CHAPTER 11

Measuring a Nation's Production and Income

The methods our government uses today to measure our economy, which we will study in this chapter, were developed in the 1930s. Before then, the government had only the most fragmented data to measure the size of the economy and how it grew over time. Thus, when the Great Depression devastated the U.S. economy, the government was ill-prepared to assess the damage. But from the 1930s to the end of the twentieth century, as it developed our national income and product accounts, the government refined our statistical measures and improved both their accuracy and their timeliness for policymakers.

As we enter the twenty-first century, however, we need to ask whether we are still measuring the right things. The United States Department of Commerce, the government agency that prepares the national income and product accounts, has experimented over time with alternative statistical measures to capture changes in our well-being more accurately. In the 1990s, it developed additional accounts that tried to take into consideration some of the environmental impacts of economic growth. It also took a closer look at work performed inside the household, such as child care, cleaning, and food preparation, which is not included in our standard measures of economic activity. But does our current approach address the most important issues for a society? In particular, does it measure our total happiness or satisfaction?

In recent years, economists and psychologists have tried innovative approaches to measure total happiness and track it over time. They focus on how individuals allocate their time to different activities and how much subjective satisfaction they enjoy from each of these activities. This approach can, in principle, inform us about trends in societal happiness over time or perhaps even allow us to compare societies in terms of their happiness. However, this work is in its early stages. Today, economists, the press, and the public still focus their attention on the traditional measures of economic growth.

APPLYING THE CONCEPTS

1. How can we use economic analysis to compare the size of a major corporation to the size of a country?
   Using Value Added to Measure the True Size of Wal-Mart
2. Can we use nonmarket factors to refine our measures of GDP?
   The Environment, Household Production, and GDP
3. Do increases in gross domestic product necessarily translate into improvements in the welfare of citizens?
   The Links Between Self-Reported Happiness and GDP

• **macroeconomics**
The study of the nation's economy as a whole; focuses on the issues of inflation, unemployment, and economic growth.

• **inflation**
Sustained increases in the average prices of all goods and services.

This chapter begins your study of **macroeconomics**: the branch of economics that deals with a nation's economy as a whole. Macroeconomics focuses on the economic issues—unemployment, inflation, growth, trade, and the gross domestic product—that are most often discussed in newspapers, on the radio and television, and on the Internet.

Macroeconomic issues lie at the heart of political debates. In fact, all presidential candidates learn a quick lesson in macroeconomics. Namely, their prospects for reelection will depend on how well the economy performs during their term in office. If voters believe the economy has performed well, the president will be reelected. Democrat Jimmy Carter as well as Republican George H. W. Bush failed in their bids for reelection in 1980 and 1992, respectively, partly because of voters' macroeconomic concerns. Both Republican Ronald Reagan in 1984 and Democrat Bill Clinton in 1996 won reelection easily because voters believed the economy was performing well in their first terms. Public opinion polling shows that presidential popularity rises and falls with the performance of the economy.

Macroeconomic events profoundly affect our everyday lives. For example, if the economy fails to create enough jobs, workers will become unemployed throughout the country, and millions of lives will be disrupted. Similarly, slow economic growth means that living standards will not increase rapidly. If prices for goods begin rising rapidly, some people will find it difficult to maintain their lifestyles.

This chapter and the next will introduce you to the concepts you need in order to understand what macroeconomics is all about. In this chapter, we'll focus on a nation's production and income. We'll learn how economists measure the income and production for an entire country and how they use these measures. In the next chapter, we'll look carefully at unemployment and inflation. Both chapters will explain the terms the media often uses when reporting economic information.

Macroeconomics focuses on two basic issues: long-run economic growth and economic fluctuations. We need to understand what happens during the long run to understand the factors behind the rise in living standards in modern economies. Today, living standards are much higher in the United States than they were for our grandparents. Living standards are also much higher than those of millions of people throughout the globe. Although living standards have improved over time, the economy has not always grown smoothly. Economic performance has fluctuated over time. During periods of slow economic growth, not enough jobs are created, and large numbers of workers become unemployed. Both the public and policymakers become concerned about the lack of jobs and the increase in unemployment.

At other times, unemployment may not be a problem, but we become concerned that the prices of everything that we buy seem to increase rapidly. Sustained increases in prices are called **inflation**. We'll explore inflation in the next chapter.

11.1 THE "FLIP" SIDES OF MACROECONOMIC ACTIVITY: PRODUCTION AND INCOME

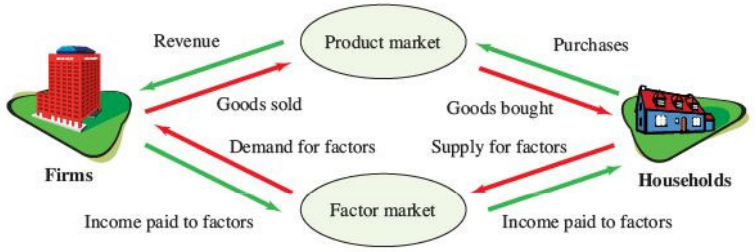
Before we can study growth and fluctuations, we need to have a basic vocabulary and understanding of some key concepts. We begin with the terms *production* and *income* because these are the "flip" sides of the macroeconomic "coin," so to speak. Every day, men and women go off to work, where they produce or sell merchandise or provide services. At the end of the week or month, they return home with their paychecks or "income." They spend some of that money on other products and services, which are produced by other people. In other words, production leads to income, and income leads to production.

But this chapter really isn't about production and income of individuals in markets. That's what a microeconomist studies. On the contrary, this chapter is about the production and income of the economy *as a whole*. From a "big picture" perspective, we will look at certain measures that will tell us how much the economy is producing

and how well it is growing. We will also be able to measure the total income generated in the economy and how this income flows back to workers and investors. These two measures—a country's production and income—are critical to a nation's economic health. Macroeconomists collect and analyze production and income data to understand how many people will find jobs and whether their living standards are rising or falling. Government officials use the data and analysis to develop economic policies.

The Circular Flow of Production and Income

Let's begin with a simple diagram known as the *circular flow*, shown in Figure 11.1. We'll start with a very simple economy that does not have a government or a foreign sector. Households and firms make transactions in two markets known as *factor markets* and *product markets*. In factor, or input, markets, households supply labor to firms. Households are also the ultimate owners of firms, as well as of all the resources firms use in their production, which we call *capital*. Consequently, we can think of households as providing capital to firms—land, buildings, and equipment—to produce output. Product, or output, markets are markets in which firms sell goods and services to consumers.



◄ **FIGURE 11.1**
The Circular Flow of Production and Income
The circular flow shows how the production of goods and services generates income for households and how households purchase goods and services produced by firms.

The point of the circular flow diagram is simple and fundamental: Production generates income. In factor markets, when households supply labor and capital to firms they are compensated by the firms. They earn wages for their work, and they earn interest, dividends, and rents on the capital they supply to the firms. The households then use their income to purchase goods and services in the product markets. The firm uses the revenues it receives from the sale of its products to pay for the factors of production (land, labor, and capital).

When goods and services are produced, income flows throughout the economy. For example, consider a manufacturer of computers. At the same time the computer manufacturer produces and sells new computers, it also generates income through its production. The computer manufacturer pays wages to workers, perhaps pays rent on offices and factory buildings, and pays interest on money it borrowed from a bank. Whatever is left over after paying for the cost of production is the firm's profit, which is income to the owners of the firm. Wages, rents, interest, and profits are all different forms of income.

In an example with a government, your taxes pay for a school district to hire principals, teachers, and other staff to provide educational services to the students in your community. These educational services are an important part of production in our modern economy that produces both goods and services. At the same time, the principals, teachers, and staff all earn income through their employment with the school district. The school district may also rent buildings where classes are held and pay interest on borrowed funds.

Our goal is to understand both sides of this macroeconomic "coin"—the production in the economy and the generation of income in the economy. In the United States, the national income and product accounts, published by the Department of

Commerce, are the source for the key data on production and income in the economy. As we will see, we can measure the value of output produced in the economy by looking at either the production or income side of the economy. Let's begin by learning how to measure the production for the entire economy.

11.2 THE PRODUCTION APPROACH: MEASURING A NATION'S MACROECONOMIC ACTIVITY USING GROSS DOMESTIC PRODUCT

To measure the production of the entire economy, we need to combine an enormous array of goods and services—everything from new computers to NBA and WNBA basketball games. We can actually add computers to basketball games, as we could add apples and oranges if we were trying to determine the total monetary value of a fruit harvest. Our goal is to summarize the total production of an entire economy into a single number, which we call the **gross domestic product (GDP)**. Gross domestic product is the total market value of all the final goods and services produced within an economy in a given year. GDP is also the most common measure of an economy's total output. All the words in the GDP definition are important, so let's analyze them.

• **gross domestic product (GDP)**
The total market value of final goods and services produced within an economy in a given year.

"Total market value" means we take the quantity of goods produced, multiply them by their respective prices, and then add up the totals. If an economy produced two cars at $25,000 per car and three computers at $2,000 per computer, the total value of these goods will be

$$\begin{aligned} 2 \text{ cars} \times \$25{,}000 \text{ per car} &= \$50{,}000 \\ + \\ 3 \text{ computers} \times \$2{,}000 \text{ per computer} &= \$\ 6{,}000 \\ &= \$56{,}000 \end{aligned}$$

The reason we multiply the goods by their prices is that we cannot simply add together the number of cars and the number of computers. Using prices allows us to express the value of everything in a common unit of measurement—in this case, dollars. (In countries other than the United States, we express the value in terms of the local currency.) We add apples and oranges together by finding out the value of both the apples and the oranges, as measured by what you would pay for them, and adding them up in terms of their prices.

"Final goods and services" in the definition of GDP means those goods and services that are sold to ultimate, or final, purchasers. For example, the two cars that were produced would be final goods if they were sold to households or to a business. However, to produce the cars the automobile manufacturer bought steel that went into the body of the cars, and we do not count this steel as a final good or service in GDP. Steel is an example of an **intermediate good**, one that is used in the production process. An intermediate good is not considered a final good or service.

• **intermediate goods**
Goods used in the production process that are not final goods and services.

The reason we do not count intermediate goods as final goods is to avoid double-counting. The price of the car already reflects the price of the steel contained in it. We do not want to count the steel twice. Similarly, the large volumes of paper a commercial printing firm uses also are intermediate goods, because the paper becomes part of the final product delivered by the printing firm to its clients.

The final words in our definition of GDP are "in a given year." GDP is expressed as a rate of production, that is, as "X" amount of dollars per year. In 2008, for example, GDP in the United States was $14,196 billion. Goods produced in prior years, such as cars or houses, are not included in GDP for a given year, even if one consumer sells a house or car to another in that year. Only *newly produced* products are included in GDP.

Because we measure GDP using the current prices for goods and services, GDP will increase if prices increase, even if the physical amount of goods that are produced remains the same. Suppose that next year the economy again produces two cars and three computers, but all the prices in the economy double: The price of cars is $50,000, and the price of computers is $4,000. GDP will also be twice as high, or $112,000, even though the quantity produced is the same as during the prior year:

$$\begin{aligned} 2 \text{ cars} \times \$50{,}000 \text{ per car} &= \$100{,}000 \\ + \\ 3 \text{ computers} \times \$4{,}000 \text{ per computer} &= \$\ 12{,}000 \\ &= \$112{,}000 \end{aligned}$$

But to say that GDP has doubled would be misleading, because exactly the same goods were produced. To avoid this problem, let's apply the real-nominal principle, one of our five basic principles of economics.

REAL-NOMINAL PRINCIPLE

What matters to people is the real value of money or income—its purchasing power—not the face value of money or income.

What we need is another measure of total output that doesn't increase just because prices increase. For this reason, economists have developed the concept of **real GDP**, a measure that controls for changes in prices. Later in this chapter, we explain how real GDP is calculated. The basic idea is simple. When we use current prices to measure GDP, we are using **nominal GDP**. Nominal GDP can increase for one of two reasons: Either the production of goods and services has increased, or the prices of those goods and services have increased.

- **real GDP**
  A measure of GDP that controls for changes in prices.
- **nominal GDP**
  The value of GDP in current dollars.

To explain the concept of real GDP, we first need to look at a simple example. Suppose an economy produces a single good: computers. In year 1, 10 computers were produced, and each sold for $2,000. In year 2, 12 computers were produced, and each sold for $2,100. Nominal GDP is $20,000 in year 1 and $25,200 in year 2; it has increased by a factor of 1.26 or 26 percent. However, we can also measure real GDP by using year 1 prices as a measure of what was produced in year 1 *and* what was produced in year 2. In year 1, real GDP is

$$10 \text{ computers} \times \$2{,}000 \text{ per computer} = \$20{,}000$$

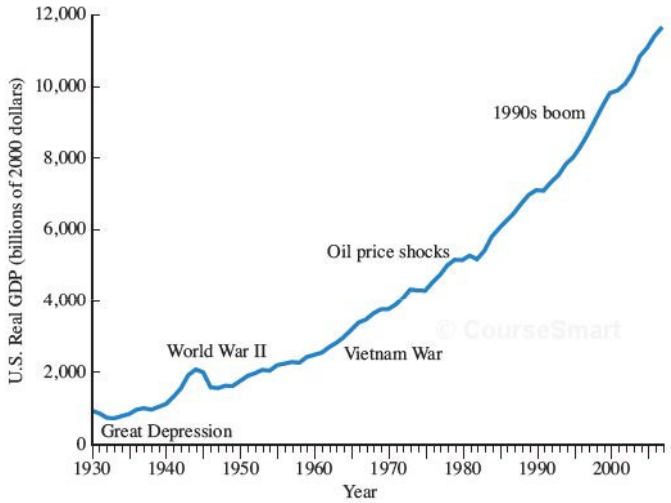
In year 2, real GDP (in year 1 terms) is

$$12 \text{ computers} \times \$2{,}000 \text{ per computer} = \$24{,}000$$

Real GDP in year 2 is still greater than real GDP in year 1, now by a factor of 1.2, or 20 percent. The key idea is that we construct a measure using the same prices for both years and thereby take price changes into account.

Figure 11.2 plots real GDP for the U.S. economy for the years 1930 through 2007. The graph shows that real GDP has grown substantially over this period. This is what economists call **economic growth**—sustained increases in the real GDP of an economy over a long period of time. In Chapter 13, we'll study economic growth in detail. Later in this chapter, we'll look carefully at the behavior of real GDP over shorter periods, during which time it can rise and fall. Decreases in real GDP disrupt the economy greatly and lead to unemployment.

- **economic growth**
  Sustained increases in the real GDP of an economy over a long period of time.



▲ **FIGURE 11.2**
U.S. Real GDP, 1930–2007
During the Great Depression in the 1930s, GDP initially fell and then was relatively flat. The economy was not growing much. However, the economy began growing rapidly in the 1940s during Word War II and has grown substantially since then.
SOURCE: U.S. Department of Commerce.

The Components of GDP

Economists divide GDP into four broad categories, each corresponding to different types of purchases represented in GDP:

1. *Consumption expenditures:* purchases by consumers
2. *Private investment expenditures:* purchases by firms
3. *Government purchases:* purchases by federal, state, and local governments
4. *Net exports:* net purchases by the foreign sector (domestic exports minus domestic imports)

Before discussing these categories, let's look at some data for the U.S. economy to get a sense of the size of each of these four components. Table 11.1 shows the figures for GDP for the first quarter of 2008. (A quarter is a three-month period; the first quarter runs from January through March, while the fourth quarter runs from October through December. Quarterly GDP expressed at annual rates is GDP for a year if the entire year were the same as the measured quarter.) In the first quarter of 2008, GDP was $14,196 billion, or approximately $14.2 trillion. To get a sense of the magnitude, consider that the U.S. population is approximately 300 million people, making GDP per person approximately $47,320. (This does not mean every man, woman, and child actually spends $47,320, but it is a useful indicator of the productive strength of the economy.)

TABLE 11.1 COMPOSITION OF U.S. GDP, FIRST QUARTER 2008 (BILLIONS OF DOLLARS EXPRESSED AT ANNUAL RATES)

GDP	Consumption Expenditures	Private Investment Expenditures	Government Purchases	Net Exports
$14,196	$10,046	$2,041	$2,825	–$716

SOURCE: U.S. Department of Commerce.

CONSUMPTION EXPENDITURES **Consumption expenditures** are purchases by consumers of currently produced goods and services, either domestic or foreign. These purchases include flat-screen TVs, smart phones, automobiles, clothing, hair-styling services, jewelry, movie or basketball tickets, food, and all other consumer items. We can break down consumption into durable goods, nondurable goods, and services. *Durable goods*, such as automobiles or refrigerators, last for a long time. *Nondurable goods*, such as food, last for a short time. *Services* are work in which people play a prominent role in delivery (such as a dentist filling a cavity). They range from haircutting to health care and are the fastest-growing component of consumption in the United States. Overall, consumption spending is the most important component of GDP, constituting about 71 percent of total purchases.

- **consumption expenditures** Purchases of newly produced goods and services by households.

PRIVATE INVESTMENT EXPENDITURES **Private investment expenditures** in GDP consist of three components:

1. First, there is spending on new plants and equipment during the year. If a firm builds a new factory or purchases a new machine, the new factory or new machine is included in the year's GDP. Purchasing an existing building or buying a used machine does not count in GDP, because the goods were not produced during the current year.
2. Second, newly produced housing is included in investment spending. The sale of an existing home to a new owner is not counted, because the house was not built in the current year.
3. Finally, if firms add to their stock of inventories, the increase in inventories during the current year is included in GDP. If a hardware store had $1,000 worth of nuts and bolts on its shelves at the beginning of the year and $1,100 at the year's end, its inventory investment is $100 ($1,100 – $1,000). This $100 increase in inventory investment is included in GDP.

- **private investment expenditures** Purchases of newly produced goods and services by firms.

We call the total of new investment expenditures **gross investment**. During the year, some of the existing plant, equipment, and housing will deteriorate or wear out. This wear and tear is called **depreciation**, or sometimes a *capital consumption allowance*. If we subtract depreciation from gross investment, we obtain net investment. **Net investment** is the true addition to the stock of plant, equipment, and housing in a given year.

Make sure you understand this distinction between gross investment and net investment. Consider the $2,041 billion in total investment spending for the first quarter of 2008, a period in which there was $1,411 billion in depreciation in the private sector. That means there was only $630 billion ($2,041 – $1,411) in net investment by firms in that year; 69 percent of gross investment went to make up for depreciation of existing capital.

- **gross investment** Total new investment expenditures.
- **depreciation** Reduction in the value of capital goods over a one-year period due to physical wear and tear and also to obsolescence; also called *capital consumption allowance*.
- **net investment** Gross investment minus depreciation.

Warning When we discuss measuring production in the GDP accounts, we use *investment* in a different way than that with which you may be accustomed. For an economist, investment in the GDP accounts means purchases of new final goods and services by firms. In everyday conversation, we may talk about investing in the stock market or investing in gold. Buying stock for $1,800 on the stock market is a purchase of an existing financial asset; it is not the purchase of new goods and services by firms. Therefore, that $1,800 does not appear anywhere in GDP. The same is true of purchasing a gold bar. In GDP accounting, *investment* denotes the purchase of new capital. Be careful not to confuse the common usage of *investment* with the definition of *investment* as we use it in the GDP accounts.

GOVERNMENT PURCHASES **Government purchases** are the purchases of newly produced goods and services by federal, state, and local governments. They include any goods that the government purchases plus the wages and benefits of all government workers (paid when the government purchases their services as employees).

- **government purchases** Purchases of newly produced goods and services by local, state, and federal governments.

The majority of spending in this category comes from state and local governments: $1,801 billion of the total $2,825 billion in 2008. Government purchases affect our lives very directly. For example, all salaries of U.S. postal employees and federal airport security personnel are counted as government purchases.

• **transfer payments**
Payments from governments to individuals that do not correspond to the production of goods and services.

This category does not include all spending by governments. It excludes **transfer payments**, payments to individuals that are not associated with the production of goods and services. For example, payments for Social Security, welfare, and interest on government debt are all considered transfer payments and thus are not included in government purchases in GDP. Nothing is being produced by the recipients in return for money being paid, or "transferred," to them. But wage payments to the police, postal workers, and the staff of the Internal Revenue Service are all included, because they do correspond to services these workers are currently producing.

Because transfer payments are excluded from GDP, a vast portion of the budget of the federal government is not part of GDP. In 2008, the federal government spent approximately $2,933 billion, of which only $1,023 billion (about 35 percent) was counted as federal government purchases. Transfer payments are important, however, because they affect both the income of individuals and their consumption and savings behavior. Transfer payments also affect the size of the federal budget deficit, which we will study in a later chapter. At this point, keep in mind the distinction between government purchases—which are included in GDP—and total government spending or expenditure—which may *not* be included.

NET EXPORTS To understand the role of the foreign sector, we first need to define three terms. **Imports** are goods and services we buy from other countries. **Exports** are goods and services made here and sold to other countries. **Net exports** are total exports minus total imports. In Table 11.1 on page 282, we see that net exports in the first quarter of 2008 were –$716 billion. Net exports were negative because our imports exceeded our exports.

• **import**
A good or service produced in a foreign country and purchased by residents of the home country (for example, the United States).

• **export**
A good or service produced in the home country (for example, the United States) and sold in another country.

• **net exports**
Exports minus imports.

Consumption, investment, and government purchases include all purchases by consumers, firms, and the government, whether or not the goods were produced in the United States. However, GDP is supposed to measure the goods produced in the United States. Consequently, we subtract purchases of foreign goods by consumers, firms, or the government when we calculate GDP, because these goods were not produced in the United States. At the same time, we add to GDP any goods produced here and sold abroad, for example, airplanes made in the United States and sold in Europe. By including net exports as a component of GDP, we correctly measure U.S. production by adding exports and subtracting imports.

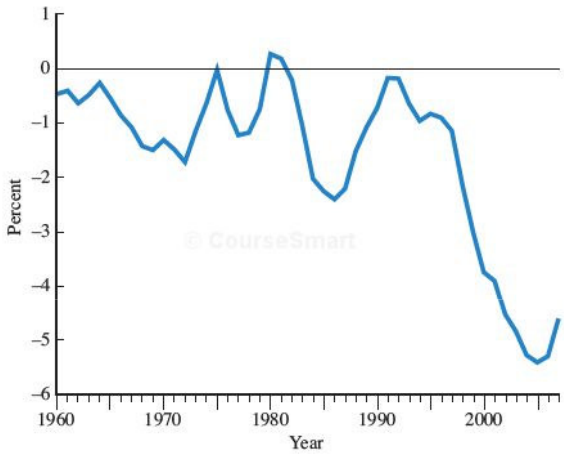
Suppose someone in the United States buys a $25,000 car made in Japan. If we look at final purchases, we will see that consumption spending rose by $25,000 because a consumer made a purchase of a consumption good. Net exports fell by $25,000, however, because we subtracted the value of the import (the car) from total exports. Notice that total GDP did not change with the purchase of the car. This is exactly what we want in this case, because the car wasn't produced in the United States.

Now suppose the United States sells a car for $22,000 to a resident of Spain. In this case, net exports increase by $22,000 because the car was a U.S. export. GDP will also be a corresponding $22,000 higher because this sale represents U.S. production.

Recall that for the United States in the first quarter of 2008 net exports were –$716 billion dollars. In other words, in that quarter the United States bought $716 billion more goods from abroad than it sold abroad. When we buy more goods from abroad than we sell, we have a **trade deficit**. A **trade surplus** occurs when our exports exceed our imports. Figure 11.3 shows the U.S. trade surplus as a share of GDP from 1960 to 2007. Although at times the United States has had a small trade surplus, it has generally run a trade deficit. In recent years, the trade deficit has increased and now is approximately 5 percent of GDP. In later chapters, we study how trade deficits can affect a country's GDP.

• **trade deficit**
The excess of imports over exports.

• **trade surplus**
The excess of exports over imports.



◀ **FIGURE 11.3**
U.S. Trade Balance as a Share of GDP, 1960–2007
In the early 1980s, the United States ran a trade surplus (when the line on the graph is above zero, this indicates a surplus). However, in other years the United States has run a trade deficit. In 2007, the trade deficit exceeded 5 percent of GDP.
SOURCE: Department of Commerce.

Putting It All Together: The GDP Equation

We can summarize our discussion of who purchases GDP with a simple equation that combines the four components of GDP:

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

where

Y = GDP
C = Consumption
I = Investment
G = Government purchases
NX = Net exports

In other words,

GDP = consumption + investment + government purchases + net exports

This equation is an *identity*, which means it is always true no matter what the values of the variables are. In any economy, GDP consists of the sum of its four components.

11.3 THE INCOME APPROACH: MEASURING A NATION'S MACROECONOMIC ACTIVITY USING NATIONAL INCOME

Recall from the circular flow that one person's production ends up being another person's income. Income is the flip side of our macroeconomic "coin." As a result, in addition to measuring a nation's activity by measuring production, we can also gauge it by measuring a nation's income. The total income earned by U.S. residents working in the United States and abroad is called **national income.**

• **national income**
The total income earned by a nation's residents both domestically and abroad in the production of goods and services.

Measuring National Income

To measure national income, economists first make two primary adjustments to GDP.

First, we add to GDP the net income earned by U.S. firms and residents abroad. To make this calculation, we add to GDP any income earned abroad by U.S. firms

or residents and subtract any income earned in the United States by foreign firms or residents. For example, we add the profits earned by U.S. multinational corporations that are sent back to the United States but subtract the profits from multinational corporations operating in the United States that are sent back to their home countries. The profits Wal-Mart sends back to the United States from its stores in Mexico are added to GDP. The profits Toyota earns in the United States that it sends back to Japan are subtracted from GDP. The result of these adjustments is the total income earned worldwide by U.S. firms and residents. This is the **gross national product (GNP)**.

• **gross national product**
GDP plus net income earned abroad.

The distinction between what they produce within their borders, GDP, and what their citizens earn, GNP, is not that important to most countries. For the United States, the difference between GDP and GNP is typically just 1 percent. In some countries, however, the differences are much larger. The country of Kuwait, for example, earned vast amounts of income from its oil riches, which it invested abroad in stocks, bonds, and other types of investments. These earnings comprised approximately 9 percent of Kuwait's 2006 GNP. Foreigners have traditionally made large investments in Australia. As they sent their profits back to their home countries, Australia's net income from abroad was negative in 2006, and Australian GDP in that year exceeded Australian GNP by 4.1 percent.

The second adjustment we make when calculating national income is to subtract depreciation from GNP. Recall that depreciation is the wear and tear on plant and equipment that occurred during the year. In a sense, our income is reduced because our buildings and machines are wearing out. When we subtract depreciation from GNP, we reach *net national product (NNP)*, where *net* means "after depreciation."

After making these adjustments and taking into account statistical discrepancies, we reach *national income*. (Statistical discrepancies arise when government statisticians make their calculations using different sources of the same data.) Table 11.2 shows the effects of these adjustments for the first quarter of 2008.

TABLE 11.2 FROM GDP TO NATIONAL INCOME, FIRST QUARTER 2008 (BILLIONS OF DOLLARS)

Gross domestic product	$14,196
Gross national product	14,351
Net national product	12,640
National income	12,507

In turn, national income is divided among six basic categories: compensation of employees (wages and benefits), corporate profits, rental income, proprietors' income (income of unincorporated business), net interest (interest payments received by households from business and from abroad), and other items. Approximately 65 percent of all national income goes to workers in the form of wages and benefits. For most of the countries in the world, wages and benefits are the largest part of national income.

In addition to national income, which measures the income earned in a given year by the entire private sector, we are sometimes interested in determining the total payments that flow directly into households, a concept known as **personal income**. To calculate personal income, we begin with national income and subtract any corporate profits that are retained by the corporation and not paid out as dividends to households. We also subtract all taxes on production and imports and social insurance taxes, which are payments for Social Security and Medicare. We then add any personal interest income received from the government and consumers and all transfer payments. The result is the total income available to households, or personal income. The amount of personal income that households retain after paying income taxes is called **personal disposable income**.

• **personal income**
Income, including transfer payments, received by households.

• **personal disposable income**
Personal income that households retain after paying income taxes.

Measuring National Income through Value Added

Another way to measure national income is to look at the **value added** of each firm in the economy. For a firm, we can measure its value added by the dollar value of the firm's sales minus the dollar value of the goods and services purchased from other firms. What remains is the sum of all the income—wages, profits, rents, and interest—that the firm generates. By adding up the value added for all the firms in the economy (plus nonprofit and governmental organizations), we can calculate national income. Let's consider a simple example illustrated in Table 11.3.

• **value added**
The sum of all the income—wages, interest, profits, and rent—generated by an organization. For a firm, we can measure value added by the dollar value of the firm's sales minus the dollar value of the goods and services purchased from other firms.

TABLE 11.3 CALCULATING VALUE ADDED IN A SIMPLE ECONOMY

	Automobile Firm	Steel Firm	Total Economy
Total sales	$16,000	$6,000	$22,000
Less purchases from other firms	6,000	0	6,000
Equals value added: the sum of all wages, interest, profits, and rents	10,000	6,000	16,000

Suppose an economy consists of two firms: an automobile firm that sells its cars to consumers and a steel firm that sells only to the automobile firm. If the automobile company sells a car for $16,000 to consumers and purchases $6,000 worth of steel from the steel firm, the auto firm has $10,000 remaining—its value added—which it can then distribute as wages, rents, interest, and profits. If the steel firm sells $6,000 worth of steel but does not purchase any inputs from other firms, its value added is $6,000, which it pays out in the form of wages, rents, interest, and profits. Total value added in the economy from both firms is $16,000 ($10,000 + $6,000), which is the sum of wages, rents, interest, and profits for the entire economy (consisting of these two firms).

As this example illustrates, we measure the value added for a typical firm by starting with the value of its total sales and subtracting the value of any inputs it purchases from other firms. The amount of income that remains is the firm's value added, which

APPLICATION 1

USING VALUE ADDED TO MEASURE THE TRUE SIZE OF WAL-MART

APPLYING THE CONCEPTS #1: How can we use economic analysis to compare the size of a major corporation to a country?

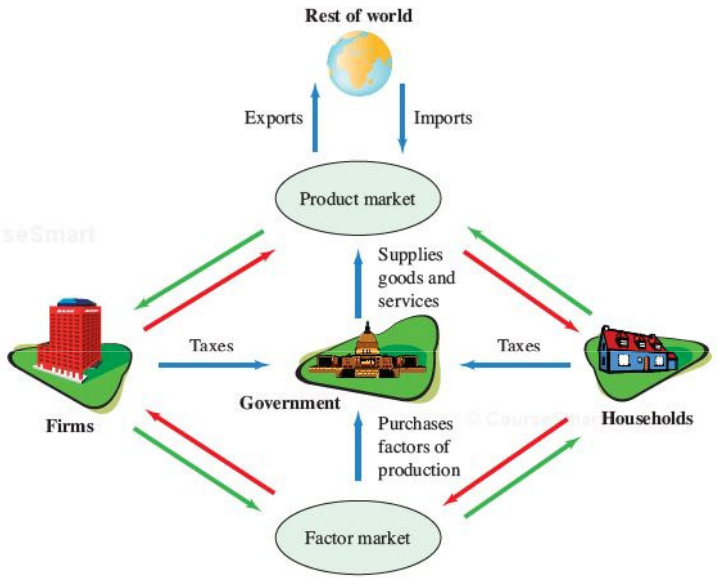
During 2008, Wal-Mart's sales were approximately $374 billion, nearly 2.6 percent of U.S. GDP. Some social commentators might want to measure the impact of Wal-Mart just through its sales. But to produce those sales, Wal-Mart had to buy goods from many other companies. Wal-Mart's value added was substantially less than its total sales. Based on Wal-Mart's annual reports, its cost of sales was $286 billion, leaving approximately $88 billion in value added. This is a very large number, as might be expected from the world's largest retailer, but it is much smaller than its total sales. If we used Wal-Mart's sales to compare it to a country, it would have a GDP similar to that of Belgium, which is ranked 28th in the world. However, using the more appropriate measure of value added, Wal-Mart's size is closer to Bulgaria, ranked 56th in the world. **Related to Exercise 3.9.**

SOURCE: Based on Wal-Mart Annual Report, 2008, http://walmartstores.com/sites/AnnualReport/2008/docs/finrep_00.pdf (accessed July, 2008).

is then distributed as wages, rents, interest, and profits. In calculating national income, we need to include all the firms in the economy, even the firms that produce intermediate goods.

An Expanded Circular Flow

Now that we have examined both production and income, including both the government and the foreign sector, let's take another look at a slightly more realistic circular flow. Figure 11.4 depicts a circular flow that includes both the government and the foreign sector. Both households and firms pay taxes to the government. The government, in turn, supplies goods and services in the product market and also purchases inputs—labor and capital—in the factor markets, just like private-sector firms do. Net exports, which can be positive or negative, are shown entering or leaving the product market.



▶ **FIGURE 11.4**
The Circular Flow with Government and the Foreign Sector
The new linkages (in blue) demonstrate the roles that the government and the foreign sector (imports and exports) play in the circular flow.

In summary, we can look at GDP from two sides: We can ask who buys the output that is produced, or we can ask how the income that is created through the production process is divided between workers and investors. From the spending side, we saw that nearly 71 percent of GDP consists of consumer expenditures. From the income side, we saw that nearly 65 percent of national income is paid in wages and benefits. Macroeconomists may use data based either on the production that occurs in the economy or on its flip side, the income that is generated, depending on whether they are more focused on current production or on current income.

11.4 A CLOSER EXAMINATION OF NOMINAL AND REAL GDP

We have discussed different ways to measure the production of an economy, looking at both who purchases goods and services and the income it generates. Of all the measures we have discussed, GDP is the one most commonly used both by the public and by economists. Let's take a closer look at it.

Measuring Real versus Nominal GDP

Output in the economy can increase from one year to the next. And prices can rise from one year to the next. Recall that we defined nominal GDP as GDP measured in current prices, and we defined real GDP as GDP adjusted for price changes.

Now we take a closer look at how real GDP is measured in modern economies. Let's start with a simple economy in which there are only two goods—cars and computers—produced in the years 2011 and 2012. The data for this economy—the prices and quantities produced for each year—are shown in Table 11.4. The production of cars and the production of computers increased, but the production of computers increased more rapidly. The price of cars rose, while the price of computers remained the same.

TABLE 11.4 GDP DATA FOR A SIMPLE ECONOMY

	Quantity Produced		Price	
Year	*Cars*	*Computers*	*Cars*	*Computers*
2011	4	1	$10,000	$5,000
2012	5	3	12,000	5,000

Let's first calculate nominal GDP for this economy in each year. Nominal GDP is the total market value of goods and services produced in each year. Using the data in the table, we can see that nominal GDP for the year 2011 is

$$(4 \text{ cars} \times \$10{,}000) + (1 \text{ computer} \times \$5{,}000) = \$45{,}000$$

Similarly, nominal GDP for the year 2012 is

$$(5 \text{ cars} \times \$12{,}000) + (3 \text{ computers} \times \$5{,}000) = \$75{,}000$$

Now we'll find real GDP. To compute real GDP, we calculate GDP using constant prices. What prices should we use? For the moment, let's use the prices for the year 2011. Because we are using 2011 prices, real GDP and nominal GDP for 2011 are both equal to $45,000. But for 2012, they are different. In 2012, real GDP is

$$(5 \text{ cars} \times \$10{,}000) + (3 \text{ computers} \times \$5{,}000) = \$65{,}000$$

Note that real GDP for 2012, which is $65,000, is less than nominal GDP for 2012, which is $75,000. The reason real GDP is less than nominal GDP here is that prices of cars rose by $2,000 between 2011 and 2012, and we are measuring GDP using 2011 prices. We can measure real GDP for any other year simply by calculating GDP using constant prices.

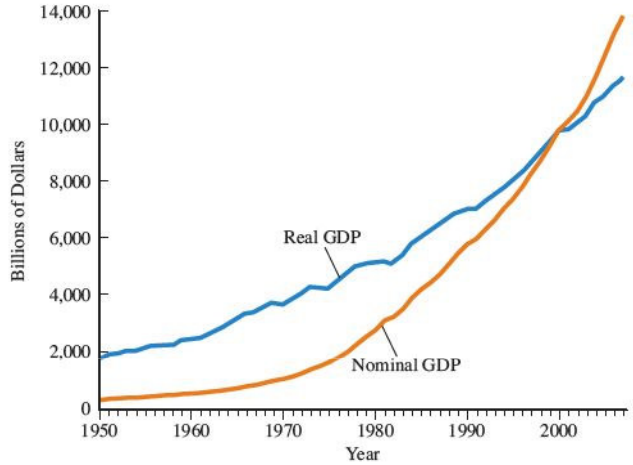
We now calculate the growth in real GDP for this economy between 2011 and 2012. Because real GDP was $45,000 in 2011 and $65,000 in 2012, real GDP grew by $20,000. In percentage terms, this is a $20,000 increase from the initial level of $45,000 or

$$\text{Percentage growth in real GDP} = \frac{\$20{,}000}{\$45{,}000} = .444$$

which equals 44.4 percent. This percentage is an average of the growth rates for both goods—cars and computers.

Figure 11.5 depicts real and nominal GDP for the United States from 1950 to 2007. Real GDP is measured in 2000 dollars, so the curves cross in 2000. Before 2000, nominal GDP is less than real GDP because prices in earlier years were lower than they were in 2000. After 2000, nominal GDP exceeds real GDP because prices in later years were higher than they were in 2000.

▶ **FIGURE 11.5**
U.S. Nominal and Real GDP, 1950–2007
This figure plots both real and nominal GDP for the United States in billions of dollars. Real GDP is measured in 2000 dollars.



How to Use the GDP Deflator

We can also use the data in Table 11.4 to measure the changes in prices for this economy of cars and computers. The basic idea is that the differences between nominal GDP and real GDP for any year arise only because of changes in prices. So by comparing real GDP and nominal GDP, we can measure the changes in prices for the economy. In practice, we do this by creating an index, called the **GDP deflator**, that measures how prices of goods and services change over time. Because we are calculating real GDP using year 2011 prices, we will set the value of this index equal to 100 in the year 2011, which we call the base year. To find the value of the GDP deflator for the year 2012 (or other years), we use the following formula:

• **GDP deflator**
An index that measures how the prices of goods and services included in GDP change over time.

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

Using this formula, we find that the value of the GDP deflator for 2012 is

$$\frac{\$75{,}000}{\$65{,}000} \times 100 = 1.15 \times 100 = 115$$

Because the value of the GDP deflator is 115 in 2012 and was 100 in the base year of 2011, this means prices rose by 15 percent between the two years:

$$\frac{115 - 100}{100} = \frac{15}{100} = 0.15$$

Note that this 15 percent is a weighted average of the price changes for the two goods—cars and computers.

Until 1996, the Commerce Department, which produces the GDP figures, used these formulas to calculate real GDP and measure changes in prices. Economists at the department chose a base year and measured real GDP by using the prices in that base year. They also calculated the GDP deflator, just as we did, by taking the ratio of nominal GDP to real GDP. Today, the Commerce Department calculates real GDP and the price index for real GDP using a more complicated method. In our example, we measured real GDP using 2011 prices. But we could have also measured real GDP using prices from 2012. If we did, we would have come up with slightly different numbers both for the increase in prices between the two years and for the