Chapter 12

Unemployment

It's a recession when your neighbor loses his job; it's a depression when you lose your own.

—Harry S. Truman

Why are some workers unemployed? This question raises some of the thorniest issues in economics. A competitive equilibrium equates the supply of workers with the demand for workers. The equilibrium wage clears the market, and all persons looking for work can find jobs.

Nevertheless, unemployment can sometimes be a widespread phenomenon. In 2010, at the peak of the Great Recession, the unemployment rate in the United States reached 9.6 percent, and almost half of the unemployed had been without work for at least 27 weeks.

It is difficult to understand the existence and persistence of large numbers of unemployed workers in terms of the typical model of supply and demand unless (1) firms pay wages that are above equilibrium and there is an excess supply of labor and (2) wages are "sticky" and cannot be driven down to the equilibrium level.

Workers are unemployed for many reasons, and some types of unemployment are more worrisome. At any time, for instance, many persons are "in between" jobs. They have either just quit or been laid off, or they have just entered (or reentered) the labor market. It takes time to learn about and locate the available job opportunities. Therefore, even a well-functioning market economy, where the number of available jobs equals the number of persons looking for work, will exhibit some unemployment as workers search for jobs.

Put differently, the equilibrium level of unemployment will not be zero. This type of frictional unemployment, however, cannot explain why nearly 25 percent of the workforce was unemployed at the nadir of the Great Depression in 1933 or why the unemployment rate hit almost 10 percent in 2010. Many workers seem to be unemployed not because they are in between jobs but because of a fundamental imbalance between the supply and the demand for workers.

This chapter shows how job search activities generate unemployment in a competitive economy and identifies some of the factors that can prevent the market from clearing—even after job search activities are accounted for. Economists have created ingenious stories of how unemployment can arise in competitive markets. Each particular theory can explain certain aspects of the unemployment problem. No single theory, however, provides

a complete explanation for why unemployment sometimes afflicts a large fraction of the workforce, why unemployment targets some groups more than others, and why some workers remain unemployed for a very long time.

12-1 Unemployment in the United States

Figure 12-1 shows the historical trend in the U.S. unemployment rate since 1900. The unemployment rate has fluctuated dramatically over time; it reached a peak of about 25 percent in 1933 and lows of about 1 percent in 1906 and 1944.

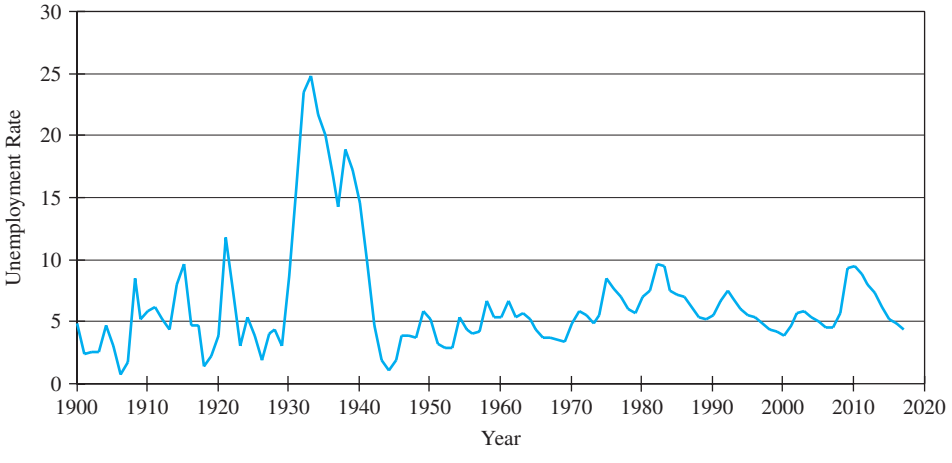
The unemployment rate gives the fraction of labor force participants looking for work. Many persons who would like to work might have withdrawn from the labor force because they could not find jobs. The count of the unemployed misses the discouraged workers. As a result, the official unemployment rate may underestimate the true severity of the unemployment problem, particularly during severe economic downturns when a large pool of discouraged workers might be in the nonmarket sector, "waiting out" the recession.

The data summarized in Figure 12-1 show a slight upward drift in the unemployment rate from the 1950s through the 1980s. In the 1950s, the average unemployment rate was 4.5 percent; during the 1960s it was 4.8 percent; during the 1970s it rose to 6.2 percent; and during the 1980s it rose further to 7.3 percent. This trend broke in the 1990s, when the unemployment rate fell to levels not seen in about 30 years. In 1998, the unemployment rate was just 4 percent.

This period of low unemployment, however, stopped abruptly in 2008 when the United States entered a deep recession after a serious financial crisis. The very rapid rise in the unemployment rate after the crisis was remarkable, from 4.6 percent in 2007 to 9.6 percent in 2010, more than doubling the unemployment rate in just 3 years.

FIGURE 12-1 Unemployment in the United States, 1900–2017

Sources: The pre-1948 unemployment rates are reported in Stanley Lebergott, "Annual Estimates of Unemployment in the United States, 1900–1950," *The Measurement and Behavior of Unemployment,* NBER Special Committee Conference Series No. 8, Princeton, NJ: Princeton University Press, 1957, pp. 213–239. The post-1948 rates are from U.S. Bureau of Labor Statistics, "Historical Data for the 'A' Tables of the Employment Situation Release. Table A-1, Employment Status of the Civilian Population by Sex and Age"; available at stats.bls.gov/cps/cpsatabs.htm. The unemployment rate refers to persons aged 16 and over.



It is important to note that this sharp jump in the unemployment rate was totally unexpected. Ironically, a popular topic in macroeconomic research just prior to the financial crisis of 2008 was the attempt to understand how the United States had been able to "moderate" the volatility of business cycle activity, leading to a period that became known as the "Great Moderation." In a 2004 lecture, for example, Ben Bernanke (who would later become chairman of the Federal Reserve) noted that "one of the most striking features of the economic landscape over the past twenty years or so has been a substantial decline in macroeconomic volatility." It is doubly ironic that the research interest in the Great Moderation eventually morphed into research interest in the Great Recession.

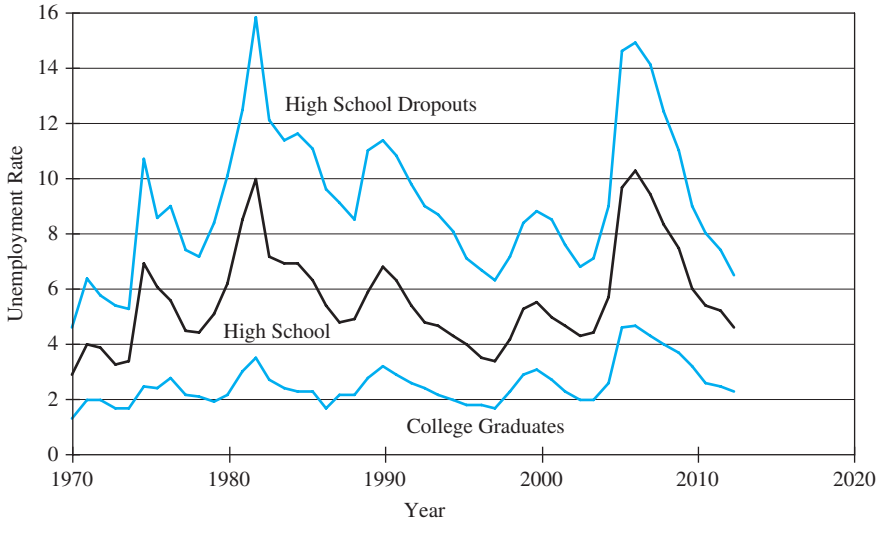
Who Are the Unemployed?

The fact that the unemployment rate in 2017 was 4.4 percent does not imply that each labor market participant had a 4.4 percent probability of being unemployed at a point in time during that calendar year. Unemployment is not an equal-opportunity employer. It is concentrated among particular demographic groups and among workers in specific sectors of the economy.

Figure 12-2 illustrates one key feature of unemployment in the United States: The unemployment rate is much higher for less-educated workers. In 2017, the unemployment rate of college graduates was 2.3 percent, as compared to 4.6 percent for high school graduates and 6.5 percent for high school dropouts. The figure also shows that the "unemployment gap" between high-educated and low-educated workers widens substantially during recessions. In 2010, the unemployment rate of high school dropouts exceeded that of college graduates by more than 10 percentage points. By 2017, that gap had narrowed to 4.2 percentage points.

FIGURE 12-2 **Unemployment Rates by Education, 1970–2017**

Sources: U.S. Bureau of Labor Statistics, *Labor Force Statistics Derived from the Current Population Survey, 1948–87,* Bulletin 2307, Washington, DC: Government Printing Office, 1988, pp. 848–849; U.S. Bureau of the Census, *Statistical Abstract of the United States,* Washington, DC: Government Printing Office, various issues. The post-1992 data are from U.S. Bureau of Labor Statistics, "Historical Data for the 'A' Tables of the Employment Situation Release. Table A-4, Employment Status of the Civilian Population 25 Years and Over by Educational Attainment"; available at stats.bls.gov/cps/cpsatabs.htm. The unemployment rates refer to the population of persons aged 25 and over.



Education reduces unemployment rates for two distinct reasons. First, educated workers invest more in on-the-job training. Because specific training "marries" firms and workers, firms are less likely to lay off educated workers when they face adverse economic conditions. In addition, educated workers often switch jobs without suffering an intervening unemployment spell. It seems as if educated workers are better informed or have better networks for learning about alternative job opportunities.

Table 12-1 reports unemployment rates by age, race, gender, and industry of employment. Younger workers are more likely to be unemployed. The unemployment rate of teenagers in 2017 was 14.0 percent as compared to about 3 percent for workers aged 45–64. Part of the higher unemployment rate of teenagers may be due to the adverse employment effects of the minimum wage.

The data also indicate that whites have lower unemployment rates than either blacks or Hispanics, but Asians have an even lower unemployment rate. In 2017, the unemployment rate of blacks was almost twice as high as that of whites (7.5 percent versus 3.8 percent). The persistently large black–white unemployment differential cannot be attributed to the different skill composition of the black and white populations. The racial gap in unemployment rates remains even if we compare black and white workers who have the same observable skills and who live in the same area.[1]

Historically, women had higher unemployment rates than men. In 1983, for example, 9.8 percent of men and 15.3 percent of women were unemployed. It was typically argued that women had a higher unemployment rate because they were much more likely to be "on the move" either in between jobs or in and out of the labor market. These transitions require women to look for work and increase their unemployment rate. By 2017, the gender gap in unemployment had disappeared; both groups had essentially the same unemployment rate of about 4.4 percent.

TABLE 12-1
Unemployment Rates in 2017, by Demographic Group and Industry

Age:		Industry:	
16–19	14.0	Agriculture	7.2
20–24	7.4	Mining	4.1
25–34	4.6	Construction	6.0
35–44	3.5	Manufacturing	3.6
45–54	3.2	Information	4.5
55–64	3.1	Transportation and utilities	4.1
		Retail trade	4.6
Race:		Finance, insurance, and real estate	2.4
White	3.8	Leisure and hospitality	6.1
Black	7.5	Professional and business services	4.5
Hispanic	5.1	Government	2.5
Asian	3.4		
Gender:		All workers	4.4
Male	4.4		
Female	4.3		

Source: U.S. Department of Labor, Bureau of Labor Statistics, *Labor Force Statistics from the Current Population Survey.* Available at: www.bls.gov/cps/tables.htm#charunem.

[1] Joseph A. Ritter and Lowell J. Taylor, "Racial Disparity in Unemployment," *Review of Economics and Statistics* 93 (February 2011): 30–42.

Note also that there are sizable differences in unemployment across industries, with workers in agriculture, construction, and "leisure and hospitality" being most likely to be unemployed. The unemployment rate in these industries exceeded 6 percent in 2017. In contrast, government workers or workers in "financial activities" have an unemployment rate below 3 percent.

There are four ways in which a worker can become unemployed: Some workers lose their jobs due to layoffs or plant closings (or job losers); some workers leave their jobs (job leavers); some job seekers reenter the labor market after spending some time in the nonmarket sector (reentrants); and some job seekers are new to the job market, such as recent high school or college graduates (new entrants). As Figure 12-3 shows, the fraction of workers who are job losers hovered around 50 percent (with up-and-down blips) between 1980 and 2005. Because of the severity of the Great Recession, this statistic peaked at 64 percent in 2009, before going back down to the 50 percent mark by 2017.

Figure 12-4 documents that a large fraction of the unemployed are likely to be in long-term unemployment spells. Even prior to the Great Recession, there had been an upward drift in the fraction of the unemployed who had been without work for more than 26 weeks. In the early 1950s, for instance, only about 5–10 percent of unemployed workers were in spells lasting more than 26 weeks. By 2007, about 18 percent of the unemployed workers were in these long spells. The Great Recession led to a dramatic explosion in this number. In 2010, 43.3 percent of the unemployed were in long-term spells, and this statistic remained at historically high levels after the recovery began. Almost a quarter of the unemployed were in long spells in 2017, a higher proportion than at any time between the end of World War II and the start of the Great Recession.

FIGURE 12-3 Unemployed Persons by Reason, 1967–2017 (as a Percent of Total Unemployment)

Source: U.S. Bureau of Labor Statistics, "Historical Data for the 'A' Tables of the Employment Situation Release. Table A-11, Unemployed Persons by Reason of Unemployment"; available at stats.bls.gov/cps/cpsatabs.htm. The population of unemployed includes all unemployed persons aged 16 or over.

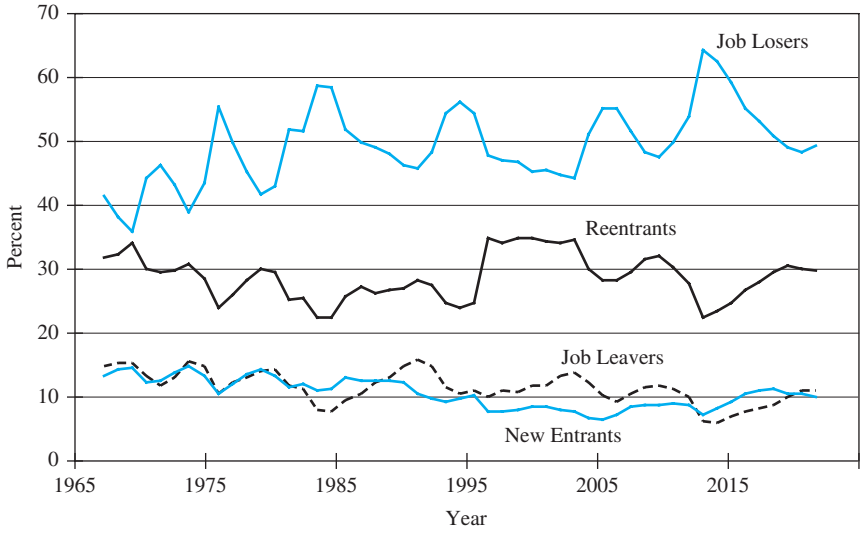
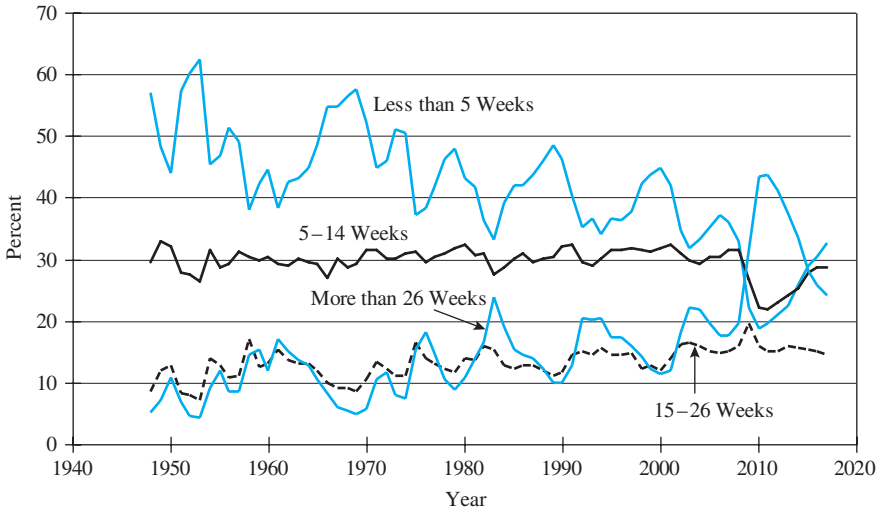


FIGURE 12-4 Unemployed Persons by Duration, 1948–2017 (as a Percent of Total Unemployment)

Source: U.S. Bureau of Labor Statistics, "Historical Data for the 'A' Tables of the Employment Situation Release. Table A-12, Unemployed Persons by Duration of Unemployment"; available at stats.bls.gov/cps/cpsatabs.htm. The population of unemployed includes all unemployed persons aged 16 or over.



Put differently, the notion that unemployment can be typically characterized by short-term spells seems to be becoming less relevant. Even prior to the Great Recession, there had been a noticeable downward drift in the fraction of unemployed persons who had been unemployed fewer than 5 weeks.

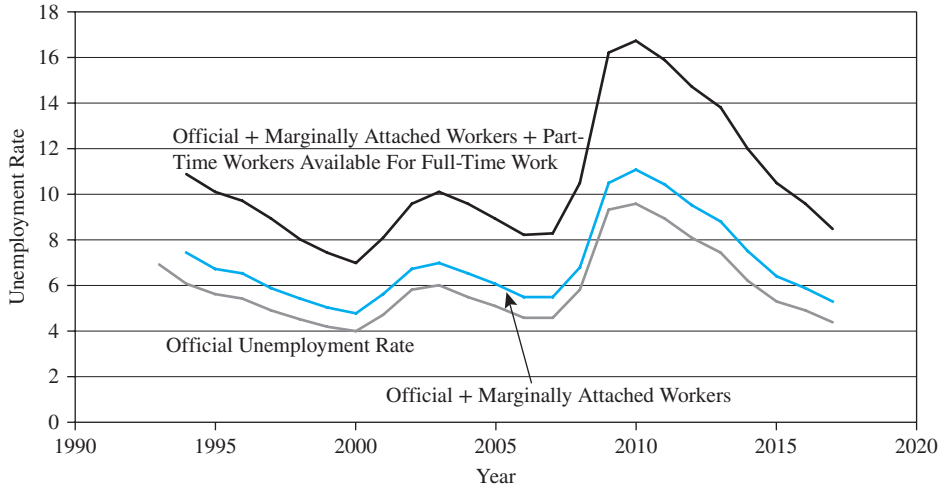
Finally, the unemployment rate gives the proportion of the labor force that is unemployed and looking for work. There also may be some discouraged workers—workers who gave up on their job search because they could not find any employment. The Bureau of Labor Statistics publishes an alternative unemployment rate that includes in the pool of unemployed any "marginally attached 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." Figure 12-5 shows that the unemployment rate goes up by about 1 percentage point when the marginally attached are counted as unemployed.

A more sizable group is made up by the "underemployed"—persons who "want and are available for full-time work but have had to settle for a part-time schedule." As the figure shows, including this group as part of the unemployed leads to an even more dramatic increase in the unemployment rate. In 2007, the broadest measure of the unemployment rate exceeded the official measure by 3.7 percentage points. By 2010, however, the broader definition implied a 16.2 percent unemployment rate as compared to the 9.3 percent official rate, a gap of almost 7 percentage points.

The official unemployment rate has probably been a misleading indicator of economic activity since the onset of the Great Recession because the labor force participation rate declined dramatically between 2008 and 2013. The labor force participation rate stood at 66.2 percent at the beginning of 2008 and fell to 62.9 percent by the end of 2013 (and was still at 62.7 percent in January 2018 despite the strong economic recovery).

FIGURE 12-5 Trends in Alternative Measures of the Unemployment Rate, 1994–2017

Source: U.S. Bureau of Labor Statistics, "Historical Data for the 'A' Tables of the Employment Situation Release. Table A-15, Alternative Measures of Labor Underutilization"; available at stats.bls.gov/cps/cpsatabs.htm. The unemployment rate refers to the population of persons aged 16 and over. The unemployment rate that includes the marginally attached is called the U-5 series; the unemployment rate that also includes workers who settled for a part-time schedule is called the U-6 series. The official unemployment rate is called the U-3 series.



The 3.3 percentage point drop in the participation rate between 2008 and 2013 implies that about 8 million persons withdrew from the labor force in that 5-year period.[2] The official unemployment rate would obviously be much higher if some of these persons were reclassified as being part of a more broadly defined "labor force."

The reasons for this historic exodus from the labor force are not well understood. But there is probably a link between these labor force trends and the more generous availability of both unemployment insurance benefits and Social Security disability benefits.[3]

Residential Segregation and Black Unemployment

As we have seen, the black unemployment rate is substantially higher than that of whites. Part of this racial gap can be attributed to racial residential segregation, which isolates many African–Americans from jobs and the economic mainstream.

Table 12-2 uses the difference-in-differences methodology to document that the clustering of blacks into a relatively small number of geographic areas contributes to a higher rate

[2] The calculation of this number makes for an interesting exercise. The Bureau of Labor Statistics website (data.bls.gov/cgi-bin/surveymost?ln) reports that the labor force participation rate of civilians aged 16 or more was 62.9 percent in December 2013, and that 154.9 million persons were in the labor force. This implies that the relevant population size (that is, the denominator in calculating the labor force participation rate) was 246.3 million. The BLS website also reports that the labor force participation rate in January 2008 was 66.2 percent, implying that had the participation rate remained constant during the period there would have been 163.1 million persons in the labor force.

[3] Andreas I. Mueller, Jesse Rothstein, and Till M. von Wachter, "Unemployment Insurance and Disability Insurance in the Great Recession," *Journal of Labor Economics* 34 (January 2016, Part 2): S445–S475.

Theory at Work

GRADUATING DURING A RECESSION

Some of us are quite lucky. We somehow manage to time our birth so that the labor market is burning hot the year we graduate from college. It's a seller's market—employers outbid each other to get our services. The wining-and-dining never ends.

Some of us, however, are not as fortunate. Our parents somehow conceived us without thinking of the fact that a couple of decades down the road, we would be graduating from college under very poor economic conditions. Jobs are scarce, and we would be lucky to have a couple of job interviews and extremely lucky to have even one job offer.

It turns out that the harmful consequences of graduating during a recession do not end there, with the hardship of trying to find a paying job after graduation. It is easy to see why labor market conditions at the time of college graduation might affect long-run outcomes. The scarcity of jobs during a severe recession, for instance, might lead young graduates to accept jobs that do not offer much opportunity for training or for moving up the ladder, limiting their options in later years.

Recent research documents the adverse consequences of graduating in a bad economy both in the United States and abroad. A 1-percentage point increase in the national unemployment rate at the time of college graduation is associated with about a 6 percent wage loss initially for American workers. In other words, the initial job pays about 6 percent less than the first job offered to other "luckier" graduation cohorts. Although this large wage effect gets weaker over time, something still remains even after a decade. The wage loss associated with graduating in a poor economy is 2.5 percent 15 years down the line.

A study of the Canadian labor market finds roughly similar results. College graduates who enter the labor market during a recession suffer an initial wage loss of about 9 percent; half of this loss remains after 5 years, but eventually disappears after a decade. Finally, a study of the Japanese labor market finds that the initial wage loss associated with graduating in a recession is about 5 percent, with the wage loss eventually dropping to about 2 percent.

Sources: Lisa Kahn, "The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy," *Labour Economics* 17 (April 2010): 303–316; Philip Oreopoulos, Till von Wachter, and Andrew Heisz, "The Short- and Long-Term Career Effects of Graduating in a Recession." *American Economic Journal: Applied Economics* 4 (January 2012): 1–29; Yuji Genda, Ayako Kondo, and Souichi Ohta, "Long-Term Effects of a Recession at Labor Market Entry in Japan and the United States," *Journal of Human Resources* 45 (Winter 2010): 157–196.

TABLE 12-2 Relation Between Black Residential Segregation and Percentage of Blacks Who Are Idle, 1990

Source: David M. Cutler and Edward L. Glaeser, "Are Ghettos Good or Bad?" *Quarterly Journal of Economics* 112 (August 1997): 842.

Group	City Is Not Very Segregated	City Is Very Segregated	Difference
Blacks aged 20–24	15.4	21.6	6.2
Whites aged 20–24	7.0	6.6	–0.4
Difference-in-differences	—	—	**6.6**

of "idleness" among young blacks, where a person is considered idle if he or she is neither employed nor in school. It turns out that 15.4 percent of young blacks living in cities with little racial residential segregation are idle. In contrast, 21.6 percent of blacks living in highly segregated cities are idle. In short, living in highly segregated cities seems to raise the idleness rate of young blacks by 6.2 percentage points.

But, of course, other factors may be at work. For instance, the industrial composition of the local labor market may differ significantly between the two types of cities. Employment

in highly segregated cities may be concentrated in declining industries, such as manufacturing. Persons living in highly segregated cities would then have higher idleness rates, *regardless* of their race.

As Table 12-2 also shows, however, the idleness rate for whites is not all that different between the two types of cities. In fact, there is slightly *less* idleness among whites in the segregated cities. The difference-in-differences methodology then suggests that racial residential segregation increased the idleness rate of blacks by 6.6 percentage points. The segregation of blacks into a small number of geographic areas may indeed be partly responsible for the less-beneficial labor market opportunities faced by black workers.[4]

12-2 Types of Unemployment

The labor market is in constant flux. Some workers quit their jobs; other workers are laid off. Some firms are cutting back; other firms are expanding. New workers enter the market after completing their education; other workers reenter after spending some time in the household sector. At any time, many workers are in between jobs. If workers looking for jobs and firms looking for workers could find each other immediately, there would be no unemployment. **Frictional unemployment** arises because both workers and firms need time to locate each other.

The existence of frictional unemployment does not suggest that there is a fundamental structural problem in the economy, such as an imbalance between the number of workers looking for work and the number of jobs available. As a result, frictional unemployment is not viewed with much alarm by policymakers. By its very nature, frictional unemployment should lead to short unemployment spells. Moreover, frictional unemployment is "productive" because the search activities of workers and firms improve the allocation of resources in the labor market. There are also easy ways of reducing frictional unemployment, such as providing workers with information about job openings and providing firms with information about unemployed workers.

Many workers also experience **seasonal unemployment**. Workers in some industries are laid off regularly because new models are introduced with clockwork regularity, and firms shut down so that they can be retooled. Spells of seasonal unemployment are usually very predictable. Seasonal unemployment, like frictional unemployment, is also not what concerns policymakers. After all, many of the unemployed workers will return to their former employer once the production season begins.

The type of unemployment that causes anxiety is **structural unemployment**. Suppose the number of workers looking for work equals the number of jobs available; there is no imbalance between the total numbers being supplied and demanded. Structural unemployment can still arise if the kinds of persons looking for work do not "fit" the jobs available. At any time, some sectors of the economy are expanding, and other sectors are contracting. If skills were perfectly transferable from one sector to another, the laid-off workers could quickly move to the growing sectors. But skills might be specific to the

[4] See also Richard W. Martin, "Can Black Workers Escape Spatial Mismatch? Employment Shifts, Population Shifts, and Black Unemployment in American Cities," *Journal of Urban Economics* 55 (January 2004): 179–194.

worker's job or industry and laid-off workers lack the qualifications needed in the growing sector. As a result, the unemployment spells of the displaced workers might last for a long time because they must retool their skills. Structural unemployment arises because of a mismatch between the skills that workers are supplying and the skills that firms are demanding.

The policy prescriptions for this type of structural unemployment are very different from those that would reduce frictional or seasonal unemployment. The problem is skills; the unemployed are stuck with human capital that is no longer useful. To reduce this type of unemployment, therefore, the government would have to provide training programs that "inject" the displaced workers with the skills that are now in demand. And because skills take time to acquire, this type of unemployment may last a while.

There also may be a structural imbalance between the number of workers looking for jobs and the number of jobs available—even if skills were perfectly portable across sectors. This imbalance could arise because of a slowdown in the aggregate economy. Firms now need a smaller workforce to satisfy consumer demand and employers lay off many workers, generating **cyclical unemployment**.

There is then an excess supply of workers, and the market does not clear because the wage is sticky and does not adjust downward. As we will see, economists have developed models that can generate sticky wages and unemployment. The policy prescriptions for cyclical unemployment have little to do with helping workers find jobs or with retooling workers' skills. To reduce this type of unemployment, the government may have to stimulate aggregate demand and reestablish market equilibrium at the sticky wage.

12-3 The Steady-State Rate of Unemployment

The flows of workers across jobs and in and out of the labor market generate some unemployment. It is easy to calculate the steady-state rate of unemployment, the unemployment rate that would be observed in the long run as a result of these labor flows.

To keep things simple, suppose a worker can be either employed or unemployed (so that we will ignore the nonmarket sector). Figure 12-6 describes the labor flows in this simplified economy. There are a total of E employed workers and U unemployed workers. In any given period, let ℓ be the fraction of the employed who lose their jobs and become unemployed, and let h be the fraction of the unemployed workers who find work and get hired. In a steady state, where the economy has reached a long-run equilibrium, the unemployment rate would be constant over time. The steady state then requires that the number of workers who lose jobs equal the number of unemployed workers who find jobs, or

$$\ell E = hU \tag{12-1}$$

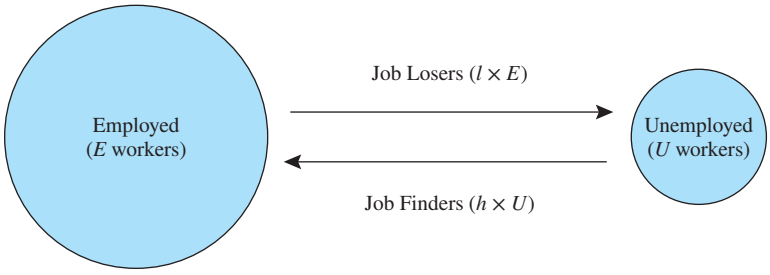
The labor force is defined as the sum of persons who are either employed or unemployed, so $LF = E + U$. Substituting this definition into equation (12-1) yields

$$\ell(LF - U) = hU \tag{12-2}$$

By rearranging terms, we can solve for the steady-state unemployment rate:

$$\text{Unemployment rate} = \frac{U}{LF} = \frac{\ell}{\ell + h} \tag{12-3}$$

FIGURE 12-6 Flows between Employment and Unemployment
A person is either working or unemployed. At any point in time, some workers lose their jobs and unemployed workers find jobs. If the probability of losing a job equals ℓ, there are $\ell \times E$ job losers. If the probability of finding a job equals h, there are $h \times U$ job finders.



Equation (12-3) shows that the steady-state unemployment rate is determined by the transition probabilities between employment and unemployment (ℓ and h). Policies designed to reduce steady-state unemployment must alter these probabilities.

As an example, suppose the probability that employed workers lose their jobs in any given month is 0.01, implying that the average job lasts 100 months. Suppose also that the probability that unemployed workers find work in any given month is 0.10, implying the average unemployment spell lasts 10 months. The steady-state unemployment rate is 9.1 percent, or 0.01/(0.01 + 0.10). The example illustrates that the unemployment rate is smaller when jobs are more stable and larger when unemployment spells last longer. In other words, two key factors determine the unemployment rate: the incidence of unemployment (that is, the probability ℓ that an employed person loses his or her job), and the duration of unemployment spells (which is the inverse of the probability that an unemployed person finds a job, or $1/h$).

The steady-state unemployment rate derived in equation (12-3) is sometimes called the **natural rate of unemployment**. We will provide a more detailed discussion of the factors that determine the natural rate later in the chapter.

Of course, this simple model of labor force dynamics does not accurately describe the actual flows observed in real-world labor markets. There are also flows in and out of the labor force, so a person can be in one of three states: Employed, unemployed, and the nonmarket sector. Figure 12-7 illustrates the magnitude of these flows for the average month between 1990 and 2006. There were 130.0 million persons employed, 7.4 million persons unemployed, and 69.3 million persons in the nonmarket sector. During the typical month, about 1.8 million persons who had a job became unemployed and 1.8 million persons who had been out of the labor force joined the unemployment rolls. At the same time, 2 million of the unemployed found a job and an additional 1.6 million left the labor force.

Incidence versus Duration

Suppose there are 100 unemployed workers in the economy, and that 99 of them are in an unemployment spell that lasts only 1 week. The remaining unemployed worker, however, is in a spell that lasts 101 weeks. Most unemployment spells in this economy would then be short-term spells because most unemployed workers are unemployed for only 1 week.

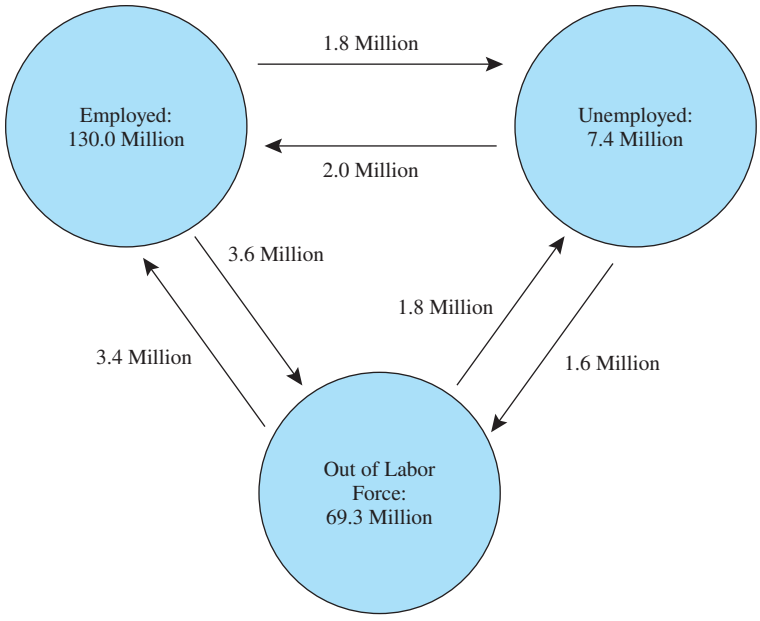


FIGURE 12-7
Dynamic Flows in the U.S. Labor Market, Monthly Average, 1990–2006

Source: Zhi Boon, Charles M. Carson, R. Jason Faberman, and Randy E. Ilg, "Studying the Labor Market Using BLS Labor Dynamics Data," *Monthly Labor Review* (February 2008): 3–16.

At the same time, however, there are a total of 200 weeks of unemployment in this economy (99 weeks for each of the workers with a 1-week spell, plus 101 weeks for the worker with the long spell). Most of the time spent unemployed, therefore, is attributable to a single worker (101/200). In other words, most spells might be short, yet most of the weeks that workers spend unemployed might be attributable to a very few workers with very long spells. As this numerical example suggests, it is important to observe both the incidence and the duration of unemployment in order to draw sensible inferences about the nature of the unemployment problem in any particular labor market.[5]

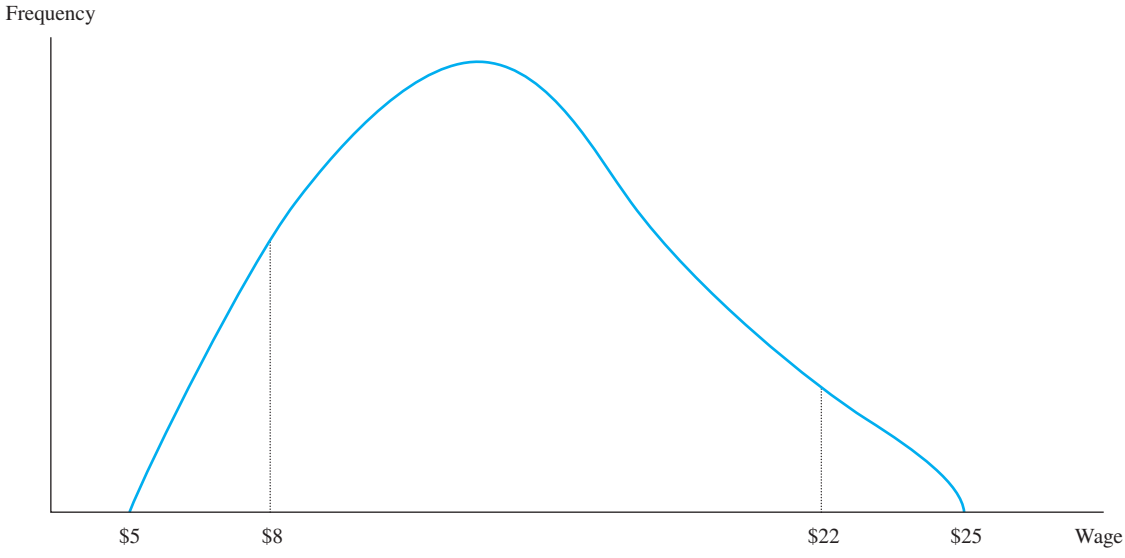
12-4 Job Search

Many theories claim to explain why unemployment exists and persists in competitive markets. We begin our discussion of these alternative stories by reemphasizing that we would observe frictional unemployment even if there were no fundamental imbalance between the supply of and demand for workers. Because different firms offer different job opportunities and because workers are not fully informed about where the best jobs are located, it takes time to find the optimal match.

Any given worker can choose from many different job offers. Just as gas stations that are one block apart charge different prices for a gallon of gas, different firms make different offers to the same worker. These wage differences encourage an unemployed worker to "shop around" until he or she finds a superior job offer. It takes time and effort to learn

[5] Kim B. Clark and Lawrence H. Summers, "Labor Market Dynamics and Unemployment: A Reconsideration," *Brookings Papers on Economic Activity* (1979): 13–60.

FIGURE 12-8 The Wage Offer Distribution
The wage offer distribution gives the frequency distribution of potential job offers for a given worker. The worker can get a job paying anywhere from $5 to $25 per hour.



about what different firms have to offer. Inevitably, search activities prolong the unemployment spell. The worker, however, is willing to endure the longer spell because it might lead to a higher-paying job. In a sense, search unemployment is a form of human capital investment; the worker is investing in information about the labor market.[6]

The Wage Offer Distribution

To simplify the analysis, assume that only unemployed workers search for a job. It is likely that some persons keep on searching for an even better job after they accept a particular job offer. However, it is easier to grasp the main implications of the search model if we restrict our attention to unemployed workers.

The **wage offer distribution** gives the frequency distribution describing the various offers available to a particular unemployed worker. Figure 12-8 illustrates a typical wage offer distribution. As drawn, the worker can end up in a job paying anywhere from $5 to $25 per hour.

We assume that the unemployed worker knows the shape of the wage offer distribution. In other words, he knows that there is a high probability that his search will locate a job paying between $8 and $22 per hour and that there is a small probability that he might end up with a job paying less than $8 or more than $22.

[6] Technical surveys of job search models include Dale T. Mortensen, "Job Search and Labor Market Analysis," in Orley C. Ashenfelter and Richard Layard, editors, *Handbook of Labor Economics,* vol. 2, Amsterdam: Elsevier, 1986, pp. 849–919; Dale T. Mortensen and Christopher A. Pissarides, "New Developments in Models of Search in the Labor Market," in Orley C. Ashenfelter and David Card, editors, *Handbook of Labor Economics,* vol. 3B, Amsterdam: Elsevier, 1999, pp. 2567–2627.

If search were free, the worker would keep on knocking from door to door until he finally hits the firm that pays the $25 wage. Search activities, however, are costly. Each time the worker applies for a new job, he must pay for transportation and other types of expenses, such as a fee to a private employment agency. There is also an opportunity cost: He could have been working at a lower-paying job. The worker's trade-off is clear: The longer he searches, the more likely he will get a high wage offer; the longer he searches, the more it costs to find that job.

Nonsequential and Sequential Search

When should the worker stop searching and settle for the job offer at hand? There are two approaches to answering this question.[7] Each approach gives a "stopping rule" telling the worker when to end his search activities.

The worker could follow a strategy of **nonsequential search**. In this strategy, the worker decides before he begins his search that he will randomly visit, say, 20 firms and accept the offer that pays the highest wage (which will not necessarily be the job paying $25 an hour). This search strategy is *not* optimal. Suppose that on his first try, the worker just happens to hit the firm that pays $25 an hour. A nonsequential search strategy would force this worker to visit another 19 firms knowing full well that he could never do better. It does not make sense, therefore, for the worker to precommit himself to a fixed number of searches regardless of what happens while he is searching.

A better strategy is one of **sequential search**. Before the worker sets out on the search process, he decides which job offers he is willing to accept. For instance, he might decide that he is not willing to work for less than, say, $12 an hour. The worker will then visit one firm and compare the wage offer to his desired $12 wage. If the wage offer exceeds $12, he accepts the job, ending the unemployment spell. If the wage offer is less than $12, he rejects the job offer and starts the search process over again (that is, he will visit a new firm, compare the new wage offer to his desired wage, and so on). The sequential search strategy implies that if a worker is lucky enough to find the $25 job on the first try, he will immediately recognize that he lucked out and stop searching.

The Asking Wage

The **asking wage** is the threshold wage that determines if the unemployed worker accepts or rejects incoming job offers.[8] There is an obvious link between a worker's asking wage and the length of the unemployment spell the worker will experience. Workers who have low asking wages find acceptable jobs very quickly and the unemployment spell will be short. Workers with high asking wages take a long time to find an acceptable job and the unemployment spell will be very long.

[7] The nonsequential search model was introduced by George J. Stigler, "Information in the Labor Market," *Journal of Political Economy* 70 (October 1962): 94–104; the sequential search model was introduced by John J. McCall, "Economics of Information and Job Search," *Quarterly Journal of Economics* 84 (February 1970): 113–126.

[8] The asking wage is called the *reservation wage* in many studies. We use the term *asking wage* to differentiate the threshold that determines whether an unemployed person accepts a job offer from the *reservation wage* defined in the labor supply chapter, which determines whether a person enters the labor market. The intuition for the threshold is the same in both contexts; it is the wage that makes a worker indifferent between two alternative actions.

It is easy to illustrate how the worker sets his asking wage. Consider the wage offer distribution in Figure 12-8. Suppose the unemployed worker goes out and samples a firm at random. By pure chance, he visits the firm that pays the lowest wage possible, $5 per hour. The worker was very unlucky in his first try, and he knows it. He must decide whether to accept or reject this offer by comparing the expected gain from one additional search (by how much would the wage offer increase) with the cost of the additional search. If the offer at hand is only $5, the gain from searching one more time is very high. Even if the worker instantly forgets which firm he visited today, the odds of hitting that $5 firm again tomorrow are very low. An additional search, therefore, will almost surely generate an offer higher than $5 per hour. The marginal gain from one additional search, therefore, is substantial.

Suppose the worker visits another firm, and this time he gets a $10 wage offer. The incentive to continue searching will again depend partly on the marginal gain from one more search. Given the wage offer distribution in Figure 12-8, there is still a good chance that an additional search will generate a higher wage offer. But the gain from this additional search is not as high as when the wage offer at hand was only $5. After all, there is a chance that if he searches one more time, he might hit a firm offering less than $10.

Suppose the worker decides to try his luck one more time. This time he hits the jackpot, getting a wage offer of $25. At this point, the marginal gain from further search is zero. The worker cannot get a higher wage offer.

The marginal gain from search, therefore, is lower if the worker has a good wage offer at hand. As a result, the marginal revenue curve (that is, the gain from one additional search) is downward sloping, as illustrated by the *MR* curve in Figure 12-9.

Of course, the asking wage is determined not only by the marginal gain from searching, but also by the marginal cost of searching. There are two types of search costs. The first is the direct cost of search, which includes transportation costs. The second is the opportunity cost of search. Even if the wage offer at hand is the $5 wage offer, the worker who rejects this offer and searches again is forgoing $5 worth of income. The marginal cost of search is large if the worker has a good wage offer at hand. Therefore, the marginal cost curve (or *MC* in Figure 12-9) is upward sloping.

The intersection of the marginal revenue and marginal cost curves gives the asking wage, $\tilde{w}$. Consider what would happen if the worker gets a wage offer of only $10, which is less than $\tilde{w}$ in the figure. The marginal revenue from search exceeds the marginal cost, and the worker should continue searching. If the wage offer at hand was $20 (above the asking wage), the worker should accept the job because the expected benefit from additional search is lower than the marginal cost of search. The asking wage, therefore, makes the worker indifferent between continuing and ending his search.

Determinants of the Asking Wage

The worker's asking wage will respond to changes in the benefits and costs of search. As with all human capital investments, the benefits from search are collected in the future, so they depend on the worker's discount rate. Workers with high discount rates are present-oriented and will perceive the future benefits from search to be low. As illustrated in Figure 12-10*a*, workers with high discount rates have lower marginal revenue curves (shifting the marginal revenue curve from MR_0 to MR_1) and will have lower asking wages (from $\tilde{w}_0$ to $\tilde{w}_1$). Because these workers do not have the patience to wait until a better offer comes along, they accept lower wage offers and have shorter unemployment spells.

FIGURE 12-9 The Determination of the Asking Wage

The marginal revenue curve gives the gain from an additional search. It is downward sloping because the better the job offer at hand, the less there is to gain from an additional search. The marginal cost curve gives the cost of an additional search. It is upward sloping because the better the job offer at hand, the greater the opportunity cost of an additional search. The asking wage equates the marginal revenue and the marginal cost of search.

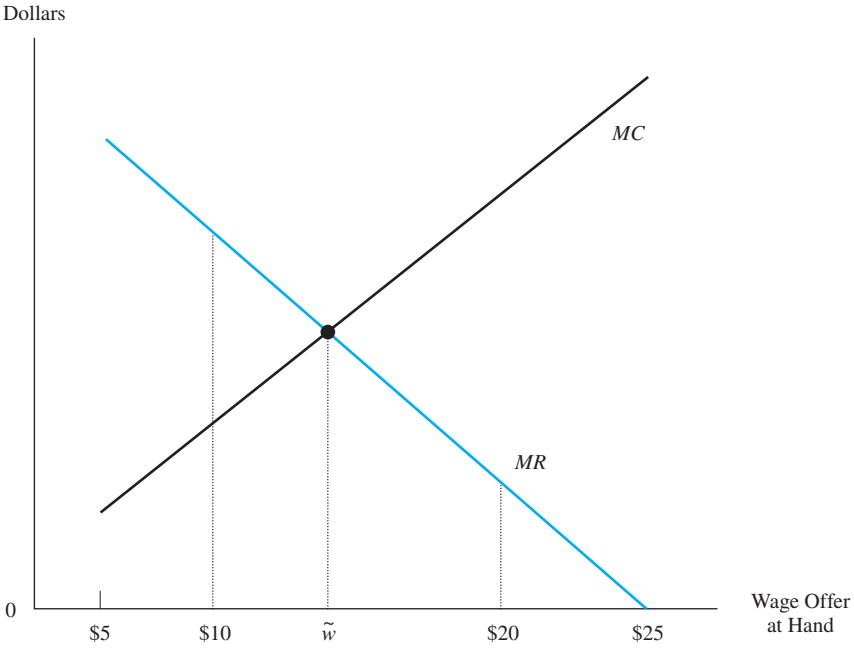
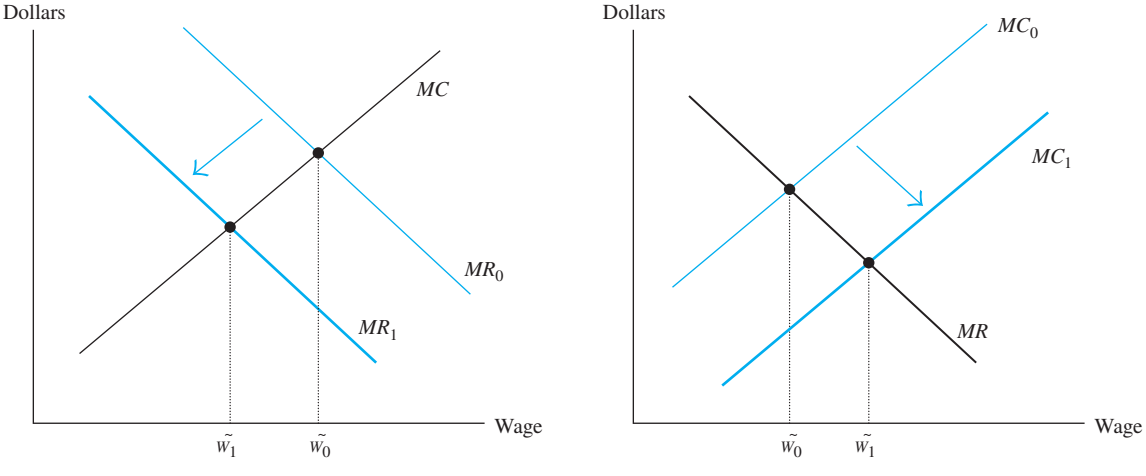


FIGURE 12-10 The Determination of the Asking Wage

(*a*) A "present-oriented" worker has a high discount rate and gains less from additional searches, so the marginal revenue curve shifts to MR_1 and the asking wage falls. (*b*) Unemployment insurance benefits reduce the marginal cost of search and shift the marginal cost curve to MC_1, increasing the asking wage.



(*a*) Increase in Discount Rates

(*b*) Increase in Unemployment Benefits

A major component of search costs is the opportunity cost of rejecting a job offer and continuing the search. The unemployment insurance (UI) system, which we discuss in greater detail below, compensates workers who are unemployed and actively engaged in search activities. Suppose that the worker has a wage offer at hand of $10 per hour (or $400 per week). If he qualifies for UI benefits of $200 per week, the worker is only giving up $200 by rejecting the job offer. Unemployment insurance benefits, therefore, reduce the marginal cost of search.

As Figure 12-10*b* shows, a reduction in the marginal cost of search (from MC_0 to MC_1) raises the asking wage from $\tilde{w}_0$ to $\tilde{w}_1$. The UI system, therefore, has three important effects: (1) It leads to longer unemployment spells, (2) it increases the unemployment rate, and (3) it leads to a higher wage after the unemployment spell ends.

Although the asking wage is not observed directly, a number of surveys have attempted to determine an unemployed worker's asking wage by asking such questions as "What type of work are you looking for?" and "At what wage would you be willing to take this job?"

In 1980, white unemployed youth in the United States reported an average asking wage of $4.30 an hour, and black unemployed youth reported $4.22 an hour.[9] The worker's self-reported asking wage was strongly correlated with the worker's unemployment experience. Workers who reported higher asking wages had longer unemployment spells. Higher asking wages also led to higher wages in their new job; a 10 percent increase in the asking wage increased the wage by 5 percent for young whites and 3 percent for young blacks. In the United Kingdom, where similar surveys have been conducted, a 10 percent increase in the asking wage increases the length of the unemployment spell by at least 5 percent.[10]

Is the Asking Wage Constant over Time?

If the marginal revenue and the marginal cost of search were constant over the length of an unemployment spell, the asking wage would also be constant. An unemployed worker would then have the same chance of finding a job in the 1st week of the spell as in the 30th week.

But the probability of escaping unemployment probably depends on how long the worker has been unemployed. After all, search is costly. The unemployed worker has limited means and will hit a "liquidity constraint" at some point; put simply, he will no longer have the cash to keep his search going.

The liquidity constraint forces the worker to recognize that he cannot spend the rest of his life searching for the best job possible (for the $25 jackpot in Figure 12-8), and that he will have to settle for less. As the worker's cash runs out, therefore, the asking wage falls. The worker will then be willing to accept job offers that were rejected at the beginning of the unemployment spell, so that the probability of escaping unemployment rises the longer the worker has been unemployed.

[9] Harry J. Holzer, "Reservation Wages and Their Labor Market Effects for Black and White Male Youth," *Journal of Human Resources* 21 (Spring 1986): 157–177; Harry J. Holzer, "Job Search by Employed and Unemployed Youth," *Industrial and Labor Relations Review* 40 (July 1987): 601–611.

[10] Stephen R. G. Jones, "The Relationship between Unemployment Spells and Reservation Wages as a Test of Search Theory," *Quarterly Journal of Economics* 103 (November 1988): 741–765.

12-5 Policy Application: Unemployment Compensation

The UI system in the United States is run mainly at the state level. In 2010, at the peak of the Great Recession, the system distributed $150.1 billion in benefits. By 2016, the economic recovery had reduced the cost of the program to $36.2 billion.

The basic parameters of the system are roughly similar across states.[11] When a worker becomes unemployed, he may become eligible for unemployment benefits depending on how long he has been employed and on the reason for the job separation. Workers who are laid off from their jobs typically qualify for unemployment benefits if they have worked for at least two quarters in the year prior to the layoff and if they have had some minimum level of earnings during that year (on the order of $1,000–$3,000 for the year). Workers who quit their jobs, who were fired for just cause, or who are on strike are usually not eligible for unemployment benefits. New labor market entrants or reentrants are also not eligible for benefits.

Eligible workers can collect UI benefits after a waiting period of 1 week. The benefit level depends on the worker's weekly wage: The higher the weekly wage, the larger the benefit. However, there is both a minimum and a maximum level of weekly benefits. In 2017, the minimum level of benefits was $45 in Alabama, $40 in California, and $24 in West Virginia; the maximum level was $265 in Alabama, $450 in California, and $424 in West Virginia.

Because benefits are capped both from below and from above, the **replacement ratio**, the proportion of weekly earnings that are replaced by UI benefits, may be very high for low-income workers but will be low for high-income workers. On average, the replacement ratio was about 40 percent in 2017.

The unemployed worker receives UI benefits as long as he actively seeks work, up to a specified number of weeks. The maximum number of benefit weeks is typically 26, but the benefit period is lengthened if the national or state economy faces particularly adverse conditions. In 2010, for instance, some unemployed workers could have collected UI benefits for a much longer period. In Massachusetts, an unemployed worker could have received benefits for up to 99 weeks. Once a worker exhausts his UI benefits, he no longer qualifies to receive benefits unless he finds another job, works the required number of quarters, and becomes unemployed once again.

UI and the Duration of Unemployment Spells

The structure of the UI system has important implications for the duration of unemployment spells. Higher replacement ratios, for instance, obviously reduce search costs. There should then be a positive correlation between the replacement ratio and the duration of the spell.

This prediction of search theory has been confirmed by many studies. A 25-percent rise in the replacement ratio (from, say, 0.4 to 0.5) increases the average duration of an unemployment spell by about 15–25 percent.[12] The BLS reports that the typical unemployment

[11] The U.S. Department of Labor maintains a website summarizing how the Unemployment Insurance system is financed in each state; see www.ows.doleta.gov/unemploy/sig_measure.asp.

[12] Kathleen P. Classen, "The Effect of Unemployment Insurance on the Duration of Unemployment and Subsequent Earnings," *Industrial and Labor Relations Review* 30 (July 1977): 438–444; Robert R. Moffitt, "Unemployment Insurance and the Distribution of Unemployment Spells," *Journal of Econometrics* 28 (April 1985), 85–101; Patricia M. Anderson and Bruce D. Meyer, "The Effects of the Unemployment Insurance Payroll Tax on Wages, Employment, Claims and Denials," *Journal of Public Economics* 78 (October 2000): 81–106.

spell in 2017 lasted an average of 25 weeks. Reducing the replacement ratio from 0.4 to 0.3 (or a 25 percent cut in the ratio) would reduce the average length of an unemployment spell by about 5 weeks. The UI system, therefore, can have a numerically important impact on the duration of unemployment.[13]

Moreover, because the replacement ratio tends to be larger for low-skill workers, these workers will have relatively higher asking wages and longer unemployment spells.[14] The observation that low-skill workers have longer unemployment spells need not imply that these workers have a particularly difficult time finding new jobs.

After collecting UI benefits for a specified time period (typically 26 weeks), an unemployed worker does not qualify for additional benefits. The benefit cut in the 26th week, therefore, substantially raises the cost of search. The worker will likely reduce his asking wage at that point, and we should expect to see a noticeable increase in the exit rate from unemployment.

The evidence indeed shows that a job-seeking worker's chance of finding a job improves dramatically the week benefits run out. Figure 12-11 illustrates how the probability that unemployed workers find a new job depends on the number of weeks remaining until exhaustion of benefits. A worker with 5–10 weeks of UI benefits left has a probability of finding a job (on any given week) of about 3 percent. But the probability spikes to almost 8 percent the week the benefits run out.

The UI system not only lengthens the duration of unemployment spells, but also leads to a higher wage in the new job. A 10 percent increase in the replacement ratio increases the subsequent wage by 2–7 percent.[15] The evidence, therefore, confirms the implications of the search model of unemployment: Lower search costs increase both the duration of spells and the eventual wage.

Many studies have documented the impact of UI by exploiting idiosyncratic legislative changes in the parameters that determine benefits. For example, in a peculiar deal that was struck to gain the support of labor unions, New Jersey extended UI benefits for 13 additional weeks to persons who exhausted their regular UI benefits between June 2 and November 24 of 1996. Despite the very short-run nature of this benefit extension, and despite the fact that many of those affected probably began looking for work prior to June 2, persons in this "notch" had a higher probability of exhausting benefits and qualifying for the additional 13 weeks.[16]

[13] There is also evidence suggesting that eligibility for UI encourages workers to have shorter jobs, presumably because it increases the propensity for employed workers to keep on searching; see Stepan Jurajda, "Estimating the Effect of Unemployment Insurance Compensation on the Labor Market Histories of Displaced Workers," *Journal of Econometrics* 108 (June 2002): 227–252; and Audrey Light and Yoshiaki Omori, "Unemployment Insurance and Job Quits," *Journal of Labor Economics* 22 (January 2004): 159–188.

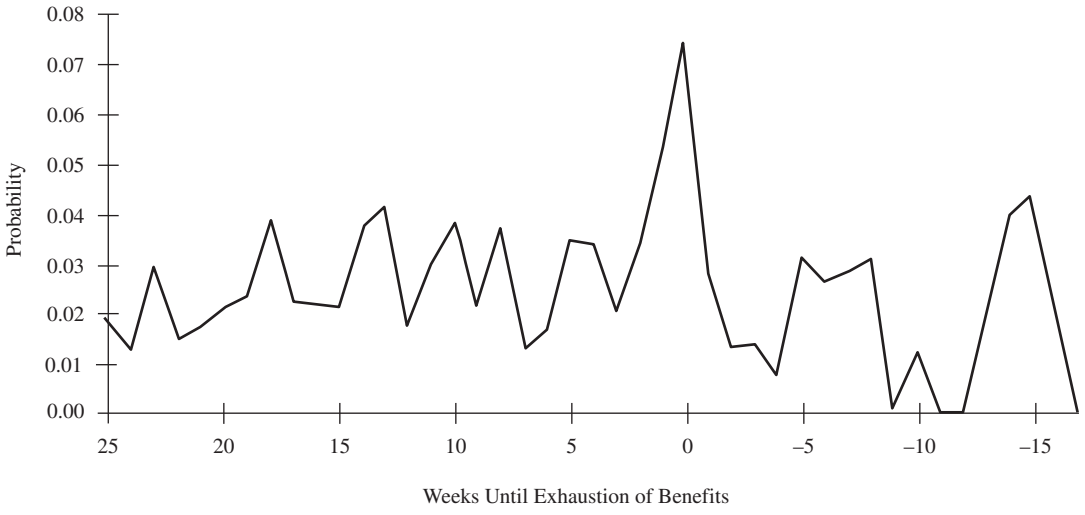
[14] Bruce D. Meyer, "Unemployment Insurance and Unemployment Spells," *Econometrica* 58 (July 1990): 757–782; Olympia Bover, Manuel Arellano, and Samuel Bentolila, "Unemployment Duration, Benefit Duration and the Business Cycle," *Economic Journal* 112 (April 2002): 223–265.

[15] Ronald G. Ehrenberg and Ronald Oaxaca, "Unemployment Insurance, Duration of Unemployment, and Subsequent Wage Gain," *American Economic Review* 66 (December 1976): 754–766.

[16] David Card and Phillip B. Levine, "Extended Benefits and the Duration of UI Spells: Evidence from the New Jersey Extended Benefit Program," *Journal of Public Economics* 78 (October 2000): 107–138; see also Johannes F. Schmieder, Till von Wachter, and Stefan Bender, "The Effects of Extended Unemployment Insurance Over the Business Cycle: Evidence from Regression Discontinuity Estimates Over 20 Years," *Quarterly Journal of Economics* 127 (May 2012): 701–752.

FIGURE 12-11 The Relationship between the Probability of Finding a New Job and UI Benefits

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



Similarly, as a response to the economic distress caused by the Great Recession, many states extended the availability of UI benefits from 26 weeks to 99 weeks between 2009 and 2012. The data indicate that this benefit extension reduced the exit rate from unemployment, mainly because fewer of the unemployed left the labor force (choosing instead to exhaust benefits).[17] About a quarter of the long-term unemployment observed during this severe downturn could be attributed to the extension of benefits.

There is also evidence that changing the parameters of the UI system has strong effects on unemployment duration in many European countries. In Switzerland, for example, government authorities are required to inform an unemployed person that he is going to be investigated for noncompliance with the eligibility requirements. Not surprisingly, this warning has a sizable impact on the speed with which unemployed workers find jobs.[18]

[17] Henry S. Farber and Robert G. Valletta, "Do Extended Unemployment Benefits Lengthen Unemployment Spells? Evidence from Recent Cycles in the U.S. Labor Market," *Journal of Human Resources* 50 (Fall 2015): 873–909; see also Marcus Hagedorn, Fatih Karahan, Iourii Manovskii, and Kurt Mitman, "Unemployment Benefits and Unemployment in the Great Recession: The Role of Macro Effects," NBER Working Paper No. 19499, October 2013.

[18] Rafael Lalive, Jan C. van Ours, and Josef Zweimuller, "The Effect of Benefit Sanctions on the Duration of Unemployment," *Journal of the European Economic Association* 3 (December 2005): 1386–1417. For related studies that examine the Slovenian and Norwegian labor markets, respectively, see Jan C. van Ours and Milan Vodopivec, "How Shortening the Potential Duration of Unemployment Benefits Affects the Duration of Unemployment: Evidence from a Natural Experiment," *Journal of Labor Economics* 24 (April 2006): 351–378 and Knut Roed and Tao Zhang, "Does Unemployment Compensation Affect Unemployment Duration?" *Economic Journal* 113 (January 2003): 190–206.

Temporary Layoffs

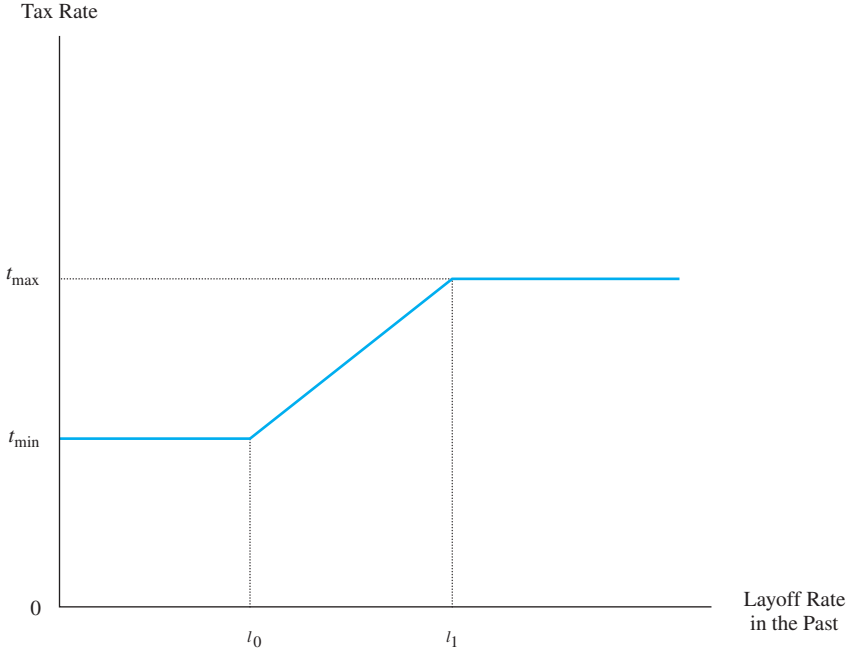
In January 2018, nearly 20 percent of unemployed workers were on **temporary layoffs**, expecting to return to their former employer at the end of the unemployment spell. And the employment practices of manufacturing firms suggest that they rehire more than 70 percent of the workers they lay off.[19] It turns out that the way in which the UI system is financed encourages employers to "overuse" temporary layoffs.

Unemployment insurance is funded by a payroll tax on employers. Typically, a state decides on a taxable wage base, indicating the maximum worker's salary that is subject to the UI payroll tax. This cap varies across states.[20] In 2017, the taxable wage base in Arizona was $7,000; in Massachusetts, $15,000; and in Oregon, $38,400. The state also chooses a tax rate t that the firm pays on the wage base.

The tax rate depends on a number of variables, including the general health of the state's economy, the layoff history of firms in that industry, and the firm's own layoff history. As Figure 12-12 shows, firms that had high layoff rates in the past are typically assessed higher tax rates. The maximum tax rate a firm can be assessed, however, is capped at t_{max}. If the firm rarely uses layoffs, it is assessed a low tax rate, but this tax rate is no lower

FIGURE 12-12 Funding the UI System: Imperfect Experience Rating

If the firm has had very few layoffs in the past (below threshold ℓ_0), the firm is assessed a very low tax rate to fund the UI system. Firms that have had many layoffs are assessed a higher tax rate, but the tax rate is capped at t_{max}.



[19] Martin Feldstein, "The Importance of Temporary Layoffs: An Empirical Analysis," *Brookings Papers on Economic Activity* 3 (1975): 725–744.

[20] U.S. Department of Labor, Employment and Training Administration, *Comparison of State Unemployment Laws,* 2017; available at www.unemploymentinsurance.doleta.gov/unemploy/comparison2017.asp.

than some rate t_{min} (which in some states is zero). In California, for example, the minimum and maximum tax rates, respectively, are 1.5 percent and 6.2 percent; in Kansas, 1.8 and 9.2 percent; and in Massachusetts, 1.21 and 18.55 percent.

Although this method of determining an employer's tax rate is guided by the belief that employers who use the UI system should pay for it, the system does not perfectly impose the tax burden on employers who initiate the most layoffs. Because the tax rate is capped at t_{max}, employers who lay off many workers do not pay their "fair share" of the cost and are instead subsidized by other firms. The determination of the employer's tax rate, therefore, uses an **imperfect experience rating**.

To see how this imperfect experience rating encourages employers to rely on temporary layoffs, consider a labor market where workers and firms are engaged in long-term contracts, perhaps because of specific training.[21] Suppose economic conditions worsen temporarily. The financing of the UI system implies that employers who lay off many workers do not pay the entire cost of the worker's "salary" during the unemployment spell (that is, the unemployment benefits). The firm can then lay off workers and shift part of the payroll to other taxpayers during the period of economic hardship. The bond between worker and firm implies that both parties find it worthwhile to continue the employment relationship. As a result, workers do not want to look for alternative employment because they expect to be recalled to their jobs, and firms do not want to look for other workers because the existing pool of workers is valuable to the firm. Imperfect experience rating, therefore, allows firms to use taxpayer funds to "ride over" some of the rough waves in the economy.

Imperfect experience rating has a significant impact on the layoff behavior of firms. Not surprisingly, the probability that an unemployed worker is recalled to his job increases substantially the week that unemployment benefits run out. In the weeks prior to the exhaustion of benefits, the probability of being recalled is only about 1–2 percent per week. In the week when benefits are exhausted, the probability of recall rises to more than 5 percent.[22] In short, employers use the taxpayer subsidy for as long as they can. Another example of the strong correlation between temporary layoffs and UI is the pattern of seasonal unemployment exhibited by many industries. Firms located in states with low tax rates make heavy use of temporary layoffs during the slow season.[23]

Not surprisingly, the frequency of temporary layoffs affects not only how firms behave, but also how unemployed workers spend their time. The likelihood of being recalled to the job greatly reduces the intensity of job search activities. A study of time-use data that yield a daily diary of how workers allocate their time documents the impact.[24] The typical

[21] Martin Feldstein, "Temporary Layoffs in the Theory of Unemployment," *Journal of Political Economy* 84 (October 1976): 937–958; Robert H. Topel, "On Layoffs and Unemployment Insurance," *American Economic Review* 73 (September 1983): 541–559.

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

[23] David Card and Phillip B. Levine, "Unemployment Insurance Taxes and the Cyclical and Seasonal Properties of Unemployment," *Journal of Public Economics* 53 (January 1994): 1–30.

[24] Alan B. Krueger and Andreas Mueller, "Job Search and Unemployment Insurance: New Evidence from Time Use data," *Journal of Public Economics* 94 (April 2010): 298–307.

Theory at Work

CASH BONUSES AND UNEMPLOYMENT

Because of the disincentive effects of UI, there are many calls for reform of the system, and some states have conducted experiments to see if various policy changes shorten the duration of unemployment spells. In these experiments, some of the workers applying for UI benefits are offered a cash bonus if they find jobs relatively quickly. This random sample of unemployed workers forms the treatment group. The remaining unemployed workers compose the control group and participate in the typical UI program.

In Illinois, workers in the treatment group who found a job within 11 weeks (and who kept that job for at least 4 months) were given a cash bonus of $500, or about four times the average weekly benefit. In Pennsylvania, unemployed workers in the treatment group who found a job within 6 weeks were entitled to a bonus equal to six times the weekly benefit amount.

The evidence from these experiments is unambiguous. Unemployed workers who are offered cash bonuses have shorter unemployment spells than workers in the control group.

Surprisingly, the treated workers did not end their unemployment spells quickly by accepting lower-paying jobs. The average wage after the unemployment spell ended was essentially the same for workers in the treatment and control groups. Offering cash incentives to find jobs quickly, therefore, seems to increase the intensity of the search process, speeds up the transition out of unemployment, and achieves this without a decline in the economic status of workers.

Sources: Stephen Woodbury and Robert Spiegelman, "Bonuses to Workers and Employers to Reduce Unemployment: Randomized Trials in Illinois," *American Economic Review* 77 (September 1987): 513–550; Bruce D. Meyer, "Lessons from the U.S. Unemployment Insurance Experiments," *Journal of Economic Literature* 33 (March 1995): 91–131.

unemployed worker who expects to be recalled to the job spends only 13 minutes per day searching, as compared to 45 minutes for an unemployed worker who lost his job permanently. Put differently, the temporary nature of the layoff cuts the amount of time that an unemployed worker devotes to search by about 75 percent.

12-6 The Intertemporal Substitution Hypothesis

Job search models provide a sensible explanation for the existence of frictional unemployment. This type of unemployment is voluntary in the sense that workers invest in information in return for a higher wage in their new jobs. It has been proposed that the large increase in unemployment observed during a severe economic downturn might also have a voluntary component.[25]

The theory of labor supply over the life cycle, introduced in the labor supply chapter, predicts that workers have an incentive to work in those years when the wage is high and to consume leisure in those years when the wage is low. The **intertemporal substitution hypothesis** also has interesting implications for how workers allocate their time over the business cycle.

[25] The influential hypothesis was first proposed by Robert E. Lucas and Leonard Rapping, "Real Wages, Employment, and Inflation," *Journal of Political Economy* 77 (September/October 1969): 721–754.

Suppose that the real wage fluctuates over the business cycle and that this fluctuation is procyclical; in other words, the real wage rises when the economy expands and declines when the economy contracts. Because it is cheap to consume leisure when the real wage is low, workers are more than willing to work less during recessions. They can collect UI benefits while unemployed, or perhaps leave the labor force altogether. Put differently, some of the unemployment observed in economic downturns might be voluntary because workers are taking advantage of the decline in the real wage to consume leisure.

The intertemporal substitution hypothesis makes two key assumptions: (1) The real wage is procyclical and (2) labor supply responds to shifts in the real wage.

The question of whether real wages are sticky over the business cycle is one of the oldest questions in macroeconomics. Although there is a growing consensus that wages are indeed procyclical, the size of the correlation between wages and the business cycle has not been established conclusively and, in fact, seems to vary across recessions.[26]

The cyclical movement of the real wage is difficult to observe because the composition of the labor force changes over the cycle. Unemployment typically has a particularly adverse effect on low-skill workers. When we calculate the average wage of workers during an economic expansion, we are using a very different sample than when we calculate it during a recession. Although it was widely believed for many years that real wages were sticky, studies that correct for this "composition" bias suggest that the real wage is procyclical.

But the interpretation of unemployment during recessions as a rational (and voluntary) reallocation of a worker's time also requires the assumption that labor supply is elastic, responding to changes in the wage. But labor supply curves—particularly for men—tend to be inelastic. In fact, the large drop in labor supply observed during recessions can be interpreted as an intertemporal substitution only if the labor supply elasticity is far larger than what is typically estimated.[27] In short, it seems doubtful that the increase in unemployment observed during downturns can be dismissed as a voluntary reallocation of the worker's time.

12-7 The Sectoral Shifts Hypothesis

Although job search activities help us understand the presence of frictional unemployment, they do not explain the existence and persistence of long-term unemployment. A number of alternative models have been proposed to explain why structural unemployment might arise in a competitive market.

One important explanation stresses the possibility that workers who are searching for jobs are not qualified to fill the available vacancies. It is well known that shifts in aggregate demand do not affect all sectors of the economy equally. At any point in time, some sectors of the economy are expanding, and other sectors are in decline.

[26] Mark J. Bils, "Real Wages over the Business Cycle: Evidence from Panel Data," *Journal of Political Economy* 93 (August 1985): 666–689; Gary Solon, Robert Barsky, and Jonathan A. Parker, "Measuring the Cyclicality of Real Wages: How Important Is Composition Bias?" *Quarterly Journal of Economics* 109 (February 1994): 1–25; and Michael W. Elsby, Donggyun Shin, and Gary Solon, "Wage Adjustments in the Great Recession and Other Downturns: Evidence from the United States and Great Britain," *Journal of Labor Economics* 34 (January 2016, Part 2): S249–S291.

[27] Solon, Barsky, and Parker, "Measuring the Cyclicality of Real Wages."

To see how these sector-specific shocks might create structural unemployment, suppose the manufacturing industry is hit by an adverse shock. Because of the reduced demand for their output, manufacturers lay off many workers. Favorable shocks to other sectors (such as the computer industry) increase the demand for labor by high-tech firms. If the skills of laid-off manufacturing workers could be easily transferred across industries, the adverse conditions in the manufacturing sector would not lead to long-term unemployment. The laid-off workers would leave the manufacturing sector and move on to jobs in the now-thriving high-tech sector. There would be frictional unemployment as workers learned about and sampled the various opportunities available in the computer industry.

Manufacturing workers, however, probably have skills that are partly specific to the manufacturing sector, so that their skills may not be very useful to computer firms. Long-term unemployment arises because it will take time for these workers to retool and acquire the skills that are now in demand. The **sectoral shifts hypothesis** suggests that there will be a pool of workers who are unemployed in long spells because of a structural imbalance between the skills of unemployed workers and the skills that employers are looking for.[28]

Although the evidence suggests that sectoral shifts do lead to unemployment, there is disagreement over just how much unemployment these shifts are responsible for. The typical empirical analysis relates the aggregate unemployment rate to the dispersion in employment growth rates across industries. The sectoral shifts hypothesis implies that the unemployment rate rises when there is a lot of dispersion in employment growth rates across industries (in other words, when some industries are growing, and some are declining). The evidence indeed documents a positive correlation between measures of dispersion in employment growth rates and the aggregate unemployment rate.[29]

Some studies have also tested the sectoral shifts hypothesis by noting that sectoral shocks should also affect stock market prices, with stock prices rising when firms are hit by favorable shocks and declining when firms are hit by adverse shocks. The dispersion in the change in stock prices across industries, therefore, provides information about the importance of sectoral shocks in the economy. It turns out that there is also a positive correlation between the dispersion in movements of stock prices and the unemployment rate.[30]

12-8 Efficiency Wages and Unemployment

As we saw in the chapter on incentive pay, firms might set an efficiency wage above the competitive wage when they find it expensive to monitor the worker's output. The high efficiency wage "buys" the worker's cooperation, discouraging shirking. Because the firm pays above-market wages, however, efficiency wage models can generate involuntary unemployment.

[28] David M. Lilien, "Sectoral Shifts and Cyclical Unemployment," *Journal of Political Economy* 90 (August 1982): 777–793.

[29] A critical appraisal of the evidence is given by Katharine G. Abraham and Lawrence F. Katz, "Cyclical Unemployment: Sectoral Shifts or Aggregate Disturbances," *Journal of Political Economy* 94 (June 1986): 507–522.

[30] S. Lael Brainard and David M. Cutler, "Sectoral Shifts and Cyclical Unemployment Reconsidered," *Quarterly Journal of Economics* 108 (February 1993): 219–243.

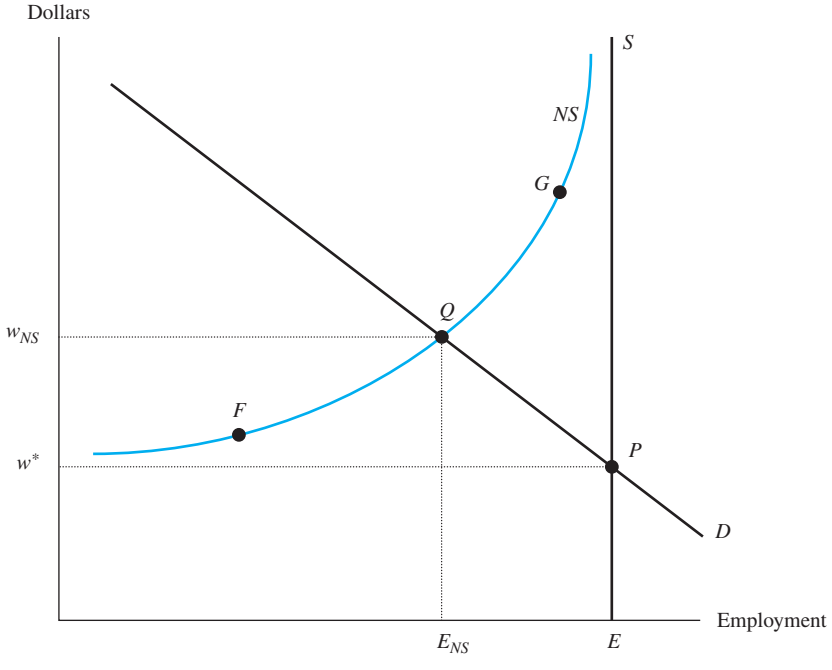
The No-Shirking Frontier

We can interpret the unemployment caused by the efficiency wage as the "stick" that keeps the well-paid workers in line.[31] To see why, consider first the wage–employment outcome in a competitive labor market where worker shirking is not a problem (perhaps because workers can be monitored at a very low cost). There are E workers in this labor market, and the labor supply curve is inelastic. Point P in Figure 12-13 gives the traditional competitive equilibrium, where the vertical supply curve S intersects the downward-sloping labor demand curve D. The market-clearing competitive wage is w^*.

Suppose now that firms cannot easily monitor the output of workers, so monitoring activities are costly. To simplify, let's assume that workers who shirk spend all their time uselessly surfing the web; in short, shirking workers are completely unproductive. The firm, therefore, will want to offer a wage–employment package that encourages its workers not to shirk at all.

FIGURE 12-13 The Efficiency Wage

If shirking is not a problem, the market clears at wage w^* (where supply S equals demand D). If monitoring is expensive, the threat of unemployment can keep workers in line. If unemployment is high (point F), firms can attract workers who will not shirk at a very low wage. If unemployment is low (point G), firms must pay a very high wage to ensure that workers do not shirk. The efficiency wage w_{NS} is given by the intersection of the no-shirking frontier (NS) and the demand curve.



[31] Carl Shapiro and Joseph E. Stiglitz, "Equilibrium Unemployment as a Worker Discipline Device," *American Economic Review* 74 (June 1984): 433–444.

Which wage must firms offer to ensure that workers do not shirk? Suppose the unemployment rate is very high. A worker will quickly realize that it is costly to shirk because if he gets caught and fired, he faces a long unemployment spell. As a result, firms would be able to attract workers who will not shirk even if they pay a relatively low wage. If the unemployment rate is very low, however, shirking workers who are caught and fired face only a short unemployment spell. To make shirking costly and to make even the short unemployment spell unprofitable, firms would have to offer the worker a high wage.

This discussion generates an upward-sloping **no-shirking frontier** (labeled *NS* in Figure 12-13), which gives the number of nonshirking workers that firms can attract at each wage. The no-shirking frontier states that when firms employ few workers out of the total E (point F), they can attract nonshirking workers at a low wage because a layoff leads to a long and costly unemployment spell. If firms hire a large number of workers (point G), they must pay higher wages to encourage workers not to shirk.

Note that the no-shirking frontier *NS* will never touch the perfectly inelastic supply curve at E workers and that the horizontal difference between the two curves gives the number of workers who are unemployed. If the market employs all the workers at a particular wage, a shirking worker who gets fired can simply walk across the street and get another job. In other words, there is no penalty for shirking. The key insight provided by the efficiency wage model is clear: Some unemployment is necessary to keep the employed workers in line.

Efficiency Wages and Unemployment

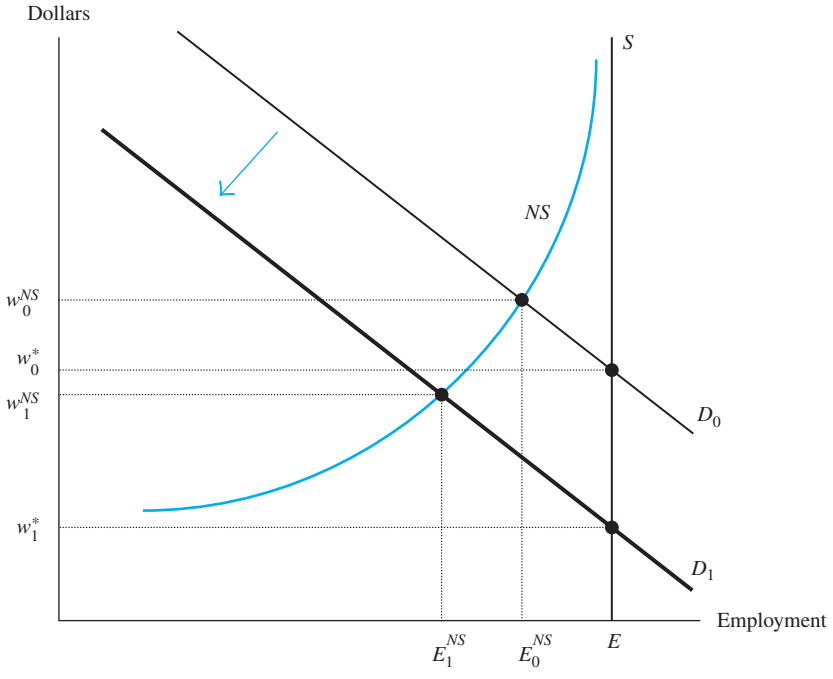
The equilibrium efficiency wage is given by the intersection of the no-shirking frontier and the labor demand curve (at point Q). The wage w_{NS} is the efficiency wage and firms will employ E_{NS} workers, so that $(E - E_{NS})$ workers will be unemployed.

The equilibrium at point Q has a number of notable properties.

1. There are no market forces driving the efficiency wage w_{NS} down toward the competitive wage w^*. If the wage was higher than the efficiency wage w_{NS}, the no-shirking frontier tells us that there will be many nonshirking workers, but firms are only willing to hire a few of them, putting downward pressure on the wage. But if the wage drops below the efficiency wage, firms would want to hire many more nonshirking workers than would be available, and the wage would rise. Therefore, the efficiency wage w_{NS} is above the market-clearing competitive wage.
2. Employed workers will not shirk. The efficiency wage w_{NS} is the wage that encourages the E_{NS} employed workers to behave.
3. There is involuntary unemployment. The $(E - E_{NS})$ unemployed workers want to work at the going wage but cannot find jobs. Firms do not wish to employ these workers because full employment, and the implied lower competitive wage, encourages workers to shirk and reduces the firm's profits.

The structural unemployment generated by efficiency wages is very different from the frictional unemployment generated by job search. Search unemployment is productive; it is an investment in information that eventually leads to a higher-paying job. The unemployment due to efficiency wages is involuntary and unproductive (from the worker's point of view). The worker would like a job but cannot find one, and he has nothing to gain from being in a long unemployment spell. From the firm's point of view, however, the involuntary unemployment is productive. It keeps the employed workers honest, increasing profits.

FIGURE 12-14 An Economic Contraction and the Efficiency Wage
A fall in aggregate demand shifts the labor demand curve from D_0 to D_1. The competitive wage falls from w_0^* to w_1^*. If firms pay an efficiency wage, the contraction also reduces the efficiency wage but by a smaller amount (from w_0^{NS} to w_1^{NS}).



The efficiency wage model also implies that wages will be relatively sticky over the business cycle. Suppose that aggregate demand falls because of a sudden downturn in economic activity. In a competitive market, the labor demand curve shifts down from D_0 to D_1 and the competitive wage drops from w_0^* to w_1^* (see Figure 12-14). If firms paid an efficiency wage, the same decline in demand lowers the wage from w_0^{NS} to w_1^{NS}. Therefore, the efficiency wage is less responsive to changes in demand than the competitive wage. Moreover, employment falls from E_0^{NS} to E_1^{NS} during the contraction and the unemployment rate rises.

The Wage Curve

Some empirical studies document a negative correlation between wages and unemployment across regional labor markets.[32] Specifically, the wage tends to be high in regions where the unemployment rate is low, and the wage tends to be low in regions where the unemployment rate is high. This correlation, which is known as the **wage curve**, is difficult to understand in the context of a competitive supply–demand framework. But it is consistent with an efficiency wage model.

Unemployment can only be observed in the standard model of a competitive labor market if the wage is relatively high—above equilibrium—and if it is sticky. The high wage

[32] David G. Blanchflower and Andrew J. Oswald, *The Wage Curve,* Cambridge, MA: MIT Press, 1994.

ensures that there are more workers who want to work than firms are willing to hire, and the stickiness means that the "excess" workers will keep looking for jobs and not find them. Note that it is *high* wages that are associated with high unemployment, the opposite of what is implied by the wage curve, where unemployment is low when wages are high.

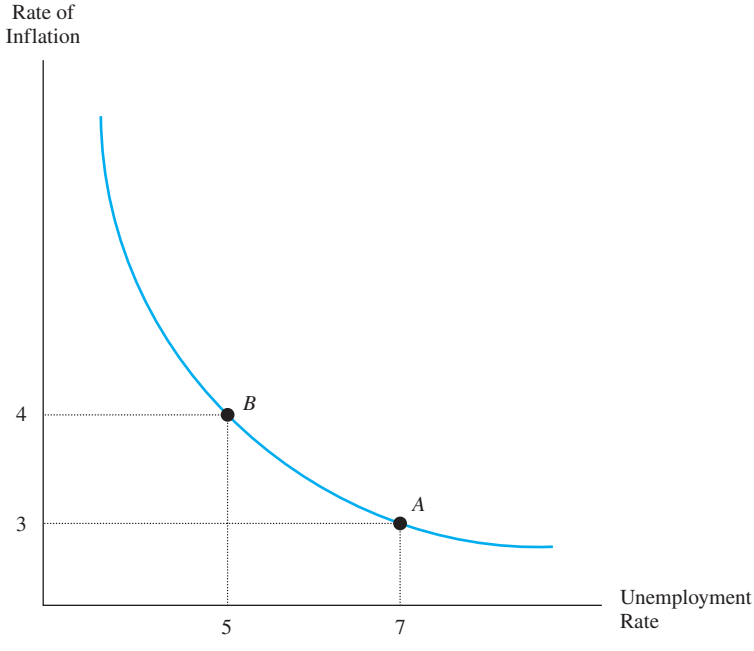
In contrast, the efficiency wage model in Figure 12-14 suggests that the wage will be relatively low when unemployment is high because the high unemployment keeps the workers in line. But wages must be relatively high when there is little unemployment, as the high wage will be required to impose a cost on workers who shirk. The efficiency wage model, therefore, predicts a negative correlation between unemployment and wages, precisely the correlation captured by the wage curve.

12-9 Policy Application: The Phillips Curve

In 1958, A. W. H. Phillips published a famous study documenting a negative correlation between the rate of inflation and the rate of unemployment in the United Kingdom from 1861 to 1957.[33] The negative relation between these two variables, illustrated in Figure 12-15, is now known as the **Phillips curve**.

FIGURE 12-15 The Phillips Curve

The Phillips curve describes the negative correlation between the inflation rate and the unemployment rate. The curve may imply that an economy faces a trade-off between inflation and unemployment.



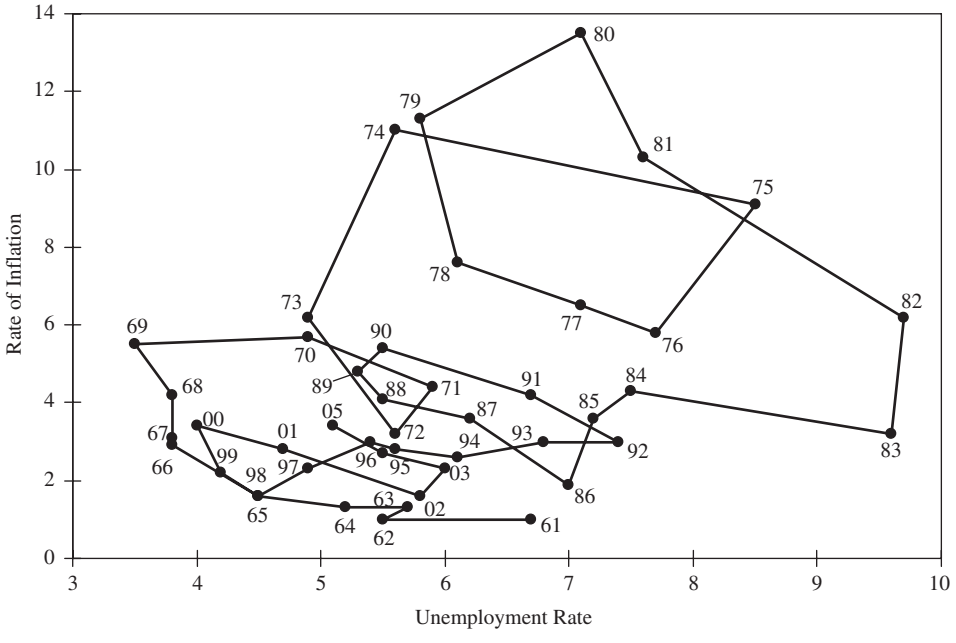
[33] A. W. H. Phillips, "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861–1957," *Economica* 25 (November 1958): 283–299.

The Phillips curve is important because it suggests that there might be a trade-off between inflation and unemployment. Suppose, for instance, that the unemployment rate is 7 percent and that the inflation rate is 3 percent, as at point *A* in the figure. The Phillips curve implies that the government could pursue expansionary policies that would move the economy to point *B*, where the unemployment rate falls to 5 percent and the inflation rate rises to 4 percent. The belief that this trade-off provided policymakers with an opportunity to permanently solve the unemployment problem is illustrated by an observation made by Nobel Prize–winning economist William Vickrey: "If unemployment could be brought down to, say, 2 percent at the cost of an assured steady rate of inflation of 10 percent per year, or even 20 percent, this would be a good bargain."

The experience of the U.S. economy during the 1960s seemed to confirm the belief that there was a trade-off between inflation and unemployment. Figure 12-16 illustrates the various inflation–unemployment outcomes observed between 1961 and 2005. Remarkably, the data points between 1961 and 1969 suggested that the United States was moving up a stable Phillips curve. As the figure makes clear, however, the confidence of policymakers in the inflation–unemployment trade-off was shattered during the 1970s. The data points simply refused to cooperate and lie along a stable Phillips curve. Instead, the relationship between inflation and unemployment went "out of kilter." If anything, there seem to be a number of different Phillips curves generated by the data points. For example, the data between 1976 and 1979 lie on a different Phillips curve than the one traced by the 1980–1983 points and from the one traced by the 2000–2002 points.

FIGURE 12-16 Inflation and Unemployment in the United States, 1961–2005

Sources: The unemployment rate data are drawn from U.S. Bureau of Labor Statistics, "Historical Data for the 'A' Tables of the Employment Situation Release. Table A-15, Alternative Measures of Labor Underutilization," stats.bls.gov/cps/cpsatabs.htm. The inflation rate is drawn from U.S. Bureau of Labor Statistics, "Table Containing History of CPI-U U.S. All Items Indexes and Annual Percent Changes from 1913 to Present," stats.bls.gov/cpi/home.htm#tables.



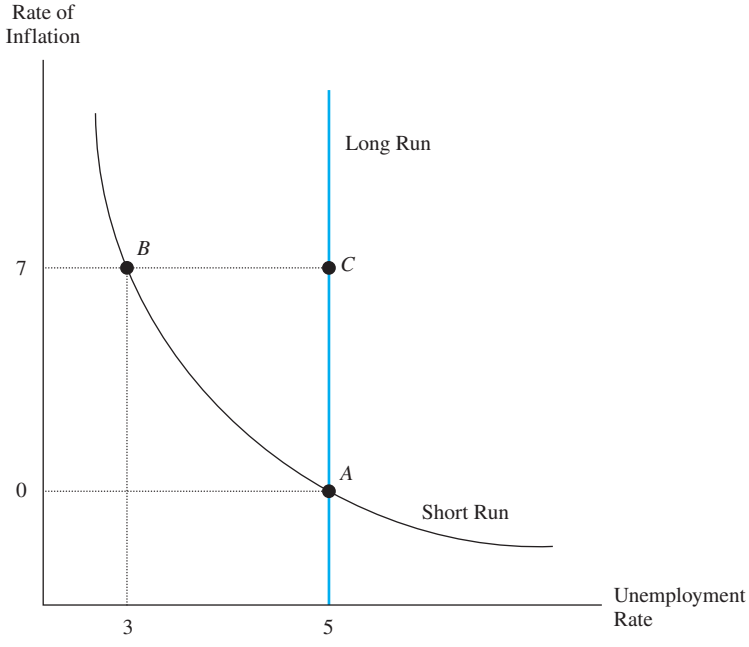
The Natural Rate of Unemployment

At the same time that the inflation–unemployment experience of the 1970s was demolishing the notion of a stable Phillips curve, some economists began to argue that a long-run trade-off between inflation and unemployment did not make theoretical sense.[34] Instead, they argued, economic theory implies that the long-run Phillips curve must be vertical. Put differently, there exists an equilibrium unemployment rate, now called the *natural rate of unemployment,* that persists regardless of the rate of inflation.

There are many ways of deriving the long-run Phillips curve, but one particularly influential approach uses the search model presented earlier in this chapter.[35] Suppose that the economy is in long-run equilibrium, with an unemployment rate of 5 percent and zero inflation, as at point *A* in Figure 12-17. Unemployed workers have an asking wage

FIGURE 12-17 The Short-Run and Long-Run Phillips Curves

The economy is initially at point *A*; there is no inflation and a 5 percent unemployment rate. If the inflation rate rises to 7 percent, job searchers will find many jobs that meet their reservation wage and the unemployment rate falls in the short run, moving the economy to point *B*. Over time, workers realize that the inflation rate is higher and adjust their reservation wage upward, returning the economy to point *C*. There is no trade-off between inflation and unemployment in the long run.



[34] Milton Friedman, "The Role of Monetary Policy," *American Economic Review* 58 (March 1968): 1–17; Edmund S. Phelps, "Phillips Curves, Expectations of Inflation, and Optimal Unemployment over Time," *Economica* 34 (August 1968): 254–281. See also N. Gregory Mankiw and Ricardo Reis, "Friedman's Presidential Address in the Evolution of Macroeconomic Thought," *Journal of Economic Perspectives* 32 (Winter 2018): 81–96.

[35] Dale T. Mortensen, "Job Search, the Duration of Unemployment and the Phillips Curve," *American Economic Review* 60 (December 1970): 847–862.

that makes them indifferent between accepting a job and continuing their search activities. Since there is no inflation and the economic environment is not changing over time, the asking wage is constant. And the unemployment rate is also constant at 5 percent, the natural rate.

Suppose the government unexpectedly pursues a monetary policy (perhaps by printing money) that pushes the inflation rate up to 7 percent. It takes time for unemployed workers to learn that inflation has increased, so even though the wage offer distribution shifted to the right by 7 percent, workers are still not aware of the increased inflation. In other words, workers do not adjust the asking wage upward to account for the unanticipated inflation. The asking wage is then too low relative to the new level of nominal wages. Workers will encounter many job offers that meet their asking wage, and the unemployment rate falls. A high rate of unanticipated inflation, therefore, reduces the unemployment rate.

We have just generated a downward-sloping short-run Phillips curve as the economy moves from point *A* to point *B* in Figure 12-17. The behavior of job seekers moves the economy to a new equilibrium where the inflation rate has risen to 7 percent and the unemployment rate has fallen to, say, 3 percent.

Workers, however, are not ignorant forever. Once they try to spend their newly found "wealth," they quickly realize that a dollar does not go as far as it used to. Workers will then revise the asking wage upward to account for the now observed 7 percent rate of inflation. The asking wage goes up by 7 percent, and the unemployment rate shifts back to the 5 percent natural rate of unemployment. At the end of the process, therefore, the economy ends up at point *C* in Figure 12-17. The unemployment rate is back at the natural rate, but the economy has a higher rate of inflation.

As noted earlier, the observed correlation between inflation and unemployment in the 1960s gave the false hope that policymakers could choose from the menu of inflation–unemployment outcomes implied by a downward-sloping Phillips curve. The subsequent experience of many industrialized economies taught the hard lesson that there is no long-run trade-off. Increases in the inflation rate do not reduce the natural rate of unemployment. They simply lead to higher prices.

What Is the Natural Rate of Unemployment?

The upward drift in the unemployment rate between 1960 and 1990 suggested that the natural rate of unemployment could change over time. In the 1960s, it was not uncommon to think of the natural rate of unemployment as being about 4 percent; by the 1980s, the natural rate of unemployment was believed to be about 6 or 7 percent.

In the 1990s, however, unemployment fell to levels that were previously thought impossible without a high rate of inflation. By 2000, the annual rate of inflation was 3.4 percent and the unemployment rate was 4 percent. And, despite the Great Recession, the inflation rate was below 3 percent and the unemployment rate was back down to about 4 percent by 2018.

As we saw earlier, the natural rate of unemployment is partly determined by transition probabilities measuring the rate of job loss among workers, the rate of job finding among the unemployed, and the flows between the market and nonmarket sectors. It is inevitable that demographic shifts influence the natural rate of unemployment. For example, the baby boom cohort that entered the labor market between the 1960s and 1980s probably

increased the natural rate. Young workers are much more likely to be in between jobs as they locate and try out alternative job opportunities.[36]

Structural economic changes also influence the natural rate. The 1980s and 1990s witnessed a substantial deterioration in the labor market status of less-skilled workers, along with the rapid decline of the manufacturing sector. The evidence suggests that part of the increase in the natural rate of unemployment through the 1980s can be attributed to the worsening economic situation of less-skilled workers.[37]

Summary

- Even a well-functioning competitive economy experiences frictional unemployment because some workers will inevitably be "in between" jobs. Structural unemployment arises when there is an imbalance between the supply of workers and the demand for workers.
- The steady-state rate of unemployment depends on the transition probabilities across the employment, unemployment, and the nonmarket sectors.
- The asking wage makes the worker indifferent between continuing his search activities and accepting the job offer at hand. An increase in the benefits from search raises the asking wage and lengthens the duration of the unemployment spell; an increase in search costs reduces the asking wage and shortens the duration of the unemployment spell.
- Unemployment insurance lengthens the duration of unemployment spells and increases the probability that workers are laid off temporarily.
- The intertemporal substitution hypothesis argues that the huge shifts in labor supply observed over the business cycle may be the result of workers reallocating their time so as to purchase leisure when it is cheap (that is, during recessions).
- The sectoral shifts hypothesis argues that structural unemployment arises because the skills of workers cannot be easily transferred across sectors. The skills of workers laid off from declining industries have to be retooled before they can find jobs in growing industries.
- Firms find it profitable to use an efficiency wage when it is difficult to monitor workers' output. The above-market efficiency wage generates involuntary unemployment.
- A downward-sloping Phillips curve can exist only in the short run. In the long run, there is no trade-off between inflation and unemployment.

[36] Michael Darby, John Haltinwanger, and Mark Plant, "Unemployment Rate Dynamics and Persistent Unemployment under Rational Expectations," *American Economic Review* 75 (September 1985): 614–637.

[37] Chinhui Juhn, Kevin M. Murphy, and Robert H. Topel, "Why Has the Natural Rate of Unemployment Increased over Time?" *Brookings Papers on Economic Activity* 2 (1991): 75–142.

Key Concepts

asking wage, *416*
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Review Questions

1. Discuss some of the basic patterns of unemployment in the United States since 1960.
2. What are the differences between frictional and structural unemployment? Should we be equally concerned with all types of unemployment? Would the same policies help alleviate both frictional and structural unemployment?
3. Derive the steady-state rate of unemployment. Show how it depends on the transition probabilities between employment and unemployment.
4. Discuss how it is simultaneously possible for "most" unemployment to be due to short spells and for "most" unemployment to be accounted for by a few persons in very long spells.
5. Should a job seeker pursue a nonsequential or a sequential search strategy? Derive a job seeker's asking wage. Discuss why the asking wage makes a worker indifferent between searching and not searching.
6. Discuss the impact of the UI system on a job seeker's search behavior. Discuss the impact of the UI system on the firm's layoff behavior.
7. What is the intertemporal substitution hypothesis? Does this argument provide a convincing account of the cyclical trend in the unemployment rate?
8. What is the sectoral shifts hypothesis?
9. Why do efficiency wages generate involuntary unemployment? What factors prevent the market from clearing in efficiency wage models?
10. Why is the Phillips curve vertical in the long run?

Problems

12-1. Suppose 25,000 persons become unemployed. You are given the following data about the length of unemployment spells in the economy:

Duration of Spell (in months)	Exit Rate
1	0.60
2	0.20
3	0.20
4	0.20
5	0.20
6	1.00

where the exit rate for month t gives the fraction of unemployed persons who have been unemployed t months and who "escape" unemployment at the end of the month.

(a) How many unemployment months will the 25,000 unemployed workers experience?

(b) What fraction of persons who are unemployed are "long-term unemployed" in that their unemployment spells will last 5 or more months?

(c) What fraction of unemployment months can be attributed to persons who are long-term unemployed?

12-2. According the U.S. labor statistics, roughly 5.8 million people were unemployed in 2006. Of these, 2.1 million were unemployed for less than 5 weeks, 1.7 million were unemployed for 5–14 weeks, 900,000 were unemployed for 15–26 weeks, and 1.1 million were unemployed for 27 or more weeks. Assume that the average spell of unemployment is 2.5 weeks for anyone unemployed for less than 5 weeks. Similarly, assume the average spell is 10 weeks, 20 weeks, and 35 weeks for the remaining categories. How many weeks did the average unemployed worker remain unemployed? What percent of total months of unemployment are attributable to the workers that remained unemployed for at least 15 weeks?

12-3. The previous question concerned the unemployment rate and the distribution of weeks of unemployment immediately prior to the Great Recession. Looking at the Great Recession, the data show roughly 12.7 million people were unemployed in 2009. Of these, 2.7 million were unemployed for less than 5 weeks, 3.3 million were unemployed for 5–14 weeks, 2.5 million were unemployed for 15–26 weeks, and 4.2 million were unemployed for 27 or more weeks. Generally, how did the unemployment picture change with the Great Recession?

12-4. Suppose the marginal revenue from search is

$$MR = 50 - 1.5w,$$

where w is the wage offer at hand. The marginal cost of search is

$$MC = 5 + w.$$

(a) Why is the marginal revenue from search a negative function of the wage offer at hand?

(b) Can you give an economic interpretation of the intercept in the marginal cost equation; in other words, what does it mean to say that the intercept equals \$5? Similarly, what does it mean to say that the slope in the marginal cost equation equals \$1?

(c) What is the worker's asking wage? Will a worker accept a job offer of \$15?

(d) Suppose Unemployment Insurance benefits are reduced, causing the marginal cost of search to increase to $MC = 20 + w$. What is the new asking wage? Will the worker accept a job offer of \$15?

12-5. A labor market has 50,000 people in the labor force. Each month, a fraction p of employed workers become unemployed ($0 < p < 1$) and a fraction q of unemployed workers become employed ($0 < q < 1$).

(a) What is the steady-state unemployment rate?

(b) Under the steady-state, how many of the 50,000 in the labor force are employed and how many are employed each month? How many of the unemployed become employed each month?

(c) Suppose $p = 0.08$ and $q = 0.32$. What is the steady-state unemployement rate and how many workers move from employment to unemployment each month?

12-6. Compare two unemployed workers; one is 25 years old while the other is 55 years old. Both workers have similar skills and face the same wage offer distribution. Suppose that both workers also incur similar search costs. Which worker will have a higher asking wage? Why? Can search theory explain why the unemployment rate of young workers differs from that of older workers?

12-7. Suppose the government proposes to increase the level of UI benefits for unemployed workers. A particular industry is now paying efficiency wages to its workers in order to discourage them from shirking. What is the effect of the proposed legislation on the wage and on the unemployment rate for workers in that industry? (Hint: This is best shown with a graph similar to Figure 12-13.)

12-8. During the debate over a federal spending bill, Senator A proposed changing the schedule for paying out unemployment benefits to be one where benefits were doubled, but offered for half the current duration (so that UI benefits would expire after 13 weeks). In contrast, Senator B proposed cutting UI benefits in half but to pay benefits for twice as long (so that UI benefits would not expire until after 52 weeks). Comparing to the status quo of offering UI benefits for 26 weeks, contrast both plans along the following dimensions: overall unemployment rate, average duration of unemployment spells, and the distribution of wages accepted by workers coming out of a spell of unemployment.

12-9. Consider a small island economy in which almost all jobs are in the tourism industry. A law is passed mandating that all workers in the tourism industry be paid the same national hourly wage, even though workers differ in their skills and effort. In fact, some workers simply cannot produce enough output to be worth the national wage.

(a) How will a worker's optimal job search strategy differ from that discussed in the text? What is the essential difference between this example and the general case discussed in the text?

(b) Despite the law, workers become more productive with experience. How might firms compete over workers when all workers must be paid the same wage?

12-10. During the Great Recession, many news stories focused on a rising number of discouraged workers. The implication of many of these stories is that the unemployment situation was worse than indicated by the unemployment rate because of the existence of these discouraged workers.

(a) What are some of the reasons typically given for not including discouraged workers in the unemployment rate calculation?

(b) Show mathematically that if discouraged workers are treated as unemployed that the unemployment rate would increase.

(c) Show mathematically that the unemployment rate as defined by the Bureau of Labor Statistics would be lower if data on the underground economy was more available.

12-11. Reread "Theory At Work: Cash Bonuses and Unmployment" from the text and answer the following questions.

(a) What is the general research question? What is the difference between the control group and the treatment group?

(b) Why is it an important result that accepted wages were essentially the same between the control group and the treatment group?

(c) What if anything might this research imply about whether discouraged workers should be included in an unemployment rate calculation?

12-12. (a) The table below provides 2006 unemployment rates for whites, blacks, and Hispanics in the United States separately for those with a high school degree (and no more schooling) and those with a college degree. Describe how educational status is related to unemployment rates for each of these groups. For which racial groups is a college education an equalizer in terms of unemployment rates compared to whites?

	2006 Unemployment Rate	
	High School Degree	College Degree
Whites	3.7	2.0
Blacks	8.0	2.8
Hispanics	4.1	2.2

(b) Consider Figure 12-2. Looking at the years of the Great Recession, did unemployment increase for all education groups? Which group was most affected?

12-13. Suppose the current UI system pays $500 per week for up to 15 weeks. The government considers changing to an UI system that requires someone to be unemployed for 5 weeks before receiving any benefits. After 5 weeks, the person receives a lump-sum payment of $2,500. He then receives no benefits for another 5 weeks. If he is still unemployed then, he receives a second lump-sum payment of $2,500. He again receives no benefits for another 5 weeks. If he is still unemployed then, he receives a third and final lump-sum payment of $2,500. Provide a graph similar to Figure 12-11 showing how the probability of finding a job over time is likely to be different under the status quo and the proposed scheme.

12-14. Unemployment Insurance automatically stimulates the economy during an economic contraction, which is good from the workers' point of view. From the firm's point of view, however, the UI system can be overbearing on business during prolonged contractions.

(a) What is it about the UI system that generates these opposing views?

(b) How could the UI system be changed to also assist firms during economic contractions while not removing the benefits available to laid-off workers?

12-15. Consider the standard job search model as described in the text.

(a) Why are the asking wage and expected unemployment duration positively related?

(b) Can the standard job search model explain why unemployment duration is longer, on average, for secondary workers when compared to primary workers? Discuss.

(c) In the context of the standard search model, explain how the economy-wide average asking wage and unemployment duration are affected by an expanded underground (cash) economy. What is the effect on the equilibrium unemployment rate?

Selected Readings

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