



Introductory Class

ECON 302, Intermediate Macroeconomics

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University of British Columbia

1. Course Outline
2. Introduction
 - 2.1 Questions and facts
 - 2.2 Macroeconomics in practice
3. Macro Data
 - 3.1 Economic Activity
 - 3.2 Prices and Inflation
 - 3.3 Exchange Rate
 - 3.4 Interest Rates

Course Outline

- **Classes:** Tuesdays and Thursdays, 10:30 - 1:30 @ IONA 301.
- **Office Hours:** Wednesdays 1:00 pm to 3:00 pm. IONA 434.
- **e-mail:** nfranzp@mail.ubc.ca
- **Course Material** will be uploaded to canvas.ubc.ca
- **TA:** Ieda Matavelli (iedamatavelli@alumni.ubc.ca).
- **TA Office Hours:** Wednesdays 10 to 11 am. IONA 038.
- **Textbook:** we will not require a textbook. Nonetheless *most* of the material we will cover can be found in "Macroeconomics", eighth canadian edition by Abel, Bernanke, Croushore and Kneebone. I also recomend to check "Macroeconomics", fifth edition by N. Gregory Mankiw.

- Exam (50%): date will be announced by VSE.
- Quizzes (30%): 3 in-class quizzes.
- Problem sets (20%): 3 problem sets.

We have 6 weeks of classes. Each week we will have either a problem set due at the end of the week or a 20 to 30 minutes quiz at the end of the Thursday class. There will be no makeup quiz or problem set. To compensate for this, we will drop the worst score on each (i.e. 2 quizzes and 2 problem sets will count).

Topic		Schedule
1	Macroeconomic questions and data	Lecture 1
2	A simple Model of production	Lecture 1
3	Long term growth and the Solow model	Lectures 1 and 2
4	Consumption / Savings	Lectures 3 and 4
5	Investment	Lectures 5 and 6
6	Investmen savings equilibrium	Lecture 7
7	Labor Market	Lecture 8 and 9
8	Money Market	Lecture 10
9	IS-LM and AD-AS framework	Lecture 11-12
10	Business Cycles	Lecture 12

QUESTIONS?

Introduction

After we cover this section you should know what is macroeconomics about, what type of questions macroeconomists look to answer and what are the challenges the field has to overcome.

- Macroeconomics: the study of the structure and performance of national economies and the elements that affect them.
- Aggregation: Micro vs Macro.

Examples of Issues addressed by macroeconomists

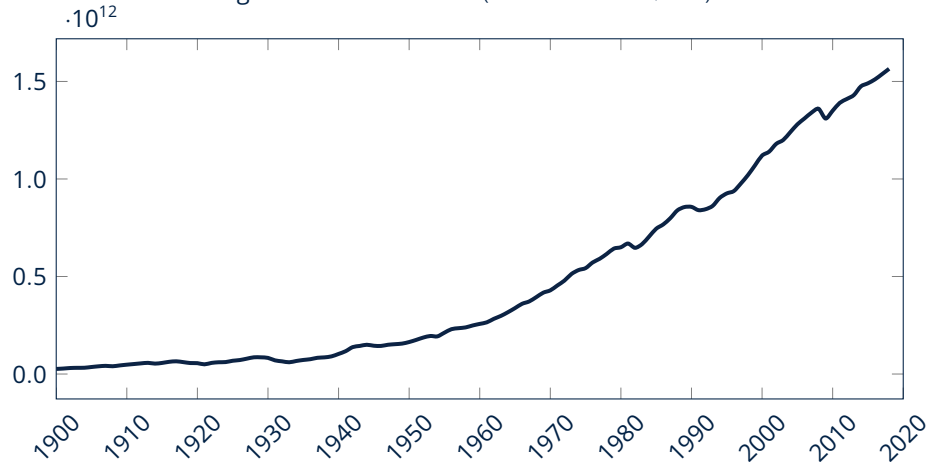
- Long-run economic growth
- Business cycles
- Unemployment
- Inflation
- Trade and exchange rates
- Macroeconomic policy

- What determines long-run economic growth?
- Why did per capita GDP increased so much during the 20th century?
- Why are some countries richer than others?
- What causes fluctuations in economic activity?
- What causes unemployment? Why does it fluctuate so much? Why is it high even during “expansions”?
- What causes inflation and deflation?
- What is the role of economic policy (Monetary/ Fiscal)
- How one economy is affected by the interaction with others?

What determines long-run economic growth?



Figure 1: Canadian GDP (constant 2005 \$PPP)

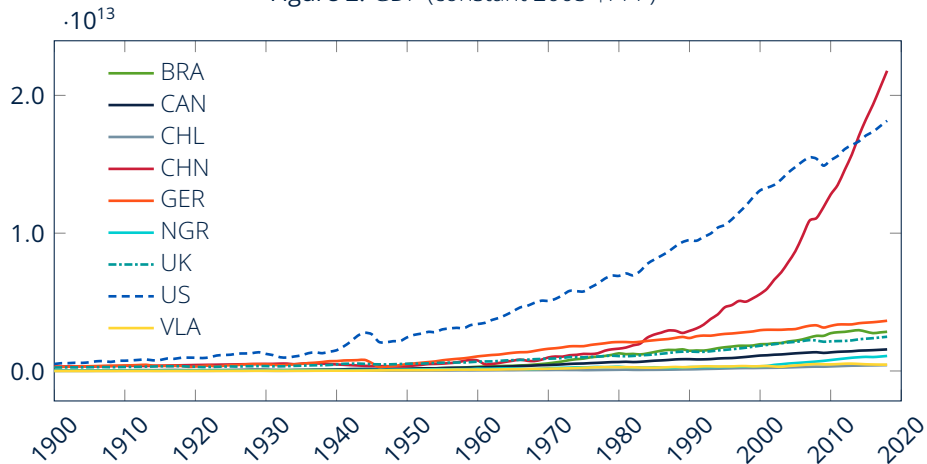


Source: Free material from www.gapminder.org

Why are some countries richer than others?



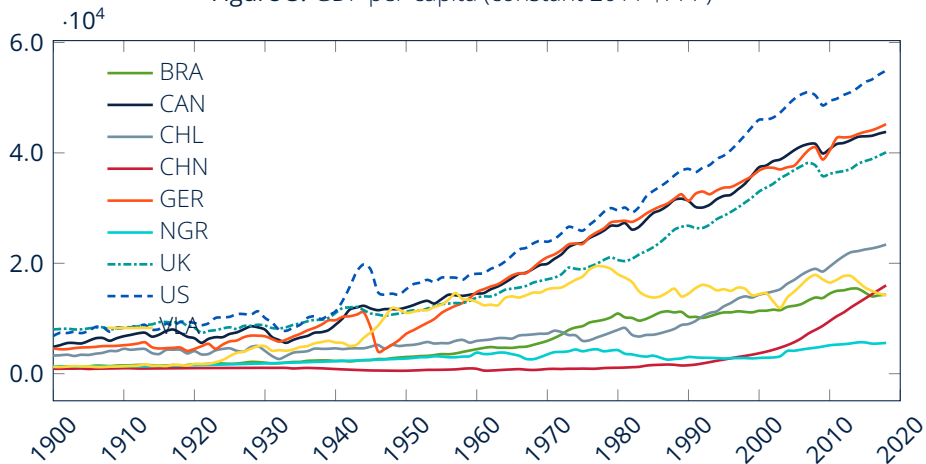
Figure 2: GDP (constant 2005 \$PPP)



Source: Free material from www.gapminder.org

Why are some countries richer than others?

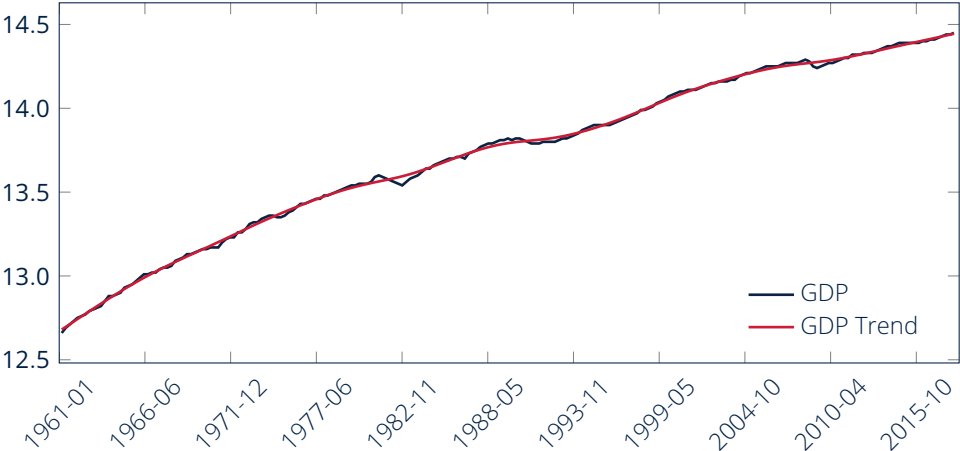
Figure 3: GDP per-capita (constant 2011 \$PPP)



Source: Free material from www.gapminder.org

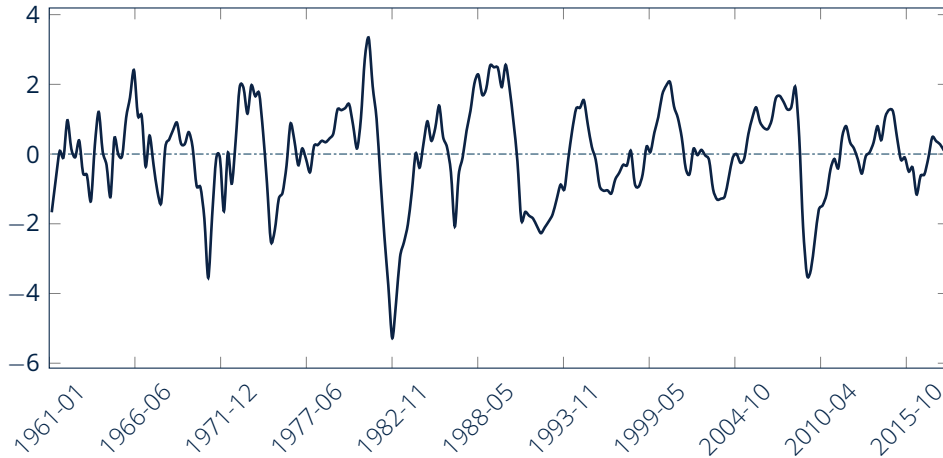
What causes fluctuations in economic activity?

Figure 4: Canadian GDP and its trend (Logs)



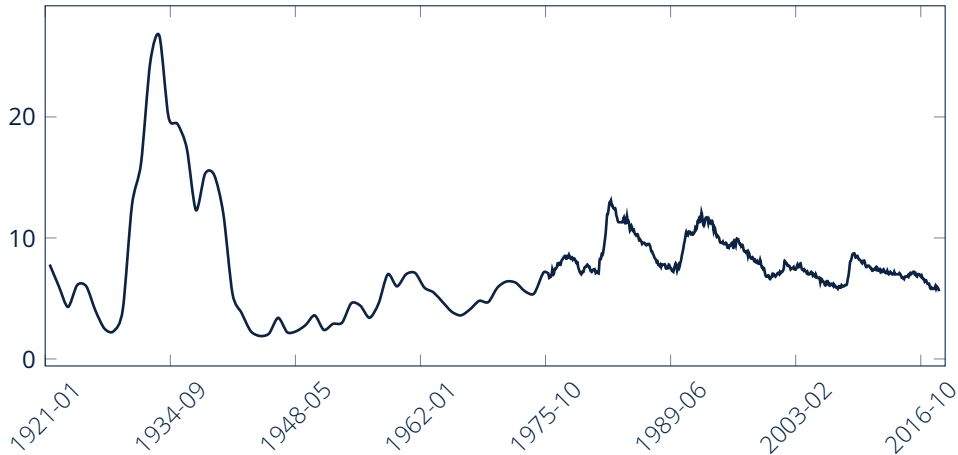
Source: Statistics Canada. Trend calculated with HP filter.

Figure 5: GDP gap (%)



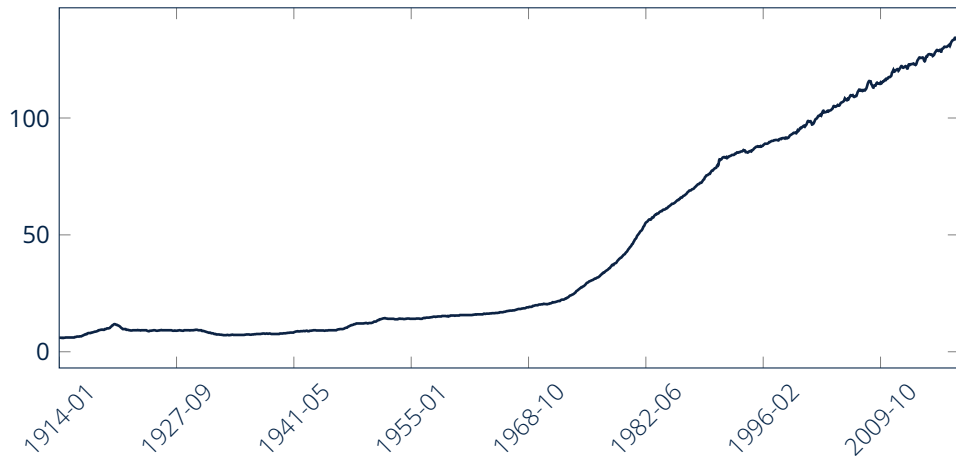
Note: difference between real GDP and its trend as a percentage of the latter.

Figure 6: Canadian unemployment rate (%)



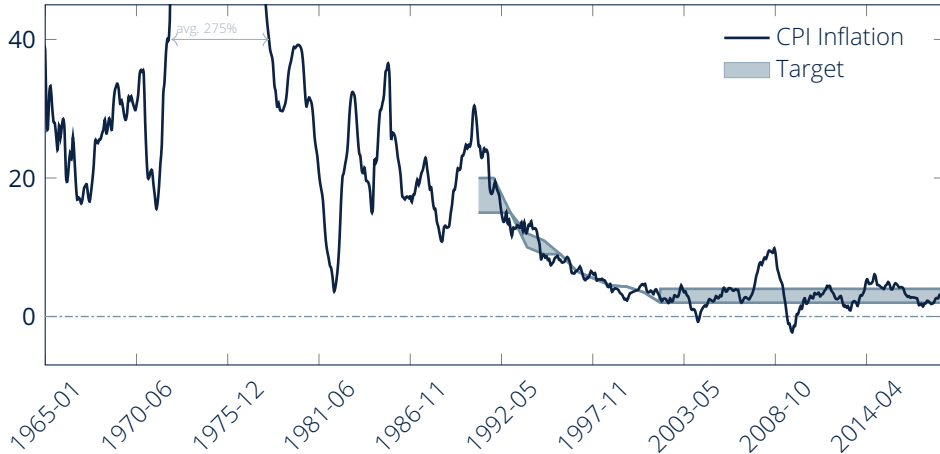
Source: Statistics Canada.

Figure 7: Canadian Consumer Price Index (2002=100)



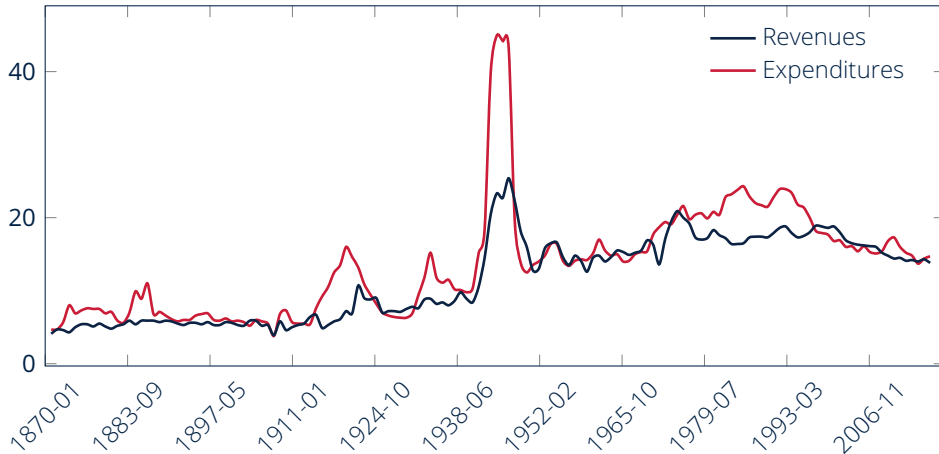
Source: Statistics Canada

Figure 8: Chilean Inflation (%)



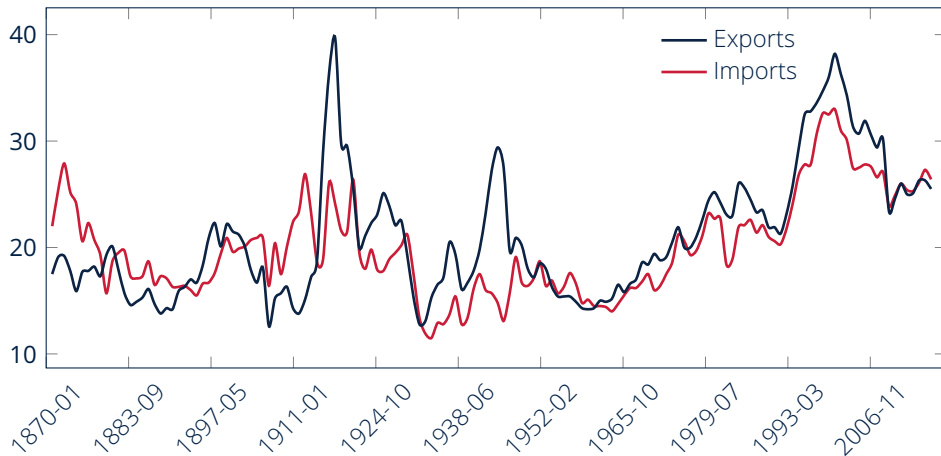
Source: Central Bank of Chile.

Figure 9: Canadian Federal Government (% of GDP)



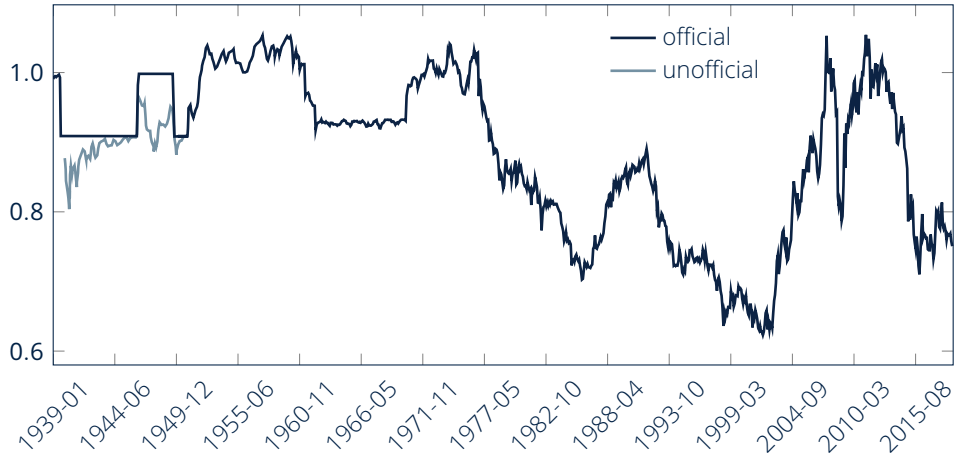
Source: Jordà et.al. 2017

Figure 10: Canadian trade (% of GDP)



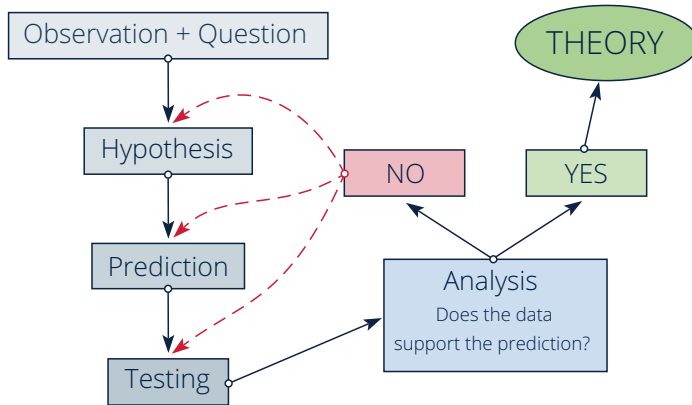
Source: Jordà et.al. 2017

Figure 11: Exchange Rate (CAD/USD)



Source: Statistics Canada

Scientific method:



- To develop a Theory we must have a common language and sound interpretation of the mechanisms playing an important role.
- We don't have a laboratory where we can control the environment.
- The data that we have comes from one "realization of the world"

Natural Experiment

Empirical study in which individuals (or clusters of individuals) are exposed to the experimental and control conditions that are determined by nature or by other factors outside the control of the investigators

- Even if we had several versions of an economy, experimenting with them is not feasible: **think about it in moral and practical terms.**
- Economics is not the only field in science facing this challenge

Example: the physics of cavitation



Sir Charles Algernon Parsons

Improvements in steam turbines allowed ships to travel faster. At the same time a mysterious damage appeared in the propellers. In 1895, Parsons discovered the relationship between cavitation and the damage to the propeller. How do you think he did it? would it be practical to build full size vessels and test them at sea?

- A model is a simplified representation of Nature.
- A good model is simple/clear and allow us to test accurately our predictions.
 - We can easily adjust the inputs.
 - We can easily observe the outcomes.

Example: the physics of cavitation



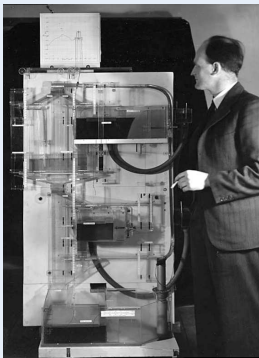
Sir Charles Algernon Parsons



The first water tunnel
to study this particular
phenomenon!



Example: Monetary National Income Analogue Computer



Professor A.W.H (Bill) Phillips with MONIAC, the analog computer that modeled economic theory with water flows.

Nowadays, in macroeconomics, a model is a set of assumptions that lead to a mathematical representation

Example: the “standard” macro model

- Three players: Households, Firms, Government
- Three competitive markets: Labor, Goods, Assets
- All households, firms, goods and assets are identical
- Firms operate to maximize profits and Individuals maximize utility

Important

different assumptions can lead to different implications and policy prescription (e.g. competitive vs non-competitive markets)

- Once we have a model we can use its predictions to test potential policy interventions.
- Most of the decisions are taken with a model on the back of the head of the policy makers.
- Usually, macroeconomic policy cross paths with politics: **Positive vs Normative analysis.**
- Agreements and Disagreements among macroeconomists.

QUESTIONS?

Macro Data

After we cover this section you should know how the most common macroeconomic aggregates and prices are constructed, and therefore, understand what are their limitations.

This is a very light refreshing of ECON 102.

- **System of National Accounts:**

“is the internationally agreed standard set of recommendations on how to compile measures of economic activity.”

— United Nations, Statistics Division

- **Gross Domestic Product (GDP):**

...“is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers’ prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units”.

— United Nations, Statistics Division

Three approaches to measure Output

1. **The Product Approach:** the amount of output produced (Value Added).
2. **The Income Approach:** total income received by all producers of output (wages, capital income, firm profits).
3. **The Expenditure Approach:** the amount of spending by ultimate purchasers (final consumers).

$$AE = C + I + G + XN \quad (1)$$

Total Production = Total Income = Total Expenditure

Table 1: Canadian GDP (expenditure, current prices)

	2015	2016
Final consumption expenditure	1,563,236	1,613,915
Household final consumption expenditure	1,117,690	1,154,829
Goods	487,180	504,453
Services	630,510	650,376
Non-profit inst serving households FCE	28,535	29,492
Gen. govts. final consumption expenditure	417,011	429,594
Gross fixed capital formation	475,988	472,419
Business gross fixed capital formation	398,389	389,592
Non-profit inst serving households' GFCF	2,981	3,065
Gen. govts. gross fixed capital formation	74,618	79,762
Investment in inventories	3,940	-487
Exports of goods and services	995,187	1,000,767
Statistical discrepancy	1,057	-1,156
Gross domestic product at market prices	1,994,911	2,035,506

Table 2: Canadian GDP (income, current prices)

	2015	2016
Compensation of employees	1,026,914	1,044,005
Wages and salaries	884,410	896,899
Employers' social contributions	142,504	147,106
Gross operating surplus	515,737	518,979
Net operating surplus: corporations	231,937	227,625
Consumption of FC: corporations	216,207	222,204
Consumption of FC: Govt. and non-profit	67,593	69,150
Gross mixed income	232,366	241,415
Net mixed income	174,982	180,653
Consumption of FC: uninc. businesses	57,384	60,762
Taxes less subsidies on production	87,853	90,507
Taxes less subsidies on products and imports	133,099	139,443
Statistical discrepancy	-1,058	1,157
Gross domestic product at market prices	1,994,911	2,035,506

- GDP does not take into account out-of-market activities:
 - Home production
 - Underground economy
 - Environmental quality
 - Crime and safety
 - Income inequality
- GDP does not measure welfare
- GDP cannot be easily compared across countries.

- The magnitudes we saw in tables 1 and 2 are Nominal (i.e they are measured in current dollars). Nominal GDP for any period is the sum of price times quantity of each good produced in the economy. Why do we do this?

$$GDP(t) = \sum_i p_t^i q_t^i \quad (2)$$

- Let's say that my country's nominal GDP was 1 Bn. dollars last year, and 2 Bn. dollars this year. Is it because we actually produced more goods?
- The measure that we are after — Real GDP— reflects changes only on quantities. How can we get this?

- Select a base year.
- Fix prices at their base year level, and adjust quantities only.

$$RGDP_0(t) = \sum_i p_0^i q_t^i \quad (3)$$

Example: Nominal vs Real GDP

	Quantity		Price	
	2017	2018	2017	2018
Computers	10 units	8 units	1,000 \$ /unit	2,000 \$ /unit
Apples	10 tons	15 tons	400 \$ /ton	50 \$ /ton

- Nominal GDP calculation:

$$GDP(2017) = 10u \times 1,000 \frac{\$}{u} + 10t \times 400 \frac{\$}{t} = \$14,000$$

$$GDP(2018) = 8u \times 2,000 \frac{\$}{u} + 15t \times 50 \frac{\$}{t} = \$16,750$$

- Nominal GDP growth: 19.6%
- But we are comparing dollars from different years

Example: Nominal vs Real GDP

	Quantity		Price	
	2017	2018	2017	2018
Computers	10 units	8 units	1,000 \$ /unit	2,000 \$ /unit
Apples	10 tons	15 tons	400 \$ /ton	50 \$ /ton

- Real GDP calculation (2017 prices):

$$RGDP_{17}(2017) = 10u \times 1,000 \frac{\$}{u} + 10t \times 400 \frac{\$}{t} = \$14,000$$

$$RGDP_{17}(2018) = 8u \times 1,000 \frac{\$}{u} + 15t \times 400 \frac{\$}{t} = \$14,000$$

- Real GDP growth: 0%
- Both are 2017 dollars

Example: Nominal vs Real GDP

	Quantity		Price	
	2017	2018	2017	2018
Computers	10 units	8 units	1,000 \$ /unit	2,000 \$ /unit
Apples	10 tons	15 tons	400 \$ /ton	50 \$ /ton

- Real GDP calculation (2018 prices):

$$RGDP_{18}(2017) = 10u \times 2,000 \frac{\$}{u} + 10t \times 50 \frac{\$}{t} = \$20,500$$

$$RGDP_{18}(2018) = 8u \times 2,000 \frac{\$}{u} + 15t \times 50 \frac{\$}{t} = \$16,750$$

- Real GDP growth: -18.3%
- Both are 2018 dollars

The previous example is deliberately extreme since it shows one of the main problems of the fixed year base: As time goes on, goods whose prices go down (and quantities usually go up) are still weighted by the old prices, and consequently get too much weight in later years' GDP calculations.

Problems with the fixed base year

- The choice of a base year is crucial when the prices of different goods grow at very different rates.
- New products don't have prices in previous years.
- Obsolete products don't have prices in following years.
- Some products are not comparable to its predecessors

- A partial solution is *Chain Weighted* GDP Growth. The idea is to update the base every year and compute the change in quantities using previous and present year prices. The growth rate of real GDP is:

$$g_{Y,t} = \left[\frac{\sum_i p_{t-1}^i q_t^i}{\sum_i p_{t-1}^i q_{t-1}^i} \right]^{1/2} \left[\frac{\sum_i p_t^i q_t^i}{\sum_i p_t^i q_{t-1}^i} \right]^{1/2} - 1 \quad (4)$$

- Recover real GDP using $GDP_{t+1} = (1 + g_t)GDP_t$

Attention!

Since we are taking a geometric average of two types of indexes, now the sub-categories will not be additive. For example real Expenditures will not be the sum of real consumption, investment, etc.



W Erwin Diewert

If you are particularly interested on these topics consider ECON 580: Economic Measurement, with Professor W Erwin Diewert.

[UBC web-page](#)

- A Price Index (P_t) is a measure of the average price level in the economy.
- The rate of Inflation is the percentage change of the price index per period

$$\pi_{t+1} = \frac{P_{t+1} - P_t}{P_t} \quad (5)$$

- Two common ways of computing price indexes are using *Laspeyres* and *Paasche* indexes.

$$p_t^{Laspeyres} = \frac{\sum_i p_t^i q_0^i}{\sum_i p_0^i q_0^i} \quad (6)$$

$$p_t^{Paasche} = \frac{\sum_i p_t^i q_t^i}{\sum_i p_0^i q_t^i} \quad (7)$$

Problems: Assume there's inflation

- Laspeyres index overstates inflation
- Paasche index understates inflation

why? SUBSTITUTION EFFECT!

- Since Laspeyres overstates and Paasche understate inflation, an average of both will be closer to the “ideal” price index.
- Fisher Ideal Index for prices:

$$P_t^{Fisher} = \sqrt{P_t^{Laspeyres} \times P_t^{Paasche}} \quad (8)$$

- Take the time to see how the chained-weight real GDP is similar to the Fisher Ideal index (for quantity instead of price).

The most common price indexes are

- **GDP deflator** = $\frac{\text{Nominal GDP}}{\text{Real GDP}}$
- **Consumer Price Index (CPI)**: measures current prices of a fixed “consumption basket”
 - Pick a base year (e.g. 2011=100)
 - Pick the representative consumption basket
 - Track the change in prices

Are these Laspeyres or Paasche indexes?

- CPI → Laspeyres, and
- GDP deflator → Paasche

Are there other differences? GDP is not only consumption goods: eg. Investment

- Suppose you want to compare GDP levels of different countries
- **Problems?**: Transactions inside the country are made in local currency (LCu) and, therefore, GDP is measured in local currency
- We have to convert the data into some common unit. Typically US dollars

- One option is to use the Nominal Exchange Rate

$$e_t^{\text{nominal}} = \frac{\text{LCu}}{\text{USD}} \quad (9)$$

e.g. 1.32 CAD per 1 USD.

- Note that the definition here is arbitrary:
 - We could use another currency in the denominator (or basket of currencies)
 - We could use the inverse ratio. When in doubt, ask yourself what would happen to the exchange rate with a local appreciation: if the exchange rate goes down, then the definition is as (9)

Problem

Prices and basket compositions of goods and services vary across countries. The market exchange rate typically does a poor job reflecting this (who participates in the FX market?)



A Dabbawala is a person who delivers hot lunches from homes and restaurants to people at work in India. Do you think we can compare the value of its services using the nominal exchange rate?

- A way to account for the **purchasing power** of a currency is to consider the price, in local currency, of the same good (or basket of goods) in different countries.

$$e_t^{pp} = \frac{p_t^{LCu}}{p_t^{US}} \quad (10)$$

- That way the conversion is based on actual quantities produced

$$GDP_t^{pp} = \frac{GDP_t^{LCu}}{e_t^{pp}}$$

- **Problem:** how can we know that the representative basket of goods is identical in two different countries? *Is a Dabbawala the same than Uber-eats?*

$$e_t^{\text{Real}} = \frac{e_t^{\text{nominal}}}{e_t^{\text{pp}}} = e_t^{\text{nominal}} \times \frac{p_t^{\text{US}}}{p_t^{\text{LCu}}} \quad (11)$$

Example: Real exchange rate

- Suppose I can buy a coffee for 2 USD in California.
- Convert 2 USD to 2.64 CAD and spend it all in coffee.
- The ratio of coffee that I get in Canada relative to the US is the Real Exchange Rate.
- If I can get exactly the same coffee in Vancouver as in California, then $e_t^{\text{Real}} = 1$. In this case we also say that *Purchasing Power Parity* (PPP) holds.
- If I can get more coffee in California then $e_t^{\text{Real}} < 1$. The USD is “undervalued” (CAD is “overvalued”).

Nominal interest rate

An interest rate is the return a borrower promises to a lender, expressed as a percentage of the principal. When this promises are expressed in dollars we refer to it as a Nominal Interest rate (i_t).

The nominal interest rate reflects the price of bringing money from, or to, the future.

- When a savings account pays $x\%$ interest rate, that is usually a nominal interest rate.
- How valuable is the nominal return? Think about why you need money and what else can you do with it instead of saving .

Real interest rates

A real interest rate (r_t) expresses the promised return in terms of goods.

If you received $x\%$ nominal return and prices did not change, then you can afford to buy $x\%$ more goods than before (positive real interest rate). If prices went up by more than $x\%$, you can buy less things than before (negative real interest rate).

Example: Nominal vs Real interest rates

- Let's say you have \$100. You can buy a Kindle today or save them in the bank for a promised 2% nominal interest per year.
- At the end of the year, you get \$ 102 but the Kindle's price is now \$104.
- What is your real return?

In general, to account for the change in prices

$$1 + r_t = \frac{1 + i_t}{1 + \pi_{t+1}}$$

When r , i and π are small (are they?), we can take natural logs and get

$$r_t \approx i_t - \pi_{t+1} \quad (12)$$

This is an ex-post equation (known i_t and known π_{t+1}). Usually i_t is known but π_{t+1} is not, therefore the expected rate becomes relevant

$$\mathbb{E}(r_t) = i_t - \mathbb{E}(\pi_{t+1}) \quad (13)$$

- For the most part of this course, we will focus on REAL variables
- Even though we focused on GDP, note that GDP is not a measure of welfare.
- The way we will think about welfare is by using a utility function.
- Individuals value things that are not counted in GDP, but can be measured in utility (smoothing consumption, environmental issues etc.)
- GDP is a useful proxy because —*ceteris paribus*— more is better.

QUESTIONS?