

GDP and national accounts

GRADUATE MACRO – LAB SESSION 1

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Class Outline

1. GDP
2. Circular Flow
3. National Income Accounts:
 - i. Production
 - ii. Expenditure
 - iii. Income

Definition

Gross domestic product (GDP)

- Market value of all final goods and services produced within a country in a given period of time

Let's break down this definition:

The Measurement of GDP

“GDP is the market value...”

- Market prices – reflect the value of the goods

“... of all...”

- All items produced in the economy
 - And sold legally in markets
- Excludes most items
 - Produced and sold illicitly
 - Produced and consumed at home

The Measurement of GDP

“... final...”

- Value of intermediate goods is already included in the prices of the final goods

“... goods and services...”

- Tangible goods & intangible services

“... produced...”

- Goods and services currently produced

“... within a country...”

- Goods and services produced domestically
 - Regardless of the nationality of the producer

“... in a given period of time”

- A year or a quarter

What is GDP?

1. Production

Example: suppose an economy that only produces cups of coffee.

- NSSR students: households.
- “O Café”: firm, produces coffee.

What is the production in the NSSR Café per year?

Need to know quantity of cups of coffee produced and price of a cup.

Price: \$2/cup

Number of cups sold per year: 800 cups

Total annual production: 800 cups * \$2/cup = \$1,600

$$\underline{\mathbf{Y = PQ}}$$

2. Expenditure

A second way to count GDP is through expenditure.

How much is GDP if we consider what NSSR students spent on coffee? → **Consumption**

Still \$1,600!

What would happen to the **unsold** coffee on December 31st? Does this not appear in the GDP measure?

In terms of accounting it is considered bought by *O Cafe*. → **Investment**

2. Expenditure

The Components of GDP

Identity: $Y = C + I + G + NX$

- $Y = \text{GDP}$
- $C = \text{consumption}$
- $I = \text{investment}$
- $G = \text{government purchases}$
- $NX = \text{net exports}$
- <https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=19&step=2&0=survey>

The Components of GDP

Consumption, C

- Spending by households on goods and services
 - Goods: durable goods, nondurable goods
 - Services: intangibles, spending on education
- Exception: purchases of new housing

Investment, I

- Purchase of (capital) goods that will be used to produce other goods and services in the future
 - Business capital: business structures, equipment, and intellectual property products
 - Residential capital: landlord's apartment building; a homeowner's personal residence
 - Inventory accumulation

The Components of GDP

Government purchases, G

- Government consumption expenditure and gross investment
- Spending on goods and services
- By local, state, and federal governments
- Does not include transfer payments

Net exports, $NX = \text{Exports} - \text{Imports}$

- Exports
 - Spending on domestically produced goods by foreigners
- Imports
 - Spending on foreign goods by domestic residents

3. Income

A third way to measure GDP in this small economy is to look at what workers and firms earn – their income.

Suppose wages are paid by cup of coffee: \$1/cup.

Then the income earned:

- By workers \$1/cup * 800 cups = \$800
- By cafe owners: the rest of revenue not paid to workers = \$800.
- Total = \$800 + \$800 = \$1,600 again!

$$\underline{Y = W + P + R}$$

- W = wages and salaries
- P = profits
- R = rents

Income-expenditure- production identity

Key identity:

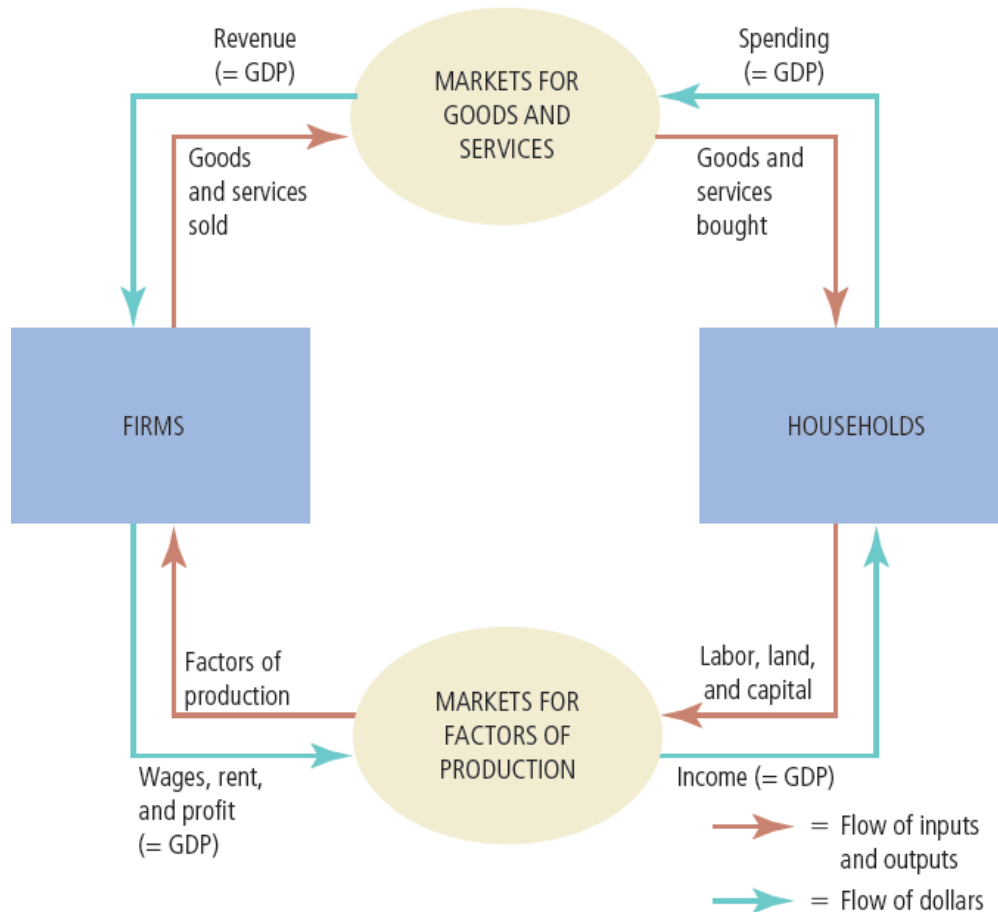
Production \equiv Expenditure \equiv Income

Economy's Income & Expenditure

Circular-flow diagram – assumptions:

- **Markets**
 - Goods and services
 - Factors of production
- **Households**
 - Spend all of their income
 - Buy all goods and services
- **Firms**
 - Pay wages, rent, profit to resource owners

Figure 1 The Circular-Flow Diagram



Households buy goods and services from firms

Firms use their revenue from sales to pay wages to workers, rent to landowners, and profit to firm owners.

GDP equals the total amount spent by households in the market for goods and services.

It also equals the **total wages, rent, and profit** paid by firms in the markets for the factors of production.

Aggregate Output - example

Steel Company (Firm 1)		Car Company (Firm 2)	
Revenues from sales	\$100	Revenues from sales	\$200
Expenses	\$80	Expenses	\$170
Wages	\$80	Wages	\$70
		Steel purchases	\$100
Profit	\$20	Profit	\$30

Consider an economy with two firms, Firm 1 and Firm 2.

Is aggregate output the sum of the values of all goods produced, i.e., \$300? Or just the value of cars, i.e., \$200?

Steel is an **intermediate good**, which is a good used in the production of another good.

Aggregate Output - example

1. GDP is the value of final goods and services produced in the economy during a given period.
 - We want to count only **final goods**, not intermediate goods.
 - If we merge the two firms in the previous example, the revenues of the new firm equal \$200.

Steel and Car Company	
Revenues from sales	\$200
Expenses (wages)	\$150
Profit	\$50

Nominal vs. Real GDP

Nominal GDP is the sum of the quantities of final goods produced times their current price.

Nominal GDP increases for two reasons:

- The production of most goods increases
- The price of most goods increases

Our goal is to measure production and its change over time.

Real GDP is the sum of quantities of final goods times *constant* (not *current*) prices.

Nominal vs. Real GDP - example

Example:

Year	Quantity of Cars	Price of Cars	Nominal GDP	Real GDP (in 2009 dollars)
2008	10	\$20,000	\$200,000	\$240,000
2009	12	\$24,000	\$288,000	\$288,000
2010	13	\$26,000	\$338,000	\$312,000

Real GDP in 2008 (in 2009 dollars) = 10 cars x \$24,000 per car = \$240,000.

Real GDP in 2009 (in 2009 dollars) = 12 cars x \$24,000 per car = \$288,000.

Real GDP in 2010 (in 2009 dollars) = 13 cars x \$24,000 per car = \$312,000.

Nominal vs. Real GDP

For more than one good, relative prices of the goods are natural weights for constructing the weighted average of the output of all final goods.

Real GDP in chained (2009) dollars reflects relative prices that change over time.

The year used to construct prices is called the *base year*.

Nominal vs. Real GDP

Nominal GDP is also called **dollar GDP**, or **GDP in current dollars**.

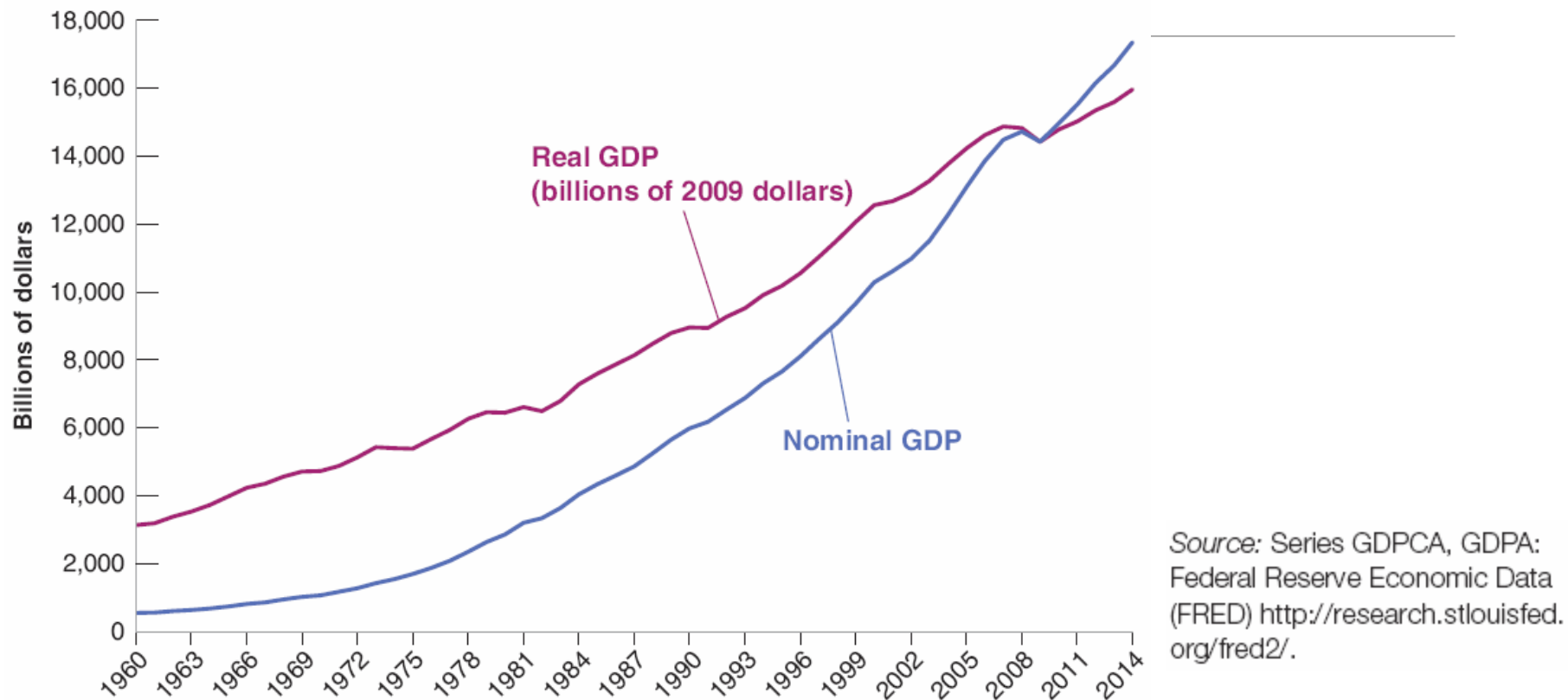
Real GDP is also called **GDP in terms of goods**, **GDP in constant dollars**, **GDP adjusted for inflation**, or **GDP in chained (2009) dollars**, or **GDP in 2009 dollars**.

GDP will refer to *real GDP*.

Y_t will denote *real GDP in year t* .

Nominal GDP and variables in current dollars will be denoted by a dollar sign in front of them, e.g., $\$Y_t$.

Figure 2-1 Nominal and Real U.S. GDP, 1960–2014

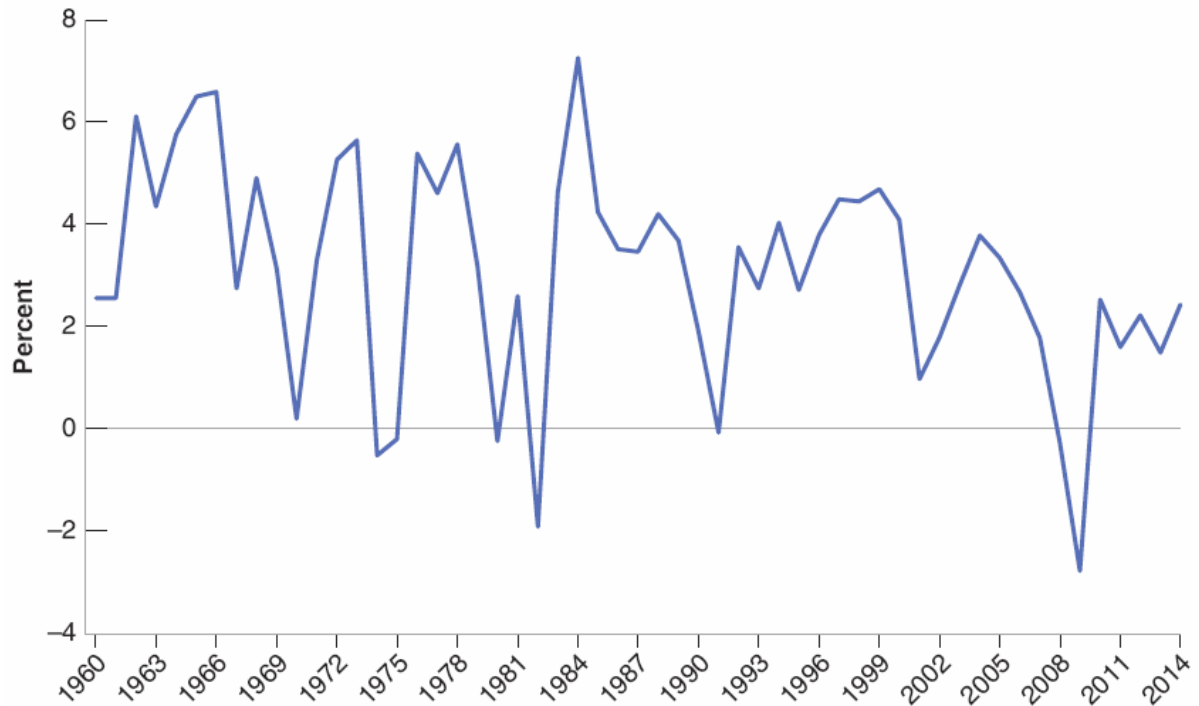


From 1960 and 2014, nominal GDP increased by a factor of 32.

Real GDP increased by a factor of about 5.

Figure 2-2 Growth Rate of U.S. GDP, 1960–2014

Aggregate Output



Source: Calculated using series GDPCA in Figure 2-1.

GDP growth in year t is $(Y_t - Y_{t-1})/Y_{t-1}$.

Since 1960, the U.S. economy has gone through a series of expansions, interrupted by short recessions. The 2008–2009 recession was the most severe recession in the period from 1960 to 2014.

National Income Accounts: Production

National income accounts will use this identity to calculate GDP.
Example:

- a. **Oroweat** is a U.S. company that is in the business of baking different kinds of bread.
 - b. After baking, Oroweat sends the bread to **Bimbo Bakeries**, which is another U.S. company that is in the business of purchasing bread from different bakeries and distributing the product to grocery stores scattered all around the country.
 - c. Walk into your local **Walmart**, and you buy a loaf of whole grain bread made by Oroweat for \$4.
-
1. Production-based accounts use **value added**.

Value added = revenues – purchase of intermediates.

What happens in Oroweat?

1. Oroweat hired factors of production (labor and capital), and rented a space where the bakery is located. Pays \$0.60 for factors of production
2. Needs **intermediate** goods to produce bread (flour, oil, salt...). Spend \$1.20 on these.
3. Sells it to Bimbo Bakery for \$2/loaf.

What is Oroweat's value added?

Oroweat's value added = final sale (\$2.00) – cost of its intermediate products (\$1.20) = *\$0.80 per loaf.*

Is that Oroweat's profit?

Oroweat's profit is \$0.20, after subtracting the cost of the factors of production (labor and capital).



What happens in Bimbo?

1. For Bimbo, the loaf of bread is an **intermediate** good.
2. Likewise, Bimbo will hire labor and capital and other factors of production that are required to distribute bread. Cost of this is \$0.35/loaf.
3. Bimbo Bakeries sells it to your local Walmart for \$2.85.

What is Bimbo's value added?

Bimbo Bakeries' value added = final sale (\$2.85) – cost of intermediate products (\$2.00) = *\$0.85 per loaf*.

What is Bimbo's profit?

\$0.50 is Bimbo Bakeries' profit per loaf after \$0.35 is subtracted for factors of production.



How about in Walmart?



1. For Walmart the loaf of bread purchased from Bimbo Bakeries is an intermediate good.
2. Walmart also employs factors of production to do business. Let's say that the cost of all of its factors of production is \$0.25 per loaf.
3. Remember you paid \$4 for this loaf of bread.

What is Walmart's value added?

Final sale (\$4.00) – cost of intermediate products (\$2.85) = *\$1.15 per loaf*.

What is Walmart's profit?

\$0.90 is Walmart's profit per loaf after subtracting \$0.25 for factors of production.

Summary

Oroweat		
	Cost of intermediate goods	\$1.20
	Final sale	\$2.00
	Value added	\$0.80
Bimbo Bakeries		
	Cost of intermediate goods	\$2.00
	Final sale	\$2.85
	Value added	\$0.85
Walmart		
	Cost of intermediate goods	\$2.85
	Final sale	\$4.00
	Value added	\$1.15

Very important to note - *the sum of all value added generated at each stage must equal the final price of the product:*

$$\$1.15 + \$0.85 + \$1.15 = \$2.80$$

Where's the rest?

The value added by the initial flour, salt, oil... producers: $\$2.80 + \$1.20 = \$4$.

Components of GDP: importance

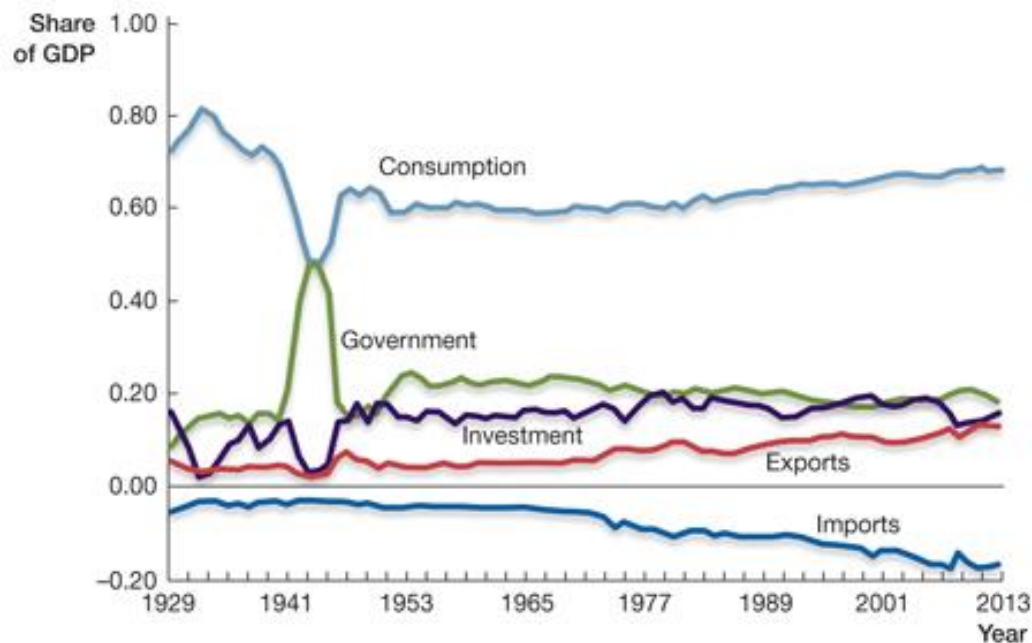


Exhibit 5.4 U.S. GDP Shares (1929–2013)

GDP shares have been relatively constant over time, with the exception of World War II.

Source: Bureau of Economic Analysis, National Income and Product Accounts.

		2019	2019	2019
		Q1	Q2	Q3
1	Gross domestic product	100.0	100.0	100.0
2	Personal consumption expenditures	67.6	68.0	68.1
3	Goods	20.8	21.1	21.2
4	Durable goods	7.0	7.1	7.2
5	Nondurable goods	13.8	14.0	14.0
6	Services	46.8	46.9	47.0
7	Gross private domestic investment	17.9	17.6	17.4
8	Fixed investment	17.4	17.2	17.1
9	Nonresidential	13.7	13.5	13.4
10	Structures	3.1	3.0	2.9
11	Equipment	5.9	5.9	5.7
12	Intellectual property products	4.7	4.7	4.7
13	Residential	3.7	3.7	3.7
14	Change in private inventories	0.5	0.4	0.3
15	Net exports of goods and services	-3.0	-3.1	-3.0
16	Exports	11.9	11.7	11.6
17	Goods	7.9	7.7	7.6
18	Services	4.1	4.0	4.0
19	Imports	14.9	14.8	14.6
20	Goods	12.1	12.0	11.8
21	Services	2.8	2.8	2.8
22	Government consumption expenditures and gross investment	17.5	17.5	17.5
23	Federal	6.6	6.6	6.6
24	National defense	3.9	3.9	3.9
25	Nondefense	2.7	2.7	2.7
26	State and local	10.8	10.9	10.9

**Table 1.1.10.
Percentage
Shares of
Gross
Domestic
Product**

Source: BEA website,
<https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=19&step=2&0=survey>

GDP vs. GNP

Remember GDP: market value of all final good and services produced within the borders of a country in a given period of time.

Regardless of who owned factors of production.

What about production by US factors of production in other countries?

- Eg: General Motors in Mexico.

That is included in GNP.

To calculate GNP from GDP we make the following adjustment:

$$\underline{\text{GNP} = \text{GDP} + \text{income receipts from ROW} - \text{income payments to ROW}}$$

Income receipts from ROW capture production from US factors of production in foreign countries.

Income payments to ROW capture production in the US using foreign factors of production.

Examples

General Motors in Mexico. Included in Mexican GDP and US GNP. (Income from ROW)

US Professor giving a summer course in Italy. (Income from ROW)

Toyota plant in Alabama. (Income to ROW)

European Professor giving a summer course at the NSSR. (Income to ROW)

GDP vs GNP values

What do you think?

- Is GNP higher or lower than GDP? Data in billions of dollars

Table 1.7.5. Relation of Gross Domestic Product, Gross National Product, Net National Product, National Income, and Personal Income

[Billions of dollars] Seasonally adjusted at annual rates

Last Revised on: August 29, 2018 - Next Release Date September 27, 2018



Line		2016				2017				2018	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Gross domestic product (GDP)	18,409.1	18,640.7	18,799.6	18,979.2	19,162.6	19,359.1	19,588.1	19,831.8	20,041.0	20,411.9
2	Plus: Income receipts from the rest of the world	828.7	860.7	854.5	892.6	899.3	924.9	979.6	1,024.5	1,063.2	1,071.7
3	Less: Income payments to the rest of the world	624.6	648.2	656.6	645.8	666.6	708.7	724.6	753.7	794.4	806.5
4	Equals: Gross national product	18,613.3	18,853.3	18,997.5	19,226.0	19,395.3	19,575.4	19,843.0	20,102.6	20,309.8	20,677.0

Retrieved from <https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=19&step=2&0=survey>

For most economies, GDP and GNP are very similar.

What isn't included in GDP?

GDP is not a perfect measure of the overall economic activity.

It leaves out a lot of relevant details.

We still use it, but need to know its limitations.

GDP - problems

GDP – not a perfect measure of well-being

- **Doesn't include**
 - Home production
 - Leisure
 - Value of almost all activity that takes place outside markets
 - Quality of the environment
 - Quality of life
- **Nothing about distribution of income**

Home production

Economists agree it is a flaw but we don't have a good way to assign a market value to home production.

Example: you buy ingredients for \$20 to prepare dinner for 2 at home or go to Momofuku and buy a dinner for 2 for \$40.

What goes into GDP from these 2 transactions?

Home production = Δ GDP by \$20

Momofuku = Δ GDP by \$40

Why is this important? Because it's **sizeable**!

Many people do not have a job outside home (*formal*) and many people who have a job outside also engage in HP.

“Rough” calculation of home production

How much would GDP go up if we were to include the output from these people in GDP?

In 2013 there were 316.4 million people in the US. 144 million had a formal job, 52 million did not.

People without formal jobs engage in
\$20,000/year of HP.

People with formal jobs, \$10,000/year.

How much would GDP go up?

52 million * \$20,000/year + 144 million *

\$10,000/year = \$2.5 trillion

That is 15% of GDP!!!

Capital depreciation

What is depreciation? Used up or consumed capital.

Example: a machine with a useful production life of 10 years. After year 1, $1/10$ of its value is deducted.

This should _____ GDP (increase or decrease?)

But this is NOT taken into account in GDP measures: remember G stands for gross here.

There are measures of **Net Domestic Product**. These are more “guesses” than estimates. NDP is 15% lower than GDP.

Why not take into account decreases in human capital?

Negative Externalities

What is a negative externality?

Any action makes that others worse-off.

Example: A factory located on a river dumps its waste into the river, thereby adversely affecting a fishery located downstream. The factory's output is included in the GDP, but GDP doesn't account for the loss of fish production caused by water pollution.

Mechanisms to ameliorate externalities:

Eg: taxes whereby the factory is required to compensate the fishery for its loss of fish production.



Underground economy.

Leisure

Underground economy: not included because they are illegal activities or because of tax evasion.

We think typically developing economies will have a bigger underground economy.

Leisure: GDP doesn't show how hard citizens worked to produce it.

Example: 2 countries with similar GDP but

In country A workers work 40 hours/week.

In country B workers work 60 hours/week. Who's better-off?

Presumably country A is better-off but we cannot see it in the GDP measure!

Inequality

GDP gives no information on how economic output is distributed.

US and Norway have similar levels of GDP per capita, but US is more unequal. Top 1% in Norway earn 7.8% of income. Top 1% in the US earn 22%.

Very high levels of inequality creates economic, social and political unrest.

Happiness

Often we use GDP per capita as a measure of standards of living. ($\text{GDP pc} = \text{GDP}/\text{population}$)

Does this really capture standards of living? Happiness?

Exhibit 5.6 GDP per Capita and Life Satisfaction

