GDP – A Measure of Output

• **Gross Domestic Product (GDP):**
  The market value of final goods and services produced within a country during a specific time period, usually a year.
  • GDP is the most widely used indicator of economic performance.

What Counts Towards GDP?

• What Counts Towards GDP?
  • Only transactions involving production count.
    • Financial transactions & income transfers are excluded because they do not reflect actual production.
    • Only production within the geographic borders of the country is counted.
    • Only those goods produced during the current period are counted.
    • Thus, the purchase and sale of goods produced during earlier years are not counted in this year’s GDP.

Dollars are the Common Denominator for GDP

• GDP is measured in dollars.
  • Each good produced increases output by the amount the purchaser pays for the good.
  • The total spending on all final-user goods and services produced during the year is summed, in dollar terms, to obtain the annual GDP.
Questions for Thought:

1. Indicate how each of the following activities will affect GDP:
   a. You pay $600 per month to lease an apartment while attending school.
   b. You pay $8,000 to purchase a four-year-old car.
   c. You have car trouble and have to pay a repair shop $1,500 to fix the transmission of your car.
   d. You pay $5,100 to purchase 100 shares of Microsoft stock ($50 per share for the stock plus a $100 brokerage fee).
   e. You sell your 100 shares of Apple stock (purchased for $30,000) for $40,000 minus a $500 brokerage fee.

2. Why isn’t the purchase of an intermediate good like steel used to build automobiles and the purchase of the new automobile itself both included in GDP?

Questions for Thought:

1. Indicate how each of the following activities will affect GDP:
   f. Your aunt sends you $500 to help with college expenses.
   g. You earn $500 providing computer services for a faculty member.
   h. You win $500 playing cards with classmates in the dormitory.

Two Ways of Measuring GDP

GDP as a Measure of Both Output and Income

- GDP is a measure of both output and income. Thus, there are two ways it can be measured.
- GDP can be derived by totaling the expenditures on final-user goods and services produced during the year.
  - This is called the expenditure approach.
- Alternatively, GDP can be calculated by summing the income payments to the resource suppliers and the indirect cost of producing the goods and services.
  - This is called the resource cost-income approach.

Expenditure Method of Measuring GDP

- **Expenditure Approach:**
  - GDP is the sum of expenditures on final-user goods and services purchased by households, investors, governments, and foreigners.
  - When calculated by this method, there are 4 components of GDP:
    - personal consumption purchases
    - gross private investment (including inventories)
    - government purchases (consumption and investment)
    - net exports (exports minus imports)

Resource Cost-Income Method of Measuring GDP

- **Resource Cost - Income Approach:**
  - GDP is the sum of costs incurred and income (including profits) generated by the production of goods & services in the period.
  - The direct cost income components of GDP:
    - employee compensation
    - self-employment income
    - rents
    - interest
    - corporate profits
  
  Sum of these = national income
### Resource Cost-Income Method of Measuring GDP

**Resource Cost - Income Approach: (cont.)**
- Not all cost components of GDP result in an income payment to a resource supplier. To get GDP using this method, we need to account for 3 other factors:
  - **Indirect business taxes:** Taxes that increase firm’s production costs.
  - **Depreciation:** Cost of wear and tear on the machines and other capital assets used to produce goods and services.
  - **Net Income of Foreigners:** The income that foreigners earn producing goods within the borders of the U.S. minus the income Americans earn abroad.

### Two Ways of Measuring GDP: A Summary

<table>
<thead>
<tr>
<th>Expenditure Approach</th>
<th>Resource Cost-Income Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal consumption expenditures +</td>
<td>Aggregate income:</td>
</tr>
<tr>
<td>Gross private domestic investment +</td>
<td>- Employee Compensation</td>
</tr>
<tr>
<td>Government consumption and gross investment +</td>
<td>- Income of self-employed</td>
</tr>
<tr>
<td>Net exports of goods and services = GDP</td>
<td>- Rents</td>
</tr>
<tr>
<td></td>
<td>- Interest</td>
</tr>
<tr>
<td></td>
<td>Non-income cost items:</td>
</tr>
<tr>
<td></td>
<td>- Indirect business taxes</td>
</tr>
<tr>
<td></td>
<td>- depreciation</td>
</tr>
<tr>
<td></td>
<td>Net income of foreigners = GDP</td>
</tr>
</tbody>
</table>

### U.S. GDP Components: 2009-2012
- The relative sizes of the major components of U.S. GDP usually fluctuate within a fairly narrow range.
- The average proportion of each U.S. component during the 2009-2012 period is shown to the right for both the expenditure and resource cost-income approach.

### Questions for Thought:

1. Which of the following is GDP designed to measure?
   - (a) Total market value of goods & services produced in a year.
   - (b) The income generated and costs incurred producing goods & services during a year.
   - (c) Both (a) and (b)

2. What is the largest component of GDP when it is derived by the expenditure approach? What is the largest component of GDP when it is derived by the income-cost approach?

### Adjusting for Price Changes and Deriving Real GDP
The Rate of Inflation is calculated as:

\[ \text{CPI} = \frac{\text{Differences Real Price}}{\text{Market Basket}} \]

Because the CPI reflects only the bundle purchased by households. Because of their more frequent updating of the typical market bundle and adjustment for the substitution away from goods with higher relative prices, the chained CPI and GDP deflator generally provide a slightly lower estimate for the annual rate of inflation than the traditional CPI.

Key Price Indexes:

- **Consumer Price Index (CPI):** Measured impact of price changes on the cost of a typical bundle of goods & services households purchase.
- **Chained Consumer Price Index** (Chained CPI): A version of the CPI that adjusts the quantities of the typical market basket each month to reflect the impact of shifts away from goods that have become relatively more expensive.
- **GDP Deflator:** designed to measure the change in the average price of the market basket of goods included in GDP.

Differences Among the Key Price Indexes:

- The GDP deflator is a broader price index than the CPI. It reflects the bundle included in GDP while the CPI reflects only the bundle purchased by households.
- Because of their more frequent updating of the typical market bundle and adjustment for the substitution away from goods with higher relative prices, the chained CPI and GDP deflator generally provide a slightly lower estimate for the annual rate of inflation than the traditional CPI.

What is Inflation?

- **Inflation** is an increase in the general level of prices. It is typically calculated annually.
- Inflation can be calculated using either the CPI or the GDP deflator.
- The Rate of Inflation is calculated as:

\[ \text{Inflation rate} = \frac{\text{This year's CPI} - \text{Last year's CPI}}{\text{Last year's CPI}} \times 100 \]

CPI, Chained CPI, and the GDP Deflator: 2000-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>CPI (2000 = 100)</th>
<th>Inflation rate (%)</th>
<th>Chained CPI (2000 = 100)</th>
<th>Inflation rate (%)</th>
<th>GDP deflator (2000 = 100)</th>
<th>Inflation rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2001</td>
<td>102.8</td>
<td>2.8</td>
<td>102.3</td>
<td>2.3</td>
<td>102.3</td>
<td>2.3</td>
</tr>
<tr>
<td>2002</td>
<td>104.5</td>
<td>1.6</td>
<td>105.1</td>
<td>1.2</td>
<td>103.9</td>
<td>1.6</td>
</tr>
<tr>
<td>2003</td>
<td>109.9</td>
<td>2.3</td>
<td>105.7</td>
<td>2.1</td>
<td>106.1</td>
<td>2.1</td>
</tr>
<tr>
<td>2004</td>
<td>109.7</td>
<td>2.7</td>
<td>108.3</td>
<td>2.5</td>
<td>109.1</td>
<td>2.8</td>
</tr>
<tr>
<td>2005</td>
<td>113.4</td>
<td>3.4</td>
<td>111.5</td>
<td>2.9</td>
<td>112.7</td>
<td>3.3</td>
</tr>
<tr>
<td>2006</td>
<td>117.1</td>
<td>3.2</td>
<td>116.7</td>
<td>2.8</td>
<td>116.4</td>
<td>3.2</td>
</tr>
<tr>
<td>2007</td>
<td>120.4</td>
<td>2.8</td>
<td>117.6</td>
<td>2.5</td>
<td>119.7</td>
<td>2.9</td>
</tr>
<tr>
<td>2008</td>
<td>125.0</td>
<td>3.8</td>
<td>122.0</td>
<td>3.7</td>
<td>122.4</td>
<td>2.9</td>
</tr>
<tr>
<td>2009</td>
<td>124.6</td>
<td>0.4</td>
<td>121.4</td>
<td>0.5</td>
<td>125.5</td>
<td>0.9</td>
</tr>
<tr>
<td>2010</td>
<td>126.6</td>
<td>1.6</td>
<td>125.2</td>
<td>1.4</td>
<td>125.1</td>
<td>1.3</td>
</tr>
<tr>
<td>2011</td>
<td>130.6</td>
<td>3.2</td>
<td>126.9</td>
<td>3.1</td>
<td>127.8</td>
<td>3.1</td>
</tr>
<tr>
<td>2012</td>
<td>133.3</td>
<td>2.1</td>
<td>130.2</td>
<td>1.8</td>
<td>130.1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Using the GDP Deflator to Derive Real GDP

- The formula for converting nominal GDP into real GDP (in period 1 prices) is:

\[ \text{Real GDP}_2 = \frac{\text{Nominal GDP}_2 \times \text{GDP Deflator}}{\text{GDP Deflator}_2} \]

- Data on both money (nominal) GDP and price changes are essential for meaningful comparisons of output between two time periods.
Using the GDP Deflator to Derive Real GDP

• Between 2005 and 2012, nominal GDP increased from $12,623 billion to $15,685 billion... an increase of 24.3%.

• But, when the 2012 GDP is deflated to account for price increases... we can see real GDP increased by only 7.7%.

<table>
<thead>
<tr>
<th>Nominal GDP (billions of $)</th>
<th>Price index (GDP at 2005 = 100)</th>
<th>Real GDP (billions of 2005’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>$12,623</td>
<td>100.0</td>
</tr>
<tr>
<td>2012</td>
<td>$15,685</td>
<td>111.4</td>
</tr>
<tr>
<td>% increase</td>
<td>24.3%</td>
<td>15.4%</td>
</tr>
</tbody>
</table>

Questions for Thought:

1. What do price indexes measure?
2. What is the difference between the CPI and the GDP deflator? How about between the CPI and Chained CPI? Which would you use if you wanted to measure whether your own earnings this year were higher than they were last year?
3. The CPI was 229.6 in 2012 compared to 99.6 in 1983. Suppose that the price of a ticket at a local movie theater rose from $4 to $12 between 1983 and 2012. Did the real ticket price increase or decrease? Calculate the 1983 ticket price measured in 2012 dollars.

Shortcomings of GDP as a Measuring Rod

• Shortcomings of GDP:
  - It does not count non-market production.
  - It does not count the underground economy.
  - It makes no adjustment for leisure.
  - It probably understates output increases because of the problem of estimating improvements in the quality of products.
  - It does not adjust for harmful side effects.

Converting Earlier Figures into Current Dollars

• Sometimes we will want to make real data (e.g. income) comparisons in terms of the purchasing power of the dollar during the current year.

• This can be done by “inflating” the data for earlier years for increases in the price level.

• The formula for converting the figures for an earlier year into current dollars is:

\[ \text{Current figure} = \text{Earlier figure} \times \frac{\text{price index current year}}{\text{price index earlier year}} \]

• If prices have risen, this will “inflate” the data for earlier years and bring them into line with the current purchasing power of the dollar.

Questions for Thought:

4. Use the following data to answer this question.

<table>
<thead>
<tr>
<th>Nominal GDP (trillions of $)</th>
<th>GDP deflator (2005=100.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>$14.29</td>
</tr>
<tr>
<td>2010</td>
<td>14.50</td>
</tr>
<tr>
<td>2012</td>
<td>15.68</td>
</tr>
</tbody>
</table>


b. What was the percent change in real GDP between 2008 and 2010? What was the percent change between 2010 and 2012?
Per Capita GDP 1930-2012

- Per capita GDP is GDP divided by the size of the population.
- The real 2012 GDP per capita figure in the U.S. is nearly six times the figure for 1930.
- How meaningful is this comparison?

GDP as a Measuring Rod

- In spite of its shortcomings, the evidence indicates that real GDP per person is a broad indicator of living standards.
  - As real per capita GDP in the United States has increased through time, the quality of most goods has increased while the amount of work time required for their purchase has declined.
  - Similarly, as real per capita GDP has risen in the United States and other countries, life expectancy and leisure time have gone up, while literacy and infant mortality rates have gone down.

Questions for Thought:

1. When making income & GDP comparisons across time, why is it important to adjust for changes in the level of prices?
2. If nominal GDP during a year increased by 2% while the GDP deflator rose by 5%, what happened to real GDP?
3. If the GDP deflator is currently 115.4 compared to the 2005 base year of 100, what does the 115.4 figure for today mean?
4. GDP does not count services such as child care, food preparation, cleaning, and laundry within the household. Why not? Is GDP a sexist measure? Does it underestimate the productive contributions of women relative to men?

Per Capita GDP Comparisons Across Time Periods

- As was shown in the previous exhibit, real U.S. per capita GDP has increased substantially over the past 82 years.
- Compared to earlier periods, current GDP is probably biased upward because more output now takes place in the market sector and less in the household sector.
- However, it is also probably biased downward because of failure to adjust for increased leisure, improvements in the work environment, and the introduction of improved products and new technologies.
- The direction of the overall bias is uncertain.

The Great Contribution of GDP

- However, the “great contribution” of GDP is its ability to measure short-term fluctuations in output.
  - Year-to-year (and quarter-to-quarter) changes in real GDP provide a reasonably precise measure of what is happening to the rate of output.

Questions for Thought:

5. On 9/11/2001, terrorists crashed 2 planes into the World Trade Center in New York, killing 3,000 people and causing the towers to collapse. Which of the following best indicates how GDP was impacted by the attack’s damages and cleanup that followed?
   (a) The damage from the attack was subtracted from GDP, while the expenditures from the cleanup were added.
   (b) Neither the damages from the attack nor the expenditures from the cleanup affected GDP.
   (c) No adjustment was made for the damages from the attack, while the expenditures from the cleanup were added to GDP.
Questions for Thought:

6. Which of the following are included in GDP?
   a. the value of goods produced in the underground economy
   b. the value of leisure
   c. increases in the value of housing and financial assets
   d. depreciation in the value of real assets such as equipment and buildings
   e. the value of services such as food preparation and house cleaning that we provide for ourselves

Questions for Thought:

7. Your father tells you he earned $1.50 per hour when he was 16 in 1969; you made $8.00 per hour when you were 16 in 2012. Given that the CPI was 36.7 in 1969 and 229.6 in 2012, which of the following is the 2012 equivalent of your father’s hourly earnings when he was 16?
   (a) $0.24
   (b) $1.28
   (c) $9.38
   (d) $15.03
   (e) $50.05

End of Chapter 7