

CHAPTER 12

GDP: Measuring Total Production and Income

Chapter Outline and Learning Objectives

12.1 Gross Domestic Product Measures Total Production, page 397

Explain how total production is measured.

12.2 Does GDP Measure What We Want It to Measure? page 404

Discuss whether GDP is a good measure of well-being.

12.3 Real GDP versus Nominal GDP, page 407

Discuss the difference between real GDP and nominal GDP.

12.4 Other Measures of Total Production and Total Income, page 411

Describe other measures of total production and total income.



Ford Motor Company Rides the Business Cycle

In the more than 100 years that the Ford Motor Company has been in business, its experiences have often mirrored those of the U.S. economy. So, it was no surprise that in 2008, with the U.S. economy suffering from its worst downturn since the 1930s, sales of Ford cars and trucks plummeted. Overall, the automobile industry, which sold 16.1 million new vehicles in 2007, saw sales tumble to 10.4 million in 2009. Although Ford was hit hard, General Motors and Chrysler, Ford's two great American rivals, were even worse off, and both declared bankruptcy. Those firms survived largely because the federal government invested more than \$62 billion in them. Ford suffered heavy losses but did not require direct government aid.

In 2015, the economy was several years into its recovery from the downturn, and Ford's sales had risen by more than one-third since their low point in 2009. With these fluctuations in sales, Ford and the automobile industry as a whole were experiencing the effects of the *business cycle*, which refers to alternating periods of economic expansion and recession. Production and employment increase during expansions and decrease during recessions.

Whether the general level of economic activity is increasing is important not just to firms such as Ford but also to workers wondering whether they will be able to keep their jobs and to college students wondering whether they will be able to find jobs when they graduate. One study found that during the slow recovery from the 2007–2009 recession, only 56 percent of those students who graduated from college in the spring of 2010 had found a job a year later. The average salary of graduates who did find a job was \$27,000, down from an average of \$30,000 for the classes of 2006 to 2008. What's more, students who graduate during recessions will continue to earn less for as long as 15 years after they graduate. The overall state of the economy is clearly important!

Sources: Vehicle sales data are from the U.S. Bureau of Economic Analysis and the Ford Motor Company; Catherine Rampell, "Many with New College Degrees Find the Job Market Humbling," *New York Times*, May 18, 2011; and Lisa B. Kahn, "The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy," *Labour Economics*, Vol. 17, No. 2, April 2010, pp. 303–316.

Economics in Your Life

What's the Best Country for You to Work In?

Suppose that Ford offers you a job after graduation in 2016. The firm has vacancies in Canada and China, and because you are fluent in Mandarin, you get to choose the country where you will work and live. Gross domestic product (GDP) is a measure of an economy's total production of goods and services, so one factor in your decision is likely to be the growth rate of GDP in each country. Based on the International Monetary Fund's forecasts for 2016, GDP would increase by 2.4 percent in Canada but by 6.8 percent in China. What effect do these two very different growth rates have on your decision to work and live in one country or the other? If China's much higher growth rate does not necessarily lead you to decide to work and live in China, why not? As you read this chapter, try to answer these questions. You can check your answers against those we provide on **page 413** at the end of this chapter.

Microeconomics The study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices.

Macroeconomics The study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.

Business cycle Alternating periods of economic expansion and economic recession.

Expansion The period of a business cycle during which total production and total employment are increasing.

Recession The period of a business cycle during which total production and total employment are decreasing.

Economic growth The ability of an economy to produce increasing quantities of goods and services.

Inflation rate The percentage increase in the price level from one year to the next.

As we saw in Chapter 1, we can divide economics into the subfields of microeconomics and macroeconomics. **Microeconomics** is the study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices.

Macroeconomics is the study of the economy as a whole, including topics such as inflation, unemployment, and economic growth. In microeconomic analysis, economists generally study individual markets, such as the market for smartphones. In macroeconomic analysis, economists study factors that affect many markets at the same time.

In the following chapters, we will deal with many key macroeconomic issues, including:

- The **business cycle**, which refers to the alternating periods of expansion and recession that the U.S. economy has experienced since at least the early nineteenth century. A business cycle **expansion** is a period during which total production and total employment are increasing. A business cycle **recession** is a period during which total production and total employment are decreasing. We will discuss the factors that influence the business cycle and policies the government may use to reduce its effects.
- **Economic growth**, which refers to the ability of an economy to produce increasing quantities of goods and services. Economic growth is important because an economy that grows too slowly fails to raise living standards. In some countries in Africa, little economic growth has occurred in the past 50 years, and many people remain in severe poverty. Macroeconomics analyzes both what determines a country's rate of economic growth and the reasons growth rates differ so greatly across countries.
- Fluctuations in the total level of employment in an economy. In the short run, the level of employment is significantly affected by the business cycle, but in the long run, the effects of the business cycle disappear, and other factors determine the level of employment. A related question is why some economies are more successful than others at maintaining high levels of employment over time.
- Fluctuations in the **inflation rate**, which is the percentage increase in the average level of prices from one year to the next. Like employment, inflation is affected both by the business cycle and by long-run factors.
- Linkages among economies in the form of international trade and international finance.

Macroeconomic analysis provides information that consumers and firms need in order to understand current economic conditions and to help predict future conditions. A family may be reluctant to buy a house if employment in the economy is declining because some family members may be at risk of losing their jobs. Similarly, firms may be willing to invest in building new factories or to undertake major new expenditures on information technology only if they expect future sales to be strong. For example, in 2015, Ford opened two new factories in China and announced that it would spend more than \$1 billion to expand an existing factory. Ford was relying on macroeconomic forecasts indicating that the Chinese economy would continue to grow rapidly and that sales of cars in the country would increase from 24 million in 2014 to 32 million in 2020. Macroeconomic analysis can also assist the federal government design policies that help the U.S. economy perform more efficiently.

In this and the following chapters, we begin our study of macroeconomics by considering how best to measure key macroeconomic variables. We start by considering measures of total production and total income in an economy.

12.1 Gross Domestic Product Measures Total Production

LEARNING OBJECTIVE: Explain how total production is measured.

“U.S. GDP Swings to Contraction in First Quarter”

“Canada GDP Posts Surprise Drop in April”

“Brazil GDP Shrinks in First Quarter”

“5 Things You Need to Know about India’s GDP Growth”

“China Maintains 7% GDP Growth in Second Quarter”

These headlines are from articles that appeared in the *Wall Street Journal* during 2015. Why is GDP so often the focus of news stories? In this section, we explore what GDP is and how it is measured. We also explore why understanding GDP is important to consumers, firms, and government policymakers.

Measuring Total Production: Gross Domestic Product

Economists use **gross domestic product (GDP)** to measure total production. GDP is the market *value* of all *final* goods and services produced in a country during a period of time, typically one year. In the United States, the Bureau of Economic Analysis (BEA) in the Department of Commerce compiles the data needed to calculate GDP. The BEA issues reports on the GDP every three months. GDP is a central concept in macroeconomics, so we need to consider its definition carefully.

Gross domestic product (GDP) The market value of all final goods and services produced in a country during a period of time, typically one year.

GDP Is Measured Using Market Values, Not Quantities The word *value* is important in the definition of GDP. In microeconomics, we measure production in quantity terms: the number of cars Ford produces, the tons of wheat U.S. farmers grow, or the number of burritos Chipotle sells. When we measure total production in the economy, we can’t just add together the quantities of every good and service because the result would be a meaningless jumble. Tons of wheat would be added to gallons of milk, numbers of burritos, and so on. Instead, we measure production by taking the *value*, in dollar terms, of all the goods and services produced.

GDP Includes Only the Market Value of Final Goods In measuring GDP, we include only the value of *final goods and services*. A **final good or service** is one that is purchased by its final user and is not included in the production of any other good or service. Examples of final goods are a hamburger purchased by a consumer and a computer purchased by a business. In contrast, **intermediate goods and services** become part of other goods and services. For example, Ford does not produce tires for its cars and trucks; it buys them from tire companies, such as Goodyear and Michelin. The tires are an *intermediate good*, while a Ford truck is a *final good*. In calculating GDP, we include the value of the Ford truck but not the value of the tire. If we included the value of the tire, we would be *double counting*: The value of the tire would be counted once when the tire company sold it to Ford and a second time when Ford sold the truck, with the tire installed, to a consumer.

Final good or service A good or service purchased by a final user.

Intermediate good or service A good or service that is an input into another good or service, such as a tire on a truck.

GDP Includes Only Current Production GDP includes only production that takes place during the indicated time period. For example, GDP in 2016 includes only the goods and services produced during that year. In particular, GDP does *not* include the value of used goods. If you buy a Blu-ray of *Star Wars: The Force Awakens* from Amazon.com, the purchase is included in GDP. If six months later you resell the Blu-ray on eBay, that transaction is not included in GDP.

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Solved Problem 12.1

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Calculating GDP

Suppose that a very simple economy produces only four goods and services: eye examinations, pizzas, shoes, and cheese. Assume that all the cheese in this economy is used in the production of pizzas. Use the information in the following table to compute GDP for the year 2017.

Production and Price Statistics for 2017		
Product	(1) Quantity	(2) Price per Unit
Eye examinations	100	\$50.00
Pizzas	80	10.00
Shoes	20	100.00
Cheese	80	2.00

Solving the Problem

- Step 1:** **Review the chapter material.** This problem is about GDP, so you may want to review the section “Measuring Total Production: Gross Domestic Product,” which begins on page 397.
- Step 2:** **Determine which goods and services listed in the table should be included in the calculation of GDP.** GDP is the value of all final goods and services. Therefore, we need to calculate the value of the final goods and services listed in the table. Eye examinations, pizzas, and shoes are final goods. Cheese would also be a final good if, for instance, a consumer bought it to use in a meal. However, here we are assuming that restaurants buy all the cheese to use in making pizzas, so the cheese is an intermediate good, and its value is not included in GDP.
- Step 3:** **Calculate the value of the three final goods and services listed in the table.** Value is equal to the quantity produced multiplied by the price per unit, so we multiply the numbers in column (1) by the numbers in column (2) to calculate the numbers in column (3).

Product	(1) Quantity	(2) Price per Unit	(3) Value
Eye examinations	100	\$50	\$5,000
Pizzas	80	10	800
Shoes	20	100	2,000

- Step 4:** **Add the value for each of the three final goods and services to find GDP.** $\text{GDP} = \text{Value of eye examinations produced} + \text{Value of pizzas produced} + \text{Value of shoes produced} = \$5,000 + \$800 + \$2,000 = \$7,800.$

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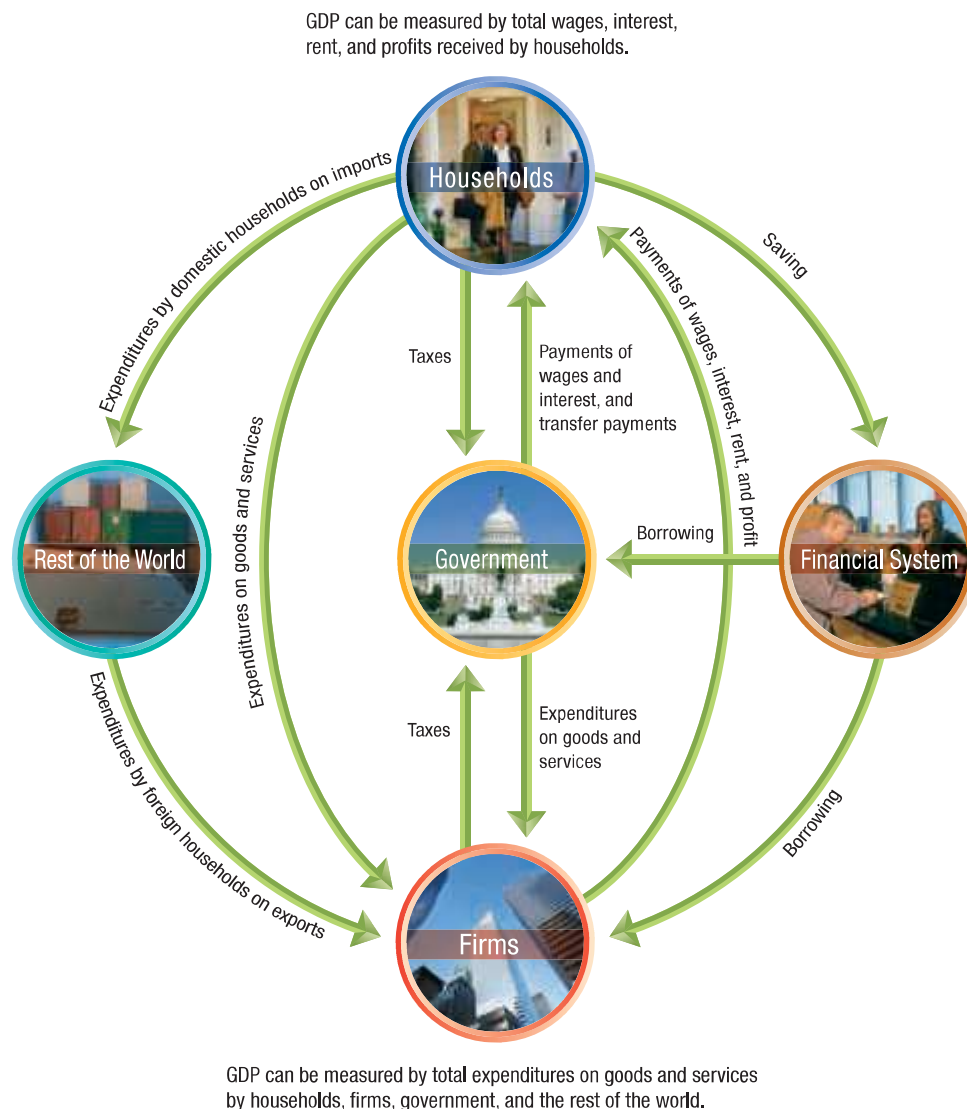
Your Turn: For more practice, do related problem 1.11 on page 415 at the end of this chapter.

Production, Income, and the Circular-Flow Diagram

When we measure the value of total production in the economy by calculating GDP, we are at the same time measuring the value of total income. To see why the value of total production is equal to the value of total income, consider what happens to the money you spend on a single product. Suppose you buy a pair of New Balance running shoes for \$149 at a Foot Locker store. All of that \$149 must end up as someone's income. New Balance and Foot Locker will receive some of the \$149 as profits, workers at New Balance will receive some as wages, the salesperson who sold you the shoes will receive some as salary, the firms that sell components to New Balance will receive some as profits, the workers for those firms will receive some as wages, and so on. Every penny must end up as someone's income. (Note, though, that any sales tax on the shoes will be collected

by the store and sent to the government, without ending up as anyone's income.) Therefore, if we add up the values of every good and service sold in the economy, we must get a total that is exactly equal to the value of all the income in the economy.

The circular-flow diagram in Figure 12.1 was introduced in Chapter 2 to illustrate the interaction of firms and households in markets. We use it here to illustrate the flow of spending and money in the economy. Firms sell goods and services to three groups: domestic households, foreign firms and households, and the government. Expenditures by foreign firms and households (shown as “Rest of the World” in the diagram) on domestically produced goods and services are called *exports*. For example, American Airlines sells many tickets to passengers in Europe and Asia. As noted at the bottom of Figure 12.1, we can measure GDP by adding up the total expenditures of these groups on goods and services.



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Figure 12.1 The Circular Flow and the Measurement of GDP

The circular-flow diagram illustrates the flow of spending and money in the economy. Firms sell goods and services to three groups: domestic households, foreign firms and households, and the government. To produce goods and services, firms use factors of production: labor, capital, natural resources, and entrepreneurship. Households supply the factors of production to firms in exchange for income in the form of wages, interest, profit, and rent. Firms make payments of wages and interest to households in exchange for hiring workers

and other factors of production. The sum of wages, interest, rent, and profit is total income in the economy. We can measure GDP as the total income received by households. The diagram also shows that households use their income to purchase goods and services, pay taxes, and save for the future. Firms and the government borrow the funds that flow from households into the financial system. We can measure GDP either by calculating the total value of expenditures on final goods and services or by calculating the value of total income.

Transfer payments Payments by the government to households for which the government does not receive a new good or service in return.

Firms use the *factors of production*—labor, capital, natural resources, and entrepreneurial ability—to produce goods and services. Households supply the factors of production to firms in exchange for income. We divide income into four categories: wages, interest, rent, and profit. Firms pay wages to households in exchange for labor services, interest for the use of capital, and rent for natural resources such as land. Profit is the income that remains after a firm has paid wages, interest, and rent. Profit is the return to entrepreneurs and other business owners for bearing the risk of producing and selling goods and services. As Figure 12.1 shows, federal, state, and local governments make payments of wages and interest to households in exchange for hiring workers and other factors of production. Governments also make *transfer payments* to households. **Transfer payments** include Social Security payments to retired and disabled people and unemployment insurance payments to unemployed workers. These payments are not included in GDP because they are not received in exchange for production of a new good or service. The sum of wages, interest, rent, and profit is total income in the economy. As noted at the top of Figure 12.1, we can measure GDP as the total income received by households.

The diagram also allows us to trace the ways that households use their income. Households spend some of their income on goods and services. Some of this spending is on domestically produced goods and services, and some is on *imports*, which are foreign-produced goods and services. Households use some of their income to pay taxes to the government. (Note that firms also pay taxes to the government.) Households also use some of the income they earn to save by making deposits in checking or savings accounts in banks or by buying stocks or bonds. Banks and stock and bond markets make up the *financial system*. The flow of funds from households into the financial system makes it possible for the government and firms to borrow. As we will see, the health of the financial system is vital to an economy. Without the ability to borrow funds through the financial system, firms will have difficulty expanding and adopting new technologies. In fact, no country without a well-developed financial system has been able to sustain high levels of economic growth.

The circular-flow diagram shows that we can measure GDP either by calculating the total value of expenditures on final goods and services or by calculating the value of total income. We get the same dollar amount of GDP with either approach.

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Consumption Spending by households on goods and services, not including spending on new houses.

Investment Spending by firms on new factories, office buildings, machinery, and additions to inventories, plus spending by households and firms on new houses.

Components of GDP

The BEA divides its statistics on GDP into four major categories of expenditures: consumption, investment, government purchases, and net exports. Economists use these categories to understand why GDP fluctuates and to forecast future GDP.

Personal Consumption Expenditures, or “Consumption” Consumption expenditures are made by households and are divided into three categories:

1. Expenditures on *services*, such as medical care, education, and haircuts
2. Expenditures on *nondurable goods*, such as food and clothing
3. Expenditures on *durable goods*, such as automobiles and furniture

The spending by households on new houses is not included in consumption. Instead, spending on new houses is included in the investment category, which we discuss next.

Gross Private Domestic Investment, or “Investment” Spending on *gross private domestic investment*, or simply **investment**, is also divided into three categories.

1. *Business fixed investment* is spending by firms on new factories, office buildings, and machinery used to produce other goods. Since 2013, this category of investment has included business spending on research and development. The BEA had previously considered such spending to be an intermediate good.

Don't Let This Happen to You

Remember What Economists Mean by *Investment*

Notice that the definition of *investment* in this chapter is narrower than in everyday use. For example, people often say they are investing in the stock market or in rare coins. As we have seen, economists reserve the word *investment* for purchases of machinery, factories, and houses. Economists don't include purchases of shares of stock or rare coins or deposits in savings accounts in the definition of investment because these activities don't result in the production of new goods. For example, a share of Twitter's stock

represents part ownership of that company. When you buy a share of Twitter's stock, nothing new is produced; there is just a transfer from the seller to you of that small piece of ownership of Twitter. Similarly, buying a rare coin or putting \$1,000 into a savings account does not result in an increase in production. GDP is not affected by any of these activities, so they are not included in the economic definition of investment.

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Your Turn: Test your understanding by doing related problem 1.12 on page 415 at the end of this chapter.

2. *Residential investment* is spending by households and firms on new single-family and multi-unit houses.
3. *Changes in business inventories* are changes in the stocks of goods that have been produced but not yet sold. If Ford has \$200 million worth of unsold cars at the beginning of the year and \$350 million worth of unsold cars at the end of the year, then the firm has spent \$150 million on inventory investment during the year.

Government Consumption and Gross Investment, or “Government Purchases” **Government purchases** are spending by federal, state, and local governments on goods and services, such as teachers' salaries, highways, and aircraft carriers. Again, government spending on transfer payments is not included in government purchases because it does not result in the production of new goods and services.

Government purchases Spending by federal, state, and local governments on goods and services.

Net Exports of Goods and Services, or “Net Exports” **Net exports** are equal to *exports* minus *imports*. Exports are goods and services produced in the United States and purchased by foreign firms, households, and governments. We add exports to our other categories of expenditures because otherwise we would not be including all spending on new goods and services produced in the United States. For example, if a farmer in South Dakota sells wheat to China, the value of the wheat is included in GDP because it represents production in the United States. Imports are goods and services produced in foreign countries and purchased by U.S. firms, households, and governments. We subtract imports from total expenditures because otherwise we would be including spending that does not result in production of new goods and services in the United States. For example, if U.S. consumers buy \$1 billion worth of furniture manufactured in China, that spending is included in consumption expenditures. But the value of those imports is subtracted from GDP because the imports do not represent production in the United States.

Net exports Exports minus imports.

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An Equation for GDP and Some Actual Values

A simple equation sums up the components of GDP:

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

The equation tells us that GDP (denoted as *Y*) equals consumption (*C*) plus investment (*I*) plus government purchases (*G*) plus net exports (*NX*). Figure 12.2 shows the values of the components of GDP for the year 2014. The graph in the figure highlights the fact

COMPONENTS OF GDP (billions of dollars)		
Consumption		\$11,930
Durable goods	\$1,303	
Nondurable goods	2,666	
Services	7,962	
Investment		2,852
Business fixed investment	2,211	
Residential investment	559	
Change in business inventories	82	
Government purchases		3,175
Federal	1,219	
State and local	1,956	
Net Exports		−538
Exports	2,337	
Imports	2,875	
Total GDP		\$17,419

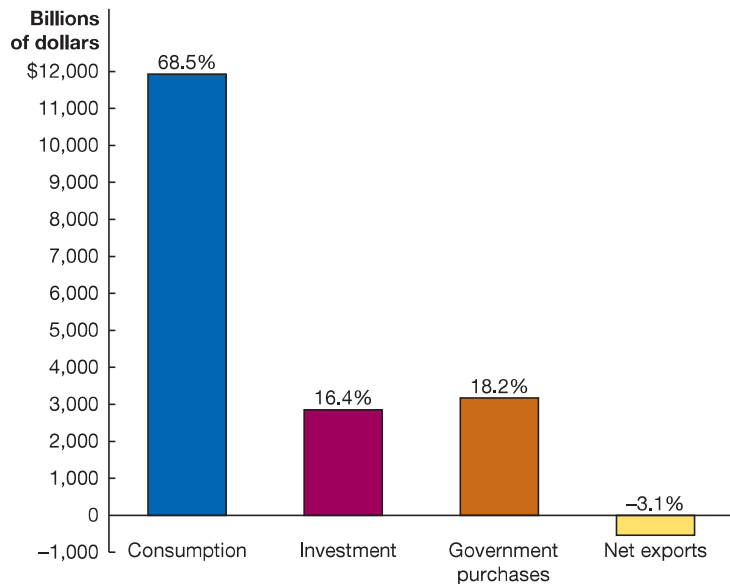


Figure 12.2 Components of GDP in 2014

Consumption accounts for a much larger percentage of GDP than any of the other components. In recent years, net exports have typically been

negative, which reduces GDP. Note that the subtotals may not sum to the totals for each category because of rounding.

Source: U.S. Bureau of Economic Analysis.

that consumption is by far the largest component of GDP. The table provides a more detailed breakdown and shows several interesting points:

- Consumer spending on services is greater than the sum of spending on durable and nondurable goods. There has been a continuing trend in the United States and other high-income countries away from the production of goods and toward the production of services. As the populations of these countries have become, on average, both older and wealthier, their demand for services such as medical care and financial advice has increased faster than their demand for goods.
- Business fixed investment is the largest component of investment. As we will see in later chapters, spending by firms on new factories, computers, and machinery can fluctuate. For example, a decline in business fixed investment played an important role in the 2007–2009 recession.
- Purchases made by state and local governments are greater than purchases made by the federal government. Because basic government activities, such as education and law enforcement, occur largely at the state and local levels, state and local government spending is greater than federal government spending.
- Imports are greater than exports, so net exports are negative. We will discuss in Chapter 19 why imports have typically been larger than exports for the U.S. economy.

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**Making
the
Connection**
MyEconLab Video

Adding More of Lady Gaga to GDP

The Bureau of Economic Analysis (BEA) is always researching to improve its measurement of GDP. A few years ago, the BEA changed how it accounts for spending on research and development (R&D). Prior to 2013, the BEA considered R&D by firms or the government to be an intermediate good, just as tires or batteries are considered intermediate goods in automobile manufacturing. But spending on R&D is similar to investment spending. For example, when Ford buys new machine tools—which are included in investment spending—it does so to help manufacture automobiles now and in the future. Similarly,

when Ford spends on R&D to improve the battery in its Ford Focus electric car, it does so to help improve the car now and in the future. The BEA now counts spending on R&D as investment. In other words, the BEA shifted from not counting spending on R&D as part of GDP to counting it.

The term *research and development* brings to mind scientists working in laboratories, trying to develop new pharmaceutical drugs or improved computer chips. But just as firms and the government devote resources to R&D, movie and television studios, book authors, and musicians devote time and resources to producing new movies, television programs, books, and recordings. In past years, the BEA counted spending by firms and individuals on developing entertainment products as part of the cost of producing those products, in the same way that it counted the cost of labor and materials. So the cost of developing entertainment products was *not* included in GDP. But in 2013, the BEA changed its procedures to include those costs as part of investment and began including it in GDP. For example, prior to 2013, sales of Lady Gaga's songs on iTunes and on CDs as well as ticket sales for her concerts were included in GDP, but the cost to Lady Gaga and her record company of writing and recording her songs was not included. Now both types of spending are included in GDP.

By broadening the definition of investment spending, the BEA increased measured GDP in 2013 by about 3 percent. The BEA adjusted its historical data on GDP back to 1929, so while the levels of GDP increased, the changes in GDP from one year to the next were not greatly affected. The BEA makes changes to its calculations of GDP after consulting with government statistical agencies in other countries. The objective is to allow economists, firms, and policymakers to more accurately compare GDP in different countries. The broadening of the definition of investment was meant to increase the importance of *intellectual property (IP)*, such as software, movies, and books, in GDP. A study by the U.S. Patent and Trademark Office estimated that in the United States, IP-intensive industries, including pharmaceuticals, computers and software, telecommunications, book publishing, and radio and television broadcasting, account for about 40 million jobs and more than one-third of GDP.

As the economy changes over time, the BEA evaluates whether to adjust the way it measures GDP.

Sources: David Kestenbaum, "Lady Gaga Writing a New Song Is Like a Factory Investing in a New Machine," www.npr.org, April 25, 2013; Osagie Imasogie and Thaddeus J. Kobylarz, "Yes, Lady Gaga's Songs Contribute to GDP," *Wall Street Journal*, May 27, 2013; U.S. Bureau of Economic Analysis, "Preview of the 2013 Comprehensive Revision of the National Income and Product Accounts," *Survey of Current Business*, Vol. 93, No. 3, March 2013; and U.S. Department of Commerce, *Intellectual Property and the U.S. Economy: Industries in Focus*, March 2012.

Your Turn: Test your understanding by doing related problem 1.13 on page 415 at the end of this chapter.



The cost to Lady Gaga and her record company of writing and recording her songs is now part of GDP.

Measuring GDP Using the Value-Added Method

We have seen that GDP can be calculated by adding together all expenditures on final goods and services. An alternative way of calculating GDP is the *value-added method*. **Value added** refers to the additional market value a firm gives to a product and is equal to the difference between the price for which the firm sells a good and the price it paid other firms for intermediate goods. Table 12.1 gives a hypothetical example of the value added by each firm involved in the production of a shirt offered for sale on L.L.Bean's Web site.

Suppose a cotton farmer sells \$1 of raw cotton to a textile mill. If, for simplicity, we ignore any inputs the farmer may have purchased from other firms—such as cottonseed

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Value added The market value a firm adds to a product.

Table 12.1
Calculating Value Added

Firm	Value of Product	Value Added
Cotton farmer	Value of raw cotton = \$1	Value added by cotton farmer = \$1
Textile mill	Value of raw cotton woven into cotton fabric = \$3	Value added by textile mill = (\$3 - \$1) = \$2
Shirt company	Value of cotton fabric made into a shirt = \$15	Value added by shirt company = (\$15 - \$3) = \$12
L.L.Bean	Value of shirt for sale on L.L.Bean's Web site = \$35	Value added by L.L.Bean = (\$35 - \$15) = \$20
	Total Value Added	= \$35

or fertilizer—then the farmer's value added is \$1. The textile mill then weaves the raw cotton into cotton fabric, which it sells to a shirt company for \$3. The textile mill's value added (\$2) is the difference between the price it paid for the raw cotton (\$1) and the price for which it can sell the cotton fabric (\$3). Similarly, the shirt company's value added is the difference between the price it paid for the cotton fabric (\$3) and the price it receives for the shirt from L.L.Bean (\$15). L.L.Bean's value added is the difference between the price it pays for the shirt (\$15) and the price for which it can sell the shirt on its Web site (\$35). Notice that *the price of the shirt on L.L.Bean's Web site is exactly equal to the sum of the value added by each firm involved in the production of the shirt*. We can calculate GDP by adding up the market value of every final good and service produced during a particular period. Or, we can arrive at the same value for GDP by adding up the value added by every firm involved in producing those final goods and services.

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12.2

Does GDP Measure What We Want It to Measure?

LEARNING OBJECTIVE: Discuss whether GDP is a good measure of well-being.

Economists use GDP to measure total production in the economy. For that purpose, we would like GDP to be as comprehensive as possible, not overlooking any significant production that takes place in the economy. Most economists believe that GDP does a good—but not flawless—job of measuring production. GDP is also sometimes used as a measure of well-being. Although it is generally true that the more goods and services people have, the better off they are, we will see that GDP provides only a rough measure of well-being.

Shortcomings in GDP as a Measure of Total Production

When the BEA calculates GDP, it does not include two types of production: production in the home and production in the underground economy.

Household Production With few exceptions, the BEA does not attempt to estimate the value of goods and services that are not bought and sold in markets. If a carpenter makes and sells bookcases, the value of those bookcases will be counted in GDP. If the carpenter makes a bookcase for personal use, it will not be counted in GDP. *Household production* refers to goods and services people produce for themselves. The most important type of household production is the services a homemaker provides to the homemaker's family. If a person has been caring for children, cleaning the house, and preparing the family meals, the value of such services is not included in GDP. If the person then decides to work outside the home, enrolls the children in day care, hires a cleaning service, and begins buying the family's meals in restaurants, the value of GDP will rise by the amount paid for day care, cleaning services, and restaurant meals, even though production of these services has not actually increased.

The Underground Economy Individuals and firms sometimes conceal the buying and selling of goods and services, in which case their production isn't counted in GDP. Individuals and firms conceal what they buy and sell for three main reasons: They are dealing in illegal goods and services, such as drugs or prostitution; they want to avoid paying taxes on the income they earn; or they want to avoid government regulations. This concealed buying and selling is called the **underground economy**. Estimates of the size of the underground economy in the United States vary widely, but

Underground economy Buying and selling of goods and services that is concealed from the government to avoid taxes or regulations or because the goods and services are illegal.

it is probably at most 10 percent of measured GDP, or about \$1.8 trillion. The underground economy in some low-income countries, such as Zimbabwe or Peru, may be more than 50 percent of measured GDP. Recently, countries in Western Europe have decided to include estimates of spending on illegal drugs and prostitution in their measures of GDP. To this point, the BEA has decided not to follow this approach. If it did, estimates are that measured U.S. GDP would increase by about 3 percent.

Is not counting household production or production in the underground economy a serious shortcoming of GDP? Most economists would answer “no” because the most important use of GDP is to measure changes in how the economy is performing over short periods of time, such as from one year to the next. For this purpose, omitting household production and production in the underground economy doesn’t matter because there is not likely to be much change in household production or the size of the underground economy from one year to the next.

We also use GDP to measure how production of goods and services grows over fairly long periods of a decade or more. For this purpose, omitting household production and production in the underground economy may be more important. For example, beginning in the 1970s, the number of women working outside the home increased dramatically. Some of the goods and services—such as childcare and restaurant meals—produced in the following years were not true additions to total production; rather, they were replacing what had been household production.

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Why Do Many Developing Countries Have Such Large Underground Economies?

Recent estimates put the size of the underground economy at 8 percent of measured GDP in the United States and 13 percent in Western Europe. The underground economy is much larger in many developing countries—perhaps 50 percent or more of measured GDP. In developing countries, the underground economy is often referred to as the *informal sector*, as opposed to the *formal sector*, in which output of goods and services is measured. Although it might not seem to matter whether production of goods and services is measured and included in GDP or unmeasured, a large informal sector can be a sign of government policies that are retarding economic growth.

Because firms in the informal sector are operating illegally, they tend to be smaller and have less capital than firms operating legally. The entrepreneurs who start firms in the informal sector may be afraid the government could someday close or confiscate their firms. Therefore, the entrepreneurs limit their investments in these firms. As a consequence, workers in these firms have less machinery and equipment to work with and so can produce fewer goods and services. Entrepreneurs in the informal sector also have to pay the costs of avoiding government authorities. For example, construction firms operating in the informal sector in Brazil have to employ lookouts who can warn workers to hide when government inspectors come around. In many countries, firms in the informal sector have to pay substantial bribes to government officials to remain in business. The informal sector is large in some developing economies because taxes are high and government regulations are extensive. For example, firms in Brazil pay 85 percent of all taxes collected, as compared with 40 percent in the United States. Not surprisingly, about half of all Brazilian workers are employed in the informal sector. According to one estimate, firms in the informal sector in Brazil can earn three times the profit of similar-sized firms in the formal sector. In Zimbabwe and Peru, the fraction of workers in the informal sector may be as high as 60 or 70 percent. One estimate puts the size of the informal sector in India at nearly 50 percent.

Many economists believe taxes in developing countries are so high because these countries are attempting to pay for government sectors that are as large relative to their economies as the government sectors of industrial economies. Including transfer payments, government spending in Brazil, for example, is 41 percent of measured GDP, compared to 36 percent in the United States. In the early twentieth century,



In some developing countries, more than half the workers may be in the underground economy.

when the United States was much poorer than it is today, government spending was only about 8 percent of GDP, so the tax burden on U.S. firms was much lower. In countries such as Brazil, bringing firms into the formal sector from the informal sector may require reductions in government spending and taxes. In most developing countries, however, voters are reluctant to see government services reduced.

Sources: “The Price Is Wrong,” *Economist*, September 28, 2013; “Dynamic but Dirty,” *Economist*, December 2, 2010; “Notes from the Underground,” *Economist*, April 2, 2009; Mary Anastasia O’Grady, “Why Brazil’s Underground Economy Grows and Grows,” *Wall Street Journal*, September 10, 2004; and the International Monetary Fund.

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Your Turn: Test your understanding by doing related problems 2.8 and 2.9 on page 416 at the end of this chapter.

Shortcomings of GDP as a Measure of Well-Being

The main purpose of GDP is to measure a country’s total production. GDP is also frequently used, though, as a measure of well-being. For example, news stories often include tables that show for different countries the levels of GDP per person, which is usually called *GDP per capita*. GDP per capita is calculated by dividing the value of GDP for a country by the country’s population. These articles imply that people in the countries with higher levels of GDP per capita are better off. Although increases in GDP often do lead to increases in the well-being of the population, it is important to be aware that GDP is not a perfect measure of well-being for several reasons.

The Value of Leisure Is Not Included in GDP If an economic consultant decides to retire, GDP will decline even though the consultant may value increased leisure more than the income he or she was earning from running a consulting firm. The consultant’s well-being has increased, but GDP has decreased. In 1890, the typical American worked 60 hours per week. Today, the typical American works fewer than 40 hours per week. If Americans still worked 60-hour weeks, GDP would be much higher than it is now, but the well-being of a typical person would be lower because less time would be available for leisure activities.

GDP Is Not Adjusted for Pollution or Other Negative Effects of Production When a dry cleaner cleans and presses clothes, the value of this service is included in GDP. If the chemicals the dry cleaner uses pollute the air or water, GDP is not adjusted to compensate for the cost of the pollution. Similarly, the value of cigarettes produced is included in GDP, with no adjustment made for the cost of the lung cancer that some smokers develop.

We should note, though, that increasing GDP often leads countries to devote more resources to pollution reduction. For example, in the United States between 1970 and 2013, as GDP was steadily increasing, emissions of the six main air pollutants declined by more than 50 percent. Developing countries often have higher levels of pollution than high-income countries because the lower GDPs of the developing countries make them more reluctant to spend resources on pollution reduction. Levels of pollution in China are much higher than those in the United States, Japan, or the countries of Western Europe. According to the World Health Organization, 7 of the 10 most polluted cities in the world are in China, but as Chinese GDP continues to rise, the country is likely to devote more resources to reducing pollution.

GDP Is Not Adjusted for Changes in Crime and Other Social Problems An increase in crime reduces well-being but may actually increase GDP if it leads to greater spending on police, security guards, and alarm systems. GDP is also not adjusted for changes in divorce rates, drug addiction, or other factors that may affect people’s well-being.

GDP Measures the Size of the Pie but Not How the Pie Is Divided When a country’s GDP increases, the country has more goods and services, but those goods and services may be very unequally distributed. Therefore, GDP may not provide good information about the goods and services consumed by a typical person.

To summarize, we can say that a person's well-being depends on many factors that are not considered in calculating GDP. Because GDP is designed to measure total production, it should not be surprising that it does an imperfect job of measuring well-being.

MyEconLab Concept Check

12.3 Real GDP versus Nominal GDP

LEARNING OBJECTIVE: Discuss the difference between real GDP and nominal GDP.

Because GDP is measured in value terms, we have to be careful about interpreting changes over time. To see why, consider interpreting an increase in the total value of pickup truck production from \$40 billion in 2016 to \$44 billion in 2017. Because \$44 billion is 10 percent greater than \$40 billion, were 10 percent more trucks produced in 2017 than in 2016? We can draw this conclusion only if the average price of trucks did not change between 2016 and 2017. In fact, when GDP increases from one year to the next, the increase is due partly to increases in production of goods and services and partly to increases in prices. Because we are mainly interested in GDP as a measure of production, we need a way of separating the price changes from the quantity changes.

Calculating Real GDP

The BEA separates price changes from quantity changes by calculating a measure of production called *real GDP*. **Nominal GDP** is calculated by summing the current values of final goods and services. **Real GDP** is calculated by designating a particular year as the *base year* and then using the prices of goods and services in the base year to calculate the value of goods and services in all other years. For instance, if the base year is 2009, real GDP for 2017 would be calculated by using prices of goods and services from 2009. By keeping prices constant, we know that changes in real GDP represent changes in the quantity of goods and services produced in the economy.

Nominal GDP The value of final goods and services evaluated at current-year prices.

Real GDP The value of final goods and services evaluated at base-year prices.

Solved Problem 12.3

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Calculating Real GDP

Suppose that a very simple economy produces only the following three final goods and services: eye examinations, pizzas, and shoes. Use the information in the table on the right to compute real GDP for the year 2017. Assume that the base year is 2009.

Product	2009		2017	
	Quantity	Price	Quantity	Price
Eye examinations	80	\$40	100	\$50
Pizzas	90	11	80	10
Shoes	15	90	20	100

Solving the Problem

Step 1: Review the chapter material. This problem is about calculating real GDP, so you may want to review the section, “Calculating Real GDP,” which begins on this page.

Step 2: Calculate the value of the three goods and services listed in the table, using the quantities for 2017 and the prices for 2009. Real GDP is the value of all final goods and services, evaluated at base-year prices. In this case, the base year is 2009, and we have the price of each product in that year:

Product	2017 Quantity	2009 Price	Value
Eye examinations	100	\$40	\$4,000
Pizzas	80	11	880
Shoes	20	90	1,800

Step 3: Add up the values of the three products to find real GDP. Real GDP for 2017 equals the sum of:

Quantity of eye examinations in 2017 $\times$ Price of eye examinations in 2009 = \$4,000
 Quantity of pizzas produced in 2017 $\times$ Price of pizzas in 2009 = \$880
 Quantity of shoes produced in 2017 $\times$ Price of shoes in 2009 = \$1,800
 or, \$6,680

Extra Credit: Notice that the quantities of each good produced in 2009 were irrelevant for calculating real GDP in 2017. Notice also that the value of \$6,680 for real GDP in 2017 is lower than the value of \$7,800 for nominal GDP in 2017 that we calculated in Solved Problem 12.1 on page 398.

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Your Turn: For more practice, do related problem 3.4 on page 417 at the end of this chapter.

One drawback to calculating real GDP using base-year prices is that, over time, prices may change relative to each other. For example, the price of smartphones may fall relative to the price of milk. Because this change is not reflected in the fixed prices from the base year, the estimate of real GDP is somewhat distorted. The further away the current year is from the base year, the worse the problem becomes. To make the calculation of real GDP more accurate, in 1996, the BEA switched to using *chain-weighted prices*, and it now publishes statistics on real GDP in “chained (2009) dollars.”

The details of calculating real GDP using chain-weighted prices are more complicated than we need to discuss here, but the basic idea is straightforward: Starting with the base year, the BEA takes an average of prices in that year and prices in the following year. It then uses this average to calculate real GDP in the year following the base year (currently the year 2009). For the next year—in other words, the year that is two years after the base year—the BEA calculates real GDP by taking an average of prices in that year and the previous year. In this way, prices in each year are “chained” to prices from the previous year, and the distortion from changes in relative prices is minimized.

Holding prices constant means that the *purchasing power* of a dollar remains the same from one year to the next. Ordinarily, the purchasing power of the dollar falls every year as price increases reduce the amount of goods and services that a dollar can buy.

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Comparing Real GDP and Nominal GDP

Real GDP holds prices constant, which makes it a better measure than nominal GDP of changes in the production of goods and services from one year to the next. In fact, growth in the economy is almost always measured as growth in real GDP. If a headline in the *Wall Street Journal* states “U.S. Economy Grew 2.3% Last Year,” the article will report that real GDP increased by 2.3 percent during the previous year.

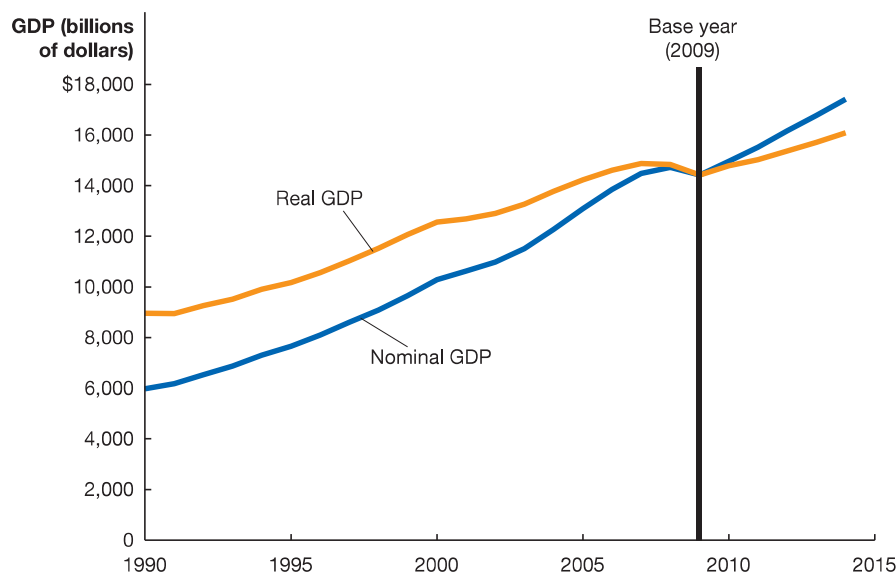
We describe real GDP as being measured in “base-year dollars.” For example, nominal GDP in 2014 was \$17,419 billion, and, with a base year of 2009, real GDP in 2014 was \$16,086 billion in 2009 dollars. Because, on average, prices rise from one year to the next, real GDP is greater than nominal GDP in years before the base year and less than nominal GDP for years after the base year. In the base year, real GDP and nominal GDP are the same because both are calculated for the base year using the same prices and quantities. Figure 12.3 shows movements in nominal GDP and real GDP between 1990 and 2014. In the years before 2009, prices were, on average, lower than in 2009, so nominal GDP was lower than real GDP. In 2009, nominal and real GDP were equal. Since 2009, prices have been, on average, higher than in 2009, so nominal GDP is higher than real GDP.

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The GDP Deflator

Price level A measure of the average prices of goods and services in the economy.

Economists and policymakers are interested not just in the level of total production, as measured by real GDP, but also in the *price level*. The **price level** measures the average prices of goods and services in the economy. One of the goals of economic policy is to maintain a



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Figure 12.3

Nominal GDP and Real GDP, 1990–2014

Currently, the base year for calculating GDP is 2009. In the years before 2009, prices were, on average, lower than in 2009, so nominal GDP was lower than real GDP. In 2009, nominal and real GDP were equal. Since 2009, prices have been, on average, higher than in 2009, so nominal GDP is higher than real GDP.

Source: U.S. Bureau of Economic Analysis.

stable price level. We can use values for nominal GDP and real GDP to compute a measure of the price level called the *GDP deflator*. We calculate the **GDP deflator** using this formula:

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

To see why the GDP deflator is a measure of the price level, think about what would happen if prices of goods and services rose while production remained the same. In that case, nominal GDP would increase, but real GDP would remain constant, so the GDP deflator would increase. In reality, both prices and production usually increase each year, but the more prices increase relative to the increase in production, the more nominal GDP increases relative to real GDP, and the higher the value for the GDP deflator. Increases in the GDP deflator allow economists and policymakers to track increases in the price level over time.

Remember that in the base year (currently 2009), nominal GDP is equal to real GDP, so the value of the GDP price deflator will always be 100 in the base year. The following table gives the values for nominal and real GDP for 2013 and 2014:

	2013	2014
Nominal GDP	\$16,768 billion	\$17,419 billion
Real GDP	\$15,710 billion	\$16,086 billion

We can use the information from this table to calculate values for the GDP price deflator for 2013 and 2014:

Formula	Applied to 2013	Applied to 2014
GDP deflator = $\left(\frac{\text{Nominal GDP}}{\text{Real GDP}} \right) \times 100$	$\left(\frac{\$16,768 \text{ billion}}{\$15,710 \text{ billion}} \right) \times 100 = 106.7$	$\left(\frac{\$17,419 \text{ billion}}{\$16,086 \text{ billion}} \right) \times 100 = 108.3$

From these values for the deflator, we can calculate that the price level increased by 1.5 percent between 2013 and 2014:

$$\left(\frac{108.3 - 106.7}{106.7} \right) \times 100 = 1.5\%.$$

In the next chapter, we will see that economists and policymakers also rely on another measure of the price level, known as the consumer price index. In addition, we will discuss the strengths and weaknesses of different measures of the price level.

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GDP deflator A measure of the price level, calculated by dividing nominal GDP by real GDP and multiplying by 100.

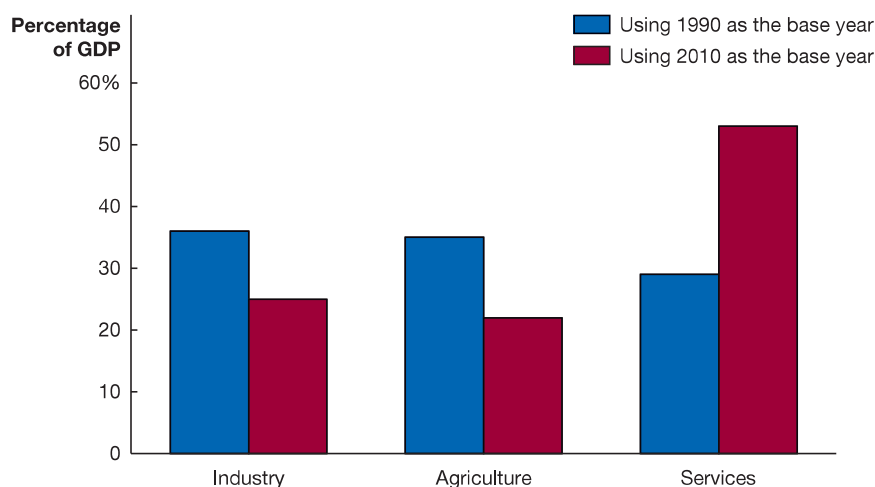
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How Did the Standard of Living in Nigeria Almost Double Overnight?

Government agencies in developing countries like Nigeria have difficulty measuring GDP for two primary reasons: First, the size of the underground economy may be large, making it difficult to gather data on many businesses. Second, government agencies may lack the budgets or the trained staff to accurately process the data they do collect or to use the same approaches to calculating GDP that are used in the United States and other high-income countries. For example, we've seen that in calculating real GDP, governments use base-year prices that, over time, may change relative to each other, potentially distorting the measurement. To deal with this problem, the BEA changes the base year fairly frequently and uses chain-weighted prices. This approach, though, can be difficult for developing countries to implement because it can be expensive to have government employees collect large amounts of price data.

By 2010, the government of Nigeria knew that the data it was publishing on real GDP were inaccurate because it was still using 1990 as its base year, even though the economy had changed dramatically over the years. The Nigerian National Bureau of Statistics was given a larger budget and the task of both changing the real GDP base year to 2010 and gathering data on previously unrecorded output in the underground economy. As an article in the *Wall Street Journal* put it, "Nigerian number crunchers traversed the West African nation by motorcycle and speedboat, visiting Internet cafe owners, movie producers and other businesspeople to record previously uncaptured commercial activity." The number of businesses being surveyed for data increased from 85,000 to 850,000.

When the new data on GDP were released in 2014, the results were dramatic. The estimate for real GDP for 2013 was changed from \$270 billion to \$510 billion, an 89 percent increase. The increase was large enough for Nigeria to pass South Africa as the largest economy in Africa. As the figure below shows, the new data also gave a more accurate picture of the structure of the Nigerian economy. For instance, where previously the service sector was believed to make up less than one-third of the economy, it was shown to actually be more than half the economy. In addition, although not shown in the figure, the telecommunications sector actually makes up 9 percent of the economy, rather than the 1 percent in previous estimates, and the oil industry is only 14 percent of the economy rather than 33 percent.



But had the standard of living of the typical Nigerian actually increased? The new estimates made it appear so, with real GDP per person increasing from \$1,500 to \$2,688. Of course, all that had really changed was how accurately the government was measuring real GDP. The country was producing no more goods and services on April 6, 2014, when the new GDP data were announced, than it had been the day before.

Nigeria's experience with measuring its GDP demonstrates the problems governments have in accurately constructing these statistics and how misleading it can be to rely on them as measures of a country's standard of living.

Sources: Drew Hinshaw and Patrick McGroarty, "Nigeria's Economy Surpasses South Africa's in Size," *Wall Street Journal*, April 6, 2014; Javier Blas and William Wallis, "Nigeria Almost Doubles GDP in Recalculation," *Financial Times*, April 7, 2014; and "How Nigeria's Economy Grew by 89% Overnight," *Economist*, April 7, 2014.

Your Turn: Test your understanding by doing related problem 3.10 on page 417 at the end of this chapter.

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12.4 Other Measures of Total Production and Total Income

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LEARNING OBJECTIVE: Describe other measures of total production and total income.

National income accounting refers to the methods the BEA uses to track total production and total income in the economy. The statistical tables containing this information are called the *National Income and Product Accounts (NIPA)* tables. Every quarter, the BEA releases NIPA tables containing data on several measures of total production and total income. We have already discussed GDP, which is the most important measure of total production and total income. In addition to computing GDP, the BEA computes the following four measures of production and income: gross national product, national income, personal income, and disposable personal income.

Gross National Product

We have seen that GDP is the value of final goods and services produced within the United States. *Gross national product (GNP)* is the value of final goods and services produced by residents of the United States, even if the production takes place *outside* the United States. U.S. firms have facilities in foreign countries, and foreign firms have facilities in the United States. Ford, for example, has assembly plants in the United Kingdom, and Toyota has assembly plants in the United States. GNP includes foreign production by U.S. firms but excludes U.S. production by foreign firms. For the United States, GNP is almost the same as GDP. For example, in 2014, GDP was \$17,419 billion, and GNP was \$17,631 billion, or only about 1.2 percent more than GDP.

For many years, GNP was the main measure of total production compiled by the federal government and used by economists and policymakers in the United States. However, in many countries other than the United States, a significant percentage of domestic production takes place in foreign-owned facilities. For those countries, GDP is much larger than GNP and is a more accurate measure of the level of production within the country's borders. As a result, many countries and international agencies had long preferred using GDP to using GNP. In 1991, the United States joined those countries in using GDP as its main measure of total production.

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National Income

In the production of goods and services, some machinery, equipment, and buildings wear out and have to be replaced. The value of this worn-out machinery, equipment, and buildings is called *depreciation*. In the NIPA tables, depreciation is called the *consumption of fixed capital*. If we subtract this value from GDP, we are left with *national income*.

In Section 12.1, we stressed that the value of total production is equal to the value of total income. This point is not strictly true if by "value of total production" we mean GDP and by "value of total income" we mean national income because national income will always be smaller than GDP by an amount equal to depreciation. In practice, though, the difference between the value of GDP and value of national income does not matter for most macroeconomic issues.

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Personal Income

Personal income is income received by households. To calculate personal income, we subtract the earnings that corporations retain rather than pay to shareholders in the form of dividends. We also add in the payments received by households from the government in the form of *transfer payments* or interest on government bonds. [MyEconLab](#) [Concept Check](#)

Disposable Personal Income

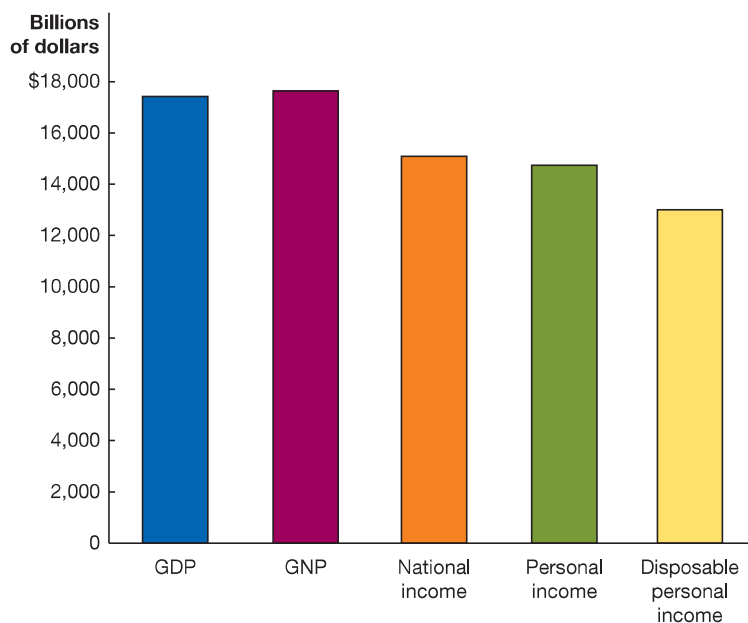
Disposable personal income is equal to personal income minus personal tax payments, such as the federal personal income tax. It is the best measure of the income households actually have available to spend.

Figure 12.4 shows the values of these measures of total production and total income for 2014 in a table and a graph. [MyEconLab](#) [Concept Check](#)

The Division of Income

Figure 12.1 on page 399 illustrates the important fact that we can measure GDP in terms of total expenditure or as the total income received by households. GDP calculated as the sum of income payments to households is sometimes called *gross domestic income*. Figure 12.5 shows the division of total income among wages, interest, rent, profit, and certain non-income items. The non-income items are included in gross domestic income because sales taxes, depreciation, and a few other items are included in the value of goods and services produced but are not directly received by households as income. *Wages* include all compensation received by employees, including fringe benefits such as health insurance. *Interest* is net interest received by households, or the difference between the interest received on savings accounts, government bonds, and other investments and the interest paid on car loans, home mortgages, and other debts. *Rent* is rent received by households. *Profits* include the profits of sole proprietorships, which are usually small businesses, and the profits of corporations. Figure 12.5 shows that the largest component of gross domestic income is wages, which are about three times as large as profits. [MyEconLab](#) [Concept Check](#)

Measure	Billions of dollars
GDP	\$17,419
GNP	17,631
National income	15,077
Personal income	14,734
Disposable personal income	12,990



[MyEconLab](#) [Real-time data](#)

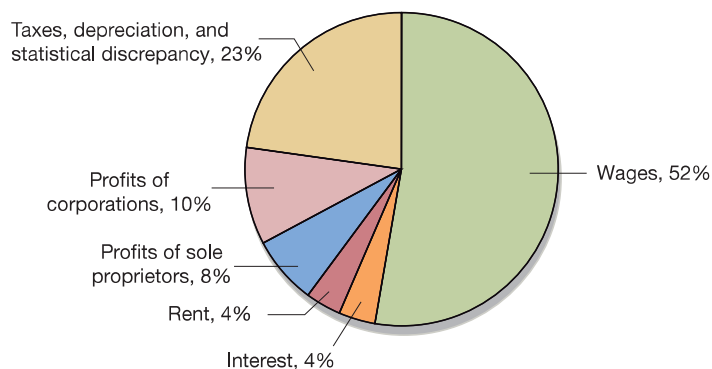
Figure 12.4 Measures of Total Production and Total Income, 2014

The most important measure of total production and total income is gross domestic product (GDP). As we will see in later chapters, for some

purposes, the other measures of total production and total income shown in the figure turn out to be more useful than GDP.

Source: U.S. Bureau of Economic Analysis.

		Billions of dollars
Wages		\$9,237
Interest		660
Rent		640
Profit		3,076
Profits of sole proprietors	1,380	
Profits of corporations	1,696	
Taxes, depreciation, and statistical discrepancy		3,989



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Figure 12.5 The Division of Income, 2014

We can measure GDP in terms of total expenditure or as the total income received by households. The largest component of income received by households is wages, which are more than three times as large as the profits received by sole proprietors and the profits received by corporations combined.

Note: The components in the figure do not sum to 100 percent because of rounding.

Source: U.S. Bureau of Economic Analysis.

Continued from page 395

Economics in Your Life

What's the Best Country for You to Work In?

At the beginning of the chapter, we posed two questions: What effect should Canada's and China's two very different growth rates have on your decision to work and live in one country or the other? And if China's much higher growth rate does not necessarily lead you to decide to work and live there, why not? This chapter has shown that although it is *generally* true that the more goods and services people have, the better off they are, GDP provides only a rough measure of well-being. GDP does not include the value of leisure; nor is it adjusted for pollution and other negative effects of production or crime and other social problems. So, in deciding where to live and work, you would need to balance China's much higher growth rate of GDP against these other considerations. You would also need to take into account that although China's *growth rate* is higher than Canada's, Canada's current *level* of real GDP is higher than China's.

Conclusion

In this chapter, we have begun the study of macroeconomics by examining an important concept: how a country's total production and income can be measured. Understanding GDP is important for understanding the business cycle and the process of long-run economic growth. In the next chapter, we discuss the issues involved in measuring two other key economic variables: the unemployment rate and the inflation rate.

Visit [MyEconLab](#) for a news article and analysis related to the concepts in this chapter.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Business cycle, p. 396	Government purchases, p. 401	Investment, p. 400	Real GDP, p. 407
Consumption, p. 400	Gross domestic product (GDP), p. 397	Macroeconomics, p. 396	Recession, p. 396
Economic growth, p. 396	Inflation rate, p. 396	Microeconomics, p. 396	Transfer payments, p. 400
Expansion, p. 396	Intermediate good or service, p. 397	Net exports, p. 401	Underground economy, p. 404
Final good or service, p. 397		Nominal GDP, p. 407	Value added, p. 403
GDP deflator, p. 409		Price level, p. 408	

12.1

Gross Domestic Product Measures Total Production, pages 397–404

LEARNING OBJECTIVE: Explain how total production is measured.

Summary

Economics is divided into the subfields of **microeconomics**—which studies how households and firms make choices—and **macroeconomics**—which studies the economy as a whole. An important macroeconomic topic is the **business cycle**, which refers to alternating periods of economic expansion and economic recession. An **expansion** is a period during which production and employment are increasing. A **recession** is a period during which production and employment are decreasing. Another important macroeconomic topic is **economic growth**, which refers to the ability of the economy to produce increasing quantities of goods and services. Macroeconomics also studies the **inflation rate**, or the percentage increase in the price level from one year to the next. Economists measure total production by **gross domestic product (GDP)**, which is the value of all *final goods and services* produced in an economy during a period of time. A **final good or service** is purchased by a final user. An **intermediate good or service** is an input into another good or service and is not included in GDP. When we measure the value of total production in the economy by calculating GDP, we are simultaneously measuring the value of total income. GDP is divided into four major categories of expenditures: consumption, investment, government purchases, and net exports. **Consumption** is spending by households on goods and services, not including spending on new houses. **Investment** is spending by firms on new factories, office buildings, machinery, research and development, and additions to inventories, plus spending by households and firms on new houses. **Government purchases** is spending by federal, state, and local governments on goods and services. **Net exports** are equal to exports minus imports. Government **transfer payments** are not included in GDP because they are payments to individuals for which the government does not receive a good or service in return. We can also calculate GDP by adding up the **value added** by every firm involved in producing final goods and services.

- 1.2 If the U.S. Bureau of Economic Analysis added up the values of every good and service sold during the year, would the total be larger, smaller, or equal to GDP? Briefly explain.
- 1.3 In the circular flow of income, why must the value of total production in an economy equal the value of total income?
- 1.4 Describe the four major components of expenditures in GDP and write the equation that represents the relationship between GDP and the four expenditure components.
- 1.5 What is meant by a firm's "value added"?

Problems and Applications

- 1.6 A student remarks, "It doesn't make sense that intermediate goods are not counted in GDP. A computer chip is an intermediate good, and without it, a laptop won't work. So, why don't we count the computer chip in GDP?" Provide an answer to the student's question.
- 1.7 Briefly explain whether each of the following transactions represents the purchase of a final good.
 - a. The purchase of flour by a bakery
 - b. The purchase of an aircraft carrier by the federal government
 - c. The purchase of French wine by a U.S. consumer
 - d. The purchase of a new airliner by American Airlines
- 1.8 An article in the *Wall Street Journal* states that a "change in ... inventories subtracted 0.57 percentage point from" what would have been the increase in GDP. For this result to occur, must there have been an increase or a decrease in inventories? Briefly explain.

Source: Eric Morath and Ben Leubsdorf, "GDP Slows to Crawl in First Quarter, up 0.1%," *Wall Street Journal*, April 30, 2014.

- 1.9 (Related to the Chapter Opener on page 395) Which component of GDP will be affected by each of the following transactions involving Ford Motor Company? If you believe that none of the components of GDP will be affected by a transaction, briefly explain why.
 - a. You purchase a new Ford Escape hybrid from a Ford dealer.
 - b. You purchase a 2011 Ford Escape hybrid from a friend.
 - c. Ford purchases door handles for the Escape from an auto parts manufacturer in Indiana.
 - d. Ford produces 1,000 Escapes in a factory in Missouri and ships them to a car dealer in Shanghai, China.

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Review Questions

- 1.1 Why in microeconomics do we measure production in terms of quantity, but in macroeconomics we measure production in terms of market value?

- e. Ford purchases new machine tools to use in its Missouri Escape factory.
- f. The state of Missouri builds a new highway to help improve access to the Ford Escape plant.
- 1.10** Is the value of a house built in 2006 and resold in 2017 included in the GDP of 2017? Briefly explain. Would the services of the real estate agent who helped sell (or buy) the house in 2017 be counted in GDP for 2017? Briefly explain.
- 1.11** (Related to Solved Problem 12.1 on page 398) Suppose that a simple economy produces only four goods: shoes, hamburgers, shirts, and cotton. Assume that all the cotton is used in the production of shirts. Use the information in the following table to calculate nominal GDP for 2017.

Production and Price Statistics for 2017		
Product	Quantity	Price
Shoes	100	\$60.00
Hamburgers	100	2.00
Shirts	50	25.00
Cotton	80	0.60

- 1.12** (Related to the Don't Let This Happen to You on page 401) Briefly explain whether you agree with the following statement: "In years when people buy many shares of stock, investment will be high and, therefore, so will GDP."

- 1.13** (Related to the Making the Connection on page 402) According to Dan Sichel, an economist at Wellesley College, the amount of time a singer spends working on a record album in a recording studio is "quite analogous to a factory investing in a new machine." Do you agree? Briefly explain.

Source: David Kestenbaum, "Lady Gaga Writing a New Song Is Like a Factory Investing in a New Machine," www.npr.org, April 25, 2013.

- 1.14** An artist buys scrap metal from a local steel mill as a raw material for her metal sculptures. Last year, she bought \$5,000 worth of the scrap metal. During the year, she produced 10 metal sculptures that she sold for \$800 each to a local art store. The local art store sold all of the sculptures to local art collectors, at an average price of \$1,000 each. For the 10 metal sculptures, what was the total value added by the artist, and what was the total value added by the local art store?

12.2 Does GDP Measure What We Want It to Measure? pages 404–407

LEARNING OBJECTIVE: Discuss whether GDP is a good measure of well-being.

Summary

GDP does not include household production, which refers to goods and services people produce for themselves, nor does it include production in the **underground economy**, which consists of concealed buying and selling. The underground economy in some developing countries may be more than half of measured GDP. GDP is not a perfect measure of well-being because it does not include the value of leisure, it is not adjusted for pollution or other negative effects of production, and it is not adjusted for changes in crime and other social problems.

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Review Questions

- 2.1** Why does the size of a country's GDP matter? How does it affect the quality of life of the country's people?
- 2.2** What is the underground economy? Why do some countries have larger underground economies than other countries?
- 2.3** Why is GDP an imperfect measure of economic well-being? What types of production does GDP not measure? If GDP included these types of production, would it still be an imperfect measure of economic well-being?

Problems and Applications

- 2.4** Which of the following are likely to increase measured GDP, and which are likely to reduce it?
- a. The fraction of women working outside the home increases.

- b. There is a sharp increase in the crime rate.
- c. Higher tax rates cause some people to hide more of the income they earn.

- 2.5** Michael Burda of Humboldt University in Germany and Daniel Hamermesh of the University of Texas examined how workers in the United States who lost their jobs spent their time. They discovered that during the period when the workers were unemployed, the decline in the number of hours of paid work these workers did was almost the same as the increase in the number of hours these workers devoted to household production. Do Burda and Hamermesh's findings allow us to draw any conclusions about whether total production in the economy—whether that production is included in GDP or not—decreased when these workers became unemployed? Does your answer depend on whether the household production they carried out while unemployed were activities, such as childcare, that the workers had been paying other people to perform before they lost their jobs? Briefly explain.

Source: Michael Burda and Daniel S. Hamermesh, "Unemployment, Market Work, and Household Production," *Economic Letters*, Vol. 107, May 2010, pp. 131–133.

- 2.6** A typical U.S. worker today works fewer than 40 hours per week, while in 1890, he or she worked 60 hours per week. Does this difference in the length of work weeks matter in comparing the economic well-being of U.S. workers today with that of 1890? Or can we use the difference between real GDP per capita today and in 1890 to measure differences in economic well-being while ignoring differences in the number of hours worked per week? Briefly explain.
- 2.7** Economic historians Roger Ransom and Richard Sutch have estimated that African-American farmers in the U.S. South worked about 30 percent fewer hours per year after

the Civil War than they had as slaves before the Civil War. If after the Civil War, African-American farmers had continued to work these additional hours, their production and income would have been higher, and U.S. GDP would have been higher. Would the farmers' well-being also have been higher as a result of working these additional hours? Does your answer affect how we should interpret changes in U.S. GDP from before the Civil War to after it? Briefly explain.

Source: Roger L. Ransom and Richard Sutch, *One Kind of Freedom: The Economic Consequences of Emancipation*, 2nd edition, New York: Cambridge University Press, 2001.

2.8 (Related to the Making the Connection on page 405) An article in the *New York Times* describes the much greater use of cash, as opposed to checks and credit cards, in buying and selling in China. The article describes someone bringing several bags of cash containing the equivalent of \$130,000 into a car dealership to buy a new BMW. Another article notes, "Many economists believe that the rise in [use of] cash is strongly related to growth in the so-called underground economy."

- What is the underground economy?
- Why might buyers and sellers in the underground economy prefer to use cash?

Sources: David Barboza, "Chinese Way of Doing Business: In Cash We Trust," *New York Times*, April 30, 2013; and Bruce Bartlett, "America's Most Profitable Export Is Cash," *New York Times*, April 9, 2013.

2.9 (Related to the Making the Connection on page 405) An article in the *Wall Street Journal* notes that many economists believe that GDP data for India are unreliable because "the average firm employs just a handful of people and the overwhelming majority of the adult population works off the books and far from major cities."

- What does the article mean by working "off the books"?
- Why would the problems listed make it difficult for the Indian government to accurately measure GDP?

- What problems can be caused for a government or for businesses in a country if the government cannot accurately measure GDP?

Source: Raymond Zhong, "Just How Bad Are India's Official GDP Numbers?" *Wall Street Journal*, August 27, 2014.

2.10 The following table shows data from the Organization for Economic Co-operation and Development (OECD) on the average number of hours employed people worked per week and on real GDP per capita for seven countries.

	Average Hours Worked	Real per Capita GDP
Germany	26.2	\$41,007
Canada	32.8	\$41,475
Japan	33.3	\$34,929
OECD average (34 nations)	34.0	\$36,074
United States	34.4	\$50,429
Greece	39.6	\$23,919
Korea	41.6	\$32,711
Mexico	43.0	\$16,022

The average German worker worked 8 fewer hours but earned \$9,000 less per year than did the average worker in the United States. Can we conclude anything about the well-being of the average German worker versus the well-being of the average worker in the United States from these data? What measures besides average number of hours worked and real per capita GDP would you like to see in evaluating the well-being of workers in OECD countries?

Sources: Eric Morath, "Are Americans Working Less Than the Rest of the World?" *Wall Street Journal*, July 10, 2015; and OECD Data, <https://data.oecd.org/emp/hours-worked.htm#indicator-chart>.

12.3

Real GDP versus Nominal GDP, pages 407–411

LEARNING OBJECTIVE: Discuss the difference between real GDP and nominal GDP.

Summary

Nominal GDP is the value of final goods and services evaluated at current-year prices. **Real GDP** is the value of final goods and services evaluated at *base-year* prices. By keeping prices constant, we know that changes in real GDP represent changes in the quantity of goods and services produced in the economy. When the **price level**, the average prices of goods and services in the economy, is increasing, real GDP is greater than nominal GDP in years before the base year and less than nominal GDP for years after the base year. The **GDP deflator** is a measure of the price level and is calculated by dividing nominal GDP by real GDP and multiplying by 100.

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Review Questions

- Why does inflation make nominal GDP a poor measure of the increase in total production from one year to the next? How does the U.S. Bureau of Economic Analysis deal with this drawback?
- What is the GDP deflator, and how is it calculated?
- Assuming that inflation has occurred over time, what is the relationship between nominal GDP and real GDP in each of the following situations?
 - In the years after the base year
 - In the base year
 - In the years before the base year

Problems and Applications

- 3.4 (Related to Solved Problem 12.3 on page 407)** Suppose the information in the following table is for a simple economy that produces only four goods and services: shoes, hamburgers, shirts, and cotton. Assume that all the cotton is used in the production of shirts.

Product	2009		2016		2017	
	Quantity	Price	Quantity	Price	Quantity	Price
Shoes	90	\$50.00	100	\$60.00	100	\$65.00
Hamburgers	75	2.00	100	2.00	120	2.25
Shirts	50	30.00	50	25.00	65	25.00
Cotton	100	0.80	800	0.60	120	0.70

- Use the information in the table to calculate real GDP for 2016 and 2017, assuming that the base year is 2009.
 - What is the growth rate of real GDP during 2017?
- 3.5** Briefly explain whether you agree with the following statements.
- "If nominal GDP is less than real GDP, then the price level must have fallen during the year."
 - "Whenever real GDP declines, nominal GDP must also decline."
 - "If a recession is so severe that the price level declines, then we know that both real GDP and nominal GDP must decline."
 - "Nominal GDP declined between 2008 and 2009; therefore, the GDP deflator must also have declined."
- 3.6** An article in the *Wall Street Journal* discussed the views of Canadian Minister of Finance Joe Oliver on the effect of falling oil prices on the Canadian economy. According to the article, Oliver argued that "lower oil prices would have a broadly neutral impact on real ... gross domestic product, but have a negative effect on nominal GDP." Given this view, can we tell what Oliver must be expecting the effect of lower oil prices to be on the inflation rate? Briefly explain.

Source: Scott Hagget, "Canada Pushes Back Budget to April Due to Market Instability," *New York Times*, January 15, 2015.

- 3.7** The following table lists hypothetical values.

(1) Year	(2) Nominal GDP	(3) GDP Deflator (base year = 2014)	(4) Real GDP (base year = 2014)	(5) Percentage Change in Real GDP	(6) GDP Deflator (base year = 2016)	(7) Real GDP (base year = 2016)	(8) Percentage Change in Real GDP
2012	\$980.00	90			81.8		
2013	1,020.00	92			83.6		
2014	1,050.00	100			90.9		
2015	1,200.00	105			95.5		
2016	1,400.00	110			100.0		

- Fill in column (4) by calculating real GDP using the GDP deflator with a base year of 2014 from column (3). Fill in column (7) by calculating real GDP using the GDP deflator with a base year of 2016 from column (6).
- Fill in column (5) by calculating the annual percentage change in real GDP for each year, using the values from column (4), and fill in column (8) by calculating the annual percentage change in real GDP by using the values from column (7).
- What effect does the change in the base year used to compute real GDP have on your calculations of the percentage changes in real GDP?

- 3.8** According to an article in the *Economist*, "China's GDP grew by 7% in the second quarter, which was higher than had been expected." Is it likely that the article is referring to the change in nominal GDP or the change in real GDP? Briefly explain.

Source: "World This Week," *Economist*, July 15, 2015.

- 3.9** Use the data in the following table to calculate the GDP deflator for each year (values are in billions of dollars):

Year	Nominal GDP	Real GDP
2010	\$14,964	\$14,784
2011	15,518	15,021
2012	16,163	15,369
2013	16,768	15,710
2014	17,348	16,086

Which year from 2011 to 2014 saw the largest percentage increase in the price level, as measured by changes in the GDP deflator? Briefly explain.

- 3.10 (Related to the Making the Connection on page 410)**

An article in the *Economist* on the revisions to Nigeria's GDP commented, "The GDP revision is not mere trickery. It provides a truer picture of Nigeria's size by giving due weight to the bits of the economy, such as telecoms, banking and the Nollywood film industry, that have been growing fast in recent years."

- What does the article mean by "giving due weight" to the sectors of the economy that have been growing quickly?
- How did the Nigerian National Bureau of Statistics accomplish the task of giving these sectors their due weight?
- Why does making this change in calculating GDP provide a truer picture of the size of Nigeria's economy?

Source: "Africa's New Number One," *Economist*, April 12, 2014.

12.4 Other Measures of Total Production and Total Income, pages 411–413**LEARNING OBJECTIVE:** Describe other measures of total production and total income.**Summary**

The most important measure of total production and total income is gross domestic product (GDP). As we will see in later chapters, for some purposes, other measures of total production and total income are actually more useful than GDP. These measures are gross national product (GNP), national income, personal income, and disposable personal income.

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Review Questions

- 4.1 What is the difference between GDP and GNP? Briefly explain whether the difference is important for the United States.
- 4.2 What are the differences between national income, personal income, and disposable personal income?
- 4.3 What is gross domestic income? Which component of gross domestic income is the largest?

Problems and Applications

- 4.4 Suppose Turkey has many of its citizens temporarily working in other countries, and many of its firms have facilities in other countries. Furthermore, relatively few citizens of foreign countries are working in Turkey, and relatively few foreign firms have facilities in Turkey. In these circumstances, which would you expect to be larger for Turkey, GDP or GNP? Briefly explain.
- 4.5 An article in the *Economist* on the Irish economy argues, “Irish progress, both economic and fiscal, is typically measured using GDP... But for an economy where foreign firms are so dominant, GNP ... is more relevant.” Briefly explain the writer’s reasoning.
Source: “Fitter, yet Fragile,” *Economist*, January 5, 2013.
- 4.6 Suppose the amount the federal government collects in personal income taxes increases, while the level of GDP remains the same. What will happen to the values of national income, personal income, and disposable personal income?
- 4.7 If you were attempting to forecast the level of consumption spending by households, which measure of total production or total income might be most helpful to you in making your forecast? Briefly explain.
- 4.8 Briefly discuss the accuracy of the following statement: “Corporate profits are much too high: Most corporations make profits equal to 50 percent of the price of the products they sell.”

Real-Time Data Exercises

D12.1 (Analyzing the components of personal consumption expenditures) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent quarter for these four variables: (1) Personal Consumption Expenditures (PCEC); (2) Personal Consumption Expenditures: Durable Goods (PCDG); (3) Personal Consumption Expenditures: Nondurable Goods (PCND); and (4) Personal Consumption Expenditures: Services (PCSV).
- b. What percentage of total household expenditures is devoted to the consumption of goods (both durable and nondurable goods)?

D12.2 (Analyzing the components of investment) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent quarter for these three variables: (1) Gross Private Domestic Investment (GPDI); (2) Private Nonresidential Fixed Investment (PNFI); and (3) Private Residential Fixed Investment (PRFI).
- b. Use these values to calculate the difference between private domestic investment and residential and nonresidential fixed private investment. What component of GDP does the value calculated represent?

D12.3 (Calculating net exports) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent two years for Real Exports of Goods and Services (EXPGSCA) and Real Imports of Goods and Services (IMPGSCA).
- b. Compute the value of net exports for each of the two most recent years.

D12.4 (Comparing GDP and GNP) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent quarter for Gross Domestic Product (GDP) and Gross National Product (GNP).
- b. Given these values, explain whether foreign production by U.S. firms exceeded U.S. production by foreign firms.

D12.5 (Analyzing the components of personal income) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent quarter for these three variables: (1) Personal Income (PINCOME); (2) Disposable Personal Income (DPI); and (3) Personal Consumption Expenditures (PCEC).
- b. Use these values to calculate the difference between personal income and disposable personal income. What does this value represent?

D12.6 (Calculating the GDP deflator and the inflation rate) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent quarter and the values for the same quarter one year ago for nominal Gross Domestic Product (GDP) and Real Gross Domestic Product (GDPC1).
- b. Use these values to calculate the GDP price deflator for the most recent quarter and the GDP price deflator for the quarter one year ago.

- c. Using the two GDP price deflators, calculate the inflation rate during this year.
- d. Look again at Figure 12.3 on page 409. Briefly explain why the nominal and real GDP lines intersect at the base year. What is the value of the GDP deflator in the year when the nominal and real GDP lines intersect?

D12.7 (Calculating real GDP and the real growth rate) Go to the  Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/).

- a. Find the values for the most recent quarter and the same quarter one year ago for nominal Gross Domestic Product (GDP) and the GDP Implicit Price Deflator (GDPDEF)
- b. Use these values to calculate real GDP for the most recent quarter and for the quarter one year ago.
- c. Use the two real GDP values to calculate the real growth rate of the economy during this year.