WEEK 2: ECONOMIC ACTIVITY & PERFORMANCE

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Economics 203: Introduction to Macroeconomics

OUTLINE

NATIONAL ACCOUNTS

- It is a framework that is essential for consistent definitions and measurement of spending, output, and incomes.
- It is important to recognize that this is an accounting system that *describes* the economy — not an economic model that *explains* the economy's behaviour.

CIRCULAR FLOW DIAGRAM

- It shows the relationship between spending, output, and income.

Circular flows in the economy
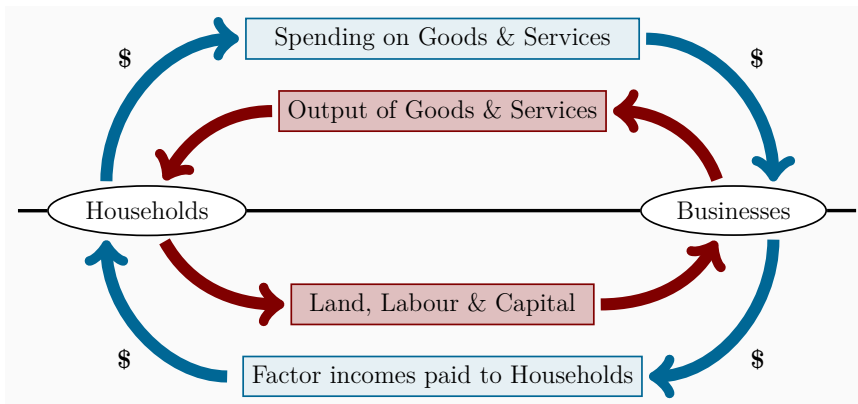
FOUR WAYS TO MEASURE ECONOMIC ACTIVITY

1 the output of goods and services at market prices;

2 the total expenditure on goods and services at market prices;

3 the inputs to the production of goods and services costed at market prices; and

4 the incomes received by households for providing factor inputs to production.

— These are the four rectangles in the CF diagram

— four alternative but equal measurements.

THE *accounting framework*

- The basic accounting principle:

$$
\begin{aligned}
\text{Market value of output} &= \text{total expenditure} \\
&= \text{market value of factor services} \\
&= \text{household income.}
\end{aligned}
$$

IS IT TOO SIMPLE!

- While the principle illustrated by the circular flow is sound, the economy in the previous figure is too simple.
- What is missing?

IS IT TOO SIMPLE!

- While the principle illustrated by the circular flow is sound, the economy in the previous figure is too simple.

- What is missing?
  — It does not allow households to save or businesses to invest.
  — It leaves out government expenditures and taxes, and
  — Transactions between households and businesses with the rest of the world.

- Including these aspects of economic activity would make our model more complex,
  — but the basic accounting principle would be the same
  — the four ways to measure total activity in the economy.

MEASURING GDP

- Nominal GDP is measured using market prices and a specific time period.

- Real GDP!! — It is not possible to add up the final physical outputs of many different businesses and arrive at a meaningful result.

- Instead, because we have a 'money economy', we let current market prices determine the money values of these different outputs.

- the total market value can be found by adding up the money values.
  — measure in same unit — CAD

- Nominal GDP is the market value at current prices of all final goods and services.
  ∗ ∗ ∗ the outputs of goods and services occur over time, not all at once —GDP measured over three-month and one-year time periods are reported as quarterly GDP and annual GDP.
  — Annual nominal GDP for any year is the value of the *final goods and services* produced in that year at the prices of that year.

∗ ∗ ∗ In Canada, Statistics Canada uses the Canadian System of National Accounts (CSNA) to measure GDP.

- Earlier — we defined and discussed *real GDP*, measured at prices of a base year
  — national accounting measures *nominal GDP* at current prices.

- The CSNA produces three measurements of nominal GDP:
  1. *Output-based GDP* is the sum of value added (output less the cost of goods and services purchased from other business) by all industries in Canada;
  2. *Income-based GDP* records the earnings generated by the production of goods and services; and
  3. *Expenditure-based GDP* is equal to expenditure on final goods and services produced.

- **Nominal GDP**: the output of final goods and services, the money incomes generated by the production of that output, and expenditure on the sale of that output in a specific time period.

OUTPUT-BASED GDP

- To measure output in the economy, and the contribution of particular businesses or industries to that output, we use the *value-added* approach to GDP.

- Value added measures the *net* output of each industry.

- To calculate the value added (net output) of a particular business or industry
  — the costs of the goods and services purchased from other businesses and industries
  (intermediate inputs used in production) are deducted from the value of the final product.

- National, or all-industry GDP, is then the sum of GDP by industry.

WHY WE DEDUCT THE COSTS OF INTERMEDIATE INPUTS?

- To avoid double counting.

- An example:
  A pizza makers buy cheese and pepperoni from cheese factories and meat processors. If we were to add up the outputs of cheese makers, meat processors, and pizza makers in our measurement of nominal GDP, we would overstate GDP by *double counting*. The cheese would be counted once at the cheese factory and again in the pizza.

- To avoid double counting, we use value added, the increase in the value of goods and services as measured by the difference between market value of output and the cost of *intermediate inputs* bought from other businesses. Or
  — we could count only the outputs sold to *final* users.

INTERMEDIATE INPUTS

- **Intermediate inputs**: services, materials, and components purchased from other businesses and used in the production of final goods.

- An example:
  A coffee shop sells 100 cups of coffee an hour at a price, before tax, of $1.50. To make 100 cups of coffee the shop uses 2 kilos of ground coffee costing $10.00 per kilo, 25 litres of pure spring water costing $0.40 a litre, and electricity and dairy products costing, in total $20. The coffee shop's sales per hour are $150 using inputs costing $50. Its value added is $150 − $50 = $100. — this value added, or $100, covers the labour costs, rent, interest expenses, and management costs of the business, for producing 100 cups of coffee an hour.

OUTPUTS OF SELECTED INDUSTRIES IN GDP, CANADA 2016 (PERCENT SHARES)

All industries	100.0
Goods producing industries	29.5
Service producing industries	70.5
Agriculture, forestry, fishing, etc.	1.7
Mining, oil and gas extraction	8.2
Construction	7.0
Manufacturing	10.4
Wholesale and retail trade	11.2
Transportation	4.5
Finance, insurance and real estate	20.3
Professional, scientific and management	8.6
Health and social assistance	6.7
Educational	5.2
Public administration	6.4
All other	9.8

EXPENDITURE AND INCOME-BASED GDP

- In the national accounts, expenditure based GDP and income based GDP are equal by definition.
- Following Table provides an example using the actual accounts for Canada in 2016Q4.

CANADIAN NATIONAL ACCOUNTS 2016Q4
($ BILLIONS AT CURRENT PRICES AND % GDP)

Expenditure Measures			Incomes Measures		
At market price	$	%	**By income source**	$	%
C by households	1,196.1	57.8	Employee compensation	1,066.0	51.5
I by business	455.3	22.0	Gross operating surplus	530.7	25.7
G by government	435.8	21.1	Gross mixed income	242.0	11.7
X exports	654.1	31.6	Net indirect taxes	228.2	11.0
IM imports	−672.7	−32.5			
Statistical discrepancy	−0.8	0.0	Statistical discrepancy	0.8	0.0
GDP at market price	**2,067.8**	100.0	**GDP at market price**	**2,067.8**	100.0

Source: Statistics Canada, CANSIM Tables 380-0063 and 380-0064

EXPENDITURE-BASED NOMINAL GDP

- *Expenditure-based nominal GDP* adds up the market value of all the final goods and services bought in a given time period, say one year.

- The national accounts classify this final expenditure into five main categories: Consumption, investment, government expenditure, exports, and imports.

-
$$\text{GDP} = \text{consumption} + \text{investment} + \text{government expenditure} + \text{exports} - \text{imports}$$

or

$$\text{GDP} = C + I + G + X - IM \tag{1}$$

- **Net exports ($X - IM$) are the value of a country's total exports minus the value of its total imports. It is a measure used to aggregate a country's expenditures in an open economy. — net exports equal the amount by which foreign countries spend on a home country's goods and services exceeds the home country's spending on imported foreign goods and services.**

INCOME-BASED GDP

- *Income-based GDP* adds up the factor costs of production of all goods and services plus the net indirect taxes included in market price.

- The income categories are: Employment compensation (W), gross operating surplus (corporate profit) (GCS), gross mixed income (unincorporated business income plus investment income) (GMI) and net indirect taxes (T_{IN}). Then GDP at market price is:

$$GDP = W + GCS + GMI + T_{IN} \tag{2}$$

- This income based GDP measures total cost of production:
  — The first three components W, GCS and GMI are factor costs of production including the depreciation of capital equipment used in production.
  — Net indirect tax T_{IN} is the revenue generated by taxes applied to goods and services and included in final price.

NOMINAL VS. REAL GDP

- We have used *real GDP* to measure growth and the growth rate, and then *nominal GDP* as recorded in the National Accounts.
    - Real GDP: The quantity of final goods and services produced by the economy in a specified time period.
    - Nominal GDP: It is the market value at current prices of all final goods and services in a specific time period.
- **Is there a relationship between Real GDP and Nominal GDP?**

WHAT IS WRONG WITH NOMINAL GDP (AS A MEASURE OF ECONOMIC ACTIVITY)?

- Again — *Nominal GDP* measures output and incomes based on *current market prices* for goods and services and factors of production.

- The changes in nominal GDP from one period to the next might be the result of
    - changes in prices of final outputs and factor inputs, or
    - the result of changes in the quantities of final outputs and factor inputs, or
    - some combination of the two above.

- Since it is (the consumption of) physical quantities of goods and services that yield satisfaction or utility
  — So it can be misleading to judge the economy's performance by looking at nominal GDP.

REAL GDP — NOMINAL GDP — GDP DEFLATOR

- Nominal GDP = output & incomes of a given year measured with current market prices of goods & services.

- Real GDP, or GDP in constant dollars = output & incomes of given year measured with base year prices of goods & services.

- Changes in nominal GDP = **Changes in prices & quantities**

- Real GDP = **nominal GDP is adjusted by GDP deflator.**

- Changes in real GDP = **Changes in quantities of goods & services**

GDP DEFLATOR

- To convert nominal GDP to real GDP — we need to use an index that includes what is happening to the prices of all these different goods and services. This index is called the GDP deflator.

- **GDP deflator**: index of current final output prices relative to base year prices.

- If we have data for both nominal and real GDP, we can calculate the GDP deflator as the ratio of nominal GDP to real GDP expressed as an index with a value of 100 in the base year.

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100 \tag{3}$$

- **Or,** the GDP deflator used to convert nominal GDP to real GDP in the prices of the base year as follows:

$$\text{Real GDP}_{\text{year } t} = \frac{\text{Nominal GDP}_{\text{year } t}}{\text{GDP deflator}} \times 100 \tag{4}$$

GDP DEFLATOR VS CPI

- GDP deflator: covers all goods & services included in GDP.

- GDP deflator: deflates the dollar value of current output to what it would have been in base year's prices.

- The CPI is based on **representative baskets** of goods & services consumers buy.

Nominal and real GDP

		2007	2017	% change
Quantity	blue jeans	4,000	5,000	25
	solar panels	2,000	4,000	100
Price in current $	blue jeans	25	50	100
	solar panels	100	60	−40
Current value	blue jeans	100,000	250,000	150
	solar panels	200,000	240,000	20
Nominal GDP		**300,000**	**490,000**	**63**
Value in 2007 $	blue jeans	100,000	125,000	25
	solar panels	200,000	400,000	100
Real GDP		**300,000**	**525,000**	**75**
GDP deflator		**100**	**93.3**	**−6.7**

- Change in nominal GDP 2007 2017 = 63%
- Change in real GDP 2007 2017= 75%
- Change in Prices 2000-2017 = - 6.7%

GDP DEFLATOR – AN EXAMPLE

Canadian nominal and real GDP 2004–2016

	2004	**2008**	**2012**	**2016**
Nominal GDP (billions $)	1,331	1,653	1,823	2,027
GDP deflator (2007=100)	91.4	104.0	109.2	112.9
Real GDP (billions 2007 $)	1,456	1,589	1,669	1,796

Source: Statistics Canada, CANSIM Tables 380-0064 and 380-0066

- In 2016, nominal GDP was $2,027 billion and the GDP deflator (2007 = 100) was 112.9. Real GDP measured in constant 2007 dollars was then:

$$\text{Real GDP}_{2016} = \frac{2027}{112.9} \times 100 = 1795.4 \text{ in 2007 dollars}$$

- When converted to constant dollars, the change in real GDP is much smaller than the change in nominal GDP.

PER CAPITA REAL GDP

- Real GDP is a simple measure of the total real income and output of an economy.

- The percentage change in real GDP shows how fast the economy is growing. But we are also interested in what is happening to *productivity*, the *standard of living* in the economy and how they change over time.

- For a given real GDP, the larger the population, the lower is productivity and the smaller is the quantity of goods and services per person.

- To get a simple measure of the standard of living enjoyed by a person in the economy it is better to look at *per capita real GDP*, which adjusts for population — we simply divide real GDP by population.

$$\text{Per capita real GDP} = \frac{\text{Real GDP}}{\text{Population}} \tag{5}$$

Per Capita real GDP : an indicator of standard of living.

Quarterly Rates of Growth in Per Capita Real GDP in Canada, 1982–2016
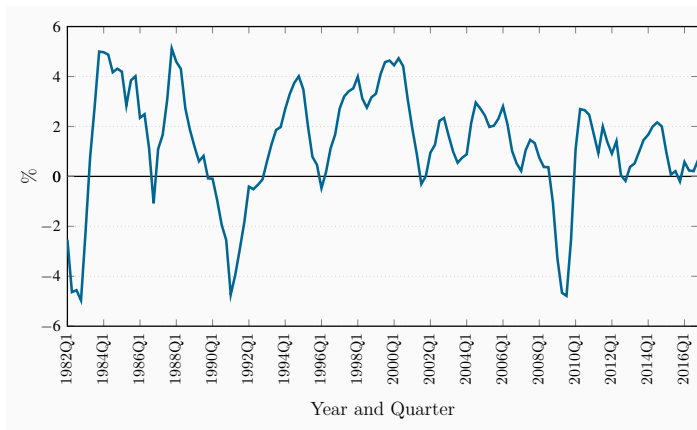
Source: Statistics Canada, CANSIM Table 380-0064 and Series V1

— The reductions in per capita real GDP during recessions motivate stabilization policy

LIMITATIONS OF REAL GDP

- Externalities — Not included in GDP:
    - Production noise, pollution, and congestion — greenhouse gases and climate.
    - We should adjust GDP for these costs — Recent policy changes by governments to impose carbon taxes on fuels and fuel efficiency targets for automobiles aim to reduce some greenhouse gases
    — But these nuisance goods are not traded through markets, so it is hard to quantify their output or decide how to value their costs to society.

LIMITATIONS OF REAL GDP

- Excluded in GDP:
    - These are not marketed and therefore are hard to measure.
    - Examples: home cleaning, maintenance, and improvements households carry out for themselves, and any unreported jobs and incomes in the economy.

- Deducting nuisance outputs and adding the value of unreported and nonmarketed incomes would make GDP a more accurate measure of the economy's production of goods and services.

- High GDP and even high per capita GDP are not necessarily good measures of economic well-being. — Health care services are likely to have different effects than military expenditures.

- The United Nations prepares an annual Human Development Index (HDI) to provide a more comprehensive measure of a country's achievements.

Top ten countries based on the United Nations human development index

HDI Rank	Country	HDI	Life Expectancy (years)	Expected yrs schooling	Mean yrs schooling	GNP/pop[1]	GNP/pop – HDI rank[2]	HDI rank
		2015	2015	2015	2015	2015	2015	2014
1	Norway	0.949	81.7	17.7	12.7	67614	5	1
2	Australia	0.939	82.5	20.4	13.2	42822	19	3
2	Switzerland	0.939	83.1	16	13.4	56364	7	2
4	Germany	0.926	81.1	17.1	13.2	45000	13	4
5	Denmark	0.925	80.4	19.2	12.7	44519	13	6
5	Singapore	0.925	83.2	15.4	11.6	78162	-3	4
7	Netherlands	0.924	81.7	18.1	11.9	46326	8	6
8	Ireland	0.923	81.1	18.6	12.3	37065	11	8
9	Iceland	0.921	82.7	19	12.2	43798	20	9
10	Canada	0.920	82.2	16.3	13.1	42582	12	9
10	United States	0.920	79.2	16.5	13.2	53245	1	11

Source: United Nations Human Development Reports: 2016 HDR Re-port.

- Exercise 4.6: Suppose you are given the following data on incomes and expenditures for the economy of Westland, in current prices for factors of production and outputs.

Consumption expenditures	2,500
Employment compensation	2,800
Government expenditure	800
Net indirect taxes	150
Exports	1,200
Gross corporate surplus and mixed income	1,050
Investment expenditure	600
Imports	1,100

  1. What is the value of nominal GDP measured by expenditures?
  2. What is net domestic income?
  3. What is the value of nominal GDP measured by the income approach?

- Answers:
  1. Nominal GDP by expenditures $= C + I + G + X - IM = 4,000$.
  2. Net domestic income
     $=$Employ income$+$Business income$+$invest income$= 2800 + 1050 + 0 = 3850$.
  3. Nominal GDP by income$= W + GCS + GMI + T_{IN} = 2800 + 1050 + 0 + 150 = 4,000$.

— Note that Nominal GDP by expenditures $=$ Nominal GDP by income.

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