



PART SIX

GDP, Growth, and Instability

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AND INFLATION

**IN THIS CHAPTER YOU WILL LEARN:**

- 1 How macroeconomics studies both long-run economic growth and short-run fluctuations in output and unemployment.
- 2 Why economists focus on GDP, inflation, and unemployment when assessing the health of an entire economy.
- 3 That sustained increases in living standards are a historically recent phenomenon.
- 4 Why savings and investment are key factors in promoting rising living standards.
- 5 Why economists believe that “shocks” and “sticky prices” are responsible for short-run fluctuations in output and employment.

## An Introduction to Macroeconomics

As you know from Chapter 1, macroeconomics studies the behavior of the economy as a whole. It is primarily concerned with two topics: long-run economic growth and the short-run fluctuations in output and employment that are often referred to as the **business cycle**. These phenomena are closely related because they happen simultaneously. Economies show a distinct growth trend that leads to higher output and higher standards of living in the long run, but in the short run there is a great deal of variability. Sometimes growth proceeds more rapidly and sometimes it proceeds more slowly. It may even turn negative for a while so that output and living standards actually decline, a situation referred to as a **recession**. This chapter provides an overview of the data that macroeconomists use to measure the status and growth of an entire economy as well as a preview of the models that they use to help explain both long-run growth and short-run fluctuations.

## Performance and Policy

In order to understand how economies operate and how their performance might be improved, economists collect and analyze economic data. An almost infinite number of data items can be looked at, including the amount of new construction taking place each month, how many ships laden with cargo are arriving at our ports each year, and how many new inventions have been patented in the last few weeks. That being said, macroeconomists tend to focus on just a few statistics when trying to assess the health and development of an economy. Chief among these are real GDP, unemployment, and inflation.

- **Real GDP, or real gross domestic product,** measures the value of final goods and services produced within the borders of a given country during a given period of time, typically a year. This statistic is very useful because it can tell us whether an economy's output is growing. For instance, if the United States' real GDP in 2007 is larger than the United States' real GDP in 2006, then we know that U.S. output increased from 2006 to 2007. To get real GDP, government statisticians first calculate **nominal GDP**, which totals the dollar value of all goods and services produced within the borders of a given country using *their current prices during the year that they were produced*. But because nominal GDP uses current prices, it suffers from a major problem: It can increase from one year to the next even if there is no increase in output. To see how, consider a sculptor who produces 10 sculptures this year and 10 sculptures next year. Clearly, her output does not change. But if the price of sculptures rises from \$10,000 this year to \$20,000 next year, nominal GDP will rise from \$100,000 ( $= 10 \times \$10,000$ ) this year to \$200,000 ( $= 10 \times \$20,000$ ) next year because of the increase in prices. Real GDP corrects for price changes. As a result, we can compare real GDP numbers from one year to the next and really know if there is a change in output (rather than prices). Because more output means greater consumption possibilities—including not only the chance to consume more fun things like movies, vacations, and video games, but also more serious things like better health care and safer roads—economists and policymakers are deeply committed to encouraging a large and growing real GDP.
- **Unemployment** is the state a person is in if he or she cannot get a job despite being willing to work and actively seeking work. High rates of unemployment are undesirable because they indicate

that a nation is not using a large fraction of its most important resource—the talents and skills of its people. Unemployment is a waste because we must count as a loss all the goods and services that unemployed workers could have produced if they had been working. Researchers have also drawn links between higher rates of unemployment and major social problems like higher crime rates and greater political unrest as well as higher rates of depression, heart disease, and other illnesses among unemployed individuals.

- **Inflation** is an increase in the overall level of prices. As an example, consider all the goods and services bought by a typical family over the course of one year. If the economy is experiencing inflation, it will cost the family more money to buy those goods and services this year than it cost to buy them last year. This can be problematic for several reasons. First, if the family's income does not rise as fast as the prices of the goods and services that it consumes, it won't be able to purchase as much as it used to and its standard of living will fall. Along the same lines, a surprise jump in inflation reduces the purchasing power of people's savings. Savings that they believed would be able to buy them a given amount of goods and services will turn out to buy them less than they expected due to the higher-than-expected prices.

Because these statistics are the standards by which economists keep track of long-run growth and short-run fluctuations, we will spend a substantial amount of time in the next few chapters examining how these statistics are computed, how well they are able to capture the well-being of actual people, and how they vary both across countries and over time. Once they are understood, we will build upon them in subsequent chapters by developing macroeconomic models of both long-run growth and short-run fluctuations. These will help us understand how policymakers attempt to maximize growth while minimizing unemployment and inflation.

Macroeconomic models also clarify many important questions about the powers and limits of government economic policy. These include:

- Can governments promote long-run economic growth?
- Can they reduce the severity of recessions by smoothing out short-run fluctuations?
- Are certain government policy tools like manipulating interest rates (monetary policy) more effective at mitigating short-run fluctuations than other government policy tools such as changes in tax rates or levels of government spending (fiscal policy)?

- Is there a trade-off between lower rates of unemployment and higher rates of inflation?
- Does government policy work best when it is announced in advance or when it is a surprise?

The answers to these questions are of crucial importance because of the vast differences in economic performance seen across various economies at different times. For instance, the amount of output generated by the U.S. economy grew at an average rate of 2.7 percent per year between 1995 and 2007 while the amount of output generated by the Japanese economy grew at an average rate of only 1.0 percent per year over the same time period. Could Japan have done as well as the United States if it had pursued different economic policies? Similarly, in 2007, unemployment in the United States was only 4.6 percent of the labor force, while it was 8.7 percent in Germany, 7.2 percent in India, 12.8 percent in Poland, and 80 percent in Zimbabwe. At the same time, the inflation rate in the United States was 2.7 percent, compared with 26,470 percent in Zimbabwe! Our models will help us understand why such large differences in rates of growth, unemployment, and inflation exist and how government policies influence them.

## The Miracle of Modern Economic Growth

Rapid and sustained economic growth is a modern phenomenon. Before the Industrial Revolution began in the late 1700s in England, standards of living showed virtually no growth over hundreds or even thousands of years. For instance, the standard of living of the average Roman peasant was virtually the same at the start of the Roman Empire around the year 500 B.C. as it was at the end of the Roman Empire 1000 years later. Similarly, historians and archeologists have estimated that the standard of living enjoyed by the average Chinese peasant was essentially the same in the year A.D. 1800 as it was in the year A.D. 100.

That is not to say that the Roman and Chinese economies did not expand over time. They did. In fact, their total outputs of goods and services increased many times over. The problem was that as they did, their populations went up by similar proportions so that the amount of output *per person* remained virtually unchanged.

This historical pattern continued until the start of the Industrial Revolution, which ushered in not only factory production and automation but also massive increases in research and development so that new and better technologies were constantly being invented. The result was that output began to grow faster than the population. This

meant that living standards began to rise as the amount of output *per person* increased.

Not all countries experienced this phenomenon, but those that did were said to be experiencing **modern economic growth** (in which output per person rises) as compared with earlier times in which output (but not output per person) increased. Under modern economic growth, the annual increase in output per person is often not large, perhaps 2 percent per year in countries such as England that were the first to industrialize. But when compounded over time, an annual growth rate of 2 percent adds up very rapidly. Indeed, it implies that the standard of living will double every 35 years. So if the average citizen of a country enjoying 2 percent growth begins this year with an income of \$10,000, in 35 years that person will have an income of \$20,000. And 35 years after that there will be another doubling so that her income in 70 years will be \$40,000. And 35 years after that, the average citizen's income will double again to \$80,000. Such high rates of growth are amazing when compared to the period before modern economic growth when standards of living remained unchanged century after century.

The vast differences in living standards seen today between rich and poor countries are almost entirely the result of the fact that only some countries have experienced modern economic growth. Indeed, before the start of the Industrial Revolution in the late 1700s, living standards around the world were very similar, so much so that the average standard of living in the richest parts of the world was at most only two or three times higher than the standard of living in the poorest parts of the world. By contrast, the citizens of the richest nations today have material standards of living that are on average more than 50 times higher than those experienced by citizens of the poorest nations, as can be seen by the GDP per person data for the year 2007 given in Global Perspective 23.1.

Global Perspective 23.1 facilitates international comparisons of living standards by making three adjustments to each country's GDP. First, it converts each country's GDP from its own currency into U.S. dollars so that there is no confusion about the values of different currencies. Second, it divides each country's GDP measured in dollars by the size of its population. The resulting number, *GDP per person*, is the average amount of output each person in each country could have if each country's total output were divided equally among its citizens. It is a measure of each country's average standard of living. Third, the table uses a method called *purchasing power parity* to adjust for the fact that prices are much lower in some countries than others. By making this adjustment, we can trust that \$1 of GDP per person in the United States represents about the same quantity of goods and services as \$1 of GDP per person in



## GLOBAL PERSPECTIVE 23.1

### GDP per Person, Selected Countries

Country	GDP per Person, 2007 (U.S. dollars based on purchasing power parity)
United States	\$45,845
Canada	38,345
United Kingdom	35,134
Japan	33,576
France	33,187
South Korea	24,782
Saudi Arabia	23,243
Russia	14,692
Mexico	12,774
China	5,292
India	2,659
North Korea	1,900
Tanzania	1,256
Burundi	371
Zimbabwe	188

Source: International Monetary Fund, [www.imf.org](http://www.imf.org), for all countries except for North Korea, the data for which comes from the *CIA World Factbook*, [www.cia.gov](http://www.cia.gov).

any of the other countries. The resulting numbers—GDP per person adjusted for purchasing power parity—are presented in Global Perspective 23.1. (**Key Question 2**)

## Savings, Investment, and Choosing between Present and Future Consumption

At the heart of economic growth is the principle that in order to raise living standards over time, an economy must devote at least some fraction of its current output to increasing future output. As implied in Chapter 1, this process requires both savings and investment, which we will define and discuss before returning to why they are so important for economic growth.

- **Savings** are generated when current consumption is less than current output (or when current spending is less than current income).

- **Investment** happens when resources are devoted to increasing future output—for instance by building a new research facility in which scientists invent the next generation of fuel-efficient automobiles or by constructing a modern, super-efficient factory.

Economics students are often confused about the way the word “investment” is used in economics. This is because only economists draw a distinction between “financial investment” and “economic investment.”

**Financial investment** captures what ordinary people mean when they say investment, namely the purchase of assets like stocks, bonds, and real estate in the hope of reaping a financial gain. Anything of monetary value is an asset and, in everyday usage, people purchase—or “invest” in—assets hoping to receive a financial gain, either by eventually selling them at higher prices than they paid for them or by receiving a stream of payments as the owner of their assets (as is the case with landlords who rent the property they own to tenants). By contrast, when economists say “investment,” they are referring to the much more specific concept of **economic investment**, which has to do with the creation and expansion of business enterprises. Specifically, economic investment only includes money spent purchasing *newly created* capital goods such as machinery, tools, factories, and warehouses.

Indeed, as defined and measured by economists, purely financial transactions such as swapping cash for a stock or a bond are not “investment.” Neither is the purchase by a firm of a factory built several years ago and previously used by another company. Both types of transactions simply transfer the ownership of old assets from one party to another. They do not pay for *newly created* capital goods. As such, they are great examples of *financial investment*, but are not examples of the narrower idea of *economic investment*. So now that you know the difference, remember that purely financial transactions like buying Google stock or a five-year-old factory are indeed referred to as “investment”—except in economics!

When thinking about why savings and investment are so important for economic growth, the key point is that the amount of economic investment (hereafter, simply “investment”) is ultimately limited by the amount of savings. The only way that more output can be directed at investment activities is if savings increase. But that, in turn, implies that individuals and society as a whole must make trade-offs between current and future consumption. This is true because the only way to pay for more investment—and the higher levels of future consumption that more investment can generate—is to increase savings in the present. But increased savings can only come at the price of reduced current consumption. Individuals and society as a whole

must therefore wrestle with a choice between present consumption and future consumption, deciding how to balance the reductions in current consumption that are necessary to fund current investment against the higher levels of future consumption that can result from more current investment.

## Banks and Other Financial Institutions

Households are the principal source of savings. But businesses are the main economic investors. So how do the savings generated by households when they spend less than they consume get transferred to businesses so that they can purchase newly created capital goods? The answer is through banks and other financial institutions such as mutual funds, pension plans, and insurance companies. These institutions collect the savings of households, rewarding savers with interest and dividends and sometimes capital gains (increases in asset values). The banks and other financial institutions then lend the funds to businesses, which invest in equipment, factories, and other capital goods.

Macroeconomics devotes considerable attention to money, banking, and financial institutions because a well-functioning financial system helps to promote economic growth and stability by encouraging savings and by properly directing that savings into the most productive possible investments.

## Uncertainty, Expectations, and Shocks

Decisions about savings and investment are complicated by the fact that the future is uncertain. Investment projects sometimes produce disappointing results or even fail totally. As a result, firms spend considerable time trying to predict future trends so that they can, hopefully, invest only in projects that are likely to succeed. This implies that macroeconomics has to take into account **expectations** about the future.

Expectations are hugely important for two reasons. The more obvious reason involves the effect that changing expectations have on current behavior. If firms grow more pessimistic about the future returns that are likely to come from current investments, they are going to invest less today than they would if they were more optimistic. Expectations therefore have a large effect on economic growth since increased pessimism will lead to less current investment and, subsequently, less future consumption.

The less-obvious reason that expectations are so important has to do with what happens when expectations are unmet. Firms are often forced to cope with **shocks**—situations in which they were expecting one thing to happen but then something else happened. For instance, consider a situation in which a firm decides to build a high-speed railroad that will shuttle passengers between Washington, D.C., and New York. They do so expecting it to be very popular and make a handsome profit. But if it unexpectedly turns out to be unpopular and loses money, the railroad must figure out how to respond. Should the railroad go out of business completely? Should it attempt to see if it can turn a profit by hauling cargo instead of passengers? Is there a possibility that the venture might succeed if the firm borrows \$30 million from a bank to pay for a massive advertising campaign? These sorts of decisions are necessitated by the shock and surprise of having to deal with an unexpected situation.

Economies are exposed to both demand shocks and supply shocks. **Demand shocks** are unexpected changes in the demand for goods and services. **Supply shocks** are unexpected changes in the supply of goods and services. Please note that the word *shock* only tells us that something unexpected has happened. It does not tell us whether what has happened is unexpectedly good or unexpectedly bad. To make things more clear, economists use more specific terms. For instance, a *positive demand shock* refers to a situation in which demand turns out to be higher than expected, while a *negative demand shock* refers to a situation in which demand turns out to be lower than expected.

Economists believe that most short-run fluctuations are the result of demand shocks. Supply shocks do happen in some cases and are very important when they do occur. But we will focus most of our attention in this chapter and subsequent chapters on demand shocks, how they affect the economy, and how government policy may be able to help the economy adjust to them. But why are demand shocks such a big problem? Why would we have to consider calling in the government to help deal with them? And why can't firms deal with demand shocks on their own?

The answer to these questions is that the prices of many goods and services are inflexible (slow to change, or “sticky”) in the short run. As we will explain, this implies that price changes do not quickly equalize the quantities demanded of such goods and services with their respective quantities supplied. Instead, because prices are inflexible, the economy is forced to respond in the short run to demand shocks primarily through changes in output and employment rather than through changes in prices.

Although an economy as a whole is much more complex than a single firm, an analogy that uses a single car factory will be helpful in explaining why demand shocks and inflexible prices are so important to understanding most of the short-run fluctuations that affect the entire economy. Consider a car manufacturing company named Buzzer Auto. Like most companies, Buzzer Auto is in business to try to make a profit. Part of turning a profit involves trying to develop accurate expectations about future market conditions. Consequently, Buzzer constantly does market research to estimate future demand conditions so that it will, hopefully, only build cars that people are going to want to buy.

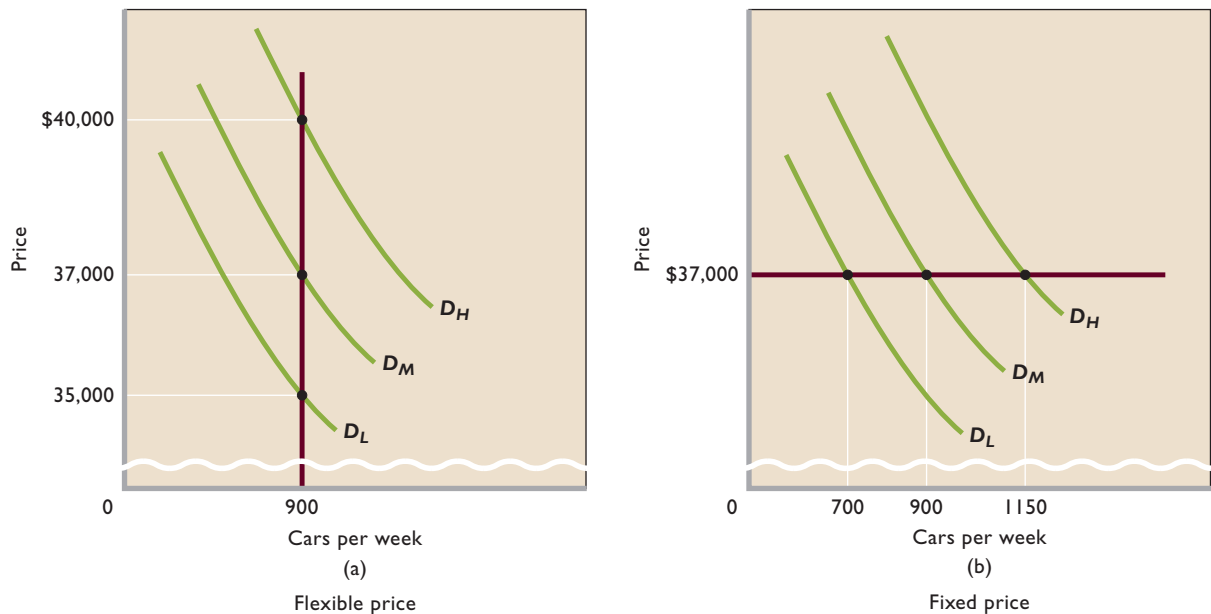
After extensive market research, Buzzer concludes that it could earn a modest profit if it builds and staffs an appropriately sized factory to build an environmentally friendly SUV, which it decides to call the Prion. Buzzer's marketing economists collaborate with Buzzer's engineers and conclude that expected profits will be maximized if the firm builds a factory that has an optimal output rate of 900 cars per week. If the factory operates at this rate, it can produce Prions for only \$36,500 per vehicle. This is terrific because the firm's estimates for demand indicate that a supply of 900 vehicles per week can be sold at a price of \$37,000 per vehicle—meaning that if everything goes according to plan, Buzzer Auto should make an accounting profit of \$500 on each Prion that it produces and sells. Expecting these future

conditions, Buzzer decides to build the factory, staff it with workers, and begin making the Prion.

Look at Figure 23.1a, which shows the market for Prions when the vertical supply curve for Prions is fixed at the factory's optimal output rate of 900 cars per week. Notice that we have drawn in three possible demand curves.  $D_L$  corresponds to low demand for the Prion;  $D_M$  corresponds to the medium level of demand that Buzzer's marketing economists are expecting to materialize; and  $D_H$  corresponds to high demand for the Prion. Figure 23.1a is consistent with the marketing economists' expectations: if all goes according to plan and the actual demand that materializes is  $D_M$ , the equilibrium price will in fact be \$37,000 per Prion and the equilibrium quantity demanded will be 900 cars per week. Thus, if all goes according to expectations, the factory will have exactly the right capacity to meet the expected quantity demanded at the sales price of \$37,000 per vehicle. In addition, the firm's books will show a profit of \$500 per vehicle on each of the 900 vehicles that it builds and expects to sell each week at that price.

Here is the key point. If expectations are always fulfilled, Buzzer Auto will never contribute to any of the short-run fluctuations in output and unemployment that affect real-world economies. First, if everything always goes according to plan and Buzzer Auto's expectations

**FIGURE 23.1** The effect of unexpected changes in demand under flexible and fixed prices. (a) If prices are flexible, then no matter what demand turns out to be, Buzzer Auto can continue to sell its optimal output of 900 cars per week since the equilibrium price will adjust to equalize the quantity demanded with the quantity supplied. (b) By contrast, if Buzzer Auto sticks with a fixed-price policy, then the quantity demanded will vary with the level of demand. At the fixed price of \$37,000 per vehicle, the quantity demanded will be 700 cars per week if demand is  $D_L$ , 900 cars per week if demand is  $D_M$ , and 1150 cars per week if demand is  $D_H$ .



always come true, then the factory will always produce and sell at its optimal output rate of 900 cars per week. This would mean that it would never experience any fluctuations in output—either in the short run or in the long run. At the same time, since producing a constant output of 900 cars each week will always require the same number of workers, the factory's labor demand and employment should never vary. So if everything always goes according to plan, Buzzer Auto will never have any effect on unemployment because it will always hire a constant number of workers.

These facts imply that the short-run fluctuations in output and unemployment that we do see in the real world must be the result of shocks and things *not* going according to plan. In particular, business cycle fluctuations typically arise because the actual demand that materializes ends up being either lower or higher than what people were expecting. When this occurs, some adjustments will be necessary to bring the quantity demanded and the quantity supplied back into alignment. As we are about to explain, the nature of these adjustments varies hugely depending upon whether prices are flexible or inflexible.

## Demand Shocks and Flexible Prices

Figure 23.1a illustrates the case of adjusting to unexpected changes in demand *when prices are flexible*. Here, if demand is unexpectedly low at  $D_L$ , the market price can adjust downward to \$35,000 per vehicle so that the quantity demanded at that price will still be equal to the factory's optimal output rate of 900 cars per week. On the other hand, if demand is unexpectedly high at  $D_H$ , the market price can adjust upward to \$40,000 per vehicle so that the quantity demanded will still be equal to the factory's optimal output rate of 900 cars per week. These adjustments imply that *if* the price of Prions is free to quickly adjust to new equilibrium levels in response to unexpected changes in demand, the factory could always operate at its optimal output rate of 900 cars per week. Only the amount of profit or loss will vary with demand.

Applying this logic to the economy as a whole, *if* the prices of goods and services could always adjust quickly to unexpected changes in demand, then the economy could always produce at its optimal capacity since prices would adjust to ensure that the quantity demanded of each good and service would always equal the quantity supplied. Simply put, if prices were fully flexible, there would be no short-run fluctuations: output would remain constant and unemployment levels would not change because firms would always need the same number of workers to produce the same amount of output.

## Demand Shocks and Sticky Prices

In reality, many prices in the economy are inflexible and are not able to change rapidly when demand changes unexpectedly. Consider the extreme case shown in Figure 23.1b, in which the price of Prions is totally inflexible, fixed at \$37,000 per Prion. Here, if demand unexpectedly falls from  $D_M$  to  $D_L$ , the quantity demanded at the fixed price of \$37,000 will only be 700 cars per week, which is 200 cars fewer than the factory's optimal output of 900 cars per week. On the other hand, if demand is unexpectedly high at  $D_H$ , the quantity demanded at the fixed price of \$37,000 will be 1150 cars per week, which is 250 cars more than the factory's optimal output of 900 cars per week.

One way for companies to deal with these unexpected shifts in quantity demanded would be to try to adjust the factory's output to match them. That is, during weeks of low demand, Buzzer Auto could attempt to produce only 700 Prions, while during weeks of high demand it could try to produce 1150 Prions. But this sort of flexible output strategy is very expensive because factories operate at their lowest costs when they are producing constantly at their optimal output levels; operating at either a higher or a lower production rate results in higher per-unit production costs.<sup>1</sup>

Knowing this, manufacturing firms typically attempt to deal with unexpected changes in demand by maintaining an inventory. An **inventory** is a store of output that has been produced but not yet sold. Inventories are useful because they can be allowed to grow or decline in periods when demand is unexpectedly low or high—thereby allowing production to proceed smoothly even when demand is variable. In our example, Buzzer Auto would maintain an inventory of unsold Prions. In weeks when demand is unexpectedly low, the inventory will increase by 200 Prions as the quantity demanded falls 200 vehicles short of the factory's optimal output. By contrast, during weeks when demand is unexpectedly high, the inventory will decrease as the quantity demanded exceeds the factory's optimal output by 250 cars. By allowing inventory levels to fluctuate with changes in demand, Buzzer Auto can respond to unexpected changes in demand by adjusting inventory levels rather than output levels. In addition, with any luck, the overall inventory level will stay roughly constant over time as unexpected increases and decreases roughly cancel each other out.

<sup>1</sup>If you have studied microeconomics, you will recognize that the firm's optimal output level of 900 cars per week is the level that minimizes the factory's average total cost (ATC) per vehicle of producing the Prion. Producing either more or fewer Prions will result in higher per-vehicle production costs.



But consider what will happen if the firm experiences many successive weeks of unexpectedly low demand. For each such week, the firm’s inventory of unsold Prions will increase by 200 cars. The firm’s managers will not mind if this happens for a few weeks, but if it continues for many weeks, then the managers will be forced to cut production because, among other things, there will simply be no place to park so many unsold vehicles. More importantly, holding large numbers of unsold cars in inventory is unprofitable because while costs must be incurred to build an unsold car, an unsold car obviously brings in no revenue. Constantly rising inventories hurt firm profits and the management will want to reduce output if it sees inventories rising week after week due to unexpectedly low demand.

This simplified story about a single car company explains why economists believe that a combination of unexpected changes in demand and inflexible prices are the key to understanding the short-run fluctuations that affect real-world economies. If prices were flexible, then the firm could always operate at the factory’s optimal output level because prices would always adjust to ensure that it could sell its optimal output of 900 cars per week no matter what happens to demand. But if prices are inflexible, then an unexpected decline in demand that persists for any length of time will result in increasing inventories that will eventually force the firm’s management to cut production to less than the optimal output level of 900 cars per week. When this happens, not only will output fall, but unemployment will also rise. The firm will lay off workers because fewer employees will be needed to produce fewer cars.

Generalizing this story to the economy as a whole, if demand falls off for many goods and services across the entire economy for an extended period of time, then the firms that make those goods and services will be forced to cut production. Manufacturing firms that maintain inventories will do so as they find inventories piling up due to sluggish sales. And services firms will do so as they encounter slow sales for their services. As both manufacturing and service output declines, the economy will go into recession, with GDP falling and unemployment rising.

On the other hand, if demand is unexpectedly high for a prolonged period of time, the economy will boom and unemployment will fall. In the case of our Prion example, for each week that demand is unexpectedly high, inventories will fall by 250 cars. If this keeps happening week after week, inventories will start to run out and the firm will have to react by increasing production

to more than the optimal output rate of 900 cars per week so that orders do not go unfilled. When this happens, GDP will increase as more cars per week are produced and unemployment will fall because the factory will have to hire more workers in order to produce the larger number of cars. (**Key Question 7**)

## How Sticky Are Prices?

We have just shown that **inflexible prices**—or “**sticky prices**” as economists are fond of saying—help to explain how unexpected changes in demand lead to the fluctuations in GDP and employment that occur over the course of the business cycle. Of course, not all prices are sticky. Indeed, the markets for many commodities and raw materials such as corn, oil, and natural gas feature extremely **flexible prices** that react within seconds to changes in supply and demand. By contrast, the prices of most of the final goods and services that people consume are quite sticky, with the average good or service going 4.3 months between price changes. To get a better appreciation for the fact that price stickiness varies greatly by product or service, look at Table 23.1, which gives the average number of months between price changes for various common goods and services. The prices of some products like gasoline and airline tickets change very rapidly—about once a month or even less

**TABLE 23.1** Average Number of Months between Price Changes for Selected Goods and Services

Item	Months
Coin-operatedla undryma chines	46.4
Newspapers	29.9
Haircuts	25.5
Taxifa re	19.7
Veterinaryse rvices	14.9
Magazines	11.2
Computerso ftware	5.5
Beer	4.3
Microwaveo vens	3.0
Milk	2.4
Electricity	1.8
Airlinetic kets	1.0
Gasoline	0.6

Source: Mark Bils and Peter J. Klenow, “Some Evidence on the Importance of Sticky Prices.” *Journal of Political Economy*, October 2004, pp. 947–985.

## Will Better Inventory Management Mean Fewer Recessions?

### Computerized Inventory Tracking Has Greatly Accelerated How Quickly Companies Can Respond to Unexpected Changes in Demand

Before computers made it possible to track inventory changes in real time, firms could only react to unexpected shifts in demand very slowly. This was true because before computers, tracking inventory was a painful, slow process that basically involved having to hire people to physically count the items held in inventory—one at a time. Since this process was both costly and annoying, firms typically counted their inventories only a few times per year.

An unfortunate side effect of counting inventory so infrequently was that unexpected shifts in demand could cause large changes in inventory levels before anyone could find out about them. To see why this is true, consider a firm that counts its inventory just twice per year, for example, once in January and once in July. If the demand for its product suddenly falls in February and then remains low, the decline in demand will not be discovered until the July inventory count is taken. Only then will a high inventory level inform the firm's management that the demand for its product must have unexpectedly declined.

The long delay between when the shift in demand happens and when it is discovered means that the firm will very likely feel pressed to sharply reduce its production of new output since the fastest way to reduce its high inventory level will be to sharply reduce its output rate (so that new sales will exceed the reduced output rate). Following this policy, however, implies not only a large cut in output but also a substantial increase in unemployment since fewer workers will be needed to produce less output. As a result, infrequent inventory counting leads to strong fluctuations in output *and* employment because by the time an unexpected change in demand is discovered, it will have had plenty of time to cause a large change in inventory levels that will very likely be rectified by a large change in production levels.

By contrast, many economists believe that economic fluctuations may have become much less severe during the last 20 years because of the introduction of computerized inventory tracking systems that allow companies to track their inventory levels in real time. These systems keep continuous track of inventory levels by means of technologies like bar codes and laser scanners. This allows firms to tell almost immediately if demand has changed unexpectedly. As a result, the firms that have adopted these systems can make much more subtle changes to output and

than once a month. By contrast, haircuts and newspapers average more than two years between price changes. And coin-operated laundry machines average nearly four years between price changes!

In later chapters, we will discuss several factors that increase short-run price stickiness. But to keep the current discussion brief, let us focus on just two factors here. One factor is that companies selling final goods and services know that consumers prefer stable, predictable prices that do not fluctuate rapidly with changes in demand. Consumers would be annoyed if the same bottle of soda or shampoo cost one price one day, a different price the next day, and yet another price a week later. Volatile prices make planning more difficult, and, in addition, consumers who come in to buy the product on a day when the price happens to be high will likely feel that they are being taken advantage of. To avoid this, most firms try to maintain stable prices that do not change very often. Firms do have occasional sales where they lower prices, but on the whole they tend to try to keep prices stable and predictable—the result being price inflexibility.

Another factor that causes sticky prices has to do with the fact that in certain situations, a firm may be afraid that cutting its price may be counterproductive because its rivals might simply match the price cut—a situation often referred to as a “price war.” This possibility is common among firms that only have one or two major rivals. Consider Coca-Cola and Pepsi. If Coca-Cola faces unexpectedly low demand for its product, it might be tempted to reduce its price in the hope that it can steal business away from Pepsi. But such a strategy would only work if Pepsi left its price alone when Coca-Cola cut its price. That, of course, is not likely. If Coca-Cola cuts its price, Pepsi will very likely cut its price in retaliation, doing its best to make sure that Coca-Cola doesn't steal away any of its customers. Thus, if Pepsi retaliates, Coca-Cola will only be made worse off by its decision to cut its price: It will not pick up much more business (because Pepsi also cut its price) and it will also be receiving less money for each bottle of Coke that it sells (because it lowered its own price.) Thus, firms that have to deal with the possibility of price wars often have sticky prices.

employment because they can discover the unexpected changes in demand before those unexpected changes have caused large shifts in inventory levels.

While it is not possible to “prove” that inventory management systems have led to smaller business cycle fluctuations, the behavior of the U.S. economy over the past 30 years is suggestive. The last severe recession happened in 1981–1982. Up to that point, recessions appeared to happen in the United States every five or so years and were often quite punishing, with high levels of unemployment and significant declines in output. But computerized inventory management systems began to be widely adopted during the 1980s and since that time the U.S. economy has only experienced two mild recessions, one in 1991–1992 and another in 2000–2001. Since these recessions were not only mild but about 10 years apart, some economists have taken this behavior as evidence that from now on recessions will be less frequent



and less severe due to the recent improvements in inventory management.

Opinions vary, however, as to how much credit computerized inventory management should be given for the apparent reduction in the frequency and severity of the business cycle. Indeed, several other explanations have been put forward to explain why things seem to have improved. One hypothesis is that we may have just been lucky in recent years in that there have simply not been that many significant demand shocks. Another explanation is that governments may have learned from past mistakes and shifted to better economic policies. Taking the various competing explanations into account, it is safe to say that while no economist would give *all* the credit for the more moderate business cycle fluctuations of the past 25 years to computerized inventory management systems, nearly all would give at least some of the credit to these systems and the fact that they allow firms to rapidly react to unexpected changes in demand.

## Categorizing Macroeconomic Models Using Price Stickiness

We have now demonstrated why price stickiness is believed to have such a large role in short-run economic fluctuations. It should be noted, however, that price stickiness moderates over time. This is true because firms that choose to use a fixed-price policy in the short run do not have to stick with that policy permanently. In particular, if unexpected changes in demand begin to look permanent, many firms will allow their prices to change so that price changes (in addition to quantity changes) can help to equalize quantities supplied with quantities demanded.

For this reason, economists speak of “sticky prices” rather than “stuck prices.” Only in the very short run are prices totally inflexible. As time passes and prices are revised, the world looks much more like Figure 23.1a, in which prices are fully flexible, rather than Figure 23.1b, in which prices are totally inflexible. Indeed, the totally inflexible case shown in the right graph can be thought of

as the extremely short-run response to an unexpected change in demand, while the fully flexible case shown in the left graph can be thought of as a longer-run response to an unexpected change in demand. In terms of time durations, the extreme short run can be thought of as the first few weeks and months after a demand shock, while the long run can be thought of as extending from many months to several years after a demand shock happens.

This realization is very useful in categorizing and understanding the differences between the various macroeconomic models that we will be presenting in subsequent chapters. For instance, the aggregate expenditures model presented in Chapter 28 assumes perfectly inflexible prices (and wages) and thus is a model in which prices are not just sticky but completely stuck. By contrast, the aggregate demand–aggregate supply model presented in Chapter 29 allows for flexible prices (with or without flexible wages) and is therefore useful for understanding how the economy behaves over longer periods of time.

As you study these various models, keep in mind that we need different models precisely because the economy

behaves so differently depending on how much time has passed after a demand shock. The differences in behavior result from the fact that prices go from stuck in the extreme short run to fully flexible in the long run. Using different models for different stages in this process gives us much better insights into not only how economies actually behave but also how various government and central bank policies may have different effects in the short run when prices are fixed versus the long run when prices are flexible.

Where will we go from here? In the remainder of Part 6, we examine how economists measure GDP and why GDP has expanded over time. Then, we discuss the terminology of business cycles and explore the measurement and types of unemployment and inflation. At that point you will be well-prepared to examine the economic models, monetary considerations, and stabilization policies that lie at the heart of macroeconomics.

## Summary

1. Macroeconomics studies long-run economic growth and short-run economic fluctuations.
2. Macroeconomists focus their attention on three key economic statistics: real GDP, unemployment, and inflation. Real GDP measures the value of all final goods and services produced in a country during a given period of time. The unemployment rate measures the percentage of all workers who are not able to find paid employment despite being willing and able to work at currently available wages. The inflation rate measures the extent to which the overall level of prices is rising in the economy.
3. Before the Industrial Revolution, living standards did not show any sustained increases over time. Economies grew, but any increase in output tended to be offset by an equally large increase in the population, so that the amount of output per person did not rise. By contrast, since the Industrial Revolution began in the late 1700s, many nations have experienced modern economic growth in which output grows faster than population—so that standards of living rise over time.
4. Macroeconomists believe that one of the keys to modern economic growth is the promotion of savings and investment (for economists, the purchase of capital goods). Investment activities increase the economy's future potential output level. But investment must be funded by saving, which is only possible if people are willing to reduce current consumption. Consequently, individuals and society face a trade-off between current consumption and future consumption since the only way to fund the investment necessary to increase future consumption is by reducing current consumption in order to gather the savings necessary to fund that investment. Banks and other financial institutions help to convert saving into investment by taking the savings generated by households and lending it to businesses that wish to make investments.
5. Expectations have an important effect on the economy for two reasons. First, if people and businesses are more positive about the future, they will save and invest more. Second, individuals and firms must make adjustments to shocks—situations in which expectations are unmet and the future does not turn out the way people were expecting. In particular, shocks often imply situations where the quantity supplied of a given good or service does not equal the quantity demanded of that good or service.
6. If prices were always flexible and capable of rapid adjustment, then dealing with situations in which quantities demanded did not equal quantities supplied would always be easy since prices could simply adjust to the market equilibrium price at which quantities demanded equal quantities supplied. Unfortunately, real-world prices are often inflexible (or “sticky”) in the short run so that the only way for the economy to adjust to such situations is through changes in output levels.
7. Sticky prices combine with shocks to drive short-run fluctuations in output and employment. Consider a negative demand shock in which demand is unexpectedly low. Because prices are fixed, the lower-than-expected demand will result in unexpectedly slow sales. This will cause inventories to increase. If demand remains low for an extended period of time, inventory levels will become too high and firms will have to cut output and lay off workers. Thus, when prices are inflexible, the economy adjusts to unexpectedly low demand through changes in output and employment rather than through changes in prices (which are not possible when prices are inflexible).
8. Prices are inflexible in the short run for various reasons, two of which are discussed in this chapter. First, firms often attempt to set and maintain stable prices in order to please customers who like predictable prices because they make for easy planning (and who might become upset if prices were volatile). Second, a firm with just a few competitors may be reluctant to cut its price due to the fear of starting a price war, a situation in which its competitors retaliate by cutting their prices as well—thereby leaving the firm worse off than it was to begin with.

## Terms and Concepts

the business cycle	modern economic growth	shocks
recession	savings	demand shocks
real GDP (Gross Domestic Product)	investment	supply shocks
nominal GDP	financial investment	inventory
unemployment	economic investment	inflexible prices (“sticky prices”)
inflation	expectations	flexible prices

## Study Questions

- Why do you think macroeconomists focus on just a few key statistics when trying to understand the health and trajectory of an economy? Would it be better to try to make use of all possible data? **LO2**
- KEY QUESTION** Consider a nation in which the volume of goods and services is growing by 5 percent per year. What is the likely impact of this high rate of growth on the power and influence of its government relative to other countries experiencing slower rates of growth? What about the effect of this 5 percent growth on the nation’s living standards? Will these also necessarily grow by 5 percent per year, given population growth? Why or why not? **LO1**
- A mathematical approximation called *the rule of 70* tells us that the number of years that it will take something that is growing to double in size is approximately equal to the number 70 divided by its percentage rate of growth. Thus, if Mexico’s real GDP per person is growing at 7 percent per year, it will take about 10 years ( $= 70 \div 7$ ) to double. Apply the rule of 70 to solve the following problem. Real GDP per person in Mexico in 2005 was about \$11,000 per person, while it was about \$44,000 per person in the United States. If real GDP per person in Mexico grows at the rate of 5 percent per year, about how long will it take Mexico’s real GDP per person to reach the level that the United States was at in 2005? (Hint: How many times would Mexico’s 2005 real GDP per person have to double to reach the United States’ 2005 real GDP per person?) **LO3**
- Why is there a trade-off between the amount of consumption that people can enjoy today and the amount of consumption that they can enjoy in the future? Why can’t people enjoy more of both? How does saving relate to investment and thus to economic growth? What role do banks and other financial institutions play in aiding the growth process? **LO4**
- How does investment as defined by economists differ from investment as defined by the general public? What would happen to the amount of investment made today if firms expected the future returns to such investment to be very low? What if firms expected future returns to be very high? **LO4**
- Why, in general, do shocks force people to make changes? Give at least two examples from your own experience. **LO5**
- KEY QUESTION** Catalogue companies are the classic example of perfectly inflexible prices because once they print and ship out their catalogues, they are committed to selling at the prices printed in their catalogues. If a catalogue company finds its inventory of sweaters rising, what does that tell you about the demand for sweaters? Was it unexpectedly high, unexpectedly low, or as expected? If the company *could* change the price of sweaters, would it raise the price, lower the price, or keep the price the same? Given that the company cannot change the price of sweaters, consider the number of sweaters it orders each month from the company that makes its sweaters. If inventories become very high, will the catalogue company increase, decrease, or keep orders the same? Given what the catalogue company does with its orders, what is likely to happen to employment and output at the sweater manufacturer? **LO5**
- Why are prices sticky? Explain the two reasons given in this chapter and then try to think of two more. **LO5**
- LAST WORD** Why do some economists believe that better inventory control software may help to reduce the frequency and severity of recessions? Could differences in technology explain why recessions appear to be more frequent and more severe in poorer countries?

## Web-Based Questions

- DO ALL POOR COUNTRIES GROW FAST?** The *CIA World Factbook* is published annually and contains economic, political, and social data for nearly every country in the world. To pull up rankings of each country on each data item, go to <https://www.cia.gov/library/publications/the-world-factbook/docs/rankorderguide.html>. Scroll down to the Economy section and click on “GDP-real growth rate.” Write down the growth rates of the countries with

the five highest real GDP growth rates and the five lowest real GDP growth rates. Go back to the Economy section and click on “GDP-per capita.” (*Per capita* is Latin for *per person*.) Look up GDP per person for each of the countries whose growth rates you have just written down. Can we say that *all* poor countries grow fast? Should we assume that countries with lower levels of GDP per person will *automatically* be able to catch up with living standards in rich countries?

2. **IS REAL GDP PER PERSON A SUFFICIENT MEASURE OF WELL-BEING?** Economists tend to focus on real GDP per person as their primary way of comparing living standards among countries. But they are also aware that real GDP per person does not capture many factors that affect the quality of life. Go to the *CIA World Factbook*'s rank-order page at <https://www.cia.gov/library/publications/the-world-factbook/docs/rankorderguide.html>. Under the People

section, click on “Infant mortality rate.” Write down the rank and the infant mortality rate for the following four countries: the United States, France, Mexico, and China. Go back to the People section and click on “Life expectancy at birth-total.” For each of the four countries, write down its rank and life expectancy at birth. Now compare the data you just wrote down for infant mortality and life expectancy at birth with the GDP per person data shown in Global Perspective 23.1. Does the country with the highest GDP per person have the lowest infant mortality or the highest life expectancy? Can poorer countries do well on these alternative measures of well-being? Could people be misled about differences in living standards if they only compared different countries' levels of GDP per person?

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