

Chapter  
**10**

## Measuring a Nation's Income

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## Chapter Introduction



When you finish school and start looking for a full-time job, your experience will, to a large extent, be shaped by prevailing economic conditions. In some years, firms throughout the economy are expanding their production of goods and services, employment is rising, and jobs are easy to find. In other years, firms are cutting back production, employment is declining, and finding a good job takes a long time. Not surprisingly, any college graduate would rather enter the labor force in a year of economic expansion than in a year of economic contraction.

Because the health of the overall economy profoundly affects all of us, changes in economic conditions are widely reported by the media. Indeed, it is hard to pick up a newspaper, check an online news service, or turn on the TV without seeing some newly reported statistic about the economy. The statistic might measure the total income of everyone in the economy (gross domestic product, or GDP), the rate at which average prices are rising or falling (inflation/deflation), the percentage of the labor force that is out of work (unemployment), total spending at stores (retail sales), or the imbalance of trade between the United States and the rest of the world (the trade deficit). All these statistics are *macroeconomic*. Rather than telling us about a particular household, firm, or market, they tell us something about the entire economy.

As you may recall from Chapter 2, economics is divided into two branches: microeconomics and macroeconomics. **Microeconomics** is the study of how individual households and firms make decisions and how they interact with one another in markets. **Macroeconomics** is the study of the economy as a whole. The goal of macroeconomics is to explain the economic changes that affect many households, firms, and markets simultaneously. Macroeconomists address diverse questions: Why is average income high in some countries while it is low in others? Why do prices sometimes rise rapidly while at other times they are more stable? Why do production and employment expand in some years and contract in others? What, if anything, can the government do to promote rapid growth in incomes, low inflation, and stable employment? These questions are all macroeconomic in nature because they concern the workings of the entire economy.

Because the economy as a whole is a collection of many households and many firms interacting in many markets, microeconomics and macroeconomics are closely linked. The basic tools of supply and demand, for instance, are as central to macroeconomic analysis as they are to microeconomic analysis. Yet studying the economy in its entirety raises some new and intriguing challenges.

In this and the next chapter, we discuss some of the data that economists and policymakers use to monitor the performance of the overall

economy. These data reflect the economic changes that macroeconomists try to explain. This chapter considers *gross domestic product*, which measures the total income of a nation. GDP is the most closely watched economic statistic because it is thought to be the best single measure of a society's economic well-being.

## 10-1 The Economy's Income and Expenditure

### BBC Video: Iraq

If you were to judge how a person is doing economically, you might first look at his or her income. A person with a high income can more easily afford life's necessities and luxuries. It is no surprise that people with higher incomes enjoy higher standards of living—better housing, better healthcare, fancier cars, more opulent vacations, and so on.

The same logic applies to a nation's overall economy. When judging whether the economy is doing well or poorly, it is natural to look at the total income that everyone in the economy is earning. That is the task of gross domestic product.

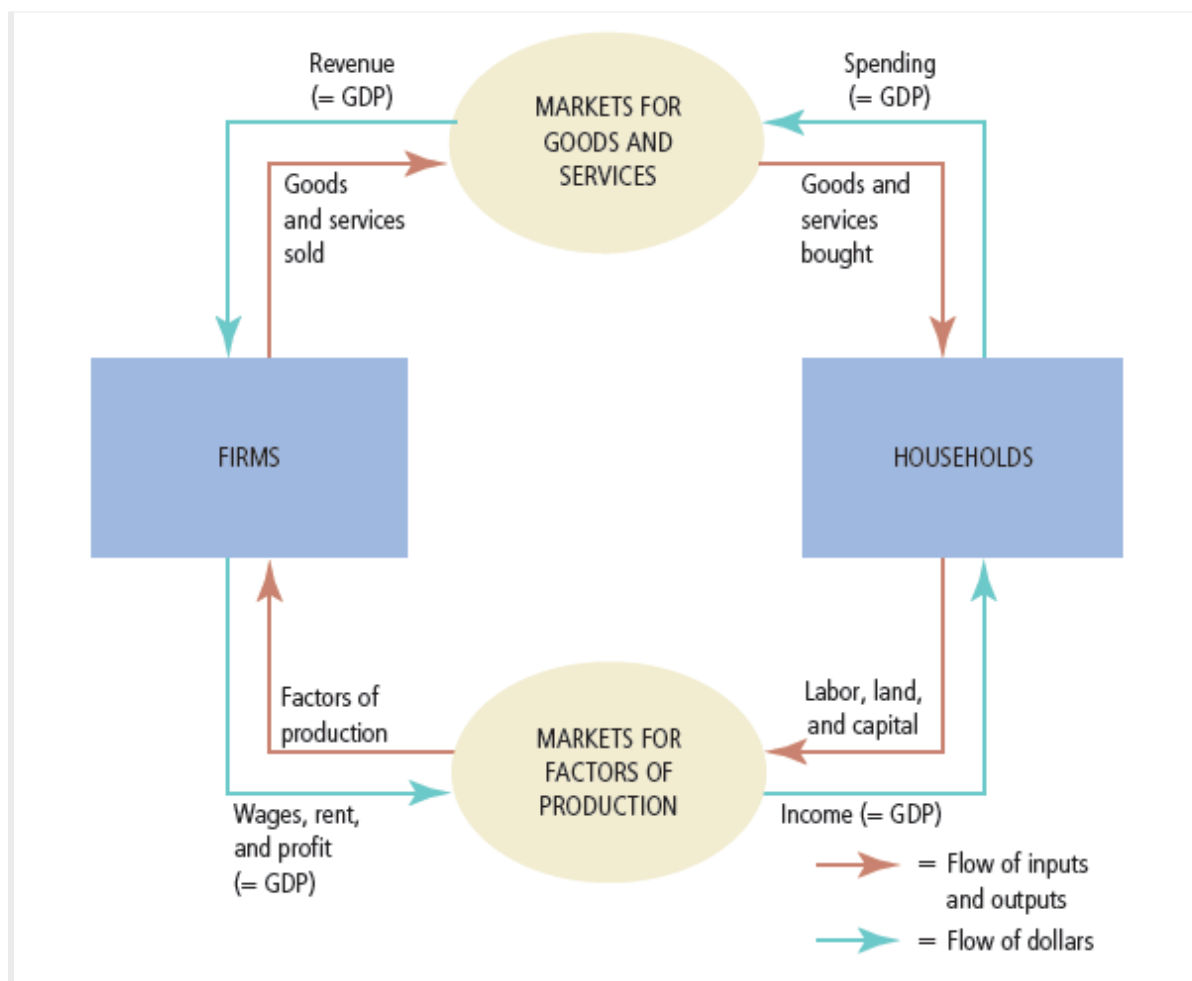
GDP measures two things at once: the total income of everyone in the economy and the total expenditure on the economy's output of goods and services. GDP can perform the trick of measuring both total income and total expenditure because these two things are really the same. *For an economy as a whole, income must equal expenditure.*

Why is this true? An economy's income is the same as its expenditure because every transaction has two parties: a buyer and a seller. Every dollar of spending by some buyer is a dollar of income for some seller. Suppose, for instance, that Karen pays Doug \$100 to mow her lawn. In this case, Doug is a seller of a service, and Karen is a buyer. Doug earns \$100, and Karen spends \$100. Thus, the transaction contributes equally to the economy's income and to its expenditure. GDP, whether measured as total income or total expenditure, rises by \$100.

Another way to see the equality of income and expenditure is with the circular-flow diagram in Figure 1. As you may recall from Chapter 2, this diagram describes all the transactions between households and firms in a simple economy. It simplifies matters by assuming that all goods and services are bought by households and that households spend all of their income. In this economy, when households buy goods and services from firms, these expenditures flow through the markets for goods and services. When the firms in turn use the money they receive from sales to pay workers' wages, landowners' rent, and firm owners' profit, this income flows through the markets for the factors of production. Money continuously flows from households to firms and then back to households.

### Figure 1. The Circular-Flow Diagram

Households buy goods and services from firms, and firms use their revenue from sales to pay wages to workers, rent to landowners, and profit to firm owners. GDP equals the total amount spent by households in the market for goods and services. It also equals the total wages, rent, and profit paid by firms in the markets for the factors of production.



GDP measures this flow of money. We can compute it for this economy in one of two ways: by adding up the total expenditure by households or by adding up the total income (wages, rent, and profit) paid by firms. Because all expenditure in the economy ends up as someone's income, GDP is the same regardless of how we compute it.

The actual economy is, of course, more complicated than the one illustrated in Figure 1. Households do not spend all of their income; they pay some of it to the government in taxes, and they save some for use in the future. In addition, households do not buy all goods and services produced in the economy; some goods and services are bought by governments, and some are bought by firms that plan to use them in the future to produce their own output. Yet the basic lesson remains the same: Regardless of whether a household, government, or firm buys a good or service, the transaction has a buyer and seller. Thus, for the economy as a whole, expenditure and income are always the same.

#### QUICK QUIZ

*What two things does gross domestic product measure? How can it measure two things at once?*

## 10-2 The Measurement of Gross Domestic Product

Having discussed the meaning of gross domestic product in general terms, let's be more precise about how this statistic is measured. Here is a definition of GDP that focuses on GDP as a measure of total expenditure:

- **Gross domestic product (GDP)** is the market value of all final goods and services produced within a country in a given period of time.

This definition might seem simple enough. But in fact, many subtle issues arise when computing an economy's GDP. Let's therefore consider each phrase in this definition with some care.

### 10-2a "GDP Is the Market Value . . ."

You have probably heard the adage, "You can't compare apples and oranges." Yet GDP does exactly that. GDP adds together many different kinds of products into a single measure of the value of economic activity. To do this, it uses market prices. Because market prices measure the amount people are willing to pay for different goods, they reflect the value of those goods. If the price of an apple is twice the price of an orange, then an apple contributes twice as much to GDP as does an orange.

### 10-2b ". . . of All . . ."

GDP tries to be comprehensive. It includes all items produced in the economy and sold legally in markets. GDP measures the market value of not just apples and oranges but also pears and grapefruit, books and movies, haircuts and healthcare, and on and on.

GDP also includes the market value of the housing services provided by the economy's stock of housing. For rental housing, this value is easy to calculate—the rent equals both the tenant's expenditure and the landlord's income. Yet many people own the place where they live and, therefore, do not pay rent. The government includes this owner-occupied housing in GDP by estimating its rental value. In effect, GDP is based on the assumption that the owner is renting the house to himself. The imputed rent is included both in the homeowner's expenditure and in his income, so it adds to GDP.

There are some products, however, that GDP excludes because measuring them is so difficult. GDP excludes most items produced and sold illicitly, such as illegal drugs. It also excludes most items that are produced and consumed at home and, therefore, never enter the marketplace. Vegetables you buy at the grocery store are part of GDP; vegetables you grow in your garden are not.

These exclusions from GDP can at times lead to paradoxical results. For example, when Karen pays Doug to mow her lawn, that transaction is part of GDP. If Karen were to marry Doug, the situation would change. Even though Doug may continue to mow Karen's lawn, the value of the mowing is now left out of GDP because Doug's service is no longer sold in a market. Thus, when Karen and Doug marry, GDP falls.

### 10-2c ". . . Final . . ."

When International Paper makes paper, which Hallmark then uses to make a greeting card, the paper is called an *intermediate good*, and the card is called a *final good*. GDP includes only the value of final goods. This is done because the value of intermediate goods is already included in the prices of the final goods. Adding the market value of the paper to the market value of the card would be double counting. That is, it would (incorrectly) count the paper twice.

An important exception to this principle arises when an intermediate good is produced and, rather than being used, is added to a firm's inventory of goods for use or sale at a later date. In this case, the intermediate good is taken to be "final" for the moment, and its value as inventory investment is included as part of GDP. Thus, additions to inventory add to GDP, and when the goods in inventory are later used or sold, the reductions in inventory subtract from GDP.

### 10-2d ". . . Goods and Services . . ."

GDP includes both tangible goods (food, clothing, cars) and intangible services (haircuts, housecleaning, doctor visits). When you buy a CD by your favorite band, you are buying a good, and the purchase price is part of GDP. When you pay to hear a concert by the same band, you are buying a service, and the ticket price is also part of GDP.

### 10-2e "... Produced ..."

GDP includes goods and services currently produced. It does not include transactions involving items produced in the past. When Ford produces and sells a new car, the value of the car is included in GDP. When one person sells a used car to another person, the value of the used car is not included in GDP.

### 10-2f "... Within a Country ..."

GDP measures the value of production within the geographic confines of a country. When a Canadian citizen works temporarily in the United States, her production is part of U.S. GDP. When an American citizen owns a factory in Haiti, the production at his factory is not part of U.S. GDP. (It is part of Haiti's GDP.) Thus, items are included in a nation's GDP if they are produced domestically, regardless of the nationality of the producer.

### 10-2g "... In a Given Period of Time."

GDP measures the value of production that takes place within a specific interval of time. Usually, that interval is a year or a quarter (three months). GDP measures the economy's flow of income and expenditure during that interval.

When the government reports the GDP for a quarter, it usually presents GDP "at an annual rate." This means that the figure reported for quarterly GDP is the amount of income and expenditure during the quarter multiplied by 4. The government uses this convention so that quarterly and annual figures on GDP can be compared more easily.

In addition, when the government reports quarterly GDP, it presents the data after they have been modified by a statistical procedure called *seasonal adjustment*. The unadjusted data show clearly that the economy produces more goods and services during some times of year than during others. (As you might guess, December's holiday shopping season is a high point.) When monitoring the condition of the economy, economists and policymakers often want to look beyond these regular seasonal changes. Therefore, government statisticians adjust the quarterly data to take out the seasonal cycle. The GDP data reported in the news are always seasonally adjusted.

Now let's repeat the definition of GDP:

- Gross domestic product (GDP) is the market value of all final goods and services produced within a country in a given period of time.

This definition focuses on GDP as total expenditure in the economy. But don't forget that every dollar spent by a buyer of a good or service becomes a dollar of income to the seller of that good or service. Therefore, in addition to applying this definition, the government adds up total income in the economy. The two ways of calculating GDP give almost exactly the same answer. (Why "almost"? Although the two measures should be precisely the same, data sources are not perfect. The difference between the two calculations of GDP is called the *statistical discrepancy*.)

It should be apparent that GDP is a sophisticated measure of the value of economic activity. In advanced courses in macroeconomics, you will learn more about the subtleties that arise in its calculation. But even now you can see that each phrase in this definition is packed with meaning.

#### QUICK QUIZ

*Which contributes more to GDP—the production of a pound of hamburger or the production of a pound of caviar? Why?*

### 10-3 The Components of GDP

Spending in the economy takes many forms. At any moment, the Smith family may be having lunch at Burger King; Ford may be building a car factory; the Navy may be procuring a submarine; and British Airways may be buying an airplane from Boeing. GDP includes all of these various forms of spending on domestically produced goods and services.

To understand how the economy is using its scarce resources, economists study the composition of GDP among various types of spending. To do this, GDP (which we denote as  $Y$ ) is divided into four components: consumption ( $C$ ), investment ( $I$ ), government purchases ( $G$ ), and net exports ( $NX$ ):

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

This equation is an *identity*—an equation that must be true because of how the variables in the equation are defined. In this case, because each dollar of expenditure included in GDP is placed into one of the four components of GDP, the total of the four components must be equal to GDP. Let's look at each of these four components more closely.

#### FYI: Other Measures of Income

When the U.S. Department of Commerce computes the nation's GDP every three months, it also computes various other measures of income to get a more complete picture of what's happening in the economy. These other measures differ from GDP by excluding or including certain categories of income. What follows is a brief description of five of these income measures, ordered from largest to smallest.

- *Gross national product* (GNP) is the total income earned by a nation's permanent residents (called *nationals*). It differs from GDP by including income that our citizens earn abroad and excluding income that foreigners earn here. For example, when a Canadian citizen works temporarily in the United States, her production is part of U.S. GDP, but it is not part of U.S. GNP. (It is part of Canada's GNP.) For most countries, including the United States, domestic residents are responsible for most domestic production, so GDP and GNP are quite close.
- *Net national product* (NNP) is the total income of a nation's residents (GNP) minus losses from depreciation. *Depreciation* is the wear and tear on the economy's stock of equipment and structures, such as trucks rusting and computers becoming obsolete. In the national income accounts prepared by the Department of Commerce, depreciation is called the "consumption of fixed capital."
- *National income* is the total income earned by a nation's residents in the production of goods and services. It is almost identical to net national product. These two measures differ because of the *statistical discrepancy* that arises from problems in data collection.
- *Personal income* is the income that households and noncorporate businesses receive. Unlike national income, it excludes *retained earnings*, which is income that corporations have earned but have not paid out to their owners. It also subtracts indirect business taxes (such as sales taxes), corporate income taxes, and contributions for social insurance (mostly Social Security taxes). In addition, personal income includes the interest income that households receive from their holdings of government debt and the income that households receive from government transfer programs, such as welfare and Social Security.
- *Disposable personal income* is the income that households and noncorporate businesses have left after satisfying all their obligations to the government. It equals personal income minus personal taxes and certain nontax payments (such as traffic tickets).

Although the various measures of income differ in detail, they almost always tell the same story about economic conditions. When GDP is growing rapidly, these other measures of income are usually growing rapidly. And when GDP is falling, these other measures are usually falling as well. For monitoring fluctuations in the overall economy, it does not matter much which measure of income we use.

#### 10-3a Consumption



**Consumption** is spending by households on goods and services, with the exception of purchases of new housing. Goods include household spending on durable goods, such as automobiles and appliances, and nondurable goods, such as food and clothing. Services include such intangible items as haircuts and medical care. Household spending on education is also included in consumption of services (although one might argue that it would fit better in the next component).

### 10-3b Investment

**Investment** is the purchase of goods that will be used in the future to produce more goods and services. It is the sum of purchases of capital equipment, inventories, and structures. Investment in structures includes expenditure on new housing. By convention, the purchase of a new house is the one form of household spending categorized as investment rather than consumption.

As mentioned earlier in this chapter, the treatment of inventory accumulation is noteworthy. When Dell produces a computer and adds it to its inventory instead of selling it, Dell is assumed to have "purchased" the computer for itself. That is, the national income accountants treat the computer as part of Dell's investment spending. (If Dell later sells the computer out of inventory, Dell's inventory investment will then be negative, offsetting the positive expenditure of the buyer.) Inventories are treated this way because one aim of GDP is to measure the value of the economy's production, and goods added to inventory are part of that period's production.

Notice that GDP accounting uses the word *investment* differently from how you might hear the term in everyday conversation. When you hear the word *investment*, you might think of financial investments, such as stocks, bonds, and mutual funds—topics that we study later in this book. By contrast, because GDP measures expenditure on goods and services, here the word *investment* means purchases of goods (such as capital equipment, structures, and inventories) used to produce other goods.

### 10-3c Government Purchases

**Government purchases** include spending on goods and services by local, state, and federal governments. It includes the salaries of government workers as well as expenditures on public works. Recently, the U.S. national income accounts have switched to the longer label *government consumption expenditure and gross investment*, but in this book, we will use the traditional and shorter term *government purchases*.

The meaning of government purchases requires a bit of clarification. When the government pays the salary of an Army general or a schoolteacher, that salary is part of government purchases. But when the government pays a Social Security benefit to a person who is elderly or an unemployment insurance benefit to a worker who was recently laid off, the story is very different: These are called *transfer payments* because they are not made in exchange for a currently produced good or service. Transfer payments alter household income, but they do not reflect the economy's production. (From a macroeconomic standpoint, transfer payments are like negative taxes.) Because GDP is intended to measure income from, and expenditure on, the production of goods and services, transfer payments are not counted as part of government purchases.

### 10-3d Net Exports

**Net exports** equal the foreign purchases of domestically produced goods (exports) minus the domestic purchases of foreign goods (imports). A domestic firm's sale to a buyer in another country, such as Boeing's sale of an airplane to British Airways, increases net exports.

The *net* in *net exports* refers to the fact that imports are subtracted from exports. This subtraction is made because other components of GDP include imports of goods and services. For example, suppose that a household buys a \$30,000 car from Volvo, the Swedish carmaker. That transaction increases consumption by \$30,000 because car purchases are part of consumer spending. It also reduces net exports by \$30,000 because the car is an import. In other words, net exports include goods and services produced abroad (with a minus sign) because these goods and services are included in consumption, investment, and government purchases (with a plus sign). Thus, when a domestic household, firm, or government buys a good or service from abroad, the purchase reduces net exports, but because it also raises consumption, investment, or government purchases, it does not affect GDP.

## Case Study: The Components of U.S. GDP

Table 1 shows the composition of U.S. GDP in 2009. In this year, the GDP of the United States was over \$14 trillion. Dividing this number by the 2009 U.S. population of 307 million yields GDP per person (sometimes called GDP per capita). In 2009 the income and expenditure of the average American was \$46,372.

**Table 1. GDP and Its Components**

This table shows total GDP for the U.S. economy in 2009 and the breakdown of GDP among its four components. When reading this table, recall the identity  $Y = C + I + G + NX$ .

	Total (in billions of dollars)	Per Person (in dollars)	Percent of Total
Gross domestic product, $Y$	\$14,259	\$46,372	100%
Consumption, $C$	10,093	32,823	71
Investment, $I$	1,623	5,278	11
Government purchases, $G$	2,933	9,540	21
Net exports, $NX$	-390	-1,269	-3

Consumption made up 71 percent of GDP, or \$32,823 per person. Investment was \$5,278 per person. Government purchases were \$9,540 per person. Net exports were -\$1,269 per person. This number is negative because Americans spent more on foreign goods than foreigners spent on American goods.

These data come from the Bureau of Economic Analysis, the part of the U.S. Department of Commerce that produces the national income accounts. You can find more recent data on GDP at its website, <http://www.bea.gov> (<http://www.bea.gov>).

#### QUICK QUIZ

*List the four components of expenditure. Which is the largest?*

## 10-4 Real versus Nominal GDP

As we have seen, GDP measures the total spending on goods and services in all markets in the economy. If total spending rises from one year to the next, at least one of two things must be true: (1) the economy is producing a larger output of goods and services, or (2) goods and services are being sold at higher prices. When studying changes in the economy over time, economists want to separate these two effects. In particular, they want a measure of the total quantity of goods and services the economy is producing that is not affected by changes in the prices of those goods and services.

To do this, economists use a measure called *real GDP*. Real GDP answers a hypothetical question: What would be the value of the goods and services produced this year if we valued these goods and services at the prices that prevailed in some specific year in the past? By evaluating current production using prices that are fixed at past levels, real GDP shows how the economy's overall production of goods and services changes over time.

To see more precisely how real GDP is constructed, let's consider an example.

### 10-4a A Numerical Example

Table 2 shows some data for an economy that produces only two goods: hot dogs and hamburgers. The table shows the prices and quantities produced of the two goods in the years 2010, 2011, and 2012.

**Table 2. Real and Nominal GDP**

This table shows how to calculate real GDP, nominal GDP, and the GDP deflator for a hypothetical economy that produces only hot dogs and hamburgers.

Prices and Quantities				
Year	Price of Hot Dogs	Quantity of Hot Dogs	Price of Hamburgers	Quantity of Hamburgers
2010	\$1	100	\$2	50
2011	\$2	150	\$3	100
2012	\$3	200	\$4	150
Calculating Nominal GDP				
2010	(\$1 per hot dog × 100 hot dogs) + (\$2 per hamburger × 50 hamburgers) = \$200			
2011	(\$2 per hot dog × 150 hot dogs) + (\$3 per hamburger × 100 hamburgers) = \$600			
2012	(\$3 per hot dog × 200 hot dogs) + (\$4 per hamburger × 150 hamburgers) = \$1,200			
Calculating Real GDP (base year 2010)				
2010	(\$1 per hot dog × 100 hot dogs) + (\$2 per hamburger × 50 hamburgers) = \$200			
2011	(\$1 per hot dog × 150 hot dogs) + (\$2 per hamburger × 100 hamburgers) = \$350			
2012	(\$1 per hot dog × 200 hot dogs) + (\$2 per hamburger × 150 hamburgers) = \$500			
Calculating the GDP Deflator				
2010	(\$200 / \$200) × 100 = 100			
2011	(\$600 / \$350) × 100 = 171			
2012	(\$1,200 / \$500) × 100 = 240			

To compute total spending in this economy, we would multiply the quantities of hot dogs and hamburgers by their prices. In the year 2010, 100 hot dogs are sold at a price of \$1 per hot dog, so expenditure on hot dogs equals \$100. In the same year, 50 hamburgers are sold for \$2 per hamburger, so expenditure on hamburgers also equals \$100. Total expenditure in the economy—the sum of expenditure on hot dogs and expenditure on hamburgers—is \$200. This amount, the production of goods and services valued at current prices, is called **nominal GDP**.

The table shows the calculation of nominal GDP for these three years. Total spending rises from \$200 in 2010 to \$600 in 2011 and then to \$1,200 in 2012. Part of this rise is attributable to the increase in the quantities of hot dogs and hamburgers, and part is attributable to the increase in the prices of hot dogs and hamburgers.

To obtain a measure of the amount produced that is not affected by changes in prices, we use **real GDP**, which is the production of goods and services valued at constant prices. We calculate real GDP by first designating one year as a *base year*. We then use the prices of hot dogs and hamburgers in the base year to compute the value of goods and services in all the years. In other words, the prices in the base year provide the basis for comparing quantities in different years.

Suppose that we choose 2010 to be the base year in our example. We can then use the prices of hot dogs and hamburgers in 2010 to compute the value of goods and services produced in 2010, 2011, and 2012. Table 2 shows these calculations. To compute real GDP for 2010, we use the prices of hot dogs and hamburgers in 2010 (the base year) and the quantities of hot dogs and hamburgers produced in 2010. (Thus, for the base year, real GDP always equals nominal GDP.) To compute real GDP for 2011, we use the prices of hot dogs and hamburgers in 2010 (the base year) and the quantities of hot dogs and hamburgers produced in 2011. Similarly, to compute real GDP for 2012, we use the prices in 2010 and the quantities in 2012. When we find that real GDP has risen from \$200 in 2010 to \$350 in 2011 and then to \$500 in 2012, we know that the increase is attributable to an increase in the quantities produced because the prices are being held fixed at base-year levels.

To sum up: *Nominal GDP uses current prices to place a value on the economy's production of goods and services. Real GDP uses constant base-year prices to place a value on the economy's production of goods and services.* Because real GDP is not affected by changes in prices, changes in real GDP reflect only changes in the amounts being produced. Thus, real GDP is a measure of the economy's production of goods and services.

Our goal in computing GDP is to gauge how well the overall economy is performing. Because real GDP measures the economy's production of goods and services, it reflects the economy's ability to satisfy people's needs and desires. Thus, real GDP is a better gauge of economic well-being than is nominal GDP. When economists talk about the economy's GDP, they usually mean real GDP rather than nominal GDP. And when they talk about growth in the economy, they measure that growth as the percentage change in real GDP from one period to another.

## 10-4b The GDP Deflator

As we have just seen, nominal GDP reflects both the quantities of goods and services the economy is producing and the prices of those goods and services. By contrast, by holding prices constant at base-year levels, real GDP reflects only the quantities produced. From these two statistics, we can compute a third, called the GDP deflator, which reflects only the prices of goods and services.

The **GDP deflator** is calculated as follows:

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

Because nominal GDP and real GDP must be the same in the base year, the GDP deflator for the base year always equals 100. The GDP deflator for subsequent years measures the change in nominal GDP from the base year that cannot be attributable to a change in real GDP.

The GDP deflator measures the current level of prices relative to the level of prices in the base year. To see why this is true, consider a couple of simple examples. First, imagine that the quantities produced in the economy rise over time but prices remain the same. In this case, both nominal and real GDP rise together, so the GDP deflator is constant. Now suppose, instead, that prices rise over time but the quantities produced stay the same. In this second case, nominal GDP rises but real GDP remains the same, so the GDP deflator rises as well. Notice that, in both cases, the GDP deflator reflects what's happening to prices, not quantities.

Let's now return to our numerical example in Table 2. The GDP deflator is computed at the bottom of the table. For year 2010, nominal GDP is \$200, and real GDP is \$200, so the GDP deflator is 100. (The deflator is always 100 in the base year.) For the year 2011, nominal GDP is \$600, and real GDP is \$350, so the GDP deflator is 171.

Economists use the term *inflation* to describe a situation in which the economy's overall price level is rising. The *inflation rate* is the percentage change in some measure of the price level from one period to the next. Using the GDP deflator, the inflation rate between two consecutive years is computed as follows:

$$\text{Inflation rate in year 2} = \frac{\text{GDP deflator in year 2} - \text{GDP deflator in year 1}}{\text{GDP deflator in year 1}} \times 100.$$

Because the GDP deflator rose in year 2011 from 100 to 171, the inflation rate is  $100 \times (171 - 100)/100$ , or 71 percent. In 2012, the GDP deflator rose to 240 from 171 the previous year, so the inflation rate is  $100 \times (240 - 171)/171$ , or 40 percent.

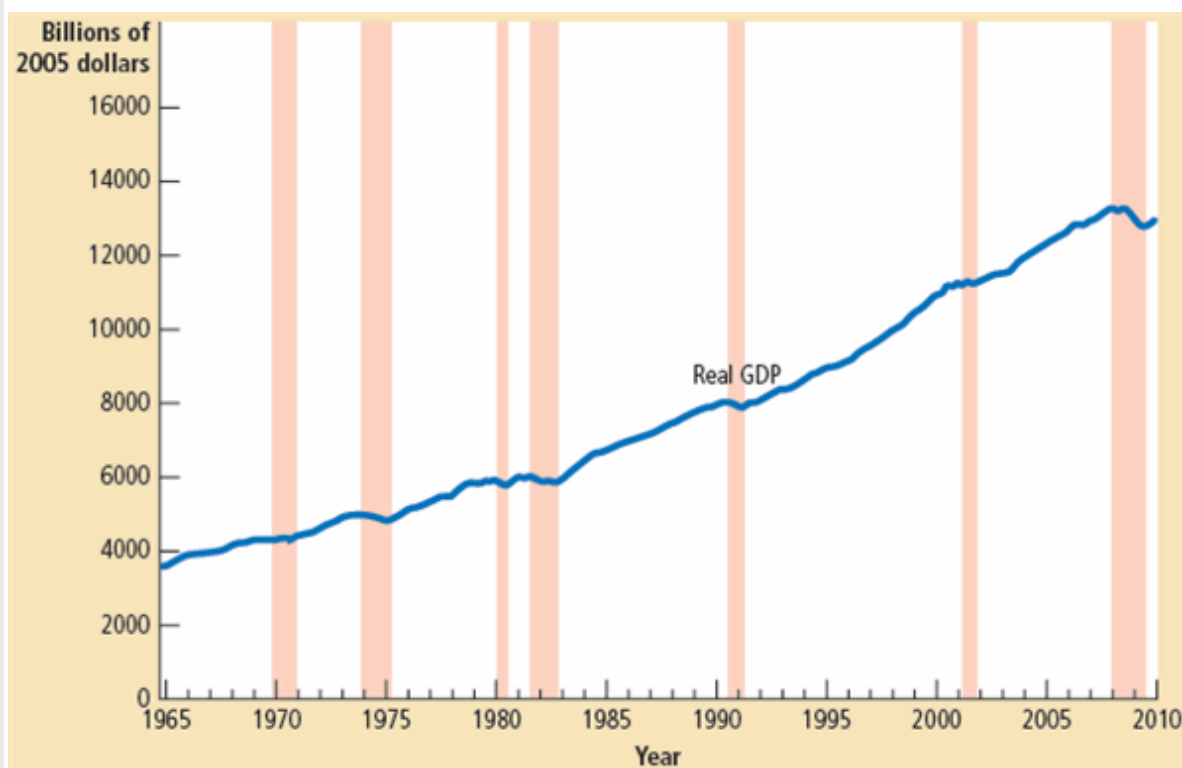
The GDP deflator is one measure that economists use to monitor the average level of prices in the economy and thus the rate of inflation. The GDP deflator gets its name because it can be used to take inflation out of nominal GDP—that is, to "deflate" nominal GDP for the rise that is due to increases in prices. We examine another measure of the economy's price level, called the consumer price index, in the next chapter, where we also describe the differences between the two measures.

## Case Study: Real GDP over Recent History

Now that we know how real GDP is defined and measured, let's look at what this macroeconomic variable tells us about the recent history of the United States. Figure 2 shows quarterly data on real GDP for the U.S. economy since 1965.

**Figure 2. Real GDP in the United States**

This figure shows quarterly data on real GDP for the U.S. economy since 1965. Recessions—periods of falling real GDP—are marked with the shaded vertical bars.



The most obvious feature of these data is that real GDP grows over time. The real GDP of the U.S. economy in 2009 was almost four times its 1965 level. Put differently, the output of goods and services produced in the United States has grown on average about 3 percent per year. This continued growth in real GDP enables the typical American to enjoy greater economic prosperity than his or her parents and grandparents did.

A second feature of the GDP data is that growth is not steady. The upward climb of real GDP is occasionally interrupted by periods during which GDP declines, called *recessions*. Figure 2 marks recessions with shaded vertical bars. (There is no ironclad rule for when the official business cycle dating committee will declare that a recession has occurred, but an old rule of thumb is two consecutive quarters of falling real GDP.) Recessions are associated not only with lower incomes but also with other forms of economic distress: rising unemployment, falling profits, increased bankruptcies, and so on.

Much of macroeconomics is aimed at explaining the long-run growth and short-run fluctuations in real GDP. As we will see in the coming chapters, we need different models for these two purposes. Because the short-run fluctuations represent deviations from the long-run trend, we first examine the behavior of key macroeconomic variables, including real GDP, in the long run. Then in later chapters, we build on this analysis to explain short-run fluctuations.

### QUICK QUIZ

*Define real GDP and nominal GDP. Which is a better measure of economic well-being? Why?*

## 10-5 Is GDP a Good Measure of Economic Well-Being?

Earlier in this chapter, GDP was called the best single measure of the economic well-being of a society. Now that we know what GDP is, we can evaluate this claim.

As we have seen, GDP measures both the economy's total income and the economy's total expenditure on goods and services. Thus, GDP per person tells us the income and expenditure of the average person in the economy. Because most people would prefer to receive higher income and enjoy higher expenditure, GDP per person seems a natural measure of the economic well-being of the average individual.

Yet some people dispute the validity of GDP as a measure of well-being. When Senator Robert Kennedy was running for president in 1968, he gave a moving critique of such economic measures:

[Gross domestic product] does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our courage, nor our wisdom, nor our devotion to our country. It measures everything, in short, except that which makes life worthwhile, and it can tell us everything about America except why we are proud that we are Americans.

Much of what Robert Kennedy said is correct. Why, then, do we care about GDP?

The answer is that a large GDP does in fact help us to lead a good life. GDP does not measure the health of our children, but nations with larger GDP can afford better healthcare for their children. GDP does not measure the quality of their education, but nations with larger GDP can afford better educational systems. GDP does not measure the beauty of our poetry, but nations with larger GDP can afford to teach more of their citizens to read and enjoy poetry. GDP does not take account of our intelligence, integrity, courage, wisdom, or devotion to country, but all of these laudable attributes are easier to foster when people are less concerned about being able to afford the material necessities of life. In short, GDP does not directly measure those things that make life worthwhile, but it does measure our ability to obtain many of the inputs into a worthwhile life.

GDP is not, however, a perfect measure of well-being. Some things that contribute to a good life are left out of GDP. One is leisure. Suppose, for instance, that everyone in the economy suddenly started working every day of the week, rather than enjoying leisure on weekends. More goods and services would be produced, and GDP would rise. Yet despite the increase in GDP, we should not conclude that everyone would be better off. The loss from reduced leisure would offset the gain from producing and consuming a greater quantity of goods and services.

Because GDP uses market prices to value goods and services, it excludes the value of almost all activity that takes place outside markets. In particular, GDP omits the value of goods and services produced at home. When a chef prepares a delicious meal and sells it at his restaurant, the value of that meal is part of GDP. But if the chef prepares the same meal for his family, the value he has added to the raw ingredients is left out of GDP. Similarly, child care provided in day-care centers is part of GDP, whereas child care by parents at home is not. Volunteer work also contributes to the well-being of those in society, but GDP does not reflect these contributions.

### In the News: The Underground Economy

***The gross domestic product misses many transactions that take place in the underground economy.***

#### Searching for the Hidden Economy

*By Doug Campbell*

Here is the brief, unremarkable story of how I recently came to participate in the underground economy:

Midafternoon on the iciest day this past winter, a man knocked at my front door. "Shovel your walk?" he asked. "Only \$5."



Outside, it was a bone-chilling 15 degrees. "Sold," I said. A half-hour later I handed over a five-dollar bill and thanked him for saving me the trouble.

Officially, this was an unofficial transaction—off the books, with no taxes paid or safety regulations followed. (At least, I assume this hired hand didn't bother to report that income or register with the proper authorities.) As such, it was technically illegal. And, of course, it's the sort of thing that happens all the time.

The size of the official U.S. economy, as measured by Gross Domestic Product (GDP), was almost \$12 trillion in 2004. Measurements of the unofficial economy—not including illegal activities like drug dealing and prostitution—differ substantially. But it's generally agreed to be significant, somewhere between 6 percent and 20 percent of GDP. At the midpoint, this would be about \$1.5 trillion a year.

Broadly defined, the underground, gray, informal, or shadow economy involves otherwise legal transactions that go unreported or unrecorded. That's a wide net, capturing everything from babysitting fees, to bartering home repairs with a neighbor, to failing to report pay from moonlighting gigs. The "underground" label tends to make it sound much more sinister than it really is.

*A shadowy enterprise?*



Criminal activities make up a large portion of what could be termed the total underground economy. Many studies have been done on the economics of drug dealing, prostitution, and gambling. But because money from crime is almost never recovered, many policymakers are more interested in portions of the underground economy that otherwise would be legal if not hidden from authorities. Things like shoveling walks.

Despite its intrigue, the informal economy's importance and consequences remain in debate. The reason: "You're trying to measure a phenomenon whose entire purpose is to hide itself from observation," says Ed Feige, an economist at the University of Wisconsin.

This uncertainty poses problems for policymakers. Without knowing the precise size, scope, and causes of the underground economy, how can they decide what—if anything—to do about it?

Was the man who shoveled my walk engaging in a socially positive or negative activity? Was I? Suffice it to say, some economists have dedicated their entire careers to answering questions about the underground economy—and still there is nothing close to a consensus about its size or description. . . .

Economists generally agree that the shadow economy is worse in developing nations, whose webs of bureaucratic red tape and corruption are notorious. For instance, [economist Friedrich] Schneider in 2003 published "shadow economy" estimates (defined broadly as all market-based, legal production of goods and services deliberately concealed from the authorities) for countries including: Zimbabwe, estimated at a whopping 63.2 percent of GDP, Thailand's at 54.1 percent, and Bolivia's at 68.3 percent. Among former Soviet bloc nations, Georgia led the way with a 68 percent of GDP shadow economy, and together those nations had an average 40.1 percent of GDP underground. This contrasts with an average of 16.7 percent among Western nations. . . .

### International Differences in the Underground Economy

Country	Underground Economy as a Percentage of GDP
Bolivia	68 percent
Zimbabwe	63
Peru	61
Thailand	54
Mexico	33
Argentina	29
Sweden	18
Australia	13
United Kingdom	12
Japan	11
Switzerland	9
United States	8

In his 2003 book, *Reefer Madness: Sex, Drugs and Cheap Labor in the American Black Market*, investigative writer Eric Schlosser invokes Adam Smith's "invisible hand" theory that men pursuing their own self-interest will generate benefits for society as a whole. This invisible hand has produced a fairly sizable underground economy, and we cannot understand our entire economic system without understanding how the hidden underbelly functions, too. "The underground is a good measure of the progress and the health of nations," Schlosser writes. "When much is wrong, much needs to be hidden." Schlosser's implication was that much is wrong in the United States. If he had taken a more global view, he might have decided relatively little is hidden here.

"Region Focus," Federal Reserve Bank of Richmond, Spring 2005.

Another thing that GDP excludes is the quality of the environment. Imagine that the government eliminated all environmental regulations. Firms could then produce goods and services without considering the pollution they create, and GDP might rise. Yet well-being would most likely fall. The deterioration in the quality of air and water would more than offset the gains from greater production.

*GDP reflects the factory's production, but not the harm that it inflicts on the environment.*



GDP also says nothing about the distribution of income. A society in which 100 people have annual incomes of \$50,000 has GDP of \$5 million

and, not surprisingly, GDP per person of \$50,000. So does a society in which 10 people earn \$500,000 and 90 suffer with nothing at all. Few people would look at those two situations and call them equivalent. GDP per person tells us what happens to the average person, but behind the average lies a large variety of personal experiences.

In the end, we can conclude that GDP is a good measure of economic well-being for most—but not all—purposes. It is important to keep in mind what GDP includes and what it leaves out.

## In the News: Beyond Gross Domestic Product

***With the encouragement of the French president, some economists wonder whether we need better measures of economic well-being.***

### GDP Seen as Inadequate Measure of Economic Health

*By David Jolly*

PARIS—President Nicolas Sarkozy told the French national statistics agency Monday to take greater account of factors like quality of life and the environment when measuring the country's economic health.

Mr. Sarkozy made the request after accepting a report from a panel of top economists he had charged with reviewing the adequacy of the current standard of fiscal well-being: gross domestic product.

The panel, chaired by two Nobel economists, Joseph E. Stiglitz of Columbia University and Amartya Sen of Harvard University, concluded that GDP was insufficient and that measures of sustainability and human well-being should be included.

*Economist Joe Stiglitz*



An "excessive focus on GDP metrics" also contributed to the onset of the current financial crisis, according to the report. Policy makers cheered rising economic growth while other data, like those that showed the increasing and unsustainable indebtedness of households and businesses, were overlooked, the report found.

"The main message is to get away from GDP fetishism and to understand the limits to it," Mr. Stiglitz said in an interview. "There are many aspects of our society that are not covered by GDP." . . .

GDP is the measure of the market value of all the goods and services produced in the economy. Its development in the 1930s, when the U.S.

government was looking for new tools to measure national income and output more accurately, has been described as one of the most important advances in macroeconomics.

However, there has long been criticism that, while it accurately captures the growth or contraction of the overall economy, it is a crude tool for describing social health.

The United States, for example, with the world's largest economy, naturally tops GDP rankings, but it ranks lower by other measures. The United Nations Development Program's human development index, which incorporates GDP as only one of a number of criteria, ranked Iceland, Norway and Canada the top three spots in 2008, with the United States a distant 15th. The human development indexes also seek to incorporate the value of a long and healthy life, access to knowledge and a decent standard of living.

As an alternative to the developed world's pursuit of GDP, the Himalayan kingdom of Bhutan has chosen to focus on "gross national happiness," complete with the 4 pillars, the 9 domains and the 72 indicators of happiness. . . .

The Stiglitz commission report, known formally as "The Measurement of Economic Performance and Social Progress Revisited," said that one of the most glaring problems with using economic growth as a proxy for well-being was the fact that it excluded the damage to society and ultimately to the economy of environmentally non-sustainable activities.

For instance, "developing countries may be encouraged to allow a foreign mining company to develop a mine, even though the country receives low royalties, even though the environment may be degraded, and even though miners may be exposed to health hazards," the report says, "because by doing so GDP will be increased."

They also identify another problem with the reliance on GDP and other "standard" measures: the gap between what the numbers say and what people are actually experiencing. Over the course of recent decades, they note, GDP was rising in most of the world, even as the median disposable income—the income of the "representative individual"—was falling in many countries, meaning that a large share of the gains from economic growth ended up in the hands of the wealthy at the expense of the rest.

The specific recommendations include ensuring that GDP itself is measured the same in every country, as statistical agencies calculate it differently from one country to the next, leading in some cases, to large variations in the way government services are valued. That has the potential to lead to policy mistakes, they warned.

"What we measure affects what we do; and if our measurements are flawed, decisions may be distorted," they wrote. "Policies should be aimed at increasing societal welfare, not GDP."

*New York Times*, September 15, 2009.

## Case Study: International Differences in GDP and the Quality of Life

One way to gauge the usefulness of GDP as a measure of economic well-being is to examine international data. Rich and poor countries have vastly different levels of GDP per person. If a large GDP leads to a higher standard of living, then we should observe GDP to be strongly correlated with various measures of the quality of life. And, in fact, we do.

Table 3 shows twelve of the world's most populous countries ranked in order of GDP per person. The table also shows life expectancy (the expected life span at birth), literacy (the percentage of the adult population who can read), and Internet usage (the percentage of the population that regularly uses the Internet). These data show a clear pattern. In rich countries, such as the United States, Japan, and Germany, people can expect to live to about 80, almost all of the population can read, and a half to two-thirds of the population uses the Internet. In poor countries, such as Nigeria, Bangladesh, and Pakistan, people typically die 10 to 20 years earlier, a substantial share of the population is illiterate, and Internet usage is rare.

### Table 3. GDP and the Quality of Life

The table shows GDP per person and three other measures of the quality of life for twelve major countries.

Country	Real GDP per Person (2007)	Life Expectancy	Adult Literacy (% of population)	Internet Usage (% of population)
United States	\$45,592	79 years	99%	63%
Germany	34,401	80	99	45
Japan	33,632	83	99	67
Russia	14,690	66	99	15
Mexico	14,104	76	93	18
Brazil	9,567	72	90	19
China	5,383	73	93	9
Indonesia	3,843	71	92	7
India	2,753	63	66	3
Pakistan	2,496	66	54	7
Nigeria	1,969	48	72	4
Bangladesh	1,241	66	54	0.3

Data on other aspects of the quality of life tell a similar story. Countries with low GDP per person tend to have more infants with low birth weight, higher rates of infant mortality, higher rates of maternal mortality, higher rates of child malnutrition, and less common access to safe drinking water. In countries with low GDP per person, fewer school-age children are actually in school, and those who are in school must learn with fewer teachers per student. These countries also tend to have fewer televisions, fewer telephones, fewer paved roads, and fewer households with electricity. International data leave no doubt that a nation's GDP per person is closely associated with its citizens' standard of living.

#### QUICK QUIZ

*Why should policymakers care about GDP?*

## 10-6 Conclusion

**Ask the Author:** Because of its lack of precision, is GDP really useful?

This chapter has discussed how economists measure the total income of a nation. Measurement is, of course, only a starting point. Much of macroeconomics is aimed at revealing the long-run and short-run determinants of a nation's gross domestic product. Why, for example, is GDP higher in the United States and Japan than in India and Nigeria? What can the governments of the poorest countries do to promote more rapid GDP growth? Why does GDP in the United States rise rapidly in some years and fall in others? What can U.S. policymakers do to reduce the severity of these fluctuations in GDP? These are the questions we will take up shortly.

At this point, it is important to acknowledge the significance of just measuring GDP. We all get some sense of how the economy is doing as we go about our lives. But the economists who study changes in the economy and the policymakers who formulate economic policies need more than this vague sense—they need concrete data on which to base their judgments. Quantifying the behavior of the economy with statistics such as GDP is, therefore, the first step to developing a science of macroeconomics.

## Chapter Recap: Summary

- Because every transaction has a buyer and a seller, the total expenditure in the economy must equal the total income in the economy.
- Gross domestic product (GDP) measures an economy's total expenditure on newly produced goods and services and the total income earned from the production of these goods and services. More precisely, GDP is the market value of all final goods and services produced within a country in a given period of time.
- GDP is divided among four components of expenditure: consumption, investment, government purchases, and net exports. Consumption includes spending on goods and services by households, with the exception of purchases of new housing. Investment includes spending on new equipment and structures, including households' purchases of new housing. Government purchases include spending on goods and services by local, state, and federal governments. Net exports equal the value of goods and services produced domestically and sold abroad (exports) minus the value of goods and services produced abroad and sold domestically (imports).
- Nominal GDP uses current prices to value the economy's production of goods and services. Real GDP uses constant base-year prices to value the economy's production of goods and services. The GDP deflator—calculated from the ratio of nominal to real GDP—measures the level of prices in the economy.
- GDP is a good measure of economic well-being because people prefer higher to lower incomes. But it is not a perfect measure of well-being. For example, GDP excludes the value of leisure and the value of a clean environment.

**Ask the Instructor: What is included in the calculation of GDP?**

**Ask the Instructor: Why are some nations rich, but others are poor?**

## Chapter Recap: Questions for Review

1. Explain why an economy's income must equal its expenditure.
2. Which contributes more to GDP—the production of an economy car or the production of a luxury car? Why?
3. A farmer sells wheat to a baker for \$2. The baker uses the wheat to make bread, which is sold for \$3. What is the total contribution of these transactions to GDP?
4. Many years ago, Peggy paid \$500 to put together a record collection. Today, she sold her albums at a garage sale for \$100. How does this sale affect current GDP?
5. List the four components of GDP. Give an example of each.
6. Why do economists use real GDP rather than nominal GDP to gauge economic well-being?
7. In the year 2010, the economy produces 100 loaves of bread that sell for \$2 each. In the year 2011, the economy produces 200 loaves of bread that sell for \$3 each. Calculate nominal GDP, real GDP, and the GDP deflator for each year. (Use 2010 as the base year.) By what percentage does each of these three statistics rise from one year to the next?
8. Why is it desirable for a country to have a large GDP? Give an example of something that would raise GDP and yet be undesirable.



## Chapter Recap: Problems and Applications

- What components of GDP (if any) would each of the following transactions affect? Explain.
  - A family buys a new refrigerator.
  - Aunt Jane buys a new house.
  - Ford sells a Mustang from its inventory.
  - You buy a pizza.
  - California repaves Highway 101.
  - Your parents buy a bottle of French wine.
  - Honda expands its factory in Marysville, Ohio.
- The government purchases component of GDP does not include spending on transfer payments such as Social Security. Thinking about the definition of GDP, explain why transfer payments are excluded.
- As the chapter states, GDP does not include the value of used goods that are resold. Why would including such transactions make GDP a less informative measure of economic well-being?
- Below are some data from the land of milk and honey.

Year	Price of Milk	Quantity of Milk	Price of Honey	Quantity of Honey
2010	\$1	100 quarts	\$2	50 quarts
2011	\$1	200	\$2	100
2012	\$2	200	\$4	100

- Compute nominal GDP, real GDP, and the GDP deflator for each year, using 2010 as the base year.
  - Compute the percentage change in nominal GDP, real GDP, and the GDP deflator in 2011 and 2012 from the preceding year. For each year, identify the variable that does not change. Explain in words why your answer makes sense.
  - Did economic well-being rise more in 2011 or 2012? Explain.
- Consider an economy that produces only chocolate bars. In year 1, the quantity produced is 3 bars and the price is \$4. In year 2, the quantity produced is 4 bars and the price is \$5. In year 3, the quantity produced is 5 bars and the price is \$6. Year 1 is the base year.
    - What is nominal GDP for each of these three years?
    - What is real GDP for each of these years?
    - What is the GDP deflator for each of these years?
    - What is the percentage growth rate of real GDP from year 2 to year 3?
    - What is the inflation rate as measured by the GDP deflator from year 2 to year 3?
    - In this one-good economy, how might you have answered parts (d) and (e) without first answering parts (b) and (c)?
  - Consider the following data on U.S. GDP:

Year	Nominal GDP (in billions of dollars)	GDP Deflator (base year 2005)
2009	14,256	109.8
1999	9,353	86.8

- What was the growth rate of nominal GDP between 1999 and 2009? (Hint: The growth rate of a variable  $X$  over a  $N$ -year period is calculated as  $100 \times [(X_{\text{final}}/X_{\text{initial}})^{1/N} - 1]$ .)
  - What was the growth rate of the GDP deflator between 1999 and 2009?
  - What was real GDP in 1999 measured in 2005 prices?
  - What was real GDP in 2009 measured in 2005 prices?
  - What was the growth rate of real GDP between 1999 and 2009?
  - Was the growth rate of nominal GDP higher or lower than the growth rate of real GDP? Explain.
- Revised estimates of U.S. GDP are usually released by the government near the end of each month. Find a newspaper article that reports on the most recent release, or read the news release yourself at <http://www.bea.gov> (<http://www.bea.gov>), the website of the U.S. Bureau of Economic Analysis. Discuss the recent changes in real and nominal GDP and in the components of GDP.
  - A farmer grows wheat, which he sells to a miller for \$100. The miller turns the wheat into flour, which he sells to a baker for \$150. The baker turns the wheat into bread, which he sells to consumers for \$180. Consumers eat the bread.
    - What is GDP in this economy? Explain.
    - Value added* is defined as the value of a producer's output minus the value of the intermediate goods that the producer buys to make the output. Assuming there are no intermediate goods beyond those described above, calculate the value added of each of the three producers.
    - What is total value added of the three producers in this economy? How does it compare to the economy's GDP? Does this example suggest another way of calculating GDP?
  - Goods and services that are not sold in markets, such as food produced and consumed at home, are generally not included in GDP. Can you think of how this might cause the numbers in the second column of Table 3 to be misleading in a comparison of the economic well-being of the United States and India? Explain.
  - The participation of women in the U.S. labor force has risen dramatically since 1970.
    - How do you think this rise affected GDP?
    - Now imagine a measure of well-being that includes time spent working in the home and taking leisure. How would the change in this measure of well-being compare to the change in GDP?
    - Can you think of other aspects of well-being that are associated with the rise in women's labor-force participation? Would it be practical to construct a measure of well-being that includes these aspects?
  - One day, Barry the Barber, Inc., collects \$400 for haircuts. Over this day, his equipment depreciates in value by \$50. Of the remaining \$350, Barry sends \$30 to the government in sales taxes, takes home \$220 in wages, and retains \$100 in his business to add new equipment in the future. From the \$220 that Barry takes home, he pays \$70 in income taxes. Based on this information, compute Barry's contribution to the following measures of income.
    - gross domestic product
    - net national product

- c. national income
- d. personal income
- e. disposable personal income

For further information on topics in this chapter, additional problems, applications, examples, online quizzes, and more, please visit our website at [www.cengage.com/economics/mankiw](http://www.cengage.com/economics/mankiw) (<http://www.cengage.com/economics/mankiw>).

## Chapter Recap: Key Terms

- **consumption**  
spending by households on goods and services, with the exception of purchases of new housing
- **GDP deflator**  
a measure of the price level calculated as the ratio of nominal GDP to real GDP times 100
- **government purchases**  
spending on goods and services by local, state, and federal governments
- **gross domestic product (GDP)**  
the market value of all final goods and services produced within a country in a given period of time
- **investment**  
spending on capital equipment, inventories, and structures, including household purchases of new housing
- **macroeconomics**  
the study of economy-wide phenomena, including inflation, unemployment, and economic growth
- **microeconomics**  
the study of how households and firms make decisions and how they interact in markets
- **net exports**  
spending on domestically produced goods by foreigners (exports) minus spending on foreign goods by domestic residents (imports); the value of a nation's exports minus the value of its imports; also called the trade balance
- **nominal GDP**  
the production of goods and services valued at current prices
- **real GDP**  
the production of goods and services valued at constant prices