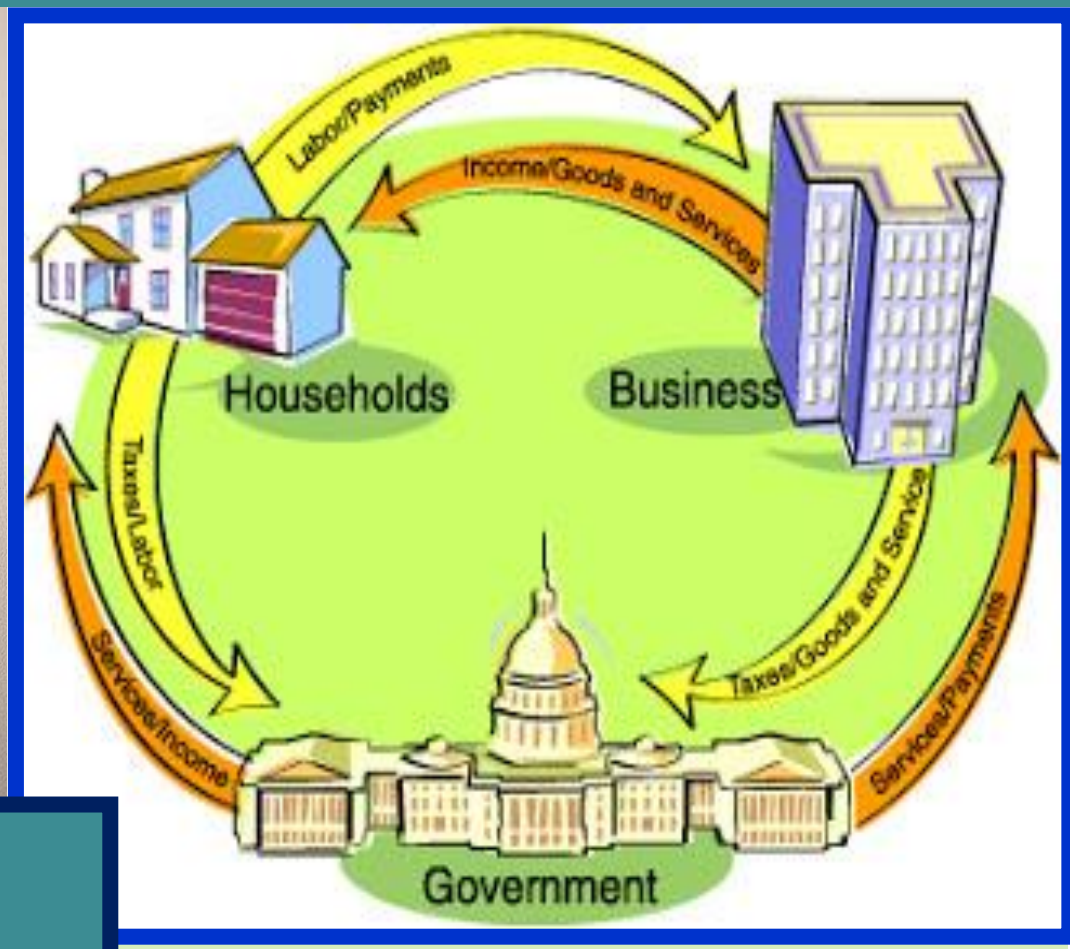
CHAPTER - 23



Measuring a Nation's Income

PRINCIPLES OF ECONOMICS

N. Gregory Mankiw

In this chapter,
look for the answers to these questions:

- What is GDP?
- What are different components of GDP?
- What are differences between Real and Nominal GDP?
- How overall price level in an economy measured through GDP deflator
- What are various measures of a Nation's Income?
- Does GDP measure society's well-being?

GDP ???

Gross Domestic Product at Market Prices (GDP_{MP}) is…

…**market value** of all final goods & services produced within a country in a given period of time.

Gross Domestic Product at Market Prices (GDP_{MP}) is…

…**market value** of all final goods & services produced within a country in a given period of time.

Goods are valued at their market prices, because market price measures the amount that people are willing to pay for different goods and services.

- All goods measured in the same units (e.g., dollars in U.S., rupees in India)
- Things that don't have a market value are excluded, e.g., housework you do for yourself.
- Excludes most items that are produced and consumed at home and, therefore, never enter the marketplace. Vegetables you buy at the grocery store are part of GDP; vegetables you grow in your garden are not.

Gross Domestic Product at Market Prices (GDP_{MP}) is…

..**market value** of all final goods & services produced within a country in a given period of time.

A farmer produces wheat worth of Rs.1,50,000. Out of this, he sells Rs. 1,25,000 of wheat to the individuals for their consumption and rest Rs. 25,000 of wheat is kept for his own consumption. How much of the farmer's production will be included as wheat in GDP?

ANSWER

Since, the farmer is consuming wheat worth Rs. 25,000 and this is not coming to the market, this will be excluded form GDP. So, Rs. 1,25,000 will be included as wheat in GDP.

Gross Domestic Product (GDP) is…

…the market value of **all** final goods & services produced within a country in a given period of time.

- Includes all items produced in the economy and are sold **legally** in markets.
- Excludes most items produced and sold illicitly, such as illegal drugs, gambling.

Gross Domestic Product (GDP) is…

…the market value of all **final** goods & services produced within a country in a given period of time.

Final goods: **Intended for the end user . No further alternation is made to the good which would change its market value.**

Intermediate goods: **Goods that are produced and then used as an input to another production process.**

GDP only includes final goods – they already embody the value of the intermediate goods used in their production. Otherwise, there would be double counting.

Exception: Intermediate good produced and, rather than being used, when added to a firm's **inventory of goods for use or sale** is taken to be "final" for the moment, and is included in GDP.

Gross Domestic Product (GDP) is…

…the market value of all **final** goods & services produced within a country in a given period of time.

A farmer sells Rs.50,000 of wheat to individuals who take them home to eat and Rs. 75,000 of wheat to a company that uses them all to produce flour. How much of the farmer's sales will be included as wheat in GDP?

ANSWER

Selling Rs.50,000 of wheat to individuals who take them home to eat is the final good and Rs. 75,000 of wheat to a company that uses them all to produce flour is coming under intermediate good. Therefore, Rs. 50,000 will be included in GDP.

Gross Domestic Product (GDP) Is…

…the market value of all final **goods & services** produced within a country in a given period of time.

GDP includes goods (tangible)
(like DVDs, bikes, pizza, clothing)

and services (intangible)
(dry cleaning, concerts, cell phone service, doctor's service).

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services **produced** within a country in a given period of time.

GDP includes currently produced goods, not goods produced in the past.

When Ford produces and sells a new car, the value of the car is included in GDP.
When one person sells a used car to another person, the value of the used car is not included in GDP.

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services **produced** within a country in a given period of time.

Santosh lived in a house that was newly constructed in 2010 for which he paid Rs.20,00,000. In 2016 he sold the house for Rs. 30,00,000. What effect does this transaction has on the GDP of 2016.

ANSWER

Since the house is constructed in past, i.e., 2010 and sold again in 2016 at Rs. 30,00,000, this will not be included in GDP of 2016. So, GDP of 2016 remains unaffected.

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced **within a country** in a given period of time.

GDP measures the value of production that occurs within a country's borders, whether done by its own citizens or by foreigners located there.

When an Indian citizen owns a factory in South Africa, the production at his factory is not part of Indian GDP. (It is part of South Africa's GDP.)

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced **within a country** in a given period of time.

Maria, a UK citizen, travels to Japan and buys a newly manufactured motorcycle made there. Her purchase of motorcycle is included in which country's GDP?

ANSWER

Since the motorcycle is produced within the geographical boundary of Japan, it will be included in the GDP of Japan and not in the GDP of UK.

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

Flow and not a stock concept.

Usually a year or a quarter (3 months)

A stock is a quantity measured at a given point in time, whereas a flow is a quantity measured per unit of time.

GDP is probably the most important flow variable in economics: it tells us how many dollars are flowing around the economy's circular flow per unit of time. When you hear someone say that the U.S. GDP is $14 trillion, you should understand that this means that it is $14 trillion per year.

Gross Domestic Product (GDP):

What is included and not included in GDP - Summary

Included…..

- Domestically produced final goods and services including capital goods, new construction of structures and changes to inventories.

Not Included…..

- Domestically produced goods and services used for self-consumption and never enter in to market place
- Items produced and sold illicitly or illegally
- Intermediate goods and services
- Inventories of previous period
- Inputs
- Used goods
- Financial assets such as stocks and bonds
- Foreign produced goods and services

Income and Expenditure

- **Gross Domestic Product (GDP)** measures total income of everyone in the economy.
- GDP also measures total expenditure on the economy's output of goods & services.

For the economy as a whole,

income equals expenditure

because every dollar a buyer spends is a dollar of income for the seller.

The Circular-Flow Diagram

- a simple depiction of the macroeconomy
- illustrates GDP as spending, revenue, factor payments, and income
- Preliminaries:
  - **Factors of production** are inputs like labor, land, capital, and natural resources.
  - **Factor payments** are payments to the factors of production (*e.g.*, wages, rent, interest).

The Circular-Flow Diagram- Two Sector

Households:

- own the factors of production, sell/rent them to firms for income
- buy and consume goods & services

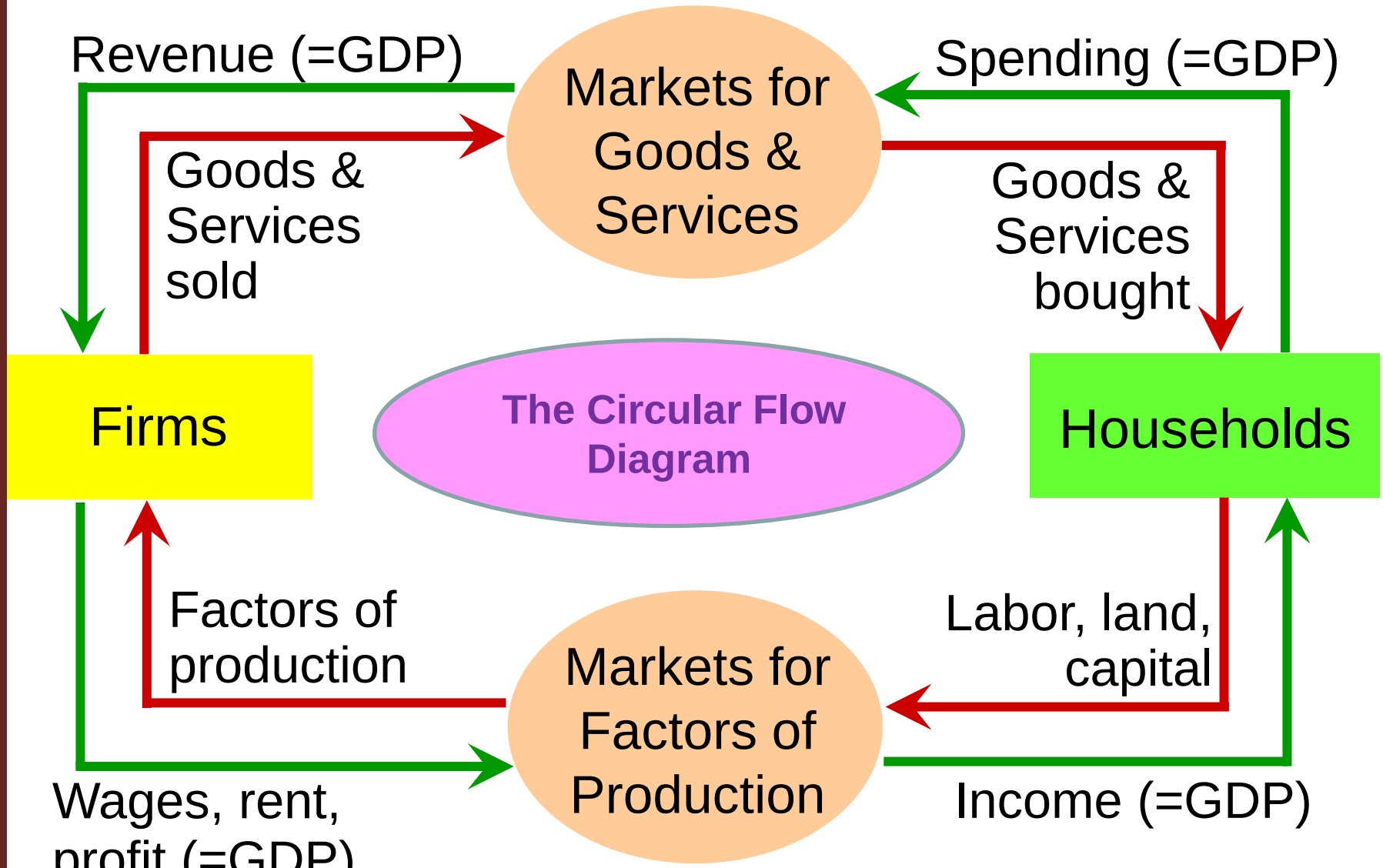
Firms

Households

Firms:

- buy/hire factors of production, use them to produce goods and services
- sell goods & services

The Circular-Flow Diagram – Two Sector Model



Red Arrows - flows of goods & services (Physical Flow)

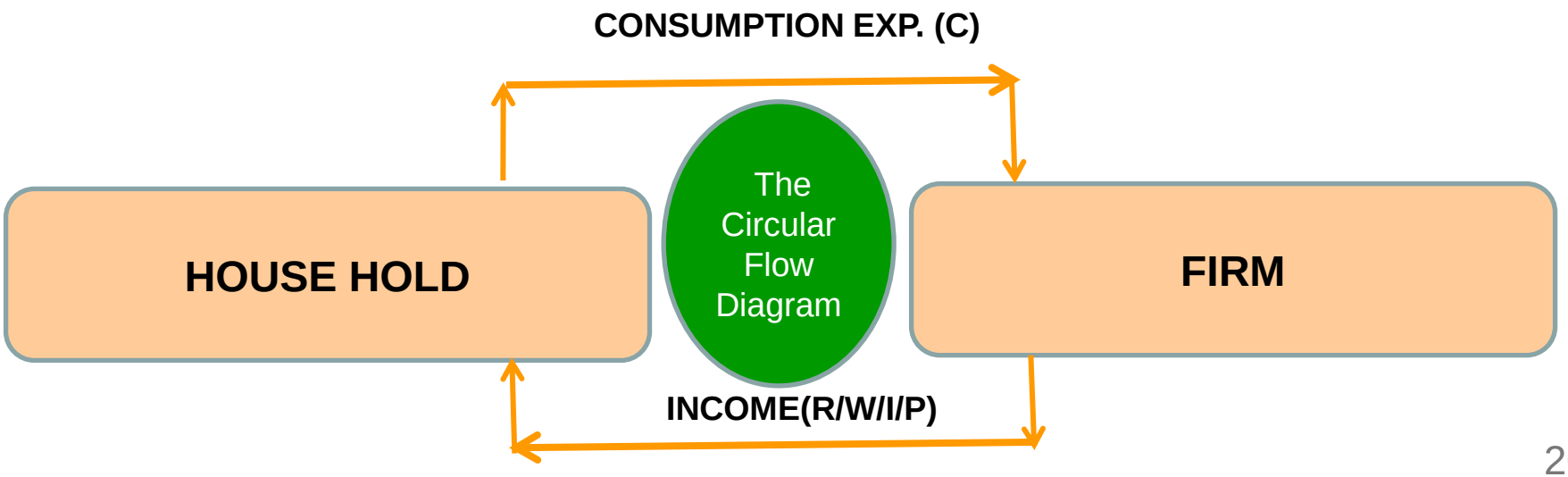
Green Arrows- flows of income/payments (Money Flow)

What This Diagram Omits ?????

- **The financial system**
  - matches savers' supply of funds (savings of household) with borrowers' demand for loans (investments made in firms)
- **The government**
  - collects taxes, buys goods & services and provides transfer payments
- **The foreign sector**
  - trades goods & services, financial assets, and currencies with the country's residents

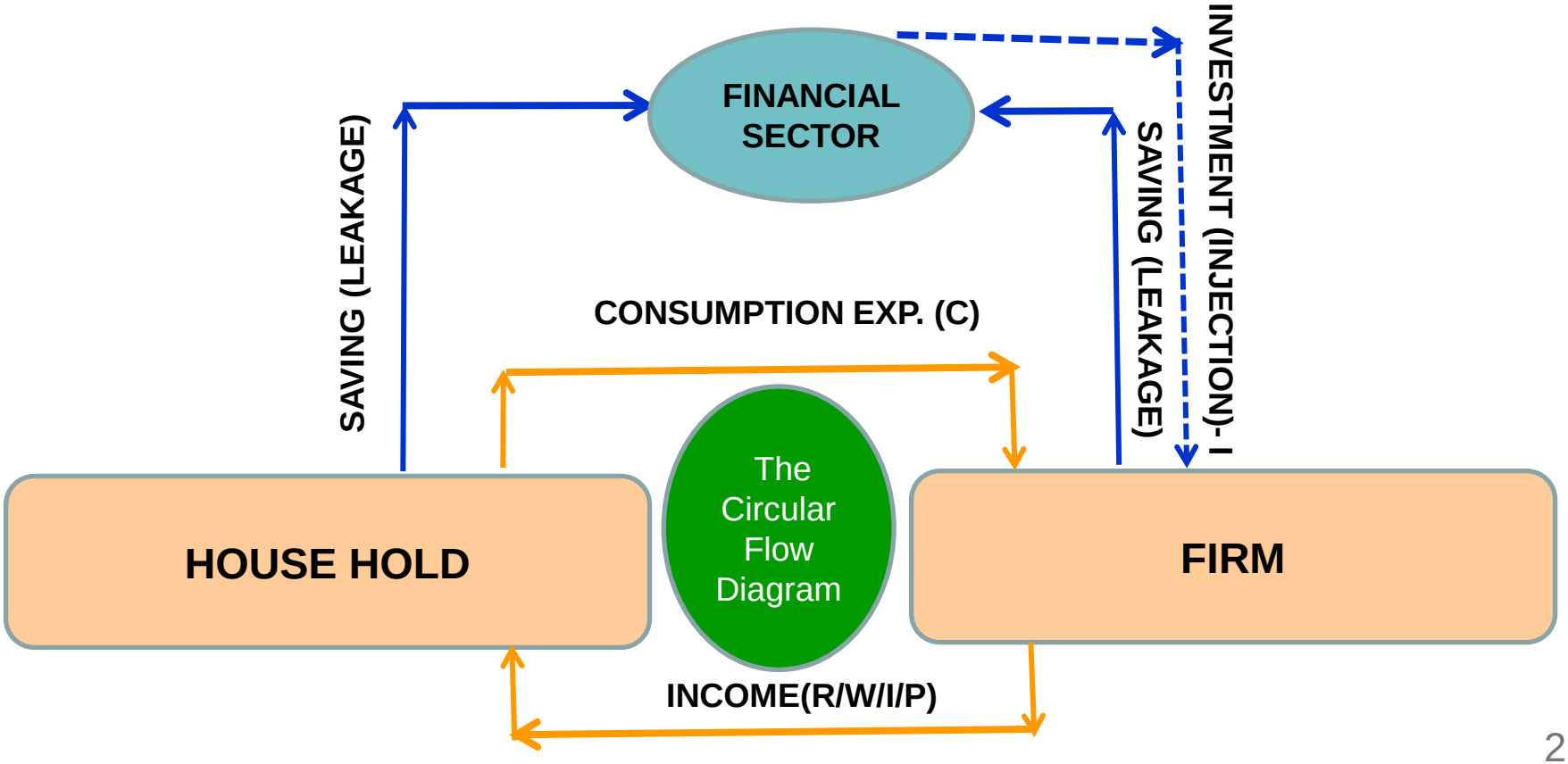
GDP = Consumption Expenditure by Household

=> Y = C



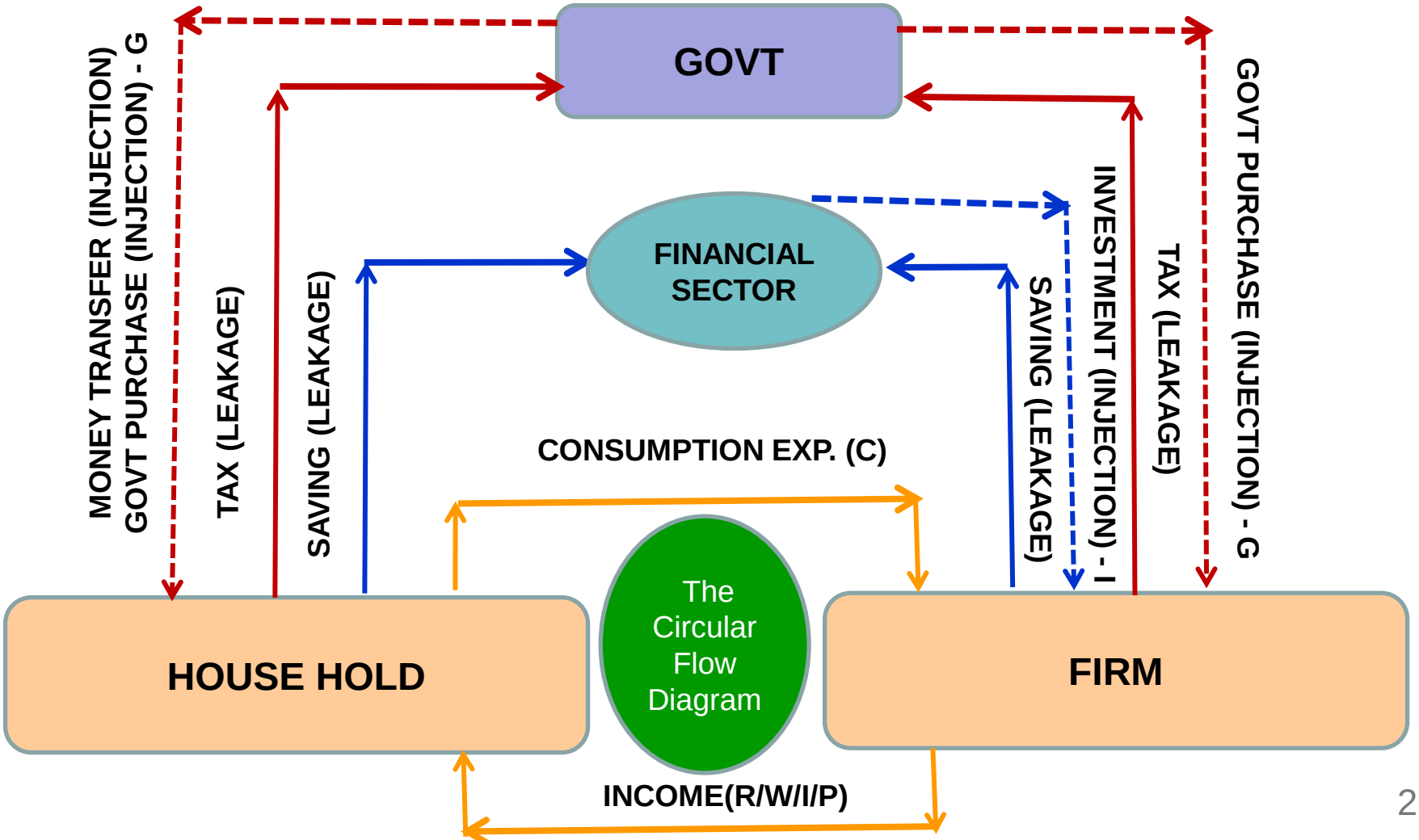
GDP = Consumption Expenditure by Household + Investment Expenditure by Firm

=> Y = C + I



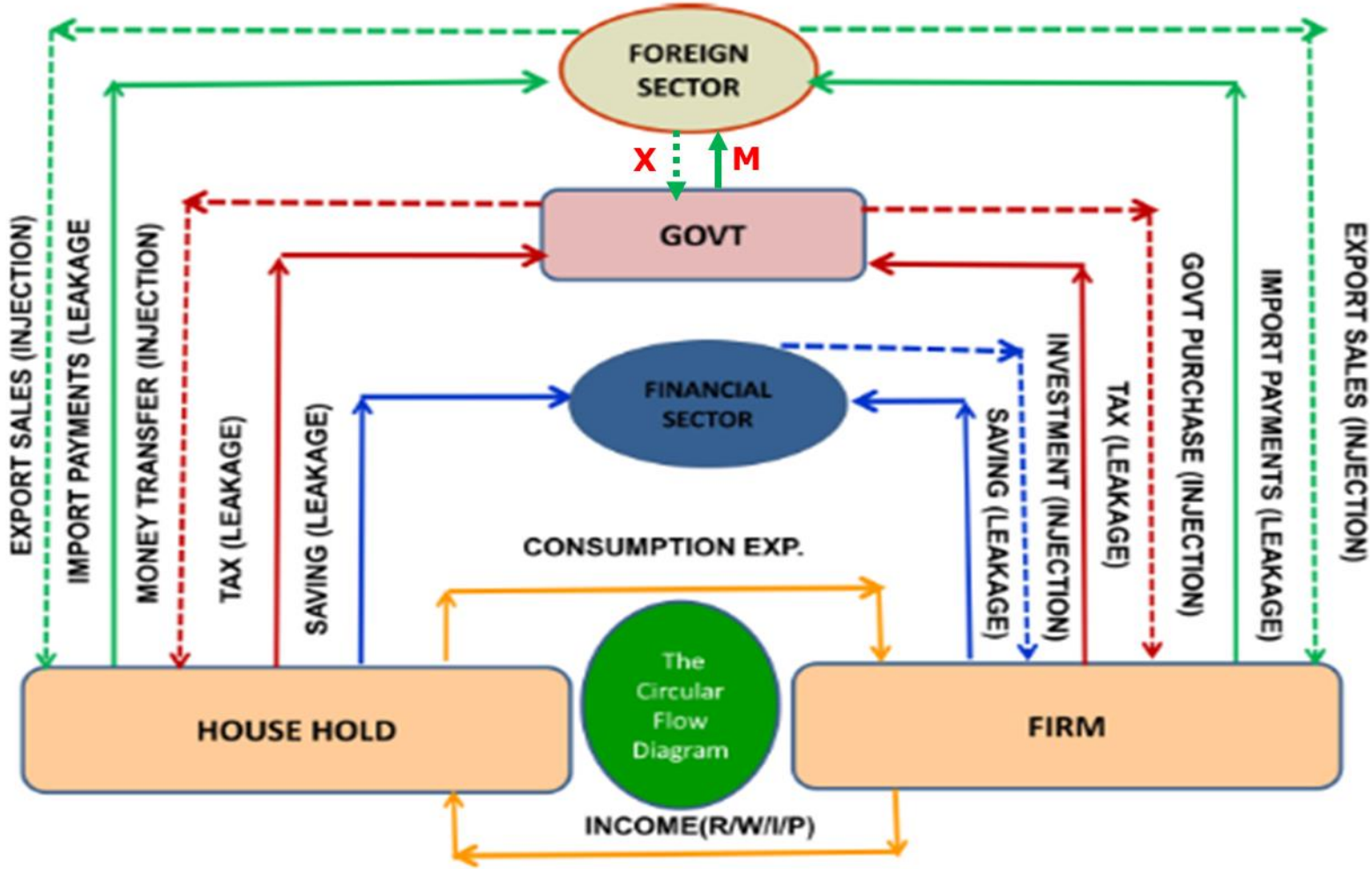
GDP = Consumption Expenditure by Household + Investment Expenditure by Firm + Govt. Purchase

$$\Rightarrow Y = C + I + G$$



GDP = Consumption Expenditure by Household + Investment Expenditure by Firm + Govt. Purchase + (Export sales – Import Payment = Net Export)

=> Y = C + I + G + (X – M) => Y = C + I + G + NX



Leakages, Injections, and Changes in Economic Activity(GDP)

SECTOR	MODEL	LEAKAGE (WITHDRAL)	INJECTION (DEPOSITS)	RELATIONSHIP BETWEEN LEAKAGE & INJECTION	IMPACT ON GDP
TWO	Y = C	-	-	-	
THREE	Y = C + I	S = SAVINGS	I = INVESTMENT	S = I	NO
				S > I	FALLS
				S < I	RISES
FOUR	Y = C + I + G	T = GOVT TAX REVENUE	G = GOVT PURCHASE	T = G Balanced budget	NO
				T > G Surplus budget	FALLS
				T < G Deficit Budget	RISES
FIVE	Y = C + I + G + (X-M) = C + I + G + NX	M = IMPORT PAYMENT	X = EXPORT SALES	M = X Trade balance	NO
				M > X or X < M Trade deficit	FALLS
				M < X or X > M Trade surplus	RISES

COMPONENTS OF GDP

Measuring a Nation's Income

The Components of GDP

- Recall: GDP is total final consumption expenditure.
- Four components:
  - Consumption (**C**) (Spending by household)
  - Investment (**I**) (Spending by firm)
  - Government Purchases (**G**) ((Spending by Government)
  - Net Exports (**NX = X - M**) ((Spending in foreign trade sector)

    Where **X** = Export Sales & **M** = Import Payment
- These components add up to GDP (denoted **Y**):

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

Consumption (C)

- **….. is total spending by households on goods & services.**
  - Includes spending on
    - **Durables** (items expected to last atleast for three years) : Automobiles, Appliances
    - **Nondurables** : Food, Clothing
    - **Services** : Haircuts, Education, Medical Care, & internet service
  - **But does not include purchase of new housing.**

Note on Housing costs:

For renters : consumption includes rent payments.

For home owners : consumption includes imputed rental value of house, but not purchase price or mortgage payments.

✓**Durable** goods: Goods that have an average **useful life of at least 03 years**.
✓**Nondurable** goods: Goods that have an average **useful life of less than 03 yr.**
✓**Services** are commodities that cannot be stored or inventoried and that are **usually consumed at the place and time of purchase (ownership can't be transferred)**

(Source: ***National Income and Product Accounts (NIPA) Handbook, Bureau of Economic Analysis, U.S. Department of commerce)***

Consumption (C)

- **…. is total spending by households on goods & services.**

Ramesh owns two houses. He rents one house to Suresh for Rs.10,000 per month. He lives in the other house. If he were to rent the house in which he lives, he could earn Rs.15,000 per month in rent. How much do the housing services provided by the two houses contribute to GDP in a year?

ANSWER

Renting: Annual rent value = Rs.10,000 X 12 = Rs.1,20,000

Homeowner: Annual imputed rental value = Rs.15,000 X 12
= Rs. 1,80,000

Total annual value of housing services
= Rs. 1,20,000 + Rs. 1,80,000 = Rs. 3,00,000

Consumption (C)

- **….. is total spending by households on goods & services.**

Joseph buys a used Maruti-800 car for Rs. 50,000 made in India. He spends Rs.10,000 on new parts to make the car operational. To which extent there is an increase in consumption expenditure and GDP in Indian economy out of these two transactions?

ANSWER

Spending Rs.10,000 on new parts to make car operational will be included in the GDP of India

Purchase of **used car** for Rs.50,000 is **not a part of GDP**, since it is not newly produced.

Investment (I)

- **….. is total spending on goods that will be used in the future to produce more goods.**
- includes spending on
  - capital equipment (*e.g*., machines, tools & equipments)
  - structures (factories, office buildings, houses)
  - inventories (goods produced but not yet sold)
- Spending by households (**not by government**) on new houses is included in Investment.

*Note: **"Investment"** does not mean the purchase of financial assets like stocks and bonds.*

It also does not mean or putting money in Banks in shape of savings or fixed deposits.

Investment (I)

- **….. is the total spending for the purpose of additional production**
- includes spending on
  - capital equipment (*e.g*., machines, tools)
  - structures (factories, office buildings, houses)
  - inventories (goods produced but not yet sold)
- **Inventories** represent goods in stock and to be sold in future. They will increase future output, so they are counted as investment.
- **Residential construction** is a part of investment because a new house produces a future stream of output – housing services for its occupants.

Investment (I)

- **….. is total spending on goods that will be used in the future to produce more goods.**

Excel Publishing House, an Indian publisher, purchases new computers that were manufactured in India. Can we say that this purchase by itself makes a positive contribution both to consumption and to GDP?

ANSWER

It makes positive contribution to GDP and investment but **not to consumption**, because purchase of new computer is an investment and not consumption.

Government Purchases (G)

- **….. is all spending on the goods & services purchased by government at the central, state, and local levels.**
- includes every thing from military spending on arms and ammunition to spending on education (chalk, school and college building, salary of the teacher), health, irrigation etc.
- **Government purchases** excludes **transfer payments**, such as Social Security or unemployment insurance benefits.

Government Purchases (G)

- **….. includes all expenditure that involve production.**
- Many Govt. payments do not involve production, so that Govt.'s budget is much larger than Govt. spending included in GDP (**G**).

- **Transfer payments**, i.e., payments to individuals that do not involve production by that individuals.
  - Transfer payments are not made in exchange of currently produced goods or services.
  - Transfer payments are not part of GDP because there is no production associated with them.
  - **Transfer payments alter household income but they do not reflect the country's production.**

Government Purchases (G)

- **is all spending on the goods & services purchased by government at the central, state, and local levels.**

Consider the following three items of spending by the government: (i) the federal government pays a $500 unemployment benefit to an unemployed person; (ii) the federal government makes a $2,000 salary payment to a Navy lieutenant; (iii) the city of Bozeman, Montana makes a $10,000 payment to ABC Lighting Company for street lights in Bozeman. Which of these payments contributes directly to government purchases in the national income accounts?

ANSWER

Only (ii) and (iii). But not (i), since it is a transfer payment.

Government Purchases (G)

- **is all spending on the goods & services purchased by government at the central, state, and local levels.**

A Texas household receives a Social Security cheque for $500, which it uses to purchase a $460 television made in Korea by a Korean firm and a $40 dinner at a local restaurant. What is the change in U.S. GDP?

ANSWER

Since the household receives the cheque as social security measure, it will not be counted as government expenditure.

Further, the consumption expenditure increases only by $40, since it is utilised within US geographical boundary.

Net Exports (NX)

- **NX** = export sales (X) – import payments (M)
- Exports represent foreign spending on the economy's goods & services
- Imports are the portions of **C**, **I**, and **G** that are spent on goods & services produced abroad.
- Net exports include goods and services produced abroad (with a minus sign) because these goods and services are included in consumption, investment and government purchase (with a plus sign).
- Purchase from abroad -
  - reduces net exports.
  - increases consumption, investment and government purchase
  - does not affect GDP.

Net Exports (NX)

- **NX** = exports (X) – imports (M)

During 2017, **BMW Motorrad** was able to sell 20 BMW S1000 RR in Bhubaneswar at a price Rs. 20 lakh per unit. All the 20 motorcycles were produced in the plant of BMW Motorrad at Berlin, Germany. How much did these transactions add to GDP of India during 2017?

ANSWER

Consumers of Bhubaneswar purchased 20 BMW S1000 RR at a price Rs. 20 lakh per unit. So contribution of consumption expenditure (C) to the GDP of India is 20 X 20 = Rs. 400 lakh.

At the same time all 20 BMW S1000 RR are imported from Germany. So Imports (M) constitute Rs.400 lakh.

Now, **GDP = C + I + G + X – M = 400Lk + 0 + 0 + 0 – 400Lk= Rs.0**

So, GDP of India is not affected by consumption of BMW S1000 RR by consumers of Bhubaneswar during 2017.

Net Exports (NX)

- **NX** = exports (X) – imports (M)

Michigan Tea Company sold $15 million worth of tea it produced in US. In producing this tea it purchased $5 million dollars worth of raw materials (tea leaves) from India. How much did these transactions add to U.S. GDP?

ANSWER

Michigan Tea Company sold $15 million worth of tea it produced in US. So consumption expenditure (C) is $15 million

Michigan Tea Company purchased $5 million dollars worth of ingredients from India. So Imports (M) is $5 million

Now, GDP = C + I + G + X – M = 15 + 0 + 0 + 0 – 5 = $10

Net Exports (NX)

- **NX** = exports (X) – imports (M)

Michigan Tea Company produces and sold tea in US. In producing this tea it purchased $5 million dollars worth of machine from India. How much did these transactions add to U.S. GDP?

ANSWER

Michigan Tea Company purchased $5 million worth of machine from India. So investment expenditure (I) on capital asset is $5 million

Since, Michigan Tea Company purchased $5 million dollars worth of machinery from India. So Imports (M) is $5 million

Now, GDP = C + I + G + X – M = 0 + 5+ 0 + 0 – 5 = $0

So, GDP of US is not affected by purchase of machinery from India.

Net Exports (NX)

- **NX** = exports (X) – imports (M)

Bhubaneswar Municipal Corporation (BMC) purchased 30 Lenovo computers produced in China at a price of Rs. 50,000 per unit. How much did these transactions add to GDP of India?

ANSWER

Purchase of 30 Lenovo computers produced in China by Bhubaneswar Municipal Corporation (BMC) is the consumption expenditure made by Government at local level.

So, G = 30 X 50,000 = Rs. 15,00,000 and Imports (M) is Rs. 15,00,000.

Now, GDP =C+I+G+X–M = 0 + 0+ Rs15,00,000 + 0 – Rs15,00,000 = Rs.0

So, GDP of India is not affected by purchase of computers from China.

Items to be Included or Excluded in National Income (GDP)

Expenditure on education of children by a family.

Yes, it is included in the national income as it is a part of the private final consumption expenditure.

Growing vegetables in a kitchen garden of the house.

No, it will not be included in the national income as it is difficult to estimate the value of production (It is a non-market transaction).

Imputed rent of self occupied houses.

Yes, it will be included in the national income as people living in such houses enjoy housing services similar to those in rented houses.

Purchase of car by a household.

Yes, it will be included in the national income as it is a part of the private final consumption expenditure.

Purchase of tractor by a farmer.

Yes, it will be included in the national income as it is a part of the capital formation or investment by the farmer.

Expenditure on fertilizers by a farmer.

No, it will not be included in the national income as it is intermediate cost for the farmer

Value of bonus shares received by shareholders of a company.

No, it will not be included in the national income as such bonus shares are mere paper claims and do not contribute to the production of goods and services

Items to be Included or Excluded in National Income (GDP)

Expenditure on construction of a house.

Yes, it will be included in the national income as it is a part of capital formation

Purchase of rented factory building by the factory owner.

No, it will not be included in the national income because payment for purchase of second hand goods is due to transfer of an already existing object

Expenditure on the purchase of shares of a new company.

No, it will not be included in the national income as it is a financial claim and does not contribute to any productive activity.

Purchase of a truck to carry goods by a production unit.

Yes, it will be included in the national income as it is a part of the gross domestic capital formation.

Expenditure on the construction of a flyover by the government.

Yes, it will be included in the national income as it is a part of gross domestic capital formation.

Expenditure by the Government on scholarships to students.

No, it will not be included in the national income as it is a transfer payment.

Expenditure on advertisement by a firm.

No, it will not be included in the national income as it is a part of intermediate consumption expenditure

Winning of a lottery prize.

No, it will not be included in the national income as it does not add to the flow of goods and services in the economy.

GDP

GDP = C + I + G + Export sales (X) – Import payments

In the economy of Ukzten in 2010, consumption was 60% of GDP, government purchases were $212, imports were $67 and 67% of the value of exports, investment was one-half of the value of consumption. What was Ukzten's GDP in 2010?

ANSWER

Let GDP = X

Consumption was 60% of GDP = 0.6X

Investment was one-half of the value of consumption = 0.3X

Government purchases = $212

Imports = $67 and 67% of the value of exports

Exports = $100

Hence, X = 0.6X + 0.3X + 212 + 100 – 67 => 0.1X = 245

=> X = 2450

ACTIVE LEARNING 1

GDP and its components

In each of the following cases, determine how much GDP and each of its components is affected (if at all).

A. Debbie spends $200 to buy her husband dinner at the finest restaurant in Boston.

B. Sarah spends $1800 on a new laptop to use in her publishing business. The laptop was built in China.

C. Jane spends $1200 on a computer to use in her editing business. She got last year's model on sale for a great price from a local manufacturer.

D. General Motors builds $500 million worth of cars, but consumers only buy $470 million worth of them.

ACTIVE LEARNING 1

Answers

A. Debbie spends $200 to buy her husband dinner at the finest restaurant in Boston.

Consumption and GDP rise by $200.

B. Sarah spends $1800 on a new laptop to use in her publishing business. The laptop was built in China.

Investment rises by $1800, net exports fall by $1800, GDP is unchanged.

ACTIVE LEARNING 1

Answers

C. Jane spends $1200 on a computer to use in her editing business. She got last year's model on sale for a great price from a local manufacturer.

Current GDP and investment do not change, because the computer was built last year.

D. General Motors builds $500 million worth of cars, but consumers only buy $470 million of them.

Consumption rises by $470 million, inventory investment rises by $30 million, and GDP rises by $500 million.

Different Versions of GDP

Real Gross Domestic Product (RGDP)

&

Nominal Gross Domestic Product (NGDP)

Measuring a Nation's Income

Real versus Nominal GDP

- Inflation can distort economic variables like GDP, so we have two versions of GDP: One is corrected for inflation, the other is not.
- **Nominal GDP** values output using ***current*** prices. NGDP is not corrected for inflation.
- **Real GDP** values output using the prices of a ***base year***. RGDP is corrected for inflation.

EXAMPLE:

	Pizza		Burger	
year	***P***	***Q***	***P***	***Q***
2005	$10	400	$2.00	1000
2006	$11	500	$2.50	1100
2007	$12	600	$3.00	1200

Compute nominal GDP for each year and its growth over previous year:

EXAMPLE:

	Pizza		Burger	
year	***P***	***Q***	***P***	***Q***
2005	$10	400	$2.00	1000
2006	$11	500	$2.50	1100
2007	$12	600	$3.00	1200

Compute nominal GDP for each year and its growth over previous year:

2005: $10 x 400 + $2 x 1000 = $6,000

2006: $11 x 500 + $2.50 x 1100 = $8,250

2007: $12 x 600 + $3 x 1200 = $10,800

Growth:

37.5%

30.9%

EXAMPLE:

	Pizza		Burger	
year	***P***	***Q***	***P***	***Q***
2005	$10	400	$2.00	1000
2006	$11	500	$2.50	1100
2007	$12	600	$3.00	1200

Compute real GDP for each year, using 2005 as the base year and its growth over previous year

EXAMPLE:

	Pizza		Burger	
year	***P***	***Q***	***P***	***Q***
2005	$10	400	$2.00	1000
2006	$11	500	$2.50	1100
2007	$12	600	$3.00	1200

Compute real GDP for each year, using 2005 as the base year and its growth over previous year

2005: $10 x 400 + $2 x 1000 = $6,000

2006: $10 x 500 + $2 x 1100 = $7,200

2007: $10 x 600 + $2 x 1200 = $8,400

Growth:

20.00%

16.67%

EXAMPLE:

year	*Nominal GDP*	*Real GDP*
2005	$6000	$6000
2006	$8250	$7200
2007	$10,800	$8400

In each year,

- nominal GDP is measured using the current prices.
- real GDP is measured using constant prices from the base year (2005 in this example).

EXAMPLE:

year	*Nominal GDP*		*Real GDP*	
2005	$6000		$6000	
		37.5%		**20.0%**
2006	$8250		$7200	
		30.9%		**16.7%**
2007	$10,800		$8400	

- The change in nominal GDP reflects both prices and quantities.
- The change in real GDP is the amount that GDP would change if prices were constant (*i.e.*, if zero inflation).

Hence, real GDP is corrected for inflation.

The GDP Deflator

- The GDP deflator is a measure of the overall level of prices.
- Definition:

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

- One way to measure the economy's **inflation rate** is to compute the **percentage increase in the GDP deflator** from one year to the next.

EXAMPLE:

year	Nominal GDP	Real GDP	GDP Deflator	Inflation Rate
2005	$6000	$6000	100.0	
2006	$8250	$7200	114.6	14.6%
2007	$10,800	$8400	128.6	12.2%

Compute the GDP deflator in each year:

2005:	100 x (6000/6000) =	100.0
2006:	100 x (8250/7200) =	114.6
2007:	100 x (10,800/8400) =	128.6

ACTIVE LEARNING 2

Computing GDP

	2007 (base yr)		2008		2009	
	P	*Q*	*P*	*Q*	*P*	*Q*
Good A	$30	900	$31	1,000	$36	1050
Good B	$100	192	$102	200	$100	205

Use the above data to solve these problems:

A. Compute nominal GDP in 2007.

B. Compute real GDP in 2008.

C. Compute the GDP deflator in 2009.

ACTIVE LEARNING 2

Answers

	2007 (base yr)		2008		2009	
	P	*Q*	*P*	*Q*	*P*	*Q*
Good A	$30	900	$31	1,000	$36	1050
Good B	$100	192	$102	200	$100	205

A. Compute nominal GDP in 2007.

$30 x 900 + $100 x 192 = $46,200

B. Compute real GDP in 2008.

$30 x 1000 + $100 x 200 = $50,000

ACTIVE LEARNING 2

Answers

	2007 (base yr)		2008		2009	
	P	*Q*	*P*	*Q*	*P*	*Q*
Good A	$30	900	$31	1,000	$36	1050
Good B	$100	192	$102	200	$100	205

C. Compute the GDP deflator in 2009.

Nominal GDP = $36 x 1050 + $100 x 205 = <u>$58,300</u>

Real GDP = $30 x 1050 + $100 x 205 = <u>$52,000</u>

GDP deflator = 100 x (Nom GDP)/(Real GDP)

= 100 x ($58,300)/($52,000) = <u>112.1</u>

Different Approaches for Measuring National Income

- ❖Income Approach
- ❖Expenditure Approach
- ❖Value Added (Output) Approach

Measuring a Nation's Income

3 Approaches for measuring GDP

1. **Value-added Approach** – measures GDP as the sum of value added at each stage of production (**from initial or first stage of production to final stage**)
2. **Income Approach** – measures GDP as the sum of incomes of factors of production (wages, rent, interest, and profit).
3. **Expenditure Approach**– measures GDP as the sum of expenditures on final goods and services by different sectors of the economy, i.e., household, firm, government and foreign trade.

   Here Value of sales to final buyers are considered.

For a simple economy where injection (deposit) equals leakage (withdrawal), all the above three approaches gives same result.

Measuring GDP - Example

Imagine a hypothetical economy where a farmer grows paddy (rice with husk). The farmer sells the paddy to miller, the processing unit to produce rice. The miller sells rice to households who are ultimate consumers of rice. Role of Government and external sector is absent.

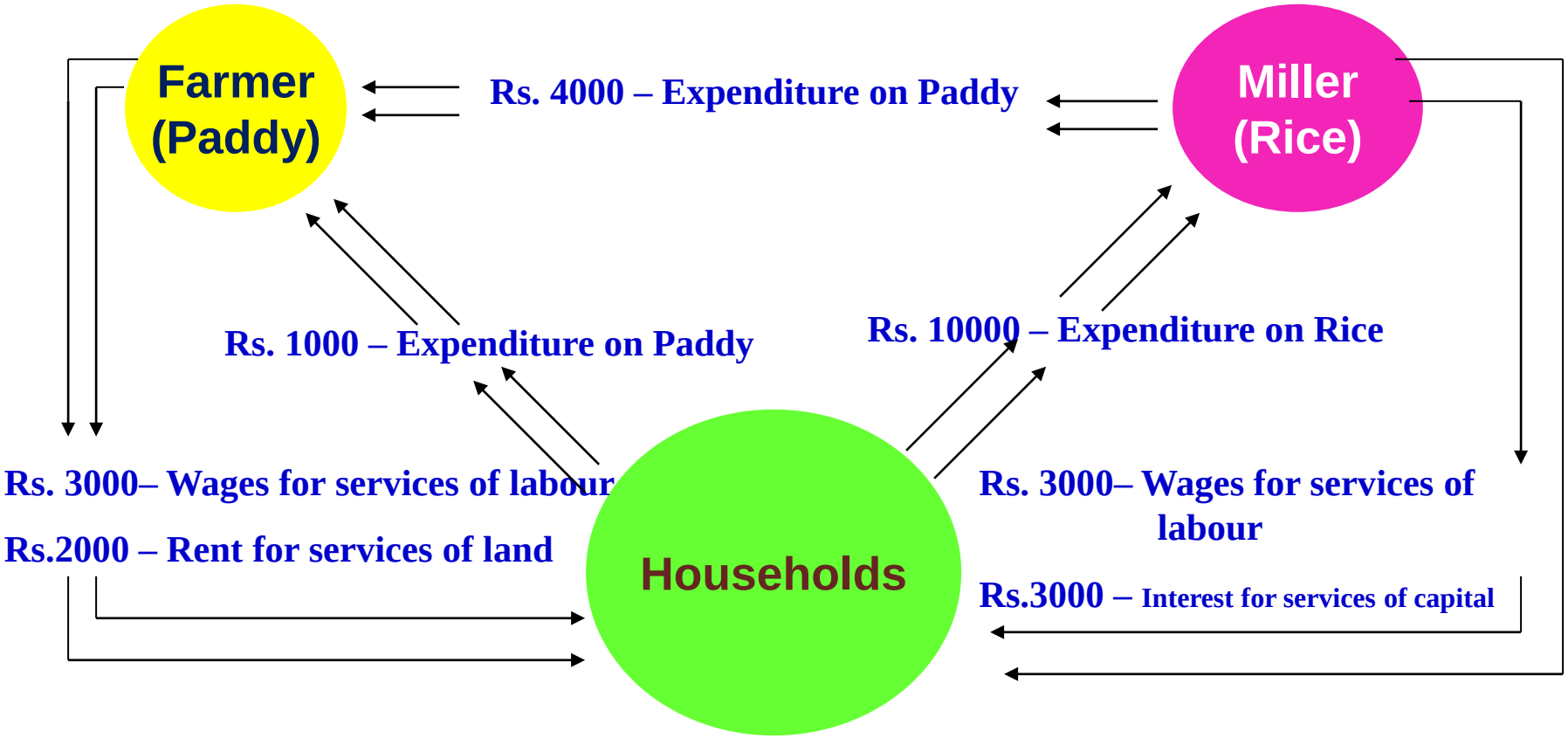
A Farmer sells part of total production of paddy to miller for Rs. 4000 and to consumers (household) for Rs. 1000.

The miller sells rice to consumers for Rs. 10000.

The farmer pays a rent of Rs. 2,000 for services of land, and a wage of Rs. 3,000 for services of labour.

The miller pays an interest of Rs. 3,000 for services of capital, and a wage of Rs. 3,000 for services of labour.

Compute GDP using the 03 approaches, i.e., value-added, income and expenditure.



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Measuring GDP : (Value Added Approach)

GDP is the sum of value added at each stage of production (from initial to final stage)

Stage of Production	Value of **Sales**	Value of **intermediate good**	Value-added
Paddy Farmer – Paddy	5,000	-	5,000
Rice Miller - Rice	10,000	4000	6,000
GDP= Total Value Added			**11,000**

N.B.:- Value added by a production unit
= Value of a producer's output (Sales Value)
– Value of intermediate goods

Measuring GDP : (Income Approach)

GDP is the sum of incomes of factors of production (factor payments, i.e., wages, rent, interest and profit.

Income through	Paid by Farmer	Paid by Miller	**Total**
Wages	3000	3,000	6,000
Rent	2000	-	2,000
Interest	-	3,000	3,000
GDP=Sum of Payments to factors of production	**5,000**	**6,000**	**11,000**

Measuring GDP : (Expenditure Approach)

GDP is the sum of expenditures on final goods and services by different sectors of the economy, i.e., households, firms, government and foreign trade.

Good	Consumption made by Household		
	To Farmer	To Miller	Total
Rice	1,000	10,000	11,000
GDP			11,000

Methods used by Central Statistical Organization (CSO) for estimating GDP in India

Value Added / Output Method	Income Method	Expenditure Method
▪Agriculture	▪Unregistered Manufacturing	▪Construction
▪Forestry & Logging	▪Electricity, Gas & Water Supply	
▪Fishing	▪Transport, Storage & Communication	
▪Mining & Quarrying	▪Trade, Hotels & Restaurants	
▪Registered Manufacturing	▪Banking & Insurance	
	▪Real Estates, Ownership of Dwellings	
	▪Public Administration & Defence	
	▪Other Services	

FYI

Other Measures of Income

When the U.S. Department of Commerce computes the nation's GDP every three months, it also computes various other measures of income to get a more complete picture of what's happening in the economy. These other measures differ from GDP by excluding or including certain categories of income. What follows is a brief description of five of these income measures, ordered from largest to smallest.

- *Gross national product* (GNP) is the total income earned by a nation's permanent residents (called *nationals*). It differs from GDP by including income that our citizens earn abroad and excluding income that foreigners earn here. For example, when a Canadian citizen works temporarily in the United States, her production is part of U.S. GDP, but it is not part of U.S. GNP. (It is part of Canada's GNP.) For most countries, including the United States, domestic residents are responsible for most domestic production, so GDP and GNP are quite close.
- *Net national product* (NNP) is the total income of a nation's residents (GNP) minus losses from depreciation. *Depreciation* is the wear and tear on the economy's stock of equipment and structures, such as trucks rusting and computers becoming obsolete. In the national income accounts prepared by the Department of Commerce, depreciation is called the "consumption of fixed capital."
- *National income* is the total income earned by a nation's residents in the production of goods and services. It is almost identical to net national product. These two measures differ because of the *statistical discrepancy* that arises from problems in data collection.
- *Personal income* is the income that households and noncorporate businesses receive. Unlike national income, it excludes *retained earnings*, which is income that corporations have earned but have not paid out to their owners. It also subtracts indirect business taxes (such as sales taxes), corporate income taxes, and contributions for social insurance (mostly Social Security taxes). In addition, personal income includes the interest income that households receive from their holdings of government debt and the income that households receive from government transfer programs, such as welfare and Social Security.
- *Disposable personal income* is the income that households and noncorporate businesses have left after satisfying all their obligations to the government. It equals personal income minus personal taxes and certain nontax payments (such as traffic tickets).

Although the various measures of income differ in detail, they almost always tell the same story about economic conditions. When GDP is growing rapidly, these other measures of income are usually growing rapidly. And when GDP is falling, these other measures are usually falling as well. For monitoring fluctuations in the overall economy, it does not matter much which measure of income we use.

OTHER MEASURES OF NATIONAL INCOME

- **Domestic :** Value of production that occurs **within a country's borders**, whether done by its own citizens or by foreigners located there.
- **National =** Domestic + Net Factor Income from Abroad

  Net Factor Income from Abroad = Incomes received by residents of a country from abroad - Incomes earned in the country by foreigners
- **Gross =** total amount of something before anything is taken away
- **Net = Gross - Depreciation**
  - Depreciation is the wear and tear on the ***economy's stock of equipment and structures***, such as trucks rusting and computers becoming obsolete.
  - Depreciation is called the "consumption of fixed capital."

Net Domestic Product (NDP) is…

the **net market value** of all goods and services produced within a nation's geographic borders over a specified period of time.

NDP = GDP – Depreciation

Gross National Product (GNP) is…

the total income earned by a nation's permanent residents (called nationals).

- It differs from GDP by including income that our citizens earn abroad and excluding income that foreigners earn here.
- **GNP = GDP + Net Factor Income from Abroad**
- **Net Factor Income from Abroad = Inflow of Income from abroad – Outflow of Income to abroad.**

Net National Product (NNP) Is…

is the total income of a nation's residents (GNP) minus losses from depreciation.

NNP = GNP – Depreciation

"NNP is known as National income"

Thus,

National income is the total income earned by a nation's resident in the production of goods and services after subtracting amount of depreciation = NNP

OTHER MEASURES OF INCOME

- The following data pertains to an economy. Compute NDP, GNP, and NNP.

	Million Rs
GDP	6000
Factor Income Received from Abroad	1500
Factor Income Paid Abroad	1200
Depreciation	600

- NDP =
- GNP =
- NNP =

OTHER MEASURES OF INCOME

- The following data pertains to an economy. Compute NDP, GNP, and NNP.

	Million Rs
GDP	6000
Factor Income Received from Abroad	1500
Factor Income Paid Abroad	1200
Depreciation	600

- NDP = GDP – Depreciation = 6000 – 600 = Rs. 5400 million

- GNP = GDP – FI paid abroad + FI received abroad
  = 6000 – 1200 + 1500 = Rs. 6300 million

- NNP = GNP – Depreciation = 6300 – 600 = Rs. 5700 million
  = NDP - FI paid abroad + FI received abroad = 5400 – 1200 + 1500
  = Rs. 5700 million

Personal Income Is…

the income that households and non-corporate businesses receive.

- Personal income excludes retained earnings, which is income that corporations have earned but have not paid out to their owners. It also subtracts indirect business taxes (such as sales taxes), corporate income taxes, and contributions for social insurance (mostly Social Security taxes).

- Personal income includes the interest income that households receive from their holdings of government debt and the income that households receive from government transfer programs, such as welfare and Social Security.

Disposable Personal Income Is…

the income that households and non-corporate businesses have left after satisfying all their obligations to the government.

It equals **personal income minus direct taxes.**

Summary: Other Measures of Income

GDP	Market value of all final goods and services produced within a country in a given period of time
NDP	GDP – Amount of depreciation
GNP	GDP + Net factor income from abroad = GDP + [income received by domestic resident from abroad – income received by foreigners in the country
NNP = **NATIONAL INCOME**	GNP – Amount of depreciation
PERSONAL INCOME	NNP – retain earning – indirect tax – corporate income tax – contribution towards social security + subsidies + interest from govt bond + income from govt transfer programme
DISPOSABLE PERSONAL INCOME	Personal income – Personal tax = personal income – income tax

GDP and Economic Well-Being

- **Real GDP per capita is the main indicator of the average person's standard of living.**
- **But GDP is not a perfect measure of economic output or welfare.**
- Robert Kennedy issued a very eloquent yet harsh criticism of GDP:

Gross Domestic Product…..

The GDP is the total market value of all final goods and services produced in a economy in a country in a given year.

Robert F. Kennedy Speech
Remarks at the University of Kansas, March 18, 1968

but that Gross National Product - if we judge the United States of America by that - that Gross National Product counts air pollution and cigarette advertising, and ambulances to clear our highways of carnage. It counts special locks for our doors and the jails for the people who break them. It counts the destruction of the redwood and the loss of our natural wonder in chaotic sprawl. It counts napalm and counts nuclear warheads and armored cars for the police to fight the riots in our cities. It counts Whitman's rifle and Speck's knife, and the television programs which glorify violence in order to sell toys to our children. Yet the gross national product does not allow for the health of our children, the quality of their education or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our country, it measures everything in short, except that which makes life worthwhile. And it can tell us everything about America except why we are proud that we are Americans.

GDP Does Not Value……

- Non-market activity, such as the child care a parent provides his or her child at home
- Legal goods sold "under the table" to avoid taxes also do not show up in GDP, i.e., **GDP Does Not Count the Underground Economy**
- Quality of goods such as change in the quality of computer, and mobile etc. and quality of services such as education, health, sanitation, and drinking water supply etc.
- The quality of the environment
- Leisure time
- An equitable distribution of income

Why Do We Care About GDP?

- Having a large GDP enables a country to afford better schools, a cleaner environment, health care, etc.
- Many indicators of the quality of life are positively correlated with GDP.

Thus, we can conclude that GDP is a good measure of economic wellbeing but not a perfect measure.

Exercise…

Measuring a Nation's Income

Our Simple Economy

- Suppose an economy produces three goods or services, Window Washing, Baseballs, and Hammers. Data for the past three years can be found below.

Prices and Quantities for our Simple Economy

	2006 Statistics		2007 Statistics		2008 Statistics	
Product	Quantity	Price	Quantity	Price	Quantity	Price
Window Washing	90	$50.00	100	$60.00	100	$65.00
Baseballs	75	$2.00	100	$2.00	120	$2.25
Hammers	50	$30.00	50	$25.00	65	$25.00

Nominal GDP

Step 1: Calculate Nominal GDP (*The value of final goods and services evaluated at current-year prices*) for each year:

$NGDP_{2006}$

$= Q_{2006} \times P_{2006}$

= (90 x $50.00) Window Washing

+ (75 x $2.00) Baseballs

+ (50 x $30.00) Hammers

= $6,150

Nominal GDP 2007

$NGDP_{2007}$

$= Q_{2007} \times P_{2007}$

= (100 x $60.00) Window Washing

+ (100 x $2.00) Baseballs

+ (50 x $25.00) Hammers

= $7,450

Nominal GDP 2008

$NGDP_{2008} = Q_{2008} \times P_{2008}$

= (100 x $65.00) Window Washing

+ (120 x $2.25) Baseballs

+ (65 x $25.00) Hammers

= $8,395

Real GDP

- Step 2: Calculate Real GDP (*The value of final goods and services evaluated at base-year prices*) for each year. For our example assume 2006 is the base year. *This means that all values are in what we call "2006 Dollars", or "Constant Dollars".*

Real GDP

- By using the prices from the base-year, (or holding prices constant over time), we eliminate the impact that rising prices have on GDP, to get a measure of “Real” economic activity.

Real GDP in 2006

$RGDP_{2006} = Q_{2006} \times P_{2006}$

= (90 x $50.00) Window Washing

+ (75 x $2.00) Baseballs

+ (50 x $30.00) Hammers

= $6,150

Note: For the Base-Year Nominal GDP always equals Real GDP

Real GDP in 2007

$RGDP_{2007} = Q_{2007} \times P_{2006}$

= (100 x $50.00) Window Washing

+ (100 x $2.00) Baseballs

+ (50 x $30.00) Hammers

= $6,700

Note: We use “Current Quantities” and “Constant Prices”.

Real GDP in 2008

$RGDP_{2008} = Q_{2008} \times P_{2006}$

= (100 x $50.00) Window Washing

+ (120 x $2.00) Baseballs

+ (65 x $30.00) Hammers

= $7,190

Note: We still use “Current Quantities” and “Constant Prices”.

The General Formula for Calculating a Growth Rate

$$Percent_Change = \%\Delta = \frac{New_Value - Old_Value}{Old_Value} \times 100$$

$$Percent_Change = \%\Delta = \frac{X_t - X_{t-1}}{X_{t-1}} \times 100$$

Calculate the Growth Rate in Real GDP between 2006 and 2007

$$\%Change = [(RGDP_{2007} - RGDP_{2006})/RGDP_{2006}] \times 100$$

$$\%Change = [(6{,}700 - 6{,}150)/6{,}150] \times 100$$

$$\%Change = 8.94\%$$

That is real GDP grew by 8.94% between 2006 and 2007.

Calculate the Growth Rate in Real GDP between 2007 and 2008

$$\%Change = [(RGDP_{2008} – RGDP_{2007})/RGDP_{2007}] \times 100$$

$$\%Change = [(7{,}190 – 6{,}700)/6{,}700] \times 100$$

$$\%Change = 7.31\%$$

That is real GDP grew by 7.31% between 2007 and 2008.

The Price Level

We can use our calculations of Nominal GDP and Real GDP to calculate the Price Level (*A measure of the average prices of goods and services in the economy.*)

The GDP Deflator

One example of a measure of the average price level is the GDP deflator.

$$GDP_Deflator_t = \frac{NGDP_t}{RGDP_t} \times 100$$

Calculate the GDP Deflator for 2006

$$\text{GDP Deflator}_{2006} = (\text{NGDP}_{2006}/\text{RGDP}_{2006}) \times 100$$

$$\text{GDP Deflator}_{2006} = (6{,}150/6{,}150) \times 100 = 100$$

Note: The GDP Deflator is always equal to 100 in the base-year.

The Price Index is “unitless”

Calculate the GDP Deflator for 2007 and 2008

$$\text{GDP Deflator}_{2007} = (\text{NGDP}_{2007}/\text{RGDP}_{2007}) \times 100$$

$$\text{GDP Deflator}_{2007} = (7{,}450/6{,}700) \times 100 = 111.19$$

$$\text{GDP Deflator}_{2008} = (\text{NGDP}_{2008}/\text{RGDP}_{2008}) \times 100$$

$$\text{GDP Deflator}_{2008} = (8{,}395/7{,}190) \times 100 = 116.76$$

Calculate the Inflation Rate from 2006 to 2007

We can use the growth rate formula from previous to calculate the Inflation Rate (the Inflation Rate is *The percentage increase in the price level from one year to the next*.)

Inflation Rate Between 2006 and 2007 =

$[(\text{GDP Def.}_{2007} - \text{GDP Def.}_{2006})/\text{GDP Def.}_{2006}] \times 100$

Inflation Rate Between 2006 and 2007 = $[(111.19 - 100)/100] \times 100 = 11.19$

That is the inflation rate between 2006 and 2007 was 11.19%.

Calculate the Inflation Rate from 2007 to 2008

Inflation Rate Between 2007 and 2008 =

$[(\text{GDP Def.}_{2008} - \text{GDP Def.}_{2007})/\text{GDP Def.}_{2007}] \times 100$

Inflation Rate Between 2007 and 2008 = [(116.76 – 111.19)/111.19] x 100 = 5.01

That is the inflation rate between 2007 and 2008 was 5.01%.

Real and Nominal GDP

- If the prices of all goods and services produced in the economy rose while the quantity of all goods and services stayed the same, which would increase, real GDP or nominal GDP?

ANSWER

Nominal GDP

- A country's real GDP rose from 500 to 550 while its nominal GDP rose from 600 to 770. What was this country's inflation rate?

ANSWER

16.667%

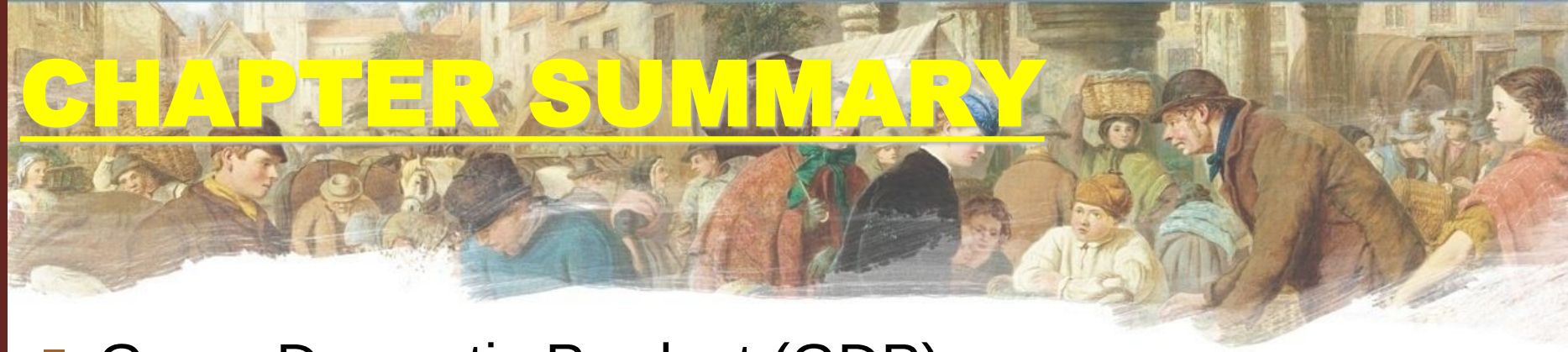
Real and Nominal GDP

- Suppose an economy produces only cheese and fish. In 2010, 20 units of cheese are sold at Rs.5 each and 8 units of fish are sold at Rs.50 each. In 2009, the base year, the price of cheese was Rs.10 per unit and the price of fish was Rs.75 per unit. Find nominal GDP, real GDP and GDP deflator for 2010.

ANSWER

???

CHAPTER SUMMARY



- Gross Domestic Product (GDP) measures a country's total income and expenditure.
- The four spending components of GDP include: Consumption, Investment, Government Purchases, and Net Exports.
- Nominal GDP is measured using current prices. Real GDP is measured using the prices of a constant base year and is corrected for inflation.
- GDP is the main indicator of a country's economic well-being, even though it is not perfect.

Practice Question (From Text Book – Ch: 23)

Measuring a Nation's income

Question for Review		Problems & Application	
1		1	
2		2	All
3		4	a, b, c, d, e
5		5	a, b, c
6		9	a, b, c
8		10	a, b, c, d, e