

# Unit 4: Measuring GDP and Prices

ECO 120 Global Macroeconomics

## 1

### 1.1 Reading

#### Reading

- Gross Domestic Product (GDP): Module 11
- Real vs Nominal GDP: Module 12

### 1.2 Goals

#### Goals

- Specific Goals:
  - Understand how to measure a country's output.
  - Learn a way to measure the overall level of prices in the economy.
  - Learn some problems with these measures.
- Learning Objectives:
  - LO4: Define macroeconomic measures of production, prices, inflation, and employment. Students will be able to explain how each is measured and evaluate usefulness and limitations for each measure.

## 2 National income accounts

### 2.1 Types of Measures

#### National income accounting

- **National income accounting:** different measures of a country's overall economic performance.
- Why do we care?
  - Assess the health of the economy by comparing output / person across countries and across time periods.

- Track long run growth out the economy.
- Access the effectiveness of macroeconomic policies.
- Measures:
  - **Gross domestic product**
  - **Net domestic product**
  - **National income**
  - **Personal income**
  - **Disposable income**

## 2.2 Gross domestic product

### Gross domestic product

- **Gross domestic product:** total market value of all *final* goods and services produced in a given year.
- To avoid double counting, intermediate goods are not counted.
- Necessary that it be a monetary measure.
- Excludes financial transactions.
- Excludes secondhand sales / sales of used goods.

### Example: \$350 suit

- The birth of suit:
  1. Sheep rancher produces and sells \$120 wool to a wool processor.
  2. A firm processes the wool and sells the material to a suit manufacturer for \$180.
  3. The suit manufacturer makes a suit and sells it to a wholesaler for \$200.
  4. The wholesaler sells the suit to a retailer for \$250.
  5. The retailer sells the suit to you for \$350.
- If we counted all these transactions in GDP we get:  $\$120 + \$180 + \$200 + \$250 + \$350 = \$1,100$ .
- When actually, in the end we are only left with a suit worth \$350.

### Value added approach

- Add to GDP only the value added at each step:
  1. Sheep rancher: \$120
  2. Wool processor:  $\$180 - \$120 = \$60$
  3. Suit manufacturer:  $\$200 - \$180 = \$20$
  4. Wholesaler:  $\$250 - \$200 = \$50$
  5. Retailer:  $\$350 - \$250 = \$100$
- Add up the value added at every stage of production:  $\$120 + \$60 + \$20 + \$50 + \$100 = \$350$

### What's not counted?

- Non-production transactions: transactions that do not involve production of a good.
- Financial transactions
  - Public transfer payments such as social security payments and veterans payments.
  - Private transfer payments such as gifts between family members.
  - Stock market transactions.
- Secondhand transactions: contribute nothing to production, just moving ownership of final goods between people.

#### 2.2.1 Expenditure approach

##### Expenditure approach

- **Expenditure approach:** method of computing GDP by adding up all expenditures of final goods and services.
- Consumption: consumption expenditures of households.
- Investment: purchases of capital goods by firms.
- Government purchases.
- Net exports.

## Investment

- **Gross private domestic investment**
  - *Most important:* Capital - final purchases of machinery, equipment, and tools.
  - All construction: includes construction of new offices, factories, *and* residential houses.
  - Changes in inventories: “unsold” output (not counted in consumption, because never purchased).
- **Net private domestic investment** = gross private domestic investment - depreciation.
  - Depreciation: every day some old investment goods need repair or replacement.

## Net exports

- **Net exports** = exports - imports.
- Export goods are produced in the U.S. and consumed outside the U.S.
- Imports are subtracted
  - Some things in consumption, investment, and government spending may have been imported (not produced in U.S.).
  - Subtracting imports from exports results in a net quantity of goods produced in the U.S. that are sold outside the U.S.

## Gross domestic product

Expenditure approach leads to the equation:

$$Y = C + I + G + X - M$$

- Y: Total Output  $\equiv$  GDP.
- C: Private Consumption
- I: investment
- G: Government Spending
- X: Exports
- M: Imports

## 2.2.2 Income approach

### Income approach

- **Income approach:** another method of computing GDP, add up total income.
- **National income** is composed of:
  - Compensation of employees (income earned from labor)
  - Rent (income earned from owning land)
  - Interest (income earned from owning capital)
  - Proprietors' income (income earned from organizing production)
  - Corporate profits (income earned from organizing production)
- National income is *almost* equal to GDP.
  - Requires some statistical adjustments (corporate income taxes, undistributed corporate profits)

### Disposable Income

- **Personal income** = National income
  1. *minus* social security payments
  2. *minus* corporate income taxes
  3. *minus* undistributed corporate profits
  4. *plus* transfer payments
- **Disposable income** = Personal income - personal taxes.
- Often, macroeconomists abstract from many of these adjustments and say:

$$\text{Disposable income} \approx \text{GDP} - \text{Personal Taxes}$$

## 3 Real GDP

### 3.1 Real vs. Nominal GDP

#### Nominal vs. Real GDP

- Problem with GDP calculation is that it measures *market value* of goods and services.
- Prices may increase, but production stay the same.
- **Nominal GDP:** (unadjusted) GDP calculation using prices that prevailed when output was produced.
- **Real GDP:** GDP calculation that is adjusted for changes in prices.
  - A single measure of the *quantity* of all final goods and services.

## 3.2 Computing GDP

### Calculating Real GDP

- Don't use current year prices to compute real GDP.
- Use prices from a chosen **base year**.
- Example:
  - Suppose only two goods: Brats and Cheese
  - Let's use 2005 as a base year, compute real GDP for 2006

$$\text{Real GDP}_{2006} = P_{Brats,2005}Q_{Brats,2006} + P_{Cheese,2005}Q_{Cheese,2006}$$

### Example: Nominal GDP

Year 2005		
Item	Quantity	Price
Brats	100	\$1.00
Cheese	20	\$5.00

  

Year 2006		
Item	Quantity	Price
Brats	150	\$2.00
Cheese	25	\$7.00

$$\begin{aligned}\text{Nominal GDP}_{2005} &= \\ 100(\$1) + 20(\$5) &= 200\end{aligned}$$

$$\begin{aligned}\text{Nominal GDP}_{2006} &= \\ 150(\$2) + 25(\$7) &= 475\end{aligned}$$

### Example: Real GDP

Year 2005		
Item	Quantity	Price
Brats	100	\$1.00
Cheese	20	\$5.00

  

Year 2006		
Item	Quantity	Price
Brats	150	\$2.00
Cheese	25	\$7.00

- Real GDP using 2005 as a base year.

$$\begin{aligned}\text{Real GDP}_{2005} &= \\ 100(\$1) + 20(\$5) &= 200\end{aligned}$$

$$\begin{aligned}\text{Real GDP}_{2006} &= \\ 150(\$1) + 25(\$5) &= 275\end{aligned}$$

- What is real GDP growth?

$$\begin{aligned} \text{Real GDP Growth} &= \frac{275-200}{200} \\ &= 0.375 = 37.5\% \end{aligned}$$

**Example: Real GDP**

Year 2005		
Item	Quantity	Price
Brats	100	\$1.00
Cheese	20	\$5.00

  

Year 2006		
Item	Quantity	Price
Brats	150	\$2.00
Cheese	25	\$7.00

- Real GDP using 2006 as a base year.

$$\begin{aligned} \text{Real GDP}_{2005} &= \\ 100(2) + 20(7) &= 340 \end{aligned}$$

$$\begin{aligned} \text{Real GDP}_{2006} &= \\ 150(2) + 25(7) &= 475 \end{aligned}$$

- What is real GDP growth?

$$\begin{aligned} \text{Real GDP Growth} &= \frac{475-340}{340} \\ &= 0.397 = 39.7\% \end{aligned}$$

**Chain weighted real GDP**

- Different base years lead to different conclusions for output growth.
- **Chain weighted GDP:** Another measure of real GDP that averages out these differences.

**3.3 Calculating the Price Level**

**Calculating the price level**

- **Price level:** an overall measure of prices in the economy.
- **GDP deflator:** average of current year prices as a percentage of base year prices.

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}(100)$$

- Compute GDP deflator using 2005 as a base year.

## 4 Shortcomings of GDP

### Shortcomings of GDP

- Does not account for non-market activities.
- Leisure: Average workweek in 1900 was 53 hours. Today it's 35 hours.
- Improved product quality (eg. computers and electronic devices).
- Underground economy, significant for lesser developed countries.
- External costs. Clean up costs are actually *added* to GDP.
- Says nothing about distribution.

## 5

### 5.1 Next up...

#### Next up...

- Measuring Unemployment: Modules 13 and 14
- Measuring Inflation - Module 16