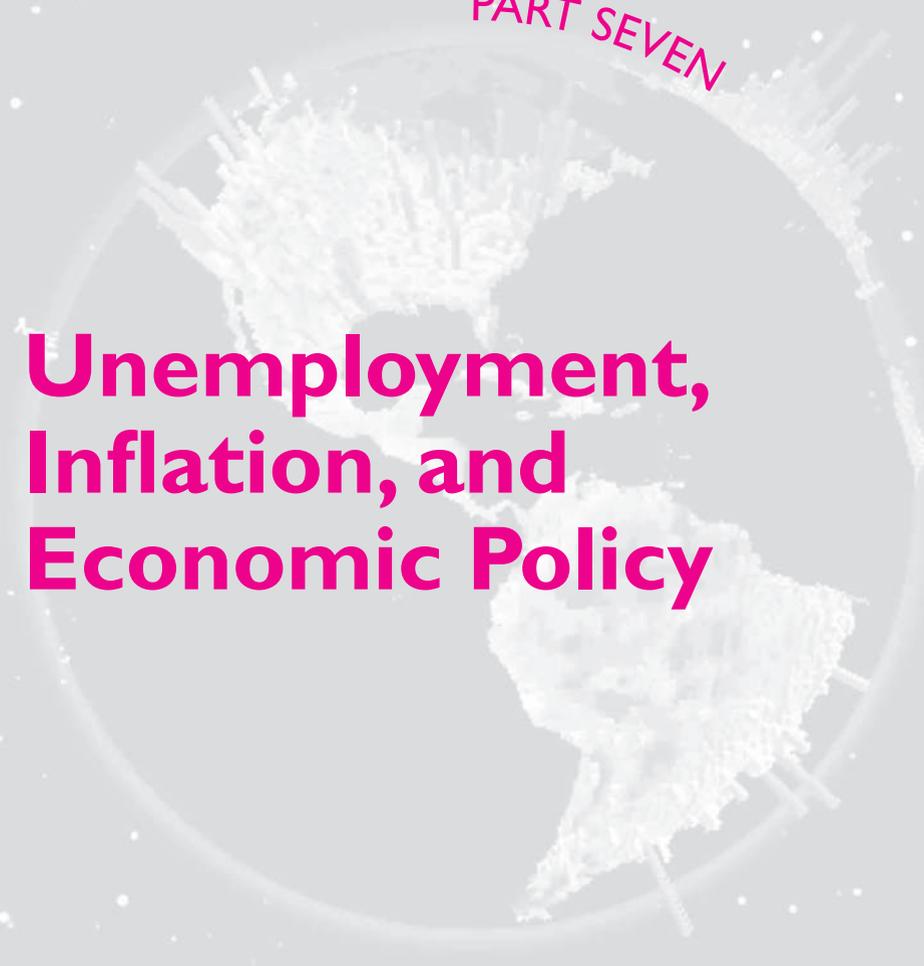


PART SEVEN

# Unemployment, Inflation, and Economic Policy



# Unemployment and the Foundations of Aggregate Supply



*Be nice to people on your way up because you'll meet them on your way down.*

Wilson Mizner

Among the persistent features of a market economy are business recessions, in which employment and output fall and unemployment rises. For most of the period since World War II, the United States avoided prolonged and deep recessions. However, even during the mild business contractions, joblessness increased and incomes fell sharply.

Occasionally, and often without much warning, countries suffer severe recessions or even decade-long depressions, and high unemployment persists for several years or even a decade. Such a situation was seen in the U.S. during the 1930s, when the unemployment rate was above 10 percent of the labor force for ten years.

The world's richest economies entered a recession in 2007, and it turned sharply worse in 2008–2009. Faced with a housing bubble, failing banks, a loss of confidence in the economy, weak investment, and a liquidity trap, the unemployment rate rose sharply in the 2007–2009 period. Although a better understanding of macroeconomics has allowed most countries to take countercyclical measures, prospects for a strong recovery of output and employment were slim.

This chapter presents an analysis of the macroeconomics of unemployment. It begins by analyzing the foundations of aggregate supply. This analysis

shows how rising unemployment is the result of slow growth of aggregate demand relative to potential output. We then examine the major policy issues surrounding unemployment.

## A. THE FOUNDATIONS OF AGGREGATE SUPPLY

Earlier chapters focused on aggregate demand and economic growth. This section describes the factors determining aggregate supply. In the short run, the nature of the inflationary process and the effectiveness of government countercyclical policies depend on aggregate demand. In the long run of a decade or more, economic growth and rising living standards are closely linked with increases in aggregate supply.

This distinction between short-run and long-run aggregate supply is crucial to modern macroeconomics. In the short run, it is the interaction of aggregate supply and demand that determines business-cycle fluctuations, inflation, unemployment, recessions, and booms. But in the long run, it is the growth of potential output working through aggregate supply which explains the trend in output and living standards.

It will be useful to summarize the key points at the outset:

- **Aggregate supply** describes the behavior of the production side of the economy. The **aggregate supply curve**, or **AS curve**, is the schedule showing the level of total national output that will be produced at each possible price level, other things held constant.
- In analyzing aggregate supply, we will make the central distinction between the long run and the short run. The short run, corresponding to the behavior over periods of a few months to a few years, involves the **short-run aggregate supply schedule**. In the short run, prices and wages have elements of inflexibility. As a result, higher prices are associated with higher production of goods and services. This is shown as an *upward-sloping AS curve*.
- The long run refers to periods associated with economic growth, after most of the elements of business cycles have damped out; it refers to a period of several years or decades. In the long run, prices and wages are perfectly flexible. Output is determined by potential output and is independent of the price level. We depict the **long-run aggregate supply schedule** as *vertical*.

This section is devoted to explaining these central points.

## DETERMINANTS OF AGGREGATE SUPPLY

Aggregate supply depends fundamentally upon two distinct sets of forces: potential output and input costs. Let us examine each of these influences.

### Potential Output

The key concept for understanding aggregate supply is *potential output* or *potential GDP*. **Potential output** is the maximum sustainable output that can be produced without triggering rising inflationary pressures.

Over the long run, aggregate supply depends primarily upon potential output. Hence, long-run *AS* is determined by the same factors which influence long-run economic growth: the quantity and quality of labor, the supply of capital and natural resources, and the level of technology.

Macroeconomists generally use the following definition of potential output:

**Potential GDP is the highest sustainable level of national output. It is the level of output that would be produced if we remove business-cycle influences. As an operational measure, we measure potential GDP as the output that would be produced at a benchmark level of the unemployment rate called the *nonaccelerating inflation rate of unemployment* (or the *NAIRU*).**

Potential output is a growing target. As the economy grows, potential output increases as well, and the aggregate supply curve shifts to the right. Table 29-1 shows the key determinants of aggregate supply, broken down into factors affecting potential output and production costs. From our analysis of economic growth, we know that the prime factors determining the growth in potential output are the growth in inputs and technological progress.



### Potential Output Is Not Maximum Output

We must emphasize a subtle point about potential output: Potential output is the maximum sustainable output but not the absolute maximum output that an economy can produce. The economy can operate with output levels above potential output for a short time. Factories and workers can work overtime for a while, but production above potential is not indefinitely sustainable. If the economy produces more than its potential output for long, price inflation tends to rise as unemployment falls, factories are worked intensively, and workers and businesses try to extract higher wages and profits.

A useful analogy is someone running a marathon. Think of potential output as the maximum speed that a marathoner can run without becoming “overheated” and dropping out from exhaustion. Clearly, the runner can run faster than the sustainable pace for a while, just as the U.S. economy grew faster than its potential growth rate during the 1990s. But over the entire course, the economy, like the marathoner, can produce only at a maximum sustainable “speed,” and this sustainable output speed is what we call potential output.

### Input Costs

It is not surprising that increased potential output would lead to increased aggregate supply. The role

Variable	Impact on aggregate supply
<b>Potential output</b>	
Inputs	Supplies of capital, labor, and natural resources are the important inputs. Potential output comes when employment of labor and other inputs is at the maximum sustainable level. Growth of inputs increases potential output and aggregate supply.
Technology and efficiency	Innovation, technological improvement, and increased efficiency increase the level of potential output and raise aggregate supply.
<b>Production costs</b>	
Wages	Lower wages lead to lower production costs; lower costs mean that quantity supplied will be higher at every price level for a given potential output.
Import prices	A decline in foreign prices or an appreciation in the exchange rate reduces import prices. This leads to lower production costs and raises aggregate supply.
Other input costs	Lower oil prices lower production costs and thereby raise aggregate supply.

**TABLE 29-1. Aggregate Supply Depends upon Potential Output and Production Costs**

Aggregate supply relates total output supplied to the price level. The AS curve depends upon fundamental factors such as potential output and production costs. The factors listed in the table would increase aggregate supply, shifting the AS curve down or to the right.

of costs in AS is less obvious. We will see, however, that aggregate supply *in the short run* is affected by the costs of production.

The intuition behind this point is the following: Businesses have certain costs that are inflexible in the short run. For example, consider an airline that has a long-term lease and a multiyear labor contract. If the demand for air travel increases, the airline will find it profitable to add flights and to raise its ticket prices. In other words, both prices and output increase with an increase in demand in the short run.

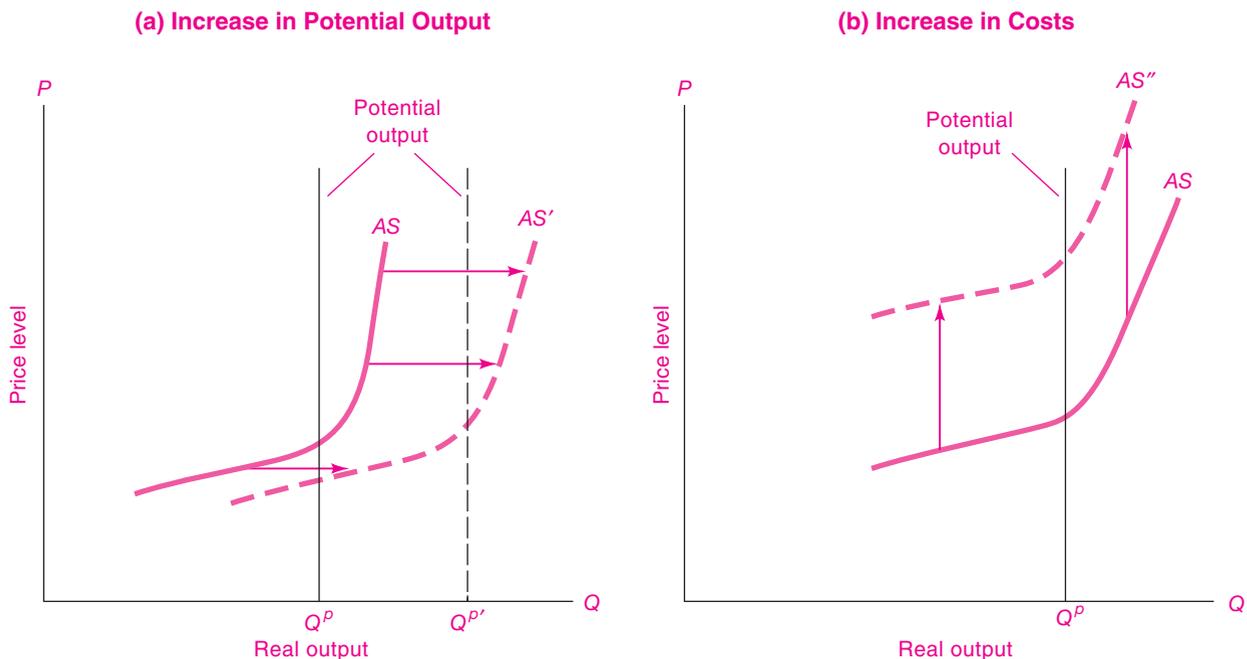
We can also see that changes in production costs will affect aggregate supply in the short run. For example, consider what happened in the early 2000s when oil prices rose sharply, increasing the price of jet fuel. Airlines were unable to adjust their operations and ticket prices sufficiently to offset the higher costs. They were making record losses. They therefore cut some of their operations, abandoned routes, cut back on food service, and mothballed a substantial number of airplanes. This example shows how input costs can affect supply behavior.

Table 29-1 shows some of the cost factors affecting aggregate supply. These examples are ones in which lower costs will increase AS, meaning that the AS curve shifts down.

**AS Shifts.** We can illustrate the effects of changes in costs and potential output graphically in Figure 29-1. The left-hand panel shows that an increase in potential output with no change in production costs would shift the aggregate supply curve outward from AS to AS'. If production costs were to increase with no change in potential output, the curve would shift straight up from AS to AS'', as shown in Figure 29-1(b).

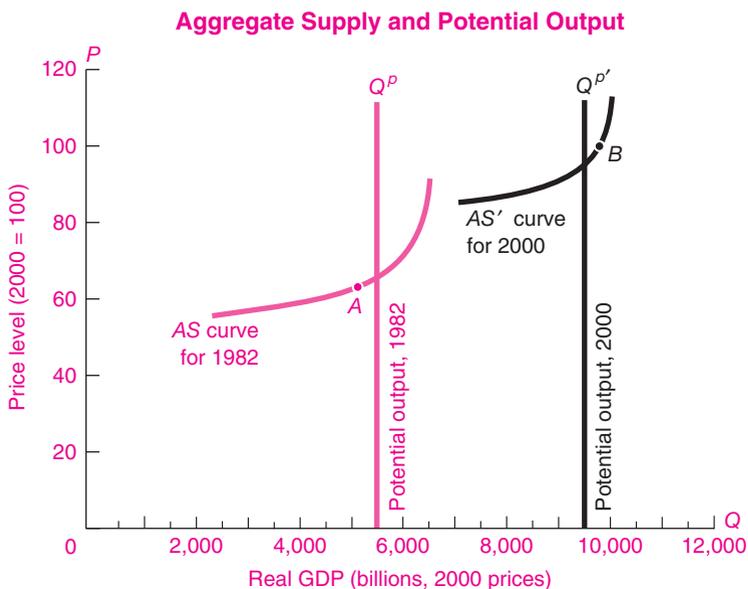
The real-world shifting of AS is displayed in Figure 29-2. The curves are realistic empirical estimates for two different years, the recession year of 1982 and the peak year of 2000. The vertical lines indicate the levels of potential output in the two years. According to studies, real potential output grew about 72 percent over this period.

The figure shows how the AS curve shifted outward and upward over the period. The *outward* shift was caused by the increase in potential output that came from growth in the labor force and the capital stock as well as from improvements in technology. The *upward* shift was caused by increases in the cost of production, as wages, oil prices, and other production costs rose. Putting together the cost increases and the potential-output growth gives the aggregate supply shift shown in Figure 29-2.



**FIGURE 29-1.** How Do Growth in Potential Output and Cost Increases Affect Aggregate Supply?

In (a), growth in potential output with unchanged production costs shifts the AS curve rightward from AS to AS'. When production costs increase, say, because of higher wages or oil costs, but with unchanged potential output, the AS curve shifts vertically upward, as from AS to AS'' in (b).



**FIGURE 29-2.** In Reality, Aggregate Supply Shifts Combine Cost Increases and Increased Potential Output

Between 1982 and 2000, potential output grew due to increases in capital and labor inputs along with technological improvements, shifting out the AS curve. At the same time, increases in production costs shifted up the AS curve. The net effect was to shift the AS curve upward and to the right.

## AGGREGATE SUPPLY IN THE SHORT RUN AND LONG RUN

How do shifts in aggregate demand affect output and employment? The answer to this question differs between the short run (which applies to business cycles) and the long run (which applies to comparisons of countries over long periods of time or to comparisons among countries). The two approaches are illustrated in Figure 29-3.

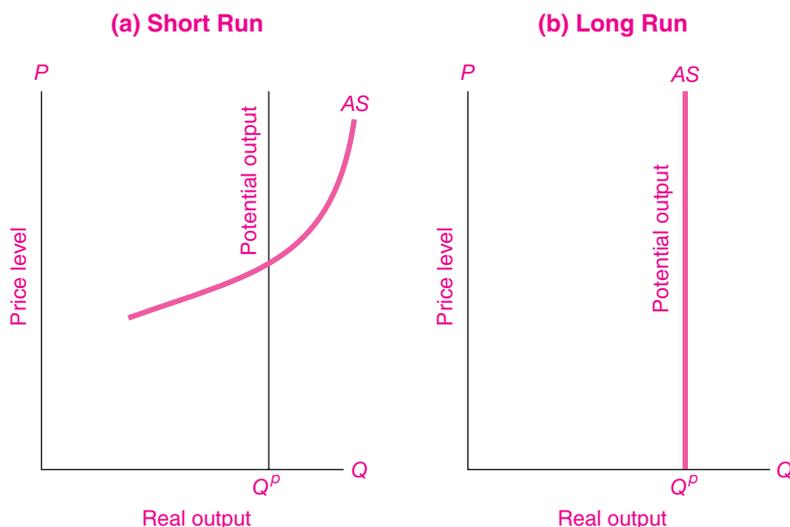
The upward-sloping, short-run aggregate supply curve is associated with the analysis called **Keynesian macroeconomics**. In this situation, changes in aggregate demand have a significant effect on output. In other words, if aggregate demand falls because of a monetary tightening or a falloff in consumer spending, this will lead to falling output and prices. In terms of our curves, this means that the *AS* curve is upward-sloping, so a decline in *AD* will lead to a decline in both prices and output.

The long-run approach, sometimes called **classical macroeconomics**, holds that changes in *AD* affect prices but have no effect on real output. In the long

run, prices and wages adjust fully to changes in aggregate demand. The classical or long-run *AS* curve is vertical; changes in aggregate demand therefore have no effect on output.

We can summarize the reasons for the difference as follows: The short-run *AS* curve in Figure 29-3(a) indicates that firms are willing to increase their output levels in response to changes in aggregate demand. Clearly, there must be unemployed resources in the economy. But the expansion of output cannot go on forever. As output rises, labor shortages appear and factories operate close to capacity. Wages and prices begin to rise more rapidly. A larger fraction of the response to aggregate demand increase comes in the form of price increases and a smaller fraction comes in output increases.

Figure 29-3(b) shows what happens in the long run—after wages and prices have had time to react fully. When all adjustments have taken place, the long-run *AS* curve becomes vertical or classical. In the long run, the level of output supplied is independent of aggregate demand.



**FIGURE 29-3.** *AS* Is Upward-Sloping in the Short Run but Turns Vertical in the Long Run

The short-run *AS* curve in (a) slopes upward because many costs are inflexible in the short run. But sticky prices and wages become unstuck as time passes, so the long-run *AS* curve in (b) is vertical and output is determined by potential output. Can you see why a Keynesian economist in (a) might desire to stabilize the economy through policies that change aggregate demand while a classical economist in (b) would concentrate primarily on increasing potential output?

### Sticky Wages and Prices and the Upward-Sloping AS Curve

Economists generally agree that the AS curve slopes up in the short run—which is to say that both output and prices respond to demand shifts. It has proved very difficult to develop a complete theory to explain this relationship, and controversies about aggregate supply are among the most heated in all of economics. We will describe one of the important and durable theories here—one involving sticky wages and prices—but don't be surprised if you hear other ones as well.

The puzzle is why firms raise both prices and output in the short run as aggregate demand increases, whereas increases in demand lead primarily to price changes in the long run. The key to this puzzle lies in the behavior of wages and prices in a modern market economy. Some elements of business costs are *inflexible* or *sticky* in the short run. As a result of this inflexibility, businesses can profit from higher levels of aggregate demand by producing more output.

For example, suppose that a wartime emergency leads to an increase in military spending. Firms know that in the short run many of their production costs are fixed in dollar terms—workers are paid \$15 per hour, rentals are \$1500 per month, and so forth. In response to the higher demand, firms will generally raise their output prices and increase production. This positive association between prices and output is seen in the upward-sloping AS curve in Figure 29-3(a).

We have spoken repeatedly of “sticky” or “inflexible” costs. What are some examples? The most significant is wages. Take unionized workers as an example. They are usually paid according to a long-term union contract which specifies a dollar wage rate. For the life of the labor agreement, the wage rate faced by the firm will be largely fixed in dollar terms. It is quite rare for wages to be raised more than once a year even for nonunion workers. It is even more uncommon for money wages or salaries actually to be cut, except when a company is visibly facing the threat of bankruptcy.

Other prices and costs are similarly sticky in the short run. When a firm rents a building, the lease will often last for a year or more and the rental is generally set in dollar terms. In addition, firms often sign contracts with their suppliers specifying the prices to be paid for materials or components.

Putting all these cases together, you can see how a certain short-run stickiness of wages and prices exists in a modern market economy.

What happens in the long run? Eventually, the inflexible or sticky elements of cost—wage contracts, rental agreements, regulated prices, and so forth—become unstuck and negotiable. Firms cannot take advantage of fixed-money wage rates in their labor agreements forever; labor will soon recognize that prices have risen and insist on compensating increases in wages. Ultimately, all costs will adjust to the higher output prices. If the general price level rises by  $x$  percent because of the higher demand, then money wages, rents, regulated prices, and other costs will in the end respond by moving up around  $x$  percent as well.

Once costs have adjusted upward as much as prices, firms will be unable to profit from the higher level of aggregate demand. In the long run, after all elements of cost have fully adjusted, firms will face the same ratio of price to costs as they did before the change in demand. There will be no incentive for firms to increase their output. The long-run AS curve therefore tends to be vertical, which means that output supplied is independent of the level of prices and costs.

Aggregate supply differs depending upon the period. In the short run, inflexible elements in wages and prices lead firms to respond to higher demand by raising both production and prices. In the longer run, as costs respond fully, all of the response to increased demand takes the form of higher prices. Whereas the short-run AS curve is upward-sloping, the long-run AS curve is vertical because, given sufficient time, all prices and costs adjust fully.

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## B. UNEMPLOYMENT

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During the recession that began in 2007, the number of unemployed people in the United States rose by more than 4 million. Of the 11 million unemployed people at the end of 2008, half were “job losers,” people who lost their jobs involuntarily. In earlier periods, such as the Great Depression or the early 1980s, the unemployment rate rose much more, reaching an all-time high of 25 percent in 1933.

The presence of involuntary unemployment in a market economy raises important questions: How can millions of people be unemployed when there is so much useful work to be done? Is there some flaw in the market mechanism that forces so many who want to work to remain idle? Alternatively, is high unemployment primarily due to flawed government programs (such as unemployment insurance) that reduce the incentive to work, or is it due to inherent properties of a market economy? The balance of this chapter provides a survey of the meaning of unemployment and some answers to these important questions.

## MEASURING UNEMPLOYMENT

Changes in the unemployment rate make monthly headlines. Look back to Figure 19-3 on page 373 to refresh your memory about the long-term trend. What lies behind the numbers? Statistics on unemployment and the labor force are among the most carefully designed and comprehensive economic data the nation collects. The data are gathered monthly in a procedure known as *random sampling* of the population. Each month about 60,000 households are interviewed about their recent work history.

The survey divides the population of those 16 years and older into four groups:

- **Employed.** These are people who perform any paid work, as well as those who have jobs but are absent from work because of illness, strikes, or vacations.
- **Unemployed.** Persons are classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work. An important point to note is that unemployment requires more than being without a job—it requires taking steps to find a job.
- **Not in the labor force.** This includes the 34 percent of the adult population that is keeping house, retired, too ill to work, or simply not looking for work.
- **Labor force.** This includes all those who are either employed or unemployed.

Figure 29-4 shows how the population in the United States is divided among the categories of employed, unemployed, and not in the labor force.



**FIGURE 29-4.** Labor-Force Status of the Population, 2007

How do Americans spend their time? This figure shows how teenagers (ages 16–19), prime-age adults (ages 25–54), and seniors (65 and older) divided their time among employment, unemployment, and not in the labor force. Many young workers are out of the labor force and in school, while most older workers are retired.

Source: Bureau of Labor Statistics.

(The status of students is examined in question 6 at the end of this chapter.)

The definition of labor-force status used by the government is the following:

People with jobs are employed; people without jobs but looking for work are unemployed; people without jobs who are not looking for work are outside the labor force. The **unemployment rate** is the number of unemployed divided by the total labor force.

## IMPACT OF UNEMPLOYMENT

High unemployment is both an economic and a social problem. Unemployment is an economic problem because it represents waste of a valuable resource. Unemployment is a major social problem because it causes enormous suffering as unemployed workers struggle with reduced incomes. During periods of high unemployment, economic distress spills over to affect people's emotions and family lives.

### Economic Impact

When the unemployment rate goes up, the economy is in effect throwing away the goods and services that the unemployed workers could have produced.

How much waste results from high unemployment? What is the opportunity cost of recessions? Table 29-2 provides a calculation of how far output fell short of potential GDP during three periods of high unemployment over the last half-century. The largest economic loss occurred during the Great Depression, but the oil and inflation crises of the 1970s and 1980s also generated more than a trillion dollars of lost output.

The economic losses during periods of high unemployment are the greatest documented wastes in a modern economy. They are many times larger than the estimated inefficiencies from microeconomic waste due to monopoly or from the waste induced by tariffs and quotas.

### Social Impact

The economic cost of unemployment is certainly large, but no dollar figure can adequately convey the human and psychological toll of long periods of persistent involuntary unemployment. The personal tragedy of unemployment has been proved again

and again. We can read of the futility of a job search in San Francisco during the Great Depression:

I'd get up at five in the morning and head for the waterfront. Outside the Spreckles Sugar Refinery, outside the gates, there would be a thousand men. You know dang well there's only three or four jobs. The guy would come out with two little Pinkerton cops: "I need two guys for the bull gang. Two guys to go into the hole." A thousand men would fight like a pack of Alaskan dogs to get through. Only four of us would get through.

Or we can listen to the recollection of an unemployed construction worker:

I called the roofing outfits and they didn't need me because they already had men that had been working for them five or six years. There wasn't that many openings. You had to have a college education for most of them. And I was looking for anything, from car wash to anything else.

So what do you do all day? You go home and you sit. And you begin to get frustrated sitting home. Everybody in the household starts getting on edge. They start arguing with each other over stupid things 'cause they're all cramped in that space all the time. The whole family kind of got crushed by it.

	Average unemployment rate (%)	Lost Output	
		GDP loss (\$, billion, 2008 prices)	As percentage of GDP during the period
Great Depression (1930–1939)	18.2	2,796	30.0
Oil and inflation crises (1975–1984)	7.7	1,694	2.7
Slump after dot.com bust (2001–2003)	5.5	509	1.4

**TABLE 29-2. Economic Costs from Periods of High Unemployment**

The two major periods of high unemployment since 1929 occurred during the Great Depression and during the oil shocks and high inflation from 1975 to 1984. The lost output is calculated as the cumulative difference between potential GDP and actual GDP. Note that during the Great Depression losses relative to GDP were 10 times greater than losses in the oil-inflation slump. The slowdown in the early 2000s was mild by comparison to earlier downturns.

Source: Authors' estimates on the basis of official GDP and unemployment data.

Unemployment is not limited to the unskilled, as many well-paid managers, professionals, and white-collar workers learned in the corporate downsizings of the last two decades. Listen to the story of one middle-aged corporate manager who lost his job in 1988 and was still without permanent work in 1992:

I have lost the fight to stay ahead in today's economy. . . . I was determined to find work, but as the months and years wore on, depression set in. You can only be rejected so many times; then you start questioning your self-worth.

### OKUN'S LAW

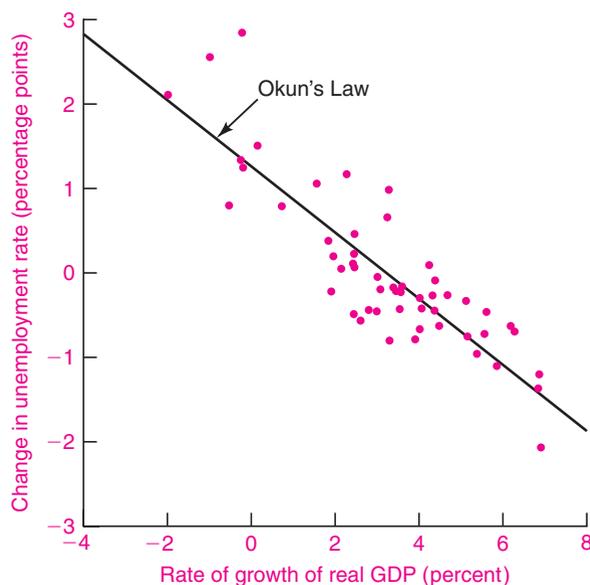
The most traumatic consequence of a recession is the accompanying rise in unemployment. As output falls, firms need fewer labor inputs, so new workers are not hired and current workers are laid off. We see that the unemployment rate usually moves inversely with output over the business cycle. This co-movement is known as Okun's Law.

**Okun's Law** states that for every 2 percent that GDP falls relative to potential GDP, the unemployment rate rises about 1 percentage point.

This means that if GDP begins at 100 percent of its potential and falls to 98 percent of potential, the unemployment rate rises by 1 percentage point, say, from 6 to 7 percent. Figure 29-5 shows how output and unemployment have moved together over time.

We can illustrate Okun's Law by examining output and unemployment trends in the 1990s. At the trough of the recession of 1991, the unemployment rate rose to 7 percent. At that point, actual GDP was estimated to be 3 percent below potential output. Then, over the next 8 years, output grew 5 percent faster than potential output, so in 1999 actual GDP was estimated to be 2 percent above potential output. According to Okun's Law, the unemployment rate should have fallen by  $2\frac{1}{2}$  percentage points ( $5/2$ ) to  $4\frac{1}{2}$  percent ( $7 - 2\frac{1}{2}$ ). In fact, the unemployment rate for 1999 was  $4\frac{1}{4}$  percent—a remarkably accurate prediction. This shows how Okun's Law can be used to relate changes in the unemployment rate to the growth in output.

One important consequence of Okun's Law is that actual GDP must grow as rapidly as potential GDP just to keep the unemployment rate from rising. In a sense, GDP has to keep running just to keep



**FIGURE 29-5. Okun's Law Illustrated, 1955–2007**

According to Okun's Law, whenever output grows 2 percent faster than potential GDP, the unemployment rate declines 1 percentage point. This graph shows that unemployment changes are well predicted by the rate of GDP growth. What output growth would lead to no change in unemployment according to the line?

Source: U.S. Departments of Commerce and Labor.

unemployment in the same place. Moreover, if you want to bring the unemployment rate down, actual GDP must be growing faster than potential GDP.

Okun's Law provides the vital link between the output market and the labor market. It describes the association between short-run movements in real GDP and changes in unemployment.

### ECONOMIC INTERPRETATION OF UNEMPLOYMENT

On the face of it, the cause of unemployment seems clear: too many workers chasing too few jobs. Yet this simple phenomenon has presented a tremendous puzzle for economists for many years. Experience shows that prices rise or fall to clear competitive markets. At the market-clearing price, buyers willingly buy what sellers willingly sell. But something is

gumming up the workings of the labor market when many hospitals are searching for nurses but cannot find them while thousands of coal miners want to work at the going wage but cannot find a job. Similar symptoms of labor market failures are found in all market economies.

Let's turn now to the economic analysis of unemployment. As with other economic phenomena, we would like to understand the reasons for unemployment. Can we understand why unemployment varies sharply over the business cycle, as well as why some groups have higher unemployment rates than other groups? We will see that a combination of imperfections in the labor market, as well as personal search dynamics, lies behind the observed behavior.

### Equilibrium Unemployment

We begin by analyzing unemployment in a supply-and-demand framework. To begin with, we will consider equilibrium unemployment. **Equilibrium unemployment** arises when people become unemployed voluntarily as they move from job to job or into and out of the labor force. This is also sometimes called *frictional unemployment* because people cannot move instantaneously between jobs. Here are some examples: Someone working at the local hamburger stand might decide that the pay is too low, or the hours are too inconvenient, and quit to look for a better job. Others might decide to take time off between school and their first job. A new mother might take 3 months of unpaid maternity leave. These workers have chosen unemployment rather than work in balancing their relative preferences of income, job characteristics, leisure, and family responsibilities.

This kind of unemployment is equilibrium because firms and workers are on their supply and demand schedules. The market is clearing properly in the sense that all workers who desire jobs at the going wages and working conditions have them and all firms that wish to hire workers at the going compensation can find them. Some economists label this *voluntary unemployment* to denote that people are unemployed because they prefer that state over other labor market states.

Equilibrium unemployment is shown in Figure 29-6(a). The workers have a labor supply schedule shown as *SS*. The left-hand panel shows the usual picture of competitive supply and demand, with a market equilibrium at point *E* and a wage of  $W^*$ . At

the competitive, market-clearing equilibrium, firms willingly hire all qualified workers who desire to work at the market wage. The number of employed is represented by the line from *A* to *E*.

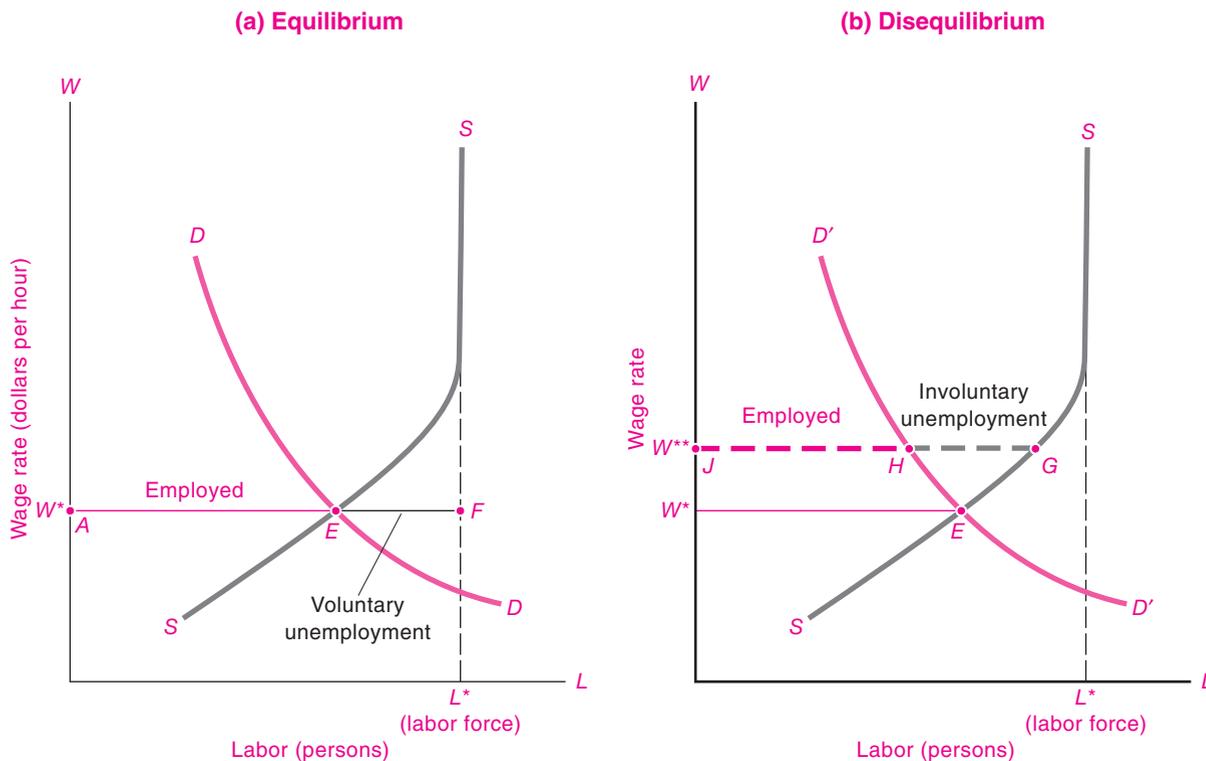
However, even though the market is in equilibrium, some people would like to work but only at a higher wage rate. These unemployed workers, represented by the segment *EF*, are unemployed in the sense that they choose not to work at the market wage rate. But this is equilibrium unemployment in the sense that they are not working because of their choice between work and nonwork given the market wages.

The existence of equilibrium unemployment leads to an often misunderstood point: *Unemployment may be an efficient outcome in a situation where heterogeneous workers are searching for work or testing different kinds of jobs.* The voluntarily unemployed workers might prefer leisure or other activities to jobs at the going wage rate. Or they may be frictionally unemployed, perhaps searching for their first job. Or they might be low-productivity workers who prefer retirement or unemployment insurance to low-paid work. There are countless reasons why people might voluntarily choose not to work at the going wage rate, and yet these people might be counted as unemployed in the official statistics.

### Disequilibrium Unemployment

Go back to reread the paragraphs above on the experiences of the three workers. The situation outside the Spreckles Sugar Refinery hardly sounds like equilibrium conditions. The unemployed workers surely do not seem like people carefully balancing the value of work against the value of leisure. Nor do they resemble people choosing unemployment as they search for a better job. Rather, these workers are in a situation of disequilibrium unemployment. This occurs when the labor market or the macroeconomy is not functioning properly and some qualified people who are willing to work at the going wage cannot find jobs. Two examples of disequilibrium are structural and cyclical unemployment.

**Structural unemployment** signifies a mismatch between the supply of and the demand for workers. Mismatches can occur because the demand for one kind of labor is rising while the demand for another kind is falling and markets do not quickly adjust. We often see structural imbalances across occupations or



**FIGURE 29-6. Equilibrium vs. Disequilibrium Unemployment**

We can depict different kinds of unemployment by using the microeconomic supply-and-demand framework.

Panel (a) shows a standard market-clearing equilibrium with flexible wages. Here, wages decline to  $W^*$  to clear the labor market and balance supply and demand. All unemployment is voluntary.

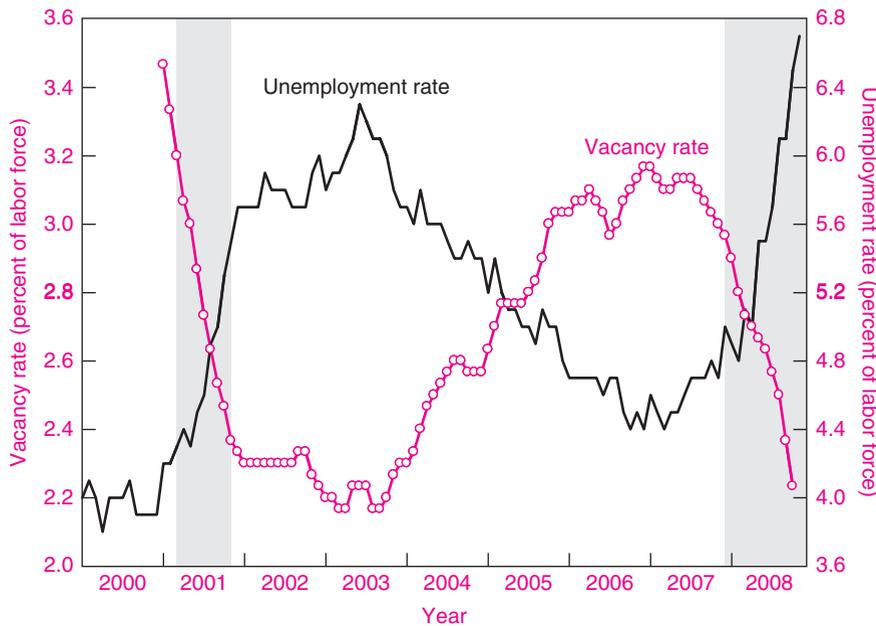
Panel (b) shows disequilibrium unemployment, with sticky wages that do not adjust to clear the labor market. At the too high wage at  $W^{**}$ ,  $JH$  workers are employed, but  $HG$  workers are involuntarily unemployed.

regions as certain sectors grow while others decline. For example, an acute shortage of nurses arose recently as the number of skilled nurses grew slowly while the demand for nursing care grew rapidly because of an aging population. Not until nurses' salaries rose rapidly and the supply adjusted did the structural shortage of nurses decline. By contrast, the demand for coal miners has been depressed for decades because of the lack of geographic mobility of labor and capital; unemployment rates in coal-mining communities remain high today.

**Cyclical unemployment** exists when the overall demand for labor declines in business-cycle downturns, as described in the Keynesian business-cycle

theory. For example, in the major recession of 2007–2009, the demand for labor declined and unemployment rose in virtually every industry and region. Similarly, in the long expansion of the 2000s, the unemployment rate fell in virtually every state in the United States. The labor market consequences of business cycles differ from case to case, from mild declines in employment growth to job losses totaling a sizable fraction of the population.

The key to understanding disequilibrium unemployment is to see that labor markets are not at their supply-and-demand equilibrium, as is shown in Figure 29-6(b). For this example, we assume that wages are sticky in the short run at the initial level of  $W^{**}$ .



Shaded areas are NBER recessions.

**FIGURE 29-7. Vacancy and Unemployment Rates**

The vacancy and unemployment rates move inversely over the business cycle. This is an important prediction of the Keynesian sticky-wage theory of unemployment.

Source: Bureau of Labor Statistics.

Hence, when there is a decline in the demand for labor, and labor demand declines to the  $D'D'$  curve in (b), the market wage at  $W^{**}$  is above the market-clearing wage at  $W^*$ .

At the too high wage rate, there are more qualified workers looking for work than there are vacancies looking for workers. The number of workers desiring to work at wage  $W^{**}$  is at point  $G$  on the supply curve, but firms want to hire only  $H$  workers, as shown by the demand curve. Because the wage exceeds the market-clearing level, there is a surplus of workers. The unemployed workers represented by the dashed line segment  $HG$  constitute *disequilibrium unemployment*. Alternatively, we may call them “involuntarily unemployed,” signifying that they are qualified workers who want to work at the prevailing wage but cannot find jobs.

The opposite case occurs when the wage is below the market-clearing rate. Here, in a labor-shortage economy, employers cannot find enough workers to fill

the existing vacancies. Firms put help-wanted signs in their windows, advertise in newspapers or on Monster.com, and even recruit people from other towns.

Figure 29-7 shows the vacancy rate along with the unemployment rate for the last decade. The two curves move inversely, as predicted by the sticky-wage theory shown in Figure 29-6.

**The Analogy of College Admissions.** The example of college admissions illustrates the kind of adjustment that takes place when shortages or gluts occur because prices do not adjust. Many colleges have enjoyed soaring applications in recent years. How did they react? Did they raise their tuition enough to choke off the excess demand? No. Instead, they raised their admission standards, requiring better grades in high school and higher average SAT scores. Upgrading the requirements rather than changing wages and prices is exactly what happens in the short run when firms experience an excess supply of labor.

### Microeconomic Foundations of Inflexible Wages

Economists have developed many approaches to understanding the microeconomic foundations of unemployment. This issue remains one of the deepest unresolved mysteries of modern macroeconomics. Our survey emphasizes the importance of inflexibility of wages and prices. But this raises the further question: Why are wages and prices inflexible? Why do wages not move up or down to clear markets?

These are controversial questions. Few economists today would argue that wages move quickly to erase labor shortages and surpluses. Yet no one completely understands the reasons for the sluggish behavior of wages and salaries. We can therefore provide no more than a tentative assessment of the sources of wage inflexibility.

**Auction vs. Administered Markets.** A helpful distinction is that between auction markets and administered markets. An *auction market* is a highly organized and competitive market at which the price floats up or down to balance supply and demand. At the Chicago Board of Trade, for example, the price of “number 2 hard red wheat delivered in Kansas City” or “dressed ‘A’ broiler chickens delivered in New York” changes every minute to reflect market conditions.

Auction markets are the exception. Most goods and all labor are sold in administered markets. Nobody grades labor into “grade B Web page developer” or “class AAA assistant professor of economics.” No market specialist ensures that every job and worker is quickly matched at a market-clearing wage.

Rather, most firms *administer* their wages and salaries, setting pay scales and hiring people at an entry-level wage or salary. These wage scales are generally fixed for a year or so, and when they are adjusted, the pay goes up for all categories. For example, every pay grade in a hospital might get a 4 percent pay increase for this year. Sometimes, the firm might decide to move one category up or down more than the average. Under standard procedures, firms will make only partial adjustments when there are shortages or gluts in a particular area.

For unionized labor markets, the wage patterns are even more rigid. Wage scales are typically set for a 3-year contract period; during that period, there are no adjustments in wages if shortages or gluts appear in particular jobs.

**Menu Costs of Adjusting Wages and Prices.** What is the economic reason for inflexible wages and salaries? Many economists believe that the inflexibility arises because of the costs of administering compensation (these are called “menu costs”). To take the example of union wages, negotiating a contract is a long process that requires much worker and management time and produces no output. Because collective bargaining is so costly, such agreements are generally negotiated only once every 3 years.

Setting compensation for nonunion workers is less costly, but it nevertheless requires scarce management time and has important effects on worker morale. Every time wages or salaries are set, every time fringe benefits are changed, earlier compensation agreements are changed as well. Some workers will feel the changes are unfair, others will complain about unjust procedures, and grievances may be triggered.

Personnel managers therefore prefer a system in which wages are adjusted infrequently and most workers in a firm get the same pay increase, regardless of the market conditions for different skills or categories. This system may appear inefficient because it does not allow for a perfect adjustment of wages to reflect market supply and demand. But it does economize on scarce managerial time and helps promote a sense of fair play and equity in the firm. In the end, it may be cheaper to recruit workers more vigorously or to change the required qualifications than to upset the entire wage structure of a firm simply to hire a few new workers.

We can summarize the microeconomic foundations as follows:

**Most wages in market economies are administered by firms or contracts. Wages and salaries are adjusted infrequently because of the costs of negotiation and wage setting. When labor supply or demand changes, because of sticky wages, the reaction is primarily in quantities of labor employed rather than wages.**

## LABOR MARKET ISSUES

Having analyzed the causes of unemployment, we turn next to major labor market issues for today. Which groups are most likely to be unemployed? How long are they unemployed? What explains differences in unemployment across countries?

Labor market group	Unemployment Rate of Different Groups (% of labor force)		Distribution of Total Unemployment across Different Groups (% of total unemployed)	
	Trough (1982)	Peak (March 2000)	Trough (1982)	Peak (March 2000)
By age:				
16–19	23.2	13.3	18.5	20.2
20 years and older	8.6	3.3	81.5	80.0
By race:				
White	8.6	3.6	77.2	77.6
Black and other	17.3	7.3	22.8	22.4
By sex (adults only):				
Male	8.8	3.8	58.5	50.5
Female	8.3	4.3	41.5	49.5
<b>All workers</b>	<b>9.7</b>	<b>4.1</b>	<b>100.0</b>	<b>100.0</b>

**TABLE 29-3. Unemployment by Demographic Group**

This table shows how unemployment varies across different demographic groups in peak and trough years. The first set of figures shows the unemployment rate for each group in 1982 and during the peak period of 2000. The last two columns show the percent of the total pool of unemployed that is in each group.

Source: U.S. Department of Labor, *Employment and Earnings*.

### Who Are the Unemployed?

We can diagnose labor market conditions by comparing years in which output is above its potential (of which 1999–2000 was a recent period) with those of deep recessions (such as was seen in 1982). Differences between these years show how business cycles affect the amount, sources, duration, and distribution of unemployment.

Table 29-3 shows unemployment statistics for peak and trough years. The first two columns of numbers are the unemployment rates by age, race, and sex. These data show that the unemployment rate of every group tends to rise during recession. The last two columns show how the total pool of unemployment is distributed among different groups; observe that the distribution of unemployment across groups changes relatively little throughout the business cycle.

Note also that nonwhite workers tend to experience unemployment rates more than twice those of whites in both trough and peak periods. Until

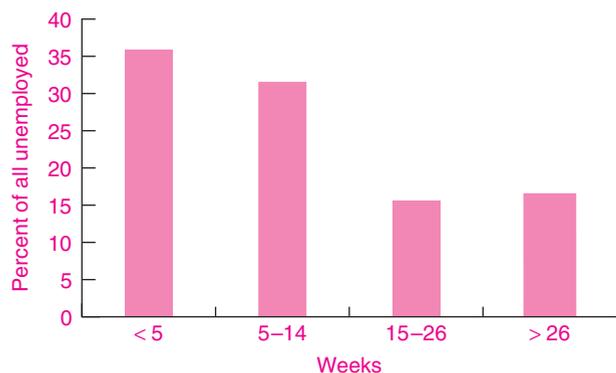
the 1980s, women tended to have higher unemployment rates than men, but in the last two decades unemployment rates differed little by gender. Teenagers, with high frictional unemployment, have generally had unemployment rates much higher than adults.

### Duration of Unemployment

Another key question concerns duration. How much of the unemployment experience is long-term and of major social concern, and how much is short-term as people move quickly between jobs?

Figure 29-8 shows the duration of unemployment in 2000–2007. A surprising feature of American labor markets is that a very large fraction of unemployment is of short duration. In 2003, one-third of unemployed workers were jobless for less than 5 weeks, and long-term unemployment was relatively rare.

In Europe, with lower mobility and greater legal obstacles to economic change, long-term unemployment in the mid-1990s reached 50 percent of the



**FIGURE 29-8. Duration of Unemployment in the United States, 2000–2007**

Most unemployment is short-term in the United States. This suggests a frictional interpretation, where people move quickly between jobs.

Source: Bureau of Labor Statistics.

unemployed. Long-term unemployment poses a serious social problem because the resources that families have available—their savings, unemployment insurance, and goodwill toward one another—begin to run out after a few months.

### Sources of Joblessness

Why are people unemployed? Figure 29-9 shows how people responded when asked the source of their unemployment, looking at the recession year of 1982 and the full-employment year of 2000.

There is always some frictional unemployment that results from changes in people’s residence or from the life cycle—moving, entering the labor force for the first time, and so forth. The major changes in the unemployment rate over the business cycle arise from the increase in job losers. This source swells enormously in a recession for two reasons: First, the number of people who lose their jobs increases, and then it takes longer to find a new job.

### Unemployment by Age

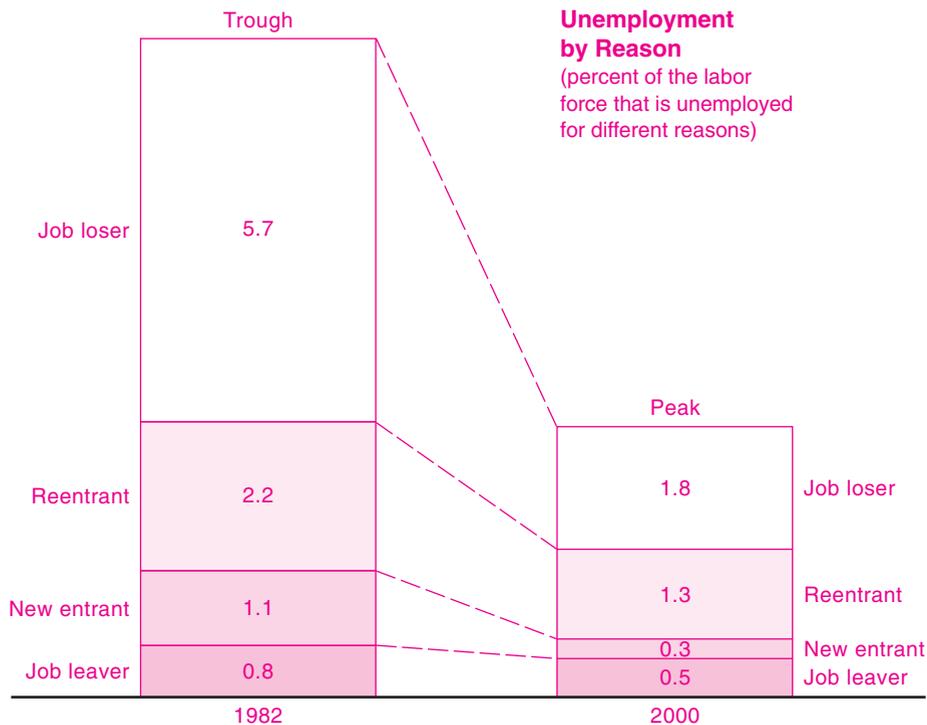
How does unemployment vary over the life cycle? Teenagers generally have the highest unemployment rate of any demographic group, and nonwhite teenagers in recent years have experienced unemployment rates between 30 and 50 percent. Is this unemployment frictional, structural, or cyclical?

Recent evidence indicates that, particularly for whites, teenage unemployment has a large frictional component. Teenagers move in and out of the labor force very frequently. They get jobs quickly and change jobs often. The average duration of teenage unemployment is only half that of adult unemployment; by contrast, the average length of a typical job is 12 times greater for adults than teenagers. In most years, half the unemployed teenagers are “new entrants” who have never had a paying job before. All these factors suggest that teenage unemployment is largely frictional; that is, it represents the job search and turnover necessary for young people to discover their personal skills and to learn what working is all about.

But teenagers do eventually learn the skills and work habits of experienced workers. The acquisition of experience and training, along with a greater desire and need for full-time work, is the reason middle-aged workers have much lower unemployment rates than teenagers.

**Teenage Unemployment of Minority Groups.** While most evidence suggests that unemployment is largely frictional for white teenagers, the labor market for young African-American workers has behaved quite differently. For the first decade after World War II, the labor-force participation rates and unemployment rates of black and white teenagers were virtually identical. After that time, however, unemployment rates for black teenagers rose sharply relative to those of other groups while their labor-force participation rates have fallen. By 2008, only 20 percent of black teenagers (16 to 19 years of age) were employed, compared to 35 percent of white teenagers.

What accounts for this extraordinary divergence in the experience of minority teenagers from that of other groups? One explanation might be that labor market forces (such as the composition or location of jobs) have worked against black workers in general. This explanation does not tell the whole story. While adult black workers have always suffered higher unemployment rates than adult white workers—because of lower education attainment, fewer contacts with people who can provide jobs, less on-the-job training, and racial discrimination—the ratio of black to white adult unemployment rates has not increased since World War II.



**FIGURE 29-9. Distribution of Unemployment by Reason, 1982 and 2000**

Why do people become unemployed? Very few were unemployed in the full-employment year of 2000 because they left their jobs, and almost 2 percent were new entrants into the labor force (say, because they just graduated from college) or reentrants (people who earlier left the labor force and are back looking for a job). The major change in unemployment from peak to trough, however, is found in the number of job losers. From 1982 to 2000 the fraction of workers who became unemployed because they lost their jobs fell from 5.7 to 1.8 percent.

Source: Bureau of Labor Statistics, at [www.bls.gov/data](http://www.bls.gov/data).

Numerous studies of the sources of the rising black teenage unemployment rate have turned up no clear explanations for the trend. One possible source is discrimination, but a rise in the black-white unemployment differential would require an increase in racial discrimination—even in the face of increased legal protection for minority workers. Another theory holds that a high minimum wage along with rising costs of fringe benefits tends to drive low-productivity black teenagers into unemployment.

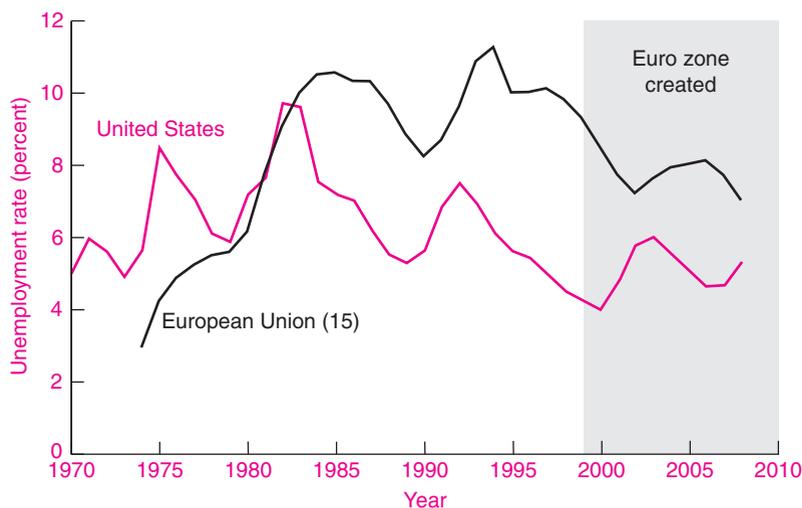
Does high teenage unemployment lead to long-lasting labor market damage, with permanently lower levels of skills and wage rates? This question is a topic of intensive ongoing research, and the tentative answer is yes, particularly for minority teenagers. It

appears that when youths are unable to develop on-the-job skills and work attitudes, they earn lower wages and experience higher unemployment when they are older. This finding suggests that public policy has an important stake in devising programs to reduce teenage unemployment among minority groups.



#### Unemployment Trends in America and Europe

Unemployment rates in the United States and Europe show different trends in recent years. European unemployment was low until the supply shocks of the 1970s and has been relatively high since that time. American unemployment rates were generally lower than those in



**FIGURE 29-10. Unemployment in the United States and Europe**

While unemployment has remained low in the United States, European unemployment has risen sharply over the last two decades. Many believe that the rising unemployment was due to labor market rigidities, while others think a fragmented monetary policy was to blame. With the introduction of the Euro and the integrated European Central Bank in 1999, European unemployment has declined gradually.

Source: U.S. Department of Labor, the OECD, and Eurostat. Data are for the EU 15 countries.

Europe over the last quarter-century. Figure 29-10 shows the unemployment-rate history for the two regions.

How can we explain the divergent labor markets of these two regions? Part of the reason probably lies in differences in macroeconomic policies. The United States has for almost a century had a single central bank, the Federal Reserve, which keeps careful watch over the American economy. When unemployment begins to rise, the Fed lowers interest rates to stimulate aggregate demand, increase output, and stem the unemployment increase.

Central banking in Europe was fragmented until very recently. Until 1999, Europe was a confederation of countries whose monetary policies were dominated by the German central bank, the Bundesbank. The Bundesbank was fiercely independent and aimed primarily at maintaining price stability in *Germany*. When unemployment rose in the rest of Europe and inflation rose in Germany—as happened after the reunification of Germany in 1990—the Bundesbank increased interest rates. This tended to depress output and raise unemployment in countries whose monetary policies were tied to Germany's. You can see this syndrome in the rise in unemployment in Europe after 1990.

A second feature of European unemployment relates to rising structural unemployment. Europe was the birthplace of the welfare state; countries like Germany, France, and Sweden legislated generous welfare benefits, unemployment insurance, minimum wages, and job protection for workers. These policies tend to increase real wages because workers possess greater bargaining power and have more attractive alternative uses for their time. Persons who are collecting welfare or unemployment benefits might be voluntarily unemployed, but they are generally counted as unemployed in the actual statistics. The United States has been less generous in its unemployment and welfare benefits.

What is the remedy for the high level of unemployment in Europe? Some economists emphasize reducing labor market barriers and welfare benefits. Other economists believe that the new European Central Bank may maintain a better balance of aggregate supply and demand in that region. (Recall our discussion of the European Monetary Union in Chapter 28.) It does appear that European unemployment has declined since the introduction of the Euro in 1999, although it is still above that in the United States.



## SUMMARY

### A. The Foundations of Aggregate Supply

1. Aggregate supply describes the relationship between the output that businesses willingly produce and the overall price level, other things being constant. The factors underlying aggregate supply are (a) potential output, determined by the inputs of labor, capital, and natural resources available to an economy, along with the technology or efficiency with which these inputs are used, and (b) input costs, such as wages and oil prices. Changes in these underlying factors will shift the AS curve.
2. A central distinction in AS analysis is between the long run and the short run. The short run, corresponding to the behavior in business cycles of a few months to a few years, involves the short-run aggregate supply schedule. In the short run, prices and wages have elements of inflexibility. As a result, higher prices are associated with increases in the production of goods and services. This is shown as an upward-sloping AS curve. The short-run AS and AD analyses are used in Keynesian analysis of the business cycle.
3. The long run refers to periods associated with economic growth, after most of the elements of business cycles have damped out. In the long run, prices and wages are perfectly flexible; output is determined by potential output and is independent of the price level. The long-run aggregate supply schedule is *vertical*. The long-run AS and AD analyses are used in the classical analysis of economic growth.

### B. Unemployment

4. The government gathers monthly statistics on unemployment, employment, and the labor force in a sample survey of the population. People with jobs are categorized as employed; people without jobs who are looking for work are said to be unemployed; people without jobs who are not looking for work are considered outside the labor force.
5. There is a clear connection between movements in output and the unemployment rate over the business cycle. According to Okun's Law, for every 2 percent that actual GDP declines relative to potential GDP, the unemployment rate rises 1 percentage point. This rule is useful in translating cyclical movements of GDP into their effects on unemployment.
6. Economists distinguish between equilibrium and disequilibrium unemployment. Equilibrium unemployment arises when people become unemployed voluntarily as they move from job to job or into and out of the labor force. This is also called frictional unemployment.
7. Disequilibrium unemployment occurs when the labor market or the macroeconomy is not functioning properly and some qualified people who are willing to work at the going wage cannot find jobs. Two examples of disequilibrium are structural and cyclical unemployment. Structural unemployment arises for workers who are in regions or industries that are in a persistent slump because of labor market imbalances or high real wages. Cyclical unemployment is a situation where workers are laid off when the overall economy suffers a downturn.
8. Understanding the causes of unemployment has proved to be one of the major challenges of modern macroeconomics. The discussion here emphasizes that involuntary unemployment arises because the slow adjustment of wages produces surpluses (unemployment) and shortages (vacancies) in individual labor markets. If inflexible wages are above market-clearing levels, some workers are employed but other equally qualified workers cannot find jobs.
9. Wages are inflexible because of the costs involved in administering the compensation system. Frequent changes of compensation for market conditions would command too large a share of management time, would upset workers' perceptions of fairness, and would undermine worker morale and productivity.
10. A careful look at the unemployment statistics reveals several regularities:
  - a. Recessions hit all segments of the labor force, from the unskilled to the most skilled and educated.
  - b. A very substantial part of U.S. unemployment is short-term. The average duration of unemployment rises sharply in deep and prolonged recessions.
  - c. In most years, a substantial amount of unemployment is due to simple turnover, or frictional causes, as people enter the labor force for the first time or reenter it. Only during recessions is the pool of unemployed composed primarily of job losers.
  - d. The difference in unemployment rates in Europe and the United States reflects both structural policies and the effectiveness of monetary management.

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## CONCEPTS FOR REVIEW

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### Foundations of Aggregate Supply

aggregate supply, *AS* curve  
 factors underlying and shifting  
 aggregate supply  
 aggregate supply: role of potential  
 output and production costs  
 short-run vs. long-run *AS*

### Unemployment

population status:  
 unemployed  
 employed  
 labor force  
 not in labor force  
 unemployment rate

### Okun's Law

equilibrium vs. disequilibrium  
 unemployment  
 inflexible wages, unemployment,  
 vacancies

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## FURTHER READING AND INTERNET WEBSITES

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### Further Reading

The quotations in the text are from Studs Terkel, *Hard Times: An Oral History of the Great Depression in America* (Pantheon, New York, 1970) for the Great Depression; Harry Maurer, *Not Working: An Oral History of the Unemployed* (Holt, New York, 1979) for the construction worker; and *Business Week*, March 23, 1992, for the corporate manager.

### Websites

Analysis of employment and unemployment for the United States comes from the Bureau of Labor Statistics,

at [www.bls.gov](http://www.bls.gov). Statistics on unemployment in Europe and other OECD countries can be found at [www.oecd.org](http://www.oecd.org). The BLS site also has an online version of *The Monthly Labor Review* at [www.bls.gov/opub/mlr/mlrhome.htm](http://www.bls.gov/opub/mlr/mlrhome.htm), which is an excellent source for studies about employment, labor issues, and compensation. It contains articles on everything from “The Sandwich Generation” ([www.bls.gov/opub/mlr/2006/09/contents.htm](http://www.bls.gov/opub/mlr/2006/09/contents.htm)) to an analysis of the effect of going to war on labor market performance ([www.bls.gov/opub/mlr/2007/12/contents.htm](http://www.bls.gov/opub/mlr/2007/12/contents.htm)).

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## QUESTIONS FOR DISCUSSION

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1. Explain carefully what is meant by the aggregate supply curve. Distinguish between movements along the curve and shifts of the curve. What might increase output by moving along the *AS* curve? What could increase output by shifting the *AS* curve?
2. Construct a table parallel to Table 29-1, illustrating events that would lead to a decrease in aggregate supply. (Be imaginative rather than simply using the same examples.)
3. What, if anything, would be the effect of each of the following on the *AS* curve in both the short run and the long run, other things being constant?
  - a. Potential output increases by 25 percent.
  - b. Oil prices double because of rising demand from China and India with a fixed supply of oil.
  - c. Consumers become pessimistic and increase their saving rate.
4. Assume that the unemployment rate is 7 percent and GDP is \$4000 billion. What is a rough estimate of potential GDP if the NAIRU is 5 percent? Assume that potential GDP is growing at 3 percent annually. What will potential GDP be in 2 years? How fast will GDP have to grow to reach potential GDP in 2 years?
5. What is the labor-force status of each of the following?
  - a. A teenager who sends out résumés in searching for a first job
  - b. An autoworker who has been laid off and would like to work but has given up hope of finding work or being recalled
  - c. A retired person who moved to Florida and answers advertisements for part-time positions
  - d. A parent who works part-time, wants a full-time job, but doesn't have time to look
  - e. A teacher who has a job but is too ill to work

6. In explaining its procedures, the Department of Labor gives the following examples:
- a. “Joan Howard told the interviewer that she has filed applications with three companies for summer jobs. However, it is only April and she doesn’t wish to start work until at least June 15, because she is attending school. Although she has taken specific steps to find a job, Joan is classified as not in the labor force because she is not currently available for work.”
  - b. “James Kelly and Elyse Martin attend Jefferson High School. James works after school at the North Star Café, and Elyse is seeking a part-time job at the same establishment (also after school). James’ job takes precedence over his non-labor force activity of going to school, as does Elyse’s search for work; therefore, James is counted as employed and Elyse is counted as unemployed.”

Explain each of these examples. Take a survey of your classmates. Using the examples above, have people

classify themselves in terms of their labor-force status as employed, unemployed, or not in the labor force.

7. Assume that Congress is considering a law that would set the minimum wage above the market-clearing wage for teenagers but below that for adult workers. Using supply-and-demand diagrams, show the impact of the minimum wage on the employment, unemployment, and incomes of both sets of workers. Is any unemployment voluntary or involuntary? What would you recommend to Congress if you were called to testify about the wisdom of this measure?
8. Do you think that the economic costs and personal stress of a teenager unemployed for 1 month of the summer might be less or more than those of a head-of-household unemployed for 1 year? Do you think that this suggests that public policy should have a different stance with respect to these two groups?

## Inflation



*Lenin is said to have declared that the best way to destroy the capitalist system was to debauch the currency. By a continuing process of inflation, governments can confiscate, secretly and unobserved, an important part of the wealth of their citizens.*

J. M. Keynes

For most of the last quarter-century, the United States succeeded in maintaining low and stable inflation. This experience was primarily due to the success of monetary and fiscal policies in keeping output in a narrow corridor between inflationary excesses and sharp downturns, but favorable experience with commodity prices as well as moderation of wage increases helped reinforce the policies.

One new factor in the inflation equation was the growing “globalization” of production. As the United States became more integrated in world markets, domestic firms found that their prices were constrained by the prices of their international competitors.

Even when sales of clothing and electronic goods were booming, domestic companies could not raise their prices too much for fear of losing market share to foreign producers.

The 2000s were a turbulent period for prices. In the first part of the decade, inflation awoke from its long slumber. Particularly under the impetus of rising oil and food prices, prices rose rapidly. Then a steep recession starting in 2007 caused commodity prices to drop sharply, and countries were faced with the peril of deflation.

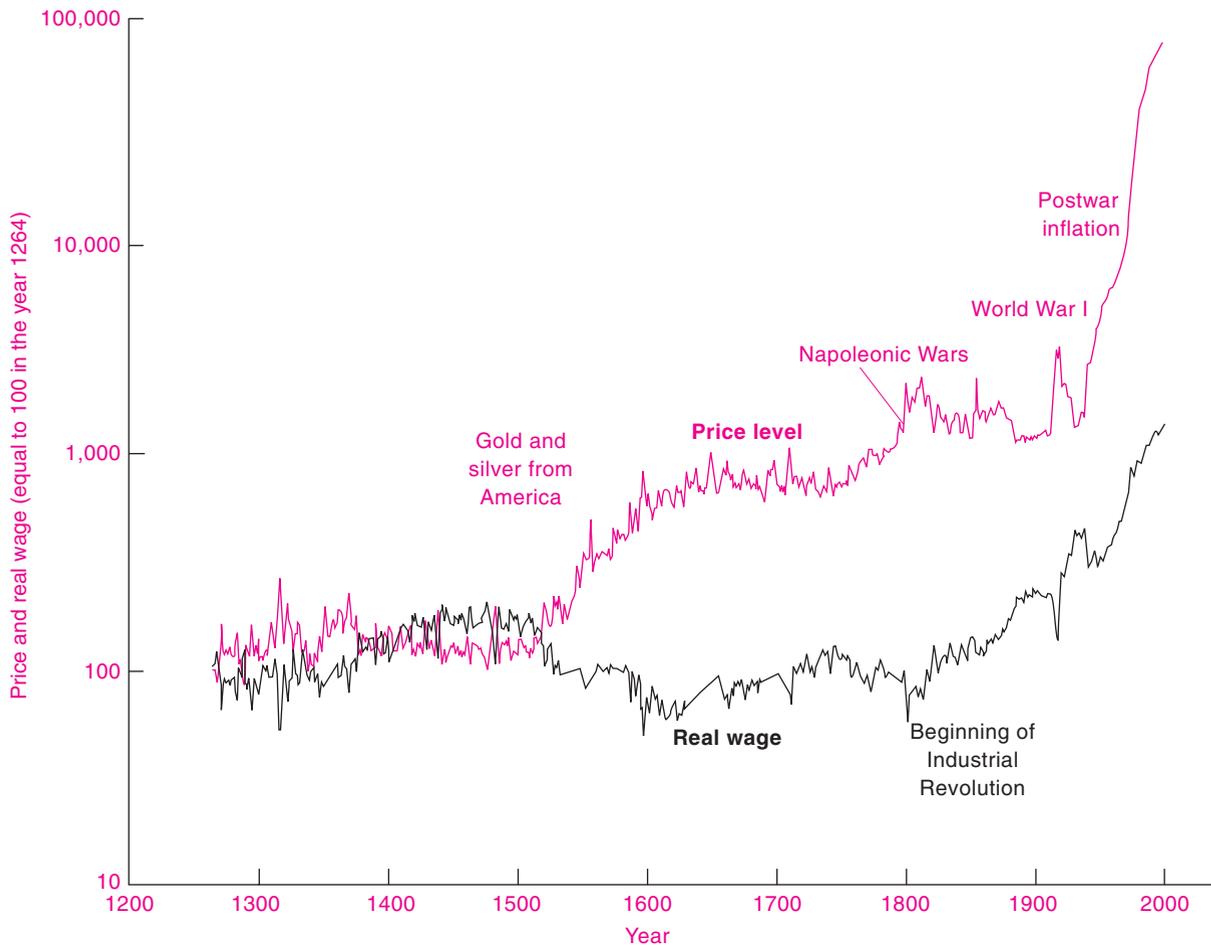
What are the macroeconomic dynamics of inflation? Why does deflation pose such a challenge for policy makers? The present chapter will examine the meaning and determinants of inflation and describe the important public-policy issues that arise in this area.

## A. DEFINITION AND IMPACT OF INFLATION

### WHAT IS INFLATION?

We described the major price indexes and defined inflation in Chapter 20, but it will be useful to reiterate the basic definitions here:

**Inflation occurs when the general level of prices is rising.** Today, we calculate inflation by using price indexes—weighted averages of the prices of thousands of individual products. The consumer price index (CPI) measures the cost of a market basket of consumer goods and services relative to the cost of that bundle during a particular base year. The GDP deflator is the price of all of the different components of GDP.



**FIGURE 30-1.** English Price Level and Real Wage, 1264–2007 (1270 = 100)

The graph shows England's history of prices and real wages since the Middle Ages. In early years, price increases were associated with increases in the money supply, such as from discoveries of New World treasure and the printing of money during the Napoleonic Wars. Note the meandering of the real wage prior to the Industrial Revolution. Since then, real wages have risen sharply and steadily.

Source: E. H. Phelps Brown and S. V. Hopkins, *Economica*, 1956, updated by the authors.

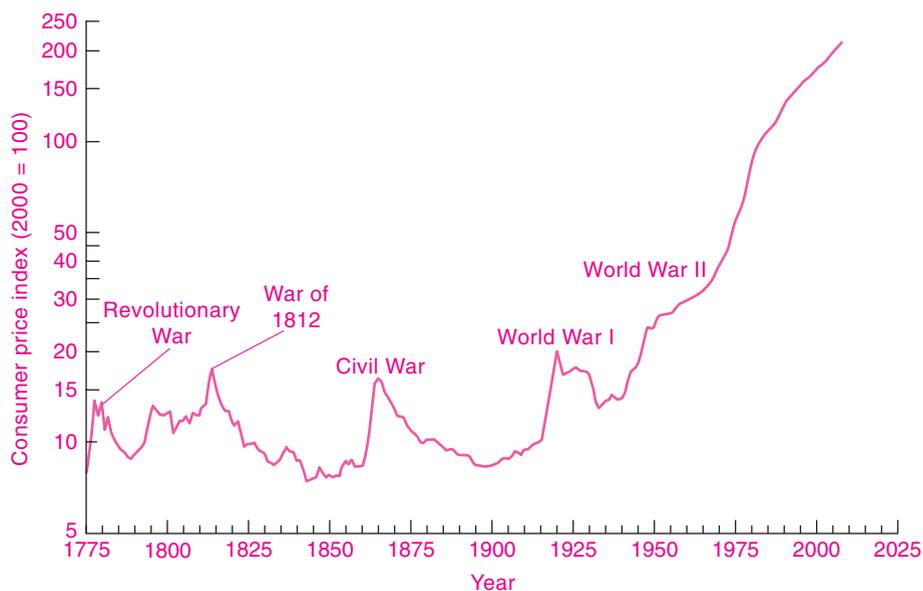
The rate of inflation is the percentage change in the price level:

$$\text{Rate of inflation in year } t = 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

If you are unclear on the definitions, refresh your memory by reviewing Chapter 20.

### The History of Inflation

Inflation is as old as market economies. Figure 30-1 depicts the history of prices in England since the thirteenth century. Over the long haul, prices have generally risen, as the green line reveals. But examine also the blue line, which plots the path of *real wages* (the wage rate divided by consumer prices).



**FIGURE 30-2. Consumer Prices in the United States, 1776–2008**

Until World War II, prices fluctuated trendlessly—rising rapidly with each war and then drifting down afterward. But since then, the trend has been upward, both here and abroad.

Source: U.S. Department of Labor, Bureau of Labor Statistics for data since 1919.

Real wages meandered along until the Industrial Revolution. Comparing the two lines shows that inflation is not necessarily accompanied by a decline in real income. You can see, too, that real wages have climbed steadily since around 1800, rising more than tenfold.

Figure 30-2 focuses on the behavior of consumer prices in the United States since the Revolutionary War. Until World War II, the United States was generally on a combination of gold and silver standards, and the pattern of price changes was regular: Prices would soar during wartime and then fall back during the postwar slump. But the pattern changed dramatically after World War II. Prices and wages now travel on a one-way street that goes only upward. They rise rapidly in periods of economic expansion and slow down in periods of slack.

Figure 30-3 shows CPI inflation over the last half-century. You can see that inflation in recent years has moved in a narrow range, fluctuating primarily because of volatile food and energy prices.

### Three Strains of Inflation

Like diseases, inflations exhibit different levels of severity. It is useful to classify them into three categories: low inflation, galloping inflation, and hyperinflation.

**Low Inflation.** Low inflation is characterized by prices that rise slowly and predictably. We might define this as single-digit annual inflation rates. When prices are relatively stable, *people trust money* because it retains its value from month to month and year to year. People are willing to write long-term contracts in money terms because they are confident that the relative prices of goods they buy and sell will not get too far out of line. Most countries have experienced low inflation over the last decade.

**Galloping Inflation.** Inflation in the double-digit or triple-digit range of 20, 100, or 200 percent per year is called **galloping inflation** or “very high inflation.” Galloping inflation is relatively common, particularly in countries suffering from weak governments, war, or revolution. Many Latin American countries, such



**FIGURE 30-3. Inflation Has Remained Low and Stable in Recent Years**

Historically, inflation in the United States was variable, and it reached unacceptably high rates in the early 1980s. In the last decade, skillful monetary management by the Federal Reserve along with favorable supply shocks has kept inflation low and in a narrow range.

Source: Bureau of Labor Statistics, [www.bls.gov](http://www.bls.gov). This graph shows inflation of the consumer price index. The graph shows the rate of inflation over the prior 12 months.

as Argentina, Chile, and Brazil, had inflation rates of 50 to 700 percent per year in the 1970s and 1980s.

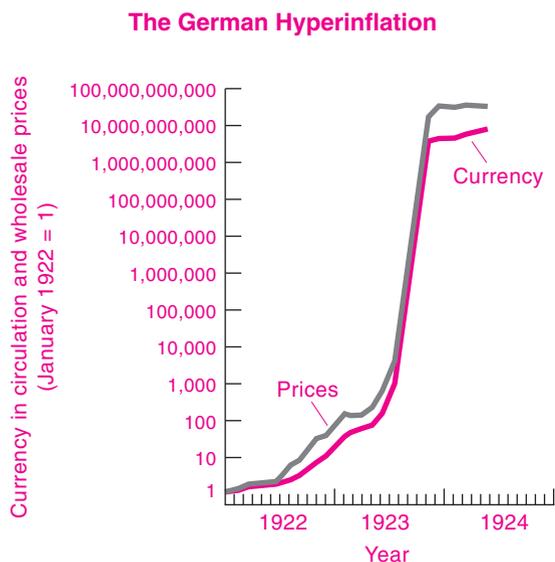
Once galloping inflation becomes entrenched, serious economic distortions arise. Generally, most contracts get indexed to a price index or to a foreign currency like the dollar. In these conditions, money loses its value very quickly, so people hold only the bare-minimum amount of money needed for daily transactions. Financial markets wither away, as capital flees abroad. People hoard goods, buy houses, and never, ever lend money at low nominal interest rates.

**Hyperinflation.** While economies seem to survive under galloping inflation, a third and deadly strain takes hold when the cancer of **hyperinflation** strikes. Nothing good can be said about an economy in which prices are rising a million or even a trillion percent per year.

Hyperinflations are particularly interesting to students of inflation because they highlight its disastrous impacts. Consider this description of hyperinflation in the Confederacy during the Civil War:

We used to go to the stores with money in our pockets and come back with food in our baskets. Now we go with money in baskets and return with food in our pockets. Everything is scarce except money! Prices are chaotic and production disorganized. A meal that used to cost the same amount as an opera ticket now costs twenty times as much. Everybody tends to hoard “things” and to try to get rid of the “bad” paper money, which drives the “good” metal money out of circulation. A partial return to barter inconvenience is the result.

The most thoroughly documented case of hyperinflation took place in the Weimar Republic of Germany in the 1920s. Figure 30-4 shows how the government unleashed the monetary printing presses,



**FIGURE 30-4. Money and Hyperinflation in Germany, 1922–1924**

In the early 1920s, Germany could not raise enough taxes, so it used the monetary printing press to pay the government's bills. The stock of currency rose astronomically from January 1922 to December 1923, and prices spiraled upward as people frantically tried to spend their money before it lost all value.

driving both money and prices to astronomical levels. From January 1922 to November 1923, the price index rose from 1 to 10,000,000,000. If a person had owned 300 million marks worth of German bonds in early 1922, this amount would not have bought a piece of candy 2 years later.

Studies have found several common features in hyperinflations. First, the real money stock (measured by the money stock divided by the price level) falls drastically. By the end of the German hyperinflation, real money demand was only one-thirtieth of its level 2 years earlier. People were seen running from store to store, dumping their money like hot potatoes before they get burned by money's loss of value. Second, relative prices become highly unstable. Under normal conditions, a person's real wages move only a percent or less from month to month. During 1923, German real wages changed on average one-third (up or down) each month. This huge variation in relative prices and real wages—and the inequities

and distortions caused by these fluctuations—took an enormous toll on workers and businesses, highlighting one of the major costs of inflation.

The impact of inflation was eloquently expressed by J. M. Keynes:

As inflation proceeds and the real value of the currency fluctuates wildly from month to month, all permanent relations between debtors and creditors, which form the ultimate foundation of capitalism, become so utterly disordered as to be almost meaningless; and the process of wealth-getting degenerates into a game and a lottery.

### **Anticipated vs. Unanticipated Inflation**

An important distinction in the analysis of inflation is whether the price increases are anticipated or unanticipated. Suppose that all prices are rising at 3 percent each year and everyone expects this trend to continue. Would there be any reason to get excited about inflation? Would it make any difference if both the actual and the expected inflation rates were 1 or 3 or 5 percent each year? Economists generally believe that anticipated inflation at low rates has little effect on economic efficiency or on the distribution of income and wealth. People would simply be adapting their behavior to a changing monetary yardstick.

But the reality is that inflation is usually unanticipated. For example, the Russian people had become accustomed to stable prices for many decades. When prices were freed from controls of central planning in 1992, no one, not even the professional economists, guessed that prices would rise by 400,000 percent over the next 5 years. People who naively put their money into ruble savings accounts saw their net worth evaporate. Those who were more sophisticated manipulated the system, and some even became fabulously wealthy “oligarchs.”

In more stable countries like the United States, the impact of unanticipated inflation is less dramatic, but the same general point applies. An unexpected jump in prices will impoverish some and enrich others. How costly is this redistribution? Perhaps “cost” does not describe the problem. The effects may be more social than economic. An epidemic of burglaries may not lower GDP, but it causes great distress. Similarly, randomly redistributing wealth by inflation is like forcing people to play a lottery they would prefer to avoid.



### The Quagmire of Deflation

If inflation is so bad, should societies instead strive for *deflation*—a situation where prices are actually falling rather than rising?

Historical experience and macroeconomic analysis suggest that deflation combined with low interest rates can produce serious macroeconomic difficulties.

A gentle deflation by itself is not particularly harmful. Rather, deflations generally trigger economic problems because they may lead to a situation where monetary policy becomes impotent.

Normally, if prices begin to fall because of a recession, the central bank can stimulate the economy by increasing bank reserves and lowering interest rates. But if prices are falling rapidly, then real interest rates may be relatively high. For example, if the nominal interest rate is  $\frac{1}{4}$  percent and prices are falling at  $3\frac{3}{4}$  percent per year, then the real interest rate is 4 percent per year. At such a high real interest rate, investment may be choked off, with recessionary consequences.

The central bank may decide to lower interest rates. *But the lower limit on nominal interest rates is zero. Why so?* Because when interest rates are zero, then bonds are essentially money, and people will hardly want to hold a bond paying negative interest when money has a zero interest rate. Now, when the central bank has lowered interest rates to zero, in our example, real interest rates would still be  $3\frac{3}{4}$  percent per year, which might still be too high to stimulate the economy. The central bank is trapped in a quagmire—a quagmire called the *liquidity trap*—in which it can lower short-term interest rates no further. The central bank has run out of ammunition.

Deflation was frequently observed in the nineteenth and early twentieth centuries but largely disappeared by the late twentieth century. However, at the end of the 1990s, Japan entered a period of sustained deflation. This was in part caused by a tremendous fall in asset prices, particularly land and stocks, but also by a long recession. Short-term interest rates were essentially zero after 2000. For example, the yield on 1-year bank deposits was 0.032 percent per year in mid-2003. The Bank of Japan was helpless in the face of deflation and zero interest rates.

The United States entered liquidity-trap territory in late 2008. Short-term, risk-free dollar securities (such as 90-day Treasury bills) fell to under  $\frac{1}{10}$ th of 1 percent in late 2008 and early 2009. At that point, many economists believed, the Fed had “run out of ammunition”—that is, there was no further room to lower short-run interest rates.

Are there any remedies for deflation and the liquidity trap? One solution is to use fiscal policy, as was emphasized

by the new Obama administration in emphasizing a large fiscal stimulus plan in early 2009. A fiscal stimulus will increase aggregate demand, and it will do so without any crowding out from higher interest rates.

Monetary policy could also expand its range of instruments, as discussed in Chapter 24. For example, the Fed could attempt to lower long-run interest rates or to lower the risk premium on risky assets, but these steps have proven difficult to achieve. Many economists believe that the best defense against a liquidity trap is a good offense. Policy makers should ensure that the economy stays safely away from deflation and the liquidity trap by maintaining full employment, ensuring a gradually rising price level, and avoiding the asset-price booms and busts that have been experienced over the last decade.

## THE ECONOMIC IMPACTS OF INFLATION

Central bankers are united in their determination to contain inflation. During periods of high inflation, opinion polls often find that inflation is economic enemy number one. What is so dangerous and costly about inflation? We noted above that during periods of inflation all prices and wages do not move at the same rate; that is, changes in *relative prices* occur. As a result of the diverging relative prices, two definite effects of inflation are:

- A *redistribution* of income and wealth among different groups
- *Distortions* in the relative prices and outputs of different goods, or sometimes in output and employment for the economy as a whole

### Impacts on Income and Wealth Distribution

Inflation affects the distribution of income and wealth primarily because of differences in the assets and liabilities that people hold. When people owe money, a sharp rise in prices is a windfall gain for them. Suppose you borrow \$100,000 to buy a house and your annual fixed-interest-rate mortgage payments are \$10,000. Suddenly, a great inflation doubles all wages and incomes. Your *nominal* mortgage payment is still \$10,000 per year, but its real cost is halved. You will need to work only half as long as before to make your mortgage payment. The great inflation has increased

your wealth by cutting in half the real value of your mortgage debt.

If you are a lender and have assets in fixed-interest-rate mortgages or long-term bonds, the shoe is on the other foot. An unexpected rise in prices will leave you the poorer because the dollars repaid to you are worth much less than the dollars you lent.

If an inflation persists for a long time, people come to anticipate it and markets begin to adapt. An allowance for inflation will gradually be built into the market interest rate. Say the economy starts out with interest rates of 3 percent and stable prices. Once people expect prices to rise at 9 percent per year, bonds and mortgages will tend to pay 12 percent rather than 3 percent. The 12 percent nominal interest rate reflects a 3 percent real interest rate plus a 9 percent inflation premium. There are no further major redistributions of income and wealth once interest rates have adapted to the new inflation rate. The adjustment of interest rates to chronic inflation has been observed in all countries with a long history of rising prices.

Because of institutional changes, some old myths no longer apply. It used to be thought that common stocks were a good inflation hedge, but stocks generally move inversely with inflation today. A common saying was that inflation hurts widows and orphans; today, they are insulated from inflation because social security benefits are indexed to consumer prices. Also, unanticipated inflation benefits debtors and hurts lenders less than before because many kinds of debt (like “floating-rate” mortgages) have interest rates that move up and down with market interest rates.

**The major redistributive impact of inflation comes through its effect on the real value of people’s wealth. In general, unanticipated inflation redistributes wealth from creditors to debtors, helping borrowers and hurting lenders. An unanticipated deflation has the opposite effect. But inflation mostly churns incomes and assets, randomly redistributing wealth among the population with little significant impact on any single group.**

### **Impacts on Economic Efficiency**

In addition to redistributing incomes, inflation affects the real economy in two specific areas: It can harm economic efficiency, and it can affect total output. We begin with the efficiency impacts.

Inflation impairs economic efficiency because it *distorts prices and price signals*. In a low-inflation

economy, if the market price of a good rises, both buyers and sellers know that there has been an actual change in the supply and/or demand conditions for that good, and they can react appropriately. For example, if the neighborhood supermarkets all boost their beef prices by 50 percent, perceptive consumers know that it’s time to start eating more chicken. Similarly, if the prices of new computers fall by 90 percent, you may decide it’s time to turn in your old model.

By contrast, in a high-inflation economy it’s much harder to distinguish between changes in relative prices and changes in the overall price level. If inflation is running at 20 or 30 percent per month, price changes are so frequent that changes in relative prices get missed in the confusion.

Inflation also *distorts the use of money*. Currency is money that bears a zero nominal interest rate. If the inflation rate rises from 0 to 10 percent per year, the real interest rate on currency falls from 0 to –10 percent per year. There is no way to correct this distortion.

As a result of the negative real interest rate on money, people devote real resources to reducing their money holdings during inflationary times. They go to the bank more often—using up “shoe leather” and valuable time. Corporations set up elaborate cash-management schemes. Real resources are thereby consumed simply to adapt to a changing monetary yardstick rather than to make productive investments.

Economists point to the *distortionary effect of inflation on taxes*. Part of the tax code is written in dollar terms. When prices rise, the real value of the taxes paid rises even though real incomes have not changed. For example, suppose you were taxed at a rate of 30 percent on your income. Further suppose that the nominal interest rate was 6 percent and the inflation rate was 3 percent. You would, in reality, be paying a 60 percent tax rate on the real interest earnings of 3 percent. Many similar distortions are present in the tax code today.

But these are not the only costs; some economists point to *menu costs* of inflation. The idea is that when prices are changed, firms must spend real resources adjusting their prices. For instance, restaurants reprint their menus, mail-order firms reprint their catalogs, taxi companies remeter their cabs, cities adjust parking meters, and stores change the price tags of goods. Sometimes, the costs are intangible, such as those involved in gathering people to make new pricing decisions.

### Macroeconomic Impacts

What are the macroeconomic effects of inflation? This question is addressed in the next section, so we merely highlight the major points here. Until the 1970s, high inflation in the United States usually went hand in hand with economic expansions; inflation tended to increase when investment was brisk and jobs were plentiful. Periods of deflation or declining inflation—the 1890s, the 1930s, some of the 1950s—were times of high unemployment of labor and capital.

But a more careful examination of the historical record reveals an interesting fact: The positive association between output and inflation appears to be only a temporary relationship. Over the longer run, there seems to be an inverse-U-shaped relationship between inflation and output growth. Table 30-1 shows the results of a multicountry study of the association between inflation and growth. It indicates that economic growth is strongest in countries with low inflation, while countries with high inflation or deflation tend to grow more slowly. (But beware the *ex post* fallacy here, as explored in question 7 at the end of this chapter.)

### What Is the Optimal Rate of Inflation?

Most nations seek rapid economic growth, full employment, and price stability. But just what is

Inflation rate (% per year)	Growth of per capita GDP (% per year)
−20–0	0.7
0–10	2.4
10–20	1.8
20–40	0.4
100–200	−1.7
1,000+	−6.5

**TABLE 30-1. Inflation and Economic Growth**

The pooled experience of 127 countries shows that the most rapid growth is associated with low inflation rates. Deflation and moderate inflation accompany slow growth, while hyperinflations are associated with sharp downturns.

Source: Michael Bruno and William Easterly, “Inflation Crises and Long-Run Growth,” *Journal of Monetary Economics*, 1998.

meant by “price stability”? Exactly zero inflation? Over what period? Or is it perhaps low inflation?

One school of thought holds that policy should aim for absolutely stable prices or zero inflation. If we are confident that the price level in 20 years will be very close to the price level today, we can make better long-term investment and saving decisions.

Many macroeconomists believe that, while a zero-inflation target might be sensible in an ideal economy, we do not live in a frictionless system. One friction arises from the resistance of workers to declines in money wages. When inflation is literally zero, efficient labor markets would require that the money wages in some sectors are reduced while wages in other sectors are increased. Yet workers and firms are extremely reluctant to cut money wages. Some economists believe that, in the context of downward rigidity of nominal wages, a zero rate of inflation would lead to higher unemployment on average.

An additional and more serious concern about zero inflation is that economies might find themselves in the liquidity trap discussed above. If a country in a zero-inflation situation were to encounter a major contractionary shock, it might need negative real interest rates to climb out of the recession with monetary policy. While fiscal policy would still be effective, most macroeconomists believe that a better solution is to aim for a positive inflation rate so that the threat of liquidity traps is minimized.

We can summarize our discussion in the following way:

Most economists agree that a predictable and gently rising price level provides the best climate for healthy economic growth. A careful analysis of the evidence suggests that low inflation has little impact on productivity or real output. By contrast, galloping inflation or hyperinflation can harm productivity and redistribute income and wealth in an arbitrary fashion. A gradual rise in prices will help avoid the deadly liquidity trap.

## B. MODERN INFLATION THEORY

What are the economic forces that cause inflation? What is the relationship between unemployment and inflation in the short run and in the long run? How

can nations reduce an unacceptably high inflation rate? What is the role of inflation targeting in central-bank policies?

Questions, questions, questions. Yet answers to these are critical to the economic health of modern mixed economies. In the balance of this chapter we explore modern inflation theory and analyze the costs of lowering inflation.

## PRICES IN THE AS-AD FRAMEWORK

There is no single source of inflation. Like illnesses, inflations occur for many reasons. Some inflations come from the demand side; others, from the supply side. But one key fact about modern inflations is that they develop an internal momentum and are costly to stop once underway.

### Expected Inflation

In modern economies like that of the United States, inflation has great momentum and tends to persist at the same rate. Expected inflation is like a lazy old dog. If the dog is not “shocked” by the push of a foot or the pull of a cat, it will stay put. Once disturbed, the dog may chase the cat, but then it eventually lies down in a new spot where it stays until the next shock.

Over the last three decades, prices in the United States rose on average around 3 percent annually, and most people came to expect this rate of inflation. This expected rate was built into the economy’s institutions: wage agreements between labor and management were designed around a 3 percent inflation rate; government monetary and fiscal plans assumed a 3 percent rate as well. During this period, the *expected rate of inflation* was 3 percent per year.

Another closely related concept is the *core rate of inflation*, which is a term often used in monetary policy. This is the inflation rate without volatile elements such as food and energy prices.

While inflation can persist at the same rate for a while, history shows that shocks to the economy tend to push inflation up or down. The economy is constantly subject to changes in aggregate demand, sharp oil- and commodity-price changes, poor harvests, movements in the foreign exchange rate, productivity changes, and countless other economic events that push inflation away from its expected rate.

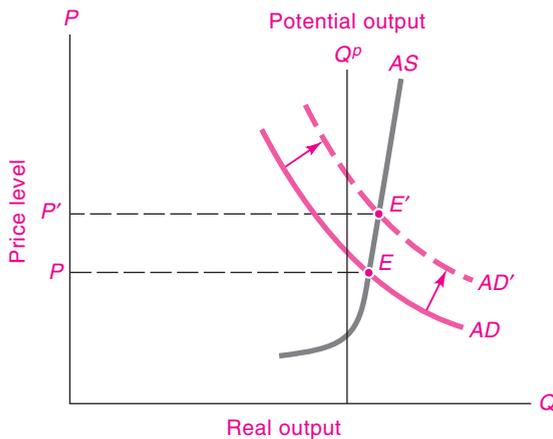
Inflation has a high degree of inertia in a modern economy. People form an **expected rate of inflation**, and that rate is built into labor contracts and other agreements. The expected rate of inflation tends to persist until a shock causes it to move up or down.

### Demand-Pull Inflation

One of the major shocks to inflation is a change in aggregate demand. In earlier chapters we saw that changes in investment, government spending, or net exports can change aggregate demand and propel output beyond its potential. We also saw how a nation’s central bank can affect economic activity. Whatever the reason, **demand-pull inflation** occurs when aggregate demand rises more rapidly than the economy’s productive potential, pulling prices up to equilibrate aggregate supply and demand. In effect, demand dollars are competing for the limited supply of commodities and bid up their prices. As unemployment falls and workers become scarce, wages are bid up and the inflationary process accelerates.

A particularly damaging form of demand-pull inflation occurs when governments engage in deficit spending and rely on the monetary printing press to finance their deficits. The large deficits and the rapid money growth increase aggregate demand, which in turn increases the price level. Thus, when the German government financed its spending in 1922–1923 by printing billions and billions of paper marks, which came into the marketplace in search of bread and fuel, it was no wonder that the German price level rose a billionfold. This was demand-pull inflation with a vengeance. This scene was replayed in the early 1990s when the Russian government financed its budget deficit by printing monetary rubles. The result was an inflation rate that averaged 25 percent *per month*, or 1355 percent per year. (Make sure you understand how 25 percent per month becomes 1355 percent per year.)

Figure 30-5 illustrates the process of demand-pull inflation in terms of aggregate supply and demand. Starting from an initial equilibrium at point  $E$ , suppose there is an expansion of spending that pushes the  $AD$  curve up and to the right. The economy’s equilibrium moves from  $E$  to  $E'$ . At this higher level of demand, prices have risen from  $P$  to  $P'$ . Demand-pull inflation has taken place.



**FIGURE 30-5.** Demand-Pull Inflation Occurs When Too Much Spending Chases Too Few Goods

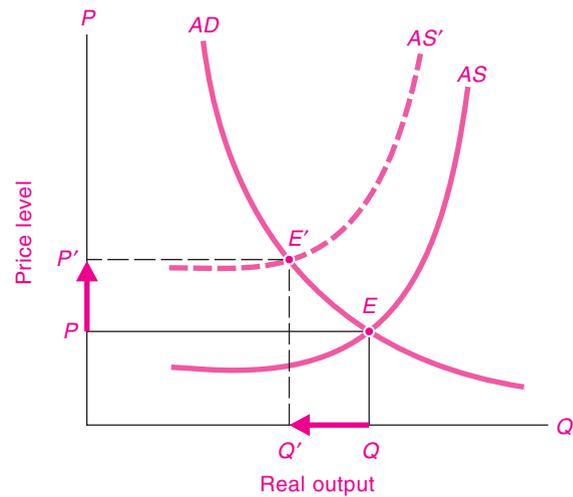
When aggregate demand increases, the rising spending is competing for limited goods. Prices rise from  $P$  to  $P'$  in demand-pull inflation.

### Cost-Push Inflation and “Stagflation”

The classical economists understood the rudiments of demand-pull inflation and used that theory to explain historical price movements. But a new phenomenon has emerged over the last half-century. We see today that inflation sometimes increases because of increases in costs rather than because of increases in demand. This phenomenon is known as *cost-push* or *supply-shock* inflation. Often, it leads to an economic slowdown and to a syndrome called “stagflation,” or *stagnation with inflation*.

Figure 30-6 shows the workings of supply-shock inflation. In 1973, 1978, 1999, and again in the late 2000s, countries were minding their macroeconomic business when severe shortages occurred in oil markets. Oil prices rose sharply, business costs of production increased, and a sharp burst of cost-push inflation followed. These situations can be seen as an upward shift in the  $AS$  curve. Equilibrium output falls while prices and inflation rise.

Stagflation poses a major dilemma for policymakers. They can use monetary and fiscal policies to change aggregate demand. However,  $AD$  shifts cannot simultaneously increase output *and* lower prices and inflation. An outward shift of the  $AD$  curve in Figure 30-6 through monetary expansion would offset the decline in output but raise prices further. Or an



**FIGURE 30-6.** Increases in Production Costs Can Cause Stagflation, with Falling Output and Rising Prices

In periods marked by rapid increases in production costs, such as with the oil-price shocks, countries can experience the dilemma of rising inflation along with falling output, the combination of which is called stagflation. Policies to affect aggregate demand can cure one problem or the other but not both simultaneously.

attempt to curb inflation by tightening monetary policy would only lower output even further. Economists explain this situation by saying that policymakers have two targets or goals (low inflation and low unemployment) but only one instrument (aggregate demand).

Such a dilemma is often faced by monetary policy makers. When inflation and unemployment are rising at the same time, what stance should the Federal Reserve or the European Central Bank take? Should it tighten money to reduce inflation? Or focus primarily on reducing unemployment? Or make some compromise between the two? Economics can provide no definitive answer to this dilemma. The response will depend upon society’s values as well as the mandates imposed by the national legislatures (such as inflation targeting for the ECB versus a dual mandate for the Fed).

Inflation resulting from rising costs during periods of high unemployment and slack resource utilization is called **supply-shock inflation**. It can lead to the policy dilemma of stagflation when output declines at the same time as inflation is rising.

### Expectations and Inflation

Why, you might ask, does inflation have such strong momentum? The answer is that most prices and wages are set with an eye to future economic conditions. When prices and wages are rising rapidly and are expected to continue doing so, businesses and workers tend to build the rapid rate of inflation into their price and wage decisions. High or low inflation expectations tend to be self-fulfilling prophecies.

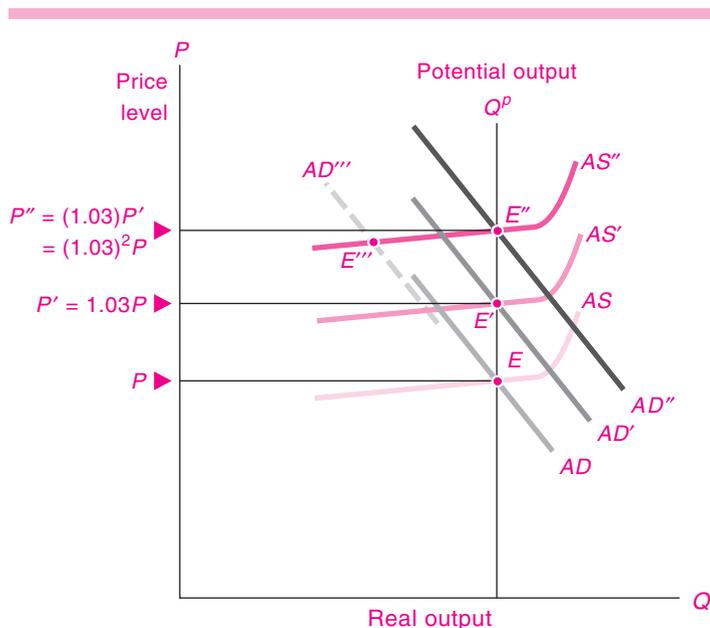
We can use a hypothetical example to illustrate the role of expectations in the inflation process. Say that in 2009, Brass Mills Inc., a nonunionized light-manufacturing firm, was contemplating its annual wage and salary decisions for 2010. Its sales were growing as well. Brass Mills' chief economist reported that no major inflationary or deflationary shocks were foreseen, and the major forecasting services were expecting national wage growth of 4 percent in 2010. Brass Mills had conducted a survey of local companies and found that most employers were planning on increases in compensation of 3 to 5 percent during the next year. All the signals, then, pointed to wage increases of around 4 percent from 2009 to 2010.

In examining its own internal labor market, Brass Mills determined that its wages were in line with the local labor market. Because the managers did not

want to fall behind local wages, Brass Mills decided that it would try to match local wage increases. It therefore set wage increases at the expected market increase, an average 4 percent wage increase for 2010.

The process of setting wages and salaries with an eye to expected future economic conditions can be extended to virtually all employers. This kind of reasoning also applies to many product prices—such as college tuitions, automobile prices, and long-distance telephone rates—that cannot be easily changed after they have been set. Because of the length of time involved in modifying inflation expectations and in adjusting most wages and many prices, expected inflation will change only if there are major shocks or changes in economic policy.

Figure 30-7 illustrates the process of expected inflation. Suppose that potential output is constant and that there are no supply or demand shocks. If everyone expects average costs and prices to rise at 3 percent each year, the AS curve will shift upward at 3 percent per year. If there are no demand shocks, the AD curve will also shift up at that rate. The intersection of the AD and AS curves will come at a price that is 3 percent higher each year. Hence, the macroeconomic equilibrium moves from  $E$  to  $E'$  to  $E''$ . Prices are rising 3 percent from one year to the next; expected inflation has set in at 3 percent.



**FIGURE 30-7.** An Upward Spiral of Prices and Wages Occurs When Aggregate Supply and Demand Shift Up Together

Suppose that production costs and AD rise by 3 percent each year. AS and AD curves would shift up 3 percent each year. As the equilibrium moves from  $E$  to  $E'$  to  $E''$ , prices march up steadily because of expected inflation.

Steady inflation occurs when the *AS* and *AD* curves are moving steadily upward at the same rate.

### Price Levels vs. Inflation

Using Figure 30-7, we can make the useful distinction between movements in the price level and movements in inflation. In general, an increase in aggregate demand will raise prices, other things being equal. Similarly, an upward shift in the *AS* curve resulting from an increase in wages and other costs will raise prices, other things being equal.

But of course other things always change; in particular, *AD* and *AS* curves never sit still. Figure 30-7 shows, for example, the *AS* and *AD* curves marching up together.

What if there were an unexpected shift in the *AS* or *AD* curve during the third period? How would prices and inflation be affected? Suppose, for example, that the third period's *AD''* curve shifted to the left to *AD'''* because of a monetary contraction. This might cause a recession, with a new equilibrium at *E'''* on the *AS''* curve. At this point, output would have fallen below potential; prices and the inflation rate would be lower than at *E''*, but the economy would still be experiencing inflation because the price level at *E'''* is still above the previous period's equilibrium *E'* with price *P'*.

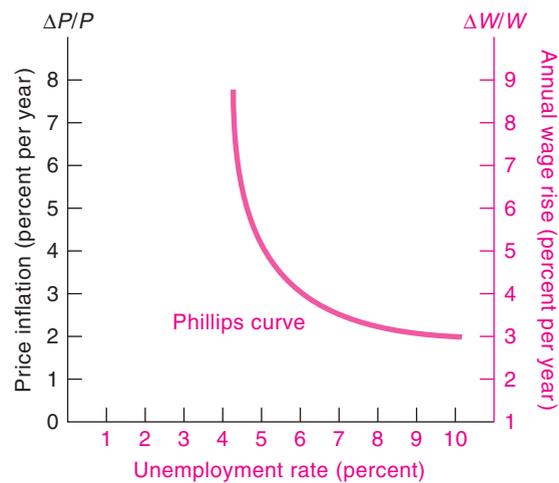
This example is a reminder that supply or demand shocks may reduce the price level below the level it would otherwise have attained. Nonetheless, because of inflation's momentum, the economy may continue to experience inflation.

## THE PHILLIPS CURVE

The major macroeconomic tool used to understand inflation is the **Phillips curve**. This curve shows the relationship between the unemployment rate and inflation. The basic idea is that when output is high and unemployment is low, wages and prices tend to rise more rapidly. This occurs because workers and unions can press more strongly for wage increases when jobs are plentiful and firms can more easily raise prices when sales are brisk. The converse also holds—high unemployment tends to slow inflation.

### Short-Run Phillips Curve

Macroeconomists distinguish between the short-run Phillips curve and the long-run Phillips curve. A typical



**FIGURE 30-8.** The Short-Run Phillips Curve Depicts the Tradeoff between Inflation and Unemployment

A short-run Phillips curve shows the inverse relationship between inflation and unemployment. The green wage-change scale on the right-hand vertical axis is higher than the blue left-hand inflation scale by the assumed 1 percent rate of growth of average labor productivity.

short-run Phillips curve is shown in Figure 30-8. On the diagram's horizontal axis is the unemployment rate. On the blue left-hand vertical scale is the annual rate of price inflation. The green right-hand vertical scale shows the rate of money-wage inflation. As you move leftward on the Phillips curve by reducing unemployment, the rate of price and wage increase indicated by the curve becomes higher.

An important piece of inflation arithmetic underlies this curve. Say that labor productivity (output per worker) rises at a steady rate of 1 percent each year. Further, assume that firms set prices on the basis of average labor costs, so prices always change just as much as average labor costs per unit of output. If wages are rising at 4 percent, and productivity is rising at 1 percent, then average labor costs will rise at 3 percent. Consequently, prices will also rise at 3 percent.

Using this inflation arithmetic, we can see the relation between wage and price increases in Figure 30-8. The two scales in the figure differ only by the assumed rate of productivity growth (so the price change of 4 percent per year would correspond to a wage change of 5 percent per year

if productivity grew by 1 percent per year and if prices always rose as fast as average labor costs).



### The Logic of Wage-Price Arithmetic

This relationship between prices, wages, and productivity can be formalized as follows: The fact that prices are based on average labor costs per unit of output implies that  $P$  is always proportional to  $WL/Q$ , where  $P$  is the price level,  $W$  is the wage rate,  $L$  is labor-hours, and  $Q$  is output. Assume that average labor productivity ( $Q/L$ ) is growing smoothly at 1 percent per year. Hence, if wages are growing at 4 percent annually, prices will grow at 3 percent annually (= 4 percent growth in wages – 1 percent growth in productivity). More generally,

$$\text{Rate of inflation} = \text{rate of wage growth} - \text{rate of productivity growth}$$

This shows the relationship between price inflation and wage inflation.

We can illustrate how closely this relationship holds with actual numbers for a high-inflation period and for a low-inflation period. The following table shows the major long-run determinants of inflation to be wage growth and productivity change. From the first to the second period, inflation rose because wage growth increased slightly while productivity fell sharply. In the third period, inflation was low because wage growth was restrained while productivity growth rebounded.

	Rate of CPI inflation (%)	Rate of wage growth (%)	Rate of productivity growth (%)
1958–1973	2.9	5.4	3.1
1973–1995	5.6	5.9	1.5
1995–2007	2.6	4.3	2.6

Source: Bureau of Labor Statistics data on the business sector, at [www.bls.gov](http://www.bls.gov).

### The Nonaccelerating Inflation Rate of Unemployment

Economists who looked carefully at inflationary periods noticed that the simple two-variable Phillips curve drawn in Figure 30-8 was unstable. On the basis of theoretical work of Edmund Phelps and Milton

Friedman, along with statistical tests of the actual history, macroeconomists developed the modern theory of inflation, which distinguishes between the long run and the short run. The downward-sloping Phillips curve of Figure 30-8 holds only in the short run. In the long run, the Phillips curve is *vertical*, not downward-sloping. This approach implies that in the long-run there is a minimum unemployment rate that is consistent with steady inflation. This is the *nonaccelerating inflation rate of unemployment* or *NAIRU* (pronounced “nay-rew”).<sup>1</sup>

**The nonaccelerating inflation rate of unemployment (or NAIRU)** is that unemployment rate consistent with a constant inflation rate. At the NAIRU, upward and downward forces on price and wage inflation are in balance, so there is no tendency for inflation to change. The NAIRU is the lowest unemployment rate that can be sustained without upward pressure on inflation.

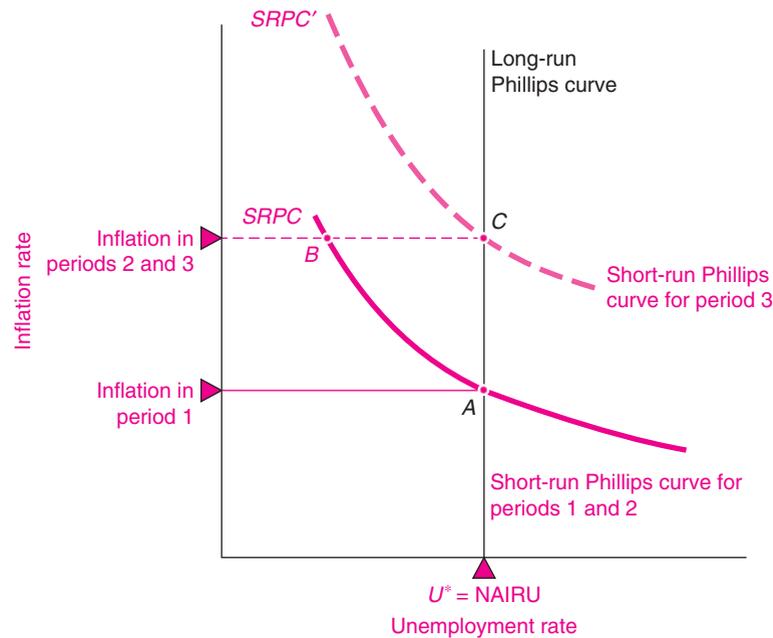
The idea behind the NAIRU is that the state of the economy can be divided into three situations:

- *Excess demand.* When markets are extremely tight, with low unemployment and high utilization of capacity, then prices and wages will be subject to demand-pull inflation.
- *Excess supply.* In recessionary situations, with high unemployment and idled factories, firms tend to sell at discounts and workers push less aggressively for wage increases. Wage and price inflation tend to moderate.
- *Neutral pressures.* Sometimes the economy is operating “in neutral.” The upward wage pressures from job vacancies just match the downward wage pressures from unemployment. There are no supply shocks from oil or other exogenous sources. Here, the economy is at the NAIRU, and inflation neither rises nor falls.

### From Short Run to Long Run

How does the economy move from the short run to the long run? The basic idea is that when price changes are unanticipated, the short-run Phillips curve tends to shift up or down. This point is

<sup>1</sup> Other terms will sometimes be encountered. The original name for the NAIRU was the “natural rate of unemployment.” This term is unsatisfactory because there is nothing natural about the NAIRU.



**FIGURE 30-9. The Shifting Phillips Curve**

This figure shows how economic expansion leads to an inflationary surprise and an upward shift in the short-run Phillips curve. The steps in the shift are explained by the bullets in the text. Note that if you connect points A, B, and C, the shifting curve produces a clockwise loop.

illustrated by a series of steps in a “boom cycle” here and in Figure 30-9:

- *Period 1.* In the first period, unemployment is at the NAIRU. There are no demand or supply surprises, and the economy is at point A on the lower short-run Phillips curve (*SRPC*) in Figure 30-9.
- *Period 2.* Next, suppose there is an economic expansion which lowers the unemployment rate. As unemployment declines, firms recruit workers more vigorously, giving larger wage increases than formerly. As output approaches capacity, price markups rise. Wages and prices begin to accelerate. In terms of our Phillips curve, the economy moves up and to the left to point B on its short-run Phillips curve (along *SRPC* in Figure 30-9). As shown in the figure, inflation expectations have not yet changed, so the economy stays on the original Phillips curve, on *SRPC*. The lower unemployment rate raises inflation during the second period.
- *Period 3.* Because inflation has risen, firms and workers are surprised, and they revise upward their inflationary expectations. They begin to incorporate the higher expected inflation into their wage and price decisions. The result is a *shift in the short-run Phillips curve*. We can see the new curve as *SRPC'* in Figure 30-9. The new short-run Phillips curve lies above the original Phillips curve, reflecting the higher expected rate of inflation. We have drawn the curve so that the new expected inflation rate for period 3 equals the actual inflation rate in period 2. If a slowdown in economic activity brings the unemployment rate back to the NAIRU in period 3, the economy moves to point C. Even though the unemployment rate is the same as it was in period 1, actual inflation will be higher, reflecting the upward shift in the short-run Phillips curve.

Note the surprising outcome. Because the expected inflation rate has increased, the rate of

inflation is higher in period 3 than during period 1 even though the unemployment rate is the same. The economy in period 3 will have the same *real* GDP and unemployment rate as it did in period 1, even though the *nominal* magnitudes (prices and nominal GDP) are now growing more rapidly than they did before the expansion raised the expected rate of inflation.

We can also track a “recession cycle” that occurs when unemployment rises and the actual inflation rate falls below its expected rate. The expected rate of inflation declines in recessions, and the economy enjoys a lower inflation rate when it returns to the NAIRU. This painful cycle of austerity occurred during the Carter-Volcker-Reagan wars against inflation during 1979–1984.

### **The Vertical Long-Run Phillips Curve**

When the unemployment rate departs from the NAIRU, the inflation rate will tend to change. What happens if the gap between the actual unemployment rate and the NAIRU persists? For example, say that the NAIRU is 5 percent while the actual unemployment rate is 3 percent. Because of the gap, inflation will tend to rise from year to year. Inflation might be 3 percent in the first year, 4 percent in the second year, 5 percent in the third year—and might continue to move upward thereafter. When would this upward spiral stop? It stops only when unemployment moves back to the NAIRU. Put differently, as long as unemployment is below the NAIRU, wage inflation will tend to increase.

The opposite behavior will be seen at high unemployment. In that case, inflation will tend to fall as long as unemployment is above the NAIRU.

Only when unemployment is *at* the NAIRU will inflation stabilize; only then will the shifts of supply and demand in different labor markets be in balance; only then will inflation—at whatever is its inertial rate—tend neither to increase nor to decrease.

The modern theory of inflation has important implications for economic policy. It implies that there is a minimum level of unemployment that an economy can enjoy in the long run. If the economy is pushed to very high levels of output and employment, this will ignite an upward spiral of wage and price inflation. This theory also provides a formula for curbing inflation. When the inflation rate is too high, a country can tighten money, trigger a

recession, raise the unemployment rate above the NAIRU, and thereby reduce inflation.

The NAIRU defines the neutral zone between excessive tightness/rising inflation and high unemployment/falling inflation. In the short run, inflation can be reduced by raising unemployment above the NAIRU, but in the long run, the NAIRU is the lowest sustainable rate of unemployment.

### **Quantitative Estimates**

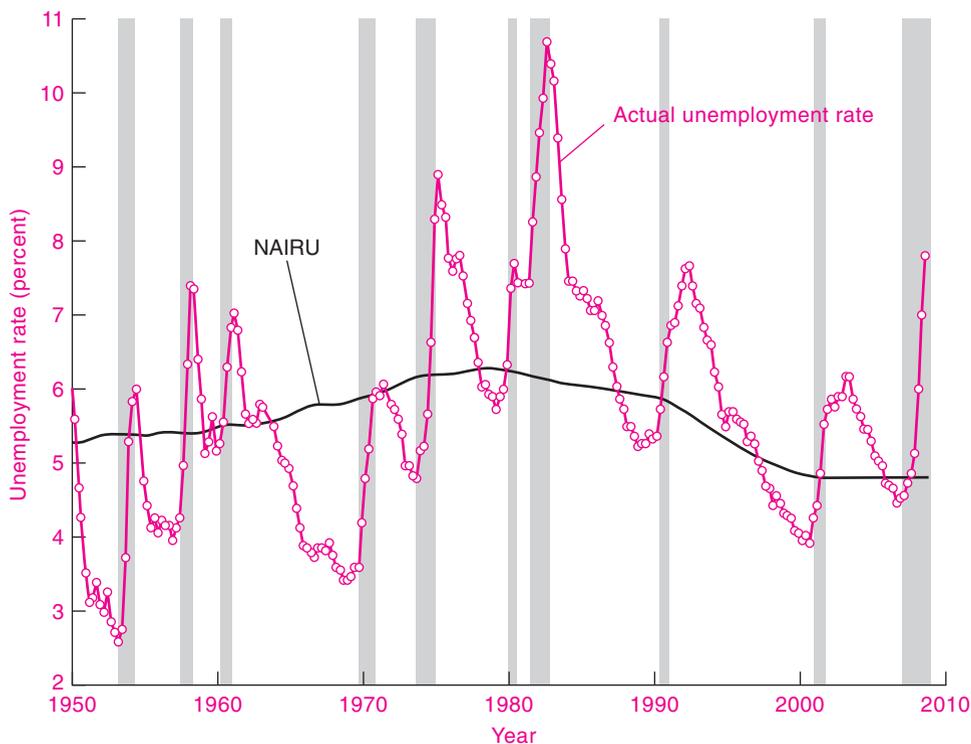
Although the NAIRU is a crucial macroeconomic concept, precise numerical estimates of the NAIRU have proved elusive. Many macroeconomists have used advanced techniques to estimate the NAIRU. For this text, we have adopted the estimates prepared by the Congressional Budget Office (CBO). According to the CBO, the NAIRU rose gradually from the 1950s, peaked at 6.3 percent of the labor force around 1980, and declined to 4.8 percent by 2008. CBO estimates, along with the actual unemployment rate through the end of 2008, are shown in Figure 30-10.

### **Doubts about the NAIRU**

The concept of the nonaccelerating inflation rate of unemployment, along with its output twin of potential GDP, is crucial for understanding inflation and the connection between the short run and the long run in macroeconomics. But the mainstream view remains controversial.

Critics wonder whether the NAIRU is a stable and reliable concept. The inflation experience of the United States has led economists to question whether there is in fact a stable NAIRU for the country. Another question is whether an extended period of high unemployment will lead to a deterioration of job skills, to loss of on-the-job training and experience, and thereby to a higher NAIRU. Might not slow growth of real GDP reduce investment and leave the country with a diminished capital stock? Might not that capacity shortage produce rising inflation even with unemployment rates above the NAIRU?

Experience in Europe over the last two decades confirms some of these worries (recall our discussion of the European unemployment puzzle at the end of the previous chapter). In the early 1960s, labor markets in Germany, France, and Britain appeared to be in equilibrium with unemployment rates between 1 and 2 percent. By the late 1990s, after a decade of stagnation and slow job growth, labor market



Shaded areas are NBER recessions.

**FIGURE 30-10. Actual Unemployment Rate and NAIRU for the United States**

The NAIRU is the unemployment rate at which upward and downward forces acting on inflation are in balance.

Source: Actual unemployment rate from Bureau of Labor Statistics; NAIRU from estimates of the Congressional Budget Office.

equilibrium seemed to be in balance with unemployment rates in the 6 to 12 percent range. On the basis of recent European experience, many macroeconomists are looking for ways to explain the instability of the NAIRU and its dependence upon actual unemployment as well as labor market institutions.

### Review

The major points to understand are the following:

- In the short run, an increase in aggregate demand which lowers the unemployment rate below the NAIRU will tend to increase the inflation rate. Recessions and high unemployment tend to lower inflation. In the short run, there is a tradeoff between inflation and unemployment.
- When inflation is higher or lower than what people expect, inflation expectations adjust. The

changed inflation expectations will generally shift the short-run Phillips curve up or down.

- The long-run Phillips curve is vertical at the non-accelerating inflation rate of unemployment (NAIRU). Unemployment above (below) the NAIRU will tend to lower (increase) the rate of inflation.

## C. DILEMMAS OF ANTI-INFLATION POLICY

The economy evolves in response to political forces and technological change. Our economic theories, designed to explain issues like inflation and unemployment, must also adapt. In this final section on

inflation theory, we discuss the pressing issues that arise in combating inflation.

### How Long Is the Long Run?

The NAIRU theory holds that the Phillips curve is vertical in the long run. Just how long is the long run for this purpose? The length of time that it takes the economy to adjust fully to a shock is not known with precision. Recent studies suggest that full adjustment takes at least 5 years or perhaps even a decade. The reason for the long delay is that it takes years for expectations to adjust, for labor and other long-term contracts to be renegotiated, and for all these effects to percolate through the economy.

### How Much Does It Cost to Reduce Inflation?

Our analysis suggests that a nation can reduce the expected rate of inflation by temporarily reducing output and raising unemployment. But policymakers may want to know just how much it costs to squeeze inflation out of the economy. How costly is *disinflation*, which denotes the policy of lowering the rate of inflation?

Studies of this subject find that the cost of reducing inflation varies depending upon the country, the initial inflation rate, and the policy used. Analyses for the United States give a reasonably consistent answer: Lowering the expected inflation rate by 1 percentage point costs the nation about 4 percent of 1 year's GDP. In terms of the current level of GDP, this amounts to an output loss of about \$600 billion (in 2008 prices) to reduce the inflation rate by 1 percentage point.

To understand the cost of disinflation, consider the Phillips curve. If the Phillips curve is relatively flat, reducing inflation will require much unemployment and loss in output; if the Phillips curve is steep, a small rise in unemployment will bring down inflation quickly and relatively painlessly. Statistical analyses indicate that when the unemployment rate rises 1 percentage point above the NAIRU for 1 year and then returns to the NAIRU, the inflation rate will decline about  $\frac{1}{2}$  percentage point. Therefore, to reduce inflation by 1 full percentage point, unemployment must be held 2 percentage points above the NAIRU for 1 year.

The loss associated with disinflationary policies is called the **sacrifice ratio**. More precisely, the sacrifice ratio is the cumulative loss in output, measured as a

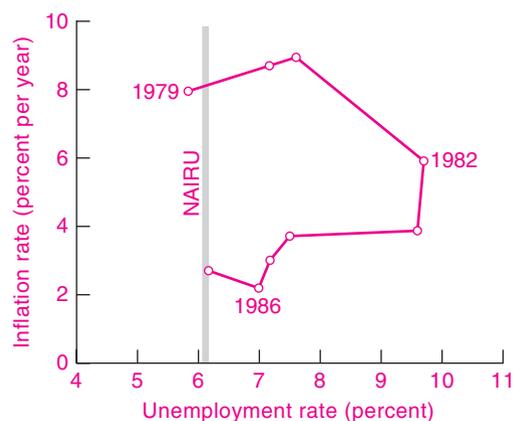


FIGURE 30-11. The Costs of Disinflation, 1979–1987

This graph shows a disinflation cycle. High interest rates led to slow economic growth and high unemployment in the early 1980s. The result was unemployment above the NAIRU and output below potential. Core inflation declined by about 5 percentage points, while cumulative output loss was about 20 percent of GDP, which leads to a sacrifice ratio of 4 percent.

percent of 1 year's GDP, associated with a 1-percentage-point permanent reduction in inflation.

We can illustrate the sacrifice ratio using the period of disinflation after 1979. The scatter plot of inflation and unemployment during this period is shown in Figure 30-11. This is an *austerity cycle* or *disinflation cycle*, which is the opposite of the boom cycle illustrated in Figure 30-9. During these years, the Federal Reserve took strong steps to reduce inflation. Tight money drove the unemployment rate up above 10 percent for 2 years, and output was below its potential for 7 years. We have shown the average NAIRU as the vertical line, which would also be the long-run Phillips curve for this period.

Tight money did reduce core inflation from around 8 to 3 percent per year during this period. The cumulative loss of output associated with this disinflation is estimated to be about 20 percent of GDP. This provides an estimate of the sacrifice ratio for this period of 4 percent [= (20 percent of GDP)/(5 percentage points of disinflation)]. In the American economy today, this implies that lowering the core inflation rate by 1 percentage point would cost about \$600 billion, or around \$6000 per American household.

The Phillips-curve theory illustrates how policy can reduce inflation by raising unemployment above the NAIRU for a period of time. Estimates of the cost of disinflation are typically around 4 percent of 1 year's GDP for 1 point of disinflation. This calculation shows why containing inflation is a costly policy and one not undertaken lightly.

### Credibility and Inflation

One of the most important questions in anti-inflation policy concerns the role of credibility of policy. Many economists argue that the Phillips-curve approach is too pessimistic. The dissenters hold that credible and publicly announced policies—for example, adopting fixed monetary rules or targeting nominal GDP—would allow anti-inflation policies to reduce inflation with lower output and unemployment costs.

The idea relies on the fact that inflation is a process that depends on people's expectations of future inflation. A credible monetary policy—such as one that relentlessly targets a fixed, low inflation rate—might lead people to expect that inflation would be lower in the future and that this belief might in some measure be a self-fulfilling prophecy. Those emphasizing credibility backed their theories by citing fundamental policy changes, such as occurred with monetary and fiscal reforms that ended Austrian and Bolivian hyperinflations at relatively low cost in terms of unemployment or lost GDP.

Many economists were skeptical about claims that credibility would significantly lower the output costs of disinflation. While such policies might work in countries torn by hyperinflation, war, or revolution, Draconian anti-inflation policies would be less credible in the United States. Congress and the president often lose heart in the fight against inflation when unemployment rises sharply and farmers or construction workers storm the Capitol and circle the White House.

The U.S. experience during the 1980s, shown in Figure 30-11, provides a good laboratory to test the credibility critique. During this period, monetary policy was tightened in a clear and forceful manner. Yet the price tag was still high, as the sacrifice calculations indicate. Using tough, preannounced policies to enhance credibility does not appear to have lowered the cost of disinflation in the United States.

Because the United States has such a high degree of stability of its political and economic institutions, its experience may be unusual. Economists have examined anti-inflation policies in other countries and have determined that anti-inflation policies can sometimes be *expansionary*. A recent study by Stanley Fischer, Ratna Sahay, and Carlos A. Végh concluded as follows:

Periods of high inflation are associated with bad macroeconomic performance. In particular, high inflation is bad for growth. The evidence is based on a sample of 18 countries which have experienced very high inflation episodes. During such periods, real GDP per capita fell on average by 1.6 percent per annum (compared to positive growth of 1.4 percent in low inflation years). . . . Exchange rate-based stabilizations appear to lead to an initial expansion in real GDP and real private consumption.

### Policies to Lower Unemployment

Given the costs of high unemployment, we might ask: Is the NAIRU the optimal level of unemployment? If not, what can we do to lower it toward a more desirable level? Some economists believe that the NAIRU (sometimes also called the “natural rate of unemployment”) represents the economy's efficient unemployment level. They hold that it is the outcome of an efficient pattern of employment, job vacancies, and job search. In their view, holding the unemployment rate below the NAIRU would be like driving your car without a spare tire.

Other economists strongly disagree, reasoning that the NAIRU is likely to be above the optimal unemployment rate. In their view, economic welfare would be increased if the NAIRU could be lowered. This group argues that there are many spillovers or externalities in the labor market. For example, workers who have been laid off suffer from a variety of social and economic hardships. Yet employers do not pay the costs of unemployment; most of the costs (unemployment insurance, medical costs, family distress, etc.) spill over as external costs and are absorbed by the worker or by the government. Moreover, there may be congestion externalities when an additional unemployed worker makes it harder for other workers to find jobs. To the extent that unemployment has external costs, the NAIRU is likely to be higher than the optimal unemployment

rate; consequently, lowering the unemployment rate would raise the nation's net economic welfare.

A large social dividend would reward the society that discovers how to lower the NAIRU. What measures might lower the NAIRU?

- *Improve labor market services.* Some unemployment occurs because job vacancies are not matched up with unemployed workers. Through better information, the amount of frictional and structural unemployment can be reduced. A recent innovation is Internet matching, run by states or private companies, which can help people find jobs and firms find qualified workers more quickly.
- *Bolster training programs.* If you look at the Internet or at help-wanted ads in the newspaper, you will see that most of the job vacancies call for skilled workers. Conversely, most of the unemployed are unskilled or semiskilled workers, or workers who are in a depressed industry. Many economists believe that government or private training programs can help unemployed workers retool for better jobs in growing sectors. If successful, such programs provide the double bonus of allowing people to lead productive lives and

of reducing the burden on government transfer programs.

- *Reduce disincentives to work.* In protecting people from the hardships of unemployment and poverty, the government has at the same time removed the sting of unemployment and reduced incentives to seek work. Some economists call for reforming the unemployment-insurance system and reforming health care, disability, and social security programs to improve work incentives. Others note that the lack of a national health insurance system may increase "job lock" and reduce the mobility of workers.

\* \* \*

Having surveyed the history and theory of unemployment and inflation, we conclude with the following cautious summary:

Critics believe that the high unemployment that often prevails in North America and Europe is a central flaw in modern capitalism. Indeed, unemployment must sometimes be kept above its socially optimal level to ensure price stability, and the tension between price stability and low unemployment is one of the cruelest dilemmas of modern society.



## SUMMARY

### A. Definition and Impact of Inflation

1. Recall that inflation occurs when the general level of prices is rising. The rate of inflation is the percentage change in a price index from one period to the next. The major price indexes are the consumer price index (CPI) and the GDP deflator.
2. Like diseases, inflations come in different strains. We generally see low inflation in the United States (a few percentage points annually). Sometimes, galloping inflation produces price rises of 50 or 100 or 200 percent each year. Hyperinflation takes over when the printing presses spew out currency and prices start rising many times each month. Historically, hyperinflations have almost always been associated with war and revolution.
3. Inflation affects the economy by redistributing income and wealth and by impairing efficiency. Unanticipated inflation usually favors debtors, profit seekers, and

risk-taking speculators. It hurts creditors, fixed-income classes, and timid investors. Inflation leads to distortions in relative prices, tax rates, and real interest rates. People take more trips to the bank, taxes may creep up, and measured income may become distorted.

### B. Modern Inflation Theory

4. At any time, an economy has a given expected inflation rate. This is the rate that people have come to anticipate and that is built into labor contracts and other agreements. The expected rate of inflation is a short-run equilibrium and persists until the economy is shocked.
5. In reality, the economy receives incessant price shocks. The major kinds of shocks that propel inflation away from its expected rate are demand-pull and supply-shock. Demand-pull inflation results from too much spending chasing too few goods, causing

the aggregate demand curve to shift up and to the right. Wages and prices are then bid up in markets. Supply-shock inflation is a new phenomenon of modern industrial economies and occurs when the costs of production rise even in periods of high unemployment and idle capacity.

6. The Phillips curve shows the relationship between inflation and unemployment. In the short run, lowering one rate means raising the other. But the short-run Phillips curve tends to shift over time as expected inflation and other factors change. If policymakers attempt to hold unemployment below the NAIRU for long periods, inflation will tend to spiral upward.
7. Modern inflation theory relies on the concept of the nonaccelerating inflation rate of unemployment, or NAIRU, which is the lowest sustainable unemployment rate that the nation can enjoy without risking

an upward spiral of inflation. It represents the level of unemployment of resources at which labor and product markets are in inflationary balance. Under the NAIRU theory, there is no permanent tradeoff between unemployment and inflation, and the long-run Phillips curve is vertical.

### C. Dilemmas of Anti-inflation Policy

8. A central concern for policymakers is the cost of reducing inflation. Current estimates indicate that a substantial recession is necessary to slow expected inflation.
9. Economists have put forth many proposals for lowering the NAIRU; notable proposals include improving labor market information, improving education and training programs, and refashioning government programs so that workers have greater incentives to work.

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## CONCEPTS FOR REVIEW

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### History and Theories of Inflation

Rate of inflation in year  $t$

$$= 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

strains of inflation:

low  
galloping  
hyperinflation

impacts of inflation (redistributive, on output and employment)  
anticipated and unanticipated inflation

costs of inflation:  
“shoe leather”  
menu costs  
income and tax distortions  
loss of information

short-run and long-run Phillips curves  
nonaccelerating inflation rate of unemployment (NAIRU) and the long-run Phillips curve

### Anti-inflation Policy

costs of disinflation  
measures to lower the NAIRU  
sacrifice ratio

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## FURTHER READING AND INTERNET WEBSITES

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### Further Reading

The quotation from Stanley Fischer, Ratna Sahay, and Carlos A. Végh is from their article, “Modern Hyper- and High Inflation,” *Journal of Economic Literature*, September 2002, pp. 837–880.

A discussion of factors influencing the NAIRU can be found in Congressional Budget Office, *The Effect of Changes in Labor Markets on the Natural Rate of Unemployment*, April 2002, available at [www.cbo.gov](http://www.cbo.gov).

### Websites

Analysis of the consumer price data for the United States comes from the Bureau of Labor Statistics, at [www.bls.gov](http://www.bls.gov). This site also contains useful discussions of inflation trends in the *Monthly Labor Review*, online at [www.bls.gov/opub/mlr/mlrhome.htm](http://www.bls.gov/opub/mlr/mlrhome.htm).

## QUESTIONS FOR DISCUSSION

1. Consider the following impacts of inflation: tax distortions, income and wealth redistribution, shoe-leather costs, and menu costs. For each, define the cost and provide an example.
2. “During periods of inflation, people use real resources to reduce their holdings of fiat money. Such activities produce a private benefit with no corresponding social gain, which illustrates the social cost of inflation.” Explain this quotation and give an example.
3. Unanticipated deflation also produces serious social costs. For each of the following, describe the deflation and analyze the associated costs:
  - a. During the Great Depression, prices of major crops fell along with the prices of other commodities. What would happen to farmers who had large mortgages?
  - b. Japan experienced a mild deflation in the 1990s. Assume that Japanese students each borrowed 2,000,000 yen (about \$20,000) to pay for their education, hoping that inflation would allow them to pay off their loans in inflated yen. What would happen to these students if wages and prices began to *fall* at 5 percent per year?
4. The data in Table 30-2 describe inflation and unemployment in the United States from 1979 to 1987. Note that the economy started out near the NAIRU in 1979 and ended near the NAIRU in 1987. Can you explain the decline of inflation over the intervening years? Do so by drawing the short-run and long-run Phillips curves for each of the years from 1979 to 1987.
5. Many economists argue as follows: “Because there is no long-run tradeoff between unemployment and inflation, there is no point in trying to shave the peaks and troughs from the business cycle.” This view suggests that we should not care whether the economy is stable or fluctuating widely as long as the average level of unemployment is the same. Discuss critically.
6. A leading economist has written: “If you think of the social costs of inflation, at least of moderate inflation, it is hard to avoid coming away with the impression that they are minor compared with the costs of unemployment and depressed production.” Write a short essay describing your views on this issue.
7. Consider the data on annual inflation rates and growth of per capita GDP shown in Table 30-1. Can you see that low inflation is associated with the highest growth rates? What are the economic reasons that growth might be lower for deflation and for hyperinflation. Explain why the *ex post* fallacy might apply here (see the discussion in Chapter 1).
8. The following policies and phenomena affected labor markets over the last three decades. Explain the likely effect of each on the NAIRU:
  - a. Unemployment insurance became subject to taxation.
  - b. Funds for training programs for unemployed workers were cut sharply by the federal government.
  - c. The fraction of the workforce in labor unions fell sharply.
  - d. The welfare-reform act of 1996 sharply reduced payments to low-income families and required them to work if they were to receive government payments.

Year	Unemployment rate (%)	Inflation rate, CPI (% per year)
1979	5.8	11.3
1980	7.1	13.5
1981	7.6	10.3
1982	9.7	6.2
1983	9.6	3.2
1984	7.5	4.4
1985	7.2	3.6
1986	7.0	1.9
1987	6.2	3.6

**TABLE 30-2. Unemployment and Inflation Data for the United States, 1979–1987**



*The task of economic stabilization requires keeping the economy from straying too far above or below the path of steady high employment. One way lies inflation, and the other lies recession. Flexible and vigilant fiscal and monetary policy will allow us to hold the narrow middle course.*

President John F. Kennedy  
(1962)

The U.S. economy has changed enormously over the last 50 years. The shares of farming and manufacturing have declined. People work with computers instead of with tractors. Trade is a growing share of production and consumption. Technology has revolutionized daily life. Advanced telecommunications systems enable businesses to control their operations across the country and around the world, and ever more powerful computers have eliminated many of the tedious tasks that used to employ so many people.

Yet, even with these tectonic shifts in our economic structure, the central goals of macroeconomic policy remain the same: stable employment, good pay, low unemployment, rising productivity and real incomes, and low and stable inflation. The challenge remains to find policies that can achieve these objectives.

This chapter uses the tools of macroeconomics to examine some of today's major policy issues. We begin with an assessment of the consequences of government deficits and debt on economic activity. We then present some of the new approaches to

macroeconomics. Some of these theories are on the frontiers of our science today but will be the staples of classroom economics in a generation. We analyze controversies involving short-run economic stabilization, including current questions on the roles of monetary and fiscal policy. Should the government stop trying to smooth out business cycles? Should policy makers rely on fixed rules rather than discretion? We then conclude with an epilogue on the importance of economic growth.

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### **A. THE ECONOMIC CONSEQUENCES OF THE GOVERNMENT DEBT**

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As the United States entered the twenty-first century, its fiscal policies were stable and the federal government was running a budget surplus. Then, like a monster rising from the deep, the budget deficit rose up to swallow the nation's fiscal resources and terrify its populace.

The budget deficit increased even during the prosperous years of the mid-2000s as taxes were cut and spending increased on new entitlement programs and seemingly endless wars in Iraq and Afghanistan. Then, the nation's banking system ran mammoth losses and the economy went into a deep recession. Tax revenues fell sharply, and hundreds of billions of dollars were spent to prop up the financial system and stimulate the economy. For 2009, the federal government was running an annual deficit of close to \$2 trillion, which was the largest percent of GDP since World War II.

How did the budget deficit get so high? What are the economic impacts of fiscal deficits? These important questions will be addressed in this section. We will see that the popular concern with deficits has a firm economic foundation. Deficit spending may be necessary to reduce the length and depth of recessions, particularly when the economy is in a liquidity trap. But high deficits during periods of full employment carry serious consequences, including reduced national saving and investment and slower long-run economic growth.

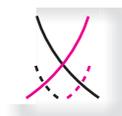
**Government Budgets.** Governments use budgets to plan and control their fiscal affairs. A **budget** shows, for a given year, the planned expenditures of government programs and the expected revenues from tax systems. The budget typically contains a list of specific programs (education, welfare, defense, etc.), as well as tax sources (individual income tax, social-insurance taxes, etc.).

A **budget surplus** occurs when all taxes and other revenues exceed government expenditures for a year. A **budget deficit** is incurred when expenditures exceed taxes. When revenues and expenditures are equal during a given period—a rare event on the federal level—the government has a **balanced budget**.

When the government incurs a budget deficit, it must borrow from the public to pay its bills. To borrow, the government issues bonds, which are IOUs that promise to pay money in the future. The **government debt** (sometimes called the *public debt*) consists of the total or accumulated borrowings by the government; it is the total dollar value of government bonds.

It is useful to distinguish between the total debt and the net debt. The *net debt*, also called the *debt held by the public*, excludes debt held by the government itself. Net debt is owned by households, banks, businesses, foreigners, and other nonfederal entities.

The *gross debt* equals the net debt plus bonds owned by the government, primarily by the social security trust fund. The social security trust fund is running a large surplus, so the difference between these two concepts is growing rapidly today.



#### Debt versus Deficit

People often confuse the debt with the deficit. You can remember the difference as follows: Debt is water in the tub, while a deficit is water flowing into the tub. The government debt is the *stock* of liabilities of the government. The deficit is a *flow* of new debt incurred when the government spends more than it raises in taxes. For example, when the government ran a deficit of \$640 billion in 2008, it added that amount to the stock of government debt. By contrast, when the government enjoyed a surplus of \$200 billion in 2000, this reduced the government debt by that amount.

## FISCAL HISTORY

Like Sisyphus, federal policymakers toil endlessly to push the stone of fiscal balance up the hill only to have it roll down to crush them again. The government passed law after law in the 1980s and 1990s to stop the rising deficit. No sooner was the deficit vanquished than it reappeared and grew rapidly after 2001. Was this typical, or was it a new feature of the American economy?

Deficits were not new to the American economy, but large deficits during peacetime are a unique feature of recent economic history. For the first two centuries after the American Revolution, the federal government of the United States generally balanced its budget. Heavy military spending during wartime was financed by borrowing, so the government debt soared in wartime. In peacetime, the government would pay off some of its debt, and the debt burden would shrink.

Then, starting in 1940, the fiscal affairs of state began to change rapidly. Table 31-1 illuminates the major trends. This table lists the major federal budget categories and their shares in GDP for the period from 1940 to 2008. The key features were the following:

- The share of federal spending and taxes grew sharply from 1940 to 1960 primarily because of the expansion of military and civilian spending. This growth was financed by a significant increase in individual and corporate taxation.

Federal budget component	Percent of GDP				
	1940	1960	1980	2000	2008
<b>Revenues</b>	<b>6.4</b>	<b>17.6</b>	<b>18.5</b>	<b>20.6</b>	<b>17.7</b>
Individual income taxes	0.9	7.7	8.8	10.2	8.1
Corporation income taxes	1.2	4.1	2.3	2.1	2.1
Social insurance and retirement receipts	1.8	2.8	5.7	6.7	6.3
Other	2.7	3.0	1.8	1.6	1.2
<b>Expenditures</b>	<b>9.4</b>	<b>17.5</b>	<b>21.2</b>	<b>18.2</b>	<b>20.9</b>
National defense and international affairs	1.8	9.7	5.3	3.2	4.4
Health	0.1	0.2	2.0	3.6	4.7
Income security	1.5	1.4	3.1	2.6	3.0
Social security	0.0	2.2	4.2	4.2	4.3
Net interest	0.9	1.3	1.9	2.3	1.7
Other	5.2	2.7	4.7	2.4	2.5
<b>Surplus or deficit</b>	<b>-2.9</b>	<b>0.1</b>	<b>-2.6</b>	<b>2.4</b>	<b>-3.2</b>

**TABLE 31-1. Federal Budget Trends, 1940–2008**

The federal share of the economy grew sharply from 1940 to 1960 as the United States took an active military role in world affairs during the hot and cold wars. After 1960, the federal-spending share stabilized, but the composition of spending moved from military to health care and other social spending. The federal government deficit grew sharply in the 2000s as revenues declined sharply due to individual income-tax cuts.

Source: Data are for fiscal years and come from the Department of the Treasury, Office of Management and Budget, and Department of Commerce. They are summarized in *Economic Indicators*, available at [origin.www.gpoaccess.gov/indicators/](http://origin.www.gpoaccess.gov/indicators/).

- The period from 1960 to 1980 marked the “New Society” programs for health, income security, and expanded social security. As a result, the expenditure share grew sharply. The share of federal revenues in GDP stabilized over this period.
- Beginning in 1981, both political parties declared that the era of big government was over. Presidents Ronald Reagan and George W. Bush introduced large tax cuts, which in each case led to large government budget deficits. From 1980 to 2008, as shown in Table 31-1, the ratio of total federal spending to GDP was essentially constant. Spending on health care rose sharply as other civilian programs were squeezed.

## GOVERNMENT BUDGET POLICY

The government budget serves two major economic functions. First, it is a device by which the government can set national priorities, allocating national output

among private and public consumption and investment and providing incentives to increase or reduce output in particular sectors. From a macroeconomic point of view, it is through fiscal policy that the budget affects the key macroeconomic goals. More precisely, by **fiscal policy** we mean the setting of taxes and public expenditures to help dampen the swings of the business cycle and contribute to the maintenance of a growing, high-employment economy, free from high or volatile inflation.

Some early enthusiasts of the Keynesian approach believed that fiscal policy was like a knob they could turn to control or “fine-tune” the pace of the economy. A bigger budget deficit meant more stimulus for aggregate demand, which could lower unemployment and pull the economy out of recession. A budget surplus could slow down an overheated economy and dampen the threat of inflation.

Few today hold such an idealized view of fiscal policy. With many decades of practice, economies

still experience recessions and inflations. Fiscal policy works better in theory than in practice. Moreover, monetary policy has become the preferred tool for moderating business-cycle swings. Still, when unemployment rises, there is usually strong public pressure for the government to boost spending. In this section, we will review the major ways in which the government can employ fiscal policy, and we will examine the practical shortcomings that have become apparent.

### **Actual, Structural, and Cyclical Budgets**

Modern public finance distinguishes between structural and cyclical deficits. The idea is simple. The *structural* part of the budget is active—determined by discretionary policies such as those covering tax rates, public-works or education spending, or the size of defense purchases. In contrast, the *cyclical* part of the budget is determined passively by the state of the business cycle, that is, by the extent to which national income and output are high or low. The precise definitions follow:

The **actual budget** records the actual dollar expenditures, revenues, and deficits in a given period.

The **structural budget** calculates what government revenues, expenditures, and deficits would be if the economy were operating at potential output.

The **cyclical budget** is the difference between the actual budget and the structural budget. It measures the impact of the business cycle on the budget, taking into account the effect of the cycle on revenues, expenditures, and the deficit.

The distinction between the actual and the structural budgets is important for policymakers who want to distinguish between long-term or trend budget changes and short-term changes that are primarily driven by the business cycle. Structural spending and revenues consist of the discretionary programs enacted by the legislature; cyclical spending and deficits consist of the taxes and spending that react automatically to the state of the economy.

The nation's saving and investment balance is primarily affected by the structural budget. Efforts to change government saving should focus on the structural budget because no durable change comes simply from higher revenues due to an economic boom.

## **THE ECONOMICS OF THE DEBT AND DEFICITS**

No macroeconomic issue is more controversial today than the impact of large government deficits upon the economy. Some argue that large deficits are placing a heavy burden on future generations. Others rejoin that there is little evidence of an impact of deficits on interest rates or investment. Yet a third group argues that deficits are favorable for the economy in recessionary times.

How can we sort through the conflicting points of view? At one extreme, we must avoid the customary practice of assuming that a public debt is bad because private debtors are punished. On the other hand, we must recognize the genuine problems associated with large government deficits and the advantages that come from a lower government debt.

## **THE SHORT-RUN IMPACT OF GOVERNMENT DEFICITS**

### **Short Run vs. Long Run**

It is useful to separate the impact of fiscal policy into the short run and the long run. The *short run* in macroeconomics considers situations where less than full employment may prevail—that is, where actual output may differ from potential output. This is the world of the Keynesian multiplier model. The *long run* refers to a full-employment situation, where actual output equals potential output. This is the world of our economic-growth analysis.

We have already discussed the role of fiscal policy in the short run, so that needs only a brief review in this section. The impact in the long run is more novel and will be presented in the next section.

### **Fiscal Policy and the Multiplier Model**

We discussed in earlier chapters the way that fiscal policy affects the economy in the short run—that is, in an economy with less than full employment.

Suppose that the government purchases computers for its schools or missiles for its army. Our multiplier model says that in the short run, with no change in interest or exchange rates, GDP will rise by a multiple (perhaps  $1\frac{1}{2}$  or 2) times the increase in  $G$ . The same argument applies (with a smaller multiplier) to reductions in taxes,  $T$ . At the same time, the

government deficit will rise because the deficit equals  $T - G$  and thus rises with  $T$  cuts or  $G$  increases.

This then is the basic result for the short run: With less than full employment, increases in the structural deficit arising from discretionary  $T$  cuts or  $G$  increases will tend to produce higher output and lower unemployment, and perhaps higher inflation.

We must, however, expand on the simplest multiplier analysis to incorporate the reactions of financial markets and monetary policy. As output rises and inflation threatens, central banks may raise interest rates, discouraging domestic investment. Higher interest rates may also cause a country's foreign exchange rate to appreciate if the country has a flexible exchange rate; the appreciation leads to a decline in net exports. These financial reactions would tend to choke off or "crowd out" investment, with a resulting decrease in the expenditure multiplier of our simplest model.

**Fiscal policy tends to expand the economy in the short run—that is, when there are unemployed resources. Higher spending and lower tax rates increase aggregate demand, output, employment, and inflation. However, this expansionary impact is reduced by the subsequent financial reactions of interest rates and foreign exchange rates.**

## GOVERNMENT DEBT AND ECONOMIC GROWTH

We turn now from the short run to the long run—to the impact of fiscal policy, and particularly a large government debt, on investment and economic growth. The analysis here deals with the costs of servicing a large external debt, the inefficiencies of levying taxes to pay interest on the debt, and the impact of the debt on capital accumulation.

### Historical Trends

Before we begin our analysis of government debt, it is useful to review historical trends. Long-run data for the United States appear in the figure on page 716 of this text, which shows the ratio of net federal debt to GDP since 1789. Notice how wars drove up the ratio of debt to GDP, while rapid output growth with generally balanced budgets in peacetime reduced the ratio of debt to GDP.

Figure 31-1 shows the debt-GDP ratio for the United States over the last seven decades. You can see the

dramatic effect of government deficits during World War II, as well as during the 1980s and the 2000s.

Most industrialized countries are today saddled with large public debts. Table 31-2 compares the United States with seven other large countries. Japan's debt-GDP ratio has climbed sharply over the last two decades because of the nation's aggressive fiscal policy and a prolonged recession. Many economists worry that Japan is caught in a vicious cycle of high debt leading to high interest payments, which in turn increase the growth of the debt.

### External vs. Internal Debt

The first distinction to be made is between an internal debt and an external debt. *Internal government debt* is owed by a nation to its own residents. Many argue that an internal debt poses no burden because "we owe it all to ourselves." While this statement is oversimplified, it does represent a genuine insight. If each citizen owned \$10,000 of government bonds and were liable for the taxes to service just that debt, it would make no sense to think of debt as a heavy load of rocks that each citizen must carry. People simply owe the debt to themselves.

An external debt is quite a different situation. An *external debt* occurs when foreigners own a fraction of the assets of a country. For example, because of

	Ratio of Gross Government Debt to GDP (%)			
	1980	1990	2000	2007
Japan	37	47	106	161
Italy	53	93	104	96
France	30	40	47	52
United Kingdom	51	35	43	43
Germany	13	20	34	39
United States	26	41	34	36
South Korea	4	13	17	32
Mexico	18	46	23	24

**TABLE 31-2. Central-Government Debt in Eight Major Countries**

Slow economic growth and rising spending on entitlement programs led to growing public debts in most major countries in the last three decades. Japan's debt-GDP ratio led to a downgrading of the nation's debt rating even though Japan is one of the world's richest countries.

Source: OECD at [webnet.oecd.org/wbos/index.aspx](http://webnet.oecd.org/wbos/index.aspx).



**FIGURE 31-1. Debt-GDP Ratio for the U.S. Federal Government**

This figure shows the ratio of net debt, or debt in the hands of the public, to GDP. See the effect of World War II and the two periods of supply-side tax cuts on the ratio.

Source: U.S. Office of Management and Budget, available at [www.gpoaccess.gov/eop/tables08.html](http://www.gpoaccess.gov/eop/tables08.html), Table B-78.

its large current-account deficits, the United States owed the rest of the world \$3 trillion at the end of 2008. What this means is that U.S. residents will eventually have to export that much in goods and services or sell that much of the nation's assets to foreigners. Suppose that the real interest rate on that debt is 5 percent per year. Then, each year, U.S. residents would need to ship abroad \$150 billion (about \$500 per capita) to "service" the external debt.

So an external debt definitely does involve a net subtraction from the resources available for consumption in the debtor nation. This lesson has been learned time and again by developing countries—particularly when their creditors wanted their debts paid back quickly.

### Efficiency Losses from Taxation

An internal debt requires payments of interest to bondholders, and taxes must be levied for this purpose. But even if the same people were taxed to pay the same

amounts they receive in interest, there would still be the *distorting effects on incentives* that are inescapably present in the case of any taxes. Taxing Paula's interest income or wages to pay Paula interest would introduce microeconomic distortions. Paula might work less and save less; either of these outcomes must be reckoned as a distortion of efficiency and well-being.

### Displacement of Capital

Perhaps the most serious consequence of a large public debt is that it displaces capital from the nation's stock of private wealth. As a result, the pace of economic growth slows and future living standards will decline.

What is the mechanism by which debt affects capital? Recall from our earlier discussion that people accumulate wealth for a variety of purposes, such as retirement, education, and housing. We can separate the assets people hold into two groups: (1) government debt and (2) capital like houses and financial assets like corporate stocks that represent ownership of private capital.

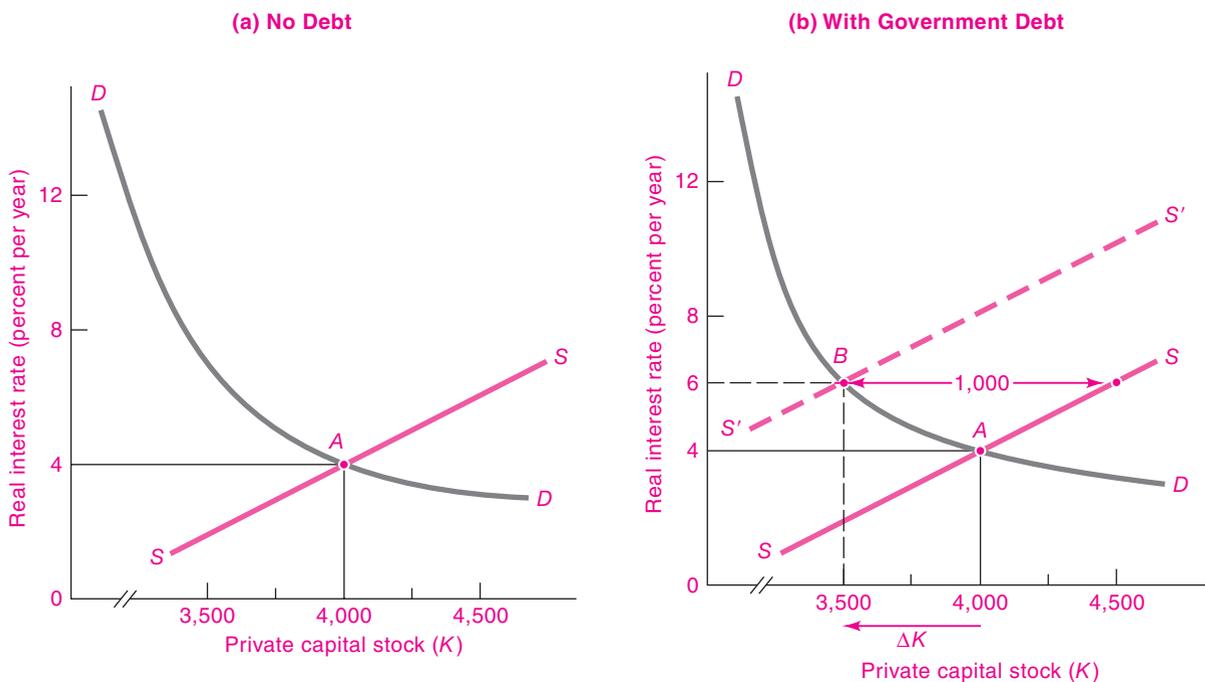
The effect of government debt is that people will accumulate government debt instead of private capital, and the nation's private capital stock will be displaced by public debt.

To illustrate this point, suppose that people desire to hold exactly 1000 units of wealth for retirement and other purposes. As the government debt increases, people's holdings of other assets will be reduced dollar for dollar. This occurs because as the government sells its bonds, other assets must be reduced, since total desired wealth holdings are fixed. But these other assets ultimately represent the stock of private capital; stocks, bonds, and mortgages are the counterparts of factories, equipment, and houses. In this example, if the government debt goes

up 100 units, we would see that people's holdings of capital and other private assets fall by 100 units. This is the case of 100 percent displacement (which is the long-run analog of 100 percent crowding out).

Full displacement is unlikely to hold in practice. The higher debt may increase interest rates and stimulate domestic saving. In addition, the country may borrow abroad rather than reduce its domestic investment (as has been the case for the U.S. in recent years). The exact amount of capital displacement will depend on the conditions of production and on the saving behavior of domestic households and foreigners.

**A Geometric Analysis.** The process by which the stock of capital is displaced in the long run is illustrated in Figure 31-2. The left panel shows the supply



**FIGURE 31-2. Government Debt Displaces Private Capital**

Firms demand capital, while households supply capital by saving in private and public assets. The demand curve is the downward-sloping business demand for  $K$ , while the supply curve is the upward-sloping household supply of wealth.

Before-debt case in (a) shows the equilibrium without government debt:  $K$  is 4000 and the real interest rate is 4 percent.

After-debt case in (b) shows the impact of 1000 units of government debt. Debt shifts the net supply of  $K$  to the left by the 1000 units of the government debt. The new equilibrium arises northwest along the demand-for- $K$  curve, moving from point  $A$  to point  $B$ . The interest rate is higher, firms are discouraged from holding  $K$ , and the capital stock falls.

and demand for capital as a function of the real interest rate or return on capital. As interest rates rise, firms demand less capital while individuals may want to supply more. The equilibrium shown is for a capital stock of 4000 units with a real interest rate of 4 percent.

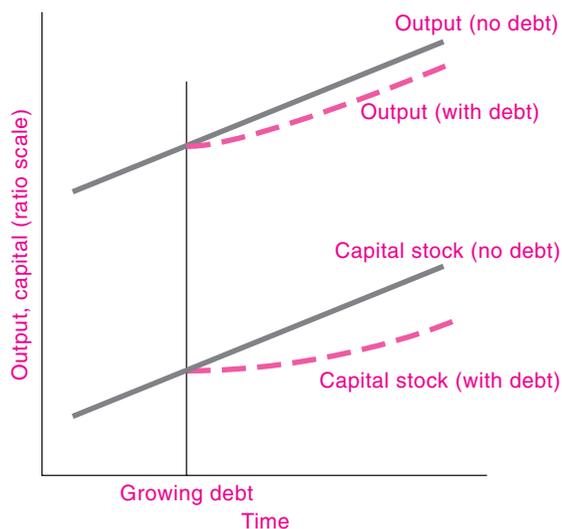
Now say that the government debt rises from 0 to 1000—because of war, recession, supply-side fiscal policies, or some other reason. The impact of the increase in debt can be seen in the right-hand diagram of Figure 31-2. This figure shows the 1000-unit increase in debt as a shift in the supply-of-capital (or  $SS$ ) curve. As depicted, the households' supply-of-capital schedule shifts 1000 units to the left, to  $S'S'$ .

We represent an increase in government debt as a leftward shift in the households' supply-of-capital schedule. Note that, because the  $SS$  curve represents the amount of private capital that people willingly hold at each interest rate, the capital holdings are equal to the total wealth holdings minus the holdings of government debt. Since the amount of government debt (or assets other than capital) rises by 1000, the amount of private capital that people can buy after they own the 1000 units of government debt is 1000 less than total wealth at each interest rate. Therefore, if  $SS$  represents the total wealth held by people,  $S'S'$  (equal to  $SS$  less 1000) represents the total amount of capital held by people. In short, after 1000 units of government debt are sold, the new supply-of-capital schedule is  $S'S'$ .

As the supply of capital dries up—with national saving going into government bonds rather than into housing or into companies' stocks and bonds—the market equilibrium moves northwest along the demand-for- $K$  curve. Interest rates rise. Firms slow their purchases of new factories, trucks, and computers.

In the illustrative new long-run equilibrium, the capital stock falls from 4000 to 3500. Thus, in this example, 1000 units of government debt have displaced 500 units of private capital. Such a reduction has significant economic effects, of course. With less capital, potential output, wages, and the nation's income are lower than they would otherwise be.

The diagrams in Figure 31-2 are illustrative. Economists do not have a firm estimate of the magnitude of the displacement effect. In a look at historical trends, the best evidence suggests that domestic capital is partially displaced by government debt but that some of the impact comes in higher foreign debt.



**FIGURE 31-3. Impact of Government Debt on Economic Growth**

The solid lines show the paths of capital and output if the government balances its books and has no debt. When the government incurs a debt, private capital is reduced. The dashed lines illustrate the impact on capital and output of the higher government debt.

### Debt and Growth

If we consider all the effects of government debt on the economy, a large public debt is likely to reduce long-run economic growth. Figure 31-3 illustrates this connection. Say that an economy were to operate over time with no debt. According to the principles of economic growth outlined in Chapter 25, the capital stock and potential output would follow the hypothetical paths indicated by the solid blue lines in Figure 31-3.

Next consider a situation with a growing national debt. As the debt accumulates over time, more and more capital is displaced, as shown by the dashed green line for the capital stock in the bottom of Figure 31-3. As taxes are raised to pay interest on the debt, inefficiencies further lower output. Also, an increase in external debt lowers national income and raises the fraction of national output that has to be set aside for servicing the external debt. All the effects taken together, output and consumption will grow more slowly than they would have had there been no large government debt and deficit, as can be seen by comparing the top lines in Figure 31-3.

What is the impact of a budget surplus and a *declining* government debt? Here, the argument works in the other direction. A lower national debt means that more of national wealth is put into capital rather than government bonds. A higher capital stock increases the growth of output and increases wages and consumption per person.

**This is the major point about the long-run impact of a large government debt on economic growth: A large government debt tends to reduce the growth in potential output because it displaces private capital, increases the inefficiency from taxation, and forces a nation to reduce consumption to service its foreign borrowing.**



#### Deficit Confusions Unraveled

Having completed our analysis of the economic impacts of deficits and debt, we can summarize the key points by unraveling

some of the major confusions in this area.

The impact of fiscal policy on the economy is one of the most misunderstood facets of macroeconomics. The confusion arises because fiscal policy operates differently depending upon the time period:

- *In the short run, higher spending and lower tax rates tend to increase aggregate demand and thereby to raise output and lower unemployment.* This is the Keynesian impact of fiscal policy, which operates by raising actual output relative to potential output. We would expect that the expansionary impact of fiscal policy—the increase in capacity utilization—would last at most for a few years. It might be offset by a monetary tightening, especially if the central bank thought the economy was operating near the inflation danger zone.
- *In the long run, higher spending and lower tax rates tend to depress the growth rate of the economy.* This is the growth impact of fiscal policy. The growth impact concerns the impact of government deficits on the national saving and investment balance in a full-employment economy. If taxes are lower, this will decrease public saving and, because private saving is unlikely to rise as much as public saving falls, total national saving and investment will decline. The investment decline will lead to slower growth in the capital stock and therefore in potential output.

These two impacts of fiscal policy can easily confuse people and are the source of many debates about fiscal

policy. Consider the following debate between Senators Hawk and Dove:

**Senator Dove:** The economy is tipping into recession.

We cannot afford to sit around while millions of people lose their jobs. Now is the time for a big stimulus package with tax cuts and new spending on infrastructure and pressing public needs. Recessions are not the time for old-fashioned dogmas about deficits.

**Senator Hawk:** A huge stimulus package today would be the height of fiscal irresponsibility. With higher government spending, the deficit will grow even larger, interest rates will rise, and businesses will reduce their spending on new plant, equipment, and information technology. With all the critical needs facing the nation, we can ill-afford slower economic growth over the next decade.

Make sure that you understand the implicit theories underlying the positions of the two distinguished senators. They are both right . . . and both wrong.

## B. ADVANCES IN MODERN MACROECONOMICS

Our philosophy in this textbook is to consider all the important schools of thought. We emphasize the modern mainstream Keynesian approach as the best way to explain the business cycle in market economies. At the same time, the forces behind long-run economic growth are best understood by using the neoclassical growth model.

While our key task has been to present mainstream thinking, experience shows how important it is to keep our minds open to alternative points of view. Time and again in science, the orthodoxies of one era are overturned by new discoveries in the next. Schools, like people, are subject to hardening of the arteries. Students learn the embalmed truth from their teachers and sacred textbooks, and the imperfections in the orthodox doctrines are glossed over as unimportant. For example, John Stuart Mill, one of the greatest economists and philosophers of all time, wrote in his 1848 classic, *Principles of Political Economy*: “Happily, there is nothing in the laws of Value which remains for the present and any future writer to clear up.” Yet the next century and a half

saw two major revolutions in economics—the marginal revolution in microeconomics and the discovery of macroeconomics.

Historians of science observe that the progress of science is discontinuous. New schools of thought rise, spread their influence, and convince skeptics. In this section, we sketch some of the leading new lines of thinking in modern macroeconomics.

## CLASSICAL MACROECONOMICS AND SAY'S LAW

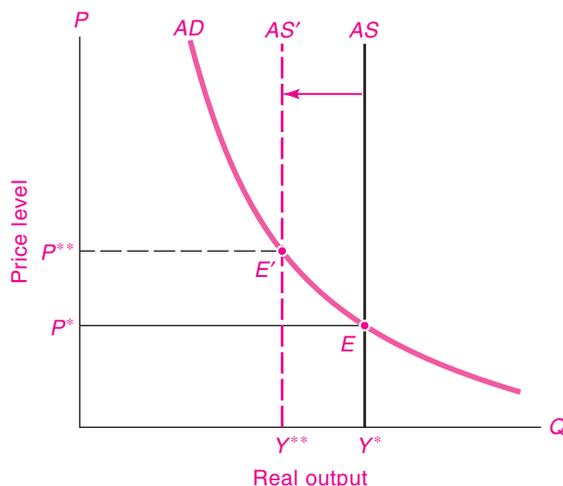
Since the dawn of economics two centuries ago, economists have wondered if a market economy has a tendency to move spontaneously toward a long-run, full-employment equilibrium without the need for government intervention. Using modern language, we label as **classical** those approaches that emphasize the self-correcting forces in an economy. The classical approach holds that prices and wages are flexible and that the economy is stable, so the economy moves automatically and quickly to its full-employment equilibrium.

### Say's Law of Markets

Before Keynes developed his macroeconomic theories, the major economic thinkers generally adhered to the classical view of the economy, at least in good times. Early economists knew about business cycles, but they viewed them as temporary and self-correcting aberrations.

Classical analysis revolved around **Say's Law of Markets**. This theory, advocated in 1803 by the French economist J. B. Say, states that overproduction is impossible by its very nature. This is sometimes expressed as “supply creates its own demand.” This law rests on a view that there is no essential difference between a monetary economy and a barter economy—in other words, people can afford to buy whatever factories can produce. Say's Law is illustrated in Figure 31-4. In the classical world, output is determined by aggregate supply, and aggregate demand affects only the price level.

A long line of the most distinguished economists, including David Ricardo (1817), John Stuart Mill (1848), and Alfred Marshall (1890), subscribed to the classical macroeconomic view that overproduction is impossible.



**FIGURE 31-4.** In the Real Business Cycle, Output Changes Come from Technological Shocks

In the classical as well as the real-business-cycle (RBC) approach,  $AS$  reflects classical flexible wages and prices and is therefore vertical. Output fluctuations come as technological shocks percolate through the economy. This figure shows how a decline in productivity can be the cause of a RBC recession. Can you see why policies to increase  $AD$  will affect prices but not output?

The classical view is that the economy moves automatically toward its full-employment equilibrium. Changes in the money supply, fiscal policy, investment, or other spending factors have no lasting impact upon output or employment. Prices and wages adjust quickly and flexibly to maintain full employment.

## MODERN CLASSICAL MACROECONOMICS

While classical economists were preaching the impossibility of persistent unemployment, eclectic economists of the 1930s could hardly ignore the vast army of unemployed workers begging for work and selling pencils on street corners. Keynes's *The General Theory of Employment, Interest and Money* (1936) offered an alternative macroeconomic theory—a new set of theoretical spectacles for looking at the impacts of shocks and economic policies. The analysis of business cycles and short-run aggregate demand presented in this text reflects the modern synthesis of the Keynesian approach.

While mainstream business-cycle analysis relies primarily on the Keynesian *AS* and *AD* model, a new branch of the classical school challenges the standard approach. This theory, called **new classical macroeconomics**, was developed by Robert Lucas (University of Chicago), Thomas Sargent (Stanford University and New York University), and Robert Barro (Harvard University). This approach is much in the spirit of the classical approach in emphasizing the role of flexible wages and prices, but it also adds a new feature called rational expectations to explain observations such as the Phillips curve.

### Rational Expectations

The major innovation of new classical economics has been to introduce the principle of rational expectations into macroeconomics. Some background on expectations will help to explain this new approach. In many areas of economics, particularly those involving investment and financial decisions, expectations are a central factor in decision making. They influence how much businesses will spend on investment goods and whether consumers spend now or save for the future. For example, assume that you are considering how much to spend on your first house. Your decision will be affected by your *expectations* about your future income, family size, and future housing prices.

How do people form their expectations? According to the **rational-expectations hypothesis**, expectations are unbiased and based on all available information.

We pause for a statistical aside: A forecast is unbiased if it contains no systematic forecasting errors. Clearly, a forecast cannot always be perfectly accurate—you cannot foresee how a coin flip will come up on a single toss. However, you should not commit the statistical sin of *bias* by predicting that a fair coin will come up tails 25 percent of the time. You would be making an unbiased forecast if you predicted that the coin would come up tails 50 percent of the time or that each of the numbers on a die would, on average, come up one-sixth of the time.

People have **rational expectations** when, in addition to lacking bias, they use all available information in making their decisions. This implies that people understand how the economy works and what the government is doing. Thus, suppose that the government always boosts spending in election years to

promote its election prospects. Under rational expectations, people will anticipate this kind of behavior and act accordingly. (Recall that this principle is also an important assumption behind the efficient-market hypothesis of financial markets, as described in Chapter 23.)

### Real Business Cycles

The major application of modern classical macroeconomics is an exciting field known as **real-business-cycle (RBC) theory**. This theory was developed principally by Finn Kydland and Edward C. Prescott, who won the Nobel Prize for their work in this area. This approach holds that business cycles are primarily due to technological shocks and do not invoke any monetary or demand-side forces.

In the RBC approach, shocks to technology, investment, or the labor supply change the potential output of the economy. In other words, the shocks shift a *vertical AS* curve. These supply shocks are transmitted into actual output by the fluctuations of aggregate supply and are completely independent of *AD*. Similarly, movements in the unemployment rate are the result of movements in the natural rate of unemployment (the NAIRU) due either to microeconomic forces, such as the intensity of sectoral shocks, or to tax and regulatory policies. Standard Keynesian monetary and fiscal policies have no effect on output or employment in RBC models; they affect only *AD* and the price level. Figure 31-4 shows an example of a RBC recession caused by a decline in productivity.

### The Ricardian View of Fiscal Policy

One of the most influential criticisms of Keynesian macroeconomics was a new view of the role of fiscal policy. This view, known as the **Ricardian view of fiscal policy** and developed by Harvard University's Robert Barro, argues that changes in tax rates have no impact upon consumption spending.

This idea is a logical extension of the life-cycle model of consumption, introduced in Chapter 21. Under the Ricardian view, individuals are farsighted and form part of a succession of family members, like a dynasty. Parents care not only about their own consumption but also about the well-being of their children; the children, in turn, care about the well-being of their own children; and so on. This structure, called “dynastic preferences,” implies that the current generation’s horizon stretches into the

indefinite future through the overlapping concerns of each generation about its offspring.

Here is where the surprising result comes: If the government cuts taxes but leaves expenditures unchanged, this necessarily requires increased government borrowing. But, with unchanged expenditures, the government will have to raise taxes at some point in the future to pay the interest on its new borrowing. In the Ricardian view, consumers have rational expectations about future policies, so when a tax cut occurs, they know they must plan for a future tax increase. They will therefore increase their saving by the amount of the tax cut, and their consumption will remain unchanged. Moreover, people take into account the well-being of their children. So, even if the future tax increase comes after their lifetime, they will save enough to increase their bequests to their children so that their children can pay the extra taxes.

The net result in the Ricardian view is that tax changes have no impact upon consumption. Moreover, government debt is not net debt from the point of view of households because they offset these assets in their mental calculations with the present value of taxes that must be paid to service the government debt.

The Ricardian view of debt and deficits has stirred much controversy among macroeconomists. Critics point out that it requires that households be extremely farsighted, planning to give bequests to their children and constantly weighing their own interests against those of their descendants. The chain would be broken if there were no children, no bequests, no concern for children, or poor foresight. The empirical evidence to date provides little support for the Ricardian view, but it is a useful reminder of the logical limitations on fiscal policy.

### Efficiency Wages

Another important recent development, fusing elements of both classical and Keynesian economics, is called **efficiency-wage theory**. This approach was developed by Edmund Phelps (Columbia University), Joseph Stiglitz (Columbia University), and Janet Yellen (president of the Federal Reserve Bank of San Francisco). It explains the rigidity of real wages and the existence of involuntary unemployment in terms of firms' attempts to increase productivity by keeping wages above the market-clearing level. According to

this theory, higher wages lead to higher productivity because workers are healthier, because workers will have higher morale and be less likely to surf the Internet at work for fear of losing their jobs, because good workers are less likely to quit and look for new jobs, and because higher wages may attract better workers.

As firms raise their wages to increase worker productivity, job seekers may be willing to stand in line for these high-paying jobs, thereby producing involuntary unemployment. The innovation in this theory is that involuntary unemployment is an equilibrium feature and will not disappear over time.

### Supply-Side Economics

In the early 1980s, a group of economists and journalists developed a popular school known as **supply-side economics**, which emphasized incentives and tax cuts as a means of increasing economic growth. Supply-side economics was espoused forcefully by President Reagan in the United States (1981–1989) and by Prime Minister Thatcher in Great Britain (1979–1990).

Supply siders argued that Keynesians, in their excessive concern with the business cycle, had ignored the impact of tax rates and incentives on economic growth. According to supply siders, high taxes lead people to reduce their labor and capital supply. Indeed, supply-side economists like Arthur Laffer suggested that high tax rates might actually lower tax revenues. This *Laffer-curve* proposition holds that high tax rates shrink the tax base because they reduce economic activity. To fix what they view as an inefficient tax system, supply-side economists proposed a radical restructuring of the tax system, through an approach sometimes called “supply-side tax cuts.”

After occupying center stage during the 1980s, the supply-side theories largely waned after Ronald Reagan left office. In studying this period, economists have generally found that many of the supply-side assertions were not supported by economic experience. Supply-side tax cuts produced lower, not higher, revenues.

Many of the supply-side policies were revived in 2001, when President George W. Bush successfully negotiated another round of income-tax cuts. These cuts were rationalized not by the argument that they would raise revenues but, instead, by the theory that they would improve the efficiency of the tax system

and raise the long-run rate of economic growth. Like their precursor in 1981, these tax cuts led to lower, rather than higher, tax revenues (see Table 31-1).

## POLICY IMPLICATIONS

### Policy Ineffectiveness

The new classical approaches have several important implications for macroeconomic policy. One of the most important contentions is the *ineffectiveness of systematic fiscal and monetary policies in reducing unemployment*. The basic idea here is that a predictable attempt to stimulate the economy would be known in advance and would therefore have no effect on the economy.

For example, suppose that the government has always stimulated the economy whenever elections were approaching. After a couple of episodes of politically motivated fiscal policy, people would rationally come to expect that behavior. They might say to themselves:

Elections are coming. From experience I know that the government always pumps up the economy before elections. I will probably get an election-year tax cut, but that will be followed by a stealth tax increase next year. They can't fool me into consuming more, working harder, and voting for incumbents.

This is the **policy-ineffectiveness theorem** of classical macroeconomics. With rational expectations and flexible prices and wages, anticipated government policy cannot affect real output or unemployment.

### The Desirability of Fixed Rules

We described the monetarist case for fixed rules in Chapter 24. New classical macroeconomics puts this argument on firmer footing. This approach holds that an economic policy can be divided into two parts, a predictable part (the “rule”) and an unpredictable part (“discretion”).

New classical macroeconomists argue that discretion is a snare and a delusion. Policymakers, they contend, cannot forecast the economy any better than can the private sector. Therefore, by the time policymakers act on the news, flexibly moving prices in markets populated by well-informed buyers and sellers have already adapted to the news and reached their efficient supply-and-demand equilibrium. There are no further *discretionary* steps the government can take

to improve the outcome or prevent the unemployment that is caused by temporary misperceptions or real-business-cycle shocks.

Although they cannot make things better, government policies can definitely make things worse. The government can generate unpredictable discretionary policies that give misleading economic signals, confuse people, distort their economic behavior, and cause waste. According to new classical macroeconomists, governments should avoid any discretionary macroeconomic policies rather than risk producing such confusing “noise.”

### A New Synthesis?

After three decades of digesting the new classical approach to macroeconomics, elements of a synthesis of old and new theories are beginning to appear. Economists today emphasize the importance of expectations. A useful distinction is between the adaptive (or “backward-looking”) approach and the rational (or “forward-looking”) approach. The adaptive assumption holds that people form their expectations on the basis of past information; the forward-looking or rational approach was described above. The importance of forward-looking expectations is crucial to understanding behavior, particularly in competitive auction markets like those in the financial sector.

Some macroeconomists have begun to fuse the new classical view of expectations with the Keynesian view of product and labor markets. This synthesis is embodied in macroeconomic models that assume (1) labor and goods markets display inflexible wages and prices, (2) the prices in financial auction markets adjust rapidly to economic shocks and expectations, and (3) the expectations in auction markets are formed in a forward-looking way.

One important forecast of such new approaches is that forward-looking models tend to have large “jumps” or discontinuous changes in interest rates, stock prices, foreign exchange rates, and oil prices in reaction to major news. Sharp reactions are often seen after elections or when wars break out. For example, when the United States invaded Iraq in March 2003, oil prices declined by 35 percent and stock prices rose by 10 percent *in a single week*. The new classical prediction of “jumpy” prices replicates one realistic feature of auction markets and thus suggests one area where forward-looking expectations might be important in the real world.

The new classical approach to macroeconomics has brought many fruitful insights. Most important, it reminds us that the economy is populated by intelligent consumers and investors who react to and often anticipate policy. This reaction and counterreaction can actually change the way the economy behaves.

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## C. STABILIZING THE ECONOMY

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The period since World War II has been one of remarkable economic progress for the high-income market democracies. Average incomes and employment grew rapidly, international trade broadened and deepened, and many poor countries, notably India and China, began to close the gap with rich countries.

The economies performed so well that some proclaimed a “Great Moderation,” in which business cycles were disappearing. Some “new” economics textbooks virtually ignored the macroeconomics of business cycles.

This fantasy was dispelled with the financial crisis and deep recession that began in 2007. Words like “recession” and “depression”—which had been banished to the history books—again took on meaning in people’s daily lives.

It is critical to find policies which can help avoid the excesses of the business cycle. We have seen that the path of output and prices is determined by the interaction of aggregate supply and aggregate demand. *However, policies designed to stabilize the business cycle must operate primarily through their impact on aggregate demand.* The government can affect the growth of aggregate demand primarily through the use of its monetary and fiscal levers and thereby counter recessions.

These observations leave open two crucial questions: What is the best mix of monetary and fiscal policies for stabilizing the economy? Should there be tight rules on policy-making, or should policymakers be allowed great discretion in their actions?

## THE INTERACTION OF MONETARY AND FISCAL POLICIES

For large economies like the United States or Euroland, the best combination of monetary and fiscal policies will depend upon two factors: the need for demand management and the desired fiscal-monetary mix.

### Demand Management

The top consideration in business-cycle management is the overall state of the economy and the need to adjust aggregate demand. When the economy is stagnating, fiscal and monetary policies can be used to stimulate the economy and promote economic recovery. When inflation threatens, monetary and fiscal policies can help slow the economy and dampen inflationary fires. These are examples of *demand management*, which refers to the active use of monetary and fiscal policies to affect the level of aggregate demand.

Suppose, for example, that the economy is entering a severe recession. Output is low relative to its potential. What can the government do to revive the lagging economy? It can increase aggregate demand by raising money growth or by boosting government spending or both. After the economy has responded to the monetary and fiscal stimulus, output growth and employment will increase and unemployment will fall. (What steps could the government take during inflationary periods?)

Let’s review the relative strengths and weaknesses of monetary policy and fiscal policy.

**The Role of Fiscal Policy.** In the early stages of the Keynesian revolution, macroeconomists emphasized fiscal policy as the most powerful and balanced remedy for demand management. Critics of fiscal policy pointed to shortcomings stemming from timing, politics, and macroeconomic theory.

One concern is the time span between cyclical shock and policy response. It takes time to recognize that a cyclical turning point has been reached—the policy lag. For example, it took one year for the NBER to declare the latest business-cycle peak. (The December 2007 peak was not announced until December 2008.) After a turning point is identified, it takes time for the President to decide what policies are necessary and then still more time for the Congress to act. Finally, even when taxation or spending is changed, there is an effectiveness lag before the economy responds.

Critics also point out that it is easier to cut taxes than to raise them, and easier to raise spending than to cut it. During the 1960s, Congress was enthusiastic about passing the Kennedy-Johnson tax cuts. Two years later, when the Vietnam War expansion ignited inflationary pressures, contractionary policies were called for.

There are two situations when countercyclical fiscal policies appear to be particularly useful. One case is temporary tax cuts in recessions. Temporary tax cuts may be aimed primarily at low- and middle-income households. The reason is that these households have high marginal propensities to consume because they have little excess saving to fall back on in hard times. Statistical studies indicate that these measures have indeed been effective in increasing aggregate demand in the short run without leading to long-run fiscal deficits.

An even more important situation is when the economy is in a liquidity trap and the central bank has no further room to lower short-term interest rates. (Recall our discussion of the liquidity trap in Chapter 24.) This was the case during the 2007–2009 recession. In its effort to revive the economy, the Obama administration worked with Congress in early 2009 to pass the largest fiscal stimulus package in U.S. history. While some people worried about the long-term impact of the fiscal stimulus on the government debt, most macroeconomists believed that fiscal policy was the only feasible way to reduce the depth and the severity of the downturn in this circumstance.

**Effectiveness of Monetary Policy.** Compared to fiscal policy, monetary policy operates much more indirectly on the economy. Whereas an expansive fiscal policy actually buys goods and services or puts income into the hands of consumers and businesses, monetary policy affects spending by altering interest rates, credit conditions, exchange rates, and asset prices. In the early years of the Keynesian revolution, some macroeconomists were skeptical about the effectiveness of monetary policy—some said, “Monetary policy was like pushing on a string.” Over the last two decades, however, these concerns have been put to rest as the Federal Reserve has shown itself quite capable of slowing down, or speeding up, the economy.

The Federal Reserve is much better placed to conduct stabilization policy than are the fiscal-policy makers. Its staff of professional economists can recognize cyclical movements as well as anyone. And it can move quickly when the need arises. For example, a cascade of failures of financial institutions caused a major financial crisis when the investment-banking firm Bear, Stearns had severe liquidity problems on Friday, March 14, 2008. The Fed needed to come up with a solution before markets opened on Monday

morning. By Sunday, working with the U.S. Treasury Department, the Fed had engineered a takeover of Bear by J.P. Morgan and had opened an entire new credit facility for its primary dealers. It is difficult to conceive of any legislature taking such complex measures in such a short time.

A key ingredient in Fed policy is its independence, and the Fed has proved that it can stand the heat of making politically unpopular decisions when they are necessary to slow inflation. Most important is that—with some qualifications—from the point of view of demand management, monetary policy can do, or undo, anything that fiscal policy can accomplish. The major reservation is that if the economy gets stuck in a liquidity trap, with nominal interest rates at or near zero, then monetary policy loses its ability to stimulate the economy. When the economy is in or near a liquidity trap, fiscal policy must therefore take over the major expansionary role.

We can summarize the current state of fiscal and monetary policy as follows:

**Because of their political independence and rapid decision making, central banks are well placed to be on the front line of defense in stabilizing the economy against business-cycle shocks. Discretionary fiscal policy is useful in recessions as a one-time stimulus. When the economy approaches a liquidity trap, fiscal policy must be the primary source of economic stimulus.**

### **The Fiscal-Monetary Mix**

The second factor affecting fiscal and monetary policy is the desired **fiscal-monetary mix**, which refers to the relative strength of fiscal and monetary policies and their effect on different sectors of the economy. A *change in the fiscal-monetary mix* is an approach which tightens one policy while easing the other in such a way that aggregate demand and therefore total output remain constant. The basic idea is that fiscal policy and monetary policy are substitutes in demand management. But while alternative combinations of monetary and fiscal policies can be used to stabilize the economy, they have different impacts upon the *composition* of output. By varying the mix of taxes, government spending, and monetary policy, the government can change the fraction of GDP devoted to business investment, consumption, net exports, and government purchases of goods and services.

Sector	Change in output (\$, billion, 2008 prices)	
<b>Investment sectors</b>		<b>132</b>
Gross private domestic investment		48
Housing	18	
Business fixed investment	30	
Net exports		83
<b>Consumption sectors</b>		<b>-106</b>
Government purchases of goods and services		-68
Personal consumption expenditures		-38
<b>Memoranda:</b>		
Change in real GDP		26
Change in federal deficit		-100

**TABLE 31-3. Changing the Fiscal-Monetary Mix**

What would be the impact of a change in the fiscal-monetary mix for the United States? This simulation assumes that the federal deficit is cut by \$100 billion through higher personal taxes and lower federal nondefense expenditures while the Federal Reserve uses monetary policy to keep unemployment on an unchanged trajectory. The simulation takes the average of the changes from the baseline path over the period 2000–2009.

Source: Simulation using the DRI model of the U.S. economy.

**Effect of Changing the Mix of Monetary and Fiscal Policies.** To understand the impact of changing the fiscal-monetary mix, let's examine a specific set of policies. Suppose that the federal government reduces the federal budget deficit by \$100 billion and that the Fed lowers interest rates to offset the contractionary impact of such a fiscal policy.

We can estimate the impact using a quantitative economic model. Table 31-3 shows the results of this experiment. Two interesting features emerge: First, the simulation indicates that a change in the fiscal-monetary mix would indeed change the composition of real GDP. While the deficit declines by \$100 billion, business investment goes up by \$30 billion. Investment in housing also increases as interest rates fall. At the same time, personal consumption declines, freeing up resources for investment. This simulation shows how a change in the fiscal-monetary mix might change the composition of output.

The simulation contains one particularly interesting result: Net exports rise far more than either housing or business fixed investment. This occurs because of the strong depreciation of the dollar which results from the lower interest rates. While this

result is clearly sensitive to the reaction of financial markets and exchange rates to the deficit-reduction package, it suggests that some of the popular analyses of the impact of such a package may be misleading. Many analysts have argued that a deficit-reduction package would have a significant impact upon domestic business investment and upon productivity. However, to the extent that lower deficits mainly increase net exports and housing, the nation is likely to experience relatively little increase in productivity growth. According to the estimates, cutting the budget deficit by \$100 billion will raise the growth rate of potential output from 2.3 percent per year to 2.5 percent per year over a 10-year period. Perhaps the small size of the payoff explains why it is so hard to muster the political will to cut the deficit.



#### Alternative Mixes in Practice

The fiscal-monetary mix has been sharply debated in American economic policy. Here are two major alternatives:

- *Loose fiscal—tight monetary policy.* Assume that the economy begins in an initial situation with low inflation

and output at its potential. A new president decides that it is necessary to increase defense spending sharply without raising taxes. By itself, this would increase the government deficit and increase aggregate demand. In this situation, the Federal Reserve would need to tighten monetary policy to prevent the economy from overheating. The result would be higher real interest rates and an appreciation of the dollar exchange rate. The higher interest rates would squeeze investment, while the appreciated dollar would reduce net exports. The net effect therefore would be that the higher defense spending would crowd out domestic investment and net exports. This policy was the one followed by the United States in the 1980s and again in the 2000s.

- *Tight fiscal—loose monetary policy.* Suppose that a country becomes concerned about a low national saving rate and desires to raise investment so as to increase the capital stock and boost the growth rate of potential output. To implement this approach, the country could raise consumption taxes and squeeze transfer payments so as to reduce disposable income and thereby lower consumption (tight fiscal policy). This would be accompanied by an expansionary monetary policy to lower interest rates and raise investment, lower the exchange rate, and expand net exports. This course would encourage private investment by increasing public saving. This was the economic philosophy of President Clinton which was embodied in the 1993 Budget Act and led to the budget surplus at decade's end.

## RULES VS. DISCRETION

We have seen that fiscal and monetary policy can *in principle* stabilize the economy. Many economists believe that countries should *in practice* take steps to shave the peaks and troughs off the business cycle. Other economists are skeptical of our ability to forecast cycles and take the right steps at the right time for the right reasons; this second group concludes that government cannot be trusted to make good economic policy, so its freedom to act should be strictly limited.

For example, fiscal conservatives worry that it's easier for Congress to increase spending and cut taxes than to do the reverse. That means it's easy to increase the budget deficit during recessions but much harder to turn around and shrink the deficit

again during booms, as a countercyclical fiscal policy would require. For that reason, conservatives have made several attempts to limit the ability of Congress to appropriate new funds or increase the deficit.

At the same time, monetary conservatives would like to tie the hands of central banks and force them to target inflation. Such a policy would eliminate the uncertainty about policy and enhance the credibility of the central bank as an inflation fighter.

At the most general level, the debate about “rules versus discretion” boils down to whether the advantages of flexibility in decision making are outweighed by the uncertainties and potential abuse in unconstrained decisions. Those who believe that the economy is inherently unstable and complex and that governments generally make wise decisions are comfortable with giving policymakers wide discretion to react aggressively to stabilize the economy. Those who believe that the government is the major destabilizing force in the economy and that policymakers are prone to selfishness and misjudgments favor tying the hands of the fiscal and monetary authorities.

### **Budget Constraints on Legislatures?**

As deficits began to grow during the 1980s, many people argued that Congress lacks the self-control to curb excessive spending and a burgeoning government debt. One proposal put forth by conservatives was a *constitutional amendment requiring a balanced budget*. Such an amendment was criticized by economists because it would make it difficult to use fiscal policy to fight recessions. To date, none of the proposed constitutional amendments has passed Congress.

Instead, Congress legislated a series of *budgetary rules to limit spending and tax reductions*. The first attempt was the Gramm-Rudman Act in 1985, which required that the deficit be reduced by a specified dollar amount each year and that the budget be balanced by 1991. This approach failed to limit spending and was abandoned.

A second approach was a *pay-as-you-go budget rule*, which was adopted in 1990. This required that Congress find the revenues to pay for any new spending program. In a sense, pay-as-you-go imposes a budget constraint on Congress, requiring that the costs of new programs be explicitly recognized either through higher taxes or through a reduction in other spending.

What was the impact of the budget constraints on Congress? Economic studies indicate that the

budget rules produced significant fiscal discipline, helped reduce the deficit over the 1990s, and eventually produced the surplus after 1998. However, when the deficit changed to surplus and the urgency of deficit-reduction declined, policymakers evaded the earlier budget caps with gimmicks like “emergency spending” for predictable items like the decennial census. Finally, in 2002, the budget caps were allowed to expire. Many economists believe that a pay-as-you-go rule is a useful mechanism to impose budget constraints on legislatures, and there were proposals to reinstate these in 2009.

### **Monetary Rules for the Fed?**

In our discussion of monetarism in Chapter 24, we laid out the case for fixed policy rules. The traditional argument for fixed rules is that the private economy is relatively stable and active policy-making is likely to destabilize rather than stabilize the economy. Moreover, to the extent that a central bank under the thumb of the government may be tempted to expand the economy before elections and to create a political business cycle, fixed rules will tie its hands. In addition, modern macroeconomists point to the value of being able to commit to action in advance. If the central bank can commit to follow a noninflationary rule, people’s expectations will adapt to this rule and inflationary expectations may be dampened.

One of the most important new developments in the last decade has been the trend toward inflation targeting in many countries. **Inflation targeting** is the announcement of official target ranges for the inflation rate along with an explicit statement that low and stable inflation is the overriding goal of monetary policy. Inflation targeting in hard or soft varieties has been adopted in recent years by many industrialized countries, including Canada, Britain, Australia, and New Zealand. Moreover, the treaty authorizing the new European Central Bank mandates that price stability be the ECB’s primary objective, although it is not formally required to target inflation. A number of economists and legislators are advocating this approach for the United States as well.

Inflation targeting involves the following:

- The government or central bank announces that monetary policy will strive to keep inflation near a numerically specified target.
- The target usually involves a range, such as 1 to 3 percent per year, rather than literal price stability. Generally, the government targets a core inflation rate, such as the CPI excluding volatile food and energy prices.
- Inflation is the primary or overriding target of policy in the medium run and long run. However, countries always make room for short-run stabilization objectives, particularly with respect to output, unemployment, financial stability, and the foreign exchange rate. These short-run objectives recognize that supply shocks can affect output and unemployment and that it may be desirable to have temporary departures from the inflation target to avoid excessive unemployment or output losses.

Proponents of inflation targeting point to many advantages. If there is no long-run tradeoff between unemployment and inflation, a sensible inflation target is that rate which maximizes the efficiency of the price system. Our analysis of inflation in Chapter 30 suggested that a low and stable rate of inflation would promote efficiency and minimize unnecessary redistribution of income and wealth. In addition, some economists believe that a strong and credible commitment to low and stable inflation will improve the short-run inflation-unemployment tradeoff. Finally, an explicit inflation target would increase the transparency of monetary policy.

Inflation targeting is a compromise between rule-based approaches and purely discretionary policies. The main disadvantage would come if the central bank began to rely too rigidly on the inflation rule and thereby allowed excessive unemployment in periods of severe supply shocks. Skeptics worry that the economy is too complex to be governed by fixed rules. Arguing by analogy, they ask whether one would advocate a fixed speed limit for cars or an automatic pilot for aircraft in all kinds of weather and emergencies.

Critics point to the financial crisis of 2007–2009 as an example of the peril of relying on rigid targets. The Fed lowered interest rates and expanded credit throughout this period, even though supply shocks were raising inflation above the Fed’s “comfort zone.” If the Fed had focused entirely on inflation under an inflation-targeting approach, it would have raised interest rates, tightened credit, and reinforced the recessionary tendencies and economic distress in

this period. Instead, the Fed concentrated on trying to cushion the economy from a deep recession and to prevent wholesale bankruptcies of financial institutions (see the discussion of Bear, Stearns above).

Monetary policy cannot banish all recessions or remove every temporary spike of inflation. However, working with fiscal policy, it can reduce the chance of spiraling contractions or hyperinflation.

The debate over rules versus discretion is one of the oldest debates of political economy. This dilemma reflects the difficult tradeoffs that democratic societies face in making decisions between short-run policies intended to attract political support and long-run policies designed to improve the general welfare. There is no single best approach for all times and places. For monetary policy, the United States has resolved the dilemma by creating an independent central bank, accountable to the legislature but given discretion to act forcefully when economic or financial crises arise.

## D. ECONOMIC GROWTH AND HUMAN WELFARE

We have come to the end of our survey of modern macroeconomics. Let us step back and reflect on the central long-run message as stated by economist-journalist Paul Krugman:

Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its living standards over time depends almost entirely on its ability to raise its output per worker.

Promoting a high and growing standard of living for the nation's residents is one of the fundamental goals of macroeconomic policy. Because the current *level* of real income reflects the history of the *growth* of productivity, we can measure the relative success of past growth by examining the per capita GDPs of different countries. A short list is presented in Table 31-4. This table compares incomes by using *purchasing-power-parity* exchange rates that measure the purchasing power of (or quantity of goods and services that can be bought by) different national currencies. Evidently, the United States has been successful in its past growth performance. Perhaps

Country	Per capita GDP, 2006
United States	44,070
Hong Kong	39,200
United Kingdom	33,650
Japan	32,840
Germany	32,680
Slovenia	23,970
South Korea	22,990
Poland	14,250
Mexico	11,990
Botswana	11,730
Argentina	11,670
China	4,660
Nigeria	1,410
Congo	270

**TABLE 31-4. Current Incomes Represent Effects of Past Growth**

Those countries that have grown most rapidly in the past have reached the highest levels of per capita GDP today.

Source: World Bank.

the most worrisome issue in recent years is that the growth in living standards has not been universally shared around the world.

In discussions of growth rates, the numbers often seem tiny. A successful policy might increase a country's growth rate by only 1 percentage point per year (recall the estimated impact of the deficit-reduction package in the last section). But over long periods, this makes a big difference. Table 31-5 shows how tiny acorns grow into mighty oaks as small growth-rate differences cumulate and compound over time. A 4 percent-per-year growth difference leads to a 50-fold difference in income levels over a century.

How can public policy boost economic growth? As we emphasized in our chapters on economic growth, the growth of output per worker and of living standards depends upon a country's saving rate and upon its technological advance. Issues involving saving were discussed earlier in this chapter. Technological change includes not only new products and processes but also improvements in management as well as entrepreneurship and the spirit of enterprise—and we close our discussion with this topic.

Growth rate (% per year)	Real Income per Capita (constant prices)		
	2000	2050	2100
0	\$ 24,000	\$ 24,000	\$ 24,000
1	24,000	39,471	64,916
2	24,000	64,598	173,872
4	24,000	170,560	1,212,118

**TABLE 31-5. Small Differences in Growth Rates Compound into Large Income Differentials over the Decades**

## THE SPIRIT OF ENTERPRISE

Although investment is a central factor in economic growth, technological advance is perhaps even more important. If we took the workers in 1900 and doubled or tripled their capital in mules, saddles, picks, and cow paths, their productivity still could not come close to that of today's workers using huge tractors, superhighways, and supercomputers.

### Fostering Technological Advance

While it is easy to see how technological advance promotes growth in productivity and living standards, governments cannot simply command people to think harder or be smarter. Centrally planned socialist countries used “sticks” to promote science, technology, and innovation, but their efforts failed because neither the institutions nor the “carrots” were present to encourage both innovation and introduction of new technologies. Governments often promote rapid technological change best when they set a sound economic and legal framework with strong intellectual property rights and then allow great economic freedom within that framework. *Free markets in labor, capital, products, and ideas have proved to be the most fertile soil for innovation and technological change.*

Within the framework of free markets, governments can foster rapid technological change both by encouraging new ideas and by ensuring that technologies are effectively used. Policies can focus on both the supply side and the demand side.

**Promoting Demand for Better Technologies.** The world is full of superior technologies that have not been adopted; otherwise, how could we explain the

vast differences in productivity shown in Table 31-4? In considering technology policies, therefore, governments must ensure that firms and industries move toward the *technological frontier*, adopting the best-practice technology available in the global marketplace.

The major lesson here is that “necessity is the mother of invention.” In other words, vigorous competition among firms and industries is the ultimate discipline that ensures innovation. Just as athletes perform better when they are trying to outrun their competitors, so are firms spurred to improve their products and processes when the victors are given fame and fortune while the laggards may go bankrupt.

Vigorous competition involves both domestic and foreign competitors. For large countries on the technological frontier, domestic competition is necessary to promote innovation. The movement to deregulation over the last three decades has brought competition to airlines, energy, telecommunications, and finance, and the positive impact on innovation has been dramatic. For small or technologically backward countries, import competition is crucial to adopting advanced technologies and ensuring product market competition.

**Promoting Supply of New Technologies.** Rapid economic growth requires pushing out the technological frontier by increasing the supply of inventions as well as ensuring that there is adequate demand for existing advanced technologies. There are three ways by which governments can encourage the supply of new technologies.

First, governments can ensure that the basic science, engineering, and technology are appropriately supported. In this respect, the world leader in the

last half-century has been the United States, which combines company support for applied research with top-notch university basic research generously supported by government funding. Particularly outstanding have been the impressive improvements in biomedical technology in the form of new drugs and equipment that benefit consumers directly in daily life. The government's role in supporting for-profit research is accomplished by a strong patent system, predictable and cost-effective regulations, and fiscal incentives such as the current R&D tax credit.

Second, governments can advance technologies at home through encouraging investment by foreign firms. As foreign countries reach and pass the American technological frontier, they can also contribute to American know-how by establishing operations in the United States. The last two decades have brought a number of Japanese automakers to the United States, and Japanese-owned plants have introduced new technologies and managerial practices to the benefit of both the profits of Japanese shareholders and the productivity of American workers.

Third, governments can promote new technologies by pursuing sound macroeconomic policies. These include low and stable taxes on capital income and a low cost of capital to firms. Indeed, the importance of the cost of capital brings us back full circle to the issue of the low saving rate and high real interest rate. American firms are sometimes accused of being myopic and being unwilling to invest for the long run. At least part of this myopia comes from being faced with high real interest rates—high real interest rates *force* rational American firms to look for quick payoffs in their investments. A change in economic policy that lowered real interest rates would change

the “economic spectacles” through which firms look when considering their technological policies. If real interest rates were lower, firms would view long-term, high-risk projects such as investments in technology more favorably, and the increased investment in knowledge would lead to more rapid improvements in technology and productivity.



#### Valediction on Economic Growth

Following the Keynesian revolution, the leaders of the market democracies believed that they could flourish and grow rapidly.

By using the tools of modern economics, countries could moderate the extremes of unemployment and inflation, poverty and wealth, privilege and deprivation. Indeed, many of these goals were achieved as the market economies experienced a period of output expansion and employment growth never seen before.

At the same time, Marxists carped that capitalism was doomed to crash in a cataclysmic depression; ecologists fretted that market economies would choke on their own fumes; and libertarians worried that government planning was leading us down the road to serfdom. But the pessimists overlooked the spirit of enterprise, which was nurtured by an open society and free markets and which led to a continuous stream of technological improvements.

A valediction from John Maynard Keynes, as timely today as it was in an earlier age, provides a fitting summary of our survey of modern economics:

It is Enterprise which builds and improves the world's possessions. If Enterprise is afoot, wealth accumulates whatever happens to Thrift; and if Enterprise is asleep, wealth decays whatever Thrift may be doing.



## SUMMARY

### A. The Economic Consequences of the Government Debt

1. Budgets are systems used by governments and organizations to plan and control expenditures and revenues. Budgets are in surplus (or deficit) when the government has revenues greater (or less) than its

expenditures. Macroeconomic policy depends upon fiscal policy, which comprises the overall stance of spending and taxes.

2. Economists separate the actual budget into its structural and cyclical components. The structural budget calculates how much the government would collect

and spend if the economy were operating at potential output. The cyclical budget accounts for the impact of the business cycle on tax revenues, expenditures, and the deficit. To assess fiscal policy, we should pay close attention to the structural deficit; changes in the cyclical deficit are a *result* of changes in the economy, while structural deficits are a *cause* of changes in the economy.

3. The government debt represents the accumulated borrowings from the public. It is the sum of past deficits. A useful measure of the size of the debt is the debt-GDP ratio, which for the United States has tended to rise during wartime and fall during peacetime.
4. In understanding the impact of government deficits and debt, it is crucial to distinguish between the short run and the long run. Review the box on page 638 and make sure you understand why a larger deficit can increase output in the short run while decreasing output in the long run.
5. To the degree that we borrow from abroad for consumption and pledge posterity to pay back the interest and principal on such external debt, our descendants will indeed find themselves sacrificing consumption to service this debt. If we leave future generations an internal debt but no change in capital stock, there are various internal effects. The process of taxing Peter to pay Paula, or taxing Paula to pay Paula, can involve various microeconomic distortions of productivity and efficiency but should not be confused with owing money to another country.
6. Economic growth may slow if the public debt displaces capital. This syndrome occurs when people substitute public debt for capital or private assets, thereby reducing the economy's private capital stock. In the long run, a larger government debt may slow the growth of potential output and consumption because of the costs of servicing an external debt, the inefficiencies that arise from taxing to pay the interest on the debt, and the diminished capital accumulation that comes from capital displacement.

### B. Advances in Modern Macroeconomics

7. Classical economists relied upon Say's Law of Markets, which holds that "supply creates its own demand." In modern language, the classical approach means that flexible wages and prices quickly remove any excess supply or demand and thereby reestablish full employment. In a classical system, macroeconomic policy has no role to play in stabilizing the real economy, although it will still affect the path of prices.
8. New classical macroeconomics holds that expectations are rational, prices and wages are flexible,

and unemployment is largely voluntary. The policy-ineffectiveness theorem holds that predictable government policies cannot affect real output and unemployment. The theory of the real business cycle points to supply-side technological disturbances and to labor market shifts as the clues to business-cycle fluctuations.

9. What is our appraisal of the contribution of the new classical approach to short-run macroeconomics? The new classical approach properly insists that the economy is populated by forward-looking consumers and investors. These economic actors react to and often anticipate policy and can thereby change economic behavior. This lesson is particularly important in financial markets, where reactions and anticipations often have dramatic effects.

### C. Stabilizing the Economy

10. Nations face two considerations in setting monetary and fiscal policies: the appropriate level of aggregate demand and the best monetary-fiscal mix. The mix of fiscal and monetary policies helps determine the composition of GDP. A high-investment strategy would call for a budget surplus along with low real interest rates.
11. Should governments follow fixed rules or discretion? The answer involves both positive economics and normative values. Conservatives often espouse rules, while liberals often advocate active fine-tuning to attain economic goals. More basic is the question of whether active and discretionary policies stabilize or destabilize the economy. Economists often stress the need for *credible* policies, whether credibility is generated by rigid rules or by wise leadership. A recent trend among countries is inflation targeting for monetary policy, which is a flexible rule-based system that sets a medium-term inflation target while allowing short-run flexibility when economic shocks make attaining a rigid inflation target too costly.

### D. Economic Growth and Human Welfare

12. Remember the dictum: "Productivity isn't everything, but in the long run it is almost everything." A country's ability to improve its living standards over time depends almost entirely on its ability to improve the technologies and capital used by the workforce.
13. Promoting economic growth entails advancing technology. The major role of government is to ensure free markets, protect strong intellectual property rights, promote vigorous competition, and support basic science and technology.

## CONCEPTS FOR REVIEW

### The Economics of Debt and Deficits

government budget  
 budget deficit, surplus, and balance budget:  
 actual  
 structural  
 cyclical  
 short-run impact of  $G$  and  $T$  on output  
 long-run impacts on economic growth:  
 internal vs. external debt  
 distortions from taxation  
 displacement of capital

### Advances in Modern Macroeconomics

Say's Law of Markets  
 rational (forward-looking)  
 expectations, adaptive (backward-looking) expectations  
 policy-ineffectiveness theorem  
 real business cycle, efficiency wages  
 Ricardian view of fiscal policy

### Stabilization

demand management  
 fiscal-monetary mix

fixed rules vs. discretion  
 inflation targeting

### Long-Run Growth

reaching the technological frontier vs. moving it outward  
 Keynes's spirit of enterprise

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

The Krugman quotation is from Paul Krugman, *The Age of Diminished Expectations* (MIT Press, Cambridge, Mass., 1990), p. 9. Many of the foundations of new classical economics were developed by Robert Lucas and republished in *Studies in Business-Cycle Theory* (MIT Press, Cambridge, Mass., 1990). Modern efficiency-wage theory is presented in Edmund Phelps, *Structural Slumps: The Modern Equilibrium Theory of Unemployment, Interest, and Assets* (Harvard University Press, Cambridge, Mass., 1994).

A nontechnical review of the different schools of macroeconomics is provided by Paul Krugman, *Peddling Prosperity: Economic Sense and Nonsense in the Age of Diminished Expectations* (Norton, New York, 1994).

### Websites

Economic issues and data on fiscal policy, budgets, and the debt are regularly provided by the nonpartisan Congressional Budget Office, which is staffed by professional economists. Recent documents are available at [www.cbo.gov](http://www.cbo.gov).

A survey of issues involved in inflation targeting can be found in a 2003 speech by Fed chair Ben Bernanke, "A Perspective on Inflation Targeting," at [www.federalreserve.gov/Boarddocs/Speeches/2003/20030325/default.htm](http://www.federalreserve.gov/Boarddocs/Speeches/2003/20030325/default.htm). Real-business-cycle theory has its own website at [dge.repec.org/index.html](http://dge.repec.org/index.html).

## QUESTIONS FOR DISCUSSION

- A common confusion is that between the debt and the deficit. Explain each of the following:
  - A budget deficit leads to a growing government debt.
  - Reducing the deficit does not reduce the government debt.
  - Reducing the government debt requires running a budget surplus.
  - Even though the government deficit was reduced in the 1993–1998 period, the government debt still rose in these years.
- Is it possible that government *promises* might have a displacement effect along with government debt? Thus, if the government were to promise large future social security benefits to workers, would workers feel richer? Might they reduce saving as a result? Could

- the capital stock end up smaller? Illustrate using Figure 31-2.
3. Trace the impact upon the government debt, the nation's capital stock, and real output of a government program that borrows abroad and spends the money on the following:
    - a. Capital to drill for oil, which is exported (as did Mexico in the 1970s)
    - b. Grain to feed its population (as did Nigeria in the 2000s)
  4. Construct a graph like that in Figure 31-3 showing:
    - a. The paths of consumption and net exports with and without a large government debt
    - b. The paths of consumption with a balanced budget and with a government fiscal surplus
  5. Review the debate between the senators on page 638. Explain which senator would be correct in the following situations:
    - a. The government increased military spending during the Great Depression.
    - b. The government reduced tax rates during a period of full employment in the early 1960s.
    - c. The government refused to raise taxes during the full-employment period of the Vietnam War.
  6. Suppose someone advocates that monetary policy should target a specific inflation rate every year—say, 2 percent per year for the CPI. What are the various arguments for and against this proposal? Specifically, consider the difficulties of attaining a strict inflation target after a sharp supply shock shifts the Phillips curve up. Compare a rigid inflation target with a flexible inflation target in which the target would be attained at the end of a 5-year period.
  7. Political candidates have proposed the policies listed below to speed economic growth in recent years. For each, explain qualitatively the impact upon the growth of potential output and upon the growth of per capita potential output. If possible, give a quantitative estimate of the increase in the growth of potential output and per capita potential output over the next decade.
    - a. Cut the federal budget deficit (or raise the surplus) by 2 percent of GDP, increasing the ratio of investment to GDP by the same amount.
    - b. Increase the federal subsidy to R&D by  $\frac{1}{2}$  percent of GDP, assuming that this subsidy will increase private R&D by the same amount and that R&D has a social rate of return that is 4 times that of private investment.
    - c. Decrease defense spending by 1 percent of GDP at full employment.
    - d. Decrease the number of immigrants so that the labor force declines by 5 percent.
    - e. Increase investments in human capital (or education and on-the-job training) by 1 percent of GDP.
  8. J. M. Keynes wrote, "If the Treasury were to fill old bottles with banknotes, bury them in disused coal mines, and leave it to private enterprise to dig the notes up again, there need be no more unemployment and the real income of the community would probably become a good deal greater than it actually is" (*The General Theory*, p. 129). Explain why Keynes's analysis of the utility of a discretionary public-works program might be correct during a depression. How could well-designed monetary policies have the same impact on employment while producing a larger quantity of useful goods and services?
  9. What would Keynesians and new classical macroeconomists predict to be the impacts of each of the following on the course of prices, output, and employment? In each case, hold tax rates and interest rates constant unless specifically mentioned:
    - a. A large tax cut
    - b. A large cut in interest rates
    - c. A wave of innovations that increases potential output by 10 percent
    - d. A burst of exports
  10. **Advanced problem** (on rational expectations): Consider the effect of rational expectations on consumption behavior.
    - a. Say that the government proposes a temporary tax cut of \$20 billion, lasting for a year. Consumers with adaptive expectations consequently assume that their disposable incomes would be \$20 billion higher every year. What would be the resulting impact on consumption spending and GDP in the simple multiplier model of Chapter 22?
    - b. Next suppose that consumers have rational expectations. They rationally forecast that the tax cut is only for 1 year. Being "life-cycle" consumers, they recognize that their average lifetime incomes will increase by only \$2 billion per year, not by \$20 billion per year. What would be the reaction of such consumers? Analyze, then, the impact of rational expectations on the effectiveness of temporary tax cuts.
    - c. Finally, assume that consumers behave according to the Ricardian view. What would be the impact of the tax cut on saving and consumption? Explain the differences between the models discussed in a, b, and c.