Lecture 1: Gross Domestic Product

August 28, 2014

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Structure of the Course

- First Part of the Class:
  - The macroeconomy in the long run
  - Why are countries rich and poor?
  - What can government policy do about it?

- Second Part of the Class:
  - The macroeconomy in the short run
  - What are “business cycles”?
  - How should governments react to them?
Rich and Poor

- Spend the next several lectures looking at the variation in income (production) across time and across countries
- Our study will be based on economic observables rather than, for instance, culture
- Particular question: what government/institutional policies might help/harm development?
- But first, we need to be able to know how we’re measuring income, and how to make it comparable across time/countries
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.*
Gross Domestic Product (GDP) Is...

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

Goods are valued at their market prices, so:

- All goods measured in the same units (e.g., dollars in the U.S.)
- Things that don’t have a market value are excluded.
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

**Intermediate goods**: used as components or ingredients in the production of other goods

GDP only includes final goods – they already embody the value of the intermediate goods used in their production.
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 tangible goods (beer, wine, brats, ketchup…)

and intangible services (dry cleaning, concerts, cell phone 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.
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.
Gross Domestic Product (GDP) Is...

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

Usually a year or a quarter (3 months)
The Components of GDP

- Recall: GDP is total spending.
- Total spending is classified into four components:
  - Consumption ($C$)
  - Investment ($I$)
  - Government Purchases ($G$)
  - Net Exports ($NX$)
- These components add up to GDP (denoted $Y$):

\[ Y = C + I + G + NX \]
Consumption (C)

- is total spending by households on goods & services.

- Note on housing costs:
  - For renters, consumption includes rent payments.
  - For homeowners, consumption includes the imputed rental value of the house, but not the purchase price or mortgage payments.
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)
  - structures (factories, office buildings, houses)
  - inventories (goods produced but not yet sold)

Note: “Investment” does not mean the purchase of financial assets like stocks and bonds.
Government Purchases (G)

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

- G excludes transfer payments, such as Social Security or unemployment insurance benefits. They are not purchases of goods & services.
Net Exports (NX)

- $\text{NX} = \text{exports} - \text{imports}$

- 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.

- Adding up all the components of GDP gives:

$$Y = C + I + G + \text{NX}$$
### U.S. GDP and Its Components, 2011

<table>
<thead>
<tr>
<th></th>
<th>billions</th>
<th>% of GDP</th>
<th>per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>$14,991</td>
<td>100.0</td>
<td>$47,881</td>
</tr>
<tr>
<td>C</td>
<td>10,729</td>
<td>71.6</td>
<td>34,283</td>
</tr>
<tr>
<td>I</td>
<td>2,236</td>
<td>14.9</td>
<td>7,134</td>
</tr>
<tr>
<td>G</td>
<td>2,594</td>
<td>17.3</td>
<td>8,283</td>
</tr>
<tr>
<td>NX</td>
<td>–568</td>
<td>–3.8</td>
<td>–1,819</td>
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</table>
## France GDP and Its Components, 2011

<table>
<thead>
<tr>
<th></th>
<th>billions</th>
<th>% of GDP</th>
<th>per capita</th>
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<tbody>
<tr>
<td>Y</td>
<td>$2,306</td>
<td>100.0</td>
<td>$36,538</td>
</tr>
<tr>
<td>C</td>
<td>1,330</td>
<td>57.7</td>
<td>21,082</td>
</tr>
<tr>
<td>I</td>
<td>476</td>
<td>20.6</td>
<td>7,527</td>
</tr>
<tr>
<td>G</td>
<td>565</td>
<td>24.5</td>
<td>8,952</td>
</tr>
<tr>
<td>NX</td>
<td>–65</td>
<td>–2.8</td>
<td>–1,023</td>
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## China GDP and Its Components, 2011

<table>
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<th>billions</th>
<th>% of GDP</th>
<th>per capita</th>
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<tr>
<td>Y</td>
<td>$11,167</td>
<td>100.0</td>
<td>$8,290</td>
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<tr>
<td>C</td>
<td>3,902</td>
<td>34.9</td>
<td>2,893</td>
</tr>
<tr>
<td>I</td>
<td>5,490</td>
<td>49.2</td>
<td>4,079</td>
</tr>
<tr>
<td>G</td>
<td>1,484</td>
<td>13.3</td>
<td>1,102</td>
</tr>
<tr>
<td>NX</td>
<td>291</td>
<td>2.6</td>
<td>215</td>
</tr>
</tbody>
</table>
Digression: Other Measures of Income

- GNP (Gross National Product): total income earned by a country’s permanent residents.
- NNP (Net National Product): 
  \[= \text{GNP} - \text{depreciation (consumption of fixed capital)}\]
- National Income: 
  \[= \text{NNP} - \text{indirect business taxes} + \text{business subsidies}\]
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. It is not corrected for inflation.

- **Real GDP** values output using the prices of a *base year*. 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.
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.

### Computing GDP

<table>
<thead>
<tr>
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<th>2007 (base yr)</th>
<th>2008</th>
<th>2009</th>
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<tbody>
<tr>
<td></td>
<td>$P$</td>
<td>$Q$</td>
<td>$P$</td>
</tr>
<tr>
<td>Good A</td>
<td>$30$</td>
<td>900</td>
<td>$31$</td>
</tr>
<tr>
<td>Good B</td>
<td>$100$</td>
<td>192</td>
<td>$102$</td>
</tr>
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</table>
### Answers

<table>
<thead>
<tr>
<th></th>
<th>2007 (base yr)</th>
<th>2008</th>
<th>2009</th>
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<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Good B</td>
<td>$100$</td>
<td>$192$</td>
<td>$102$</td>
</tr>
</tbody>
</table>

**A.** Compute nominal GDP in 2007.

\[30 \times 900 + 100 \times 192 = 46,200\]

**B.** Compute real GDP in 2008.

\[30 \times 1000 + 100 \times 200 = 50,000\]
C. Compute the GDP deflator in 2009.

Nom GDP = $36 \times 1050 + $100 \times 205 = $58,300

Real GDP = $30 \times 1050 + $100 \times 205 = $52,000

GDP deflator = 100 \times \frac{\text{Nom GDP}}{\text{Real GDP}}
= 100 \times \frac{($58,300)}{($52,000)} = 112.1
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 great measure of well-being.
GDP Does Not Value:

- the quality of the environment
- leisure time
- non-market activity, such as the child care a parent provides his or her child at home
- an equitable distribution of income
GDP Maximization Strategies:

- Require everyone to work 100 hours per week
- Allow for (or encourage) child labor
- Minimize consumption to maximize investment
- Run perpetual trade surpluses (produce lots of stuff, and send it abroad for nothing in exchange)

Clearly these outcomes are not good!
GDP and Welfare

- Pete Klenow and Chad Jones (both from Stanford University) measure welfare across countries in a recent paper (2011). They take into account:
  - Life expectancy at birth
  - Consumption of goods & services (instead of income)
  - Leisure
  - Income inequality
GDP and Welfare

Jones & Klenow (2010), Figure 3, p. 17:
Welfare and Income across Countries, 2000
GDP and Welfare: Digression on Correlations

![Correlation Coefficient = 0](chart1.png)

![Correlation Coefficient = 1](chart2.png)
GDP and Welfare

Correlation coefficient: .97

Jones & Klenow (2010), Figure 3, p. 17:
Welfare and Income across Countries, 2000
## GDP and Welfare

<table>
<thead>
<tr>
<th>Country</th>
<th>Welfare</th>
<th>Per capita income</th>
<th>&quot;Difference&quot;</th>
<th>Life expectancy</th>
<th>C/Y</th>
<th>Leisure</th>
<th>Inequality</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>1.000</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>77.0</td>
<td>0.762</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.941</td>
<td>0.701</td>
<td>0.295</td>
<td>0.084</td>
<td>-0.055</td>
<td>0.140</td>
<td>0.125</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>78.9</td>
<td>0.721</td>
<td></td>
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<tr>
<td>Singapore</td>
<td>0.426</td>
<td>0.829</td>
<td>-0.667</td>
<td>0.036</td>
<td>-0.581</td>
<td>-0.106</td>
<td>-0.016</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>78.1</td>
<td>0.426</td>
<td></td>
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<tr>
<td>Botswana</td>
<td>0.074</td>
<td>0.179</td>
<td>-0.887</td>
<td>-0.577</td>
<td>-0.171</td>
<td>0.028</td>
<td>-0.167</td>
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<td></td>
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<td></td>
<td>48.9</td>
<td>0.642</td>
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</tbody>
</table>
GDP is not perfect, but...

- Having a large GDP enables a country to afford better schools, a cleaner environment, health care, better infrastructure, etc.

- Many indicators of the quality of life are positively correlated with GDP. For example...
GDP and School Enrollment

GDP and Urbanization

![Graph showing the relationship between GDP per capita (2007) and the share of urban population (1990).]
GDP and Cell Phones
Next Class

- Reading before class: Chapter 11
- Topics: Inflation, the Consumer Price Index, and the Producer Price Index
- From today’s lecture, you can do Section 1 of the homework