and the total expenditure on its output of goods and services. The **consumer price index**, or **CPI**, measures the level of prices. The **unemployment rate** tells us the fraction of workers who are unemployed. In the following pages, we see how these statistics are computed and what they tell us about the economy.

2-1 Measuring the Value of Economic Activity: Gross Domestic Product

Gross domestic product is often considered the best measure of how well the economy is performing. This statistic is computed every three months by the Bureau of Economic Analysis (a part of the U.S. Department of Commerce) from a large number of primary data sources. The goal of GDP is to summarize in a single number the dollar value of economic activity in a given period of time.

There are two ways to view this statistic. One way to view GDP is as *the total income of everyone in the economy*. Another way to view GDP is as *the total expenditure on the economy's output of goods and services*. From either viewpoint, it is clear why GDP is a gauge of economic performance. GDP measures something people care about—their incomes. Similarly, an economy with a large output of goods and services can better satisfy the demands of households, firms, and the government.

How can GDP measure both the economy's income and the expenditure on its output? The reason is that these two quantities are really the same: for the economy as a whole, income must equal expenditure. That fact, in turn, follows from an even more fundamental one: because every transaction has both a buyer and a seller, every dollar of expenditure by a buyer must become a dollar of income to a seller. When Joe paints Jane's house for $1,000, that $1,000 is income to Joe and expenditure by Jane. The transaction contributes $1,000 to GDP, regardless of whether we are adding up all income or adding up all expenditure.

To understand the meaning of GDP more fully, we turn to **national income accounting**, the accounting system used to measure GDP and many related statistics.

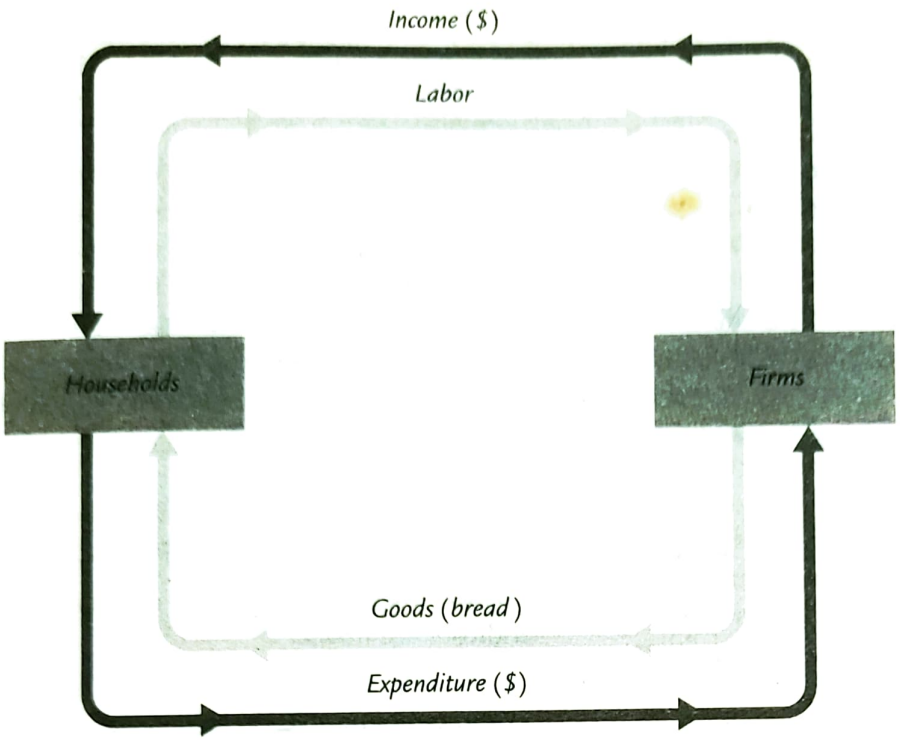
Income, Expenditure, and the Circular Flow

Imagine an economy that produces a single good, bread, from a single input, labor. Figure 2-1 illustrates all the economic transactions that occur between households and firms in this economy.

The inner loop in Figure 2-1 represents the flows of bread and labor. The households sell their labor to the firms. The firms use the labor of their workers to produce bread, which the firms in turn sell to the households. Hence, labor flows from households to firms, and bread flows from firms to households.

The outer loop in Figure 2-1 represents the corresponding flow of dollars. The households buy bread from the firms. The firms use some of the revenue

figure 2-1



The Circular Flow This figure illustrates the flows between firms and households in an economy that produces one good, bread, from one input, labor. The inner loop represents the flows of labor and bread: households sell their labor to firms, and the firms sell the bread they produce to households. The outer loop represents the corresponding flows of dollars: households pay the firms for the bread, and the firms pay wages and profit to the households. In this economy, GDP is both the total expenditure on bread and the total income from the production of bread.

from these sales to pay the wages of their workers, and the remainder is the profit belonging to the owners of the firms (who themselves are part of the household sector). Hence, expenditure on bread flows from households to firms, and income in the form of wages and profit flows from firms to households.

GDP measures the flow of dollars in this economy. We can compute it in two ways. GDP is the total income from the production of bread, which equals the sum of wages and profit—the top half of the circular flow of dollars. GDP is also the total expenditure on purchases of bread—the bottom half of the circular flow of dollars. To compute GDP, we can look at either the flow of dollars from firms to households or the flow of dollars from households to firms.

Keynesian cross

These two ways of computing GDP must be equal because the expenditure of buyers on products is, by the rules of accounting, income to the sellers of those products. Every transaction that affects expenditure must affect income, and every transaction that affects income must affect expenditure. For example, suppose that a firm produces and sells one more loaf of bread to a household. Clearly this transaction raises total expenditure on bread, but it also has an equal effect on total income. If the firm produces the extra loaf without hiring any more labor (such as by making the production process more efficient), then profit increases. If the firm produces the extra loaf by hiring more labor, then wages increase. In both cases, expenditure and income increase equally.

FYI Stocks and Flows

Many economic variables measure a quantity of something—a quantity of money, a quantity of goods, and so on. Economists distinguish between two types of quantity variables: stocks and flows. A **stock** is a quantity measured at a given point in time, whereas a **flow** is a quantity measured per unit of time.

The bathtub, shown in Figure 2-2, is the classic example used to illustrate stocks and flows. The amount of water in the tub is a stock: it is the quantity of water in the tub at a given point in time. The amount of water coming out of the faucet is a flow: it is the quantity of water being added to the tub per unit of time. Note that we measure stocks and flows in different units. We say that the bathtub contains 50 *gallons* of water, but that water is coming out of the faucet at 5 *gallons per minute*.

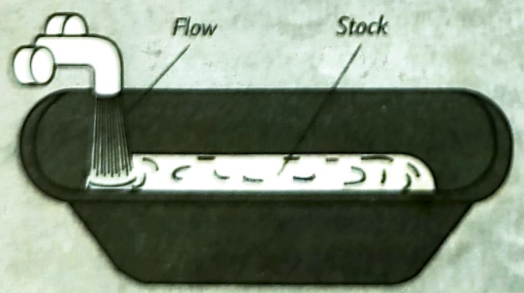
GDP is probably the most important flow variable in economics: it tells us how many dollars are flowing around the economy's circular flow per unit of time. When you hear someone say that the U.S. GDP is $10 trillion, you should understand that this means that it is $10 trillion *per year*. (Equivalently, we could say that U.S. GDP is $317,000 per second.)

Stocks and flows are often related. In the bathtub example, these relationships are clear. The stock of water in the tub represents the accumulation of the flow out of the faucet, and the flow of water represents the change in the stock. When building theories to explain economic variables, it is often useful to determine whether the variables are stocks or flows and whether any relationships link them.

Here are some examples of related stocks and flows that we study in future chapters:

- A person's wealth is a stock; income and expenditure are flows.
- The number of unemployed people is a stock; the number of people losing their jobs is a flow.
- The amount of capital in the economy is a stock; the amount of investment is a flow.
- The government debt is a stock; the government budget deficit is a flow.

figure 2-2



Stocks and Flows The amount of water in a bathtub is a stock: it is a quantity measured at a given moment in time. The amount of water coming out of the faucet is a flow: it is a quantity measured per unit of time.

Rules for Computing GDP

In an economy that produces only bread, we can compute GDP by adding up the total expenditure on bread. Real economies, however, include the production and sale of a vast number of goods and services. To compute GDP for such a complex economy, it will be helpful to have a more precise definition: *gross*

domestic product (GDP) is the market value of all final goods and services produced within an economy in a given period of time. To see how this definition is applied, let's discuss some of the rules that economists follow in constructing this statistic.

Adding Apples and Oranges The U.S. economy produces many different goods and services—hamburgers, haircuts, cars, computers, and so on. GDP combines the value of these goods and services into a single measure. The diversity of products in the economy complicates the calculation of GDP because different products have different values.

Suppose, for example, that the economy produces four apples and three oranges. How do we compute GDP? We could simply add apples and oranges and conclude that GDP equals seven pieces of fruit. But this makes sense only if we thought apples and oranges had equal value, which is generally not true. (This would be even clearer if the economy had produced four watermelons and three grapes.)

To compute the total value of different goods and services, the national income accounts use market prices because these prices reflect how much people are willing to pay for a good or service. Thus, if apples cost \$0.50 each and oranges cost \$1.00 each, GDP would be

$$\begin{aligned} \text{GDP} &= (\text{Price of Apples} \times \text{Quantity of Apples}) \\ &\quad + (\text{Price of Oranges} \times \text{Quantity of Oranges}) \\ &= (\$0.50 \times 4) + (\$1.00 \times 3) \\ &= \$5.00. \end{aligned}$$

GDP equals \$5.00—the value of all the apples, \$2.00, plus the value of all the oranges, \$3.00.

Used Goods When the Topps Company makes a package of baseball cards and sells it for 50 cents, that 50 cents is added to the nation's GDP. But what about when a collector sells a rare Mickey Mantle card to another collector for \$500? That \$500 is not part of GDP. GDP measures the value of currently produced goods and services. The sale of the Mickey Mantle card reflects the transfer of an asset, not an addition to the economy's income. Thus, the sale of used goods is not included as part of GDP.

The Treatment of Inventories Imagine that a bakery hires workers to produce more bread, pays their wages, and then fails to sell the additional bread. How does this transaction affect GDP?

The answer depends on what happens to the unsold bread. Let's first suppose that the bread spoils. In this case, the firm has paid more in wages but has not received any additional revenue, so the firm's profit is reduced by the amount that wages are increased. Total expenditure in the economy hasn't changed because no one buys the bread. Total income hasn't changed either—although more is distributed as wages and less as profit. Because the transaction affects neither expenditure nor income, it does not alter GDP.

Now suppose, instead, that the bread is put into inventory to be sold later. In this case, the transaction is treated differently. The owners of the firm are assumed to have "purchased" the bread for the firm's inventory, and the firm's profit is not

reduced by the additional wages it has paid. Because the higher wages raise total income, and greater spending on inventory raises total expenditure, the economy's GDP rises.

What happens later when the firm sells the bread out of inventory? This case is much like the sale of a used good. There is spending by bread consumers, but there is inventory disinvestment by the firm. This negative spending by the firm offsets the positive spending by consumers, so the sale out of inventory does not affect GDP. The general rule is that when a firm increases its inventory of goods, this investment in inventory is counted as expenditure by the firm owners. Thus, production for inventory increases GDP just as much as production for final sale. A sale out of inventory, however, is a combination of positive spending (the purchase) and negative spending (inventory disinvestment), so it does not influence GDP. This treatment of inventories ensures that GDP reflects the economy's current production of goods and services.

Intermediate Goods and Value Added Many goods are produced in stages: raw materials are processed into intermediate goods by one firm and then sold to another firm for final processing. How should we treat such products when computing GDP? For example, suppose a cattle rancher sells one-quarter pound of meat to McDonald's for $0.50, and then McDonald's sells you a hamburger for $1.50. Should GDP include both the meat and the hamburger (a total of $2.00), or just the hamburger ($1.50)?

The answer is that GDP includes only the value of final goods. Thus, the hamburger is included in GDP but the meat is not: GDP increases by $1.50, not by $2.00. The reason is that the value of intermediate goods is already included as part of the market price of the final goods in which they are used. To add the intermediate goods to the final goods would be double counting—that is, the meat would be counted twice. Hence, GDP is the total value of final goods and services produced.

One way to compute the value of all final goods and services is to sum the value added at each stage of production. The **value added** of a firm equals the value of the firm's output less the value of the intermediate goods that the firm purchases. In the case of the hamburger, the value added of the rancher is $0.50 (assuming that the rancher bought no intermediate goods), and the value added of McDonald's is $1.50 − $0.50, or $1.00. Total value added is $0.50 + $1.00, which equals $1.50. For the economy as a whole, the sum of all value added must equal the value of all final goods and services. Hence, GDP is also the total value added of all firms in the economy.

Housing Services and Other Imputations Although most goods and services are valued at their market prices when computing GDP, some are not sold in the marketplace and therefore do not have market prices. If GDP is to include the value of these goods and services, we must use an estimate of their value. Such an estimate is called an **imputed value**.

Imputations are especially important for determining the value of housing. A person who rents a house is buying housing services and providing income for the landlord; the rent is part of GDP both as expenditure by the renter and as income for the landlord. Many people, however, live in their own homes. Although they do not pay rent to a landlord, they are enjoying housing services similar to those that

renters purchase. To take account of the housing services enjoyed by homeowners, GDP includes the "rent" that these homeowners "pay" to themselves. Of course, homeowners do not in fact pay themselves this rent. The Department of Commerce estimates what the market rent for a house would be if it were rented and includes that imputed rent as part of GDP. This imputed rent is included both in the homeowner's expenditure and in the homeowner's income.

Imputations also arise in valuing government services. For example, police officers, firefighters, and senators provide services to the public. Giving a value to these services is difficult because they are not sold in a marketplace and therefore do not have a market price. The national income accounts include these services in GDP by valuing them at their cost. That is, the wages of these public servants are used as a measure of the value of their output.

In many cases, an imputation is called for in principle but, to keep things simple, is not made in practice. Because GDP includes the imputed rent on owner-occupied houses, one might expect it also to include the imputed rent on cars, lawn mowers, jewelry, and other durable goods owned by households. Yet the value of these rental services is left out of GDP. In addition, some of the output of the economy is produced and consumed at home and never enters the marketplace. For example, meals cooked at home are similar to meals cooked at a restaurant, yet the value added in meals at home is left out of GDP.

Finally, no imputation is made for the value of goods and services sold in the *underground economy*. The underground economy is the part of the economy that people hide from the government either because they wish to evade taxation or because the activity is illegal. Domestic workers paid "off the books" is one example. The illegal drug trade is another.

Because the imputations necessary for computing GDP are only approximate, and because the value of many goods and services is left out altogether, GDP is an imperfect measure of economic activity. These imperfections are most problematic when comparing standards of living across countries. The size of the underground economy, for instance, varies from country to country. Yet as long as the magnitude of these imperfections remains fairly constant over time, GDP is useful for comparing economic activity from year to year.

Real GDP Versus Nominal GDP

Economists use the rules just described to compute GDP, which values the economy's total output of goods and services. But is GDP a good measure of economic well-being? Consider once again the economy that produces only apples and oranges. In this economy GDP is the sum of the value of all the apples produced and the value of all the oranges produced. That is,

$$\begin{aligned}\text{GDP} = &(\text{Price of Apples} \times \text{Quantity of Apples}) \\ &+ (\text{Price of Oranges} \times \text{Quantity of Oranges}).\end{aligned}$$

Notice that GDP can increase either because prices rise or because quantities rise.

It is easy to see that GDP computed this way is not a good gauge of economic well-being. That is, this measure does not accurately reflect how well the

economy can satisfy the demands of households, firms, and the government. If all prices doubled without any change in quantities, GDP would double. Yet it would be misleading to say that the economy's ability to satisfy demands has doubled, because the quantity of every good produced remains the same. Economists call the value of goods and services measured at current prices **nominal GDP**.

A better measure of economic well-being would tally the economy's output of goods and services and would not be influenced by changes in prices. For this purpose, economists use **real GDP**, which is the value of goods and services measured using a constant set of prices. That is, real GDP shows what would have happened to expenditure on output if quantities had changed but prices had not.

To see how real GDP is computed, imagine we wanted to compare output in 2002 and output in 2003 in our apple-and-orange economy. We could begin by choosing a set of prices, called *base-year prices*, such as the prices that prevailed in 2002. Goods and services are then added up using these base-year prices to value the different goods in both years. Real GDP for 2002 would be

$$\begin{aligned}\text{Real GDP} = {} & (\text{2002 Price of Apples} \times \text{2002 Quantity of Apples}) \\ & + (\text{2002 Price of Oranges} \times \text{2002 Quantity of Oranges}).\end{aligned}$$

Similarly, real GDP in 2003 would be

$$\begin{aligned}\text{Real GDP} = {} & (\text{2002 Price of Apples} \times \text{2003 Quantity of Apples}) \\ & + (\text{2002 Price of Oranges} \times \text{2003 Quantity of Oranges}).\end{aligned}$$

And real GDP in 2004 would be

$$\begin{aligned}\text{Real GDP} = {} & (\text{2002 Price of Apples} \times \text{2004 Quantity of Apples}) \\ & + (\text{2002 Price of Oranges} \times \text{2004 Quantity of Oranges}).\end{aligned}$$

Notice that 2002 prices are used to compute real GDP for all three years. Because the prices are held constant, real GDP varies from year to year only if the quantities produced vary. Because a society's ability to provide economic satisfaction for its members ultimately depends on the quantities of goods and services produced, real GDP provides a better measure of economic well-being than nominal GDP.

The GDP Deflator

From nominal GDP and real GDP we can compute a third statistic: the GDP deflator. The **GDP deflator**, also called the implicit price deflator for GDP, is defined as the ratio of nominal GDP to real GDP:

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}.$$

The GDP deflator reflects what's happening to the overall level of prices in the economy.

To better understand this, consider again an economy with only one good, bread. If P is the price of bread and Q is the quantity sold, then nominal GDP is

FYI Two Arithmetic Tricks for Working With Percentage Changes

For manipulating many relationships in economics, there is an arithmetic trick that is useful to know: *the percentage change of a product of two variables is approximately the sum of the percentage changes in each of the variables.*

To see how this trick works, consider an example. Let P denote the GDP deflator and Y denote real GDP. Nominal GDP is $P \times Y$. The trick states that

$$\begin{aligned}&\text{Percentage Change in } (P \times Y)\\ &\quad \approx (\text{Percentage Change in } P)\\ &\quad\quad + (\text{Percentage Change in } Y).\end{aligned}$$

For instance, suppose that in one year, real GDP is 100 and the GDP deflator is 2; the next year, real GDP is 103 and the GDP deflator is 2.1. We can calculate that real GDP rose by 3 percent and that the GDP deflator rose by 5 percent. Nominal GDP rose from 200 the first year to 216.3 the second year, an increase of 8.15 percent. Notice that the growth in nominal GDP (8.15 percent) is approximately the sum of the growth in the GDP deflator (5 percent) and the growth in real GDP (3 percent).[1]

A second arithmetic trick follows as a corollary to the first: *the percentage change of a ratio is approximately the percentage change in the numerator minus the percentage change in the denominator.* Again, consider an example. Let Y denote GDP and L denote the population, so that Y/L is GDP per person. The second trick states

$$\begin{aligned}&\text{Percentage Change in } (Y/L)\\ &\quad \approx (\text{Percentage Change in } Y)\\ &\quad\quad - (\text{Percentage Change in } L).\end{aligned}$$

For instance, suppose that in the first year, Y is 100,000 and L is 100, so Y/L is 1,000; in the second year, Y is 110,000 and L is 103, so Y/L is 1,068. Notice that the growth in GDP per person (6.8 percent) is approximately the growth in income (10 percent) minus the growth in population (3 percent).

The Components of Expenditure

Economists and policymakers care not only about the economy's total output of goods and services but also about the allocation of this output among alternative uses. The national income accounts divide GDP into four broad categories of spending:

- Consumption (C)
- Investment (I)
- Government purchases (G)
- Net exports (NX).

Thus, letting Y stand for GDP,

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

[1] *Mathematical note:* The proof that this trick works begins with the chain rule from calculus:

$$d(PY) = Y\,dP + P\,dY.$$

Now divide both sides of this equation by PY to obtain

$$d(PY)/(PY) = dP/P + dY/Y.$$

Notice that all three terms in this equation are percentage changes.

FYI What Is Investment?

Newcomers to macroeconomics are sometimes confused by how macroeconomists use familiar words in new and specific ways. One example is the term "investment." The confusion arises because what looks like investment for an individual may not be investment for the economy as a whole. The general rule is that the economy's investment does not include purchases that merely reallocate existing assets among different individuals. Investment, as macroeconomists use the term, creates new capital.

Let's consider some examples. Suppose we observe these two events:

- Smith buys for himself a 100-year-old Victorian house.
- Jones builds for herself a brand-new contemporary house.

What is total investment here? Two houses, one house, or zero?

A macroeconomist seeing these two transactions counts only the Jones house as investment. Smith's transaction has not created new housing for the economy; it has merely reallocated existing housing. Smith's purchase is investment for Smith, but it is disinvestment for the person selling the house. By contrast, Jones has added new housing to the economy; her new house is counted as investment.

Similarly, consider these two events:

- Gates buys $5 million in IBM stock from Buffett on the New York Stock Exchange.
- General Motors sells $10 million in stock to the public and uses the proceeds to build a new car factory.

Here, investment is $10 million. In the first transaction, Gates is investing in IBM stock, and Buffett is disinvesting; there is no investment for the economy. By contrast, General Motors is using some of the economy's output of goods and services to add to its stock of capital; hence, its new factory is counted as investment.

GDP is the sum of consumption, investment, government purchases, and net exports. Each dollar of GDP falls into one of these categories. This equation is an *identity*—an equation that must hold because of the way the variables are defined. It is called the **national income accounts identity**.

Consumption consists of the goods and services bought by households. It is divided into three subcategories: nondurable goods, durable goods, and services. Nondurable goods are goods that last only a short time, such as food and clothing. Durable goods are goods that last a long time, such as cars and TVs. Services include the work done for consumers by individuals and firms, such as haircuts and doctor visits.

Investment consists of goods bought for future use. Investment is also divided into three subcategories: business fixed investment, residential fixed investment, and inventory investment. Business fixed investment is the purchase of new plant and equipment by firms. Residential investment is the purchase of new housing by households and landlords. Inventory investment is the increase in firms' inventories of goods (if inventories are falling, inventory investment is negative).

Government purchases are the goods and services bought by federal, state, and local governments. This category includes such items as military equipment, highways, and the services that government workers provide. It does not include

transfer payments to individuals, such as Social Security and welfare. Because transfer payments reallocate existing income and are not made in exchange for goods and services, they are not part of GDP.

The last category, **net exports**, takes into account trade with other countries. Net exports are the value of goods and services exported to other countries minus the value of goods and services that foreigners provide us. Net exports represent the net expenditure from abroad on our goods and services, which provides income for domestic producers.

CASE STUDY

GDP and Its Components

In 2000 the GDP of the United States totaled about $10 trillion. This number is so large that it is almost impossible to comprehend. We can make it easier to understand by dividing it by the 2000 U.S. population of 275 million. In this way, we obtain GDP per person—the amount of expenditure for the average American—which equaled $36,174 in 2000.

table 2-1

GDP and the Components of Expenditure: 2000

	Total (billions of dollars)	Per Person (dollars)
Gross Domestic Product	**9,963.1**	**36,174**
Consumption	**6,757.3**	**24,534**
Nondurable goods	2,010.0	7,298
Durable goods	820.3	2,978
Services	3,927.0	14,258
Investment	**1,832.7**	**6,654**
Nonresidential fixed investment	1,362.2	4,946
Residential fixed investment	416.0	1,510
Inventory investment	54.5	198
Government Purchases	**1,743.7**	**6,331**
Federal	595.2	2,161
Defense	377.0	1,369
Nondefense	218.2	792
State and local	1,148.6	4,170
Net Exports	**−370.7**	**−1,346**
Exports	1,097.3	3,984
Imports	1,468.0	5,330

Source: U.S. Department of Commerce.

How did this GDP get used? Table 2-1 shows that about two-thirds of it, or $24,534 per person, was spent on consumption. Investment was $6,654 per person. Government purchases were $6,331 per person, $1,369 of which was spent by the federal government on national defense.

The average American bought $5,330 of goods imported from abroad and produced $3,984 of goods that were exported to other countries. Because the average American imported more than he exported, net exports were negative. Furthermore, because the average American earned less from selling to foreigners than he spent on foreign goods, the difference must have been financed by taking out loans from foreigners (or, equivalently, by selling them some assets). Thus, the average American borrowed $1,346 from abroad in 2000.

Other Measures of Income

The national income accounts include other measures of income that differ slightly in definition from GDP. It is important to be aware of the various measures, because economists and the press often refer to them.

To see how the alternative measures of income relate to one another, we start with GDP and add or subtract various quantities. To obtain *gross national product (GNP)*, we add receipts of factor income (wages, profit, and rent) from the rest of the world and subtract payments of factor income to the rest of the world:

$$\text{GNP} = \text{GDP} + \text{Factor Payments From Abroad} - \text{Factor Payments to Abroad}.$$

Whereas GDP measures the total income produced *domestically*, GNP measures the total income earned by *nationals* (residents of a nation). For instance, if a Japanese resident owns an apartment building in New York, the rental income he earns is part of U.S. GDP because it is earned in the United States. But because this rental income is a factor payment to abroad, it is not part of U.S. GNP. In the United States, factor payments from abroad and factor payments to abroad are similar in size—each representing about 3 percent of GDP—so GDP and GNP are quite close.

To obtain *net national product (NNP)*, we subtract the depreciation of capital—the amount of the economy's stock of plants, equipment, and residential structures that wears out during the year:

$$\text{NNP} = \text{GNP} - \text{Depreciation}.$$

In the national income accounts, depreciation is called the *consumption of fixed capital*. It equals about 10 percent of GNP. Because the depreciation of capital is a cost of producing the output of the economy, subtracting depreciation shows the net result of economic activity.

The next adjustment in the national income accounts is for indirect business taxes, such as sales taxes. These taxes, which make up about 10 percent of NNP, place a wedge between the price that consumers pay for a good and the price

that firms receive. Because firms never receive this tax wedge, it is not part of their income. Once we subtract indirect business taxes from NNP, we obtain a measure called *national income*:

$$\text{National Income} = \text{NNP} - \text{Indirect Business Taxes}.$$

National income measures how much everyone in the economy has earned.

The national income accounts divide national income into five components, depending on the way the income is earned. The five categories, and the percentage of national income paid in each category, are

- *Compensation of employees* (70%). The wages and fringe benefits earned by workers.
- *Proprietors' income* (9%). The income of noncorporate businesses, such as small farms, mom-and-pop stores, and law partnerships.
- *Rental income* (2%). The income that landlords receive, including the imputed rent that homeowners "pay" to themselves, less expenses, such as depreciation.
- *Corporate profits* (12%). The income of corporations after payments to their workers and creditors.
- *Net interest* (7%). The interest domestic businesses pay minus the interest they receive, plus interest earned from foreigners.

A series of adjustments takes us from national income to *personal income*, the amount of income that households and noncorporate businesses receive. Three of these adjustments are most important. First, we reduce national income by the amount that corporations earn but do not pay out, either because the corporations are retaining earnings or because they are paying taxes to the government. This adjustment is made by subtracting corporate profits (which equals the sum of corporate taxes, dividends, and retained earnings) and adding back dividends. Second, we increase national income by the net amount the government pays out in transfer payments. This adjustment equals government transfers to individuals minus social insurance contributions paid to the government. Third, we adjust national income to include the interest that households earn rather than the interest that businesses pay. This adjustment is made by adding personal interest income and subtracting net interest. (The difference between personal interest and net interest arises in part from the interest on the government debt.) Thus, personal income is

$$\begin{aligned}\text{Personal Income} = {} & \text{National Income} \\ & - \text{Corporate Profits} \\ & - \text{Social Insurance Contributions} \\ & - \text{Net Interest} \\ & + \text{Dividends} \\ & + \text{Government Transfers to Individuals} \\ & + \text{Personal Interest Income}.\end{aligned}$$

Next, if we subtract personal tax payments and certain nontax payments to the government (such as parking tickets), we obtain *disposable personal income*:

Disposable Personal Income
= Personal Income − Personal Tax and Nontax Payments.

We are interested in disposable personal income because it is the amount households and noncorporate businesses have available to spend after satisfying their tax obligations to the government.

CASE STUDY

The Seasonal Cycle and Seasonal Adjustment

Because real GDP and the other measures of income reflect how well the economy is performing, economists are interested in studying the quarter-to-quarter fluctuations in these variables. Yet when we start to do so, one fact leaps out: all these measures of income exhibit a regular seasonal pattern. The output of the economy rises during the year, reaching a peak in the fourth quarter (October, November, and December), and then falling in the first quarter (January, February, and March) of the next year. These regular seasonal changes are substantial. From the fourth quarter to the first quarter, real GDP falls on average about 8 percent.[2]

It is not surprising that real GDP follows a seasonal cycle. Some of these changes are attributable to changes in our ability to produce: for example, building homes is more difficult during the cold weather of winter than during other seasons. In addition, people have seasonal tastes: they have preferred times for such activities as vacations and holiday shopping.

When economists study fluctuations in real GDP and other economic variables, they often want to eliminate the portion of fluctuations caused by predictable seasonal changes. You will find that most of the economic statistics reported in the newspaper are *seasonally adjusted*. This means that the data have been adjusted to remove the regular seasonal fluctuations. (The precise statistical procedures used are too elaborate to bother with here, but in essence they involve subtracting those changes in income that are predictable simply from the change in season.) Therefore, when you observe a rise or fall in real GDP or any other data series, you must look beyond the seasonal cycle for the explanation.

[2] Robert B. Barsky and Jeffrey A. Miron, "The Seasonal Cycle and the Business Cycle," *Journal of Political Economy* 97 (June 1989): 503-534.

$$\text{Percentage Change in Real GDP} = 3\% - 2 \times (8\% - 6\%)$$
$$= -1\%.$$

In this case, Okun's law says that GDP would fall by 1 percent, indicating that the economy is in a recession.

2-4 Conclusion: From Economic Statistics to Economic Models

The three statistics discussed in this chapter—gross domestic product, the consumer price index, and the unemployment rate—quantify the performance of the economy. Public and private decisionmakers use these statistics to monitor changes in the economy and to formulate appropriate policies. Economists use these statistics to develop and test theories about how the economy works.

In the chapters that follow, we examine some of these theories. That is, we build models that explain how these variables are determined and how economic policy affects them. Having learned how to measure economic performance, we are now ready to learn how to explain it.

Summary

1. Gross domestic product (GDP) measures both the income of everyone in the economy and the total expenditure on the economy's output of goods and services.
2. Nominal GDP values goods and services at current prices. Real GDP values goods and services at constant prices. Real GDP rises only when the amount of goods and services has increased, whereas nominal GDP can rise either because output has increased or because prices have increased.
3. GDP is the sum of four categories of expenditure: consumption, investment, government purchases, and net exports.
4. The consumer price index (CPI) measures the price of a fixed basket of goods and services purchased by a typical consumer. Like the GDP deflator, which is the ratio of nominal GDP to real GDP, the CPI measures the overall level of prices.
5. The unemployment rate shows what fraction of those who would like to work do not have a job. When the unemployment rate rises, real GDP typically grows slower than its normal rate and may even fall.