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CHAPTER 7

# Measuring Domestic Output and National Income

## Learning Objectives:

- LO7.1** Explain how gross domestic product (GDP) is defined and measured.
- LO7.2** Describe how expenditures on goods and services can be summed to determine GDP.
- LO7.3** Explain how GDP can be determined by summing up all of the incomes that were derived from producing the economy's output of goods and services.
- LO7.4** Describe the relationships among GDP, net domestic product, national income, personal income, and disposable income.

**LO7.5** Discuss the nature and function of a GDP price index, and describe the difference between nominal GDP and real GDP.

**LO7.6** List and explain some limitations of the GDP measure.

“Disposable Income Flat.” “Personal Consumption Surges.” “Investment Spending Stagnates.” “GDP Up 4 Percent.” These headlines, typical of those found on Yahoo! Finance or in *The Wall Street Journal*, give knowledgeable readers valuable information on the state of the economy. This chapter will help you interpret such headlines and understand the stories reported under them. Specifically, it will help you become familiar with the vocabulary and methods of national income accounting. Such accounting enables economists to measure the

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long-run rate of economic growth and identify the recessions and expansions associated with the economic ups and downs known as the business cycle. In addition, the terms and ideas that you encounter in this chapter will provide a needed foundation for the macroeconomic models found in subsequent chapters.

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## Assessing the Economy's Performance

LO7.1 Explain how gross domestic product (GDP) is defined and measured.

*National income accounting* measures the economy's overall performance. It does for the economy as a whole what private accounting does for the individual firm or for the individual household.

A business firm measures its flows of income and expenditures regularly—usually every 3 months or once a year. With that information in hand, the firm can gauge its economic health. If things are going well and profits are good, the accounting data can be used to explain that success. Were costs down? Was output up? Have market prices risen? If things are going badly and profits are poor, the firm may be able to identify the reason by studying the record over several accounting periods. All this information helps the firm's managers plot their future strategy.

**National income accounting** operates in much the same way for the economy as a whole. The Bureau of Economic Analysis (BEA), an agency of the Commerce Department, compiles the National Income and Product Accounts (NIPA) for the U.S. economy. This accounting enables economists and policymakers to:

- Assess the health of the economy by comparing levels of production at regular intervals.
- Track the long-run course of the economy to see whether it has grown, been constant, or declined.
- Formulate policies that will safeguard and improve the economy's health.

## Gross Domestic Product

The primary measure of the economy's performance is its annual total output of goods and services or, as it is called, its *aggregate output*. There are several ways to measure aggregate output depending upon how one wishes to define “an economy.” For instance, should the value of the cars produced at a Toyota plant in Ohio count as part of the output of the U.S. economy because they are made within the United States or as part of the Japanese economy because Toyota is a Japanese company? As mentioned in Chapter 6, **gross domestic product (GDP)** defines aggregate output as the dollar value of all final goods and services produced within the borders of a country during a specific period of time, typically a year. Under this definition, the value of the cars produced at the Toyota factory in Ohio clearly count as part of U.S. aggregate output rather than Japanese aggregate output because the cars are made within the borders of the United States.<sup>1</sup>

**TABLE 7.1** Comparing Heterogeneous Output by Using Money Prices

Year	Annual Output	Market Value
1	3 sofas and 2 computers	3 at \$500 + 2 at \$2,000 = \$5,500
2	2 sofas and 3 computers	2 at \$500 + 3 at \$2,000 = \$7,000

## A Monetary Measure

By necessity, GDP is a *monetary measure*. To see why, suppose that the economy produces three sofas and two computers in year 1 and two sofas and three computers in year 2. In which year is output greater? We can't answer that question until we attach a price tag to each of the two products to indicate how society evaluates their relative worth.

That's what GDP does. It measures the value of output in monetary terms. Without such a measure we would have no way of comparing the relative values of the vast number of goods and services produced in different years. In Table 7.1 the price of sofas is \$500 and the price of computers is \$2,000. GDP would gauge the output of year 2 (\$7,000) as greater than the output of year 1 (\$5,500) because society places a higher monetary value on the output of year 2. Society is willing to pay \$1,500 more for the combination of goods produced in year 2 than for the combination of goods produced in year 1.

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## Avoiding Multiple Counting

To measure aggregate output accurately, all goods and services produced in a particular year must be counted once and only once. Because most products go through a series of production stages before they reach the market, some of their components are bought and sold many times. To avoid counting those components each time, GDP includes only the market value of *final goods* and ignores *intermediate goods* altogether.

**Intermediate goods** are products that are purchased for resale or further processing or manufacturing. **Final goods** are products that are purchased by their end users. Crude oil is an intermediate good; gasoline used for personal transportation is a final good. Steel beams are intermediate goods; completed high-rise apartments are final goods. Lettuce, carrots, and vinegar in restaurant salads are intermediate goods; restaurant salads are final goods. Other examples of final goods are sunglasses bought by consumers, assembly machinery purchased by businesses, surveillance satellites bought by government, and smart phones purchased by foreign buyers.

Why is the value of final goods included in GDP but the value of intermediate goods excluded? Because the value of final goods already includes the value of all the intermediate goods that were used in producing them. Including the value of intermediate goods would amount to **multiple counting**, and that would distort the value of GDP.

To see why, suppose that five stages are needed to manufacture a wool coat and get it to the consumer—the final user. Table 7.2 shows that firm A, a sheep ranch, sells \$120 worth of wool to firm B, a wool processor. Firm A pays out the \$120 in wages, rent, interest, and profit. Firm B processes the wool and sells it to firm C, a coat manufacturer, for \$180. What does firm B do with the \$180 it receives? It pays \$120 to firm A for the wool and uses the remaining \$60 to pay wages, rent, interest, and profit for the resources used in processing the wool. Firm C, the manufacturer, sells the coat to firm D, a wholesaler, which sells it to firm E, a retailer. Then at last a consumer, the final user, comes in and buys the coat for \$350.

How much of these amounts should we include in GDP to account for the production of the coat? Just \$350, the value of the final product. The \$350 includes all the intermediate transactions leading up to the product's final sale. Including the sum of all the intermediate sales, \$1,140, in GDP would amount to multiple counting. The production and sale of the final coat generated just \$350 of output, not \$1,140.

Alternatively, we could avoid multiple counting by measuring and cumulating only the *value added* at each stage. **Value added** is the market value of a firm's output *less* the value of the inputs the firm has bought from others. At each stage, the difference between what a firm pays for inputs and what it receives from selling the product made from those inputs is paid out as wages, rent, interest, and profit. Column 3 of Table 7.2 shows that the value added by firm B is \$60, the difference between the \$180 value of its output and the \$120 it paid for the input from firm A. We find the total value of the coat by adding together all the values added by the five firms. Similarly, by calculating and summing the values added to all the goods and services produced by all firms in the economy, we can find the market value of the economy's total output—its GDP.

## GDP Excludes Nonproduction Transactions

Although many monetary transactions in the economy involve final goods and services, many others do not. These nonproduction transactions must be excluded from GDP because they have nothing to do with the generation of final goods. *Nonproduction transactions* are of two types: purely financial transactions and second-hand sales.

**TABLE 7.2** Value Added in a Five-Stage Production Process

(1) Stage of Production	(2) Sales Value of Materials or Product	(3) Value Added
	\$ 0	
Firm A, sheep ranch	120	\$120 (= \$120 - \$ 0)
Firm B, wool processor	180	60 (= 180 - 120)
Firm C, coat manufacturer	220	40 (= 220 - 180)
Firm D, clothing wholesaler	270	50 (= 270 - 220)
Firm E, retail clothier	<b>350</b>	80 (= 350 - 270)
Total sales values	\$1,140	
Value added (total income)		<b>\$350</b>

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**Financial Transactions** Purely financial transactions include the following:

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- **Public transfer payments** These are the social security payments, welfare payments, and veterans' payments that the government makes directly to households. Since the recipients contribute nothing to *current production* in return, to include such payments in GDP would be to overstate the year's output.
- **Private transfer payments** Such payments include, for example, the money that parents give children or the cash gifts given during the holidays. They produce no output. They simply transfer funds from one private individual to another and consequently do not enter into GDP.
- **Stock market transactions** The buying and selling of stocks (and bonds) is just a matter of swapping bits of paper. Stock market transactions create nothing in the way of current production and are not included in GDP. Payments for the services provided by a stockbroker *are* included, however, because their services are currently provided and are thus a part of the economy's current output of goods and services.

**Secondhand Sales** Secondhand sales contribute nothing to current production and for that reason are excluded from GDP. Suppose you sell your 2005 Ford Mustang to a friend; that transaction would be ignored in reckoning this year's GDP because it generates no current production. The same would be true if you sold a brand-new Mustang to a neighbor a week after you purchased it.

## Two Ways of Looking at GDP: Spending and Income

Let's look again at how the market value of total output—or of any single unit of total output—is measured. Given the data listed in Table 7.2, how can we measure the market value of a coat?

One way is to see how much the final user paid for it. That will tell us the market value of the final product. Or we can add up the entire wage, rental, interest, and profit incomes that were created in producing the coat. The second approach is the value-added technique used in Table 7.2.

The final-product approach and the value-added approach are two ways of looking at the same thing. What is spent on making a product is income to those who helped make it. If \$350 is spent on manufacturing a coat, then \$350 is the total income derived from its production.

We can look at GDP in the same two ways. We can view GDP as the sum of all the money spent in buying it. That is the *output approach*, or **expenditures approach**. Or we can view GDP in terms of the income derived or created from producing it. That is the *earnings* or *allocations approach*, or the **income approach**.

As illustrated in Figure 7.1, we can determine GDP for a particular year either by adding up all that was spent to buy total output or by adding up all the money that was derived as income from its production. Buying (spending money) and selling (receiving income) are two aspects of the same transaction. On the expenditures side of GDP, all final goods produced by the economy are bought either by three domestic sectors (households, businesses, and government) or by foreign buyers. On the income side (once certain statistical adjustments are made), the total receipts acquired from the sale of that total output are allocated to the suppliers of resources as wage, rent, interest, and profit.

**FIGURE 7.1** The expenditures and income approaches to GDP. There are two general approaches to measuring gross domestic product. We can determine GDP as the value of output by summing all expenditures on that output.

Alternatively, with some modifications, we can determine GDP by adding up all the components of income arising from the production of that output.

Expenditures, or output, approach

Consumption expenditures by households
plus
Investment expenditures by businesses
plus
Government purchases of goods and services
plus
Expenditures by foreigners

= GDP =

Income, or allocations, approach

Wages
plus
Rents
plus
Interest
plus
Profits
plus
Statistical adjustments

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**TABLE 7.3** Accounting Statement for the U.S. Economy, 2012 (in Billions)\*

Receipts: Expenditures Approach		Allocations: Income Approach	
Sum of:		Sum of:	
Personal consumption expenditures (C)	\$11,150	Compensation of employees	\$8,612
Gross private domestic investment ( $I_g$ )	2,475	Rents	541
Government purchases (G)	3,167	Interest	440
Net exports ( $X_n$ )	-547	Proprietors' income	1,225
		Corporate profits	2,031
		Taxes on production and imports	1,123
		<b>Equals:</b>	
		<b>National income</b>	<b>\$13,972</b>
		National income	\$13,972
		Less: Net foreign factor income	253
		Plus: Consumption of fixed capital	2,543
		Plus: Statistical discrepancy	-17
<b>Equals:</b>		<b>Equals:</b>	
<b>Gross domestic product</b>	<b>\$16,245</b>	<b>Gross domestic product</b>	<b>\$16,245</b>

\*Some of the items in the Allocations column combine related categories that appear in the more detailed accounts. All data are subject to government revision.

Source: Bureau of Economic Analysis, [www.bea.gov](http://www.bea.gov).

Table 7.3 shows U.S. GDP for the year 2012 totaled up using both the expenditures approach (on the left side) and the income approach (on the right side). As you would expect, both methods reach the same conclusion: U.S. GDP in 2012 was \$16,245 billion.

We will now go through both approaches in detail. Doing so will help you better understand both methods and, in particular, why the income side of Table 7.3 looks substantially more complicated than the income side of Figure 7.1.

## The Expenditures Approach

LO7.2 Describe how expenditures on goods and services can be summed to determine GDP

To determine GDP using the expenditures approach, we add up all the spending on final goods and services that has taken place throughout the year. National-income accountants use precise terms for the types of spending listed on the left side of Figure 7.1.

### Personal Consumption Expenditures (C)

What we have called “consumption expenditures by households,” the national income accountants call **personal consumption expenditures**. This term covers all expenditures by households on goods and services.

In a typical year, roughly 10 percent of these personal consumption expenditures are on **durable goods**—products that have expected lives of three years or more. Such goods include new automobiles, furniture, and refrigerators. Another 30 percent are on **nondurable goods**—products with less than three years of expected life. Included are goods like food, clothing, and gasoline.

About 60 percent of personal consumption expenditures are on **services**—the work done by lawyers, hair stylists, doctors, mechanics, and other service providers. Because of this high percentage, economists sometimes refer to the U.S. economy as a *service economy*. National income accountants combine the household spending on durable goods, nondurable goods, and services and use the symbol  $C$  to designate the personal consumption expenditures component of GDP.

### Gross Private Domestic Investment ( $I_g$ )

Under the heading **gross private domestic investment**, the accountants include the following items:

- All final purchases of machinery, equipment, and tools by business enterprises.
- All construction.
- Changes in inventories.
- Money spent on research and development (R&D) or for the creation of new works of art, music, writing, film, and so on.

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Notice that this list, except for the first item, includes more than we have meant by “investment” so far. The second item includes residential construction as well as the construction of new factories, warehouses, and stores. Why do the accountants regard residential construction as investment rather than consumption? Because apartment buildings and houses, like factories and stores, earn income when they are rented or leased. Owner-occupied houses are treated as investment goods because they *could be* rented to bring in an income return. So the national income accountants treat all residential construction as investment.

Increases in inventories (unsold goods) are considered to be investment because they represent, in effect, “unconsumed output.” For economists, all new output that is not consumed is, by definition, capital. An increase in inventories is an addition (although perhaps temporary) to the stock of capital goods, and such additions are precisely how we define investment.

Starting in 2013, the NIPA accountants who compile U.S. GDP statistics began to include expenditures on R&D as well as money spent to develop new works of writing, art, music, and software as a form of investment. They did so because a country's stock of “capital goods” useful in producing output can be thought of as including not only tangible pieces of physical capital like fiber optic networks and factories but also useful ideas that increase the economy's ability to produce goods and services.

Software is a great example, as it is merely sets of instructions for telling computers what to do. But without those instructions, computers would be useless. So spending on software as well as on R&D and other intellectual activities that improve the economy's stock of “know-how” are now counted as investment.

To make it possible to compare GDP numbers across time, the accountants have gone back and applied the new, more comprehensive definition of investment all the way back to 1929. The numbers for U.S. GDP for the year 2012 that are used in this chapter incorporate the revised definition of investment.

**Positive and Negative Changes in Inventories** We need to look at changes in inventories more closely. Inventories can either increase or decrease over some period. Suppose they increased by \$10 billion between December 31, 2012, and December 31, 2013. Therefore, in 2013 the economy produced \$10 billion more output than people purchased. We need to count all output produced in 2013 as part of that year's GDP, even though some of it remained unsold at the end of the year. This is accomplished by including the \$10 billion increase in inventories as investment in 2013. That way the expenditures in 2013 will correctly measure the output produced that year.

Alternatively, suppose that inventories decreased by \$10 billion in 2013. This “drawing down of inventories” means that the economy sold \$10 billion more of output in 2013 than it produced that year. It did this by selling goods produced in prior years—goods already counted as GDP in those years. Unless corrected, expenditures in 2013 will overstate GDP for 2013. So in 2013 we consider the \$10 billion decline in inventories as “negative investment” and subtract it from total investment that year. Thus, expenditures in 2013 will correctly measure the output produced in 2013.

**Noninvestment Transactions** So much for what investment *is*. You also need to know what it *isn't*. For economists and NIPA accountants, investment does *not* include noninvestment transactions such as the transfer of paper assets (stocks, bonds) or the resale of tangible assets (houses, jewelry,

boats). Such financial transactions merely transfer the ownership of existing assets. The investment in the GDP accounts is economic investment—the creation of *new* capital assets. The mere transfer (sale) of claims to existing capital goods does not produce new capital goods. Therefore such transactions (so-called financial investments) are not included as investment in the GDP accounts.

**Gross Investment versus Net Investment** As we have seen, the category gross private domestic investment includes (1) all final purchases of machinery, equipment, and tools; (2) all construction; (3) changes in inventories; and (4) spending on R&D and other activities that expand the economy's stock of technology and know-how. The words “private” and “domestic” mean that we are speaking of spending by private businesses, not by government (public) agencies, and that the investment is taking place inside the country, not abroad.

The word “gross” means that we are referring to *all* investment goods—both those that replace machinery, equipment, and buildings that were used up (worn out or made obsolete) in producing the current year's output and any net additions to the economy's stock of capital. Gross investment includes investment in replacement capital *and* in added capital.

In contrast, **net private domestic investment** includes *only* investment in the form of added capital. The amount of capital that is used up over the course of a year is called *depreciation*. So

$$\text{Net investment} = \text{gross investment} - \text{depreciation}$$

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## The Underground Economy

Embedded in our economy is a flourishing, productive underground sector. Some of the people who conduct business there are gamblers, smugglers, prostitutes, “fences” of stolen goods, drug growers, and drug dealers. They have good reason to conceal their incomes.

Most participants in the underground economy, however, engage in perfectly legal activities but choose illegally not to report their full incomes to the Internal Revenue Service (IRS). A barista at a coffee shop may report just a portion of the tips received from customers. Storekeepers may report only a portion of their sales receipts. Workers who want to hold on to their unemployment compensation benefits may take an “off-the-books” or “cash-only” job. A brick mason may agree to rebuild a neighbor's fireplace in exchange for the neighbor's repairing his boat engine. The value of none of these transactions shows up in GDP.

The value of underground transactions is estimated to be about 8 percent of the recorded GDP in the United States. That would mean that GDP in 2012 was understated by about \$1.3 trillion. Global Perspective 7.2 shows estimates of the relative sizes of underground economies in selected nations.

## GDP and the Environment

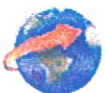
The growth of GDP is inevitably accompanied by “gross domestic by-products,” including dirty air and polluted water, toxic waste, congestion, and noise. The social costs of the negative by-products reduce our economic well-being. And since those costs are not deducted from total output, GDP overstates our national well-being. Ironically, when money is spent to clean up pollution and reduce congestion, those expenses are added to GDP!

## Composition and Distribution of Output

The composition of output is undoubtedly important for well-being. But GDP does not tell us whether the currently produced mix of goods and services is enriching or potentially detrimental to society. GDP assigns equal weight to an assault rifle and a set of encyclopedias, as long as both sell for the same price. Moreover, GDP reveals nothing about the way output is distributed. Does 90 percent of the output go to 10 percent of the households, for example, or is the output more evenly distributed? The distribution of output may make a big difference for society's overall well-being.

## Noneconomic Sources of Well-Being

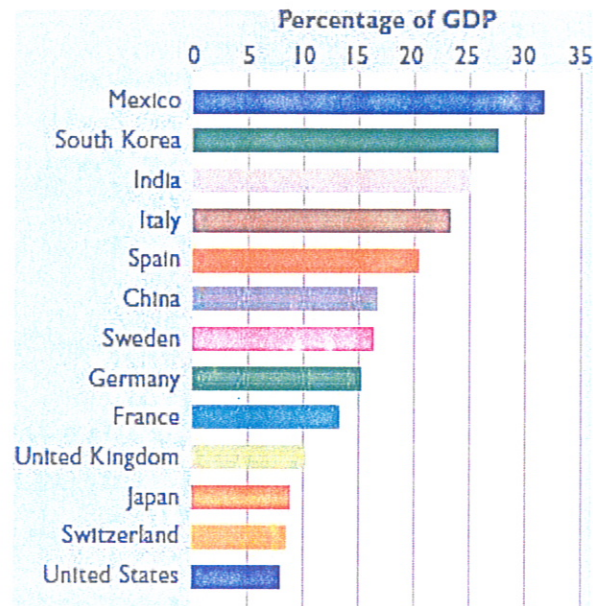
Finally, the connection between GDP and well-being is problematic for another reason. Just as a household's income does not measure its total happiness, a nation's GDP does not measure its total well-being. Many things could make a society better off without necessarily raising GDP: a reduction of crime and violence, peaceful relations with other countries, people's greater civility toward one another, better understanding between parents and children, and a reduction of drug and alcohol abuse.



GLOBAL PERSPECTIVE 7.2

### The Underground Economy as a Percentage of GDP, Selected Nations

Underground economies vary in size worldwide. Three factors that help explain the variation are (1) the extent and complexity of regulation, (2) the type and degree of taxation, and (3) the effectiveness of law enforcement.



Source: Friedrich Schneider, "Shadow Economies and Corruption All Over the World: New Estimates for 145 Countries." *Economics: The Open-Access, Open-Assessment E-Journal*, vol. 1, no. 2007-9 (July 24, 2007). Used with permission of Friedrich Schneider.

#### QUICK REVIEW 7.4

- GDP is a reasonably accurate and very useful indicator of a nation's economic performance but should not be interpreted as a comprehensive measure of well-being.
- The major limitations of GDP as an indicator of wellbeing are that it fails to account for nonmarket and illegal transactions, changes in leisure and in product quality, the composition and distribution of output, and the environmental effects of production.

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## SUMMARY

### LO7.1 Explain how gross domestic product (GDP) is defined and measured.

Gross domestic product (GDP), a basic measure of an economy's economic performance, is the market value of all final goods and services produced within the borders of a nation in a year.

Final goods are those purchased by end users, whereas intermediate goods are those purchased for resale or for further processing or manufacturing. Intermediate goods, nonproduction transactions, and secondhand sales are purposely excluded in calculating GDP.

### LO7.2 Describe how expenditures on goods and services can be summed to determine GDP.

GDP may be calculated by summing total expenditures on all final output or by summing the income derived from the production of that output.

By the expenditures approach, GDP is determined by adding consumer purchases of goods and services, gross investment spending by businesses, government purchases, and net exports:  $GDP = C + I_g + G + X_n$ .

Personal consumption expenditures consist of expenditures on goods (durable goods and nondurable goods) and services. About 60 percent of consumer expenditures in the United States are on services, leading economists to refer to the U.S. economy as a *service economy*.

Gross investment is divided into (a) replacement investment (required to maintain the nation's stock of capital at its existing level) and (b) net investment (the net increase in the stock of capital). In most years, net investment is positive and therefore the economy's stock of capital and production capacity increase.

### LO7.3 Explain how GDP can be determined by summing up all of the incomes that were derived from producing the economy's output of goods and services.

By the income or allocations approach, GDP is calculated as the sum of compensation to employees, rents, interest, proprietors' income, corporate profits, taxes on production and imports *minus* net foreign factor income, *plus* consumption of fixed capital and a statistical discrepancy.

### LO7.4 Describe the relationships among GDP, net domestic product, national income, personal income, and disposable income.

Other national accounts are derived from GDP. Net domestic product (NDP) is GDP less the consumption of fixed capital. National income (NI) is total income earned by a nation's resource suppliers plus taxes on production and imports; it is found by subtracting a statistical discrepancy from NDP and adding net foreign factor income to NDP. Personal income (PI) is the total income paid to households prior to any allowance for personal taxes. Disposable income (DI) is personal income after personal taxes have been paid. DI measures the amount of income available to households to consume or save.

### LO7.5 Discuss the nature and function of a GDP price index, and describe the difference between nominal GDP and real GDP.

Price indexes are computed by dividing the price of a specific collection or market basket of output in a particular period by the price of the same market basket in a base period and multiplying the result (the

quotient) by 100. The GDP price index is used to adjust nominal GDP for inflation or deflation and thereby obtain real GDP.

Nominal (current-dollar) GDP measures each year's output valued in terms of the prices prevailing in that year. Real (constant-dollar) GDP measures each year's output in terms of the prices that prevailed in a selected base year. Because real GDP is adjusted for price-level changes, differences in real GDP are due only to differences in production activity.

#### LO7.6 List and explain some limitations of the GDP measure.

GDP is a reasonably accurate and very useful indicator of a nation's economic performance, but it has its limitations. It fails to account for nonmarket and illegal transactions, changes in leisure and in product quality, the composition and distribution of output, and the environmental effects of production. GDP should not be interpreted as a complete measure of well-being.

## TERMS AND CONCEPTS

national income accounting  
 gross domestic product (GDP)  
 intermediate goods  
 final goods  
 multiple counting  
 value added  
 expenditures approach  
 income approach  
 personal consumption expenditures ( $C$ )  
 durable goods  
 nondurable goods  
 services  
 gross private domestic investment ( $I_g$ )  
 net private domestic investment  
 government purchases ( $G$ )  
 net exports ( $X_n$ )  
 taxes on production and imports  
 national income  
 consumption of fixed capital  
 net domestic product (NDP)  
 personal income (PI)  
 disposable income (DI)  
 nominal GDP  
 real GDP  
 price index  
 base year