



CHAPTER

6

Unemployment

A man willing to work, and unable to find work, is perhaps the saddest sight that fortune's inequality exhibits under the sun.

— Thomas Carlyle

Unemployment is the macroeconomic problem that affects people most directly and severely. For most people, the loss of a job means a reduced living standard and psychological distress. It is no surprise that unemployment is a frequent topic of political debate and that politicians often claim that their proposed policies would help create jobs.

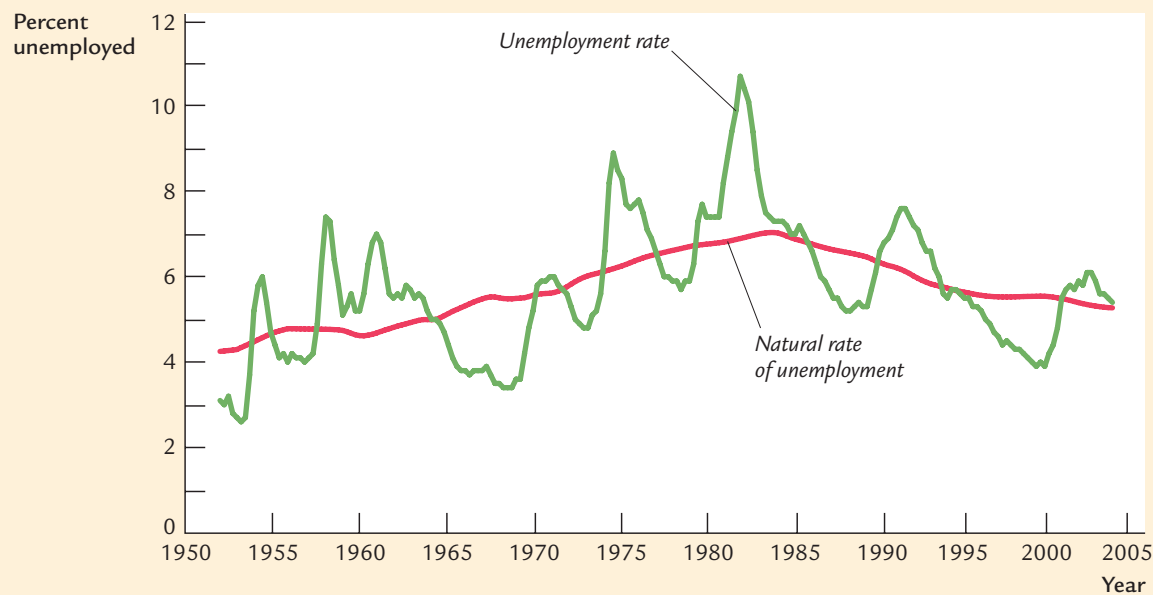
Economists study unemployment to identify its causes and to help improve the public policies that affect the unemployed. Some of these policies, such as job-training programs, help people find employment. Others, such as unemployment insurance, alleviate some of the hardships that the unemployed face. Still other policies affect the prevalence of unemployment inadvertently. Laws mandating a high minimum wage, for instance, are widely thought to raise unemployment among the least skilled and experienced members of the labor force.

Our discussions of the labor market so far have ignored unemployment. In particular, the model of national income in Chapter 3 was built with the assumption that the economy was always at full employment. In reality, of course, not everyone in the labor force has a job all the time: all free-market economies experience some unemployment.

Figure 6-1 shows the rate of unemployment—the percentage of the labor force unemployed—in the United States since 1952. Although the rate of unemployment fluctuates from year to year, it never gets even close to zero. The average is between 5 and 6 percent, meaning that about 1 out of every 18 people wanting a job does not have one.

In this chapter we begin our study of unemployment by discussing why there is always some unemployment and what determines its level. We do not study what determines the year-to-year fluctuations in the rate of unemployment until Part Four of this book, which examines short-run economic fluctuations. Here we examine the determinants of the **natural rate of unemployment**—the average rate of unemployment around which the economy fluctuates. The natural rate is

FIGURE 6-1



The Unemployment Rate and the Natural Rate of Unemployment in the United States

There is always some unemployment. The natural rate of unemployment is the average level around which the unemployment rate fluctuates. (The natural rate of unemployment for any particular quarter is estimated here by averaging all the unemployment rates from ten years earlier to ten years later. Future unemployment rates are set at 5.5 percent.)

Source: Bureau of Labor Statistics.

the rate of unemployment toward which the economy gravitates in the long run, given all the labor-market imperfections that impede workers from instantly finding jobs.

6-1

Job Loss, Job Finding, and the Natural Rate of Unemployment

Every day some workers lose or quit their jobs, and some unemployed workers are hired. This perpetual ebb and flow determines the fraction of the labor force that is unemployed. In this section we develop a model of labor-force dynamics that shows what determines the natural rate of unemployment.¹

We start with some notation. Let L denote the labor force, E the number of employed workers, and U the number of unemployed workers. Because every

¹ Robert E. Hall, "A Theory of the Natural Rate of Unemployment and the Duration of Unemployment," *Journal of Monetary Economics* 5 (April 1979): 153–169.

worker is either employed or unemployed, the labor force is the sum of the employed and the unemployed:

$$L = E + U.$$

In this notation, the rate of unemployment is U/L .

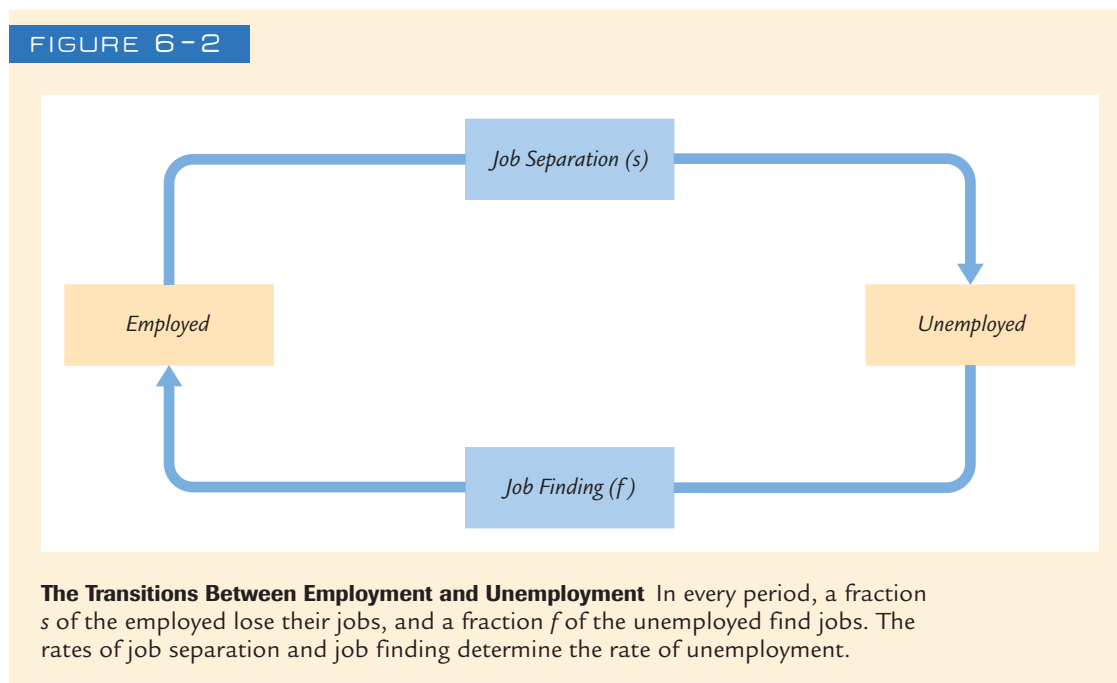
To see what factors determine the unemployment rate, we assume that the labor force L is fixed and focus on the transition of individuals in the labor force between employment E and unemployment U . This is illustrated in Figure 6-2. Let s denote the *rate of job separation*, the fraction of employed individuals who lose their job each month. Let f denote the *rate of job finding*, the fraction of unemployed individuals who find a job each month. Together, the rate of job separation s and the rate of job finding f determine the rate of unemployment.

If the unemployment rate is neither rising nor falling—that is, if the labor market is in a steady state—then the number of people finding jobs must equal the number of people losing jobs. The number of people finding jobs is fU and the number of people losing jobs is sE , so we can write the steady-state condition as

$$fU = sE.$$

We can use this equation to find the steady-state unemployment rate. From our definition of the labor force, we know that $E = L - U$; that is, the number of employed equals the labor force minus the number of unemployed. If we substitute $(L - U)$ for E in the steady-state condition, we find

$$fU = s(L - U).$$



To get closer to solving for the unemployment rate, divide both sides of this equation by L to obtain

$$f \frac{U}{L} = s \left(1 - \frac{U}{L}\right).$$

Now we can solve for U/L to find

$$\frac{U}{L} = \frac{s}{s + f}.$$

This can also be written as

$$\frac{U}{L} = \frac{1}{1 + f/s}.$$

This equation shows that the steady-state rate of unemployment U/L depends on the rates of job separation s and job finding f . The higher the rate of job separation, the higher the unemployment rate. The higher the rate of job finding, the lower the unemployment rate.

Here's a numerical example. Suppose that 1 percent of the employed lose their jobs each month ($s = 0.01$). This means that on average jobs last 100 months, or about 8 years. Suppose further that 20 percent of the unemployed find a job each month ($f = 0.20$), so that spells of unemployment last 5 months on average. Then the steady-state rate of unemployment is

$$\begin{aligned} \frac{U}{L} &= \frac{0.01}{0.01 + 0.20} \\ &= 0.0476. \end{aligned}$$

The rate of unemployment in this example is about 5 percent.

This simple model of the natural rate of unemployment has an important implication for public policy. *Any policy aimed at lowering the natural rate of unemployment must either reduce the rate of job separation or increase the rate of job finding. Similarly, any policy that affects the rate of job separation or job finding also changes the natural rate of unemployment.*

Although this model is useful in relating the unemployment rate to job separation and job finding, it fails to answer a central question: Why is there unemployment in the first place? If a person could always find a job quickly, then the rate of job finding would be very high and the rate of unemployment would be near zero. This model of the unemployment rate assumes that job finding is not instantaneous, but it fails to explain why. In the next two sections, we examine two underlying reasons for unemployment: job search and wage rigidity.

6-2 Job Search and Frictional Unemployment

One reason for unemployment is that it takes time to match workers and jobs. The equilibrium model of the aggregate labor market discussed in Chapter 3 assumes that all workers and all jobs are identical, and therefore that all workers

are equally well suited for all jobs. If this were true and the labor market were in equilibrium, then a job loss would not cause unemployment: a laid-off worker would immediately find a new job at the market wage.

In fact, workers have different preferences and abilities, and jobs have different attributes. Furthermore, the flow of information about job candidates and job vacancies is imperfect, and the geographic mobility of workers is not instantaneous. For all these reasons, searching for an appropriate job takes time and effort, and this tends to reduce the rate of job finding. Indeed, because different jobs require different skills and pay different wages, unemployed workers may not accept the first job offer they receive. The unemployment caused by the time it takes workers to search for a job is called **frictional unemployment**.

Some frictional unemployment is inevitable in a changing economy. For many reasons, the types of goods that firms and households demand vary over time. As the demand for goods shifts, so does the demand for the labor that produces those goods. The invention of the personal computer, for example, reduced the demand for typewriters and, as a result, for labor by typewriter manufacturers. At the same time, it increased the demand for labor in the electronics industry. Similarly, because different regions produce different goods, the demand for labor may be rising in one part of the country and falling in another. An increase in the price of oil may cause the demand for labor to rise in oil-producing states such as Texas, but because expensive oil makes driving less attractive, it decreases the demand for labor in auto-producing states such as Michigan. Economists call a change in the composition of demand among industries or regions a **sectoral shift**. Because sectoral shifts are always occurring, and because it takes time for workers to change sectors, there is always frictional unemployment.

Sectoral shifts are not the only cause of job separation and frictional unemployment. In addition, workers find themselves unexpectedly out of work when their firms fail, when their job performance is deemed unacceptable, or when their particular skills are no longer needed. Workers also may quit their jobs to change careers or to move to different parts of the country. Regardless of the cause of the job separation, it will take time and effort for the worker to find a new job. As long as the supply and demand for labor among firms is changing, frictional unemployment is unavoidable.

Public Policy and Frictional Unemployment

Many public policies seek to decrease the natural rate of unemployment by reducing frictional unemployment. Government employment agencies disseminate information about job vacancies in order to match jobs and workers more efficiently. Publicly funded retraining programs are designed to ease the transition of workers from declining to growing industries. If these programs succeed at increasing the rate of job finding, they decrease the natural rate of unemployment.

Other government programs inadvertently increase the amount of frictional unemployment. One of these is **unemployment insurance**. Under this program, unemployed workers can collect a fraction of their wages for a certain period after losing their jobs. Although the precise terms of the program differ

from year to year and from state to state, a typical worker covered by unemployment insurance in the United States receives 50 percent of his or her former wages for 26 weeks. In many European countries, unemployment-insurance programs are significantly more generous.

By softening the economic hardship of unemployment, unemployment insurance increases the amount of frictional unemployment and raises the natural rate. The unemployed who receive unemployment-insurance benefits are less pressed to search for new employment and are more likely to turn down unattractive job offers. Both of these changes in behavior reduce the rate of job finding. In addition, because workers know that their incomes are partially protected by unemployment insurance, they are less likely to seek jobs with stable employment prospects and are less likely to bargain for guarantees of job security. These behavioral changes raise the rate of job separation.

That unemployment insurance raises the natural rate of unemployment does not necessarily imply that the policy is ill-advised. The program has the benefit of reducing workers' uncertainty about their incomes. Moreover, inducing workers to reject unattractive job offers may lead to a better matching between workers and jobs. Evaluating the costs and benefits of different systems of unemployment insurance is a difficult task that continues to be a topic of much research.

Economists who study unemployment insurance often propose reforms that would reduce the amount of unemployment. One common proposal is to require a firm that lays off a worker to bear the full cost of that worker's unemployment benefits. Such a system is called *100 percent experience rated*, because the rate that each firm pays into the unemployment-insurance system fully reflects the unemployment experience of its own workers. Most current programs are *partially experience rated*. Under this system, when a firm lays off a worker, it is charged for only part of the worker's unemployment benefits; the remainder comes from the program's general revenue. Because a firm pays only a fraction of the cost of the unemployment it causes, it has an incentive to lay off workers when its demand for labor is temporarily low. By reducing that incentive, the proposed reform may reduce the prevalence of temporary layoffs.

CASE STUDY

Unemployment Insurance and the Rate of Job Finding

Many studies have examined the effect of unemployment insurance on job search. The most persuasive studies use data on the experiences of unemployed individuals, rather than economy-wide rates of unemployment. Individual data often yield sharp results that are open to few alternative explanations.

One study followed the experience of individual workers as they used up their eligibility for unemployment-insurance benefits. It found that when unemployed workers become ineligible for benefits, they are more likely to find jobs. In particular, the probability of a person finding a job more than doubles when his or her benefits run out. One possible explanation is that an absence of benefits increases the search effort of unemployed workers. Another possibility is that

workers without benefits are more likely to accept job offers that would otherwise be declined because of low wages or poor working conditions.²

Additional evidence on how economic incentives affect job search comes from an experiment that the state of Illinois ran in 1985. Randomly selected new claimants for unemployment insurance were each offered a \$500 bonus if they found employment within 11 weeks. The subsequent experience of this group was compared to that of a control group not offered the incentive. The average duration of unemployment for the group offered the \$500 bonus was 17.0 weeks, compared to 18.3 weeks for the control group. Thus, the bonus reduced the average spell of unemployment by 7 percent, suggesting that more effort was devoted to job search. This experiment shows clearly that the incentives provided by the unemployment-insurance system affect the rate of job finding.³

6-3 Real-Wage Rigidity and Structural Unemployment

A second reason for unemployment is **wage rigidity**—the failure of wages to adjust to a level at which labor supply equals labor demand. In the equilibrium model of the labor market, as outlined in Chapter 3, the real wage adjusts to equilibrate labor supply and labor demand. Yet wages are not always flexible. Sometimes the real wage is stuck above the market-clearing level.

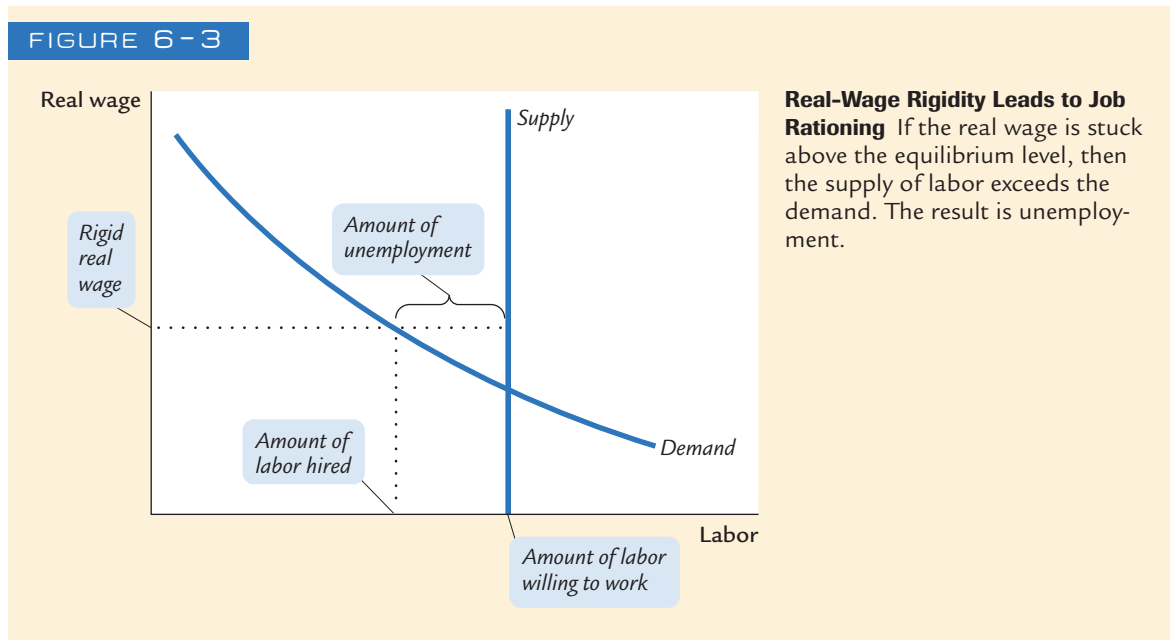
Figure 6-3 shows why wage rigidity leads to unemployment. When the real wage is above the level that equilibrates supply and demand, the quantity of labor supplied exceeds the quantity demanded. Firms must in some way ration the scarce jobs among workers. Real-wage rigidity reduces the rate of job finding and raises the level of unemployment.

The unemployment resulting from wage rigidity and job rationing is sometimes called **structural unemployment**. Workers are unemployed not because they are actively searching for the jobs that best suit their individual skills but because there is a fundamental mismatch between the number of people who want to work and the number of jobs that are available. At the going wage, the quantity of labor supplied exceeds the quantity of labor demanded, so many workers are simply waiting for jobs to open up.

To understand wage rigidity and structural unemployment, we must examine why the labor market does not clear. When the real wage exceeds the equilibrium level and the supply of workers exceeds the demand, we might expect firms to lower the wages they pay. Structural unemployment arises because firms fail

² Lawrence F. Katz and Bruce D. Meyer, “Unemployment Insurance, Recall Expectations, and Unemployment Outcomes,” *Quarterly Journal of Economics* 105 (November 1990): 973–1002.

³ Stephen A. Woodbury and Robert G. Spiegelman, “Bonuses to Workers and Employers to Reduce Unemployment: Randomized Trials in Illinois,” *American Economic Review* 77 (September 1987): 513–530.



to reduce wages despite an excess supply of labor. We now turn to three causes of this wage rigidity: minimum-wage laws, the monopoly power of unions, and efficiency wages.

Minimum-Wage Laws

The government causes wage rigidity when it prevents wages from falling to equilibrium levels. Minimum-wage laws set a legal minimum on the wages that firms pay their employees. Since the passage of the Fair Labor Standards Act of 1938, the U.S. federal government has enforced a minimum wage that usually has been between 30 and 50 percent of the average wage in manufacturing. For most workers, then, this minimum wage is not binding, because they earn well above the minimum. Yet for some workers, especially the unskilled and inexperienced, the minimum wage raises their wage above its equilibrium level and, therefore, reduces the quantity of their labor that firms demand.

Economists believe that the minimum wage has its greatest impact on teenage unemployment. The equilibrium wages of teenagers tend to be low for two reasons. First, because teenagers are among the least skilled and least experienced members of the labor force, they tend to have low marginal productivity. Second, teenagers often take some of their “compensation” in the form of on-the-job training rather than direct pay. An apprenticeship is a classic example of training offered in place of wages. For both these reasons, the wage at which the supply of teenage workers equals the demand is low. The minimum wage is therefore more often binding for teenagers than for others in the labor force.

Many economists have studied the impact of the minimum wage on teenage employment. These researchers compare the variation in the minimum wage

over time with the variation in the number of teenagers with jobs. These studies find that a 10 percent increase in the minimum wage reduces teenage employment by 1 to 3 percent.⁴

The minimum wage is a perennial source of political debate. Advocates of a higher minimum wage view it as a means of raising the income of the working poor. Certainly, the minimum wage provides only a meager standard of living: in the United States, two adults working full time at minimum-wage jobs would just exceed the official poverty level for a family of four. Although minimum-wage advocates often admit that the policy causes unemployment for some workers, they argue that this cost is worth bearing to raise others out of poverty.

Opponents of a higher minimum wage claim that it is not the best way to help the working poor. They contend not only that the increased labor costs would raise unemployment but also that the minimum wage is poorly targeted. Many minimum-wage earners are teenagers from middle-class homes working for discretionary spending money, rather than heads of households working to support their families.

Many economists and policymakers believe that tax credits are a better way to increase the incomes of the working poor. The *earned income tax credit* is an amount that poor working families are allowed to subtract from the taxes they owe. For a family with very low income, the credit exceeds its taxes, and the family receives a payment from the government. Unlike the minimum wage, the earned income tax credit does not raise labor costs to firms and, therefore, does not reduce the quantity of labor that firms demand. It has the disadvantage, however, of reducing the government's tax revenue.

CASE STUDY

The Characteristics of Minimum-Wage Workers

Who earns the minimum wage? The question can be answered using the Current Population Survey—the labor market survey used to calculate the unemployment rate and many other statistics. In 2005, the Bureau of Labor Statistics released a report describing the workers who earned at or below the minimum wage in 2004, when the minimum was \$5.15 per hour. Here is a summary:

- ▶ About 74 million American workers are paid hourly, representing 60 percent of all wage and salary workers. Of these workers, 520,000 report earning exactly \$5.15 per hour, and another 1.5 million report earning

⁴ Charles Brown, "Minimum Wage Laws: Are They Overrated?" *Journal of Economic Perspectives* 2 (Summer 1988): 133–146. Brown presents the mainstream view of the effects of minimum wages, but it should be noted that the magnitude of employment effects is controversial. For research suggesting negligible employment effects, see David Card and Alan Krueger, *Myth and Measurement: The New Economics of the Minimum Wage* (Princeton, NJ: Princeton University Press, 1995); and Lawrence Katz and Alan Krueger, "The Effects of the Minimum Wage on the Fast-Food Industry," *Industrial and Labor Relations Review* 46 (October 1992): 6–21. For research suggesting the opposite conclusion, see David Neumark and William Wascher, "Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws," *Industrial and Labor Relations Review* 46 (October 1992): 55–81.

less. A reported wage below the minimum is possible because some workers are exempt from the statute (newspaper delivery workers, for example), because enforcement is imperfect, and because some workers round down to \$5.00 when reporting their wages on surveys.

- ▶ Minimum-wage workers are more likely to be women than men. About 2 percent of men and 4 percent of women reported wages at or below the prevailing federal minimum.
- ▶ Minimum-wage workers tend to be young. About half of all hourly-paid workers earning \$5.15 or less were under age 25, and about one-fourth were age 16–19. Among teenagers, about 9 percent earned \$5.15 or less, compared with about 2 percent of workers age 25 and over.
- ▶ Minimum-wage workers tend to be less educated. Among hourly-paid workers age 16 and over, about 2 percent of those who had only a high-school diploma earned \$5.15 or less, compared with about 1 percent for those who had obtained a college degree.
- ▶ Minimum-wage workers are more likely to be working part-time. Among part-time workers (those who usually work less than 35 hours per week), 7 percent were paid \$5.15 or less, compared to 1 percent of full-time workers.
- ▶ The industry with the highest proportion of workers with reported hourly wages at or below \$5.15 was leisure and hospitality (about 15 percent). About three-fifths of all workers paid at or below the minimum wage were employed in this industry, primarily in food services and drinking places. For many of these workers, tips supplement the hourly wages received.

These facts by themselves do not tell us whether the minimum wage is a good or bad policy, or whether it is too high or too low. But when evaluating any public policy, it is useful to keep in mind those individuals who are affected by it.⁵

Unions and Collective Bargaining

A second cause of wage rigidity is the monopoly power of unions. Table 6-1 shows the importance of unions in several major countries. In the United States, only 18 percent of workers have their wages set through collective bargaining. In most European countries, unions play a much larger role.

The wages of unionized workers are determined not by the equilibrium of supply and demand but by bargaining between union leaders and firm management. Often, the final agreement raises the wage above the equilibrium level and allows the firm to decide how many workers to employ. The result is a reduction

⁵ The figures reported here are from the website of the Bureau of Labor Statistics. The link is <http://www.bls.gov/cps/minwage2004.htm>

TABLE 6-1

Percent of Workers Covered by Collective Bargaining

United States	18%
Japan	23
Canada	38
United Kingdom	47
Switzerland	53
New Zealand	67
Spain	68
Netherlands	71
Norway	75
Portugal	79
Australia	80
Sweden	83
Belgium	90
Germany	90
France	92
Finland	95
Austria	98

Source: OECD Employment Outlook 2004, as reported in Alberto Alesina, Edward Glaeser, and Bruce Sacerdote, "Work and Leisure in the U.S. and Europe: Why So Different?" *NBER Macroeconomics Annual* 2005.

in the number of workers hired, a lower rate of job finding, and an increase in structural unemployment.

Unions can also influence the wages paid by firms whose workforces are not unionized because the threat of unionization can keep wages above the equilibrium level. Most firms dislike unions. Unions not only raise wages but also increase the bargaining power of labor on many other issues, such as hours of employment and working conditions. A firm may choose to pay its workers high wages to keep them happy and discourage them from forming a union.

The unemployment caused by unions and by the threat of unionization is an instance of conflict between different groups of workers—**insiders** and **outsiders**. Those workers already employed by a firm, the insiders, typically try to keep their firm's wages high. The unemployed, the outsiders, bear part of the cost of higher wages because at a lower wage they might be hired. These two groups inevitably have conflicting interests. The effect of any bargaining process on wages and employment depends crucially on the relative influence of each group.

The conflict between insiders and outsiders is resolved differently in different countries. In some countries, such as the United States, wage bargaining takes place at the level of the firm or plant. In other countries, such as Sweden, wage bargaining takes place at the national level—with the government often playing a key role. Despite a highly unionized labor force, Sweden has not experienced extraordinarily high unemployment throughout its history. One

possible explanation is that the centralization of wage bargaining and the role of the government in the bargaining process give more influence to the outsiders, which keeps wages closer to the equilibrium level.

Efficiency Wages

Efficiency-wage theories propose a third cause of wage rigidity in addition to minimum-wage laws and unionization. These theories hold that high wages make workers more productive. The influence of wages on worker efficiency may explain the failure of firms to cut wages despite an excess supply of labor. Even though a wage reduction would lower a firm's wage bill, it would also—if these theories are correct—lower worker productivity and the firm's profits.

Economists have proposed various theories to explain how wages affect worker productivity. One efficiency-wage theory, which is applied mostly to poorer countries, holds that wages influence nutrition. Better-paid workers can afford a more nutritious diet, and healthier workers are more productive. A firm may decide to pay a wage above the equilibrium level to maintain a healthy work force. Obviously, this consideration is not important for employers in wealthier countries, such as the United States and most of Europe, because the equilibrium wage is well above the level necessary to maintain good health.

A second efficiency-wage theory, which is more relevant for developed countries, holds that high wages reduce labor turnover. Workers quit jobs for many reasons—to accept better positions at other firms, to change careers, or to move to other parts of the country. The more a firm pays its workers, the greater is their incentive to stay with the firm. By paying a high wage, a firm reduces the frequency at which its workers quit, thereby decreasing the time and money spent hiring and training new workers.

A third efficiency-wage theory holds that the average quality of a firm's work force depends on the wage it pays its employees. If a firm reduces its wage, the best employees may take jobs elsewhere, leaving the firm with inferior employees who have fewer alternative opportunities. Economists recognize this unfavorable sorting as an example of *adverse selection*—the tendency of people with more information (in this case, the workers, who know their own outside opportunities) to self-select in a way that disadvantages people with less information (the firm). By paying a wage above the equilibrium level, the firm may reduce adverse selection, improve the average quality of its work force, and thereby increase productivity.

A fourth efficiency-wage theory holds that a high wage improves worker effort. This theory posits that firms cannot perfectly monitor their employees' work effort, and that employees must themselves decide how hard to work. Workers can choose to work hard, or they can choose to shirk and risk getting caught and fired. Economists recognize this possibility as an example of *moral hazard*—the tendency of people to behave inappropriately when their behavior is imperfectly monitored. The firm can reduce the problem of moral hazard by paying a high wage. The higher the wage, the greater the cost to the worker of

getting fired. By paying a higher wage, a firm induces more of its employees not to shirk and thus increases their productivity.

Although these four efficiency-wage theories differ in detail, they share a common theme: because a firm operates more efficiently if it pays its workers a high wage, the firm may find it profitable to keep wages above the level that balances supply and demand. The result of this higher-than-equilibrium wage is a lower rate of job finding and greater unemployment.⁶

CASE STUDY

Henry Ford's \$5 Workday

In 1914 the Ford Motor Company started paying its workers \$5 per day. The prevailing wage at the time was between \$2 and \$3 per day, so Ford's wage was well above the equilibrium level. Not surprisingly, long lines of job seekers waited outside the Ford plant gates hoping for a chance to earn this high wage.

What was Ford's motive? Henry Ford later wrote, "We wanted to pay these wages so that the business would be on a lasting foundation. We were building for the future. A low wage business is always insecure. . . . The payment of five dollars a day for an eight hour day was one of the finest cost cutting moves we ever made."

From the standpoint of traditional economic theory, Ford's explanation seems peculiar. He was suggesting that *high* wages imply *low* costs. But perhaps Ford had discovered efficiency-wage theory. Perhaps he was using the high wage to increase worker productivity.

Evidence suggests that paying such a high wage did benefit the company. According to an engineering report written at the time, "The Ford high wage does away with all the inertia and living force resistance. . . . The workingmen are absolutely docile, and it is safe to say that since the last day of 1913, every single day has seen major reductions in Ford shops' labor costs." Absenteeism fell by 75 percent, suggesting a large increase in worker effort. Alan Nevins, a historian who studied the early Ford Motor Company, wrote, "Ford and his associates freely declared on many occasions that the high wage policy had turned out to be good business. By this they meant that it had improved the discipline of the workers, given them a more loyal interest in the institution, and raised their personal efficiency."⁷

⁶ For more extended discussions of efficiency wages, see Janet Yellen, "Efficiency Wage Models of Unemployment," *American Economic Review Papers and Proceedings* (May 1984): 200–205; and Lawrence Katz, "Efficiency Wages: A Partial Evaluation," *NBER Macroeconomics Annual* (1986): 235–276.

⁷ Jeremy I. Bulow and Lawrence H. Summers, "A Theory of Dual Labor Markets With Application to Industrial Policy, Discrimination, and Keynesian Unemployment," *Journal of Labor Economics* 4 (July 1986): 376–414; Daniel M. G. Raff and Lawrence H. Summers, "Did Henry Ford Pay Efficiency Wages?" *Journal of Labor Economics* 5 (October 1987, Part 2): S57–S86.

6-4

**Labor Market Experience:
The United States**

So far we have developed the theory behind the natural rate of unemployment. We began by showing that the economy's steady-state unemployment rate depends on the rates of job separation and job finding. Then we discussed two reasons why job finding is not instantaneous: the process of job search (which leads to frictional unemployment) and wage rigidity (which leads to structural unemployment). Wage rigidity, in turn, arises from minimum-wage laws, unionization, and efficiency wages.

With these theories as background, we now examine some additional facts about unemployment, focusing at first on the case of American labor markets. These facts will help us to evaluate our theories and assess public policies aimed at reducing unemployment.

The Duration of Unemployment

When a person becomes unemployed, is the spell of unemployment likely to be short or long? The answer to this question is important because it indicates the reasons for the unemployment and what policy response is appropriate. On the one hand, if most unemployment is short-term, one might argue that it is frictional and perhaps unavoidable. Unemployed workers may need some time to search for the job that is best suited to their skills and tastes. On the other hand, long-term unemployment cannot easily be attributed to the time it takes to match jobs and workers: we would not expect this matching process to take many months. Long-term unemployment is more likely to be structural unemployment, representing a mismatch between the number of jobs available and the number of people who want to work. Thus, data on the duration of unemployment can affect our view about the reasons for unemployment.

The answer to our question turns out to be subtle. The data show that most spells of unemployment are short but that most weeks of unemployment are attributable to the long-term unemployed. Consider the data for a typical year, 1974, during which the unemployment rate was 5.6 percent. In that year, 60 percent of the spells of unemployment ended within one month, yet 69 percent of the weeks of unemployment occurred in spells that lasted two or more months.⁸

To see how both these facts can be true, consider the following example. Suppose that 10 people are unemployed for part of a given year. Of these 10 people, 8 are unemployed for 1 month, and 2 are unemployed for 12 months, totaling 32 months of unemployment. In this example, most spells of unemployment are short: 8 of the 10 unemployment spells, or 80 percent, end in 1 month. Yet most months of unemployment are attributable to the long-term unemployed: 24 of the 32 months of unemployment, or 75 percent, are experienced by the 2 work-

⁸ Kim B. Clark and Lawrence H. Summers, "Labor Market Dynamics and Unemployment: A Reconsideration," *Brookings Papers on Economic Activity* (1979:1): 13–72.

ers who are unemployed for 12 months. Depending on whether we look at spells of unemployment or months of unemployment, most unemployment can appear to be short-term or long-term.

This evidence on the duration of unemployment has an important implication for public policy. If the goal is to lower substantially the natural rate of unemployment, policies must aim at the long-term unemployed, because these individuals account for a large amount of unemployment. Yet policies must be carefully targeted, because the long-term unemployed constitute a small minority of those who become unemployed. Most people who become unemployed find work within a short time.

Variation in the Unemployment Rate Across Demographic Groups

The rate of unemployment varies substantially across different groups within the population. Table 6-2 presents the U.S. unemployment rates for different demographic groups in 2004, when the overall unemployment rate was 5.5 percent.

This table shows that younger workers have much higher unemployment rates than older ones. To explain this difference, recall our model of the natural rate of unemployment. The model isolates two possible causes for a high rate of unemployment: a low rate of job finding and a high rate of job separation. When economists study data on the transition of individuals between employment and unemployment, they find that those groups with high unemployment tend to have high rates of job separation. They find less variation across groups in the rate of job finding. For example, an employed white male is four times more likely to become unemployed if he is a teenager than if he is middle-aged; once unemployed, his rate of job finding is not closely related to his age.

These findings help explain the higher unemployment rates for younger workers. Younger workers have only recently entered the labor market, and they are often uncertain about their career plans. It may be best for them to try different types of jobs before making a long-term commitment to a specific occupation. If so, we should expect a higher rate of job separation and a higher rate of frictional unemployment for this group.

Another fact that stands out from Table 6-2 is that unemployment rates are much higher for blacks than for whites. This phenomenon is not well understood.

TABLE 6-2

Unemployment Rate by Demographic Group: 2004

Age	White Men	White Women	Black Men	Black Women
16-19	16.4	13.7	35.6	27.6
20 and over	4.4	4.2	9.9	8.9

Source: U.S. Department of Labor.

Data on transitions between employment and unemployment show that the higher unemployment rates for blacks, and especially for black teenagers, arise because of both higher rates of job separation and lower rates of job finding. Possible reasons for the lower rates of job finding include less access to informal job-finding networks and discrimination by employers.

Trends in Unemployment

Over the past half century, the natural rate of unemployment in the United States has not been stable. If you look back at Figure 6-1, you will see that unemployment averaged below 5 percent in the 1950s and 1960s, rose to over 6 percent in the 1970s and 1980s, and then drifted back below 5 percent in the 1990s. Although economists do not have a conclusive explanation for these changes, they have proposed several hypotheses.

Demographics One explanation stresses the changing composition of the U.S. labor force. After World War II, birthrates rose dramatically: the number of births rose from 2.9 million in 1945 to a peak of 4.3 million in 1957, before falling back to 3.1 million in 1973. This rise in births in the 1950s led to a rise in the number of young workers in the 1970s. Younger workers have higher unemployment rates, however, so when the baby-boom generation entered the labor force, they increased the average level of unemployment. Then as the baby-boom workers aged, the average age of the labor force increased, lowering the average unemployment rate in the 1990s.

This demographic change, however, cannot fully explain the trends in unemployment because similar trends are apparent for fixed demographic groups. For example, for men between the ages of 25 and 54, the average unemployment rate rose from 3.0 percent in the 1960s to 6.1 percent in the 1980s. Thus, although demographic changes may be part of the story of rising unemployment over this period, there must be other explanations of the long-term trend as well.

Sectoral Shifts A second explanation is based on changes in the prevalence of sectoral shifts. The greater the amount of reallocation among regions and industries, the greater the rate of job separation and the higher the level of frictional unemployment. One source of sectoral shifts during the 1970s and early 1980s was the great volatility in oil prices caused by OPEC, the international oil cartel. These large changes in oil prices may have required reallocating labor between more-energy-intensive and less-energy-intensive sectors. If so, oil-price volatility may have increased unemployment during this period. The increase in oil-price volatility in the early 2000s, however, did not cause a similar rise in the natural rate of unemployment, but this may be because the economy is now significantly less oil-intensive (as measured by oil consumption per unit of GDP) than it was three decades ago.

Productivity A third explanation for the trends in unemployment emphasizes the link between unemployment and productivity. As Chapter 8 discusses more fully, the 1970s experienced a slowdown in productivity growth, and the 1990s

experienced a pickup in productivity growth. These productivity changes roughly coincide with changes in unemployment. Perhaps slowing productivity during the 1970s raised the natural rate of unemployment, and accelerating productivity during the 1990s lowered it.

Why such an effect would occur, however, is not obvious. In standard theories of the labor market, higher productivity means greater labor demand and thus higher real wages, but unemployment is unchanged. This prediction is consistent with the long-term data, which show consistent upward trends in productivity and real wages but no trend in unemployment. Yet suppose that workers are slow to catch on to news about productivity. When productivity changes, workers may only gradually alter the real wages they ask from their employers, making real wages sluggish in response to labor demand. An acceleration in productivity growth, such as that experienced during the 1990s, will increase labor demand and, with a sluggish real wage, reduce the amount of unemployment.

In the end, the trends in the unemployment rate remain a mystery. The proposed explanations are plausible, but none seems conclusive on its own. Perhaps there is no single answer. The upward drift in the unemployment rate in the 1970s and 1980s and the downward drift in the 1990s may be the result of several unrelated developments.⁹

Transitions Into and Out of the Labor Force

So far we have ignored an important aspect of labor-market dynamics: the movement of individuals into and out of the labor force. Our model of the natural rate of unemployment assumes that the labor force is fixed. In this case, the sole reason for unemployment is job separation, and the sole reason for leaving unemployment is job finding.

In fact, movements into and out of the labor force are important. About one-third of the unemployed have only recently entered the labor force. Some of these entrants are young workers still looking for their first jobs; others have worked before but had temporarily left the labor force. In addition, not all unemployment ends with job finding: almost half of all spells of unemployment end in the unemployed person's withdrawal from the labor market.

Individuals entering and leaving the labor force make unemployment statistics more difficult to interpret. On the one hand, some individuals calling themselves unemployed may not be seriously looking for jobs and perhaps should best be viewed as out of the labor force. Their "unemployment" may not represent a social problem. On the other hand, some individuals may want jobs but, after unsuccess-

⁹ On the role of demographics, see Robert Shimer, "Why Is the U.S. Unemployment Rate So Much Lower?" *NBER Macroeconomics Annual* 13 (1998). On the role of sectoral shifts, see David M. Lilien, "Sectoral Shifts and Cyclical Unemployment," *Journal of Political Economy* 90 (August 1982): 777–793. On the role of productivity, see Laurence Ball and Robert Moffitt, "Productivity Growth and the Phillips Curve," in Alan B. Krueger and Robert M. Solow, eds., *The Roaring Nineties: Can Full Employment Be Sustained?* (New York: Russell Sage Foundation and Century Foundation Press, 2002).

ful searches, have given up looking. These **discouraged workers** are counted as being out of the labor force and do not show up in unemployment statistics. Even though their joblessness is unmeasured, it may nonetheless be a social problem.

Because of these and many other issues that complicate the interpretation of the unemployment data, the Bureau of Labor Statistics calculates several measures of labor underutilization. Table 6-3 gives the definitions and their values as of October 2005. The measures range from 1.7 to 8.7 percent, depending on the characteristics one uses to classify a worker as not fully employed.

TABLE 6-3

Alternative Measures of Labor Underutilization

Variable	Description	Rate
U-1	Persons unemployed 15 weeks or longer, as a percent of the civilian labor force (includes only very long-term unemployed)	1.7 %
U-2	Job losers and persons who have completed temporary jobs, as a percent of the civilian labor force (excludes job leavers)	2.3
U-3	Total unemployed, as a percentage of the civilian labor force (official unemployment rate)	5.0
U-4	Total unemployed, plus discouraged workers, as a percent of the civilian labor force plus discouraged workers	5.2
U-5	Total unemployed plus all marginally attached workers, as a percent of the civilian labor force plus all marginally attached workers	5.8
U-6	Total unemployed, plus all marginally attached workers, plus total employed part-time for economic reasons, as a percent of the civilian labor force plus all marginally attached workers	8.7

Note: Marginally attached workers are persons who currently are neither working nor looking for work but indicate that they want and are available for a job and have looked for work sometime in the recent past. *Discouraged workers*, a subset of the marginally attached, have given a job-market related reason for not currently looking for a job. *Persons employed part time for economic reasons* are those who want and are available for full-time work but have had to settle for a part-time schedule.

Source: U.S. Department of Labor. Data are for October 2005.

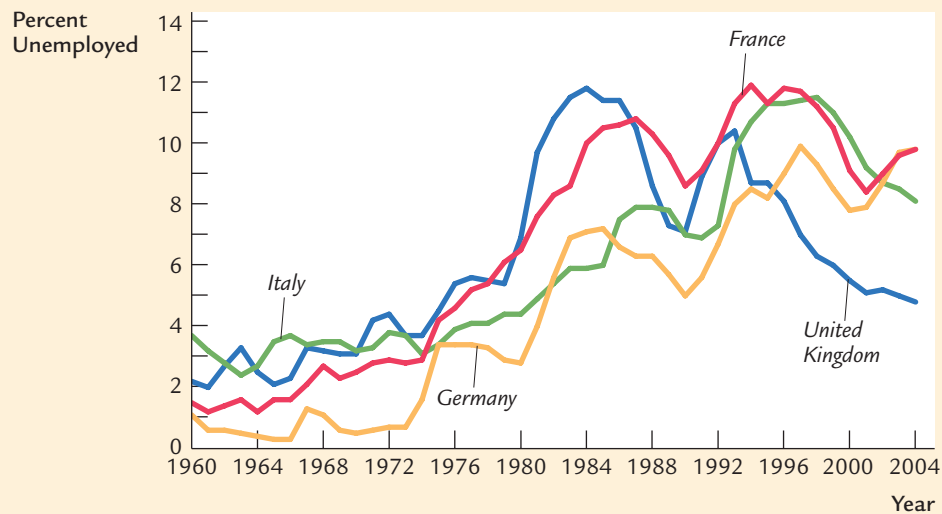
6-5 Labor Market Experience: Europe

Although our discussion has focused largely on the United States, many fascinating and sometimes puzzling phenomena become apparent when economists compare the experiences of Americans in the labor market with those of Europeans.

The Rise in European Unemployment

Figure 6-4 shows the rate of unemployment in the four largest European countries—France, Germany, Italy, and the United Kingdom. As you can see, the rate of unemployment in these countries has risen substantially. For France and Germany, the change is particularly pronounced: unemployment averaged about 2 percent in the 1960s and about 10 percent in recent years.

FIGURE 6-4



Unemployment in Europe This figure shows the unemployment rate in the four largest nations in Europe. The figure shows that the European unemployment rate has risen substantially over time, especially in France and Germany.

Source: Bureau of Labor Statistics.

What is the cause of rising European unemployment? No one knows for sure, but there is a leading theory. Many economists believe that the problem can be traced to the interaction between a long-standing policy and a recent shock. The long-standing policy is generous benefits for unemployed workers. The recent shock is a technologically driven fall in the demand for unskilled workers relative to skilled workers.

There is no question that most European countries have generous programs for those without jobs. These programs go by various names: social insurance, the welfare state, or simply “the dole.” Many countries allow the unemployed to collect benefits for years, rather than for only a short period of time as in the United States. In some sense, those living on the dole are really out of the labor force: given the employment opportunities available, taking a job is less attractive than remaining without work. Yet these people are often counted as unemployed in government statistics.

There is also no question that the demand for unskilled workers has fallen relative to the demand for skilled workers. This change in demand is probably due to changes in technology: computers, for example, increase the demand for workers who can use them and reduce the demand for those who cannot. In the United States, this change in demand has been reflected in wages rather than unemployment: over the past two decades, the wages of unskilled workers have fallen substantially relative to the wages of skilled workers. In Europe, however, the welfare state provides unskilled workers with an alternative to working for low wages. As the wages of unskilled workers fall, more workers view the dole as their best available option. The result is higher unemployment.

This diagnosis of high European unemployment does not suggest an easy remedy. Reducing the magnitude of government benefits for the unemployed would encourage workers to get off the dole and accept low-wage jobs. But it would also exacerbate economic inequality—the very problem that welfare-state policies were designed to address.¹⁰

Unemployment Variation Within Europe

Europe is not a single labor market but is, instead, a collection of national labor markets, separated not only by national borders but also by differences in culture and language. Because these countries differ in their labor-market policies and institutions, variation within Europe provides a useful perspective on the causes of unemployment. Many empirical studies have, therefore, focused on these international differences.

The first noteworthy fact is that the unemployment rate varies substantially from country to country. For example, in the summer of 2005, when the unemployment rate was 4.9 percent in the United States, it was 3.6 percent in Switzerland and 11.6 percent in Germany. Although in recent years average unemployment has been higher in Europe than in the United States, about a third of Europeans have been living in nations with unemployment rates lower than the U.S. rate.

A second notable fact is that much of the variation in unemployment rates is attributable to the long-term unemployed. The unemployment rate can be separated into two pieces—the percentage of the labor force that has been unemployed for less than a year and the percentage of the labor force that has been unemployed for more than a year. The long-term unemployment rate exhibits more variability from country to country than does the short-term unemployment rate.

National unemployment rates are correlated with a variety of labor-market policies. Unemployment rates are higher in nations with more generous unemployment insurance, as measured by the replacement rate—the percentage of previous wages that is replaced when a worker loses a job. In addition, nations tend to have higher unemployment, especially higher long-term unemployment, if benefits can be collected for longer periods of time.

Although government spending on unemployment insurance seems to raise unemployment, spending on “active” labor-market policies appears to decrease it. These active labor-market policies include job training, assistance with job search, and subsidized employment. Spain, for instance, has historically had a high rate of unemployment, a fact that can be explained by the combination of generous payments to the unemployed with minimal assistance at helping them find new jobs.

The role of unions also varies from country to country, as we saw in Table 6-1. This fact also helps explain differences in labor-market outcomes. National

¹⁰ For more discussion of these issues, see Paul Krugman, “Past and Prospective Causes of High Unemployment,” in *Reducing Unemployment: Current Issues and Policy Options*, Federal Reserve Bank of Kansas City, August 1994.

unemployment rates are positively correlated with the percentage of the labor force whose wages are set by collective bargaining with unions. The adverse impact of unions on unemployment is smaller, however, in nations where there is substantial coordination among employers in bargaining with unions, perhaps because coordination may moderate the upward pressure on wages.

A word of warning: Correlation does not imply causation, so empirical results such as these should be interpreted with caution. But they do suggest that a nation's unemployment rate, rather than being immutable, is instead a function of the choices a nation makes.¹¹

CASE STUDY

The Secrets to Happiness

Why are some people more satisfied with their lives than others? This is a deep and difficult question, most often left to philosophers, psychologists, and self-help gurus. But part of the answer is macroeconomic. Recent research has shown that people are happier when they are living in a country with low inflation and low unemployment.

From 1975 to 1991, a survey called the Euro-Barometer Survey Series asked 264,710 people living in 12 European countries about their happiness and overall satisfaction with life. One question asked, "On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?" To see what determines happiness, the answers to this question were correlated with individual and macroeconomic variables. Other things equal, people are more satisfied with their lives if they are rich, educated, married, in school, self-employed, retired, female, and young or old (as opposed to middle aged). They are less satisfied if they are unemployed, divorced, or living with adolescent children. (Some of these correlations may reflect the effects, rather than causes, of happiness: for example, a happy person may find it easier than an unhappy one to keep a job and a spouse.)

Beyond these individual characteristics, the economy's overall rates of unemployment and inflation also play a significant role in explaining reported happiness. An increase in the unemployment rate of 4 percentage points is large enough to move 11 percent of the population down from one life-satisfaction category to another. The overall unemployment rate reduces satisfaction even after controlling for an individual's employment status. That is, the employed in a high-unemployment nation are less happy than their counterparts in a low-unemployment nation, perhaps because they are more worried about job loss or perhaps out of sympathy with their fellow citizens.

High inflation is also associated with lower life satisfaction, although the effect is not as large. A 1.7 percentage point increase in inflation reduces happiness by about as much as a 1 percentage point increase in unemployment.

¹¹ Stephen Nickell, "Unemployment and Labor Market Rigidities: Europe versus North America," *Journal of Economic Perspectives* 11 (September 1997): 55–74.

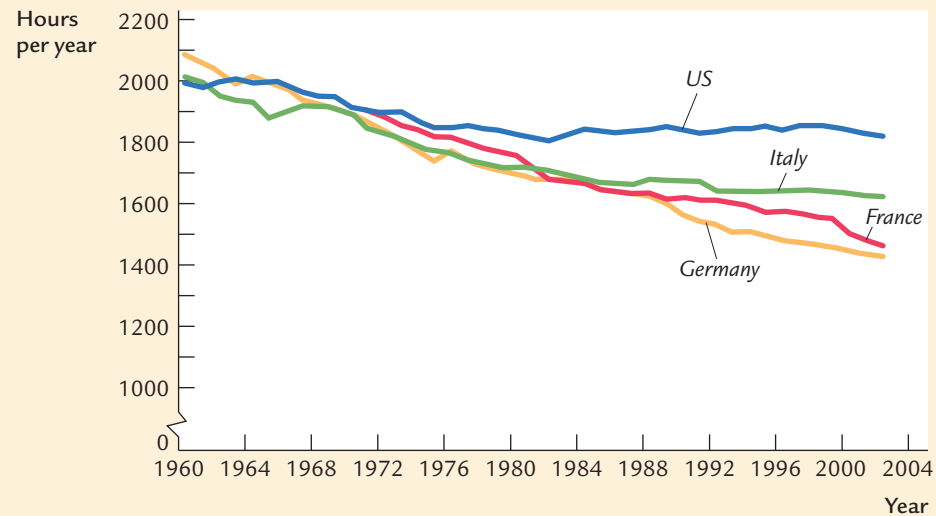
The commonly cited “misery index,” which is the sum of the inflation and unemployment rates, apparently gives too much weight to inflation relative to unemployment.¹²

The Rise of European Leisure

Not only are Europeans more likely to be unemployed than Americans, but those who have jobs typically work fewer hours than do their American counterparts. Figure 6-5 presents some data on how many hours a typical employed person works in four major countries. In the 1960s, the number of hours worked was about the same in each of these countries, and it was declining gradually on both sides of the Atlantic. But around 1980, hours worked settled at a plateau in the United States, while it continued to decline in Europe. Today, the typical American works about 20 percent more hours than does the typical resident of western Europe.

Economists have proposed several hypotheses to explain this difference.

FIGURE 6-5



Annual Hours Worked per Employed Person Over time, European workers have reduced the number of hours they work.

Source: OECD. Annual hours are equivalent to 52 times usual weekly hours minus holidays, vacations, sick leave. Computations from Alberto Alesina, Edward Glaeser, and Bruce Sacerdote, “Work and Leisure in the U.S. and Europe: Why So Different?” *NBER Macroeconomics Annual* 2005.

¹² Rafael Di Tella, Robert J. MacCulloch, and Andrew J. Oswald, “Preferences over Inflation and Unemployment: Evidence from Surveys of Happiness,” *American Economic Review* 91 (March 2001): 335–341.

Edward Prescott, the 2004 winner of the Nobel Prize in economics, has concluded that “virtually all of the large differences between U.S. labor supply and those of Germany and France are due to differences in tax systems.” This hypothesis is consistent with the two facts: (1) Europeans face higher tax rates than Americans, and (2) European tax rates have risen significantly over the past several decades. Some economists take these facts as powerful evidence for the impact of taxes on work effort. Yet others are skeptical, arguing that to explain the differences in hours worked by tax rates alone requires an implausibly large elasticity of labor supply.

A related hypothesis is that the difference in observed work effort may be attributable to the underground economy. When tax rates are high, people have a greater incentive to work “off the books” in order to evade taxes. For obvious reasons, data on the underground economy are hard to come by. But economists who study the subject believe the underground economy is larger in Europe than it is in the United States. This fact suggests that the difference in actual hours worked, including work in the underground economy, may be smaller than the difference in measured hours worked.

Another hypothesis stresses the role of unions. As we have seen, collective bargaining is more important in European than in U.S. labor markets. Unions often push for shorter workweeks in contract negotiations, and they lobby the government for a variety of labor-market regulations, such as official holidays. Economists Alberto Alesina, Edward Glaeser, and Bruce Sacerdote conclude that “mandated holidays can explain 80 percent of the difference in weeks worked between the U.S. and Europe and 30 percent of the difference in total labor supply between the two regions.” They suggest that Prescott may overstate the role of taxes because, looking across countries, tax rates and unionization rates are positively correlated; as a result, the effects of high taxes and the effects of widespread unionization are hard to disentangle.

A final hypothesis emphasizes the possibility of different preferences. As technological advance and economic growth have made all advanced countries richer, people around the world must decide whether to take the greater prosperity in the form of increased consumption of goods and services or increased leisure. According to economist Olivier Blanchard, “the main difference [between the continents] is that Europe has used some of the increase in productivity to increase leisure rather than income, while the U.S. has done the opposite.” Blanchard believes that Europeans simply have more taste for leisure than do Americans. (As a French economist working in the United States, he may have special insight into this phenomenon.) If Blanchard is right, this raises the even harder question of why tastes vary by geography.

Economists continue to debate the merits of these alternative hypotheses. In the end, there may be some truth to all of them.¹³

¹³ To read more about this topic, see Edward C. Prescott “Why Do Americans Work So Much More Than Europeans?” *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 28, No. 1 (July 2004): 2–13; Alberto Alesina, Edward Glaeser, and Bruce Sacerdote, “Work and Leisure in the U.S. and Europe: Why So Different?” *NBER Macroeconomics Annual 2005*; Olivier Blanchard, “The Economic Future of Europe” NBER Working Paper No. 10310, 2004, forthcoming in the *Journal of Economic Perspectives*.

6-6 Conclusion

Unemployment represents wasted resources. Unemployed workers have the potential to contribute to national income but are not doing so. Those searching for jobs to suit their skills are happy when the search is over, and those waiting for jobs in firms that pay above-equilibrium wages are happy when positions open up.

Unfortunately, neither frictional unemployment nor structural unemployment can be easily reduced. The government cannot make job search instantaneous, and it cannot easily bring wages closer to equilibrium levels. Zero unemployment is not a plausible goal for free-market economies.

Yet public policy is not powerless in the fight to reduce unemployment. Job-training programs, the unemployment-insurance system, the minimum wage, and the laws governing collective bargaining are often topics of political debate. The policies we choose are likely to have important effects on the economy's natural rate of unemployment.

Summary

1. The natural rate of unemployment is the steady-state rate of unemployment. It depends on the rate of job separation and the rate of job finding.
2. Because it takes time for workers to search for the job that best suits their individual skills and tastes, some frictional unemployment is inevitable. Various government policies, such as unemployment insurance, alter the amount of frictional unemployment.
3. Structural unemployment results when the real wage remains above the level that equilibrates labor supply and labor demand. Minimum-wage legislation is one cause of wage rigidity. Unions and the threat of unionization are another. Finally, efficiency-wage theories suggest that, for various reasons, firms may find it profitable to keep wages high despite an excess supply of labor.
4. Whether we conclude that most unemployment is short-term or long-term depends on how we look at the data. Most spells of unemployment are short. Yet most weeks of unemployment are attributable to the small number of long-term unemployed.
5. The unemployment rates among demographic groups differ substantially. In particular, the unemployment rates for younger workers are much higher than for older workers. This results from a difference in the rate of job separation rather than from a difference in the rate of job finding.
6. The natural rate of unemployment in the United States has exhibited long-term trends. In particular, it rose from the 1950s to the 1970s and then started drifting downward again in the 1990s and early 2000s. Various

explanations have been proposed, including the changing demographic composition of the labor force, changes in the prevalence of sectoral shifts, and changes in the rate of productivity growth.

7. Individuals who have recently entered the labor force, including both new entrants and reentrants, make up about one-third of the unemployed. Transitions into and out of the labor force make unemployment statistics more difficult to interpret.
8. American and European labor markets exhibit some significant differences. In recent years, Europe has experienced significantly more unemployment than the United States, and employed Europeans work fewer hours than employed Americans.

KEY CONCEPTS

Natural rate of unemployment	Unemployment insurance	Insiders versus outsiders
Frictional unemployment	Wage rigidity	Efficiency wages
Sectoral shift	Structural unemployment	Discouraged workers

QUESTIONS FOR REVIEW

1. What determines the natural rate of unemployment?
2. Describe the difference between frictional unemployment and structural unemployment.
3. Give three explanations why the real wage may remain above the level that equilibrates labor supply and labor demand.
4. Is most unemployment long-term or short-term? Explain your answer.
5. How do economists explain the high natural rate of unemployment in the 1970s and 1980s? How do they explain the fall in the natural rate in the 1990s and early 2000s?

PROBLEMS AND APPLICATIONS

1. Answer the following questions about your own experience in the labor force:
 - a. When you or one of your friends is looking for a part-time job, how many weeks does it typically take? After you find a job, how many weeks does it typically last?
 - b. From your estimates, calculate (in a rate per week) your rate of job finding f and your rate of job separation s . (*Hint:* If f is the rate of job finding, then the average spell of unemployment is $1/f$.)
 - c. What is the natural rate of unemployment for the population you represent?
2. In this chapter we saw that the steady-state rate of unemployment is $U/L = s/(s + f)$. Suppose that the unemployment rate does not begin at this level. Show that unemployment will evolve over time and reach this steady state. (*Hint:* Express the change in the number of unemployed as a function of s , f , and U . Then show that if unemployment is above the natural rate, unemployment falls, and if unemployment is below the natural rate, unemployment rises.)

3. The residents of a certain dormitory have collected the following data: People who live in the dorm can be classified as either involved in a relationship or uninvolved. Among involved people, 10 percent experience a breakup of their relationship every month. Among uninvolved people, 5 percent will enter into a relationship every month. What is the steady-state fraction of residents who are uninvolved?
4. Suppose that Congress passes legislation making it more difficult for firms to fire workers. (An example is a law requiring severance pay for fired workers.) If this legislation reduces the rate of job separation without affecting the rate of job finding, how would the natural rate of unemployment change? Do you think that it is plausible that the legislation would not affect the rate of job finding? Why or why not?
5. Consider an economy with the following Cobb-Douglas production function:

$$Y = K^{1/3}L^{2/3}.$$

The economy has 1,000 units of capital and a labor force of 1,000 workers.

 - a. Derive the equation describing labor demand in this economy as a function of the real wage and the capital stock. (*Hint:* Review Chapter 3.)
 - b. If the real wage can adjust to equilibrate labor supply and labor demand, what is the real wage? In this equilibrium, what is employment, output, and the total amount earned by workers?
 - c. Now suppose that Congress, concerned about the welfare of the working class, passes a law requiring firms to pay workers a real wage of 1 unit of output. How does this wage compare to the equilibrium wage?
 - d. Congress cannot dictate how many workers firms hire at the mandated wage. Given this fact, what are the effects of this law? Specifically, what happens to employment, output, and the total amount earned by workers?
 - e. Will Congress succeed in its goal of helping the working class? Explain.
 - f. Do you think that this analysis provides a good way of thinking about a minimum-wage law? Why or why not?
6. Suppose that a country experiences a reduction in productivity—that is, an adverse shock to the production function.
 - a. What happens to the labor demand curve?
 - b. How would this change in productivity affect the labor market—that is, employment, unemployment, and real wages—if the labor market were always in equilibrium?
 - c. How would this change in productivity affect the labor market if unions prevented real wages from falling?
7. When workers' wages rise, their decision on how much time to spend working is affected in two conflicting ways—as you may have learned in courses in microeconomics. The *income effect* is the impulse to work less, because greater incomes mean workers can afford to consume more leisure. The *substitution effect* is the impulse to work more, because the reward to working an additional hour has risen (equivalently, the opportunity cost of leisure has gone up). Apply these concepts to Blanchard's hypothesis about American and European tastes for leisure. On which side of the Atlantic do income effects appear larger than substitution effects? On which side do the two effects approximately cancel? Do you think it is a reasonable hypothesis that tastes for leisure vary by geography? Why or why not?
8. In any city at any time, some of the stock of usable office space is vacant. This vacant office space is unemployed capital. How would you explain this phenomenon? Is it a social problem?