CHAPTER – 6 : Determination of National Income

UNIT-1 NATIONAL INCOME ACCOUNTING

- The central statistical organization (CSO) in the ministry of statistics and programme implementation (MoSP & I) is responsible for the compilation of National Income.
- DES's (Directorates of economic and statistics) are responsible for the same at state level.

Usefulness and Significance of National Income Estimates

(1) It provides a framework for analyzing the short-run performance.

(2) The distribution pattern of national income helps businesses to forecast future demand.

(3) Economic welfare depends on magnitude & distribution of national income

(4) NI shows composition and structure of NI of different sectors & variations in them. Helps to make comparisons of trend and speed of development

(5) Provides quantitative basis for assessing, choosing & evaluating economic policies

(6) Shows income distribution and possible inequality in its distribution. Make comparisons of statistics, such as ratios of investment, taxes, to GDP

(7) Provides guide to make policies for growth and inflation

Concept of GDP

GDPmp- GDP is the Value of all final goods and services produced in a country during a period of time. It includes value of goods produced at market place and these values add together to GDPmp.

Nominal GDP – it is the GDP calculated at current year price level.

Real GDP- it is the GDP calculated at base year price level.

Nominal GDP increases over time because-

(1) Production of most goods increases over time

(2) Prices of most goods increases over time

GDP deflator- (imp. Topic)

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- GDP deflator is the price index used to convert nominal GDP to Real GDP.
- It measures the current level of prices relative to the level of prices in base year.
- Since nominal GDP & real GDP must be same in the base year, deflator in the base year = 100 (imp. Fact)
- GDP deflator in year 1 = GDP defaltor_1

- GDP deflator in year 2 = GDP defaltor_2

$$\text{Inflation rate in year 2} = \frac{\text{GDP defaltor}_2 - \text{GDP defaltor}_1}{\text{GDP defaltor}_1} \times 100$$

NUMERICAL ILLUSTRATIONS-

Q. Find out GDP deflator and Interpret it.

	Real GDP	Nominal GDP (Cr)
Year 1	400	500
Year 2	450	600

Ans. GDP Deflator = $\frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$

Year 1	Year 2
$\frac{500}{400} \times 100 = 125$	$\frac{600}{450} \times 100 = 133.33$ (approx..)

Interpretation:

- Year 1 GDP deflator is 125, prices have increased by 25% since base.
- Year 2 GDP deflator is 133.33 (approx.), inc. in price since last year.

Q. Find nominal GDP if real GDP = 450, Price index = 120

Ans. Nominal GDP = Real GDP × $\frac{\text{Price Index}}{100}$ = 450 × $\frac{120}{100}$ = 540

■ Net Domestic Product (NDP)

Net amount/value of goods and services produced in a country during a given period of time.

$$\mathbf{NDP_{MP} = GDP_{MP} - Depreciation}$$

■ Gross National Product

- GNP is total value of all goods and services produced by a country's residents both domestically and abroad in a specific period.
- GNP_{MP} = GDP_{MP} + factor income earned by domestic factors of production employed in rest of the world.
- Factor income earned by the factors of production of rest of the world employed in domestic territory.

$$\mathbf{GNP_{MP} = GDP_{MP} + Net\ factor\ from\ abroad\ (NFIA)}$$

NFIA = Net compensation of employees + Net income from property and entrepreneurship + Net retained earning.

$$\mathbf{National = Domestic + NFIA}$$

Net National Product at Market Price (MP)

NNP_{MP} and GNP – Depreciation, representing the next net market value of all final goods and services produced domestically.

$NNP_{MP} = GNP_{MP}$ – Depreciation

$NNP_{MP} = NDP_{MP}$ + NFIA

$NNP_{MP} = GDP_{MP}$ + NFIA – Depreciation

Gross Domestic Product at Factor Cost

GDP_{FC} is the money value of output produced within a country's domestic limits in a year as received by the factors of production.

Market Price = Factor cost + Net indirect tax

= FC + Indirect tax – Subsidies

GDP_{FC} = GDP_{MP} – Indirect taxes + Subsidies

= Compensation of employees + Operating surplus (rent + interest + profit + royality) + mixed income of self-employed + Depreciation.

Factor cost – Actual cost of payments to factors of production like labour, capital and land.

Basic price – Excludes tax, on products that producers received from purchases but includes subsides received from the government to lower prices charged to purchases.

Market Prices – Reflect the final price paid by consumers and includes both product and production taxes while subtracting subsidies.

Relationship:

Basic Price = Factor cost + Production tax – Production subsidy.

Market Price = Basic Price + Product tax – Product subsidy.

Net Domestic Product at Factor Cost (NDP_{FC})

- Total factor income earned by the factors of production.
- Sum of domestic factor incomes / domestic factor incomes net of depreciation.

NDP_{FC} = NDP_{MP} – Net indirect tax

= Compensation of employees + operating surplus (rent + interest + profit) + mixed income of self employed.

Net National Product at Factor cost :

National income is the factor income occurring to normal residents of the country during the year.

NNP_{FC} = National Income = Domestic income + NFIA

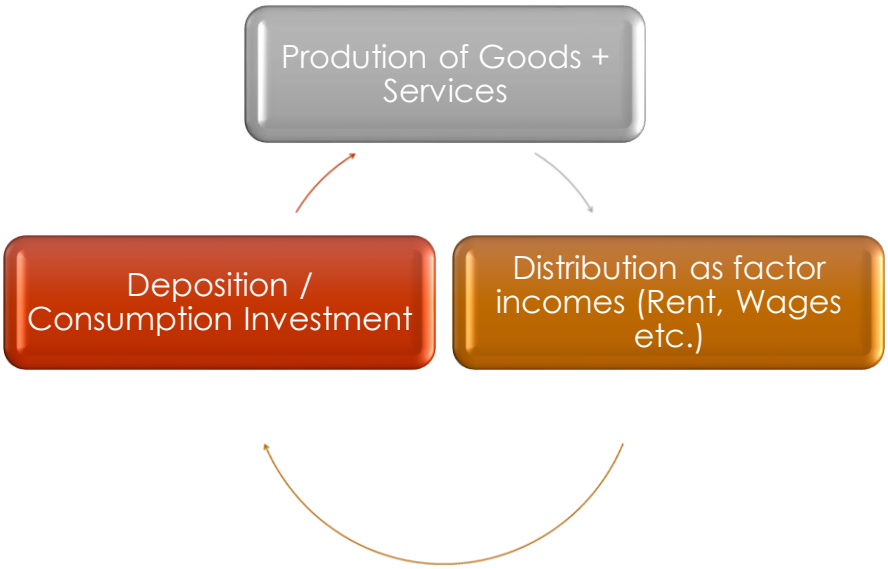
If NFIA is +ve, then national income will be greater than domestic national income.

Per Capita Income-

GDP per capita measures a countries output per person, indicating the standard of living.

$$\text{Per capita income} = \frac{\text{GDP (adjusted for inflation)}}{\text{Total population}}$$

The Circular Flow of Income–



Phase 1- Production

Firm produces goods/services with help of factor services

Phase 2- Income/ Distribution

The flow of factor income in form of rent etc, from firms to households.

Phase 3- Expenditure/ disposition

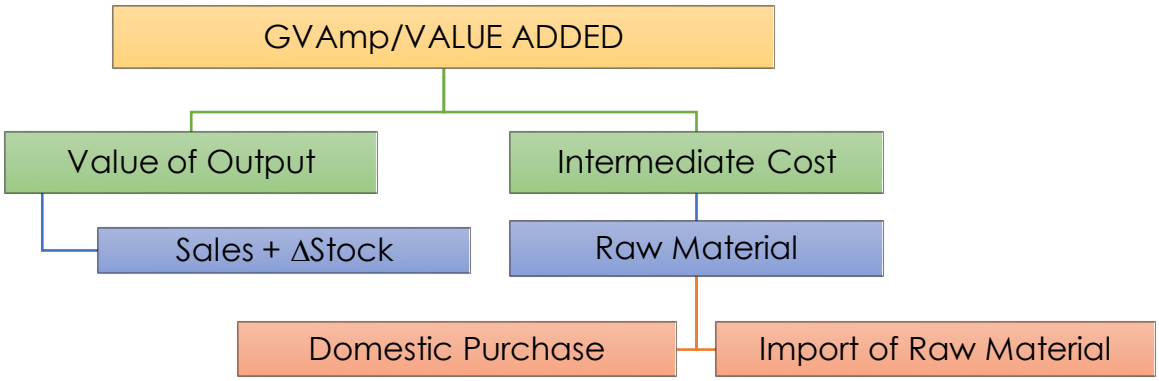
The income received by different factors of production, is spent on consumption of goods and services.

THERE ARE 3 METHODS OF CALCULATING NATIONAL INCOME

1. PRODUCT METHOD
2. EXPENDITURE METHOD
3. INCOME METHOD

Value Added Method/ Product Method

- **Through this method , Gross Value Added at mp is calculated**



- **GVAmp = Sales + Δstock - IC**

NVA at FC = GVAmp – Dep – NIT

Estimation of National Income

[ΣGVA_{MP} – Depreciation = Net value added (NVA_{MP})]

[NVA_{MP} – Net indirect tax = Net domestic product (NDP_{FC})]

[NDP_{FC} + NFIA = National income (NNP_{FC})]

- **Income Method**

  - Total factor incomes generated in the production of goods and services is required for calculation.
  - Relative contribution of factor owners is calculated.
  - It sums up incomes earned by all factors of production within a country's economy.

NNP_{FC} = Compensation of employees + operating surplus (rent + interest + profit + royalty) + mixed income of self employed + Net factor income from abroad **(NFIA)**

Profit = Corporate Taxes + Dividend + Retained Earnings

- **Expenditure Method/Income disposable method**

  - In this method, national income is the aggregate final expenditure in an economy during an accounting year.

GDP = ΣFinal expenditure

- **Private expenditure-** Spending by households on goods & services for consumption purpose (C)
- **Investment expenditure/Gross domestic capital formation-** Spending by business on capital goods, to inc. production capacity. (I)
- **Government expenditure-** Spending by govt. on goods & services (public services, defence etc.) (G)
- **Net export-** Difference b/w the exports and imports. (NX)

Calculation-

$GDP_{MP} = C + I + G + NX$

$NNP_{FC} = GDP_{mp} – Depreciation – NIT + NFIA$

- **Personal Income–**

Income received by the household sector, including non-profit institutions, excluding retained earnings, indirect business taxes and corporate income taxes.

PI = NI + Income received but not earned – Income earned but not received.

PI = NI – undistributed profits – Net interest payments made by households – Corporate tax + transfer payments to households from firms and govt.

- **Disposable Personal Income–**

It's a measure of the amount of money in the hands of the individuals that is available for the consumption/savings.

DI = PI – Personal income taxes – non tax payments

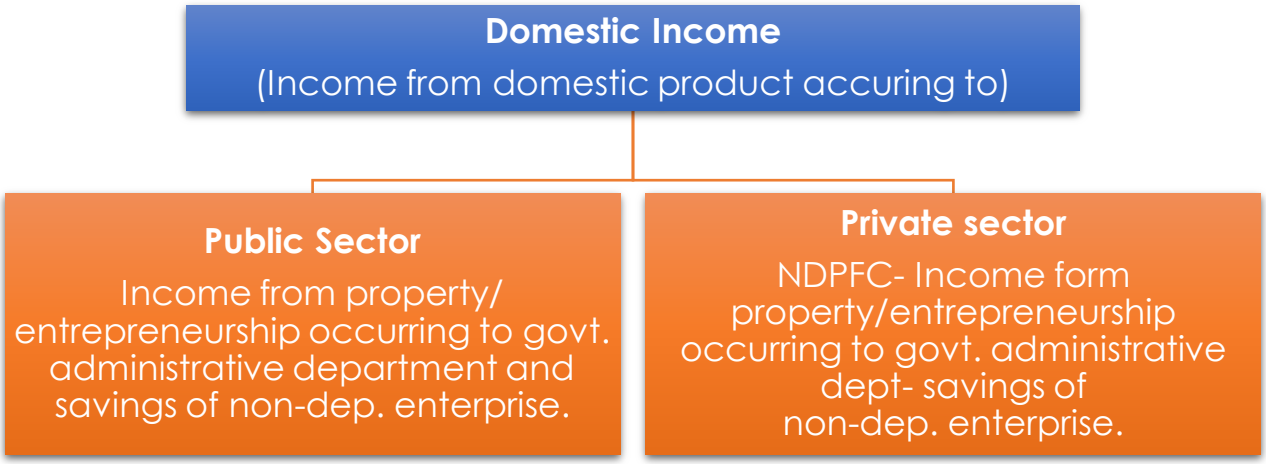
- **Net National Disposable Income (NNDI)–**

NNDI = Net national income + other net current transfers from the rest of the world.

NNDI = NNI + Net taxes on income and wealth receivable from abroad + net social contributions and benefits receivable from abroad.

- **Gross National Disposable Income–**

NNDI + CFC = GNI + Other net current transfers from the rest of the world.



- **Private Income**

Measure of income which occurs to private sector from all sources within and outside the country.

PI = Factor income from NDP which accures to private sector + Net factor income from abroad + National debt interest + Current transfers from govt. + other net transfers from the rest of the world.

NDP_{FC}	**–**
Less: Income from Property and Entrepreneurship accruing to Government Administrative	–
Departments (Railways, Post Office etc.)	–
Less: Savings of Non-departmental Enterprises.	–
Income from Domestic Product Accruing To Private Sector	–
Add: NFIA	–
Add: National Debt Interest	–

Add: Current Transfers from Government	–
Add: other Net Current Transfers from rest of the world	–
Private Income	–
Private Income	–
Less: Undistributed Profits	(–)
Less: Corporate Tax	(–)
Personal Income	–
Less:Personal Taxation	(–)
Less: Non-Tax Payment	(–)
Disposable Personal Income	–

System of Regional Accounts in India

- Provides integrated database on the innumerable transactions in original economy.
- Net State domestic Product (NSDP)- Measure in monetary terms, volume of all goods and services produced in a state within a given period of time.

$$\text{Per Capita State Income} = \frac{\text{Mid–Year Projected income of state}}{\text{NSDP}}$$

- State level estimates are prepared by state income units within state directorates of economics and statistics (DESs), with assistance from the central statistical organization.
- **"Supra-regional sectors"-** Railways, communication, banking insurance, central government administration etc.
- Estimates of supra regional sector are compiled and then allocated to stats and based on relevant indicators.

GDP AND WELFARE

GDP is often used as an indicator of a welfare of a country.

LIMITATIONS OF GDP CONCEPT

1. Income distribution is not reflected in GDP per capita.
2. Technology and managerial improvements are not captures.
3. Illegal activities are not accounted for.
4. Non-market and non-economical activities (health/ education) are not included.
5. Increased GDP due to longer working hours aren't accounted for disability of loss of leisure time.
6. Economic bads such as crime/pollution aren't deduced from GDP.

7. Volunteer work and unpaid services are not included.
8. Externalities (positive/negative) are not considered in GDP.

Limitations and Challenges-National Income Calculation

- Lack of agreed definition- national income.
- Accurate distinction of final and intermediate goods. Issue of transfer payments.
- Services of durable goods.
- Difficulty of incorporating distribution of income.
- Valuation of new goods at constant price.
- Valuation of govt. services.

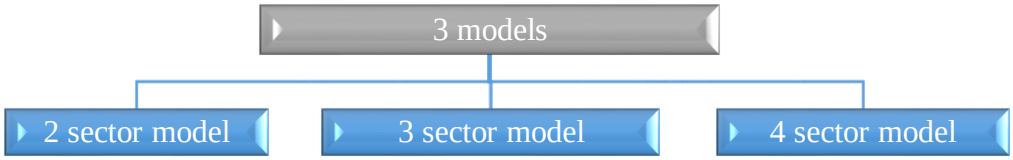
Other challenges related to-

- Inaccurate and unrelatable data.
- Presence of unmonetized sector.
- Production of self-consumption.
- Illiteracy and ignorance leading to unrecorded incomes.
- Lack of proper occupational classification.
- Accurate estimation of consumption of fixed capitals.

UNIT-2 : The Keynesian Theory of Determination of National Income

- The great depression 1930 promoted a revaluation of economic theory and policy.
- Classical economists lacked a comprehensive theory to explain persistent unemployment.
- John Maynard Keyne's General theory of employment, interest and many 1936, revolutionized modern economics (macro).

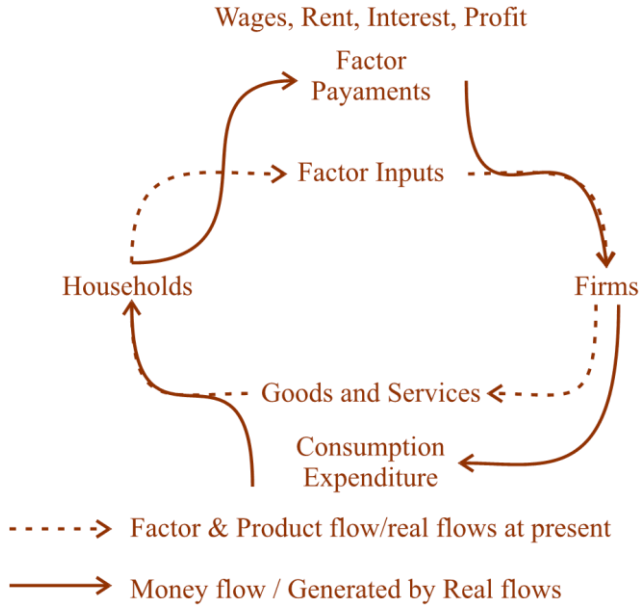
- Keynesian's of income determination is presented in



2 sector model

Circular Flow in a Simple 2-Step Model

- Circular flow model demonstrates how money moves in the society.
- It breaks the economy down into 2 primary players-
  (1) House hold (2) Corporation
- Household owns all factors of production and they sell their factor services to earn factor incomes which are entirely spent to consume final goods/services.
- Business firms produce final goods and services by hiring factors of production from households.
- Businesses do not save.



Factor Payment = Household Income = Household Expenditure
= Total Receipts of firm = Value of Output

Basic Concepts and Functions

Aggregate Demand functions-

- It's the total planned expenditure.
- The ex ante AD for the final goods consist of 2 components.

1. Ex ante aggregate demand for consumer goods (C)
2. Ex ante aggregate demand in investment goods (I)

AD = C + I

I = Constant investment

(**Note-** we see AD largely depends on the aggregate consumption expenditure)

Consumption function –

It's the functional relationship b/w aggregate consumption expenditure and aggregate disposable income

C = f(Y)

Low Income	Inc. in Income
Household spend > disposable income	This causes more disposable income.
This lead to saving	This leads to smaller inc. in consumption expenditure.

Consumption- Income Relationship

C = a + bY **MPC = $\frac{C}{Y}$ = b**

C = aggregate consumption exp.

Y = total disposable income

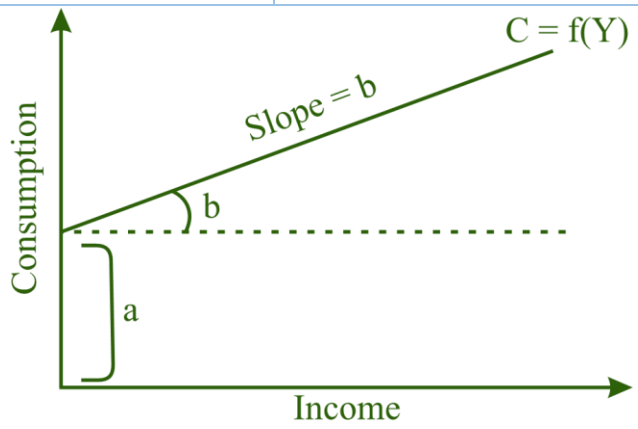
a = autonomous consumption (occurs at 0 disposable income)

b = marginal propensity to consume.

C/ Y = Slope of function

MPC = Marginal propensity to consume

Consumption Function OR Propensity to Consume	
Average Propensity to Consume (APC)	Marginal Propensity to Consume (MPC) It is denoted by 'b'
APC = $\frac{C}{Y}$	MPC = $\frac{\Delta C}{\Delta Y}$



Keynesian assumption–

- Increase in income > Increase in disposable income
- But inc. in consumption < inc. in disposable income. (b/MPC < 1)
- 0 < b < 1

Relationship B/W Income and Consumption :

- Average propensity of consume (APC)

$$APC = \frac{\text{Total Consumption}}{\text{Total Income}}$$

- It indicates proportion of income spent on consumption at different income levels.
- APC dec. with inc. in income.
- **Saving-** Remainder/part of income not spent on consumption.
  Saving = Income – Consumption

- Saving is function of disposable income. **S = f (Y)**

Saving Function (Equation) $\boxed{S = \bar{S} MPS.Y}$	
APS	MPS
APC = $\frac{S}{Y}$	MPS = $\frac{\Delta S}{\Delta Y}$

Relationship B/W Income, Consumption and Saving

- Saving shows a functional relationships b/w national income and savings.

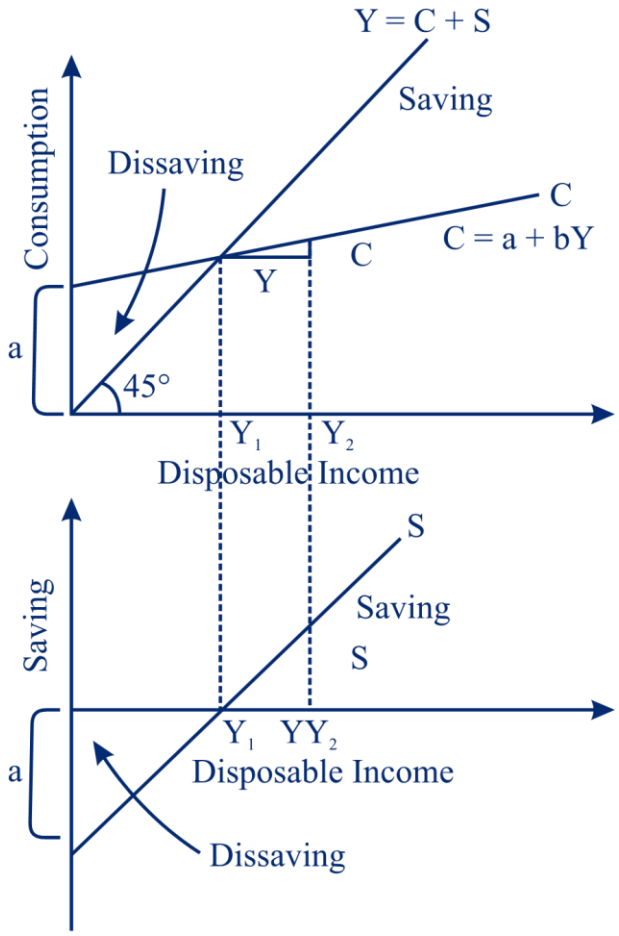


Fig- The consumption and saving function

- At zero income, there is consumption, resulting in dissaving at the same magnitude.
- Slope of saving function = MPS (marginal propensity to save)
- Eg- Increase of one- unit in disposable income, leads to 'b' units dec. in consumption and (1-b) is the inc. in savings

Hence,

S, MPS = 1 – c

MPS = S / Y = 1 – b

- MPS = 0 < b < 1
- MPC + MPS = 1
- MPS = 0 < b < 1
- Saving is an increasing factor

Average Propensity To Save (APS)

$$APS = \frac{\text{Total Saving}}{\text{Total Income}} = \frac{S}{Y}$$

Aggregate Demand (AD) OR Aggregate Expn (AE)–

- GDP_{mp} it is sum total of demand of all goods & services by all the buyers during a period of time.

Aggregate Supply –

It is the total supply of goods and services which firms in a national economy plan on selling during a specific period.

$$AS = C + S$$

TWO – Sector Model of National Income Determination :

- Its model of determination of equilibrium level of output using AD function and AS function.
- The Kensian function defines equilibrium as a level where AD = AS

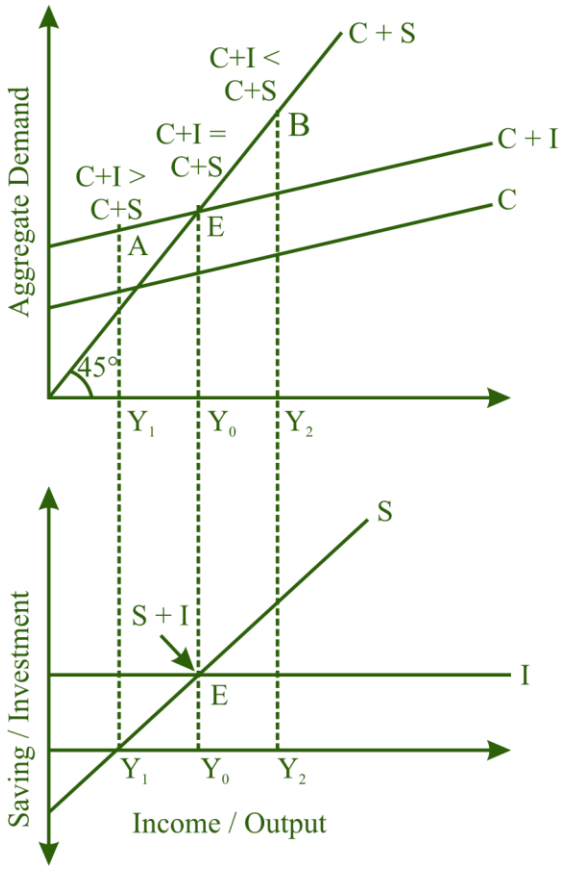
$$AD = C + I \qquad AS = C + S \qquad C + I = C + S$$

OR

$$I = S$$

- The AD curve is linear and + vely sloped (National income rises, AD also increases).
- Aggregate expenditure line is flatter than 45° lines as consumption inc. with increase in income.

Increase in consumption < Increase in income



Determination of Equilibrium income: 2 sector model

- **45° line:** Planned aggregate expenditure = aggregate output signifying equilibrium income levels.
- **Points below 45° line =** Planned aggregate expenditure > GDP
- **Points above 45° line =** Planned aggregate expenditure < GDP.
- Equilibrium occurs at potential GDP (full employment), AD = Output.
- Keynes assets, AD may not be equal to AS as households saving and consumption plan is producers production plan.
- Equilibrium is achieved when, planned investment = Savings.
- National income accounting reveals Income is either saved or spent

$$Y = C + S$$

with govt. and foreign trade

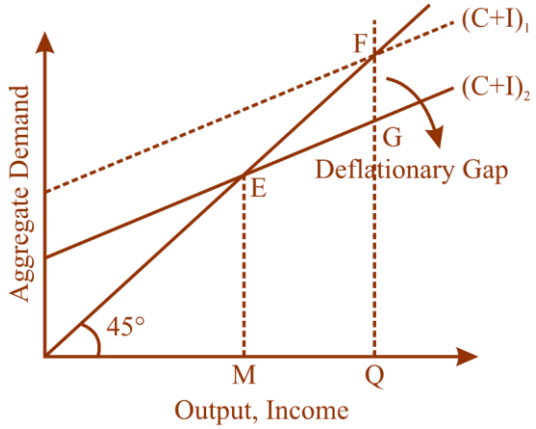
$$AD = C + I$$

Equilibrium with Unemployment and Inflation :

Keynesian equilibrium may not necessarily occur at full employment, it occurs when planned aggregate expenditure equals output, which may / may not coincide with potential GDP.

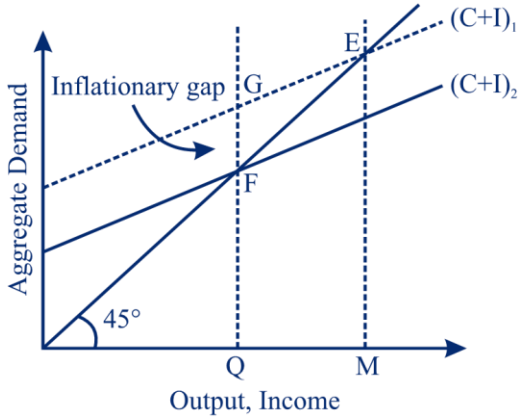
Deflatinary GAP

- AD for an output < full employment of output, this causes a deficit demand.
- Deficient demand gives rise to 'deflationary gap' or 'recessionary gap' or 'contractionary gap'.
- This occurs when the economy is in a business cycle or recession.



Inflationary GAP

- AD > AS corresponding to full employment levels of output in the economy.
- It is the excess of anticipated expenditure over the value of full employment output.
- Inflationary gap – A gap by which actual AD exceeds the AD required to establish full employment equilibrium.



F = Economy at full employment.

OQ* = Full employment output and income

If D at Q*G, excess demand resulting in inflationary gap.

FG = Inflationary gap

E = Equilibrium point (ME = OM)

Investment Multiplier (K)

It expresses the relationship b/w an initial agreement in investment & the resulting inc. in aggregate income.

$$K = \frac{Y}{I}$$

Eg- Additional Investment = ₹ 4,000 Cr.

Additional Income = ₹ 16,000 Cr.

Value of multiplier = 16,000/4,000 = 4

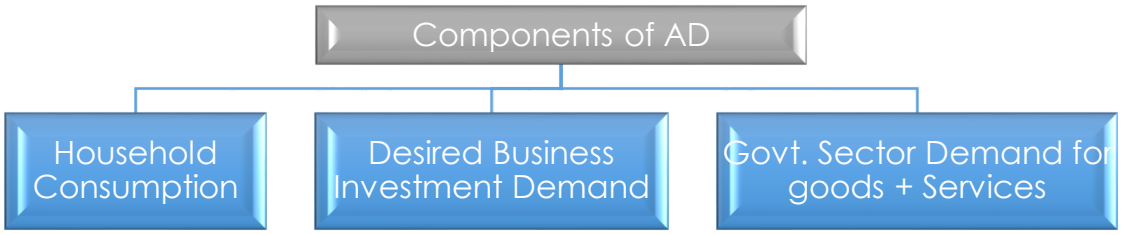
■ Multiplier and MPC

- Direct relationship b/w multiplier and MPC.
- Inc. in MPC – Inc. multiplier (vice versa).
- Concept – One person's expenditure is others income.
- Inc. in investment leads to Inc. in income, which is spent in consumption.
- However an amt. spent on consumption depends on the value of MPC.

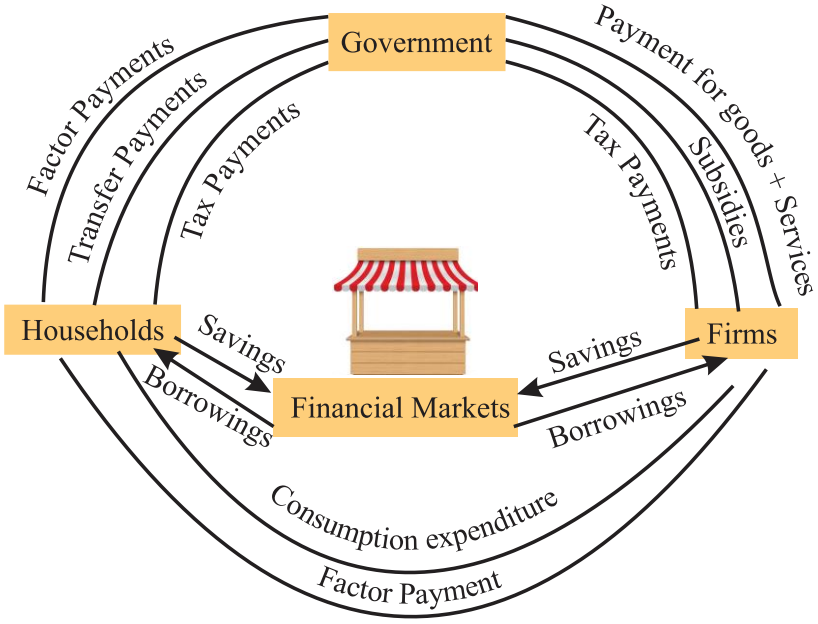
$$K = \frac{1}{1-MPC} = \frac{1}{MPS}$$

- Max. value of multiplier = Infinity (when MPC = 1), i.e., the economic consumes whole of its additional income.
- Min. value of multiplier = 1 (when MPC = 0) i.e. economy saves the whole additional income.
- The Keynesian theory explains how shifts in investment triggers changes in both investment and consumption throughout economy.
- Income inc. from initial investment doesn't continue endlessly due to leakages (income not spent on consumption of goods/services).
- **Causes of Leakage-**
  1. Progressive taxation.
  2. High liquidity preferences
  3. Undistributed profits.
  4. Debt repayment.
  5. Purchase of existing wealth/govt. securities.
  6. Demand met through existing stock / imports etc.
- In underdeveloped countries, MPC is high, multiplier is Low (Structural inadequacies).
- Keynesian model focuses on short term equilibrium and lack dynamic elements with no provisions for analyzing process through time or linking over period to next.

■ Determination of National Income – 3 Sector Economy :



- At equilibrium, Y = C + I + G
- GDP = National Income (no foreign trade)
- **Assumptions-** Fixed price, All variables are real variables, All changes are in real terms.



Leakages –

- Saving flow (towards the financial markets).
- Tax flow (towards government).

Injections –

In circular flow, additional demands for output on part of the business sector itself for investment and from the govt. sector.

Investment Injections- Funds flowing from financial markets to Business sector.

- Investment goods purchasers, financed by borrowing are usually business sector firms.

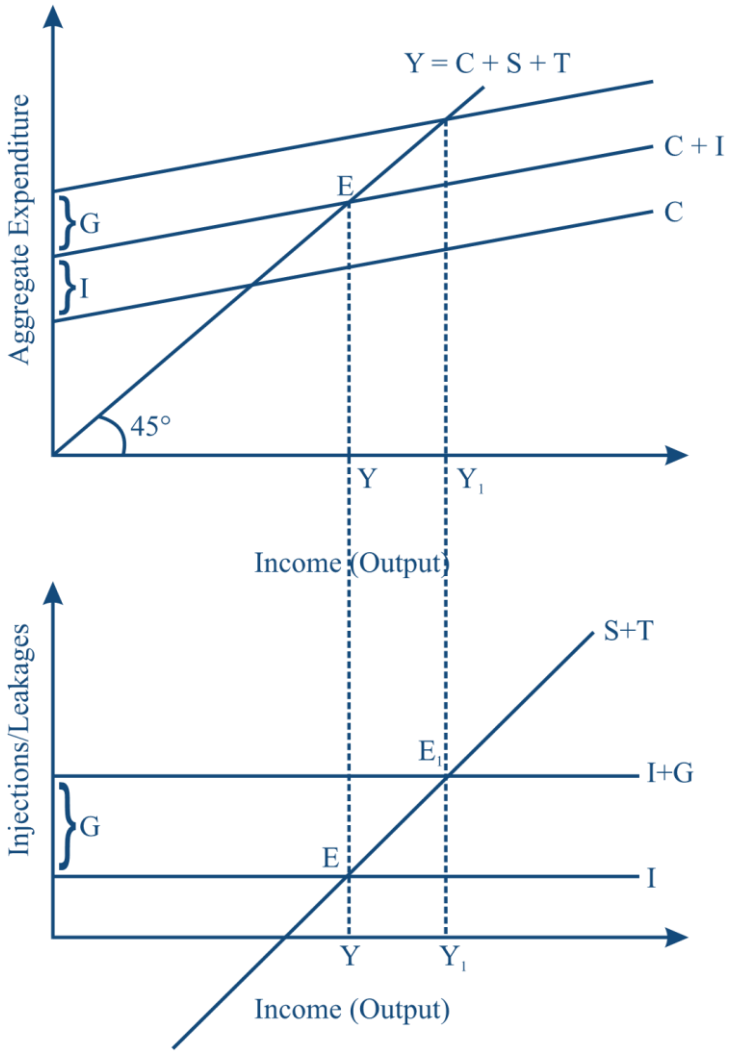
Three sector Keynesian model assumes- govt. purchases are autonomous.

$$AD = C + I + G$$

$$AS = C + S + T$$

Equilibrium: $AD = Y = AS$

$$C + I + G = C + S + T$$



Variables on vertical axis- Consumption, Investment, Govt. spending.

Exogenous variables (not directly influenced by income) horizontal axis- **Investment govt. spending.**

- C + I + G schedule lies above consumption function by a constant.
- S + T (savings and taxes) sloping upward as saving inc. with income.
- Equilibrium- 45° line intersects C + I + G
- AD = Income (at equilibrium point)
- Points- Below equilibrium: AD > AS

  Above equilibrium: AD < AS
- Equilibrium restores within changes in - Total spending, Output, Equilibrium.

The Government Sector and Income Determination :

Government influences level of income (taxes, transfer payments, government purchases etc.)

- **Income Determination with Lump Sum Taxes :**

Lump sum taxes i.e., taxes that do not depend on income, has balanced budget.

$$G = T$$

There are no transfer payments.

- **Consumption function–**

$$C = a + bYd$$

When, $Yd = Y - T$

$$Y = a + b(Y-T) + I + G$$

$$Y = \frac{1}{1-b}(a - bT + I + G)$$

- **Income Determination with Lump Sum Taxes & Transfer Payments :**

Consumption function – $C = a + bYd$

$$Yd = Y - T + TR$$

$$C = a + b(Y - T + TR)$$

$Y = a + b(Y - T + TR) + I + G$ [T = Lump sum tax TR autonomous transfer payments]

$$Y(1 - b) = a - bT + bTR + I + G$$

$$Y = \frac{1}{1-b}(a - bT + bTR + I + G)$$

- **Income Determination with Tax as a Function of Income**

Tax function $T = \overline{T} + tY$

$\overline{T}$ = Autonomous constant tax

t = Income tax rate

T = Total tax.

$$Y = C + I + G$$

$$Y = a + bYd + I + G$$

$$Y = a + b(Y - \overline{T} - tY) + I + G$$

$$Y = a + bY - b\overline{T} - btY + I + G$$

$$Y - bY + btY = a - b\overline{T} + I + G$$

$$Y(1 - b - bt) = a - b\overline{T} + I + G$$

$Y = \frac{1}{1-b(1-t)} (a - b\bar{T} + I + G)$

Investment multiplier

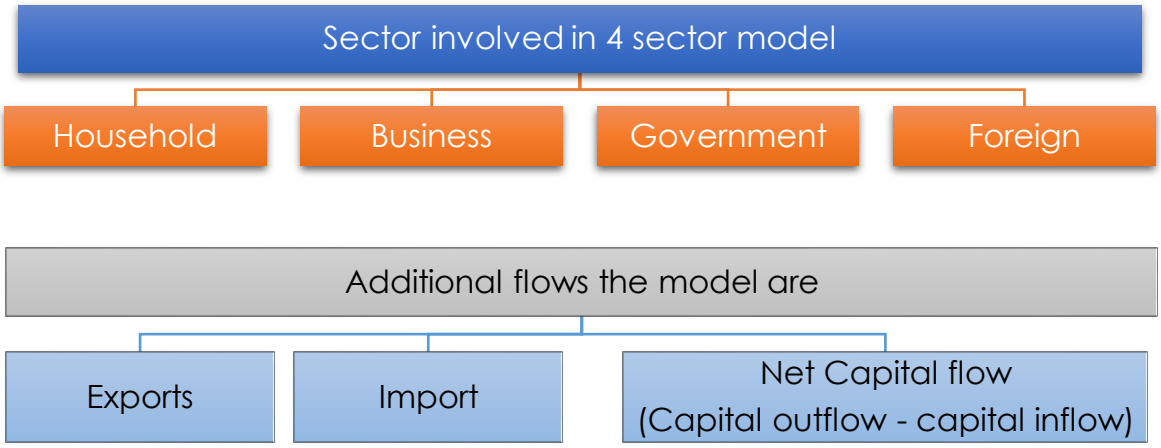
- **Income Determination with Taxes f(Y), Govt. Expenditure and Transfer Paymeents**

$C = a + b(Y - \bar{T} - tY + TR)$

$Y = a + b(Y - \bar{T} - tY + TR) + I + G$

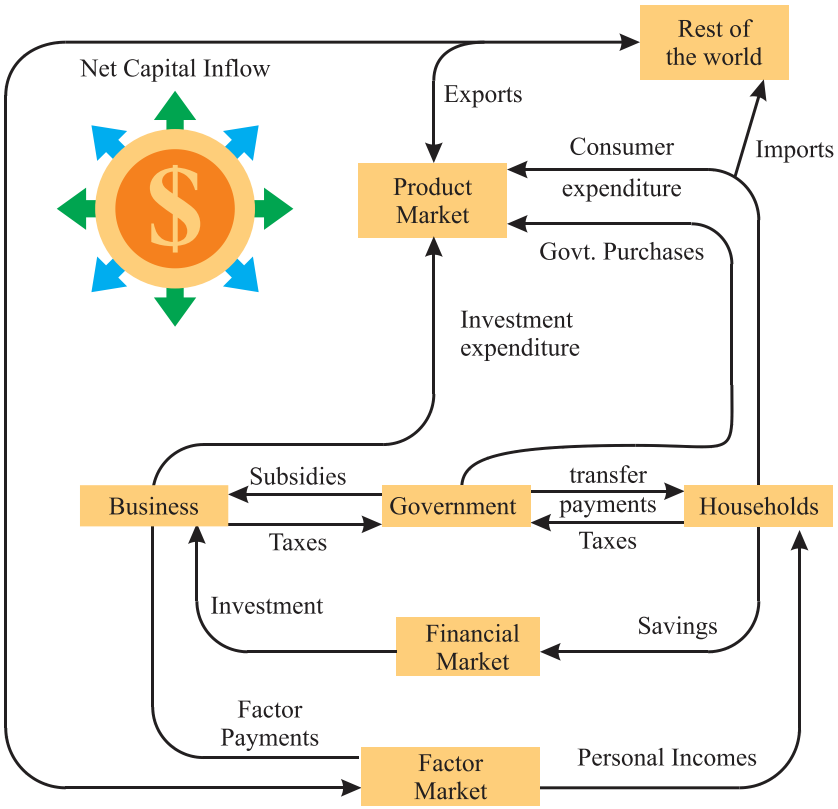
$Y = \frac{1}{1-b(1-t)} (a - b\bar{T} + bTR + I + G)$

- **Determination of Equilibrium Income – 4 Sector Model :**



$C + I + G + (X - M) = Y$

Equilibrium point



- C + I + G + (X – M) line indicates – Total planned expenditure of consumers, investors, governments and foreigners at each income level.
- Exports are the injections of national income; Imports are leakages of National Income.

Demand for exports-

1. Depends on foreign income.
2. Exogenously determined.
3. Autonomous.

Imports demand-

Depends on marginal propensity to import, i.e., increase in import demand per unit increase in GDP.

- $\bar{M}$ = Autonomous import.
- m = marginal propensity to import.
- Y = Income

Equilibrium condition -

$Y = C + I + G + (X - M)$

$C = a + b(Y = \bar{I})$

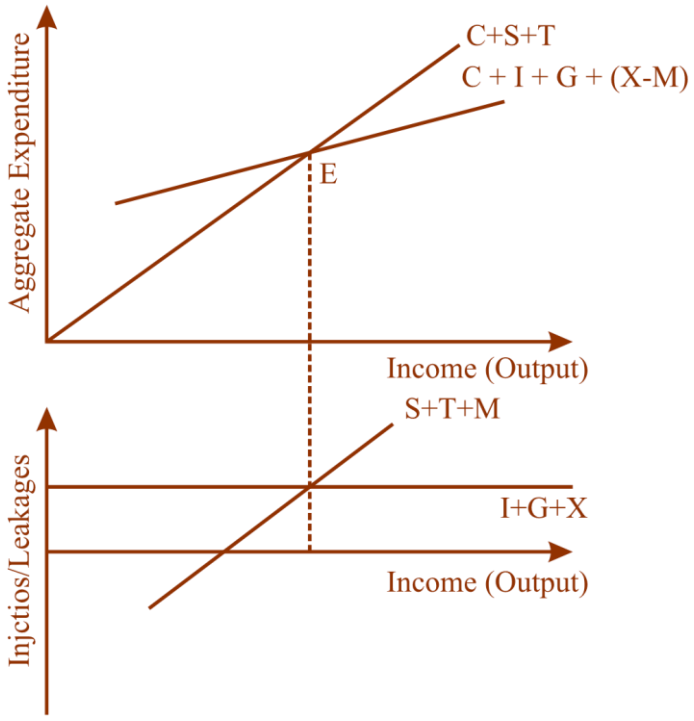
$M = \bar{M} + mY$

Equilibrium level of National Income-

$$Y = C + I + G + (X - M)$$

$$Y = a + b(Y - T) + I + G + X = \bar{M}$$

$$Y = \frac{1}{1-b+m}(a - bT + I + G + X - \bar{M})$$



Leakages = S + T + M; Injections = I + G + X

INJECTIONS	LEAKAGES
X > M	X < M
Exports are positive	Net withdrawal
Income increases	Income decreases

Lets revise in very short

AD FORMULAE UNDER DIFFERENT SECTORS

$\frac{2\text{Sector Eco}^y}{(H,F)} \Rightarrow$ AD = C + I

$\frac{3\text{Sector Eco}^y}{(H,F,G)} \Rightarrow$ AD = C + I + G

$\frac{4\text{Sector Eco}^y}{(H,F,G,\text{Foreign})} \Rightarrow$ AD = C + I + G + Nx Net Export = X – M

AS FORMULA'S UNDER DIFFERENT SECTORS

$\frac{2\text{Sector Eco}^{y}}{(H,F)} \Rightarrow$ **AS =** $Y = C + S$

$\frac{3\text{Sector Eco}^{y}}{(H,F,G)} \Rightarrow$ **AS =** $Y = C + S + T$

$\frac{4\text{Sector Eco}^{y}}{(H,F,G,\text{Foreign})} \Rightarrow$ **AS =** $Y = C + S + T$

Equilibrium Formulae under different sector $\Rightarrow$ AD = Y)

$\frac{2\text{Sector Eco}^{y}}{(H,F)} \Rightarrow C + I = Y$

$\frac{3\text{Sector Eco}^{y}}{(H,F,G)} \Rightarrow C + I + G = Y$

$\frac{4\text{Sector Eco}^{y}}{(H,F,G,\text{Foreign})} \Rightarrow C + I + G + (x - m) = Y$

LEAKAGE & INJECTIONS IN DIFFERENT SECTORS

- Leakage- It is referred to as an outflow of income from the circular flow model. Leakages are that part of the income which is not used to purchase goods or what households withdraws.
  - In 2 sector Model: Leakages = Savings
  - In 3 sector Model: Leakages = Savings + Taxes
  - In 4 sector Model: Leakages = Savings + Taxes + Imports
- Injection- It is an inflow of income to the circular flow. Due to injection, the volume of income increases.
  - In 2 sector Model: Injection = Investment
  - In 3 sector Model: Injection = Investment + Govt. Exp.
  - In 4 sector Model: Injection = Investment + Govt. Exp. + Exports