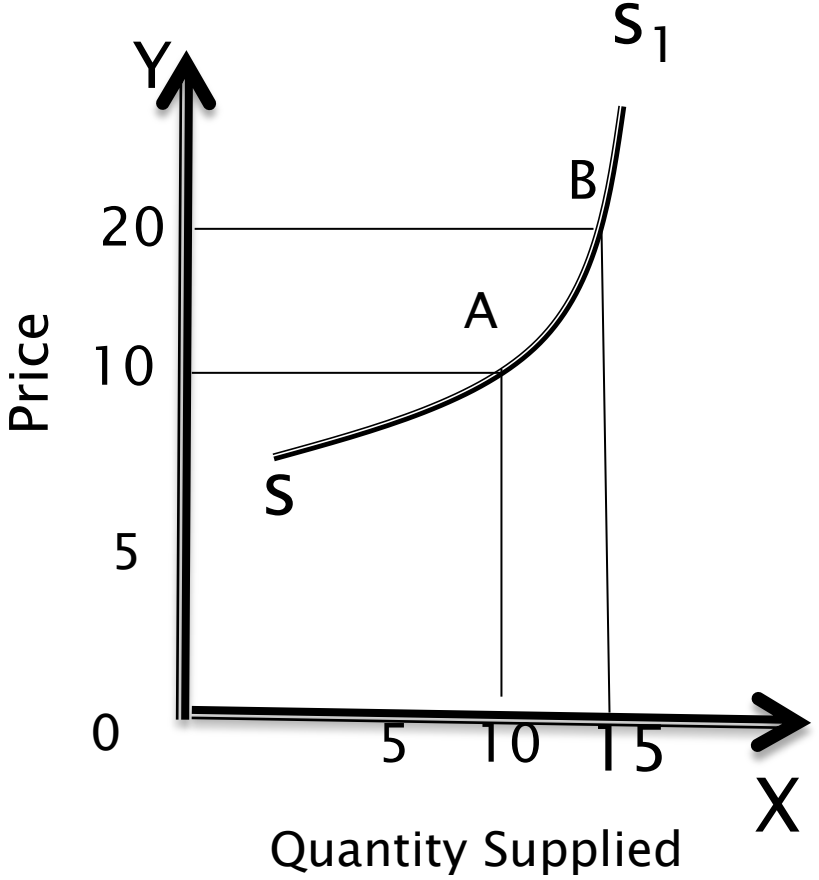
Where,

$P_1$= Initial Price ,$P_2$ = new price

$Q_1$=Initial Supply $Q_2$ = new Supply

$\Delta q$= change in supply (q2-q1)

$\Delta p$= change in price (P2-p1)



# Types (or Degrees) of price elasticity of Supply

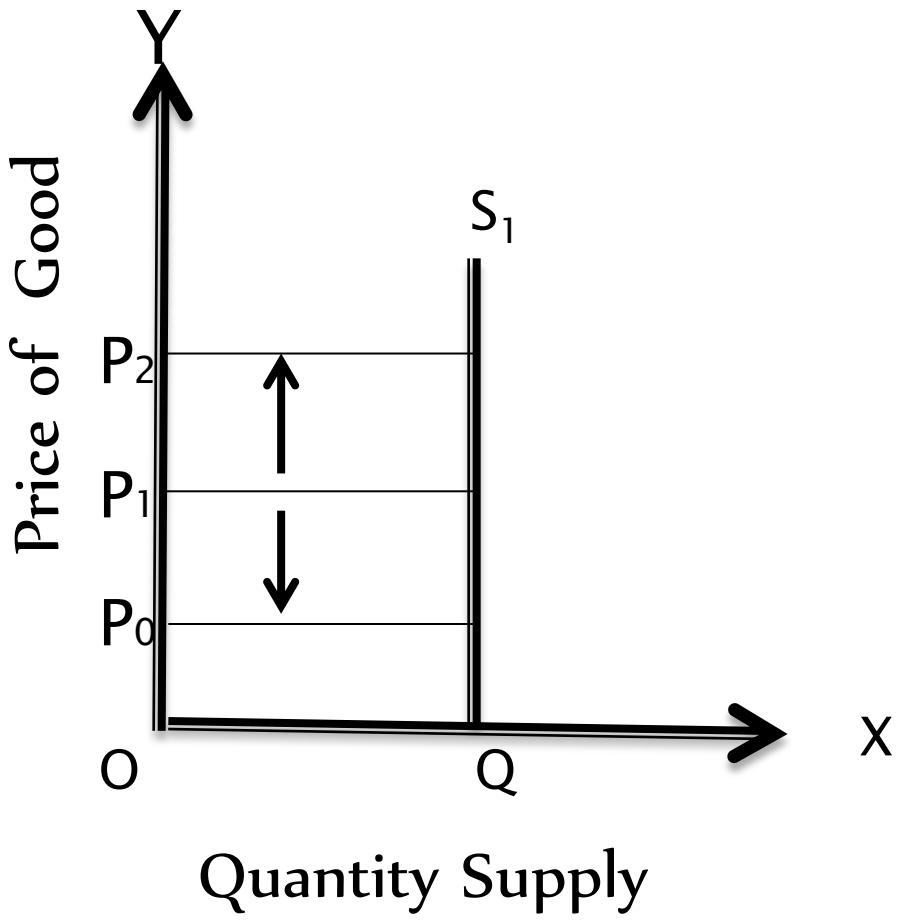
- Perfectly Inelastic Supply ($e_s=0$)
- Relatively Inelastic Supply ($e_s<1$)
- Unitary Elastic Supply ($e_s=1$)
- Relatively Elastic Supply ($e_s>1$)
- Perfectly Elastic Supply ($e_s=\infty$)

# Perfectly Inelastic Supply ($e_s$=0)

- If the quantity supplied of a commodity **remains unchanged** with the **change(i.e. rise or fall)in price.** It is said to be perfectly inelastic supply.

# Perfectly Inelastic Supply ($e_s$=0)

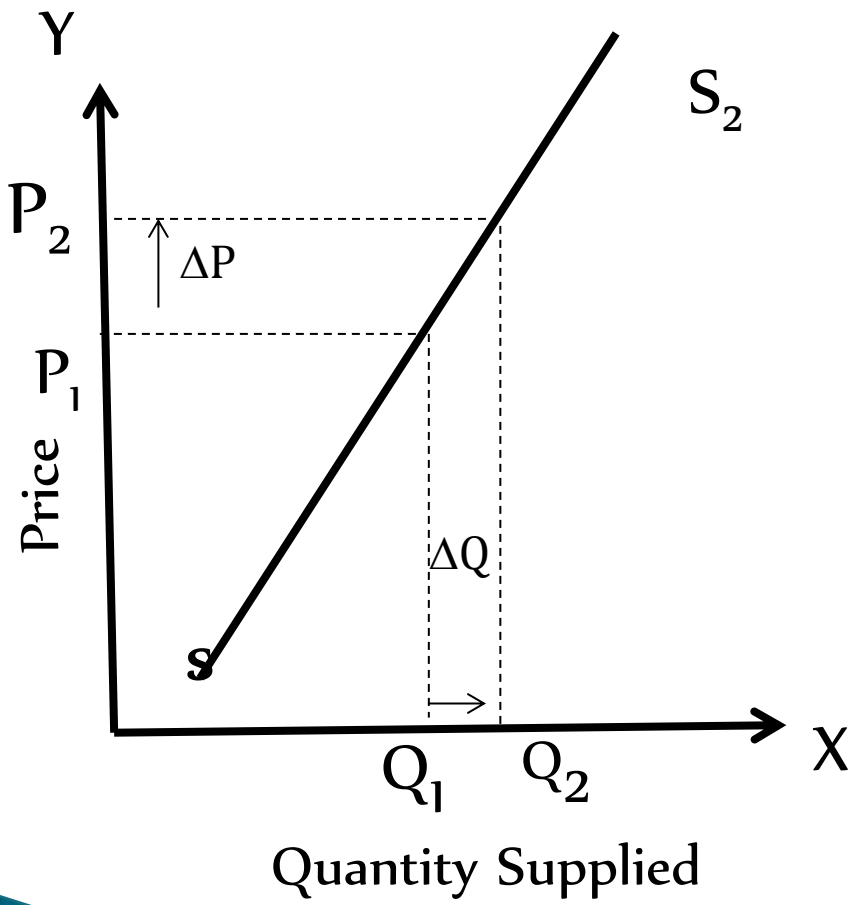
- Let, OX is measured Quantity Supply and OY measures price of goods. Initial price and quantity supplied are $OP_1$ and OQ, respectively, when price falls from $OP_1$ to $OP_0$ rises from $OP_1$ to $OP_2$ quantity supplied remains fixed, i.e. OQ. Thus, the price elasticity lying on any points on supply curve ($QS_1$), is perfectly inelastic ($e_s$=0).



# Relatively Inelastic Supply ($e_s$<1)

- If the percentage or proportionate change in quantity supplied is less than the percentage or proportionate change in price, it is said to be Relatively inelastic supply.
- It is also called elasticity less than unity.
- When 20% change in price causes less than 20% change in supply, then it is the case of relatively inelastic supply.

# Relatively Inelastic Supply ($e_s$<1)




**Explanation**

- Quantity Supply and price of goods are measured: **OX and OY** respectively.
- Initial price and quantity supplied : **$OP_1$ and $OQ_1$**
- New price and quantity supplied: **$OP_2$ and $OQ_2$**
- **Change in Supply ΔQ < change in price ΔP.**
- **Price elasticity of supply curve $ss_2$ is relative inelastic.**

# Unitary Elastic Supply ($e_s$=1)

- If the percentage or proportionate change in quantity supplied is equals to the percentage or proportionate change in price, it is said to be unitary elastic supply.
- If 20% change in price causes 20% change in supply, it is unitary elastic supply.

# Unitary Elastic Supply ($e_s$=1)

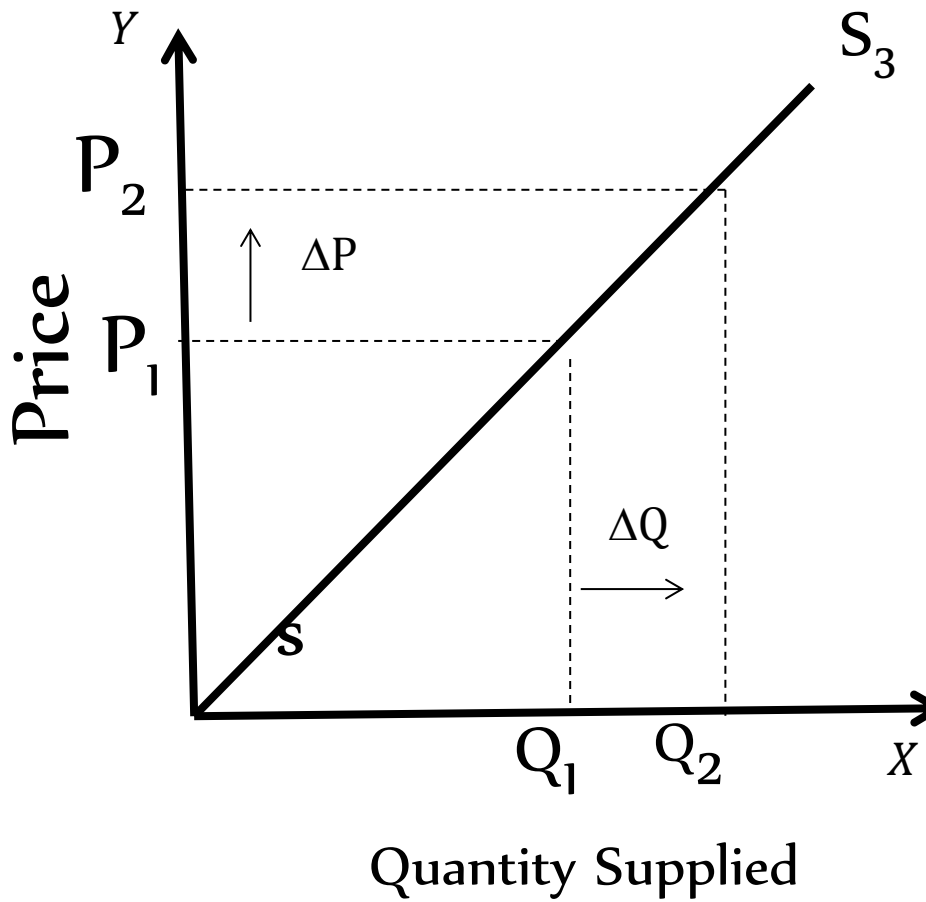
**Explanation**

Quantity Supply and price of goods are measured: **OX and OY** respectively.

Initial price and quantity supplied : $OP_1$ and $OQ_1$

New price and quantity supplied: $OP_2$ and $OQ_2$

Change in Supply $\Delta Q$ = change in price $\Delta P$.



# Relatively Elastic Supply ($e_s$>1)

- If the percentage or proportionate change in quantity suppled is greater than the percentage or proportionate change in price.
- If 20% change in price results more than 20% change in quantity supplied, it is case of relatively elastic supply.

# Relatively Elastic Supply ($e_s$>1)

**Explanation**

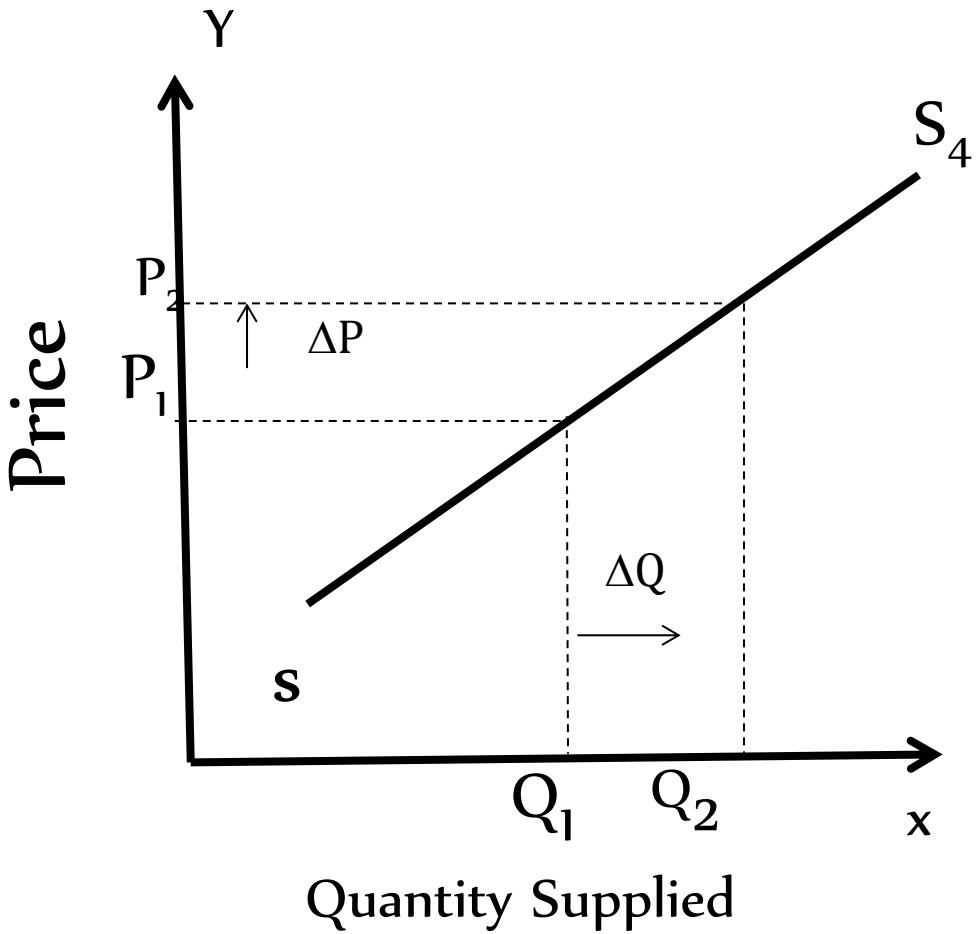
Quantity Supply and price of goods are measured: **OX and OY** respectively.

Initial price and quantity supplied : $OP_1$ and $OQ_1$

New price and quantity supplied: $OP_2$ and $OQ_2$

Change in Supply $\Delta Q$ > change in price $\Delta P$.

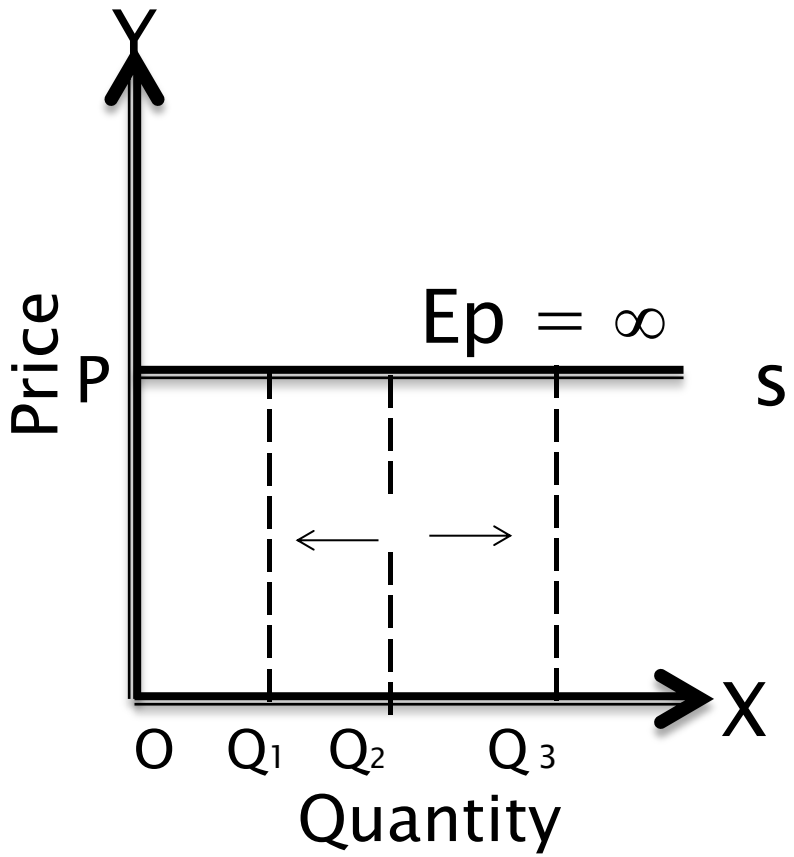
Price elasticity of supply curve $ps_2$ is relatively elastic.



# Perfectly Elastic Supply ($e_s=\infty$)

- If the small rise in price leads to infinity in quantity supplied, it is said to be perfectly elastic supply.
- Visibly, no change in price causes infinite change in supply. It is shown in figure

# Perfectly Elastic Supply ($e_s=\infty$)

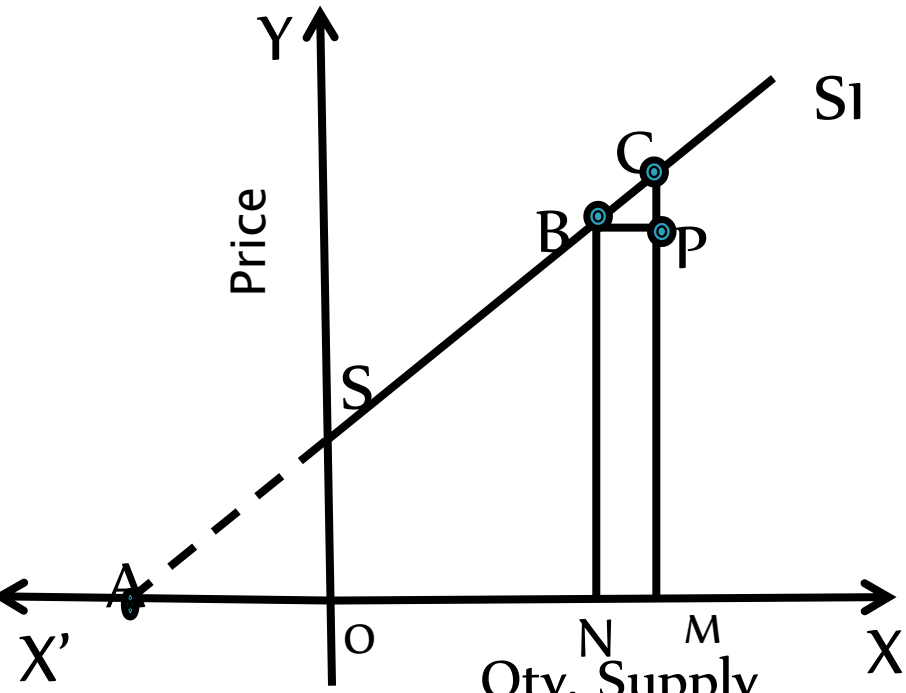



- Quantity Supply and price of goods are measured: **OX and OY** respectively.
- Initial price and quantity supplied : **OP and $OQ_2$**
- If the negliable change in price and quantity supplied move to **$OQ_1$** or **$OQ_3$.**
- **Change in Supply $\Delta Q = \infty$**
- Price elasticity of supply curve $ps_2$ is Perfectly elastic.

# Measurement of point Elasticity of supply

- It is used to measure price elasticity of supply when there is a very small change in price and quantity supplied.
- It is measure of the percentage change in quantity supplied in response to a very small percentage in price.
- The elasticity of supply depends upon the nature and supply of the supply curve as explained below.
  - Point elasticity on a linear supply curve
  - Point elasticity on a non-linear supply curve

Cont...d




First Figure

$SS_1$ is the supple curve and extending it reach up to point A in X-axis.

Let, Initial price (P) = BN,

Initial supply (Q) = ON

New price $(\Delta P)$ = PC

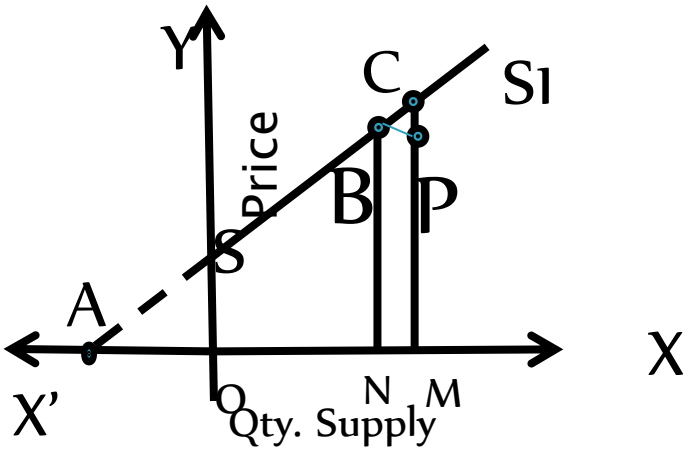
Change in supply $(\Delta Q)$ = NM (or BP)

Let, we measure point price elasticity of supply at B point

Since, $e_s = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$ ..... (i)

At point B, $e_s = \frac{BP}{PC} \cdot \frac{BN}{ON}$.....(ii)

# Cont...d




Now, in triangles BPC and BNA

$\angle CBP = \angle BAN$ (Corresponding angles)

$\angle BPC = \angle ANB$ (Right angles)

$\angle NBA = \angle PCB$ (Remaining angles)

Therefore, the triangles BPC and BNA are similar

Hence, $\frac{BP}{PC} = \frac{AN}{BN}$

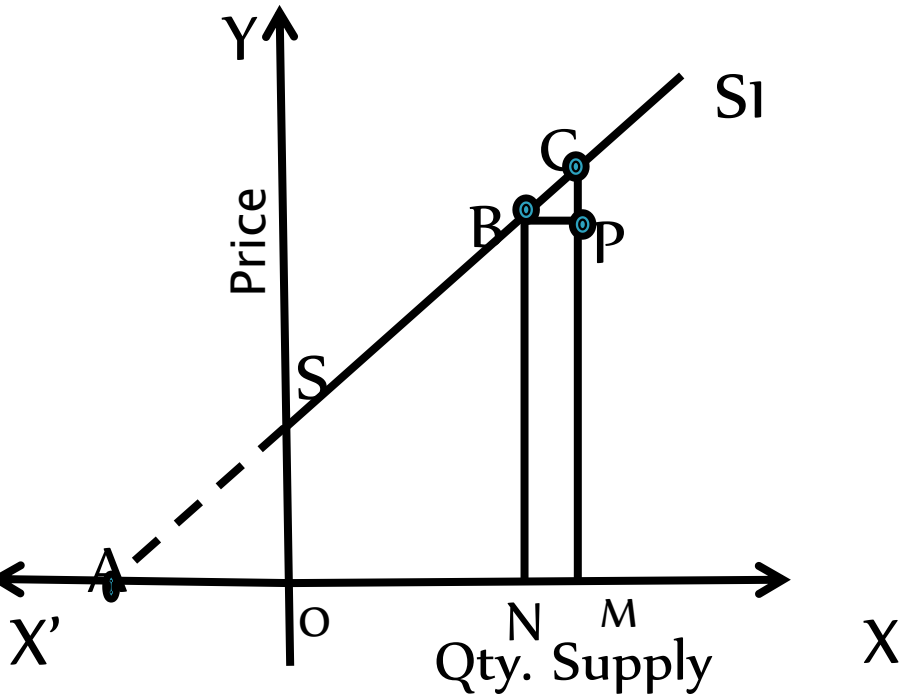
Substituting $\frac{AN}{BN}$ for $\frac{BP}{PC}$ in expression (ii), we get

$e_s$ = at B = $\frac{AN}{BN} \cdot \frac{BN}{ON}$

$e_s$ at B = $\frac{AN}{ON} > 1$.....(iii)

The above expression (iii) clearly shows that value of price elasticity of supply can be computed from dividing AN by ON. Therefore, $e_s$ at point B will be greater than unity. It is concluded that:

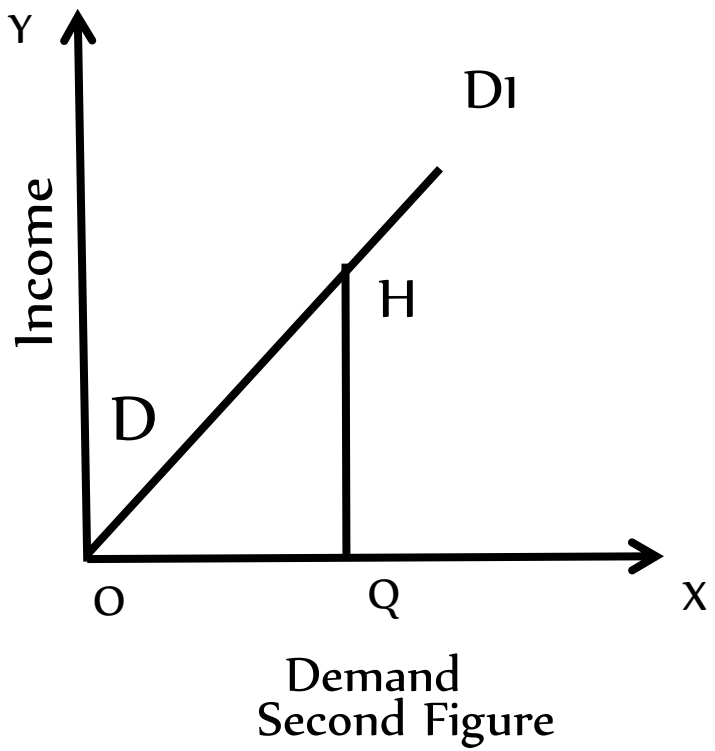
# Cont…d




First Figure

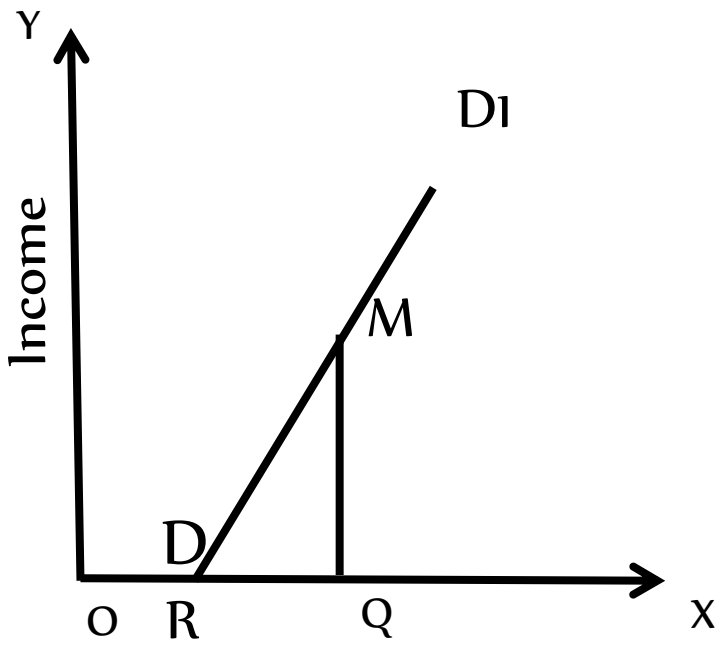
- If supply curve meets at X-axis (or left side of origin), price elasticity of supply will be always greater than unity.(i.e. $e_s$ at B $=\frac{AN}{ON}$ >1),

Cont...d




Demand
Second Figure

- If supply curve touches the point of origin, price elasticity of supply will be equals to unity.(i.e. $e_s$ at $=\frac{OQ}{OQ}=1$),




Demand

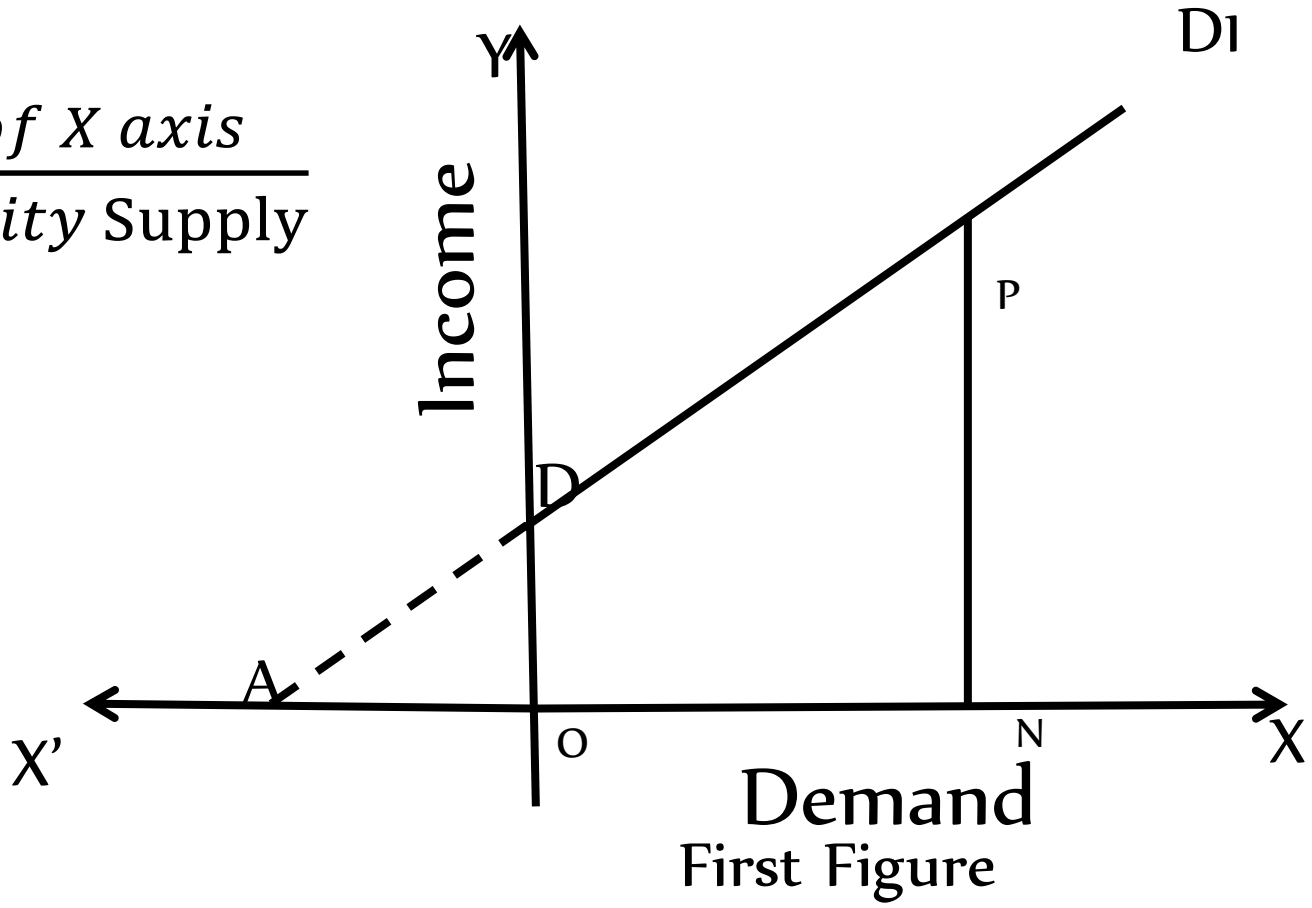
Third Figure

- If supply curve meets at X-axis (or right side of origin), price elasticity of supply will be always less than unity.(i.e. $e_s$ at M $=\frac{RQ}{OQ}$ <1),

# Alternatively

- $e_y = \frac{Intercept\ of\ X\ axis}{Initial\ quantity}$ Supply

$e_y = \frac{AN}{ON} > 1$




First Figure

# Point Price Elasticity of Supply at Non- Linear Demand Curve

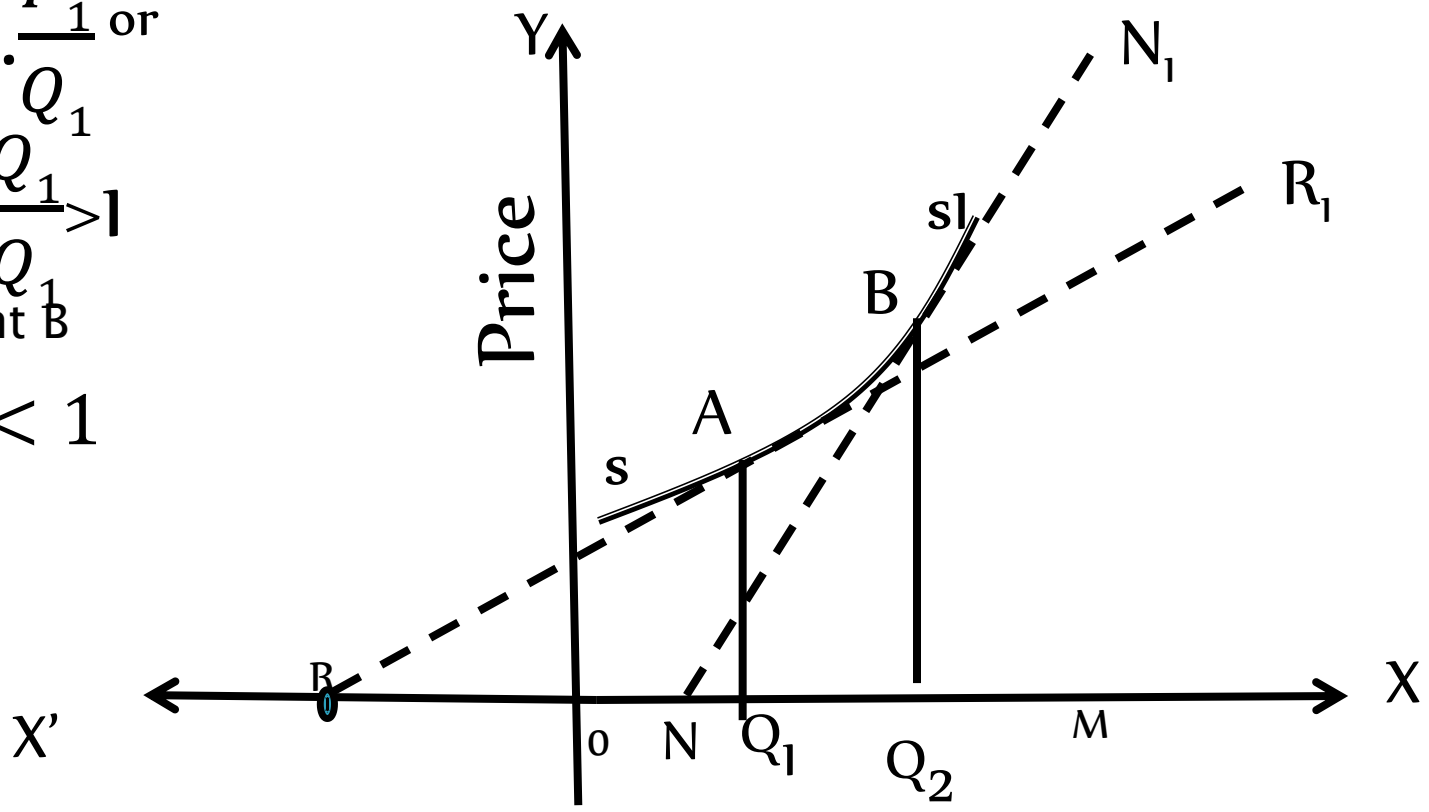
In point A

$$e_y = \frac{\Delta Q}{\Delta P} \cdot \frac{P_1}{Q_1} \text{ or}$$

$$e_y = \frac{RQ_1}{OQ_1} > 1$$

In point B

$$= \frac{NQ2}{OQ2} < 1$$



# Cont…d

- If the income demand curve is on **non-linear** instead of a linear or straight line , then the income elasticity of demand at a point on it can be computed by **drawing a tangent line** to that point and then apply the income elasticity formula.
- In figure, $DD_1$ is income demand curve as non-linear. Price elasticity of supply at point A on it can be computed by drawing a tangent line $RR_1$ to the point A.
- Then, income **at point A is** $\frac{RQ_1}{OQ_1}$**. Since** $RQ_1$ **is, greater than** $OQ_1$, income elasticity at **A on suply curve** $ss_1$ **greater than one**. Similarly, Price elasticity at point **B is** $\frac{NQ_1}{OQ_1}$ **. Since** $NQ_2$ is here less than $OQ_2$. Price elasticity at point B on supply curve $ss_1$ **is less than one**.