ECO 202 Principles of Economics II

Lecture 2: Measuring Total Production and Income

Xiaozhou Ding

January 22, 2018

Overview

Measures of Total Production

Microeconomics and Macroeconomics

- Recall what we learned in the first lecture where microeconomics is the study of how households and firms make decisions, how they interact in markets, and how they respond to government policies.
- In contrast, macroeconomics is the study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.
- When we want to study the overall economy-level actions of people and governments, the models and tools of macroeconomics become very useful.
- Above all, being able to measure total output is incredibly important, since much of macroeconomic depends on our ability to measure and predict aggregate economic activity.

Gross Domestic Product

The most common measure used by economists of overall economic activity in an economy is gross domestic product, or GDP.

Definition

GDP is the market *value* of all *final* goods and services produced in a country during a period of time, typically one year.

“Market Values”

- We cannot simply add quantities of different goods and services together.
- The best practical way is to value each good and service in monetary terms, and the best measure of this that we have is the price that each good or service is sold for.

“Final Goods and Services”

Definition

A final good or service is a good or service purchased by a final user.

If we count **intermediate goods and services**, we would be **double counting**.

Example

If we counted the value of the milk an ice cream store bought to make ice cream and also counted the value of that ice cream when it was sold to a consumer, we would be double counting the wholesale value of the ice cream.

To see why this is the case, let us do a simple math. Suppose making an ice cream needs \$$a$ dollars milk and \$$b$ dollars labor, and the store sells it at y dollars with zero profit.

$$y = a + b.$$

If there is only one ice cream made within a country in a year, the GDP is just y, not $y + a$.

“During a Period of Time”

- To measure total output in a given year, we measure the goods and services produced only in that given year.
- If you buy a DVD in 2011, that DVD counts in 2011’s GDP. If you resell it in 2012, it will not count again in 2012.
- So GDP counts only **new** goods and services. **Used** items were previously produced and counted, so do not need to be counted again.

Example: Calculating GDP

Suppose a very simple economy produces only four goods and services as follows. Assume that all the cheese in this economy is used in producing pizzas. Use the information provided to compute GDP for the year 2017.

Table: Production and Price Statistics for 2017

Product	Quantity	Price ($)
Eye examinations	100	50.00
Pizzas	80	10.00
Shoes	20	100.00
Cheese	80	2.00

Example: Calculating GDP

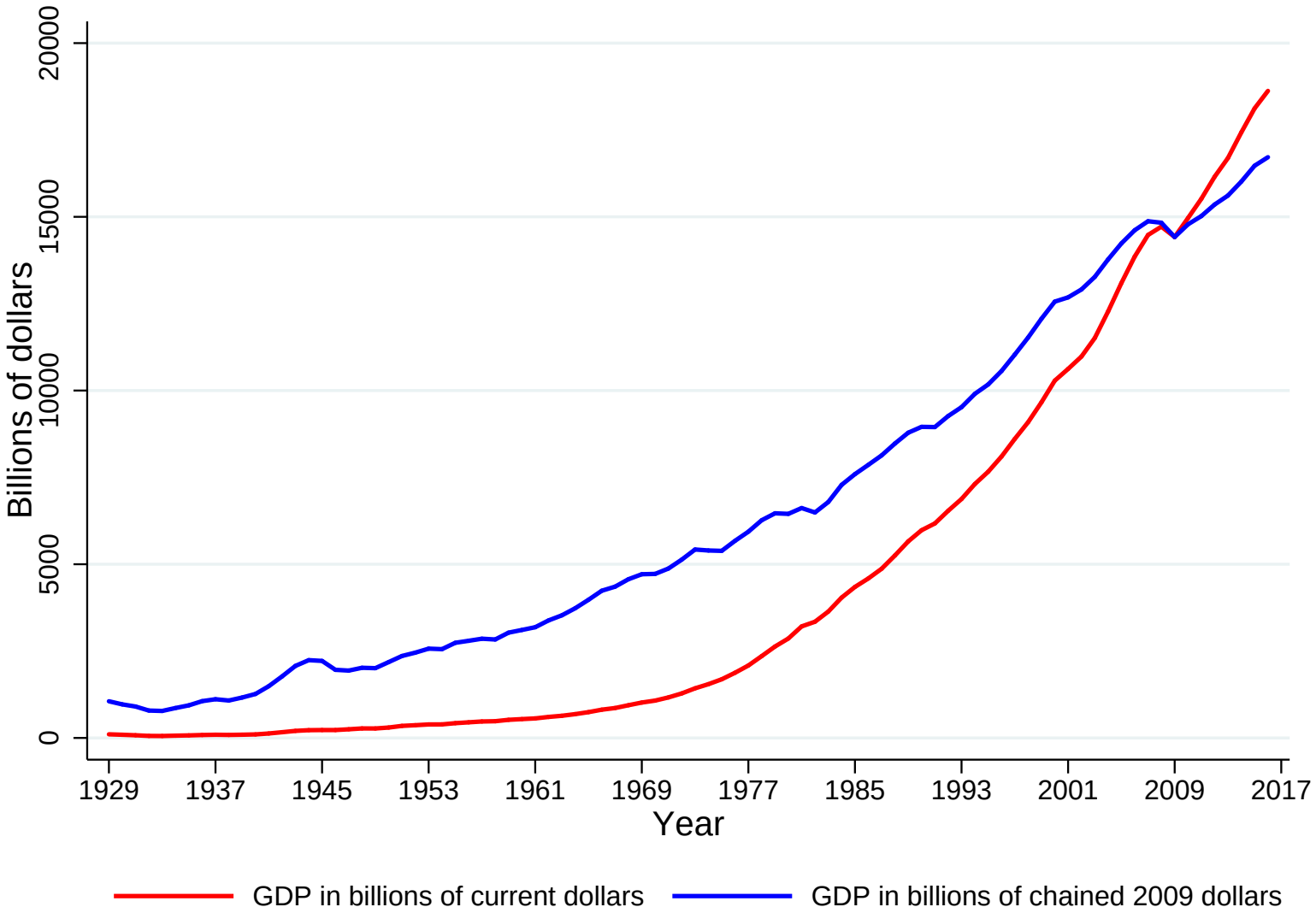
The value of each product is calculated in the last column:

Product	Quantity	Price ($)	Value ($)
Eye examinations	100	50.00	5000.00
Pizzas	80	10.00	800.00
Shoes	20	100.00	2000.00
Cheese	80	2.00	160.00

Sum up all final goods and services, which are eye examinations, pizzas, and shoes:

$$\text{GDP} = \$5000 + \$800 + \$2000 = \$7800.$$

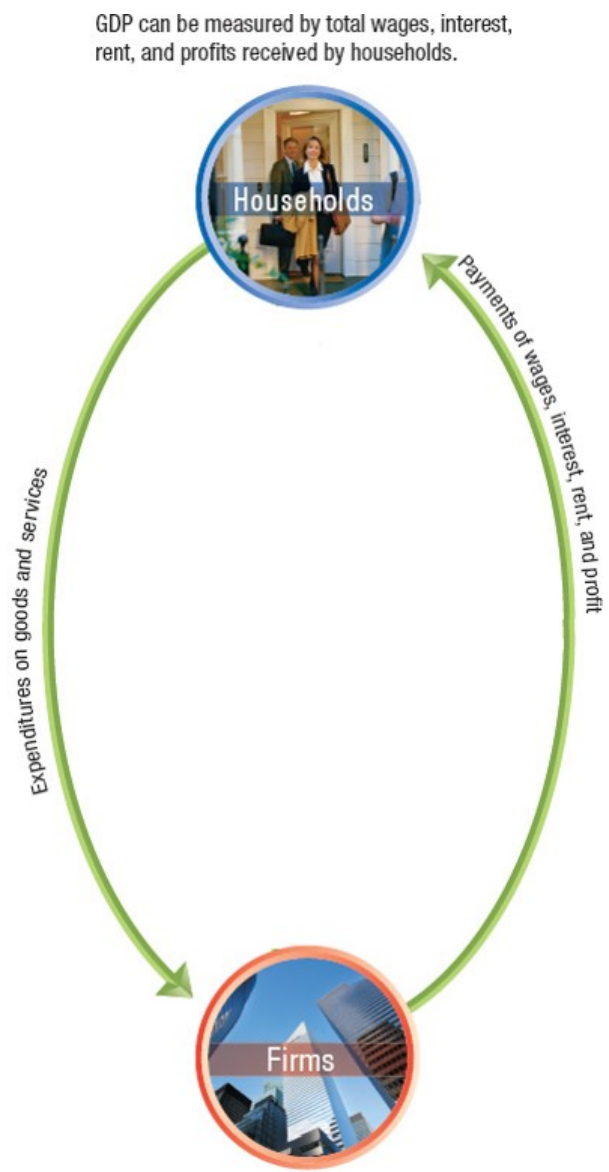
U.S. GDP


Billions of dollars
0
5000
10000
15000
20000
1929
1937
1945
1953
1961
1969
1977
1985
1993
2001
2009
2017
Year
GDP in billions of current dollars
GDP in billions of chained 2009 dollars

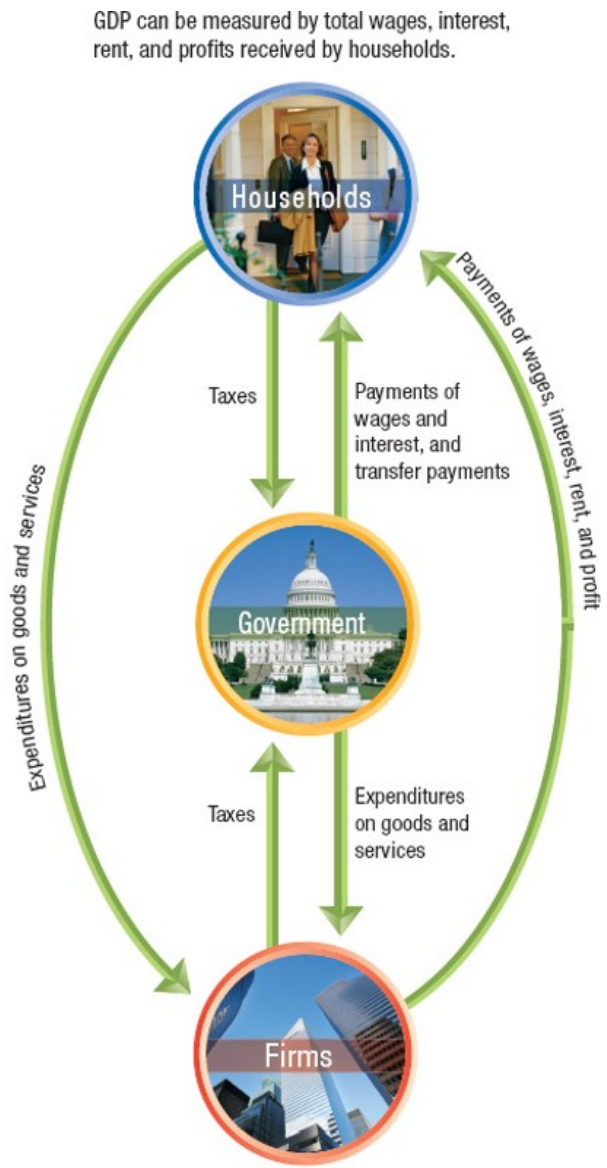
Production and Income

- There are two main conceptual ways to measure the total economic activity in an economy: total production or total income.
- When we measure one, we are also measuring the other.
- Why? Everything that is produced and sold constitutes income for someone; so we have the choice of measuring the value of products produced and sold, or the value of incomes, and each is a valid way of measuring economic activity.

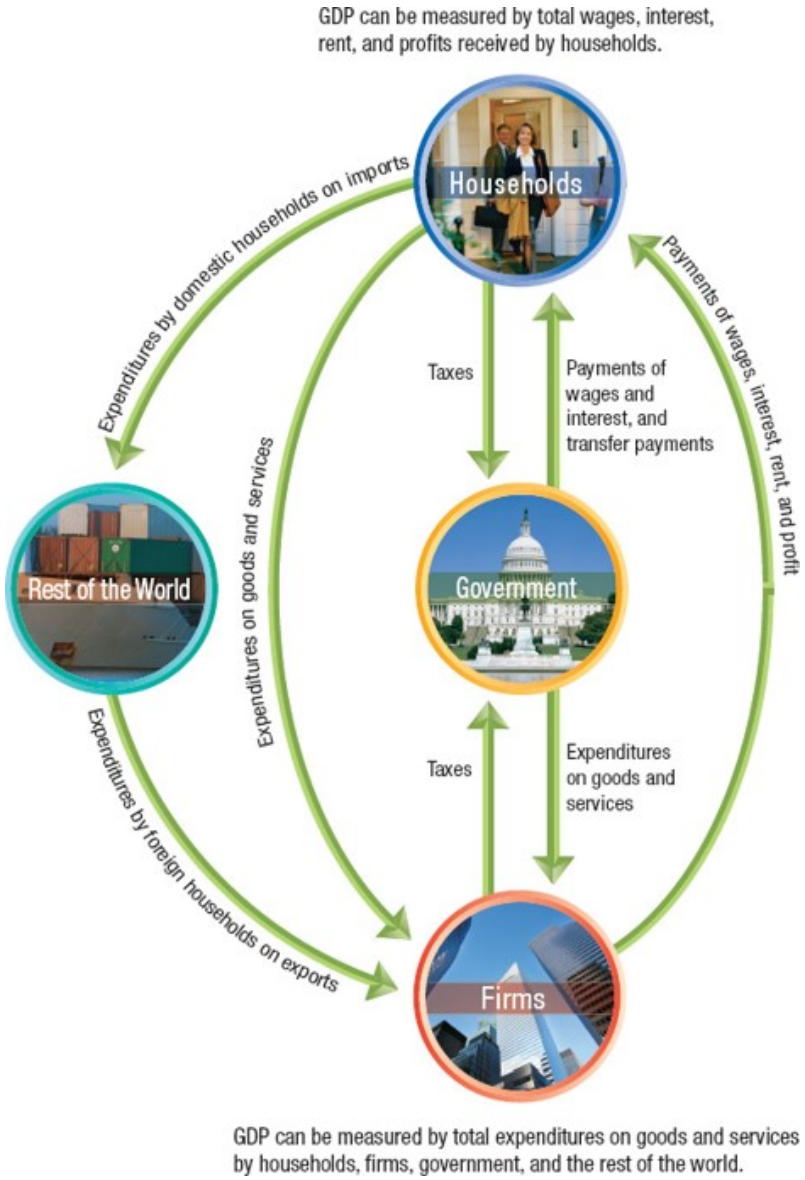
The Circular Flow and the Measurement of GDP



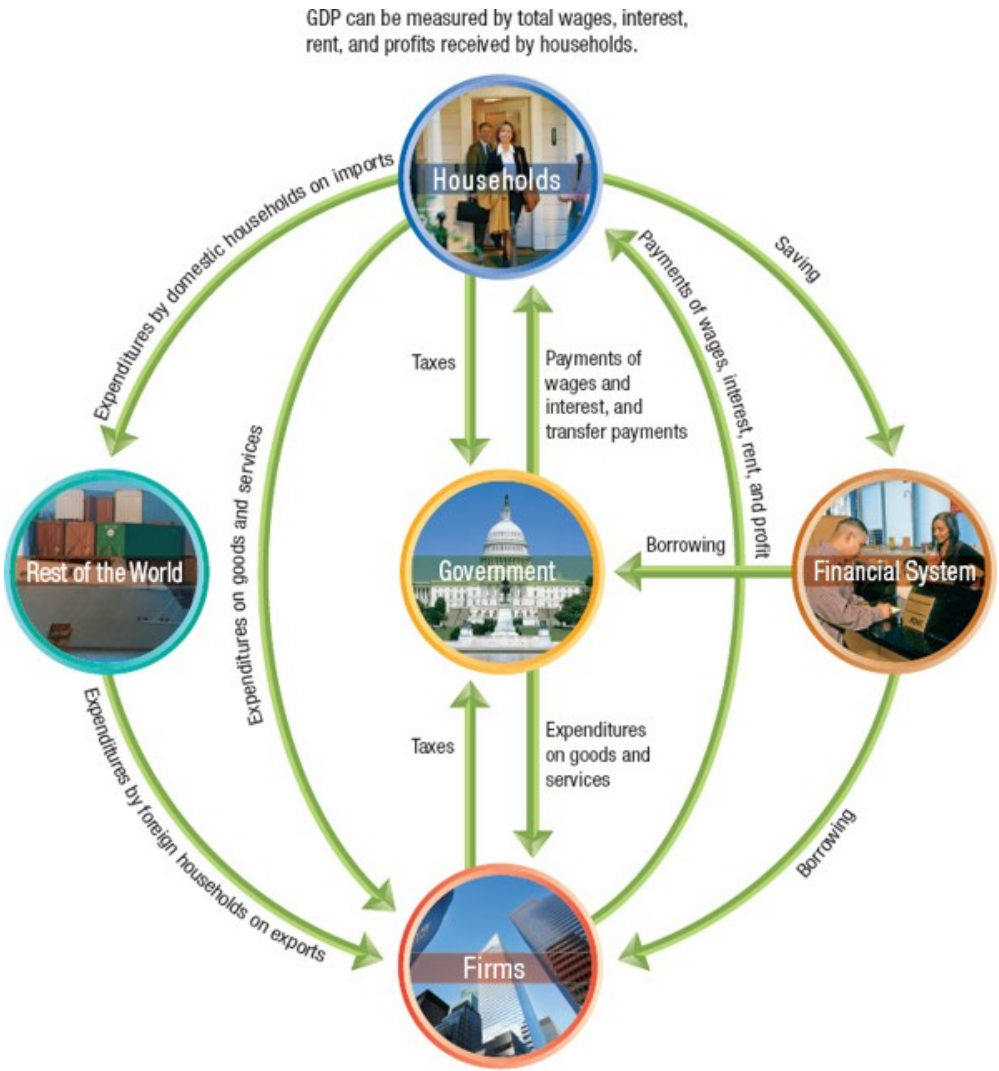
The Circular Flow and the Measurement of GDP



The Circular Flow and the Measurement of GDP



The Circular Flow and the Measurement of GDP



Components of GDP

To measure GDP, the Bureau of Economic Analysis (BEA) in the Department of Commerce measures four major categories of expenditures:

- Personal consumption, C
- Private domestic investment, I
- Government purchases, G
- Net exports, NX.

GDP can be expressed as the sum of these four components:

$$Y = C + I + G + NX.$$

Consumption

Consumption is spending by households on goods and services, including

- Services, such as medical care, education, and haircuts.
- Nondurable goods, such as food and clothing.
- Durable goods, such as automobiles and furniture.

Notice, spending on new houses is not included in consumption. Instead, it is included in the investment category.

Investment

Private domestic investment includes:

- Business fixed investment, such as new factories, office buildings, machinery, and research and development.
- Residential investment, i.e. new single-family and multi-unit houses.
- Changes in business inventories, i.e. goods that have been produced but not yet sold.

Government Purchases

- Government purchases are spending by federal, state, and local governments on goods and services, such as teachers salaries, highways, and aircraft carriers.
- This does **not** include transfer payments, since those do not result in immediate production of new goods and services.

Net Exports

- Net exports are the value of exports minus the value of imports.
- This difference might be positive or negative; in recent years, this has been negative in the United States.
- Since we want to count domestic production (production in the United States), we add up the value of the goods and services sold to foreigners and subtract the value of the goods and services sold to Americans by foreigners.

Components of Current GDP

https://www.bea.gov/iTable/index_nipa.cfm

Calculating Value Added

- An alternative method to measure GDP is to measure the value added: the market value a firm adds to a product.
- The final selling price of a product must equal the sum of the values added to the product at each stage of production.
- The following example illustrates this method for a shirt sold on L.L.Beans web site.

Firm	**Value of Product**	**Value Added**	
Cotton farmer	Value of raw cotton = \$1	Value added by cotton farmer	= \$1
Textile mill	Value of raw cotton woven into cotton fabric = \$3	Value added by textile mill = (\$3 − \$1)	= \$2
Shirt company	Value of cotton fabric made into a shirt = \$15	Value added by shirt company = (\$15 − \$3)	= \$12
L.L.Bean	Value of shirt for sale on L.L.Bean's Web site = \$35	Value added by L.L.Bean = (\$35 − \$15)	= \$20
	Total Value Added		= **\$35**

Shortcomings in GDP Measure

I: Measure of Total Production

Two important types of production are omitted from the BEAs measurement of GDP:

- Household production such as child care, cleaning, and cooking is not typically paid for with money.
  - But such contributions are real-if they were performed by a non-household member, they would be paid for and counted in GDP.
- Underground economy such as buying and selling of goods and services that is concealed from the government to avoid taxes or regulations, or because the goods and services are illegal.
  - This may be 10 percent or more of the economy in America and substantially more in low-income households.

GDP per capita (i.e., GDP divided by population) is often used to represent differences in standards of living from country to country. However, even if it accurately measured total production, it would not reflect:

- The value of leisure.
- Pollution and other negative effects of production.
- Crime and other social problems.
- The distribution of income.

In fact, improvements in many of these will result in lower GDP per capita.

Example

Lower crime would allow lower spending on police, prisons, and private security. This would decrease GDP, but surely result in improvements in economic well-being.

How Important Are These Shortcomings?

- If we are comparing GDP from year to year, the size of household production and the underground economy is probably about the same from year to year, so GDP growth is a reasonable measure of the growth in total production.
- However over long periods of time, these shortcomings might be more serious.

Example

As women have entered the workforce in larger numbers, some household production has been replaced by paid child care and restaurant meals. So increases in GDP may exaggerate the increase in actual total production.

Example: Underground Economies in Developing Countries

- Informal sector versus formal sector.
- Causes: poor government polices, high taxes and regulations, and low confidence in the security of private property.

Real GDP versus Nominal GDP

Real GDP and Nominal GDP

Recall that GDP is valued by monetary terms (price times quantity). Then we can ask the question that is the increase in GDP due to production increasing, or due to prices increasing?

Example

In year 1, country A produces 10 computers and each was sold at $100. In year 2, country A also produces 10 computers and each was sold at $200. Which year has higher GDP?

Real GDP and Nominal GDP

Definition

Nominal GDP is the value of final goods and services evaluated at current-year prices.

Definition

Real GDP is the value of final goods and services evaluated at base-year prices.

The choice of a base-year is arbitrary; we might use any years prices to compare real GDP. The current standard is 2009.

Real GDP and Nominal GDP

Sometimes people also call real GDP the price-adjusted GDP because it adjusts GDP for different price levels. The price level is a measure of the average prices of goods and services in the economy.

Definition

The GDP deflator is a measure of the price level, calculated by dividing nominal GDP by real GDP and multiplying by 100, i.e.,

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

Real GDP and Nominal GDP

Example

Consider the following example,

	2013	2014
Nominal GDP	\$16,768 billion	\$17,419 billion
Real GDP	\$15,710 billion	\$16,086 billion

Real GDP and Nominal GDP

Using previous formula, we can calculate the GDP deflator for each year:

$$\text{GDP deflator}_{2013} = \frac{\$16,768 \text{ billion}}{\$15,710 \text{ billion}} \times 100 = 106.7$$

and

$$\text{GDP deflator}_{2014} = \frac{\$17,419 \text{ billion}}{\$16,086 \text{ billion}} \times 100 = 108.3.$$

The GDP deflator increased from 106.7 to 108.3:

$$\frac{108.3 - 106.7}{106.7} \times 100 = 1.5\%.$$

So we can say the price level rose by 1.5% over this period.

Other Measures of Total Production and Total Income

Gross National Product

Definition

Gross National Product (GNP) is the value of final goods and services produced by residents of a country, even if the production takes place outside the country.

GNP includes foreign production by domestic firms but excludes domestic production by foreign firms. For the United States, GNP is almost the same as GDP.

National Income

Definition

Gross National Income (GNI) is defined as gross domestic product, plus net receipts from abroad of wages and salaries and of property income, plus net taxes and subsidies receivable from abroad.

Definition

Net national income (NNI) is equal to GNI net of depreciation.

Depreciation is referred to as the consumption of fixed capital. In producing goods and services, some machinery, buildings and equipment wear out and have to be replaced.

Personal Income

Definition

Personal income is income received by households.

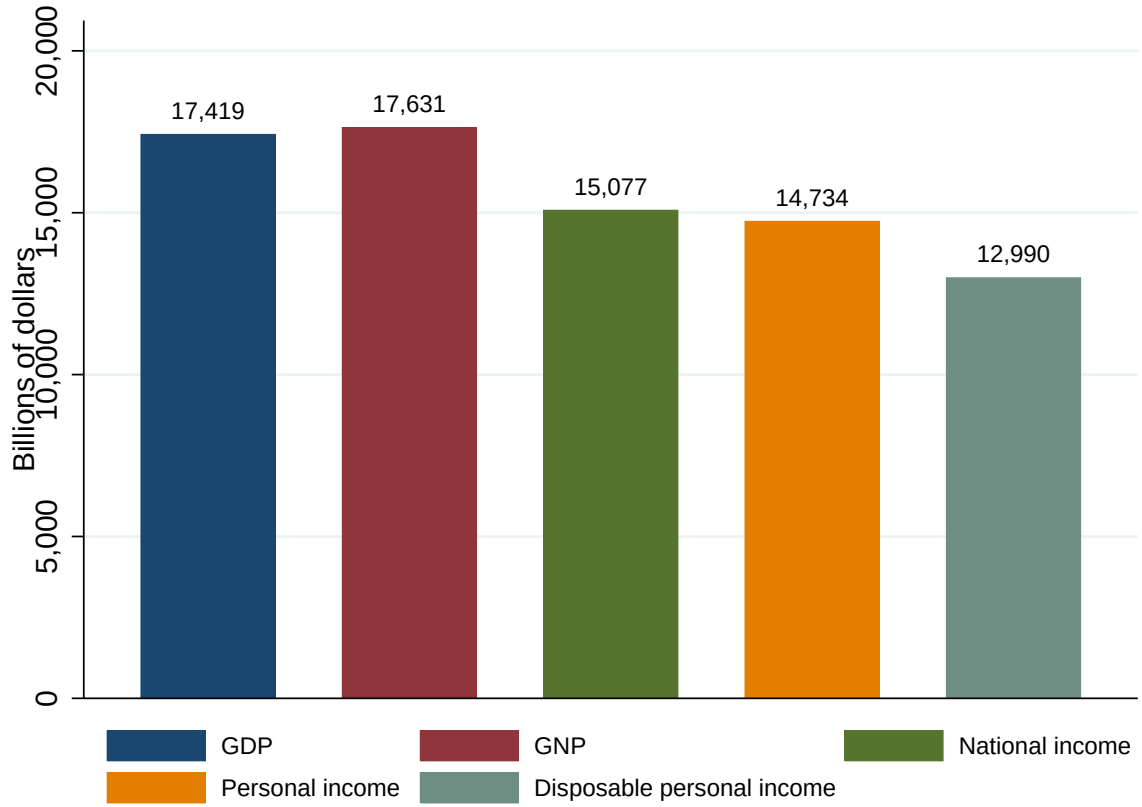
It includes transfer payments but excludes firms' retained earnings.

Disposable Personal Income

Definition

Disposable personal income is personal income minus personal tax payments.

Measures of Total Production and Total Income in 2014



- National income must be smaller than GDP, since it is just GDP minus depreciation.
- Similarly, disposable personal income must be less than personal income, since it is just personal income minus taxes.

The Division of Income in 2014

	Billions of dollars	
Wages	$9,237	
Interest	660	
Rent	640	
Profit	3,076	
Profits of sole proprietors		1,380
Profits of corporations		1,696
Taxes, depreciation, and statistical discrepancy	3,989	

- All production must be rewarded with income; so in theory, we could count either in order to calculate GDP.
- In practice, data limitations make us unlikely to come up with the same number; there will always be some statistical discrepancy.