Measuring National Output and National Income

6

CHAPTER OUTLINE AND LEARNING OBJECTIVES

We saw in the last chapter that macroeconomics is concerned with aggregate output, unemployment, and inflation. In this chapter, we discuss the measurement of aggregate output and inflation. In the next chapter, we discuss the measurement of unemployment. Accurate measures of these variables are critical for understanding the economy. Without good measures, economists would have a hard time analyzing how the economy works and policy makers would have little to guide them on which policies are best for the economy.

Much of the macroeconomic data we use come from the **national income and product accounts**, which are compiled by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. It is hard to overestimate the importance of these accounts. They are, in fact, one of the great inventions of the twentieth century. (See the *Economics in Practice*, p. 141.) They not only convey data about the performance of the economy but also provide a conceptual framework that macroeconomists use to think about how the pieces of the economy fit together. When economists think about the macroeconomy, the categories and vocabulary they use come from the national income and product accounts.

The national income and product accounts can be compared with the mechanical or wiring diagrams for an automobile engine. The diagrams do not explain how an engine works, but they identify the key parts of an engine and show how they are connected. Trying to understand the macroeconomy without understanding national income accounting is like trying to fix an engine without a mechanical diagram and with no names for the engine parts.

national income and product accounts Data collected and published by the government describing the various components of national income and output in the economy.

There are literally thousands of variables in the national income and product accounts. In this chapter, we discuss only the most important. This chapter is meant to convey the way the national income and product accounts represent or organize the economy and the *sizes* of the various pieces of the economy.

6.1 LEARNING OBJECTIVE

Describe GDP fundamentals and differentiate between GDP and GNP.

Gross Domestic Product

The key concept in the national income and product accounts is **gross domestic product (GDP)**.

gross domestic product (GDP) The total market value of all final goods and services produced within a given period by factors of production located within a country.

> GDP is the total market value of a country's output. It is the market value of all final goods and services produced within a given period of time by factors of production located within a country.

U.S. GDP for 2017—the value of all output produced by factors of production in the United States in 2017—was $19,390.6 billion. GDP is a critical concept. Just as an individual firm needs to evaluate the success or failure of its operations each year, so the economy as a whole needs to assess itself. GDP, as a measure of the total production of an economy, provides us with a country's economic report card. Because GDP is so important, we need to take time to explain exactly what its definition means.

Final Goods and Services MyLab Economics Concept Check

final goods and services Goods and services produced for final use.

intermediate goods Goods that are produced by one firm for use in further processing or for resale by another firm.

First, note that the definition refers to **final goods and services**. Many goods produced in the economy are not classified as *final* goods, but instead as intermediate goods. **Intermediate goods** are produced by one firm for use in further processing or for resale by another firm. For example, tires sold to automobile manufacturers are intermediate goods. The chips that go in Apple's iPhone are also intermediate goods. The value of intermediate goods is not counted in GDP.

Why are intermediate goods not counted in GDP? Suppose that in producing a car, General Motors (GM) pays $200 to Goodyear for tires. GM uses these tires (among other components) to assemble a car, which it sells for $24,000. The value of the car (including its tires) is $24,000, not $24,000 + $200. The final price of the car already reflects the value of all its components. To count in GDP both the value of the tires sold to the automobile manufacturers and the value of the automobiles sold to the consumers would result in double counting. It would also lead us to conclude that a decision by GM to produce its own tires rather than buy them from Goodyear leads to a reduction in the value of goods produced by the economy.

value added The difference between the value of goods as they leave a stage of production and the cost of the goods as they entered that stage.

Double counting can also be avoided by counting only the value added to a product by each firm in its production process. The **value added** during some stage of production is the difference between the value of goods as they leave that stage of production and the cost of the goods as they entered that stage. Value added is illustrated in Table 6.1. The four stages of the production of a gallon of gasoline are: (1) oil drilling, (2) refining, (3) shipping, and (4) retail sale. In the first stage, value added is the value of the crude oil. In the second stage, the refiner purchases the oil from the driller, refines it into gasoline, and sells it to the shipper. The refiner pays the driller $3.00 per gallon and charges the shipper $3.30. The value added by the refiner is thus $0.30 per

TABLE 6.1 Value Added in the Production of a Gallon of Gasoline (Hypothetical Numbers)

Stage of Production	Value of Sales	Value Added
(1) Oil drilling	$3.00	$3.00
(2) Refining	3.30	0.30
(3) Shipping	3.60	0.30
(4) Retail sale	4.00	0.40
Total value added		$4.00

gallon. The shipper then sells the gasoline to retailers for $3.60. The value added in the third stage of production is $0.30. Finally, the retailer sells the gasoline to consumers for $4.00. The value added at the fourth stage is $0.40, and the total value added in the production process is $4.00, the same as the value of sales at the retail level. Adding the total values of sales at each stage of production ($3.00 + $3.30 + $3.60 + $4.00 = $13.90) would significantly overestimate the value of the gallon of gasoline.

In calculating GDP, we can sum up the value added at each stage of production or we can take the value of final sales. We do not use the value of total sales in an economy to measure how much output has been produced.

Exclusion of Used Goods and Paper Transactions MyLab Economics Concept Check

GDP is concerned only with new, or current, production. Old output is not counted in current GDP because it was already counted when it was produced. It would be double counting to count sales of used goods in current GDP. If someone sells a used car to you, the transaction is not counted in GDP because no new production has taken place. Similarly, a house is counted in GDP only at the time it is built, not each time it is resold. In short:

GDP does not count transactions in which money or goods changes hands and in which no new goods and services are produced.

Sales of stocks and bonds are not counted in GDP. These exchanges are transfers of ownership of assets, either electronically or through paper exchanges, and do not correspond to current production. What if you sell the stock or bond for more than you originally paid for it? Profits from the stock or bond market have nothing to do with current production, so they are not counted in GDP. However, if you pay a fee to a broker for selling a stock of yours to someone else, this fee is counted in GDP because the broker is performing a service for you. This service is part of current production. Be careful to distinguish between exchanges of stocks and bonds for money (or for other stocks and bonds), which do not involve current production, and fees for performing such exchanges, which do.

Exclusion of Output Produced Abroad by Domestically Owned Factors of Production MyLab Economics Concept Check

GDP is the value of output produced by factors of production *located within a country*.

The three basic factors of production are land, labor, and capital. The output produced by U.S. citizens abroad—for example, U.S. citizens working for a foreign company—is *not* counted in U.S. GDP because the output is not produced within the United States. Likewise, profits earned abroad by U.S. companies are not counted in U.S. GDP. However, the output produced by foreigners working in the United States is counted in U.S. GDP because the output is produced within the United States. Also, profits earned in the United States by foreign-owned companies are counted in U.S. GDP.

It is sometimes useful to have a measure of the output produced by factors of production owned by a country's citizens regardless of where the output is produced. This measure is called **gross national product (GNP)**. For most countries, including the United States, the difference between GDP and GNP is small. In 2017, GNP for the United States was $19,607.4 billion, which is close to the $19,390.6 billion value for U.S. GDP.

gross national product (GNP) The total market value of all final goods and services produced within a given period by factors of production owned by a country's citizens, regardless of where the output is produced.

The distinction between GDP and GNP can be tricky. Consider the Honda plant in Marysville, Ohio. The plant is owned by the Honda Corporation, a Japanese firm, but most of the workers

employed at the plant are U.S. workers. Although all the output of the plant is included in U.S. GDP, only part of it is included in U.S. GNP. The wages paid to U.S. workers are part of U.S. GNP, whereas the profits from the plant are not. The profits from the plant are counted in Japanese GNP because this is output produced by Japanese-owned factors of production (Japanese capital in this case). The profits, however, are not counted in Japanese GDP because they were not earned in Japan.

6.2 LEARNING OBJECTIVE

Explain two methods for calculating GDP.

Calculating GDP

GDP can be computed two ways. One way is to add up the total amount spent on all final goods and services during a given period. This is the **expenditure approach** to calculating GDP. The other way is to add up the income—wages, rents, interest, and profits—received by all factors of production in producing final goods and services. This is the **income approach** to calculating GDP. These two methods lead to the same value for GDP for the reason we discussed in the previous chapter: *Every payment (expenditure) by a buyer is at the same time a receipt (income) for the seller.* We can measure either income received or expenditures made, and we will end up with the same total output.

expenditure approach A method of computing GDP that measures the total amount spent on all final goods and services during a given period.

income approach A method of computing GDP that measures the income—wages, rents, interest, and profits—received by all factors of production in producing final goods and services.

Suppose the economy is made up of just one firm and the firm's total output this year sells for $1 million. Because the total amount spent on output this year is $1 million, this year's GDP is $1 million. (Remember: The expenditure approach calculates GDP on the basis of the total amount spent on final goods and services in the economy.) However, *every one* of the million dollars of GDP either is paid to someone or remains with the owners of the firm as profit. Using the income approach, we add up the wages paid to employees of the firm, the interest paid to those who lent money to the firm, and the rents paid to those who leased land, buildings, or equipment to the firm. What is left over is profit, which is, of course, income to the owners of the firm. If we add up the incomes of all the factors of production, including profits to the owners, we get a GDP of $1 million.

The Expenditure Approach MyLab Economics Concept Check

Recall from the previous chapter the four main groups in the economy: households, firms, the government, and the rest of the world. There are also four main categories of expenditure:

- Personal consumption expenditures (C): household spending on consumer goods
- Gross private domestic investment (I^a): spending by firms and households on new capital, that is, plant, equipment, inventory, and new residential structures[1].
- Government consumption and gross investment (G)
- Net exports ($EX - IM$): net spending by the rest of the world, or exports (EX) minus imports (IM)

The expenditure approach calculates GDP by adding together these four components of spending. It is shown here in equation form:

$$\text{GDP} = C + I^a + G + (EX - IM)$$

personal consumption expenditures (*C*) Expenditures by consumers on goods and services.

durable goods Goods that last a relatively long time, such as cars and household appliances.

nondurable goods Goods that are used up fairly quickly, such as food and clothing.

services The things we buy that do not involve the production of physical things, such as legal and medical services and education.

U.S. GDP was $19,390.6 billion in 2017. The four components of the expenditure approach are shown in Table 6.2, along with their various categories.

Personal Consumption Expenditures (*C*) The largest part of GDP consists of **personal consumption expenditures (*C*)**. Table 6.2 shows that in 2017, the amount of personal consumption expenditures accounted for 69.1 percent of GDP. These are expenditures by consumers on goods and services.

There are three main categories of consumer expenditures: durable goods, nondurable goods, and services. **Durable goods**, such as automobiles, furniture, and household appliances, last a relatively long time. **Nondurable goods**, such as food, clothing, and gasoline, are used up fairly quickly. Payments for **services**—those things we buy that do not involve the production

[1]When we begin the macro theory in Chapter 8, we need to distinguish between actual investment and planned investment. We will use I to denote planned investment, and so in this chapter we will use I^a to denote actual investment so as not to confuse the two. We will see that sometimes planned investment is not equal to actual investment.

ECONOMICS IN PRACTICE

Are Christie's Brokerage Services Counted in GDP?

Christie's is the world's oldest and largest auction house, dealing in fine art, antiques, jewelry, and real estate with 85 offices in over 43 countries. In 2017, seven out of the top-notch ten art works were sold at this British auction house. Each item is simultaneously bidden for via a live platform, online, and through phone orders.

In 2017, the auction art sales at Christie's broke its own worldwide sales record of €5.8 billion. The most significant art piece sold that year was Leonardo da Vinci's masterpiece, *Salvator Mundi* or Savior of the World, which was sold by Russian collector Dmitry Rybolovlev to Louvre Abu Dhabi for over $450 million at Christie's New York auction house. This is the highest price ever paid for an art piece at any auction.

So which country's GDP should da Vinci's sixteenth century masterpiece count as a part of—France, Abu Dhabi, Russia, the United States, or the United Kingdom? Since the painting was commissioned in the early sixteenth century by the French monarch, Louis XII, it was counted as part of France's GDP in the year when it was painted, i.e., 1,500. The sale does not affect either Abu Dhabi or Russia's GDP. However, since Christie's services were rendered on U.S. soil by the British auction house via its New York branch, it would have been recorded as a service brokerage fee in the United States' GDP in 2017. As we shall study later in the chapter, once the brokerage income fee is remitted to the United Kingdom, it is recorded under its

national income or gross national product (GNP). So although masterpieces like these date way back to the early sixteenth century and its valuation does not contribute to current GDP, the cost of getting together interested buyers and getting a lucrative price for it does indeed get counted.

CRITICAL THINKING

1. Would a contemporary painting completed in 2017 and sold by Christie's in the same year be recorded in GDP of 2017? What about a painting painted in 2015?

of physical items—include expenditures for doctors, lawyers, and educational institutions. As Table 6.2 shows, in 2017, durable goods expenditures accounted for 7.6 percent of GDP, nondurables for 14.6 percent, and services for 46.9 percent. Almost half of GDP is now service consumption.

Gross Private Domestic Investment (I^g)

Investment, as we use the term in economics, refers to the purchase of new capital—housing, plants, equipment, and inventory. The economic use of the term is in contrast to its everyday use, where *investment* often refers to purchases of stocks, bonds, or mutual funds.

Total investment in capital by the private sector is called **gross private domestic investment (I^g)**. Expenditures by firms for machines, tools, plants, and so on make up **nonresidential investment**.[1] Because these are goods that firms buy for their own final use, they are part of "final sales" and counted in GDP. Expenditures for new houses and apartment buildings constitute **residential investment**. The third component of gross private domestic investment, the **change in business inventories**, is the amount by which firms' inventories change during a period. Business inventories can be looked at as the goods that firms produce now but intend to sell later. In 2017, gross private domestic investment accounted for 16.6 percent of GDP. Of that, 12.6 percent was nonresidential investment, 3.9 percent was residential investment, and 0.1 percent was change in business inventories.

Change in Business Inventories Why is the change in business inventories considered a component of investment—the purchase of new capital? To run a business most firms hold inventories, in part because they cannot predict exactly how much will be sold each day and want to avoid losing sales by running out of a product. Inventories—goods produced for later sale—are counted as capital because they produce value in the future. An increase in inventories is an increase in capital.

gross private domestic investment (I^g). Total investment in capital—that is, the purchase of new housing, plants, equipment, and inventory by the private (or nongovernment) sector.

nonresidential investment Expenditures by firms for machines, tools, plants, and so on.

residential investment Expenditures by households and firms on new houses and apartment buildings.

change in business inventories The amount by which firms' inventories change during a period. Inventories are the goods that firms produce now but intend to sell later.

TABLE 6.2 Components of U.S. GDP, 2017: The Expenditure Approach

	Billions of Dollars ($)	Percentage of GDP (%)
Personal consumption expenditures (C)	13,395.5	69.1
Durable goods	1,473.8	7.6
Nondurable goods	2,821.5	14.6
Services	9,100.2	46.9
Gross private domestic investment (I^a)	3,212.8	16.6
Nonresidential	2,449.6	12.6
Residential	747.6	3.9
Change in business inventories	15.7	0.1
Government consumption and gross investment (G)	3,353.8	17.3
Federal	1,260.7	6.5
State and local	2,093.2	10.8
Net exports ($EX - IM$)	−571.6	−2.9
Exports (EX)	2,344.0	12.1
Imports (IM)	2,915.6	15.0
Gross domestic product	19390.6	100.0

Note: Numbers may not add exactly because of rounding.
Source: U.S. Bureau of Economic Analysis, March 28, 2018.

MyLab Economics Real-time data

Regarding GDP, remember that it is not the market value of total final *sales* during the period, but rather the market value of total final *production*. The relationship between total production and total sales is as follows:

$$GDP = \text{Final sales} + \text{Change in business inventories}$$

Total production (GDP) equals final sales of domestic goods plus the change in business inventories. In 2017, production in the United States was larger than sales by $15.7 billion. The stock of inventories at the end of 2017 was $15.7 billion *larger* than it was at the end of 2016—the change in business inventories was $15.7 billion.

Gross Investment versus Net Investment During the process of production, capital (especially machinery and equipment) produced in previous periods gradually wears out. GDP includes newly produced capital goods but does not take account of capital goods "consumed" in the production process. As a result, GDP overstates the real production of an economy because it does not account for the part of that production that serves just to replace worn out capital.

depreciation The amount by which an asset's value falls in a given period.

The amount by which an asset's value falls each period is called its **depreciation**.[2] A personal computer purchased by a business today may be expected to have a useful life of 4 years before becoming worn out or obsolete. Over that period, the computer steadily depreciates.

gross investment The total value of all newly produced capital goods (plant, equipment, housing, and inventory) produced in a given period.

net investment Gross investment minus depreciation.

What is the relationship between gross investment (I^a) and depreciation? **Gross investment** is the total value of all newly produced capital goods (plant, equipment, housing, and inventory) produced in a given period. It takes no account of the fact that some capital wears out and must be replaced. **Net investment** is equal to gross investment minus depreciation. Net investment is a measure of how much the stock of capital *changes* during a period. Positive net investment means that the amount of new capital produced exceeds the amount that wears out, and negative net investment means that the amount of new capital produced is less than the amount that wears out. Therefore, if net investment is positive, the capital stock has increased, and if net investment

[1]The distinction between what is considered investment and what is considered consumption is sometimes fairly arbitrary. A firm's purchase of a car or a truck is counted as investment, but a household's purchase of a car or a truck is counted as consumption of durable goods. In general, expenditures by firms for items that last longer than a year are counted as investment expenditures. Expenditures for items that last less than a year are seen as purchases of intermediate goods.

[2]This is the formal definition of economic depreciation. Because depreciation is difficult to measure precisely, accounting rules allow firms to use shortcut methods to approximate the amount of depreciation that they incur each period. To complicate matters even more, the U.S. tax laws allow firms to deduct depreciation for tax purposes under a different set of rules.

ECONOMICS IN PRACTICE

Estimating Depreciation in the National Income and Product Accounts

As we suggest in the text, in order to estimate GDP the government needs to know how much of the economy's new investment is really incremental and how much just replaces worn out stock. But how does the government figure this out?

For some products, the calculation is relatively simple. Depreciation is mostly physical, and we can get some data on when those goods fall apart and are no longer useful. But many other goods, particularly in the high tech area, depreciate not so much from physical wear and tear but because they become obsolete. How is the depreciation of these goods determined?

A paper by four Federal Reserve Board economists takes us through the calculation of depreciation rates for personal computers.[1] Using data on prices and model characteristics for more than 10,000 transactions involving used personal computers, these researchers were able to determine the depreciation rate of personal computers by type. Their results indicated that computers lose roughly half their value with each additional year of use. Most of this depreciation comes from the inability of older models to match the functionality of the newer models. So depreciation comes not so much because the machines cannot do what they always did, but because expectations for what a computer needs to be able to do change over time as new machines enter the workplace.

Interestingly, the estimates of these economists made their way into the depreciation schedules used by the government in constructing the NIPA accounts, showing us the practical importance of macroeconomics.

CRITICAL THINKING

1. If a computer is initially worth $1,000 and loses half of its value per year, what is its value after three years of depreciation? How much depreciation takes place in the third year?

[1]Mark Doms, Wendy Dunn, Stephen Oliner, Daniel SIchel, "How Fast do Personal Computers Depreciate?" in James Poterba, ed, "Tax Policy and the Economy." *MIT Press*, 2007.

is negative, the capital stock has decreased. Put another way, the capital stock at the end of a period is equal to the capital stock that existed at the beginning of the period plus net investment:

$$\text{capital}_{\text{end of period}} = \text{capital}_{\text{beginning of period}} + \text{net investment}$$

Government Consumption and Gross Investment (*G*) **Government consumption and gross investment (*G*)** include expenditures by federal, state, and local governments for final goods (bombs, pencils, school buildings) and services (military salaries, congressional salaries, school teachers' salaries). Some of these expenditures are counted as government consumption, and some are counted as government gross investment. Government transfer payments (Social Security benefits, veterans' disability stipends, and so on) are not included in *G* because these transfers are not purchases of anything currently produced. The payments are not made in exchange for any goods or services. Because interest payments on the government debt are also counted as transfers, they are excluded from GDP on the grounds that they are not payments for current goods or services.

government consumption and gross investment (*G*) Expenditures by federal, state, and local governments for final goods and services.

As Table 6.2 shows, government consumption and gross investment accounted for $3,353.8 billion, or 17.3 percent of U.S. GDP, in 2017. Federal government consumption and gross investment accounted for 6.5 percent of GDP, and state and local government consumption and gross investment accounted for 10.8 percent.

***Net Exports* (*EX* − *IM*)** The value of **net exports (*EX* − *IM*)** is the difference between *exports* (sales to foreigners of U.S.-produced goods and services) and *imports* (U.S. purchases of goods and services from abroad). This figure can be positive or negative. In 2017, the United

net exports (*EX* − *IM*) The difference between exports (sales to foreigners of U.S. produced goods and services) and imports (U.S. purchases of goods and services from abroad). The figure can be positive or negative.

States exported less than it imported, so the level of net exports was negative (–$571.6 billion). Before 1976, the United States was generally a net exporter—exports exceeded imports, so the net export figure was positive.

The reason for including net exports in the definition of GDP is simple. Consumption, investment, and government spending (C, I^a, and G, respectively) include expenditures on goods produced at home and abroad. Therefore, $C + I^a + G$ overstates domestic production because it contains expenditures on foreign-produced goods—that is, imports (IM), which have to be subtracted from GDP to obtain the correct figure. At the same time, $C + I^a + G$ understates domestic production because some of what a nation produces is sold abroad and therefore is not included in C, I^a, or G—exports (EX) have to be added in. If a U.S. firm produces smartphones and sells them in Germany, the smartphones are part of U.S. production and should be counted as part of U.S. GDP.

national income The total income earned by the factors of production owned by a country's citizens.

compensation of employees Includes wages, salaries, and various supplements—employer contributions to social insurance and pension funds, for example—paid to households by firms and by the government.

proprietors' income The income of unincorporated businesses.

rental income The income received by property owners in the form of rent.

corporate profits The income of corporations.

net interest The interest paid by business.

indirect taxes minus subsidies Taxes such as sales taxes, customs duties, and license fees less subsidies that the government pays for which it receives no goods or services in return. Is net revenue received by the government.

net business transfer payments Net transfer payments by businesses to others.

surplus of government enterprises Income of government enterprises.

The Income Approach MyLab Economics Concept Check

We now turn to calculating GDP using the income approach, which looks at GDP in terms of who receives it as income rather than as who purchases it.

We begin with the concept of **national income**, which is defined in Table 6.3. National income is the sum of eight income items. **Compensation of employees**, the largest of the eight items by far, includes wages and salaries paid to households by firms and by the government, as well as various supplements to wages and salaries such as contributions that employers make to social insurance and private pension funds. **Proprietors' income** is the income of unincorporated businesses. **Rental income**, a minor item, is the income received by property owners in the form of rent. **Corporate profits**, the second-largest item of the eight, is the income of corporations. **Net interest** is the interest paid by business. (Interest paid by households and the government is not counted in GDP because it is not assumed to flow from the production of goods and services.)

The sixth item, **indirect taxes minus subsidies**, includes taxes such as sales taxes, customs duties, and license fees less subsidies that the government pays for which it receives no goods or services in return. (Subsidies are like negative taxes.) The value of indirect taxes minus subsidies is thus net revenue received by the government. **Net business transfer payments** are net transfer payments by businesses to others and are thus income of others. The final item is the **surplus of government enterprises**, which is the income of government enterprises. Table 6.3 shows that this item was negative in 2017: government enterprises on net ran at a loss.

National income is the total income of the country, but it is not quite GDP. Table 6.4 shows what is involved in going from national income to GDP. Table 6.4 first shows that in moving from GDP to GNP, we need to add receipts of factor income from the rest of the world and subtract payments of factor income to the rest of the world. National income is income of the country's citizens, not the income of the residents of the country. So we first need to move from GDP to GNP. This, as discussed previously, is a minor adjustment.

TABLE 6.3 National Income, 2017

	Billions of Dollars ($)	Percentage of National Income (%)
National income	16,607.7	100.0
Compensation of employees	10,307.2	62.1
Proprietors' income	1,386.0	8.3
Rental income	743.9	4.5
Corporate profits	2,164.6	13.0
Net interest	586.4	3.5
Indirect taxes minus subsidies	1,268.8	7.6
Net business transfer payments	161.8	1.0
Surplus of government enterprises	−11.0	−0.1

Source: U.S. Bureau of Economic Analysis, March 28, 2018.

TABLE 6.4 GDP, GNP, NNP, and National Income, 2017

	Billions of Dollars ($)
GDP	19,390.6
Plus: Receipts of factor income from the rest of the world	+934.7
Less: Payments of factor income to the rest of the world	−717.9
Equals: GNP	19,607.4
Less: Depreciation	−3,034.7
Equals: Net national product (NNP)	16,572.7
Less: Statistical discrepancy	−(−35.0)
Equals: National income	16,607.7

Source: U.S. Bureau of Economic Analysis, March 28, 2018.

We then need to subtract depreciation from GNP, which is a large adjustment. GNP less depreciation is called **net national product (NNP).** Why is depreciation subtracted? To see why, go back to the example previously in this chapter in which the economy is made up of just one firm and total output (GDP) for the year is $1 million. Assume that after the firm pays wages, interest, and rent, it has $100,000 left. Assume also that its capital stock depreciated by $40,000 during the year. National income includes corporate profits (see Table 6.3), and in calculating corporate profits, the $40,000 depreciation is subtracted from the $100,000, leaving profits of $60,000. So national income does not include the $40,000. When we calculate GDP using the expenditure approach, however, depreciation is not subtracted. We simply add consumption, investment, government spending, and net exports. In our simple example, this is just $1 million. We thus must subtract depreciation from GDP (actually GNP when there is a rest-of-the-world sector) to get national income.

net national product (NNP) Gross national product minus depreciation; a nation's total product minus what is required to maintain the value of its capital stock.

Table 6.4 shows that net national product and national income are the same except for a **statistical discrepancy**, a data measurement error. If the government were completely accurate in its data collection, the statistical discrepancy would be zero. The data collection, however, is not perfect, and the statistical discrepancy is the measurement error in each period. Table 6.4 shows that in 2017, this error was −$35.0 billion, which is small compared to national income of $16,607.7 billion.

statistical discrepancy Data measurement error.

We have so far seen from Table 6.3 the various income items that make up total national income, and we have seen from Table 6.4 how GDP and national income are related. A useful way to think about national income is to consider how much of it goes to households. The total income of households is called **personal income**, and it turns out that almost all of national income is personal income. Table 6.5 shows that of the $16,607.7 billion in national income in 2017, $16,427.3 billion was personal income. The second line in Table 6.5, the amount of national income not going to households, includes the profits of corporations not paid to households in the form of dividends, called the *retained earnings* of corporations. This is income that stays inside corporations for some period rather than going to households, and so it is part of national income but not personal income.

personal income The total income of households.

TABLE 6.5 National Income, Personal Income, Disposable Personal Income, and Personal Saving, 2017

	Billions of Dollars ($)
National income	16,607.7
Less: Amount of national income not going to households	− 180.4
Equals: Personal income	16,427.3
Less: Personal income taxes	− 2,048.3
Equals: Disposable personal income	14,379.0
Less: Personal consumption expenditures	− 13,395.5
Personal interest payments	− 300.5
Transfer payments made by households	− 197.0
Equals: Personal saving	485.9
Personal saving as a percentage of disposable personal income:	3.4%

Source: U.S. Bureau of Economic Analysis, March 28, 2018.

disposable personal income or **after-tax income** Personal income minus personal income taxes. The amount that households have to spend or save.

Personal income is the income received by households before they pay personal income taxes. The amount of income that households have to spend or save is called **disposable personal income,** or **after-tax income** It is equal to personal income minus personal income taxes, as shown in Table 6.5.

personal saving The amount of disposable income that is left after total personal spending in a given period.

Because disposable personal income is the amount of income that households can spend or save, it is an important income concept. Table 6.5 shows there are three categories of spending: (1) personal consumption expenditures, (2) personal interest payments, and (3) transfer payments made by households. The amount of disposable personal income left after total personal spending is **personal saving**. If your monthly disposable income is $500 and you spend $450, you have $50 left at the end of the month. Your personal saving is $50 for the month. Your personal saving level can be negative: If you earn $500 and spend $600 during the month, you have *dissaved* $100. To spend $100 more than you earn, you will have to borrow the $100 from someone, take the $100 from your savings account, or sell an asset you own.

personal saving rate The percentage of disposable personal income that is saved. If the personal saving rate is low, households are spending a large amount relative to their incomes; if it is high, households are spending cautiously.

The **personal saving rate** is the percentage of disposable personal income saved, an important indicator of household behavior. A low saving rate means households are spending a large fraction of their income. As Table 6.5 shows, the U.S. personal saving rate in 2017 was 3.4 percent. Saving rates tend to rise during recessionary periods, when consumers become anxious about their future, and fall during boom times, as pent-up spending demand gets released. In 2005 the saving rate got down to 2.5 percent.

6.3 LEARNING OBJECTIVE

Discuss the difference between real GDP and nominal GDP.

Nominal versus Real GDP

current dollars The current prices that we pay for goods and services.

nominal GDP Gross domestic product measured in current dollars.

We have thus far looked at GDP measured in **current dollars**, or the current prices we pay for goods and services. When we measure something in current dollars, we refer to it as a *nominal* value. **Nominal GDP** is GDP measured in current dollars—all components of GDP valued at their current prices.

In most applications in macroeconomics, however, nominal GDP is not what we are after. It is not a good measure of aggregate output over time. Why? Assume that there is only one good—say, pizza, which is the same quality year after year. In each year 1 and 2, one hundred units (slices) of pizza were produced. Production thus remained the same for year 1 and year 2. Suppose the price of pizza increased from $1.00 per slice in year 1 to $1.10 per slice in year 2. Nominal GDP in year 1 is $100 (100 units × $1.00 per unit), and nominal GDP in year 2 is $110 (100 units × $1.10 per unit). Nominal GDP has increased by $10 even though no more slices of pizza were produced and the quality of the pizza did not improve. If we use nominal GDP to measure growth, we can be misled into thinking production has grown when all that has really happened is a rise in the price level (inflation).

If there were only one good in the economy—for example, pizza—it would be easy to measure production and compare one year's value to another's. We would add up all the pizza slices produced each year. In the example, production is 100 in both years. If the number of slices had increased to 105 in year 2, we would say production increased by 5 slices between year 1 and year 2, which is a 5 percent increase. Alas, however, there is more than one good in the economy which makes adjusting for price changes more complex.

The following is a discussion of how the BEA adjusts nominal GDP for price changes. As you read the discussion, you will see that this adjustment is not easy. Even in an economy of just apples and oranges, it would not be obvious how to add up apples and oranges to get an overall measure of output. The BEA's task is to add up thousands of goods, each of whose price is changing over time.

weight The importance attached to an item within a group of items.

In the following discussion, we will use the concept of a **weight**, either price weights or quantity weights. What is a weight? It is easiest to define the term by an example. Suppose in your economics course there is a final exam and two other tests. If the final exam counts for one-half of the grade and the other two tests for one-fourth each, the "weights" are one-half, one-fourth, and one-fourth. If instead the final exam counts for 80 percent of the grade and the other two tests for 10 percent each, the weights are 0.8, 0.1, and 0.1. The more important an item is in a group, the larger its weight.

ECONOMICS IN PRACTICE

GDP: One of the Great Inventions of the 20th Century

As the 20th century drew to a close, the U.S. Department of Commerce embarked on a review of its achievements. At the conclusion of this review, the Department named the development of the national income and product accounts as "its achievement of the century."

J. Steven Landefeld *Director, Bureau of Economic Analysis*

While the GDP and the rest of the national income accounts may seem to be arcane concepts, they are truly among the great inventions of the twentieth century.

Paul A. Samuelson and William D. Nordhaus

GDP! The right concept of economy-wide output, accurately measured. The U.S. and the world rely on it to tell where we are in the business cycle and to estimate long-run growth. It is the centerpiece of an elaborate and indispensable system of social accounting, the national income and product accounts. This is surely the single most innovative achievement of the Commerce Department in the 20th century. I was fortunate to become an economist in the 1930s when Kuznets, Nathan, Gilbert, and Jaszi were creating this most important set of economic time series. In economic theory, macroeconomics was just beginning at the same time. Complementary, these two innovations deserve much credit for the improved performance of the economy in the second half of the century.

James Tobin

From The *Survey of Current Business*

Prior to the development of the NIPAs [national income and product accounts], policy makers had to guide the economy using limited and fragmentary information about the state of the economy. The Great Depression underlined the problems of incomplete data and led to the development of the national accounts:

One reads with dismay of Presidents Hoover and then Roosevelt designing policies to combat the Great Depression of the 1930s on the basis of such sketchy data as stock price indices, freight car loadings, and incomplete indices of industrial production. The fact was that comprehensive measures of national income and output did not exist at the time. The Depression, and with it the growing role of government in the economy, emphasized the need for such measures and led to the development of a comprehensive set of national income accounts.

Richard T. Froyen

In response to this need in the 1930s, the Department of Commerce commissioned Nobel laureate Simon Kuznets of the National Bureau of Economic Research to develop a set of national economic accounts.… Professor Kuznets coordinated the work of researchers at the National Bureau of Economic Research in New York and his staff at Commerce. The original set of accounts was presented in a report to Congress in 1937 and in a research report, *National Income, 1929–35*.

The national accounts have become the mainstay of modern macroeconomic analysis, allowing policy makers, economists, and the business community to analyze the impact of different tax and spending plans, the impact of oil and other price shocks, and the impact of monetary policy on the economy as a whole and on specific components of final demand, incomes, industries, and regions.

CRITICAL THINKING

1. The articles emphasize the importance of being able to measure an economy's output to improve government policy. Looking at recent news, can you identify one economic policy debate or action that referenced GDP?

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Washington, DC." *Survey of Current Business*, January 2000, pp. 6–9.

Calculating Real GDP MyLab Economics Concept Check

Nominal GDP adjusted for price changes is called *real GDP*. All the main issues involved in computing real GDP can be discussed using a simple three-good economy and 2 years. Table 6.6 presents all the data that we will need. The table presents price and quantity data for 2 years and three goods. The goods are labeled *A*, *B*, and *C*, and the years are labeled 1 and 2. *P* denotes price, and *Q* denotes quantity. Keep in mind that everything in the following discussion, including the discussion of the GDP deflation, is based on the numbers in Table 6.6. Nothing has been brought in from the outside. The table is the entire economy.

The first thing to note from Table 6.6 is that *nominal output*—in current dollars—in year 1 for good *A* is the number of units of good *A* produced in year 1 (6) times the price of good *A* in year 1 ($0.50), which is $3.00. Similarly, nominal output in year 1 is $7 \times \$0.30 = \$2.10$ for good *B* and $10 \times \$0.70 = \$7.00$ for good *C*. The sum of these three amounts, $12.10 in column 5, is nominal GDP in year 1 in this simple economy. Nominal GDP in year 2—calculated by using the year 2 quantities and the year 2 prices—is $19.20 (column 8). Nominal GDP has risen from $12.10 in year 1 to $19.20 in year 2, an increase of 58.7 percent.[3]

You can see that the price of each good changed between year 1 and year 2—the price of good *A* fell (from $0.50 to $0.40) and the prices of goods *B* and *C* rose (*B* from $0.30 to $1.00; *C* from $0.70 to $0.90). Some of the change in nominal GDP between years 1 and 2 is as a result of price changes and not production changes. How much can we attribute to price changes and how much to production changes? Here things get tricky. The procedure that the BEA used before 1996 was to pick a **base year** and to use the prices in that base year as weights to calculate real GDP. This is a **fixed-weight procedure** because the weights used, which are the prices, are the same for all years—namely, the prices that prevailed in the base year.

base year The year chosen for the weights in a fixed-weight procedure.

fixed-weight procedure A procedure that uses weights from a given base year.

Let us use the fixed-weight procedure and year 1 as the base year, which means using year 1 prices as the weights. Then in Table 6.6, real GDP in year 1 is $12.10 (column 5) and real GDP in year 2 is $15.10 (column 6). Note that both columns use year 1 prices and that nominal and real GDP are the same in year 1 because year 1 is the base year. Real GDP has increased from $12.10 to $15.10, an increase of 24.8 percent.

Let us now use the fixed-weight procedure and year 2 as the base year, which means using year 2 prices as the weights. In Table 6.6, real GDP in year 1 is $18.40 (column 7) and real GDP in year 2 is $19.20 (column 8). Note that both columns use year 2 prices and that nominal and real GDP are the same in year 2, because year 2 is the base year. Real GDP has increased from $18.40 to $19.20, an increase of 4.3 percent.

This example shows that growth rates can be sensitive to the choice of the base year—24.8 percent using year 1 prices as weights and 4.3 percent using year 2 prices as weights. For many policy decisions, the growth rates of the economy play an important role so that large differences coming from a seemingly arbitrary choice of base year is troubling. The old BEA procedure

TABLE 6.6 A Three-Good Economy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Production		Price per Unit					
	Year 1 Q_1	Year 2 Q_2	Year 1 P_1	Year 2 P_2	GDP in Year 1 in Year 1 Prices $P_1 \times Q_1$	GDP in Year 2 in Year 1 Prices $P_1 \times Q_2$	GDP in Year 1 in Year 2 Prices $P_2 \times Q_1$	GDP in Year 2 in Year 2 Prices $P_2 \times Q_2$
Good *A*	6	11	$0.50	$0.40	$ 3.00	$ 5.50	$ 2.40	$ 4.40
Good *B*	7	4	0.30	1.00	2.10	1.20	7.00	4.00
Good *C*	10	12	0.70	0.90	7.00	8.40	9.00	10.80
Total					$12.10 Nominal GDP in Year 1	$15.10	$18.40	$19.20 Nominal GDP in Year 2

[3]The percentage change is calculated as $[(19.20 - 12.10)/12.10] \times 100 = .587 \times 100 = 58.7$ percent.

simply picked one year as the base year and did all the calculations using the prices in that year as weights. The new BEA procedure makes two important changes. The first (using the current example) is to take the average of the two years' price changes, in other words, to "split the difference" between 24.8 percent and 4.3 percent. What does "splitting the difference" mean? One way is to take the average of the two numbers, which is 14.55 percent. What the BEA does is to take the *geometric* average, which for the current example is 14.09 percent.[4] These two averages (14.55 percent and 14.09 percent) are quite close, and the use of either would give similar results. The point here is not that the geometric average is used, but that the first change is to split the difference using some average. When prices are going up, this procedure will lower the estimates of real growth rates relative to the use of year 1 as a base year, and conversely when prices are falling. Note that this new procedure requires two "base" years because 24.8 percent was computed using year 1 prices as weights and 4.3 percent was computed using year 2 prices as weights.

The second BEA change is to use years 1 and 2 as the base years when computing the percentage change between years 1 and 2, then use years 2 and 3 as the base years when computing the percentage change between years 2 and 3, and so on. The two base years change as the calculations move through time. The series of percentage changes computed this way is taken to be the series of growth rates of real GDP. So in this way, nominal GDP is adjusted for price changes. To make sure you understand this, review the calculations in Table 6.6, which provides all the data you need to see what is going on.

Calculating the GDP Deflator MyLab Economics Concept Check

We now switch gears from real GDP, a quantity measure, to the GDP deflator, a price measure. One of economic policy makers' goals is to keep changes in the overall price level small. For this reason, policy makers not only need good measures of how real output is changing but also good measures of how the overall price level is changing. The GDP deflator is one measure of the overall price level. We can use the data in Table 6.6 to show how the BEA computes the GDP deflator.

In Table 6.6, the price of good *A* fell from \$0.50 in year 1 to \$0.40 in year 2, the price of good *B* rose from \$0.30 to \$1.00, and the price of good *C* rose from \$0.70 to \$0.90. If we are interested only in how individual prices change, this is all the information we need. However, if we are interested in how the overall price *level* changes, we need to weight the individual prices in some way. Is it getting more expensive to live in this economy or less expensive? In this example that clearly depends on how people spend their incomes. So, the obvious weights to use are the quantities produced, but which quantities—those of year 1 or year 2? The same issues arise here for the quantity weights as for the price weights in computing real GDP.

Let us first use the fixed-weight procedure and year 1 as the base year, which means using year 1 quantities as the weights. Then in Table 6.6, the "bundle" price in year 1 is \$12.10 (column 5) and the bundle price in year 2 is \$18.40 (column 7). Both columns use year 1 quantities. The bundle price has increased from \$12.10 to \$18.40, an increase of 52.1 percent.

Next, use the fixed-weight procedure and year 2 as the base year, which means using year 2 quantities as the weights. Then the bundle price in year 1 is \$15.10 (column 6), and the bundle price in year 2 is \$19.20 (column 8). Both columns use year 2 quantities. The bundle price has increased from \$15.10 to \$19.20, an increase of 27.2 percent.

This example shows that overall price increases can be sensitive to the choice of the base year: 52.1 percent using year 1 quantities as weights and 27.2 percent using year 2 quantities as weights. Again, the old BEA procedure simply picked one year as the base year and did all the calculations using the quantities in the base year as weights. First, the new procedure splits the difference between 52.1 percent and 27.2 percent by taking the geometric average, which is 39.1 percent. Second, it uses years 1 and 2 as the base years when computing the percentage change between years 1 and 2, years 2 and 3 as the base years when computing the percentage change between years 2 and 3, and so on. The series of percentage changes computed this way is taken to be the series of percentage changes in the GDP deflator, that is, a series of inflation rates.

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[4]The geometric average is computed as the square root of 124.8×104.3, which is 114.09.

The Problems of Fixed Weights MyLab Economics Concept Check

To see why the BEA switched to the new procedure, let us consider a number of problems using fixed-price weights to compute real GDP. First, 1987 price weights, the last price weights the BEA used before it changed procedures, are not likely to be accurate for, say, 2014. Many structural changes took place in the U.S. economy between 1987 and 2014, and it seems unlikely that 1987 prices are good weights to use for this much later period.

Another problem is that the use of fixed-price weights does not account for the responses in the economy to supply shifts. Perhaps bad weather leads to a lower production of oranges in year 2. In a simple supply-and-demand diagram for oranges, this corresponds to a shift of the supply curve to the left, which leads to an increase in the price of oranges and a decrease in the quantity demanded. As consumers move up the demand curve, they are substituting away from oranges. If technical advances in year 2 result in cheaper ways of producing computers, the result is a shift of the computer supply curve to the right, which leads to a decrease in the price of computers and an increase in the quantity demanded. Consumers are substituting toward computers. (You should be able to draw supply-and-demand diagrams for both cases.) Table 6.6 shows this tendency. The quantity of good *A* rose between years 1 and 2 and the price decreased (the computer case), whereas the quantity of good *B* fell and the price increased (the orange case). The computer supply curve has been shifting to the right over time, primarily because of technical advances. The result has been large decreases in the price of computers and large increases in the quantity demanded.

To see why these responses pose a problem for the use of fixed-price weights, consider the data in Table 6.6. Because the price of good *A* was higher in year 1, the increase in production of good *A* is weighted more if we use year 1 as the base year than if we used year 2 as the base year. Also, because the price of good *B* was lower in year 1, the decrease in production of good *B* is weighted less if we use year 1 as the base year. These effects make the overall change in real GDP larger if we use year 1 price weights than if we use year 2 price weights. Using year 1 price weights ignores the kinds of substitution responses discussed in the previous paragraph and leads to what many believe are too-large estimates of real GDP changes. In the past, the BEA tended to move the base year forward about every 5 years, resulting in the past estimates of real GDP growth being revised downward. It is undesirable to have past growth estimates change simply because of the change to a new base year. The new BEA procedure avoids many of these fixed-weight problems.

Similar problems arise when using fixed-quantity weights to compute price indexes. For example, the fixed-weight procedure ignores the substitution away from goods whose prices are increasing and toward goods whose prices are decreasing or increasing less rapidly. The procedure tends to overestimate the increase in the overall price level. As discussed in the next chapter, there are still a number of price indexes that are computed using fixed weights. The GDP deflator differs because it does not use fixed weights. It is also a price index for all the goods and services produced in the economy. Other price indexes cover fewer domestically produced goods and services but also include some imported (foreign-produced) goods and services.

It should finally be stressed that there is no "right" way of computing real GDP. The economy consists of many goods, each with its own price, and there is no exact way of adding together the production of the different goods. We can say that the BEA's new procedure for computing real GDP avoids the problems associated with the use of fixed weights, and it seems to be an improvement over the old procedure. We will see in the next chapter, however, that the consumer price index (CPI)—a widely used price index—is still computed using fixed weights.

6.4 LEARNING OBJECTIVE

Discuss the limitations of using GDP to measure well-being.

Limitations of the GDP Concept

We generally think of increases in GDP as good. Increasing GDP (or preventing its decrease) is usually considered one of the chief goals of the government's macroeconomic policy. But there are some limitations to the use of GDP as a measure of welfare.

GDP and Social Welfare MyLab Economics Concept Check

If crime levels went down, society would be better off, but a decrease in crime is not an increase in output and is not reflected in GDP. Neither is an increase in leisure time. Yet to the extent that households want extra leisure time (instead of having it forced on them by a lack of jobs

in the economy), an increase in leisure is also an increase in social welfare. Furthermore, some increases in social welfare are associated with a *decrease* in GDP. An increase in leisure during a time of full employment, for example, leads to a decrease in GDP because less time is spent on producing output.

Most nonmarket and domestic activities, such as housework and child care, are not counted in GDP even though they amount to real production. However, if I decide to send my children to day care or hire someone to clean my house or drive my car for me, GDP increases. The salaries of day care staff, cleaning people, and chauffeurs are counted in GDP, but the time I spend doing the same things is not counted. A mere change of institutional arrangements, even though no more output is being produced, can show up as a change in GDP.

Furthermore, GDP seldom reflects losses or social ills. GDP accounting rules do not adjust for production that pollutes the environment. The more production there is, the larger the GDP, regardless of how much pollution results in the process. GDP also has nothing to say about the distribution of output among individuals in a society. It does not distinguish, for example, between the case in which most output goes to a few people and the case in which output is evenly divided among all people.

The Informal Economy MyLab Economics Concept Check

Many transactions are missed in the calculation of GDP even though, in principle, they should be counted. Most illegal transactions are missed unless they are "laundered" into legitimate business. Income that is earned but not reported as income for tax purposes is usually missed, although some adjustments are made in the GDP calculations to take misreported income into account. The part of the economy that should be counted in GDP but is not is sometimes called the **informal economy**.

informal economy The part of the economy in which transactions take place and in which income is generated that is unreported and therefore not counted in GDP.

ECONOMICS IN PRACTICE

An Alternative to GDP: The Human Development Index

GDP and GNI are often used as indicators of economic welfare. However, there is some dissatisfaction with both as measures of a nation's overall well-being. During the second half of the 20th century, debates about the various dimensions of economic development led to the creation, in 1990, of a new indicator—the Human Development Index (HDI). First introduced by the United Nations Development Program, an international development agency, it is now widely used to compare well-being across nations.

Comparing country classifications based on GNI per capita and HDI yields interesting results. While the two are strongly correlated, since the HDI already incorporates the GNI, some high-income countries exhibit lower HDI scores than lower-income countries. Norway, a small high-income country, has consistently topped the HDI chart while having a lower gross national income than other countries such as Singapore or Kuwait. However, it neglects important aspects of a country's well-being, such as human rights or political participation. It also provides only aggregate country-level measures and not the distribution of wellbeing within countries, leading some economists to propose alternatives like a "household-based HDI."[1]

CRITICAL THINKING

1. What are the other aspects of a nation's well-being you think are missing from both HDI and GDP (or GNI) measures?

[1]Kenneth Harttgen and Stephan Klasen, "A Household-Based Human Development Index," *Proceedings of the German Development Economics Conference*, Hannover 2010, No. 30.

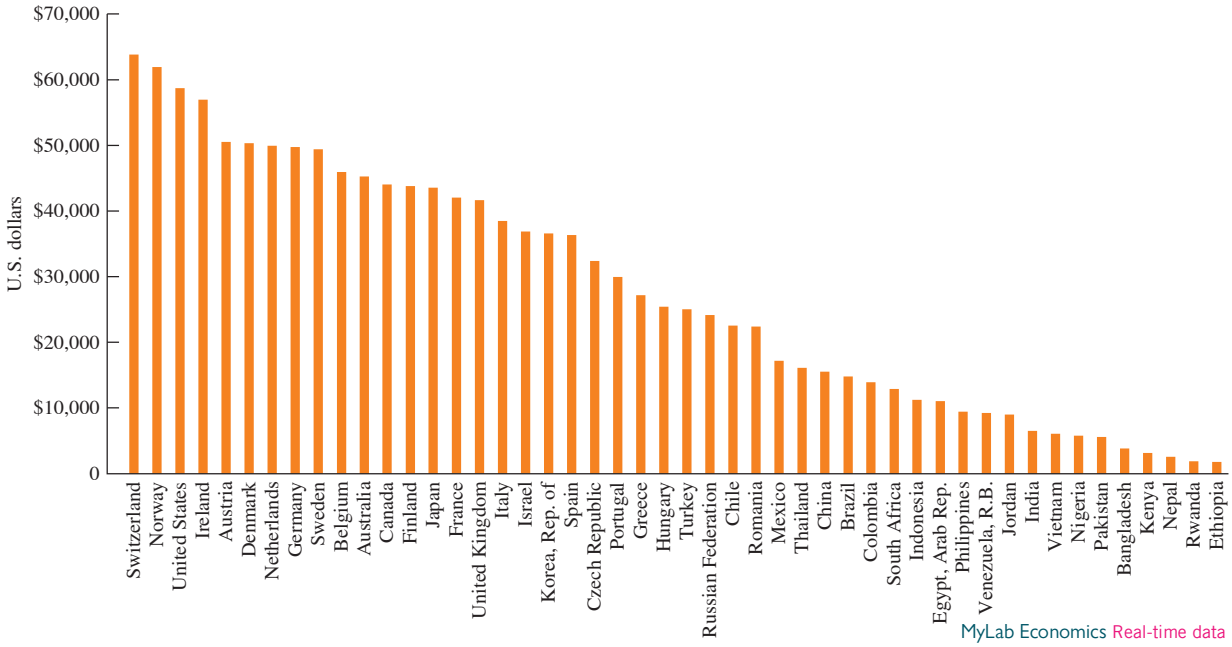
Tax evasion is usually thought to be one of the major incentives for people in developed countries to participate in the informal economy. Studies estimate the size of the U.S. informal economy at about 10 percent, whereas Europe is closer to 20 percent. In the developing world, for a range of reasons, the informal economy is much larger, particularly for women workers. In Latin America and Africa, it is estimated that the informal economy comprises well more than a third of GDP in many nations.[5]

Why should we care about the informal economy? To the extent that GDP reflects only a part of economic activity instead of a complete measure of what the economy produces, it is misleading. Unemployment rates, for example, may be lower than officially measured if people work in the informal economy without reporting this fact to the government. Also, if the size of the informal economy varies among countries—as it does—we can be misled when we compare GDP among countries. For example, Italy's GDP would be much higher if we considered its informal sector as part of the economy, and Switzerland's GDP would change very little.

Gross National Income per Capita MyLab Economics Concept Check

gross national income (GNI) GNP converted into dollars using an average of currency exchange rates over several years adjusted for rates of inflation.

Making comparisons across countries is difficult because such comparisons need to be made in a single currency, generally U.S. dollars. Converting GNP numbers for Japan into dollars requires converting from yen into dollars. Because exchange rates can change quite dramatically in short periods of time, such conversions are tricky. Recently, the World Bank adopted a new measuring system for international comparisons. The concept of **gross national income (GNI)** is GNP converted into dollars using an average of currency exchange rates over several years adjusted for rates of inflation. Figure 6.1 lists the gross national income per capita (GNI divided by population) for various countries in 2016. Of the countries in the figure, Switzerland had the highest per capita GNI, followed by Norway, the United States, and Ireland. Ethiopia was estimated to have per capita GNI of only $1,730 in 2016. This compares to $63,810 for Switzerland.



▲ **FIGURE 6.1 Per Capita Gross National Income for Selected Countries, 2016**

Source: Data from GNI per capita, PPP (current international $), The World Bank Group, Retrieved from **http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD**

[5]Jacques Chermes, "The Informal Economy," *Journal of Applied Economic Research*, 2012.

Looking Ahead

This chapter has introduced many key variables in which macroeconomists are interested, including GDP and its components. There is much more to be learned about the data that macroeconomists use. In the next chapter, we will discuss the data on employment, unemployment, and the labor force. In Chapter 10, we will discuss the data on money and interest rates. Finally, in Chapter 19, we will discuss in more detail the data on the relationship between the United States and the rest of the world.

SUMMARY

1. One source of data on the key variables in the macroeconomy is the *national income and product accounts*. These accounts provide a conceptual framework that macroeconomists use to think about how the pieces of the economy fit together.

6.1 GROSS DOMESTIC PRODUCT *p. 132*

2. *Gross domestic product* (*GDP*) is the key concept in national income accounting. GDP is the total market value of all final goods and services produced within a given period by factors of production located within a country. GDP excludes *intermediate goods*. To include goods when they are purchased as inputs and when they are sold as final products would be double counting and would result in an overstatement of the value of production.
3. GDP excludes all transactions in which money or goods change hands but in which no new goods and services are produced. GDP includes the income of foreigners working in the United States and the profits that foreign companies earn in the United States. GDP excludes the income of U.S. citizens working abroad and profits earned by U.S. companies in foreign countries.
4. *Gross national product* (*GNP*) is the market value of all final goods and services produced during a given period by factors of production owned by a country's citizens.

6.2 CALCULATING GDP *p. 134*

5. The *expenditure approach* to GDP adds up the amount spent on all final goods and services during a given period. The four main categories of expenditures are *personal consumption expenditures* (*C*), *gross private domestic investment* (*I*), *government consumption and gross investment* (*G*), and *net exports* (*EX* − *IM*). The sum of these categories equals GDP.
6. The three main components of *personal consumption expenditures* (*C*) are *durable goods*, *nondurable goods*, and *services*.
7. *Gross private domestic investment* (*I*) is the total investment made by the private sector in a given period. There are three kinds of investment: *nonresidential investment*, *residential investment*, and *changes in business inventories*. Gross investment does not take *depreciation*—the decrease in the value of assets—into account. *Net investment* is equal to gross investment minus depreciation.
8. *Government consumption and gross investment* (*G*) include expenditures by state, federal, and local governments for final goods and services. The value of *net exports* (*EX* − *IM*) equals the differences between exports (sales to foreigners of U.S.-produced goods and services) and imports (U.S. purchases of goods and services from abroad).
9. Because every payment (expenditure) by a buyer is a receipt (income) for the seller, GDP can be computed in terms of who receives it as income—the *income approach* to calculating gross domestic product.
10. GNP minus depreciation is *net national product* (*NNP*). *National income* is the total amount earned by the factors of production in the economy. It is equal to NNP except for a statistical discrepancy. *Personal income* is the total income of households. *Disposable personal income* is what households have to spend or save after paying their taxes. The *personal saving rate* is the percentage of disposable personal income saved instead of spent.

6.3 NOMINAL VERSUS REAL GDP *p. 140*

11. GDP measured in current dollars (the current prices that one pays for goods) is *nominal GDP*. If we use nominal GDP to measure growth, we can be misled into thinking that production has grown when all that has happened is a rise in the price level, or inflation. A better measure of production is *real GDP*, which is nominal GDP adjusted for price changes.
12. The GDP deflator is a measure of the overall price level.

6.4 LIMITATIONS OF THE GDP CONCEPT *p. 144*

13. We generally think of increases in GDP as good, but some problems arise when we try to use GDP as a measure of happiness or well-being. The peculiarities of GDP accounting mean that institutional changes can change the value of GDP even if real production has not changed. GDP ignores most social ills, such as pollution. Furthermore, GDP tells us nothing about what kinds of goods are being produced or how income is distributed across the population. GDP also ignores many transactions of the *informal economy*.
14. The concept of *gross national income* (*GNI*) is GNP converted into dollars using an average of currency exchange rates over several years adjusted for rates of inflation.

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