

# **ECO 209Y**

## **MACROECONOMIC THEORY AND POLICY**

### **LECTURE 2:**

### **NATIONAL INCOME ACCOUNTING**

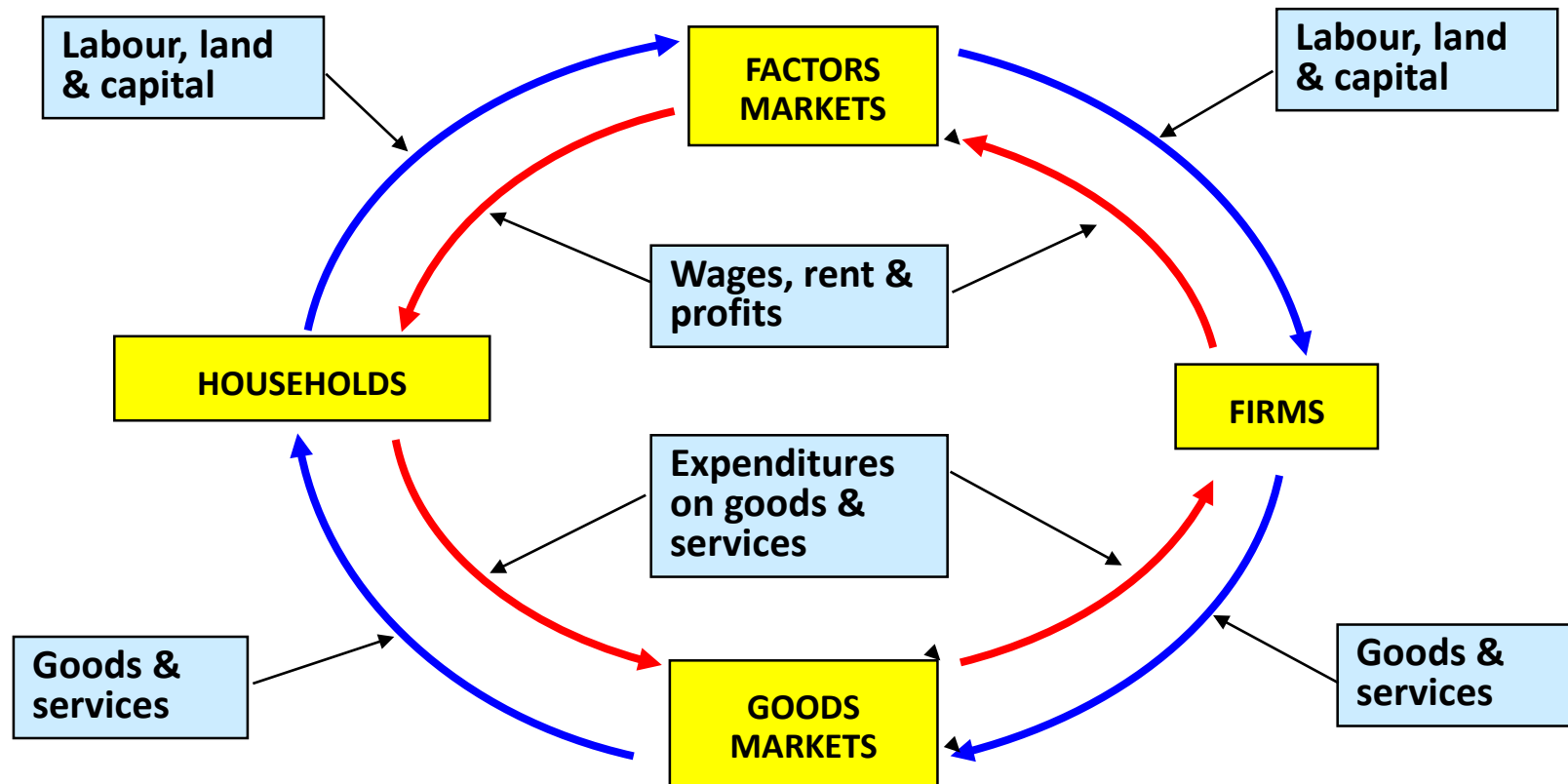
# GROSS DOMESTIC PRODUCT

- Gross Domestic Product (GDP) is the value of all *final* goods and services produced in Canada during a given period of time
  - That is, GDP is a *flow* of new value produced during a period of time, usually one year
- We can use three different approaches to measure GDP:
  - *Production* approach
  - *Expenditure* approach
  - *Income* approach

# MEASURING GDP

- ***Production Approach*** – We can measure GDP by measuring the ***value added*** in the production of goods and services in the different industries (e.g., agriculture, mining, manufacturing, commerce, etc.)
- ***Expenditure Approach*** – We can measure GDP by measuring the total expenditure on ***final*** goods and services by different groups (households, businesses, government, and foreigners)
- ***Income Approach*** – We can measure GDP by measuring the ***total income*** earned by those producing goods and services (wages, rents, profits, etc.)

# FLOW OF EXPENDITURE AND INCOME



# MEASURING GDP

- **Current Output** – GDP includes only the value of output *currently produced*. For instance, GDP includes the value of currently produced cars and houses but not the sales of used cars and old houses
- **Market Prices** – GDP values goods at *market prices*, and the market price of a good includes indirect taxes (and subsidies) such as sales taxes and excise taxes
- **Not All Goods and Services Are Considered** – In general, only the value of goods and services *exchanged in the market* – except illegal transaction (e.g., drugs) – are included in GDP, but there are some other services arbitrarily added (such as the imputed rent to owners' occupied houses)

# THE PRODUCTION APPROACH

- GDP is the value of *final* goods and services produced in Canada within a year
  - The emphasis on the word *final* (goods and services) is important in order to avoid double counting
- If we were to consider also the value of *intermediate* goods, then their values would be counted twice:
  - First, as an output of the industry producing this intermediate good
  - Second, as part of the value of the final good of the industry that uses it as an intermediate good

# THE PRODUCTION APPROACH (CONT'D)

- To avoid this double counting we must consider only the **value added** in each industry or at each stage in the process of manufacturing a good
- The **value added** by a firm is the difference between the revenue the firm earns by selling its product and the amount it pays for the product of other firms it uses as intermediate goods

# EXAMPLE

- Suppose that the production and sale of *bread* in a given period of time is \$1000, and that the *flour* used in the production of this bread costs \$400
- Also suppose that \$200 worth of *wheat* is needed to produce this \$400 worth of *flour*
- And for simplicity, assume the farmer produces *wheat* without any material input
- What is the contribution of these activities to GDP?
- The contribution to GDP is only \$1,000 since *bread* is the only *final* good (*flour* and *wheat* are both *intermediate* goods)



# EXAMPLE (CONT'D)

Product	Value of Output	Value Added
Bread	\$1000	\$600
Flour	\$400	\$200
Wheat	\$200	\$200
<b>Total</b>	<b>\$1600</b>	<b>\$1000</b>

# THE EXPENDITURE APPROACH

- Total spending on *final* goods and services produced in Canada during any period can be broken down as follows:

GDP = Consumption

+ Investment

+ Government expenditure

+ Net exports (or exports minus imports)

or, in symbols,  **$Y = C + I + G + NX$**

- Here we are measuring GDP taking into account who buys the output

# CONSUMPTION EXPENDITURE

- Consumption spending is the largest component of GDP
- It includes:
  - Services (haircuts, medical care, education)
  - Durable goods (cars, stereos, washing machines)
  - Semi-durable goods (clothing)
  - Non-durable goods (food, gasoline)
- Note that the purchase of durable goods could be argued to be an investment since they are not completely consumed during the period when they are purchased (and they store value)

# INVESTMENT EXPENDITURE

- For GDP purposes, investment spending is the type of expenditure that results in an addition to the physical stock of capital
  - Therefore, investment does **not** include buying a bond or stock in a company
- Investment includes expenditure on:
  - Machinery and equipment
  - Non-residential construction
  - Residential construction
  - Changes in inventories

} ***Business fixed capital investment***
- Investment expenditure includes ***private investment*** but not ***government investment***

# INVESTMENT EXPENDITURE (CONT'D)

- Investment is a **flow** of new capital during the year that is added to the **stock** of capital
- The capital **stock** is the total amount of capital in the economy (all buildings, equipment, and houses)
- The capital stock increases from one year to the next as a result of investment
  - However, not all investment expenditure is devoted to increasing the capital stock
  - Because the capital stock is constantly wearing out (i.e., depreciating), part of the investment is devoted to replacing worn-out capital
- **Net** investment is gross investment minus depreciation
- What is reported in GDP is **gross** investment

# GOVERNMENT EXPENDITURE

- Government spending (federal, provincial, territorial, and municipal) on goods and services is the second largest component of GDP
- It includes the salaries of all government employees and expenditures on such items as road paving, military airplanes, and advertising
- It also includes government *investment* expenditure
- It does *not* include transfer payments such as welfare payments and interest payments on the national debt

# NET EXPORTS

- Exports are added in as they represent spending by foreigners on Canadian goods and services
- Imports are subtracted since they represent the part of domestic spending that is **not** on domestically produced goods and services
- Consumption, investment, and government expenditure include spending on both domestically produced and foreign produced goods
  - To obtain total spending on domestically produced goods (GDP), imports must be subtracted

# CANADA'S GDP (2012)

	At Market Prices (\$ millions)	As % of GDP
Consumption	1,012,386	55.6
Investment	371,552	20.4
Government	471,707	25.9
Exports	546,617	30.0
Imports	582,829	32.0
Statistical discrepancy	534	...
<b>GDP</b>	<b>1,819,967</b>	<b>100.0</b>

Source: Statistics Canada.



# THE INCOME APPROACH

- Those Canadians who contribute towards the production of GDP receive income for their services
- Some of the **value added** in production – i.e., the revenue from selling the product minus the cost of the intermediate goods (and services) used in its production – represents the income of the owners of the factors of production
- But not all of the value added represents someone's income
  - Part of GDP goes as **depreciation** (which is a cost of production) and thus can't be counted as part of anyone's income
  - Also GDP is valued at market prices which include **indirect taxes minus subsidies** and the income accruing to producers does not include these net indirect taxes

# NET DOMESTIC INCOME

- The part of the value added that goes to payment to the owners of the different factors of production is called **Net Domestic Income** (NDI)
  - **NDI = GDP – net indirect taxes – depreciation**
- Net domestic income is also equal to the sum of **all** the different sources of income: **wages and salaries + corporate profits + interest + rents + net income of unincorporated business**
- Net Domestic Income is also called **Net Domestic Product at factor cost**
  - Net Domestic Product at market prices is GDP minus depreciation

# PERSONAL INCOME

- From *Net Domestic Income* we can obtain *Personal Income*
  - *Personal Income* is the income received by individuals, that is, by households
- Therefore, to get to Personal Income we have to subtract *corporate profits* from Net Domestic Income and add *dividends, government transfer payments, and interest on government debt*
  - $\text{Corporate profits} = \text{Dividends} + \text{Corporate taxes} + \text{Undistributed profits}$
- *Transfers* are payments that do *not* arise out of current productive activity, that is, they are not payments for the service of a factor of production

# PERSONAL DISPOSABLE INCOME

- *Personal Disposable Income* is the amount of income available for consumption
- To obtain *Personal Disposable Income* we must subtract *Personal Income Taxes* from *Personal Income*
- Not all *Personal Disposable Income* is spent on personal consumption – i.e., a fraction is saved
- Therefore, *Personal Disposable Income* =  
*Personal Consumption Expenditure*  
+ *Personal Saving*

# GROSS DOMESTIC PRODUCT VS. GROSS NATIONAL PRODUCT

- **Gross Domestic Product** (GDP) measures production *within* Canada taking into account the contributions of both *Canadian* and *non-residents'* factors of production
- **Gross National Product** (GNP) measures production *within* and *outside* Canada taking into account the contributions of only *Canadian* factors of production
  - Therefore, using the income approach we consider only payments to Canadian factors of production both at home and abroad
  - **GNP** represents the *national income* of the country

# REAL AND NOMINAL GDP

- **Nominal** GDP measures the value of output in a given period in the prices of that period, that is, in **current dollars**
  - Nominal GDP changes from year to year because the physical output changes and also because market prices change
- **Real** GDP measures the value of output in a given period in the prices of a base period, that is, in **constant dollars**
  - Therefore, real GDP changes from year to year only because the physical output changes

# MEASURING REAL GDP WITH THE 'CHAIN-WEIGHTED METHOD'

- What happens if there is, for instance, a significant decrease in the price of a good in an important industry?
  - Real GDP would be overvalued when using the prices of the base year
- Solution → Use of the *chain-weighted method*
  - Averaging the prices of the current and previous year
  - Adjustments are made every year

# GDP DEFLATOR

- The calculation of real GDP gives us a useful measure of inflation known as the ***GDP Deflator*** or ***GDP Implicit Price Index***
- The GDP Deflator shows the change in the price level taking into account current physical output

$$\textbf{GDP Deflator} = \frac{\text{GDP measured in current prices}}{\text{GDP measured in base year prices}} \times 100$$



# PRICE INDEXES

- The **Consumer Price Index (CPI)** shows the change in the price level taking into account a **constant** basket of consumer goods

$$\text{CPI} = \frac{\text{Value of basket measured in current prices}}{\text{Value of basket measured in prices of based period}} \times 100$$

- The **Industrial Product Price Index (IPPI)** is also a measure of the cost of a given basket of goods, but of intermediate goods

# THE RATE OF INFLATION

The inflation rate ( $\pi$ ) is the percentage increase in the level of prices during a given period:

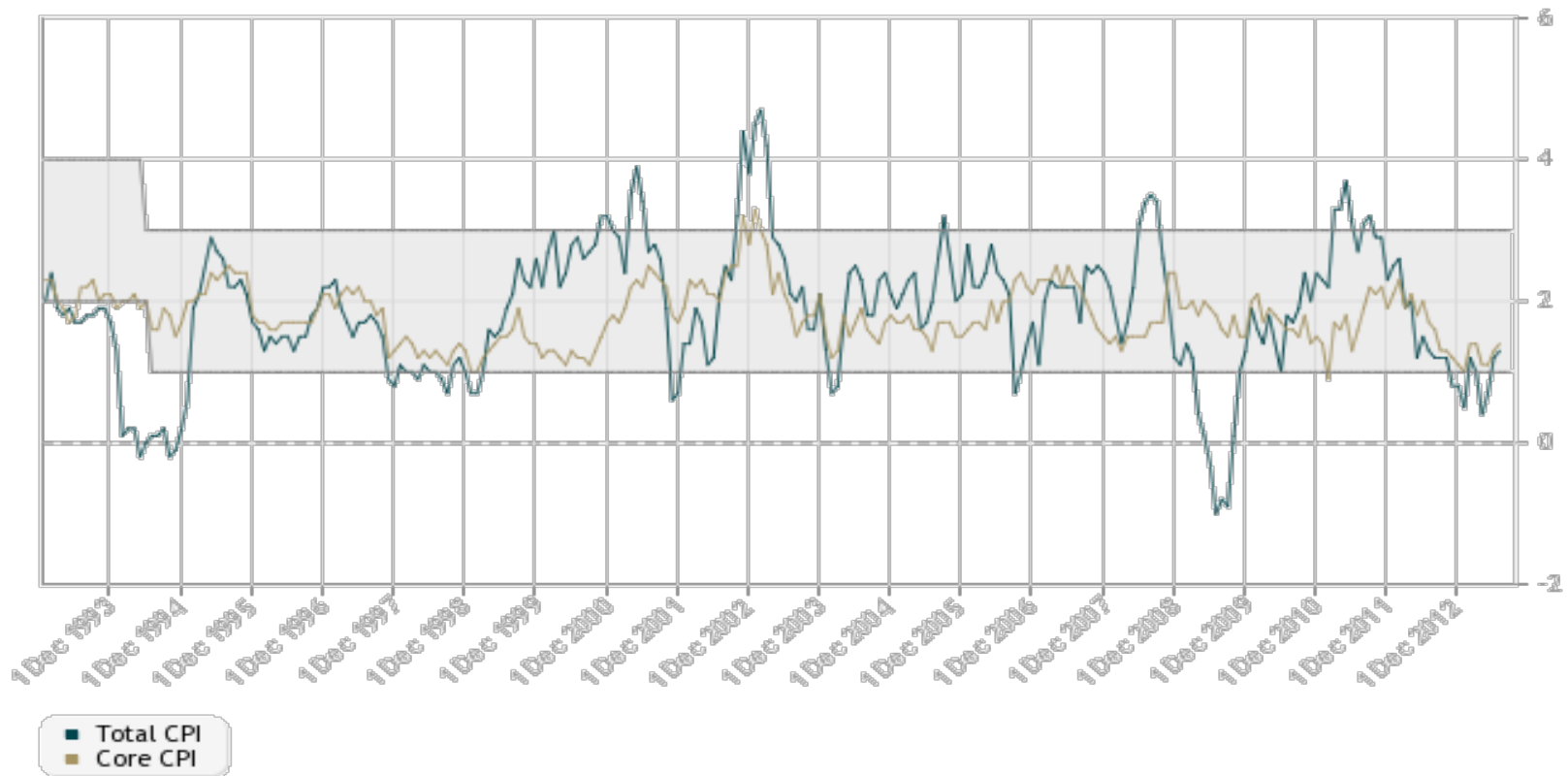
$$\pi = \frac{P - P_{-1}}{P_{-1}}$$

where  $P$  is the current price level and  $P_{-1}$  is the price level at the end of the previous period.

For instance,  $P$  could be the value of **CPI** or **GDP Deflator** in the current period.

# PERCENTAGE CHANGES IN CPI

## DECEMBER 1993 TO SEPTEMBER 2013



**Source:** Bank of Canada.

# MAIN DIFFERENCES BETWEEN THE CPI AND THE GDP DEFLATOR

- The GDP deflator measures the prices of all goods and services produced in the economy, while the CPI measures the prices of only the goods and services bought by consumers
- The GDP deflator includes only goods and services produced domestically, while the CPI includes the prices of goods and services both produced domestically and imported
- The GDP deflator allows the basket of goods and services to change over time as the composition of GDP changes, while CPI considers a relatively more constant basket of goods and services

# ASSUMPTIONS

- From now on we will make the following assumptions:
  - **First assumption:** There is no depreciation in the model
    - Therefore, **gross investment** = **net investment**
  - **Second assumption:** There are no indirect taxes and subsidies in the model
    - Therefore, **GDP** = **Net Domestic Income**
  - **Third assumption:** Net payment to foreign factors of production is nil
    - Therefore, **GDP** = **GNP**
- We will use **Y** to denote all **GDP**, **GNP**, and **Net Domestic Income**

# AN IMPORTANT ACCOUNTING IDENTITY (I)

- Consider an economy without government sector (i.e., taxes = transfer payments = 0) and without external sector (imports = exports = 0)

- $Y = C + I$  (1)

- Assuming profits = dividends, then

- GDP = Net Domestic Income = Personal Income = Personal Disposable Income (i.e.,  $Y = YD$ )

- Therefore,

- $Y = C + S$  (2)

- Therefore, given (1) and (2) above

- $C + I = C + S$

- $S = I$

# AN IMPORTANT ACCOUNTING IDENTITY (II)

- Let's now introduce the government sector and the external sector while keeping the assumptions:

1)  $\text{GDP} = \text{Net Domestic Income} = \text{GNP}$

2)  $\text{Profits} = \text{Dividends}$

- The simple economy now becomes:

➤  $Y = C + I + G + NX$  (3)

- Now part of income goes to taxes and households also receive transfers from the government. Therefore,

➤  $YD = Y - TA + TR$  (4)

➤  $YD = C + S$

# AN IMPORTANT ACCOUNTING IDENTITY (II) (CONT'D)

- Given  $C + S = Y - TA + TR$ , then
  - $C = Y - TA + TR - S$  (5)
- Given (3) and (5) above,
  - $Y = (Y - TA + TR - S) + I + G + NX$
  - $S = I + (G + TR - TA) + NX$
- The term  $(G + TR - TA)$  is the government budget deficit, and the term  $NX$  is the trade surplus (Net Exports)
- Note that **National Saving** is equal to **Private Saving** ( $S$ ) plus **Public Saving** or **Government Budget Surplus** ( $BS$ )