CHAPTER

23

Measuring a Nation's Income

Goals

In this chapter you will

- Consider why an economy's total income equals its total expenditure
- Learn how gross domestic product (GDP) is defined and calculated
- See the breakdown of GDP into its four major components
- Learn the distinction between real GDP and nominal GDP
- Consider whether GDP is a good measure of economic well-being

Outcomes

After accomplishing these goals, you should be able to

- Demonstrate why income equals expenditure equals output
- Explain the key words and phrases in the definition of GDP
- Define consumption, investment, government purchases, and net exports
- Calculate real and nominal GDP using base-year and current-year prices
- List a number of welfare-enhancing activities that are not captured by GDP

Strive for a Five

Chapter 23 is the first chapter to present material that only appears on the AP macroeconomics test. None of the information in this chapter is relevant to the AP microeconomics exam. Material covered in this chapter, the calculation of GDP, may be more easily understood in conjunction with classroom practice. Concepts that you are required to know for the AP exam from this chapter include:

- The circular-flow model
- The gross domestic product (GDP)
- The components of GDP
- Real GDP and nominal GDP
- The GDP deflator as a measure of price level

Key Terms

- *Inflation*—The rate at which prices are rising
- *Unemployment*—Percent of the labor force that is out of work
- *Macroeconomics*—The study of economy-wide phenomena
- *Microeconomics*—The study of how households and firms make decisions and how they interact in markets
- *Total income*—Wages, rent, and profit
- *Total expenditure*—Consumption, investment, government purchases, and net exports
- *Gross domestic product (GDP)* —Market value of all final goods and services produced within a country in a given period of time
- *Intermediate production*—Goods that are produced by one firm to be further processed by another firm
- *Final production*—Finished products sold to the end user
- *Gross national product (GNP)*—Market value of all final goods and services produced by a nation's residents in a given period of time
- *Depreciation*—Value of worn-out equipment and structures
- *Consumption*—Spending by households on goods and services, excluding new housing
- *Investment*—Spending on capital equipment, inventories, and structures, including household purchases of new housing
- *Government purchases*—Spending on goods and services by all levels of government
- *Net exports*—Spending on domestically produced goods by foreigners (exports) minus spending on foreign goods by domestic residents (imports)
- *Transfer payment*—Expenditures by government for which they receive no goods or services
- *Real GDP*—The production of goods and services valued at base year prices
- *Nominal GDP*—The production of goods and services valued at current year prices
- *Base year*—The year from which prices are used to measure real GDP
- *GDP deflator*—A measure of the price level calculated as the ratio of nominal GDP to real GDP then multiplied by 100
- *Recession*—Period of decline in GDP

Chapter Overview

Context and Purpose

Chapter 23 is the first chapter in the macroeconomic section of the text. It is the first of a two-chapter sequence that introduces you to two vital statistics that economists use to monitor the macroeconomy—GDP and the consumer price index. Chapter 23 develops how economists measure production and income in the macroeconomy. Chapter 24 develops how economists measure the level of prices in the macroeconomy. Taken together, Chapter 23 concentrates on the *quantity* of output in the macroeconomy while Chapter 24 concentrates on the *price* of output in the macroeconomy.

The purpose of this chapter is to provide you with an understanding of the measurement and the use of gross domestic product (GDP). GDP is the single most important measure of the health of the macroeconomy. Indeed, it is the most widely reported statistic in every developed economy.

Chapter Review

Introduction Microeconomics is the study of individual markets and the decision making of individual firms and households that meet in those markets. Macroeconomics is the study of the entire economy as a whole. This chapter and the remainder of this text deals with macroeconomics.

The Economy's Income and Expenditure

In a nation's macroeconomy, income must equal expenditure. This is true because, in every transaction, the income of the seller must be equal to the expenditure of the buyer. Gross domestic product (GDP) is a measure of the *total income* or total output in the economy. Since income equals expenditure, GDP can be measured by adding up the income earned in the economy (wages, rent, and profit) or the expenditure on goods and services produced in the economy. That is, income equals expenditure equals GDP.

The Measurement of Gross Domestic Product

GDP is defined as the market value of all final goods and services produced within a country in a given period of time.

- "Market value" means that production is valued at the price paid for the output. Hence, items sold at higher prices are more heavily weighted in GDP.
- "Of all" means that GDP attempts to measure all production in the economy that is legally sold in markets. For example, GDP excludes the production and sale of illegal drugs and household production such as when homeowners clean their own houses. However, in an attempt to be comprehensive, GDP does include the estimated rental value of owner-occupied housing as an expenditure on housing services.
- "Final" means that GDP includes only goods and services that are sold to the end user. Thus, GDP counts the sale of a Ford Taurus when it is sold at retail, but it excludes Ford's purchases of intermediate goods such as glass, steel, and tires used up during the production of the car. *Intermediate goods* are goods that are produced by one firm to be further processed by another firm. Counting only final goods and services avoids double counting *intermediate production*.
- "Goods and services" means that while GDP clearly includes tangible manufactured items such as cars and trucks, it also includes intangible items such as lawyers' and doctors' services.
- "Produced" means that we exclude the sale of used items that were produced (and counted) in a previous period. Again, this avoids double counting.

- "Within a country" means that GDP measures the value of production within the geographic borders of a country.
- "In a given period of time" means that we measure GDP per year or per quarter.

GDP data are statistically "seasonally adjusted" to eliminate the systematic variations in the data that are caused by seasonal events such as Christmas and crop harvest. Our definition of GDP focuses on expenditures. The government also adds up income to measure GDP. The difference between the two calculations is statistical discrepancy.

Other measures of income besides GDP are listed below, from largest to smallest.

- *Gross national product (GNP):* GNP measures the income or production of a nation's permanent residents or "nationals" (both people and their factories) no matter where they are located.
- *Net national product (NNP):* NNP is the total income of a nation's residents (GNP) minus depreciation. *Depreciation* is the value of the wear and tear on the economy's capital stock.
- *National income:* National income is the total income earned by a nation's residents. It is NNP less indirect business taxes plus business subsidies.
- *Personal income:* Personal income is the income of households and noncorporate businesses. It excludes retained earnings (corporate income not paid out as dividends) but includes interest income households receive from government debt and government *transfer payments* (welfare and Social Security).
- *Disposable personal income:* This is income of households and nonincorporated businesses after they pay their obligations to the government (taxes, traffic tickets).

The Components of GDP

GDP can be measured by adding up the value of the expenditures on final goods and services. Economists divide expenditures into four components: consumption (C), investment (I), government purchases (G), and net exports (NX).

- Consumption is spending by households on goods and services, with the exception of new housing.
- Investment is spending on capital equipment, inventories, and structures such as new housing. Investment does not include spending on stocks, bonds, and mutual funds.
- Government purchases is spending on goods and services by all levels of government (federal, state, and local). Government purchases do not include *transfer payments* such as government payments for Social Security, welfare, and *unemployment* benefits because the government does not receive any product or service in return.
- Net exports is the value of foreign purchases of U.S. domestic production (exports) minus U.S. domestic purchases of foreign production (imports). Imports must be subtracted because consumption, investment, and government purchases include expenditures on all goods, foreign and domestic, and the foreign component must be removed so that only spending on domestic production remains.

Denoting GDP as Y, we can say that $Y = C + I + G + NX$. The variables are defined in such a way that this equation is an identity.

Real versus Nominal GDP

Nominal GDP is the value of output measured in the prices that existed during the year in which the output was produced (current prices). Real GDP is the value of output measured in the prices that prevailed in some arbitrary (but fixed) *base year* (constant prices). If we observe that nominal GDP has risen from one year to the next, we are unable to determine whether the quantity of goods and services has risen or whether the prices of goods and services have risen. However, if we observe that real GDP has risen, we are certain that the quantity of goods and services has risen because the output from each year is valued in terms of the same base-year prices. Thus, real GDP is the better measure of production in the economy.

The GDP deflator = (nominal GDP/real GDP) × 100. The GDP deflator is a price index that measures the level of prices in the current year relative to the level of prices in the base year. The percentage change in the GDP deflator is a measure of the rate of inflation.

In the United States, real GDP has grown on average at a rate of 3.2 percent per year since 1965. Occasional periods of decline in real GDP are known as *recessions.*

Is GDP a Good Measure of Economic Well-Being?

Real GDP is a strong indicator of the economic well-being of a society because countries with a large real GDP per person tend to have better educational systems, better health care systems, more literate citizens, better housing, a better diet, a longer life expectancy, and so on. A country with a larger GDP even wins more Olympic medals. That is, a larger real GDP per person generally indicates a larger consumption per person. However, GDP is not a perfect measure of material well-being because it excludes leisure, the quality of the environment, and goods and services produced at home and not sold in markets such as child rearing, housework, and volunteer work. In addition, GDP says nothing about the *distribution* of income. GDP also fails to capture the underground or shadow economy—the portion of the economy that does not report its economic activity. For example, GDP does not measure illegal drug sales or income that is unreported to avoid taxation. The underground economy is relatively small in the United States.

Helpful Hints

1. GDP measures production. When we set out to measure GDP, we must first remember that we are measuring production (and the income earned from producing it) over a period of time. If we can remember that, we will generally account for unusual types of production correctly. Examples:
   - How should we handle the measurement of the production of a cruise ship that takes three years to build and is sold at the end of the third year? Logically, we should count the portion of the ship that was completed during each year and apply it to that year's GDP. In fact, that is what economists do. If we had accounted for the entire ship in the year in which it was sold, we would have overestimated GDP in the third year and underestimated GDP in the previous two years.
   - Similarly, if a new house were built during one year but sold for the first time during the next year, we should account for it during the first year because that is when it was produced. That is, the builder "purchased" the finished home during the first year and added it to his or her inventory of homes.

   While in general we only wish to count final goods and services, we do count the production of intermediate goods that were not used during the period but were added to a firm's inventory because this production will not be captured by counting all of the final goods.

2. GDP does not include all expenditures. We have learned that we can measure GDP by adding the expenditures on final goods and services ($Y = C + I + G + NX$). Once we have learned the expenditure approach, however, we must not forget the words "on final goods and services" and mistakenly count all expenditures. When we include expenditures on used items, intermediate goods, stocks and bonds, or government transfer payments, we get a very large dollar value, but it has nothing to do with GDP. The dollar value of total transactions in the economy is enormous and many times that of GDP.

3. Intermediate goods and final goods are distinct. It should be helpful to clarify the distinction between intermediate goods and final goods with an example. Recall:
   - Intermediate goods are goods that are produced by one firm to be further processed by another firm.

- Final goods are sold to the end user.

GDP only includes the value of the final goods and services because the value of the intermediate goods used in the production of a final good or service is fully captured in the price of the final good or service. If we include the value of intermediate production in GDP, we would double count the intermediate goods.

If we understand this distinction, can we list the items in the economy that are intermediate or final? For example, is a tire an intermediate good or a final good? The answer is: It depends on who bought it. When General Motors buys a tire from Goodyear, the tire is an intermediate good because General Motors will attach it to a car and sell it. When you buy a tire from your Goodyear dealer, it is a final good and should be counted in GDP. Thus, it is difficult to list items in the economy that are intermediate or final without knowledge of the buyer.

4. Comparisons of GDP across countries and time can be biased. We should be cautious when we compare GDP across nations of different levels of market development and when we compare GDP across long periods of time within a single nation. This is because GDP excludes most nonmarket activities. Clearly, a greater proportion of the output of lesser-developed nations is likely to be household production such as when someone does their own farming, cleaning, sewing, and maybe even home construction. Since these activities are not captured by a market transaction, they are not recorded in lesser-developed nations or in earlier periods of industrialized nations when market development was less extensive. The result is an even lower estimate of their GDP.

Self-Test

Multiple-Choice Questions

1. For an economy as a whole,
   a. wages must equal profit.
   b. consumption must equal saving.
   c. income must equal expenditure.
   d. the number of buyers must equal the number of sellers.
   e. investment must equal consumption.

2. GDP is defined as
   a. the market value of all goods and services produced within a country in a given period of time.
   b. the market value of all goods and services produced by the citizens of a country, regardless of where they are living, in a given period of time.
   c. the market value of all final goods and services produced within a country in a given period of time.
   d. the market value of all final goods and services produced by the citizens of a country, regardless of where they are living, in a given period of time.
   e. the quantity of all final goods and services produced within a country in a given period of time.

3. If the price of a DVD player is three times the price of a CD player, then a DVD player contributes
   a. more than three times as much to GDP as does a CD player.
   b. less than three times as much to GDP as does a CD player.
   c. exactly three times as much to GDP as does a CD player.
   d. to GDP but a CD player does not contribute to GDP.
   e. the same amount to GDP as the CD player because their values are adjusted.

4. Over the last few decades, Americans have chosen to cook less at home and eat more at restaurants. This change in behavior, by itself, has
   a. reduced measured GDP.
   b. not affected measured GDP.
   c. increased measured GDP only to the extent that the value of the restaurant meals exceeded the value of meals previously cooked at home.
   d. increased measured GDP by the full value of the restaurant meals.
   e. increased measured real GDP by the full value of the restaurant meals but not nominal GDP.

5. Spots, Inc., produces ink and sells it to Write on Target, which makes pens. The ink produced by Spots, Inc., is
   a. an inventory good and increases GDP.
   b. an inventory good and decreases GDP.
   c. an intermediate good and decreases GDP.
   d. an intermediate good and increases GDP.
   e. an intermediate good and does not change GDP.

6. What would be the effect on GDP if a car produced in 2008 is sold in 2009?
   a. GDP in 2009 would increase by the price of the car.
   b. Consumption would increase in 2009, investment would decrease in 2009 by the same amount, and GDP would be unaffected.
   c. GDP would increase in 2008 and would decrease in 2009 by the same amount.
   d. GDP would decrease in 2008 and would increase in 2009 by the same amount.
   e. GDP in 2008 would be unaffected as the car was not sold.

7. U.S. GDP and U.S. GNP are related as follows:
   a. GNP = GDP + Value of exported goods - Value of imported goods.
   b. GNP = GDP - Value of exported goods + Value of imported goods.
   c. GNP = GDP + Income earned by foreigners in the U.S. - Income earned by U.S. citizens abroad.
   d. GNP = GDP - Income earned by foreigners in the U.S. + Income earned by U.S. citizens abroad.
   e. GNP = GDP.

8. For the purpose of calculating GDP, investment is spending on
   a. stocks, bonds, and other financial assets.
   b. real estate and financial assets such as stocks and bonds.
   c. capital equipment, inventories, and structures, including household purchases of new housing.
   d. capital equipment, inventories, and structures, excluding household purchases of new housing.
   e. capital equipment, structures, including household purchases of new housing, but not inventory accumulation.

9. A transfer payment is
   a. a payment for moving expenses a worker receives when he or she is transferred by an employer to a new location and therefore included in GDP.
   b. a payment that is automatically transferred from your bank account to pay a bill or some other obligation and therefore included in GDP.
   c. a form of government spending that is not made in exchange for a currently produced good or service and therefore not included in GDP.
   d. a form of government spending that is not made in exchange for a currently produced good or service but is still included in GDP.
   e. the benefit that a person receives from an expenditure by government minus the taxes that were collected by government to fund that expenditure and therefore not included in GDP.

10. Net exports equal
    a. exports plus imports.
    b. exports minus imports.
    c. imports minus exports.
    d. GDP minus imports.
    e. GDP minus GNP.

11. If nominal GDP doubles and the GDP deflator doubles, then real GDP
    a. remains constant.
    b. doubles.
    c. triples.
    d. quadruples.
    e. is cut in half.

12. Suppose the government eliminates all environmental regulations and, as a result, the production of goods and services increases, but there is considerably more pollution. Based on this scenario, which of the following statements is correct?
    a. GDP would definitely increase, despite the fact that GDP includes environmental quality.
    b. GDP would definitely decrease because GDP includes environmental quality.
    c. GDP would definitely increase because GDP excludes environmental quality.
    d. GDP could either increase or decrease because GDP excludes environmental quality.
    e. Nominal GDP would increase but real GDP would remain unchanged.

Free Response Questions

1. GDP is defined as the market value of all final goods and services produced within a country in a given period of time. In spite of this definition, some production is left out of GDP. Explain why some final goods and services are not included.

2. Identify the immediate effect of each of the following events on U.S. GDP and its components.
    a. James receives a Social Security check.
    b. John buys an Italian sports car.
    c. Henry buys domestically produced tools for his construction company.

Solutions

Multiple-Choice Questions

1. c TOP: Income/Expenditure
2. c TOP: GDP
3. c TOP: GDP
4. d TOP: GDP
5. e TOP: Intermediate goods
6. b TOP: GDP
7. d TOP: GDP/GNP
8. c TOP: Investment
9. c TOP: Transfer payments
10. b TOP: Net exports
11. a TOP: Real GDP
12. c TOP: GDP

Free Response Questions

1. GDP excludes some products because they are so difficult to measure. These products include services performed by individuals for themselves and their families, and most goods that are produced and consumed at home and, therefore, never enter the marketplace. In addition, illegal products are not included in GDP even if they can be measured because, by society's definition, they are "bads," not "goods."

TOP: GDP

2. a. Because this is a transfer payment, there is no change to GDP or to any of its components.
   b. Consumption and imports will rise and cancel each other out so that there is no change in U.S. GDP.
   c. This increases the investment component of GDP and so increases GDP.

TOP: GDP | Transfer payments | Net exports | Investment