What is macroeconomics about?

- Understanding the behavior of an economy as a whole.
  - studying aggregated indicators

- Taking both a national/regional perspective (closed economy) and an integrated perspective (open economy)

- Examining many markets (goods, financial, labor), separately and together

- Looking at what is happening in the short run...
  - Business cycle, some economic policies (fiscal policy, monetary policy...), etc

- ... and in the long run
  (even though "In the long run, we are all dead" Keynes)
  - Trend, some economic policies (education, competitiveness, labor market...), etc
Why should we care about macroeconomics?

For firms:
- Importance of knowing the economic situation of a region/country
- Importance of anticipating and assessing government policies that might impact the economic situation of a region/country

For everyone:
- Importance of understanding the world we live in.
Road map:

1. Aggregate output
2. HDI
3. Unemployment rate
4. Inflation rate
5. Trend and Business cycle
TOPIC 1: Introduction, definitions, measures

Introduction, definitions, measures

1. Aggregate output
   - 1.1. National accounts
   - 1.2. GDP vs. GNP
   - 1.3. Nominal vs. Real GDP
   - 1.4. PPP adjusted GDP

2. HDI

3. Unemployment rate
   - 3.1. Definition
   - 3.2. Who are the unemployed?
   - 3.3. Why to look at the UR?

4. Inflation rate
   - 4.1. How to define the price level?
     - 4.1.1. GDP deflator
     - 4.1.2. CPI
   - 4.2. Evolution of the inflation rate

5. Trend and Business cycle
   - 5.1. GDP
   - 5.2. Cyclical properties
     - 5.2.1. Unemployment
     - 5.2.2. Employment
     - 5.2.3. Inflation
     - 5.2.4. Imports
     - 5.2.5. Pro/countercyclical
1. Aggregate output

   - 1.1. National accounts
   - 1.2. GDP vs. GNP
   - 1.3. Nominal vs. Real GDP
   - 1.4. PPP adjusted GDP
1. Aggregate output

Macroeconomics:

Understanding the behavior of an economy as a whole

How to assess the situation of a country?

Most important macroeconomic variables:

- **GDP** (Gross Domestic Product): measure of aggregate output
- **GDP per Capita**: proxy of the welfare per person
National accounts: implementation of accounting techniques for measuring the economic activity of a nation.

*How to measure GDP? How is GDP constructed?*

3 methods:

- **M1.** GDP is the value of the final goods and services produced in the economy during a given period.
- **M2.** GDP is the sum of value added in the economy during a given period.
- **M3.** GDP is the sum of incomes (wages, profits and taxes) in the economy during a given period.
1.1. Aggregate output - National accounts

*Figure: Decomposition of GDP*

Income composition, US, average 1959-2005
Consider an economy composed of only three firms: firms A, B and C. Firms A takes wood in the forest at no cost and produces planks out of this wood. Firms B, a manufacturing company, buys these planks from firm A and produces wardrobes. These wardrobes are sold to firm C, a retailer firm.

<table>
<thead>
<tr>
<th>Firms</th>
<th>Quantity</th>
<th>Price</th>
<th>Wages</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm A</td>
<td>100 planks</td>
<td>12</td>
<td>1000</td>
<td>200</td>
</tr>
<tr>
<td>Firm B</td>
<td>10 wardrobes</td>
<td>200</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Firm C</td>
<td>10 wardrobes</td>
<td>250</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

What is the GDP of this economy?
1.1. Aggregate output - National accounts, example

<table>
<thead>
<tr>
<th>Firms</th>
<th>Quantity</th>
<th>Price</th>
<th>Wages</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm A</td>
<td>100 planks</td>
<td>12</td>
<td>1000</td>
<td>200</td>
</tr>
<tr>
<td>Firm B</td>
<td>10 wardrobes</td>
<td>200</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Firm C</td>
<td>10 wardrobes</td>
<td>250</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

**M1:** GDP is the value of the final goods and services produced in the economy during a given period.

\[
GDP = 10 \times 250 = 2500
\]
1.1. Aggregate output - National accounts, example

<table>
<thead>
<tr>
<th>Firms</th>
<th>Quantity</th>
<th>Price</th>
<th>Wages</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm A</td>
<td>100 planks</td>
<td>12</td>
<td>1000</td>
<td>200</td>
</tr>
<tr>
<td>Firm B</td>
<td>10 wardrobes</td>
<td>200</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Firm C</td>
<td>10 wardrobes</td>
<td>250</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

**M2:** GDP is the sum of value added in the economy during a given period.

What does value added mean?
Value added: value of the production minus value of the intermediate goods that are used in production.
## 1.1. Aggregate output - National accounts, example

<table>
<thead>
<tr>
<th>Firms</th>
<th>Quant</th>
<th>Price</th>
<th>Val of prod</th>
<th>Interm costs</th>
<th>Wages</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm A</td>
<td>100 planks</td>
<td>12</td>
<td>1200</td>
<td>0</td>
<td>1000</td>
<td>200</td>
</tr>
<tr>
<td>Firm B</td>
<td>10 wardrobes</td>
<td>200</td>
<td>2000</td>
<td>1200</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Firm C</td>
<td>10 wardrobes</td>
<td>250</td>
<td>2500</td>
<td>2000</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

### M2:

\[
GDP = (1200-0) + (2000-1200) + (2500-2000) \\
GDP = 1200 + 800 + 500 = 2500
\]
M3: GDP is the sum of incomes (wages, profits and taxes) in the economy during a given period.

\[
GDP = \text{wages in all firms} + \text{profits in all firms} + \text{taxes}
\]

\[
GDP = (1000+500+300) + (200+300+200) + 0 = 2500
\]

NB: in case the profit is not given, it can be calculated:

Profits = revenues - intermediate goods’ purchases - wages - taxes
1.1. Aggregate output - National accounts

Technical considerations:

- The value of exports are included in the value of production.
- The value of imports must be deducted from the value of production.
- Taxes should be considered as an income (for the government).
1.2. Aggregate output - GDP vs. GNP

**GDP:**
- is the market value of all final goods and services produced within a country in a given period of time.

**GNP:**
- is the market value of all the products and services produced in one year by labor and property supplied by the residents of a country.
- is equal to GDP plus income earned by its citizens (including income of those located abroad), minus income of non-residents located in that country.

*Substantial difference between GDP & GNP in open economies.*
1.3. Aggregate output - Nominal vs. Real GDP

**Nominal GDP**: product of the quantities of final goods and their current prices (like in the wardrobe economy example).

- An increase in nominal GDP can come from both an increase in quantities and from an increase in prices.
- Important to disentangle the two drivers of the fluctuations in nominal GDP.

**Real GDP**: product of the quantities of final goods and constant prices (reference year prices).
Consider an economy with three goods only. Prices and quantities are the following:

<table>
<thead>
<tr>
<th></th>
<th>Quantities</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Books</td>
<td>15000</td>
</tr>
<tr>
<td></td>
<td>Cars</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Bicycles</td>
<td>50</td>
</tr>
<tr>
<td>2012</td>
<td>Books</td>
<td>16000</td>
</tr>
<tr>
<td></td>
<td>Cars</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Bicycles</td>
<td>70</td>
</tr>
</tbody>
</table>

What is the nominal GDP for both years and the real GDP for both years referring to 2011 as the base year?

Nominal GDP 2011 = 15000*10+100*10000+50*100 = 1 155 000
Nominal GDP 2012 = 16000*15+125*10500+70*104 = 1 559 780
Real GDP 2011 = 15000*10+100*10000+50*100 = 1 155 000
Real GDP 2012 = 16000*10+125*10000+70*100 = 1 417 000
NB 1:
By construction, nominal GDP = real GDP for the base year.

NB 2:
Growth rate nominal GDP = \(\frac{1559780-1155000}{1155000} = 35.05\%\)
Growth rate real GDP = \(\frac{1417000-1155000}{1155000} = 22.68\%\)

The real GDP growth rate is smaller than the nominal GDP growth rate if there is inflation.
1.3. Aggregate output - Nominal vs. Real GDP

Which base year to choose?

Lets calculate the growth rate of real GDP, taking 2012 as the base year.

Real GDP 2011 = 15000*15+100*10500+50*104 = 1 280 200
Real GDP 2012 = 16000*15+125*10500+70*104 = 1 559 780
Growth rate real GDP=(1271700-1017000)/1017000 = 21,84%

The choice of base year affects the levels and growth rate of real GDP.

Bureau of Economic Analysis (US): method detailed in Chapter 2 Appendix.
What increases faster: nominal or real GDP?
1.3. Aggregate output - Nominal vs. Real GDP
1.3. Aggregate output - Nominal vs. Real GDP

Some vocabulary:

**Nominal GDP**
- Dollar GDP
- GDP in current dollars

**Real GDP**
- GDP in terms of goods
- GDP in constant dollars
- GDP adjusted for inflation
- GDP in 1996 dollars
1.4. Aggregate output - PPP adjusted GDP

How to compare the GDPs of two countries when prices differ in these two countries?

- Using nominal GDP might lead to wrong conclusions due to the distortion created by price differentials.
- Needs to take these price differentials into account for international comparison of GDPs

PPP adjusted GDP:
- we calculate real GDP using prices of a base country.
2. HDI
Is GDP a good indicator of the standard of living of a country? Isn’t it too narrow to only look at the output of a country?

The United Nation developed an index called Human Development Index (HDI) that gathers information about:

- education
- life expectancy (proxy for health)
- GDP per capita

It is a index between 0 and 1.
It is a weighted average of the 3 components: broader measure, better assessment of human well-being.
2. **HDI**: HDI 2009 (Martin Lewis, UN data)

Human Development Index
2. **HDI**: HDI and GDP per capita 2009 (Martin Lewis, UN data)

**Human Development Index, 2009**

**Per Capita GDP (PPP), US$, 2009**
2. HDI: Correlation HDI - GDP, 2011 (Gapminder, various sources)
HDI vs. GDP

We do not lose much by focusing on GDP as the correlation between GDP and HDI is very high (around 0.85), which means that ordering countries based on HDI would give a very similar picture that ordering the countries based on GDP per capita.
3. Unemployment rate

- 3.1. Definition
- 3.2. Who are the unemployed?
- 3.3. Why to look at the UR?
3.1. Unemployment rate - Definition

The GDP (and GDP per capita) is not the only variable under scrutiny. Another important variable is the unemployment rate.

\[ \text{labor force} = \text{employed} + \text{unemployed} \]

\[ \text{unemployment rate} = \frac{\text{unemployed}}{\text{labor force}} \]

NB: the employment rate and the unemployment rate do not sum to 1.

\[ \text{employment rate} = \frac{\text{employed}}{\text{population}} \]
\[ \text{population} = \text{labor force} + \text{out of the labor force} \]
In most countries, the criteria for being unemployed are:

- not to have a job
- to be looking for a job

An individual who has no job and is not looking for a job is classified as out of the labor force.

The flows in and out the labor force should not be disregarded as they give a lot of information. For example, the flow out of the labor force generally increases in periods of recession as many discouraged individuals stop looking for jobs.
3.3. Unemployment rate - Why to look at the UR?

The unemployment rate gives information on the level of activity.

Negative relation between the unemployment rate and GDP per capita. Correlation = -0.38.
The unemployment rate gives information on the level of activity.

**Okun’s law:**
Clear relation between the change in the unemployment rate and GDP growth.

- High output growth generally associated with a decrease in the unemployment rate.
- Low output growth generally associated with an increase in the unemployment rate.

**Intuition:**
High output growth, increase in production, more hiring, less unemployment.
3.3. Unemployment rate - Why to look at the UR?

Okun’s law. Source: Owyang and Sekhposyan 2012
Social implications of unemployment: financial and psychological suffering, isolation...

Unemployment negatively impacts well-being.
4. Inflation rate

4.1. How to define the price level?
   - 4.1.1. GDP deflator
   - 4.1.2. CPI

4.2. Evolution of the inflation rate
4. Inflation rate

Another macro variable often examined: the **inflation rate**.

*The inflation rate is the rate at which the price level increases.*

Why is it important to look at the inflation rate?

- In periods of inflation, not all wages rise proportionally. Some rise as much, some less, some much less, (few more!). Therefore, inflation modifies the structure on income and might lead to the impoverishment of some people.

- In periods of inflation, not all prices rise proportionally. It creates distortions and increases uncertainty.

- In periods of high inflation, the rate of inflation is often unpredictable by individuals. This increases uncertainty, makes investment decisions harder and therefore lowers investment.
4.1. Inflation - How to define the price level?

Macroeconomists typically look at 2 measures of the price level:

- GDP deflator
- Consumer Price Index (CPI)
4.1.1. Inflation - GDP deflator

Definition:

GDP deflator = \( \frac{\text{nominal GDP}}{\text{real GDP}} \)

Therefore, when the price level is measured by the GDP deflator:

Inflation rate = growth rate of the GDP deflator
4.1.1. Inflation - GDP deflator

Lets consider again the economy we look at before, with prices and quantities being the following:

<table>
<thead>
<tr>
<th></th>
<th>Quantities</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Books</td>
<td>15000</td>
</tr>
<tr>
<td></td>
<td>Cars</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Bicycles</td>
<td>50</td>
</tr>
<tr>
<td>2012</td>
<td>Books</td>
<td>16000</td>
</tr>
<tr>
<td></td>
<td>Cars</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Bicycles</td>
<td>70</td>
</tr>
</tbody>
</table>

Nominal GDP 2011 = 1 155 000
Real GDP 2011 = 1 155 000

Nominal GDP 2012 = 1 559 780
Real GDP 2012 = 1 417 000

What is the inflation rate as defined by the growth rate of the GDP deflator?

GDP deflator 2011 = 1
GDP deflator 2012 = 1559780/1417000 = 1,1008

The inflation rate is 10,08%.
The GDP deflator is the average price of the final goods produced in an economy. But consumers care more about the average price of consumed goods (which might differ from the produced ones). Macroeconomists constructed a **Consumer Price Index (CPI)** which gives the cost of a specific list of goods and services (representative of the consumption basket of a typical urban consumer). The CPI is set to 1 in the period chosen as the reference period.

When the price level is measured by the CPI:

Inflation rate = growth rate of the CPI
4.1.2. Inflation - CPI

Let's consider again the same economy. Let say that the representative consumption basket is 10 books, one car and 2 bicycles. 2011 is set to be the base year.

<table>
<thead>
<tr>
<th></th>
<th>Quantities</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>15000</td>
<td>10</td>
</tr>
<tr>
<td>Cars</td>
<td>100</td>
<td>10000</td>
</tr>
<tr>
<td>Bicycles</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

2012:
<table>
<thead>
<tr>
<th></th>
<th>Quantities</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>16000</td>
<td>15</td>
</tr>
<tr>
<td>Cars</td>
<td>125</td>
<td>10500</td>
</tr>
<tr>
<td>Bicycles</td>
<td>70</td>
<td>104</td>
</tr>
</tbody>
</table>

CPI 2011 = 1

CPI 2012 = Value of the consumption basket in 2012 / Value of the consumption basket in the base year

CPI 2012 = 

\[
\frac{(10 \times 15) + (1 \times 10500) + (2 \times 104)}{(10 \times 10) + (1 \times 10000) + (2 \times 100)} = 1.0542
\]

The inflation rate is 5.42%.
3.2. The evolution of the inflation rate

Source: Mankiw 2009
5. Trend and Business cycle

5.1. GDP

5.2. Cyclical properties
   - 5.2.1. Unemployment
   - 5.2.2. Employment
   - 5.2.3. Inflation
   - 5.2.4. Imports
   - 5.2.5. Pro/countercyclical
5. Trend and Business cycle

3 main variables of interest:

- Real GDP per capita
- Unemployment rate
- Inflation rate

How do these variables evolve, in the short run and in the long run?
5.1. Trend and Business cycle - GDP

**Long-term real growth in US GDP per capita** 1871–2009

GDP per capita adjusted for inflation using 2005 dollars

Data from MeasuringWorth.com
It is important to disentangle the cyclical component from the trend. Why?

→ different forces behind the slope of the trend and the cyclical movements.
The business cycle is the upward and downward movements of levels of GDP and refers to the period of expansions and contractions in the level of economic activities (business fluctuations) around its long-term growth trend.
5.1. Trend and Business cycle - GDP

In this course, we will mostly study what happens in the short run. Let's remove the trend. How? By looking only at the difference between the GDP series and the trend, or by looking at the GDP growth rate.
In this course, we will mainly focus on the short run. In the short run, what matters are the cyclical movements of macroeconomic variables. The main variable under scrutiny is real GDP per capita because its cyclical movements define business cycles. How are the unemployment rate and the inflation rate related to the cyclical movements of GDP?
Economic variables show comovement—they have regular and predictable patterns of behavior over the course of the business cycle.

- A variable is **procylical** when its cyclical component is positively correlated with the cyclical component of GDP. That is, any quantity that tends to increase in periods of expansion and to decrease in periods of recessions is classified as procylical.

- A variable is **countercylical** when its cyclical component is negatively correlated with the cyclical component of GDP. A countercylical economic indicator is one which cycle moves in the opposite direction as the business cycle.

- A variable is **acyclical** when it is not correlated with GDP.
5.2.1. Trend and Business cycle - Cyclical properties of unemployment

![Graph showing Unemployment and Economic Growth from January 1948 to April 2012.](image)

5.2.2. Trend and Business cycle - Cyclical properties of employment

Source: FRB Philadelphia National Leading Index. GDP = Real GDP growth
5.2.3. Trend and Business cycle - Cyclical properties of inflation

Shaded areas: recessions as defined by the National Bureau of Economic Research

5.2.4. Trend and Business cycle - Cyclical properties of imports

Imports and GDP. Percentage deviation from trend. Source: FRB Philadelphia
5.2.5. Trend and Business cycle - Pro/countercyclical

Procyclical:
- Inflation
- Real consumer spending
- Investment
- Financial variables (stock and bond prices)
- Importations
- Employment
- ...

Countercyclical:
- Unemployment and unemployment rate
- ...

Exercise - Calculating GDP

Consider the following economy in which only two firms operate. The activities of the two firms can be summarized as follows:

<table>
<thead>
<tr>
<th>Firm A</th>
<th>Costs</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wages</td>
<td>Exports</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>Purchases from B</td>
<td>Sales to B</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sales to the public</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Firm B</th>
<th>Costs</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wages</td>
<td>Sales to A</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Purchases from A</td>
<td>Sales to public</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Taxes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Compute GDP for this economy using the three possible definitions.
Exercise - Calculating inflation using the GDP deflator and the CPI

A country produces the following final goods: bananas, mobile phones, and umbrellas. The statistics agency reports the following data:

<table>
<thead>
<tr>
<th>Year</th>
<th>Products</th>
<th>Quantity produced</th>
<th>Unit price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Bananas</td>
<td>2000</td>
<td>10</td>
</tr>
<tr>
<td>2011</td>
<td>Mobile phones</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td>2011</td>
<td>Umbrellas</td>
<td>250</td>
<td>30</td>
</tr>
<tr>
<td>2012</td>
<td>Bananas</td>
<td>2100</td>
<td>10</td>
</tr>
<tr>
<td>2012</td>
<td>Mobile phones</td>
<td>130</td>
<td>160</td>
</tr>
<tr>
<td>2012</td>
<td>Umbrellas</td>
<td>220</td>
<td>50</td>
</tr>
</tbody>
</table>

a) Compute the inflation rate in the period 2011-2012 using the GDP deflator, taking 2011 as the base year.

b) The representative bundle of goods is composed of 10 bananas and 2 mobile phones (the production of umbrellas is entirely exported because of the country’s dry climate). Compute the inflation rate during 2011-2012 using the consumer price index (CPI), taking 2011 as the base year. How can you explain the differences compared with a)?