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Job Loss, Job Finding, and Unemployment in the U.S. Economy over the Past Fifty Years

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1 Introduction

The turnover view of unemployment has a firm grip on modern thinking about joblessness in the United States. Unemployment occurs when a worker departs from a job and spends time finding a new job. In addition, unemployment arises when a person looks for a new job after a period out of the labor force. Job-seekers find new jobs at monthly rates ranging from 10 to 40 percent. Unemployment varies positively with the separation rate and negatively with the job-finding rate.

For many years, students of the labor market believed that recessions—periods of sharply rising unemployment—were the result of higher separation rates from jobs as well as lower job-finding rates. In this view, a recession begins with a wave of layoffs, mainly in cyclical durable-goods industries. As the labor market becomes clogged with job-seekers, job-finding rates go down and the duration of unemployment rises. The second part of this account is not in dispute. Much of this paper will focus on the large movements at cyclical and subcyclical frequencies in the job-finding rate. But new research and new data have challenged the first part. The new view is that separations are not an important part of the story of rising unemployment in recessions. Unemployment is high in a recession because jobs are hard to find, not because more job-seekers have been dumped into the labor market by elevated separation rates.

The new view puts the focus on the hiring decision as the central topic for understanding cyclical variation in unemployment. The labor market goes through extended periods when the number of new hires remains constant despite the availability of large numbers of job-seekers. The surplus created by a new hire appears to be greater in those periods than when unemployment is lower. Productivity is hardly cyclical, so the marginal product of a new hire is as high as ever. The opportunity cost of a job-seeker is lower in a soft labor market. The surplus arises from the gap between the marginal product and the opportunity cost. In spite of the substantial joint gain from a hire, employers do not raise hiring rates during periods of high unemployment. Slack labor markets persist for several years following a recession. The challenge to unemployment theory is to explain why hiring remains stable. Arbitrage does not close the gap in the labor market as fast as it seems to in other markets. In addition to experiencing periods of high unemployment following every recession, the economy suffers from chronically high unemployment for extended periods, such as the 1970s and 1980s. These periods are equally puzzling.

I begin by documenting the surprising proposition that layoffs and other separations do not rise during the time when output and employment are falling at the beginning of a recession. The evidence is strongest for the most recent recession, thanks to a survey that measures separations directly, across the entire economy. For earlier periods, the evidence is less direct but reasonably compelling. I stress that the proposition does *not* mean that employers make all employment adjustments through variations in hires and keep separations at a constant level independent of the need to adjust their employment levels. The point is that the changes in separation rates that accompany employment changes at the industry or aggregate level are tiny compared to the regular flow of workers out of jobs.

Job-seekers are unemployed, out of the labor force, or employed in jobs they would like to leave. I show that only a minority of new hires come from the unemployed. Hence, the measurement of a job-finding rate would ideally incorporate job-seekers in all three statuses—unemployed, out of the labor force, or employed. Despite the importance of the employed among job-seekers, I am unable to include them for lack of data. I am able to include a group of those out of the labor force whose behavior is known to be similar to those counted as unemployed. I then calculate a job-finding rate as the ratio of new hires to my measure of job-seekers. The job-finding rate is highly cyclical—it plunges in every recession. It also has important movements at lower frequencies—it was high in the 1960s and 1990s and low in the 1970s and 1980s. One of my themes is that the subcyclical movements of the job-finding rates are just as informative and puzzling as the cyclical movements. A full understanding of the labor market requires a unified explanation of the cyclical and subcyclical movements.

The past few years have seen an explosion of new models of the job-finding process. The models share some common features. In particular, information limitations constrain the labor market. Job-seekers and employers are imperfectly informed about each others' identities. A matching technology describes the random meetings of job-seekers and employers. In most of the models, the job-seeker and the employer make a bilateral wage bargain after they meet each other. In the standard model, the wage turns out to be highly responsive to conditions in the labor market. The wage adjusts immediately to exogenous forces thought to be candidates for causes of recessions. The standard model has the classical property that these forces mainly alter the wage and have little effect on employment and unemployment.

The recent discovery of the limited success of the standard model set off the explosion of research that introduces mechanisms to amplify the response of unemployment to driving forces. These models overturn the classical property of the standard model. Some of them make the wage less responsive, while others keep the flexible-wage property of the standard model and achieve amplification through other channels.

The models I discuss here are entirely in the equilibrium tradition of the standard model. The equilibrium property admits of a fairly precise definition—periods of high unemployment are *not* times when workers and employers could make simple bilateral deals that would make both better off. In this respect, the models considered here differ from another interesting branch of business-cycle theory that invokes sticky wages and prices that do result in bilateral inefficiencies. Discussion of the relative roles of the equilibrium models against disequilibrium models in the ultimate understanding of unemployment movements is beyond the scope of this paper, though it is not a secret that I lean toward the equilibrium models.

My review of new models of the job-finding process identifies a long list of driving forces and amplification mechanisms that may play a role in the ultimate theory of the dynamics of the aggregate labor market. The driving force that receives the most attention is productivity. Other forces that figure in most models include hiring costs, unemployment compensation, the separation rate, and the real interest rate. Recent thinking has added the shapes of distributions of match information private to employers or to workers, a wage norm, and costs of delay during bargaining. I do not reach a strong conclusion about the roles of the driving forces. Indeed, I rather suspect that the ultimate account of recessions and other movements of unemployment will give weight to quite a few of them—recessions are not the uniform result of a single cause.

2 The Separation Rate

The separation rate is the monthly rate of departure from jobs for all reasons: layoffs, quits, firings, and the termination of time-limited employment. Although the distinctions among the various types of separation are important for a full account of flows in the labor market, I will concentrate on the overall separation rate. I think it is a mistake to treat layoffs and quits as if they were sharply distinguished. In the theory of turnover, a separation occurs when it is no longer in the mutual interest of worker and employer to continue the match. The layoff-quit distinction turns on institutional arrangements about who takes the initiative in breaking the match. Models have not yet tackled systematically the question of the design of these arrangements.

2.1 New Survey Data on Separations

Knowledge of the behavior of separations advanced materially with the introduction of an economy-wide survey of gross flows in the labor market: the Job Openings and Labor Turnover Survey (JOLTS). Each month a large stratified sample of employers report on separations and hires. The survey began in December 2000, so it tracked the recession that began in early 2001. Figure 2.1 shows the JOLTS separation rate and the standard unemployment rate from the Current Population Survey (CPS). The rise in unemployment through 2001 has no counterpart in higher separation rates. Rather, the separation rate fell a bit.

The JOLTS data show definitively that separations did not rise in the recession of 2001. It would be a leap to conclude that separations were equally constant in earlier recessions or even that they will remain constant in future recessions. The data in figure 2.1 may reveal only that the recession of 2001 was unique.

The breakdown of quits and involuntary separations (all categories of separations apart from quits—mostly layoffs) at the bottom of figure 2.1 shows, not surprisingly, that quits fell during the contraction and involuntary separations (mainly layoffs) rose. But the magnitude of

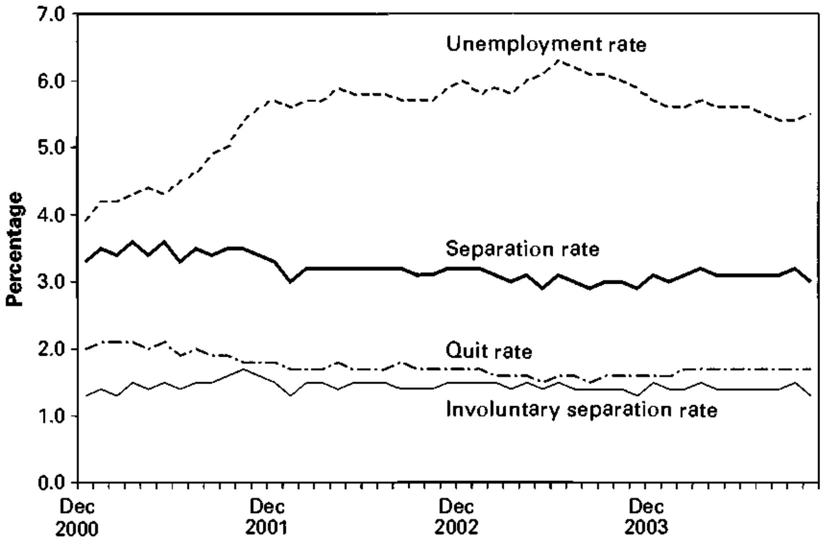

Figure 2.1
Separation and Unemployment Rates, December 2000 to October 2004

these changes is small. The overwhelming message from figure 2.1 is that the recession involved no significant increase in departures from jobs.

2.2 *The Roles of Hiring and Separations in Adjusting the Employment Level*

The finding that the separation rate hardly declined during the recession of 2001 says almost nothing about how employment adjustments divide between hires and separations. The finding says that the part of separations that reflects employment adjustment is small in comparison to the general level of separations. Table 2.1 shows why this proposition has to be true. It compares the average monthly separation rate from JOLTS to the standard deviation of monthly employment changes as reported in the BLS payroll employment data.

In the typical industry—as reflected in the weighted average reported in the last line of table 2.1—more than 3 percent of workers depart employment each month. The standard deviation of employment change, on the other hand, is only about 0.7 percent. Furthermore, many of the larger monthly deviations are transitory, unlike the long sequence of declines that occur in a recession. The standard

Table 2.1
Separation Rates from JOLTS and Standard Deviation of Employment Change

Industry	Average Monthly Separation Rate in JOLTS (Percentage)	Standard Deviation of Monthly Employ-ment Change (Percentage)	Standard Deviation of Annual Employment Change at Monthly Rate (Percentage)	Employment Share, 1990 (Percentage)
Natural resources and mining	3.17	1.79	0.59	0.7
Construction	5.76	1.04	0.43	5.0
Durable goods manufacturing	2.81	0.89	0.48	9.9
Nondurable goods manufacturing	2.90	0.36	0.21	6.4
Wholesale trade	2.53	0.27	0.17	4.8
Retail trade	4.39	0.37	0.16	12.1
Transportation, warehousing, and utilities	2.74	0.47	0.20	3.8
Information	2.37	1.72	0.32	2.4
Finance and insurance	1.85	0.18	0.14	4.6
Real estate and rental and leasing	3.10	0.22	0.12	1.5
Professional and business services	3.65	0.28	0.19	9.9
Educational services	1.79	0.40	0.19	1.5
Health care and social assistance	2.55	0.11	0.07	8.3
Arts, entertainment, and recreation	6.29	0.73	0.21	1.0
Accommodation and food services	6.26	0.24	0.11	7.5
Other services	3.18	0.22	0.14	3.9
Federal	1.23	1.10	0.32	2.8
State and local	1.23	0.27	0.16	13.8
Weighted average	3.23	0.69	0.26	

deviation of employment changes over twelve-month spans, stated at monthly rates, is less than 0.3 percent. Even if all employment changes occurred through changes in the separation rate and none through changes in hiring, the changes in the separation rate would be close to invisible because of the high normal level of separations.

Next I will present some results based on the hypothesis that JOLTS reveals behavior that was stable over the period considered in this paper, 1948 to 2004. To generate a rough approximation of separations for years before JOLTS, I regress the JOLTS separation rate on industry employment-growth variables. Because an industry can expand rapidly only by hiring and can contract rapidly only through separations, I include the positive part of growth separately from the negative part.

I pooled the JOLTS data for the eighteen industries listed in table 2.1, jointly accounting for all civilian employment, over the forty-six available monthly observations. I used seasonally unadjusted data for all variables (the BLS has not released seasonally adjusted data for JOLTS at the industry level). The resulting estimate of the effect of negative industry employment growth on separations is 0.29 with a standard error of 0.04, and the estimate of the effect of positive industry growth is −0.05 with a standard error of 0.02. These results confirm asymmetry in a reduced form sense, but they do not deserve structural interpretations because there is no reason to expect that the disturbance in the equation is uncorrelated with employment growth. The equation serves only its intended purpose of measuring the expectation of separations conditional on employment growth.

Figure 2.2 displays the fitted separations in terms of economy-wide aggregates, formed by applying employment weights to the results by industry. I consolidate to the level of the fifteen JOLTS industries that can be matched to payroll employment data back to 1948. The figure shows twelve-month centered moving averages. The smooth line labeled "Component from Weighted Industry Constants" shows that the overall predicted separation rate rose gradually over the period because of a change in the industry mix toward those with higher constants in the regression. The line at the bottom shows the separations predicted from employment change. It demonstrates the declining volatility that has attracted much recent comment. Although the employment-change component had little role in the recessions of 1990–1991 and 2001, it did make a noticeable contribution in earlier recessions. Notice that the fitted separation rate shows a small increase in 2000–2001, beginning just before JOLTS became available.

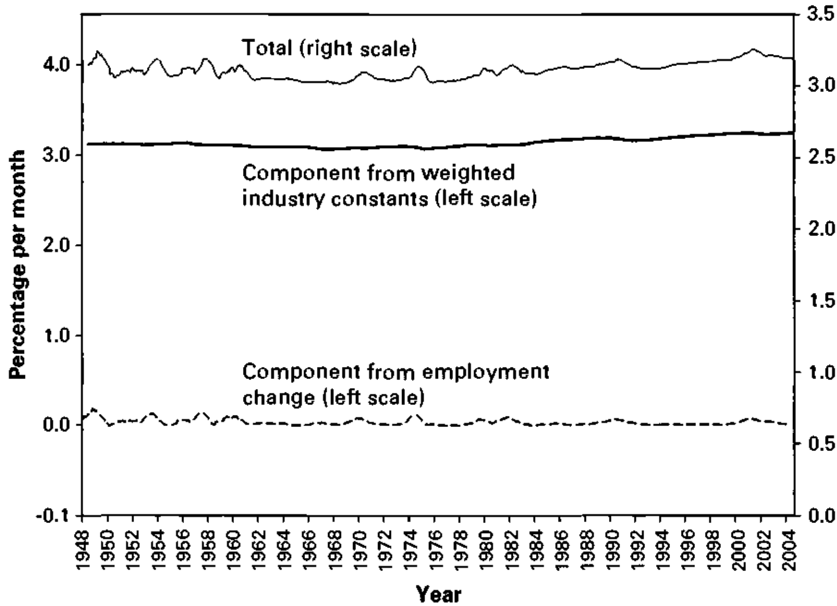

Figure 2.2
Calculated Separation Rate and Components

2.3 *Estimates of the Entry Rate to Unemployment*

About one-fifth of separated workers enter unemployment (see table 2.2, below), so the entry rate to unemployment sheds some light on the separation rate. Robert Shimer has made estimates of the entry rate from data from the Current Population Survey (Shimer 2005b). He concludes that there is little tendency for the rate to rise in recessions. He starts with published data on total unemployment and on short-duration unemployment. The latter serves as a measure of the flow into unemployment. His procedure pays close attention to issues of time aggregation. The relation between the inflow to unemployment and the stock of unemployed reveals the exit rate from unemployment—the flow probability of leaving unemployment by finding work or leaving the labor force. From the stock of unemployment and his calculated exit rate, he infers the entry rate.

The entry rate to unemployment measures the separation rate from employment if every worker leaving a job becomes unemployed and if everybody becoming unemployed was previously employed. Neither of these holds even as a first approximation. Transitions from jobs to

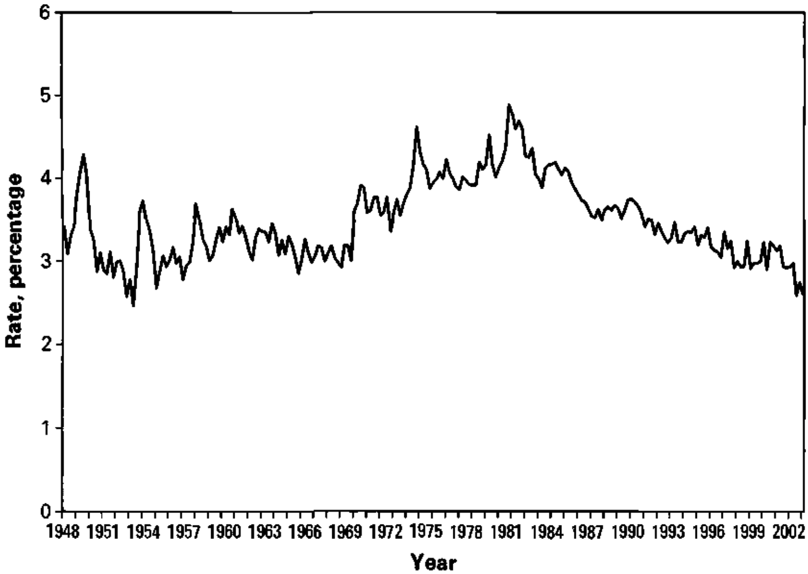

Figure 2.3
Shimer's Unemployment Entry Rate Calculated from the CPS

new jobs without intervening unemployment are common and so are transitions from employment to out of the labor force and from out of the labor force to unemployment. Shimer (2005c) shows that the flow from employment to out of the labor force is not cyclical, though it has subcyclical trends. He also shows that the flow from out of the labor force to unemployment rises slightly in recessions, so removing it from his measure of separations would strengthen his finding that the separation rate does not rise in recessions. Finally, he shows that, during the time since the CPS was revised to include the relevant question, job-to-job transitions fell during the one observed recession, in 2001.

Figure 2.3 shows Shimer's calculated entry rate to unemployment. The rate jumped a bit in some recessions, such as 1973–1975 and 1981–1982, but hardly increased at all in the recessions of 1990–1991 and 2001.

2.4 *Separations Measured Directly from Flows in the CPS*

Closely related to Shimer's approach is direct measurement of separations from the raw data from the CPS (I am grateful to Shimer for providing his compilations of the data). The CPS was not designed to measure flows; measurement is only possible because, in most months, one can match data for people reported in that month to data reported in the previous month. Flows are inferred from differences in status reported in consecutive months. As a result, random errors in measuring status raise the levels of the flows. This problem has impeded research on labor-market dynamics based on the CPS. Longitudinal data overcome the problem—I discuss one important longitudinal survey below.

Starting in 1994, the CPS has provided a direct measure of separations—it added a question for a person who has been at work in successive months whether it is for the same or a different employer. Separations are the number of people who were at work in one month and unemployed the next month plus the number at work in one month and not in the labor force the next month plus those at work in both months but with different employers. Figure 2.4 shows the flows as twelve-month centered moving averages of seasonally unadjusted data.

The first feature to note about the CPS measure of separations is that the average rate of about 7 percent per month is much higher than the

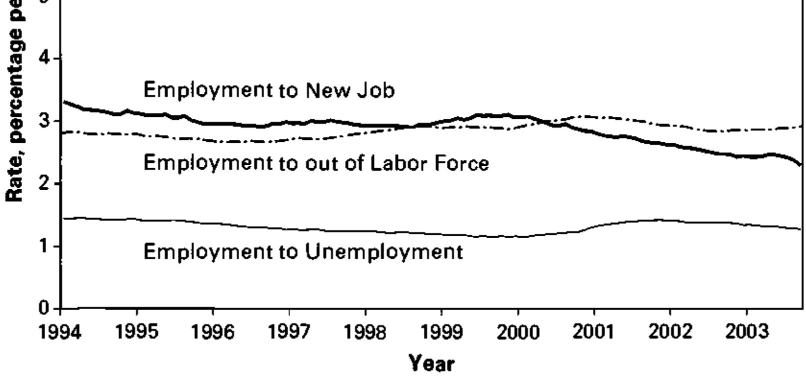

Figure 2.4
Separation Rate Measured in the CPS, 1994–2004

rate shown in figures 2.1 and 2.2 of a bit over 3 percent. Separation rates are sensitive to the accounting period because a small fraction of jobs but a large fraction of separations come from jobs lasting as little as a day—see Hall (1995). Both surveys use the same accounting period—a month—so the length of the accounting period cannot be a factor explaining the large discrepancy in average separations. Rather, random errors in measuring status are the likely cause of the discrepancy.

The CPS separation rate in figure 2.4 shows no spike during the 2001 recession, confirming the finding of the JOLTS survey in figure 2.1. The flow from employment to unemployment rose a bit during the recession, while the flow from employment to a new job without intervening unemployment fell. This shift occurred because jobs became harder to find. The flow from employment to out of the labor force—always surprisingly high—also fell slightly after 2001.

Figure 2.4 shows the difficulty in measuring separations from the flow into unemployment. Only about 20 percent of workers leaving employment become unemployed. The remaining 80 percent are usually split about evenly between moving directly to new jobs and leaving the labor force.

Nagypál (2004a) has studied the CPS data on total separations in an econometric framework that takes account of changes in demographic and industry mix. Her results confirm that there was no rise in separations in the recession in 2001.

The CPS did not report job-to-job transitions before 1994 but did report the other two flows out of employment, as shown in figure 2.5. Notice that the sum does rise distinctly in recessions. This appears to be the result of the omission of job-job transitions, which fall in recessions. There is nothing in the CPS flows data to suggest that total separations, including the unmeasured job-job flow, rise in recessions. The cyclical stability of separations remains unchallenged by the CPS data prior to 1994.

The flow of workers out of the labor force shown in the middle line of figure 2.5 has a pronounced downward trend through 1990. The employment to unemployment flow trends upward through the early 1980s. As a result, the sum is at a high level through the early 1980s and then declines. Part of this high level may be offset by lower job-job separations. But there is some indication of a disagreement between the constancy of the separation rate shown in figure 2.2 (and the other data to be discussed shortly) and the CPS flows.

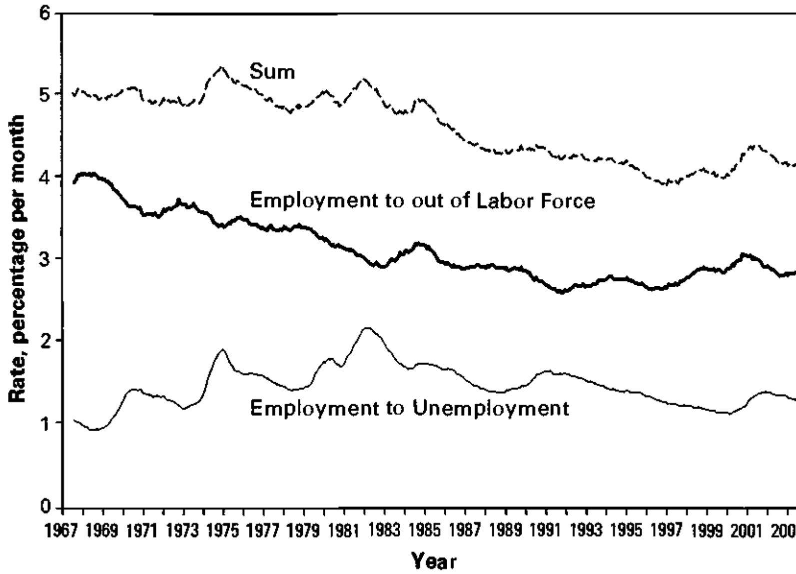

Figure 2.5
Flows out of Employment in the CPS, 1967–2004

2.5 *Separation Rates from the Survey of Income and Program Participation*

Gottschalk and Moffitt (2000) compiled data from the Survey of Income and Program Participation (SIPP) for the period 1983 to 1995 on monthly separation rates. Although the SIPP contains data for only about 30,000 workers, its design is far better suited to the measurement of labor-market transitions than is the CPS. Figure 2.6 shows the separation rate for the single largest demographic group in the study, white males. Results for other groups are quite similar.

The separation rate from the SIPP shows almost none of the discrepancy in overall level relative to JOLTS found in the CPS. It also contradicts the downward trend in CPS separations in figure 2.4. Except for bulges in 1985 and 1994, the SIPP separation rate supports the hypothesis of constant separations. These bulges—both in years of high employment growth when separations should be slightly lower, according to the earlier results—have no obvious explanation.

2.6 *Separation Rates Inferred from Data on Job Tenure*

Another useful source of information is a question about tenure that has appeared every few years in the March CPS. The fraction of

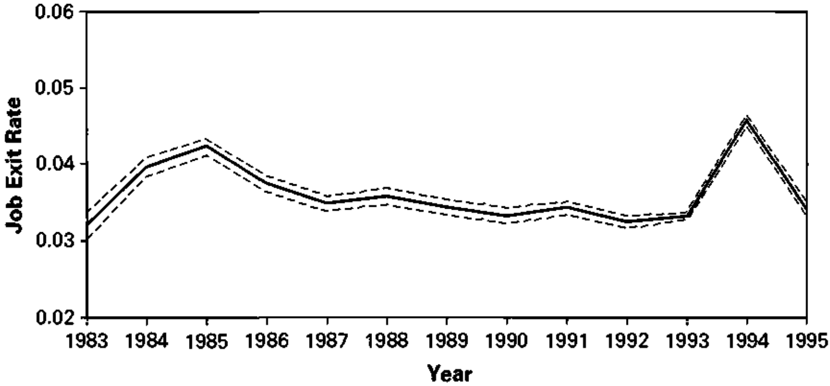

Figure 2.6
Gottschalk and Moffitt's Separation Rate for White Males from SIPP
Reprinted with permission of Robert Moffitt.

workers who started work recently is a measure of the hiring rate. As noted earlier, differences between the hiring rate and the separation are tiny, so the tenure data come close to revealing the separation rate. Although the CPS records tenure in months if it is one year or less, I have not found a tabulation of the data that reports the one-month figure separately, which is the measure most comparable to the others I consider in this paper. Jaeger and Stevens (2000) tabulate the fraction of workers with tenure of one year or less, as shown in figure 2.7. Higher monthly separation rates would result in higher fractions of workers with short tenure. Except the one high figure in 1979, the low-tenure fraction is close to constant. Again, I find support for the view that the separation rate has been constant over past decades, despite the higher apparent rate in the CPS data.

Much additional research could be done on this point with existing sources. My tentative conclusion is that a constant separation rate is the best approximation over past decades. But this conclusion comes from examining a number of sources, each of which shows movement over the period, and finding that the movements are not correlated. The evidence is not strong. And, of course, the constancy of the separation rate in figure 2.2 is virtually an assumption and should not be taken as confirmation of constancy.

2.7 Relation between Separations and Job Destruction

Davis and Haltiwanger (1992) introduced the concept of job destruction to labor turnover analysis. It is important to distinguish job destruction

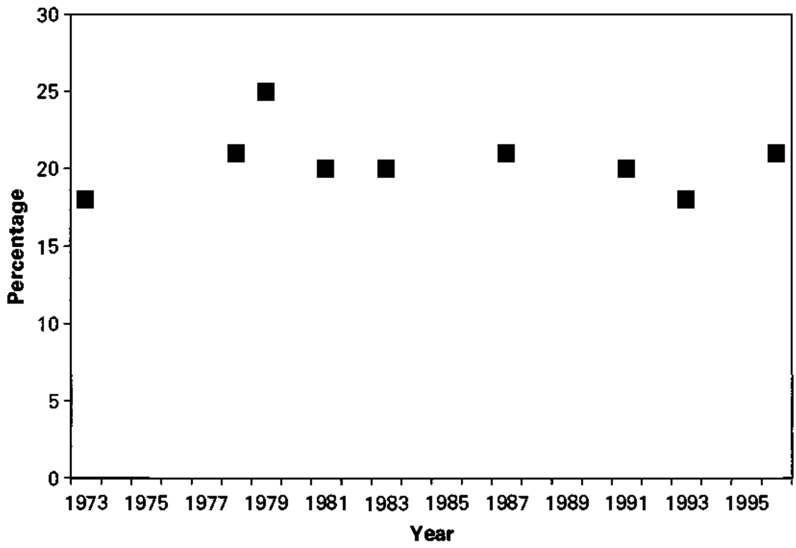

Figure 2.7
Jaeger and Stevens's Data on Tenure of One Year or Less from the March CPS

from separations. At the plant level, job destruction occurs when employment shrinks—it is the separation rate less the hiring rate, or zero, whichever is greater. At the aggregate level, the job-destruction rate is job destruction divided by employment, averaged across all firms, including those creating rather than destroying jobs.

The job-destruction rate is a close cousin of employment growth. To see this, consider the following simple model at the plant level:

$$x_{i,t} = z_t + \epsilon_{i,t} \tag{2.1}$$

Here z_t is the aggregate component and $\epsilon_{i,t}$ is the plant-specific component of employment growth $x_{i,t}$. Suppose that $\epsilon_{i,t}$ is identically distributed across plants and time with cdf $F(\epsilon)$. The implied job-destruction rate is

$$\hat{d}_t = E(\max(-x, 0)) = -\int_{-\infty}^{-z_t} (z_t + \epsilon)\, dF(\epsilon) = -z_t F(-z_t) - \mu(-z_t) \tag{2.2}$$

Here $\mu(\cdot)$ is the mean of ϵ truncated at the designated point. Thus the job-destruction rate is a function of the aggregate component of employment growth alone.

Davis's discussion following this paper calculates $\hat{d}_t$ and compares it to job destruction measured directly from plant-level data for manufacturing only. The version calculated from employment growth, $\hat{d}_t$, tracks job destruction quite well in most years, especially recently. It falls somewhat short for the biggest spikes, in the severe contractions of 1973–1975 and 1981–1982. As Davis explains, shifts of the distribution, notably increasing frequencies of major employment reductions, occurred in these contractions.

The spike of job destruction that Davis and Haltiwanger find in recessions does not contradict the point I made at the beginning of this section that the shrinkage of employment during a recession is at such a low monthly rate in comparison to the usual level of separations as to be essentially invisible. I note also that job destruction would occur in a situation where all employment reductions took the form of reductions in the hiring rate rather than increases in separations.

3 Unemployment and the Job-Finding Rate

Because the separation rate is close to constant—or at least does not rise in recessions—all of the burden of explaining fluctuations in the unemployment rate falls on variations in the rate that job-seekers find jobs. But there are many ways to measure the job-finding rate. As the CPS flows data demonstrate, workers often change jobs without visible intervening unemployment. Thus, there is a job-finding rate for job-holders. People often take jobs after having been out of the labor force, so there is a job-finding rate for that group. And the job-finding rate for the unemployed is a third important concept.

A job-finding rate is the ratio of the flow from another activity into employment, divided by the number of people seeking to find jobs. Finding the denominator for any job-finding rate is a challenge. Only a minority of the employed are looking for work—most have sufficiently strong comparative advantages in their current jobs so that the likelihood of finding better jobs is small. A job-finding rate for the employed that took total employment as the denominator would fail to record any significant changes, given the constancy of the numerator.

Finding a denominator for those out of the labor force encounters the same obstacles. Most people not working or looking for work have a strong comparative advantage in some nonwork activity, so they are not looking for work.

To deal with this issue, I proceed in the following way. First, I do not attempt to measure a job-finding rate for the employed. I believe that the rate based on a denominator that omits employed job-seekers is

Table 2.2
Transition Matrix for the CPS, 1967–2004, Percent per Month

To	From: Not in Labor Force	Unemployed	Working
Not in labor force	92.8	22.7	3.2
Unemployed	2.5	49.6	1.5
Working	4.7	27.6	95.4

Source: Robert Shimer's tabulations of raw data from the CPS.

the best available measure. When it is hard for the unemployed or those out of the labor force to find jobs, it is surely likely to be just as hard for those thinking of leaving existing jobs to find new jobs. This relation is an implication of the various recent models incorporating on-the-job searches, discussed in a later section.

Second, I consider a measure of unemployment expanded to include people who are classified as out of the labor force in a given month but are likely to move into the labor force soon. The improvements in the CPS introduced in 1994 included questions that identify this group—see Kodrzycki (2000). The group includes those classified as discouraged workers, those who want to work but believe no work is available for a variety of reasons. It also includes marginally attached workers, who give reasons such as transportation problems or child-care responsibilities that would indicate a likelihood of return to the labor force in the near future.

Table 2.2 shows the reason for including people in the denominator who are classified as out of the labor force but with high likelihoods of job-seeking. The table gives the transition matrix in the CPS among the three states of not being in the labor force, being unemployed, and working. Each month, 7.2 percent of those classified as out of the labor force in the previous month are in the labor force this month. About one-third become unemployed and two-thirds become employed. The high transition rate from out of the labor force directly to employment suggests that some fraction of those classified as out of the labor force are nonetheless effectively job-seekers. They find jobs without passing through unemployment, even though they did not previously report any of the job-seeking activities that would have placed them in the unemployment category in the CPS.

It would be desirable to validate the inclusion of the extra unemployed in my measure of expanded unemployment by tabulating the

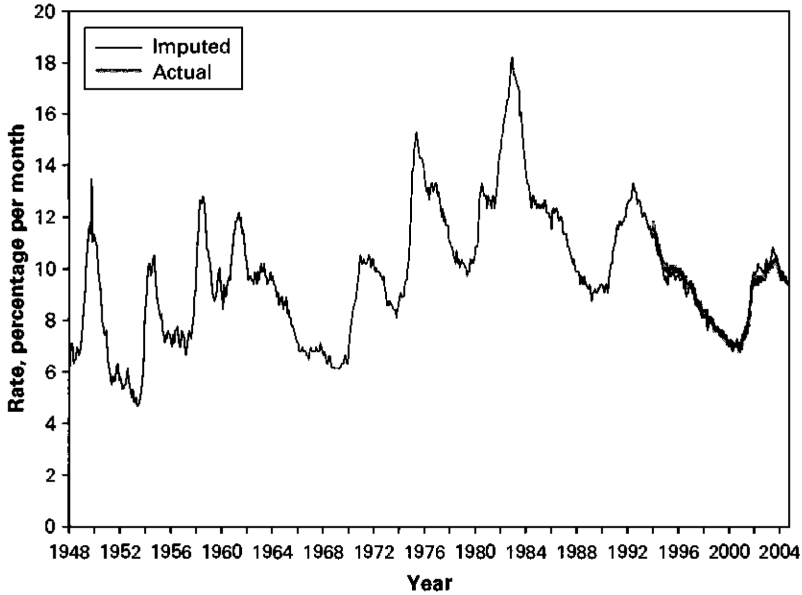

Figure 2.8
Expanded Unemployment Rate

transition matrix for this concept, along with the remaining group that is thought to be more firmly out of the labor force and the employed. The expanded unemployment rate is available from the Bureau of Labor Statistics starting in 1994. I have approximated it for earlier years by regressing it by the standard unemployment rate for 1994 through 2004 and using the fitted values for the years before 1994. The fit over the eleven observed years is outstanding ($R^2 = 0.96$). Although there is surely some drift in the relation from 1948 through 1993, I doubt that this is nearly as large as the uncertainty about the separation rate. Figure 2.8 shows the actual and imputed expanded unemployment rate.

Figure 2.9 shows the job-finding rate calculated as the ratio of the new hires implicit in figure 2.2 to the number of job-seekers implicit in figure 2.8. To calculate the numerator, I add the separation rate and the rate of employment growth to get the new hire rate. Then I multiply by the level of employment to get the number of new hires. To calculate the denominator, I multiply the expanded unemployment rate by the expanded labor force. The job-finding rate has quite remarkable volatility. It reached high levels in the tight labor markets of the early

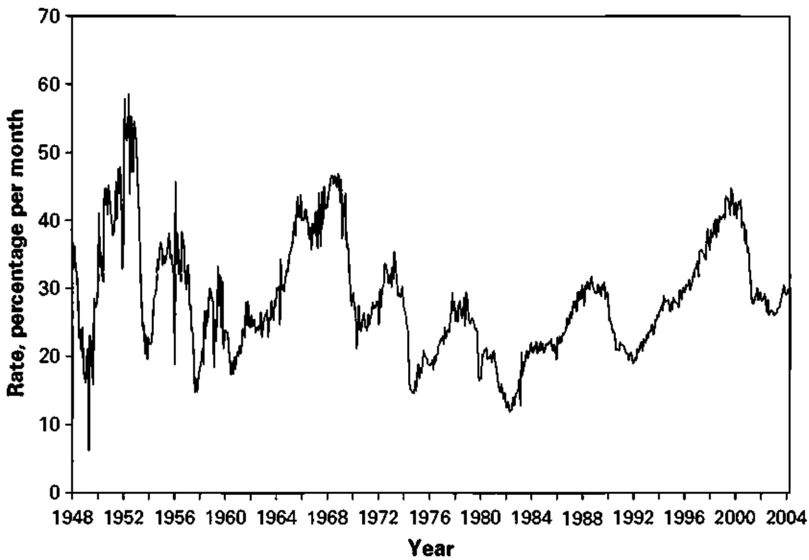

Figure 2.9
Calculated Job-Finding Rate

1950s, the late 1960s, and the late 1990s of over 40 percent per month. It plunged below 20 percent in the more severe recessions. The volatility of the job-finding rate is a central fact for macroeconomics to explain.

3.1 *Recruiting Effort*

A common feature of modern theories of the job-finding rate is that the market tightens when the incentives for job creation improve. Thus, measures of recruiting effort and the job-finding rate should move together. Figure 2.10 shows that this relationship is remarkably strong. It shows the only measure of recruiting effort available over a long period, the Conference Board's index of help-wanted advertising in newspapers, along with the job-finding rate from figure 2.9.

4 Economics of the Job-Finding Rate

Diamond (1982), Mortensen (1982), and Pissarides (1985) introduced the analysis of the job-finding rate that permeates modern thinking. At its heart, the analysis considers unemployment as the result of rent seeking. In that respect, the modern analysis is a refinement of the

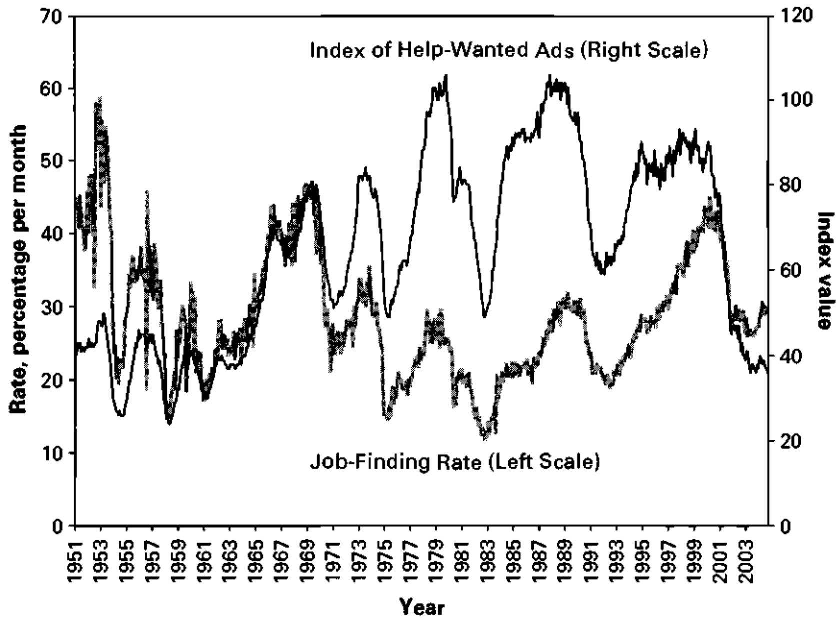

Figure 2.10
Help-Wanted Advertising and the Job-Finding Rate

view in Harris and Todaro (1970), where a wage premium in cities attracts workers from rural areas who form queues for urban jobs. In the modern view, holding a job has a value above the value of the best alternative activity. Job-seekers are willing to spend time looking for work because of the premium for employment.

Harris and Todaro proposed the simplest model of unemployment, the queue. A job-seeker arriving in the city would join the end of a line and wait for jobs to open up for the people ahead in the line before finding a job. The modern analysis refines this view a bit by invoking a matching technology, but the basic role of the technology is the same as the role of the queue in Harris and Todaro.

The value that attracts job-seekers depends on the wage that workers receive upon employment. Thus, a critical piece of the theory of the job-finding rate is the model of wage determination. Until recently, the standard model was the Nash bargain. The worker's threat point is to continue searching rather than work for a candidate employer, and the employer's threat point is to deny the worker employment. The wage bargain places the parties on a point partway between the threat points. To put it differently, the two parties have a

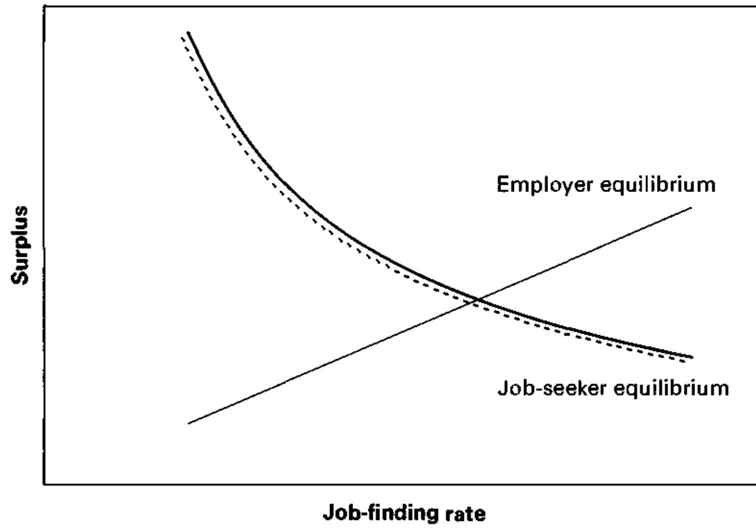

Figure 2.11
Equilibrium in the Standard Model

joint surplus, equal to the joint value they achieve from a match less their values at the threat points. The Nash bargain splits the surplus between the parties in given proportions.

The standard setup includes a theory of separations, implicit in the wage-bargain model. If the surplus of an existing match becomes negative, the parties will split up and a separation will occur. Because separations are not actually variable and because models with endogenous separations have other unrealistic implications, many models assume a fixed exogenous probability of separation, viewed as a probability that the productivity of a match will plunge to zero and make the separation inevitable.

The standard theory of the job-finding rate, depicted in figure 2.11, runs as follows: employers put resources into recruiting workers. They expand their efforts until the cost of recruiting a worker exhausts the employer's share of the surplus from employing the worker. The job-finding rate depends on the recruiting efforts of employers. The employer-equilibrium curve in figure 2.11 slopes upward because a higher surplus draws forth more recruiting effort and creates a tighter labor market with a higher job-finding rate.

From the job-seeker's perspective, a tighter labor market lowers the surplus. The surplus is the difference between the value of the output that a match produces and the opportunity cost of the worker. The opportunity cost, in turn, depends on the ease of finding a job—in a tight market with a high job-finding rate, the opportunity cost is higher and the surplus from a job is lower. Figure 2.11 shows a downward-sloping curve depicting job-seeker equilibrium.

The equilibrium of the labor market occurs at the intersection of the two curves. Notice the key role of the Nash-bargain model of wage determination. The employer-equilibrium curve deals with the employer's share of the surplus and the job-seeker-equilibrium with the job-seeker's share. The Nash assumption locks the two together.

The dashed line in figure 2.11 shows the effect of a 3 percent decline in productivity. The job-seeker-equilibrium curve shifts downward slightly, the job-finding rate drops a little, and unemployment rises a bit. No shift occurs in the employer-equilibrium curve. The shift in the job-seeker curve is small for the following reason: the surplus is the difference between the present value of a worker's product and the worker's opportunity cost. The opportunity cost depends mainly on the wage that would be paid by alternative jobs. Under the Nash assumption, that wage falls almost as much as does productivity. The surplus hardly changes. Shimer (2005a) was the first to make this observation.

The finding of limited response of unemployment to changes in productivity suggests that the standard theory is not a satisfactory account of fluctuations in unemployment. In the typical recession, unemployment rises by several percentage points and remains high for several years. No conceivable movement of productivity, when fed into the standard model, could replicate the observed movements of unemployment in recessions. Shimer's paper set off a quest for alternative models that could explain the high volatility of unemployment.

Mortensen (2005) and Hagedorn and Manovskii (2005) observe that Shimer's result is not universal—it rests on an assumption about labor supply. Shimer and I belong to the school of macroeconomics that believes that alternative activities for most workers, including unemployment compensation, are worth far less than the workers produce on the job. The elasticity of labor supply is low. The fundamental driving force of the standard model is the difference between productivity and the value of nonwork. A given change in productivity has a larger proportional effect on that difference if the value of nonwork is close to the level of productivity. The standard model can generate high levels of unemployment volatility by setting the value of nonwork only a bit below the level of productivity. The rest of my discussion is for the benefit of readers who share Shimer's and my belief in a relatively inelastic labor supply.

5 Alternative Views of Wage Determination

Much of the effort focusing on creating a modern theory of unemployment fluctuations replaces the Nash bargain with some other model of wage determination.

5.1 Fixed Wage

Job-finding and unemployment are highly sensitive to productivity if the standard model is altered in just one way: by keeping the wage fixed and unresponsive to changes in productivity—see Shimer (2004). Figure 2.12 shows why. If the wage is fixed, the surplus received by the employer is the difference between the present value of the worker's product and the fixed wage. The employer-equilibrium curve is unaffected, but job-seeker equilibrium no longer plays a role in determining the job-finding rate. Instead, the diagram has a horizontal line showing the exogenous value of the surplus. In any reasonable view of the labor market, most of the wage is earned as a rent, so the surplus is small in

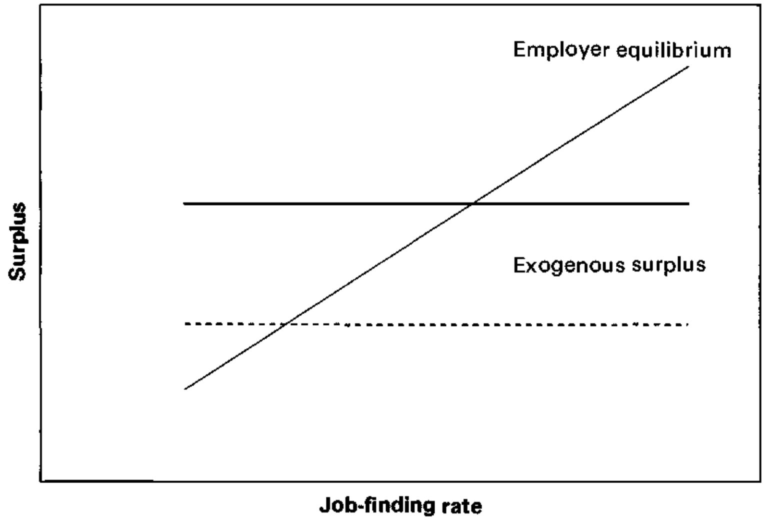

Figure 2.12
Equilibrium in the Sticky-Wage Model

comparison to the present value of the worker's product. Consequently, a small proportional change in productivity results in a large proportional change in the surplus. The downward shift of the dashed line in figure 2.12, corresponding to the same decline in productivity as in figure 2.11, is substantial. The new equilibrium has a much lower job-finding rate and correspondingly high unemployment rate.

Hall (2005b) explores some aspects of the fixed wage. Within certain fairly wide bounds, a fixed wage is an economic equilibrium. Earlier views of fixed wages invoked disequilibrium—the fixed wage resulted in an inefficient allocation of labor. Barro (1977) pointed out that private inefficiency in bilateral economic relationships was paradoxical because a simple renegotiation could restore efficiency. The type of sticky wage I discussed does not result in inefficiency and is free from Barro's critique, which I have long found utterly persuasive. In a matching model, the joint surplus measures the width of the bargaining set for the wage. A sticky wage remains efficient as long as it is within the bargaining set. I derive conditions under which a sticky wage remains within the bargaining set, even though the boundaries of the set fluctuate along with productivity. These conditions are not very restrictive.

Not a single reader of Hall (2005b) has failed to point out that the demonstration that a sticky wage is an equilibrium is far from an explanation for stickiness. Many other patterns of wage movement are equilibria, including those that are more volatile than the Nash wage and result in increases in unemployment when productivity falls. I do try to connect wage inertia with the idea of a social norm. Still, the primary reason that the sticky-wage case is interesting is the general impression that wages are, in fact, quite sticky.

The paper also makes the point that wages can be sticky relative to an index that grows over time. The result is a more sophisticated model of wage inertia, similar to the model implicit in many discussions of the Phillips curve and monetary nonneutrality.

Gertler and Trigari (2005) develop another version of the equilibrium sticky-wage model. Employers and workers make a standard Nash bargain that last many periods. Workers hired between wage bargaining episodes receive the previously bargained wage. This setup delivers the essential feature of the equilibrium sticky-wage model—the sensitivity of the employer's gain from a new hire to current economic conditions. The wage does not respond immediately to those conditions. Unemployment is sensitive to driving forces until the next wage bargain. The persistence of unemployment fluctuations depends on the duration of wage bargains.

5.2 *Kennan's Model*

Kennan (2005) considers the standard model with the following alternative model of wage determination: upon forming a candidate match, the parties toss a coin to decide who will make an offer to the other. If the employer wins the toss, the employer offers the job-seeker her reservation wage. If the job-seeker wins, he or she has a more complicated decision because the job-seeker's productivity is known to the employer but is hidden from the job-seeker. The job-seeker is in the same position as a bidder in a first-price sealed-bid auction. Kennan makes assumptions that cause the job-seeker to bid a wage that is insensitive to current conditions. Thus, he reaches a sticky-wage property as a derived conclusion rather than as a bald assumption, a step forward. Kennan's model delivers a high sensitivity of unemployment to changes in productivity for the reasons shown in figure 2.12.

The sticky-wage conclusion is a special feature of the setup of his model. The hidden information is binary—match productivity is either high or low. The job-seeker knows the two values but does not know which one holds. Kennan assumes an environment where the job-seeker always picks the lower value, thus guaranteeing employment but giving the employer a large part of the surplus when the realization is the higher value of match productivity. Increases in aggregate productivity take the form of a higher probability of the better level of match productivity, but not enough higher to cause any job-seeker to bid higher. Thus, a sticky wage is essentially built into the model.

In a more general version of the model, the job-seeker knows that match productivity can take on many values or is a continuous random variable. In that case, the job-seeker will make a higher bid when conditions are better, using the general principles of first-price auction theory. In another variant of this type of model, the wage might be determined by a different procedure, such as a double auction where both employer and job-seeker make bids. Tawara (2005) generalizes wage determination in Kennan's model.

Kennan's emphasis on informational rents that vary over time is an important contribution to the theory of fluctuations in the job-finding rate. When rents earned by employers are high, firms will invest more heavily in recruitment efforts and the market will tighten, with higher job-finding rates. Further work in this area may demonstrate that variation in informational rents might plausibly be large enough to explain observed fluctuations. Such work needs to elucidate how the exogenous events that trigger recessions cause reductions in rents and thus bring higher unemployment.

5.3 *Reconsideration of the Threat Points in the Wage Bargain*

Hall and Milgrom (2005) explain that the threat points considered in the standard labor-market bargaining model are not credible. Once a qualified worker and an employer have met and found that they would enjoy a joint surplus, the threats to disclaim the match are hollow. The sequential bargaining framework of Binmore, Rubinstein, and Wolinsky (1986) considers alternative, credible threats. The parties alternate in making wage proposals to each other. The threat point of each is to prolong bargaining by declining an offer and making a counteroffer. Each understands the implications of the process, so the unique equilibrium is an immediate Nash-type bargain in which the threat points are the payoffs to delaying indefinitely.

Changing the standard model in only one respect—changing the threat points to the payoffs to endless delay—has a profound effect. The wage becomes fully insulated from conditions in the labor market, such as unemployment. The wage does respond to productivity, but only half as much as in the standard model. The result is a strong response of unemployment to productivity and other driving forces. The wage no longer has an equilibrating role. If productivity falls, the part of the surplus accruing to employers falls sharply, and they cut back on recruiting effort. The labor market softens dramatically.

We also consider two variants in which the wage is more closely connected to unemployment, though not as strongly as in the standard model. First, we alter the matching framework so that, part of the time, more than one applicant bargains with an employer for a job opening. If there is a single applicant, the parties engage in the bargaining process just described. If there are more applicants, they engage in Bertrand competition for the opening, and one of them winds up with the job but is paid only his or her reservation wage. The employer gains all of the surplus. Because the likelihood of competition is greater in a soft labor market, recruiting effort equilibrates the market more aggressively with this modification. Nonetheless, the model delivers a higher response of unemployment to productivity and other fluctuations than does the standard model.

In the second variant, there is a small probability that a worker will take another job during the process of bargaining with a prospective employer. Again, this modification links the wage to conditions in the labor market but does not completely undo the effect of using credible threat points in the basic wage-bargaining model.

6 Models That Explain Job-Finding Volatility with Flexible Wages

Research has been active recently in trying to meet the challenge of Shimer (2005a) without invoking sticky wages directly. In some cases, low-wage volatility is a conclusion derived from the fundamentals.

6.1 Models with On-the-Job Search

Figure 2.3 shows that the job-to-job flow accounts for almost half of all separations in normal times. No theory of labor-market dynamics could possibly be complete without consideration of this key flow. Many job-seekers are recorded as employed, not unemployed. A number of authors have created models with on-the-job search—one of the most prominent is Burdett and Mortensen (1998). Prior to the search for amplification mechanisms launched by Shimer, these models tended to deliver even less job-finding volatility than did the basic Mortensen-Pissarides model—see Nagypál (2004b).

Nagypál combines on-the-job search with a number of other key ingredients to achieve quite substantial amplification relative to the Mortensen-Pissarides model, where workers search only after losing jobs. First, employers need to prefer recruiting people directly out of other jobs rather than from the unemployed. In the standard model, employers have the opposite preference because the likelihood of forming a match with a candidate who is unemployed is higher than with a candidate who has a job. The latter has a higher reservation wage. In a recession, when the mix of job-seekers shifts toward the unemployed, employers intensify recruiting efforts on account of the more favorable mix. This factor results in the attenuation of the already low response of the job-finding rate to changes in productivity.

To reverse this effect, Nagypál introduces heterogeneity in job matches. Workers have different satisfaction levels with their jobs, which are hidden from employers. Workers hired from unemployment are less desirable because those who form matches will have a lower average job satisfaction. They are more likely to leave the job soon because they search for better jobs while employed. The final key element is a fixed cost of training a new worker. A quit deprives the employer of the value of the training cost. Nagypál suggests that it is plausible that the costs from the higher turnover of workers hired from the unemployed considerably more than offsets the easier recruitment of the unemployed.

If the offset is strong enough, the mix effect goes in the opposite direction from earlier models with on-the-job search. In Nagypál's calibration, the elasticity of the unemployment rate with respect to productivity is about −5. A decline of productivity of 1 percent raises the unemployment rate by about 0.3 percentage points. Although this is quite a bit more than in the standard model, it still requires implausibly large shocks to explain the increase in unemployment of two or three percentage points in the typical recession.

Krause and Lubik (2004), working independently from Nagypál, present a different model of amplification from on-the-job search. Their model permits variations in the intensity of on-the job-search, a feature also present in Nagypál's work. Search effort of workers intending to move directly to better jobs is highly elastic. When a persistent but ultimately temporary productivity shock hits the economy, the stock of workers who find it newly desirable to look for higher-wage jobs rises. During the fairly long period before these workers actually move, wages do not rise as much as productivity. The surplus available to employers—the difference between productivity and the wage—remains high for an extended period. Through the standard mechanism of the Mortensen-Pissarides class of models, the higher surplus to employers stimulates recruiting effort and tightens the labor market. Endogenous wage stickiness delivers a result in their model similar to the one reported for exogenous wage stickiness in Shimer (2005a).

The Krause-Lubik view calls for high volatility of job-job flows. They show that quits, as recorded in the old manufacturing turnover survey, were quite volatile, but they do not mention the direct measure of the job-job flow shown in figure 2.2. In their model, as the market tightened from slack conditions in 1994 to extremely tight conditions in 2000, the job-job flow should have risen. Instead, it fell a small amount.

6.2 *Shimer and Wright's Model with Hidden Information and Hidden Action*

Shimer and Wright (2004) develop a model of the labor market featuring numerous submarkets. All the employers in a submarket offer the same contingent employment contract to workers who choose to enter the submarket. Workers know the terms of the contracts in all of the submarkets and pick the submarket offering the most favorable contract. Having chosen a submarket, the job-seeker encounters a standard matching technology that delivers a flow probability of meeting an employer and entering into a contract. The contracting problem has an action hidden from employers—the investment that the worker makes in establishing the relationship—and information hidden from workers—the productivity of the resulting match. The contract needs to provide an incentive for the worker's effort. The only tool that the employer can use to induce effort is to make pay contingent on productivity. To make use of this tool, the employer has to make a credible announcement of productivity, a variable the worker does not observe directly. The contract embodies incentives for truthful disclosure by the employer to achieve credibility. The distribution of match-specific productivity is a key object in the model. Under reasonable restrictions on the distribution, the equilibrium contract is a lump sum plus a bonus if the firm asks the worker to work, after observing and announcing the worker's productivity.

Shimer and Wright make important advances on the earlier literature on employment contracts with hidden action and hidden information. They mention some reasons that the model may help explain the volatility of the job-finding rate and unemployment. The model has a threshold that is absent from the standard model. Volatility may be higher because changes in the environment move firms past the threshold. But the paper does not measure the resulting volatility—the authors are still working on that task.

6.3 *Self-Selection*

Hall (2005a) considers a rather different hidden-information problem in the labor market. A job-seeker is either qualified or not qualified for a particular job. She has information about her likelihood of being qualified prior to applying for a job with an employer. That information is hidden from employers until they test and otherwise evaluate a job applicant. Making an application is costly to the applicant. Job-seekers set a cutoff level of the likelihood and apply for every job that meets the cutoff. Employers know the fraction of applicants who are qualified and expand job openings up to the point that the surplus they enjoy from testing and hiring the average applicant exhausts the testing cost. Job-seekers are in equilibrium when the anticipated share of the surplus exhausts the application cost. Once an applicant is tested and found qualified, the job-seeker and employer make the standard Nash bargain.

The key determinant of equilibrium in the labor market in the model is the cutoff level of the qualification likelihood. The equilibrium is fragile because a higher cutoff is beneficial to both job-seekers and employers. The equilibrium is at the intersection of two curves in surplus-cutoff value space, and the two curves may have almost the same slope. If the cutoff level is low, the market is in an undesirable equilibrium—employers are receiving large numbers of applications from unqualified workers. Employers recruit correspondingly less, so the market is slack. In a slack market, job-seekers set low cutoffs because jobs are hard to find. When the cutoff level is high, the market equilibrium induces efficient self-selection. Employers hire enthusiastically because each costly test is likely to yield a new employee who is qualified. Workers set high cutoffs because jobs are easy to find.

This description suggests that the equilibrium is indeterminate, which is definitely a possibility and is not a borderline case. If the equilibrium is determinate and satisfies a standard stability condition, the equilibrium is fragile—it responds sensitively to driving forces.

The driving forces that alter the cutoff qualification level and thus the job-finding rate do not include productivity. Shifts in productivity alter the employer's and worker's surplus in proportion, so the intersection in cutoff-surplus space occurs at the same cutoff level. The most interesting potential driving force is a property of the probability distribution of the signal that job-seekers receive about the likelihood of qualification for a job. The property is the relation between the cutoff level adopted by the job-seeker and the average likelihood of the qualification of applicants employing the rule of applying for every job where the information conveys a likelihood at least as high as the cutoff. The latter controls the employer's payoff from testing. The elasticity of the ratio of the two is key. If the elasticity is 1, equilibrium is indeterminate. Small changes in the elasticity are a potent driving force for large fluctuations in the job-finding rate and other aspects of the labor market.

7 Synthesis

Table 2.3 lists the full set of driving forces identified in the standard model and in the recent literature revising the standard model to

Table 2.3
Driving Forces Identified in Models of the Labor Market

Driving Force	Model
Productivity	Standard
Recruiting cost	Standard
Real interest rate	Standard
Unemployment compensation	Standard
Leisure value during search	Standard
Separation rate	Standard
Match value information hidden from employer	Self-selection, on-the-job search
Application cost incurred by job-seeker	Self-selection
Match value information hidden from job-seeker	Shimer-Wright, Kennan
Wage norm	Hall
Job-seeker's payoff during bargaining	Hall-Milgrom
Employer's cost of delay during bargaining	Hall-Milgrom

increase the predicted amplitude of unemployment fluctuations. For some entries, I will have little more to say because data are lacking.

Productivity is a natural choice of driving force partly because of the attention that the real-business-cycle literature has given to it, generally in models that lack any treatment of unemployment. In the standard model, higher productivity results in lower unemployment by increasing the surplus from employment and thus increasing the incentives facing employers to create jobs. As Shimer demonstrated, wage increases take away almost all the increase, so the effect is small in the standard model. In the variations from the standard model I discussed earlier, the effect of productivity changes is much greater because the take-back through wages is smaller or is absent altogether.

Fitting productivity as a driving force into a coherent account of fifty years of unemployment fluctuations faces some challenges. Productivity rose dramatically over the period, while unemployment has been roughly steady. One would need a trend in some other driving force to offset the effect of growth in productivity to explain the stability of unemployment—the likely choice is the value of leisure time to job-seekers. Mechanisms similar to those in real-business-cycle models might deliver a relationship between the rate of growth of productivity and unemployment. The data demonstrate a weak relationship, as shown in figure 2.13. Shimer (2005a) has a figure suggesting a much tighter relationship, based on Hodrick-Prescott-filtered data. I take the

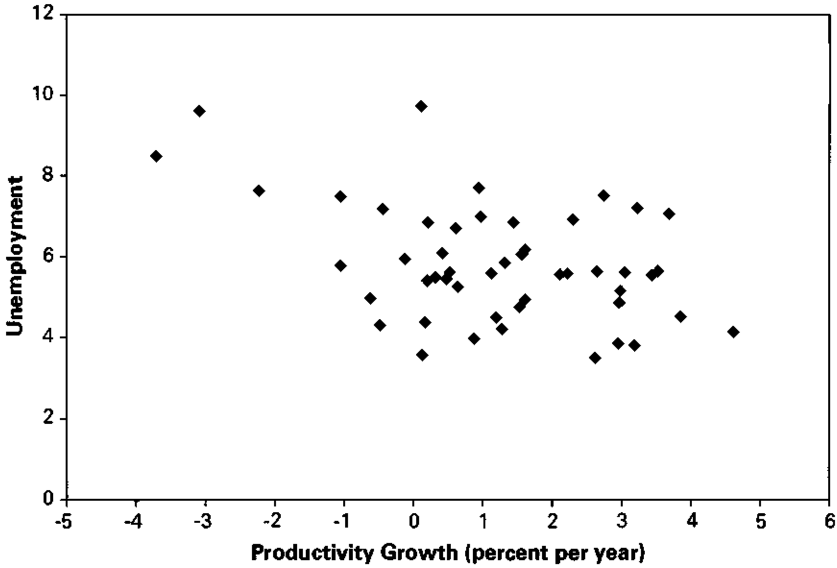

Figure 2.13
Productivity Growth and Unemployment

more ambitious view that the model should be able to explain the lower-frequency movements that the HP filter removes.

The role of the real interest rate in the standard model and its variants remains largely unexplored. One reason is that it has proven difficult to generate movements of real rates in dynamic general-equilibrium models that resemble those found in the data. Phelps (1994) gives the real rate an important role in a model based on rather different principles. In the standard model, a higher real rate raises unemployment by decreasing the present value of the employer's part of the surplus, which is the difference between productivity and the wage. Employers recruit less actively in the face of the lower present value.

Figure 2.14 suggests that the real rate deserves further consideration as a driving force. The horizontal axis is the one-year Treasury bill rate at the beginning of the year less the rate of growth of the consumption deflator over the year—it is the realized real rate. The relationship has a noticeable and statistically unambiguous upward slope. But explanation of the high volatility of the real rate has eluded general-equilibrium modelers to date.

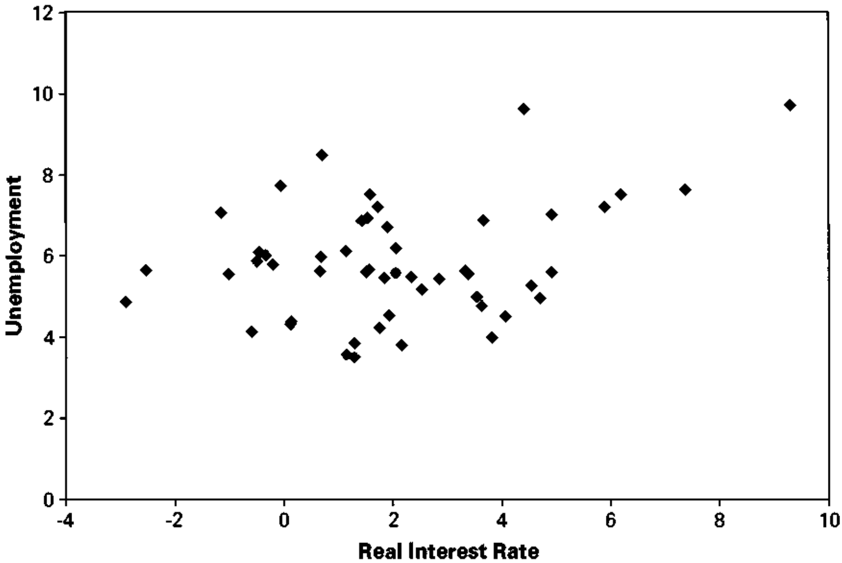

Figure 2.14
Real Interest Rate and Unemployment

The role of unemployment compensation in the determination of unemployment is straightforward in any model—subsidizing the activity creates more of it. Figure 2.15 shows the relation over the past fifty years between the replacement rate for unemployment compensation and the standard unemployment rate. I measure the numerator of the replacement rate as the ratio of state and federal unemployment compensation as reported in the *Economic Report of the President* to the number of unemployed reported in the CPS. I measure the denominator as compensation per worker as reported in the U.S. National Income and Product Accounts. The figure shows no obvious relationship. In particular, the replacement rate was unusually low in the 1980s, a decade of high unemployment.

Some of the new models emphasize the shapes of distributions of hidden information. In the self-selection and on-the-job-search models, employers make decisions knowing the shape of a distribution of job-seeker characteristics but not the hidden value for a particular job-seeker. In the Shimer-Wright and Kennan models, job-seekers make decisions in the reverse setting. For example, in Kennan's model, a job-seeker makes a wage demand without knowing the employer's reservation wage based on hidden match productivity. This type of model

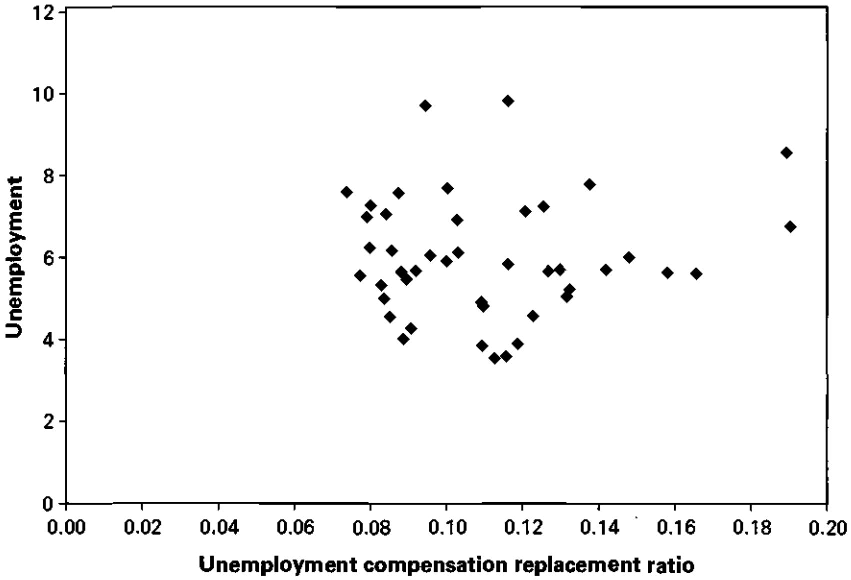

Figure 2.15
Unemployment Compensation Replacement Rate and Unemployment

opens the possibility of subtle driving forces involving changes in the shapes of those distributions.

Changes in distributions may provide the needed link between the practical macroeconomist's notion of a recession and the class of theories considered in this paper. When asked to describe a particular recession or recessions in general, the practical macroeconomist will omit mention of any of the forces in table 2.3. Instead, the story will focus on the collapse of purchases of certain categories of products—producer and consumer durables. For example, all practical accounts of the recession of 2001 emphasize the huge decline in high-tech investment. In earlier recessions, declines in home-building were prominent features.

Table 2.4 shows the changes in employment that occur in various industries from the peak to the trough, as determined by the National Bureau of Economic Research. The data confirm the uneven effects of the forces that cause recessions. Construction, durables, and nondurables manufacturing suffer large employment reductions, while other industries shrink only slightly or continue to grow.

Models in the Diamond-Mortensen-Pissarides (DMP) tradition do not provide an immediate analysis linking changes in the industry

Table 2.4
Peak-to-Trough Employment Changes by Industry, Averages over Recessions, 1948–2001

Industry	Employment Change During Recessions
Construction	−5.5
Durables	−11.4
Nondurables	−4.2
Wholesale	−0.9
Retail	−1.0
Finance	1.4
Professional and business services	−0.9
Education and health services	2.1
Leisure and hospitality	−0.3
Other services	1.7
Government	1.4

composition of employment to the aggregate unemployment rate. As Section 2 of this paper documented, the flows of separations corresponding to the employment changes in table 2.4 are insignificant in comparison to the normal flows of separations. The rise in unemployment is the result of diminished job-creation among employers in general.

The new additions to the DMP class of models may offer some hope of linking the facts in table 2.4 to the dramatic rise in unemployment that accompanies every recession. For example, the events leading to a large decline in employment in durables might shift the economy from the favorable equilibrium described in the self-selection model to the unfavorable one. In the favorable equilibrium, the applicants for a job opening are largely people who know they are qualified. Employers waste few resources screening out unsuitable applicants. They are correspondingly enthusiastic about creating jobs, so the market is tight. A subtle change in the distribution of the signal that workers receive about their likelihood of qualification can move the equilibrium perversely. Finding it difficult to locate any job, applicants apply for jobs where they are less likely to be qualified. Employers are overwhelmed by applicants and dissipate resources screening out the unqualified ones. The market becomes slack, with high unemployment.

In Kennan's model, the shape of the distribution of match productivity, a variable observed only by the employer, has two key roles. Job-seekers know the distribution but not the realization, so they solve a wage-bidding problem defined by the distribution. Firms earn an informational rent on the difference between the productivity realization and the wage bid. Shifts in the distribution induced by changes in the composition of employment might result in changes in the rent.

Shimer and Wright's model also has a distribution of individual productivity where the realization is hidden from the worker. Changes in the shape of this distribution may have important effects on the equilibrium job-finding rate in the model.

The successful model of fluctuations in the job-finding rate will incorporate on-the-job search, as emphasized by Nagypál and Krause-Lubik.

8 Concluding Remarks

The job-finding rate is the key variable in understanding the large fluctuations in unemployment over the past fifty years. The separation rate, the other determinant of unemployment, has been stable by all the available evidence. Movements of the job-finding rate occur at cyclical frequencies—the rate plunges in every recession. Movements also occur at low frequency—the rate remained low even at the peaks in the 1950s and early 1960s and again in the 1970s through the end of the 1980s.

Research has not yet settled on the exogenous driving forces that cause the secular and cyclical movements of the job-finding rate. Productivity and the real interest rate are modestly correlated with unemployment. New theories have added to the list of driving forces, including some that raise interesting measurement challenges.

Recent thinking has added many amplification mechanisms that help explain the strong response of unemployment to what appear to be small changes in exogenous driving forces. Wage stickiness is moderately plausible as an explanation of the movements of the job-finding rate over periods of a year or two. The substantial swings of labor-market conditions over longer periods seem beyond this explanation. More subtle changes in the economic environment seem promising ways to explain the movements of the job-finding rate at both cyclical and subcyclical frequencies.

The business cycle appears to be a complicated phenomenon. I am convinced that the labor market is the place to look for an understanding of the depth and persistence of recessions. The turnover view is surely helpful in understanding these issues. The explosion of recent research on amplification mechanisms seems to be leading in a direction that will create a rich theory capable of explaining the volatility and amplitude of cyclical and other fluctuations in the job-finding rate.

Endnote

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Comment

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Like several other recent studies, Robert Hall's paper puts the job-finding rate front and center in the effort to explain unemployment fluctuations. Three observations motivate this attention to the job-finding rate. First, the rate at which job-seeking workers find and accept new employment positions fluctuates in a strongly pro-cyclical manner. Second, changes in estimated job-finding rates account for much of the movements in the unemployment rate over time. And third, the job-finding rate is a key variable in equilibrium search and matching theories that build on Diamond (1982), Mortensen (1982), and Pissarides (1985). In light of these observations, I share Hall's view that the hiring decision is a central topic for students of unemployment fluctuations.

My remarks below take issue with other themes in Hall's paper. For example, Hall suggests that new research and new data challenge the traditional view that "a recession begins with a wave of layoffs, mainly in cyclical durable-goods industries." There is little in Hall's paper or other recent research that undermines this aspect of the traditional view. It is useful, however, to recognize that the declining share of aggregate employment in cyclically sensitive durable-goods industries tends to diminish the wave of layoffs that accompany recessions.

Hall also downplays the distinction between quits and layoffs, and the heterogeneous character of separations more generally, choosing instead to focus on the total rate of job separations. This choice fits with the theoretical models that Hall considers, but it has three shortcomings as a device for organizing the evidence. First, there is wide variability in the nature of employment relationships and the resulting job separations. Some separations reflect the termination of long-tenure employment relationships, some reflect the termination of unsuccessful matches after a short trial period, and some reflect the end of short jobs that were never intended to endure. Second, some separations occur at the initiative of workers (quits) and others at the initiative of employers (layoffs). Much evidence indicates that the post-separation path of earnings and unemployment differ sharply between quits and layoffs. Third, the ratio of quits to layoffs rises and falls with the growth rate of employment, so that the composition of total separations varies in a systematic cyclical manner. I argue below that the cyclical behavior of job loss and worker displacement remains a key issue for macroeconomic analyses of labor market fluctuations. In this respect, my views are closer to Hall (1995) than Hall (2005).

Hall's Method for Estimating Separation Rates Back to 1948

To estimate the rate of job separations back to 1948, Hall first fits the relationship between separations and net employment growth to monthly, industry-level data for the period covered by the Job Openings and Labor Turnover Survey (December 2000 onward). He then relies on the fitted relationship and historical data on net employment growth to obtain an estimated series for the job separations rate back to 1948, shown in figure 2.2.

To evaluate Hall's method, it is helpful to plot the industry-level data on the separations rate against the net growth rate. See figure 2.16, which also shows a nonparametric regression fit of the separations rate to the net growth rate. There is a pronounced nonlinearity in the separations-net relationship, with a slope of about −1.6 to the left of 0 and 0.6 to the right of 0. By way of comparison, Hall obtains an estimated slope of −0.29 to the left of 0 and 0.05 to the right of 0. I suspect that Hall finds a much flatter relationship and a much less pronounced nonlinearity because his regression relies on the Bureau of Labor Statistics (BLS) establishment survey for data on industry-level employment growth. In contrast, figure 2.16 relies on Job Openings and Labor Turnover Survey (JOLTS) data for both the separations rate and the net growth rate. Discrepancies between the two surveys lead to measurement error in Hall's regressors, which is likely to attenuate the estimated relationship.[1] The fitted relationship in figure 2.16 would produce a greater rise in the estimated separations rate during recessions, especially deep ones, than Hall's fitted relationship. I conclude

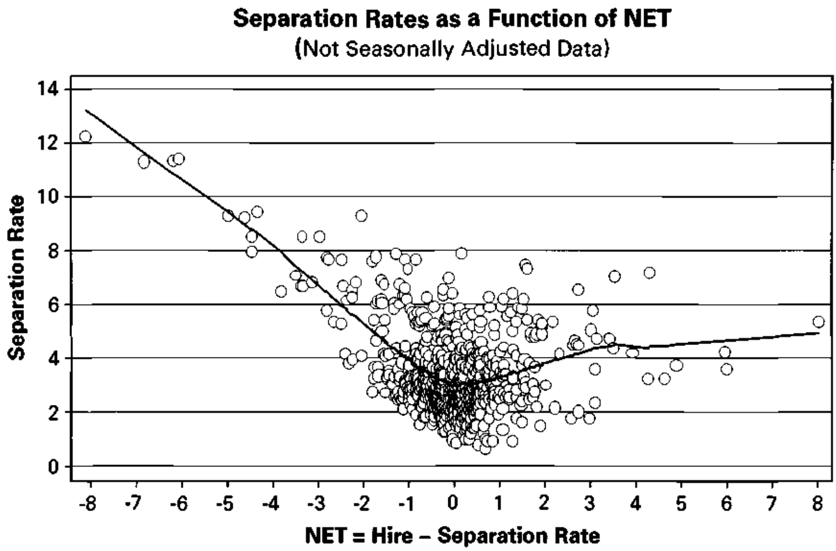

Figure 2.16
Separation Rates as a Function of NET (Not Seasonally Adjusted Data)
Note: Loess smoothing plot using JOLTS monthly flows, December 2000 to October 2004. Bandwidth = .8.

that Hall understates the volatility and cyclical movements in the total separations rate.

Hall's Method for Estimating Job-Finding Rates Back to 1948

Given the separations rate, s, Hall calculates the job-finding rate as:

$$f = s(E/X) \Rightarrow \log(f) = \log(s) + \log(E/X) \quad (1)$$

where E denotes employment and X is Hall's measure of expanded unemployment. It follows from equation (1) that any understatement in the cyclical variation of the estimated separations rate translates directly into a corresponding overstatement for the job-finding rate. Hence, I also conclude that Hall exaggerates cyclical movements in the job-finding rate. This conclusion is reinforced by comparing Hall's series for the job-finding rate in figure 2.9 to direct estimates of the job-finding rate for unemployed workers in Bleakley et al. (1999) and Shimer (2005a, 2005b). Nevertheless, it is important to recognize that direct estimates of job-finding rates for unemployed workers also show strongly pro-cyclical movements.

The Job-Finding Rate and the Cyclical Behavior of Unemployment Flows

Changes in the job-finding rate play a bigger role than changes in the separations rate in accounting for movements in the unemployment rate. Hall states this point in a very strong form, claiming, "Unemployment rises [in recessions] almost entirely because jobs become harder to find." Shimer (2005b) makes the point using the steady-state expression for unemployment:

$$(\text{Steady-state unemployment rate})_t = s_t/(s_t + f_t) \tag{2}$$

where s_t denotes the rate of job separations for employed persons at t, and f_t denotes the job-finding rate for unemployed persons. Shimer observes that this steady-state expression closely approximates the actual unemployment rate in monthly data. In light of this observation, he compares equation (2) to the time series generated by $\bar{s}/(\bar{s} + f_t)$, where $\bar{s}$ is the mean separations rate. This generated series closely tracks major movements in the postwar U.S. unemployment rate, although it typically understates the rise in unemployment during recessions. In comparison, the time series generated by $s_t/(s_t + \bar{f})$ fares not nearly as well in accounting for unemployment rate movements. These results lead Shimer to conclude that changes in the job-finding rate play the major role in accounting for unemployment rate movements, very similar to Hall's view.

However, it is also important to recognize that the cyclical behavior of unemployment inflows and outflows cannot be explained without appealing to a leading role for changes in the job separations rate. Several empirical studies document the rise in worker flows from employment to unemployment *and* from unemployment to employment during postwar U.S. recessions.[2] For example, figure 2.10 in Blanchard and Diamond (1990) shows that the monthly flows from employment to unemployment nearly double during the 1970 and 1973–1975 recessions, and that flows from unemployment to employment rise by more than one-third. Accounting for this pattern in unemployment flows requires a central role for the job separations rate.

To see this point, consider figure 2.17, which plots the monthly path of unemployment, worker flows from employment to unemployment ($E \rightarrow U$), and worker flows from unemployment to employment ($U \rightarrow E$) in response to a hypothetical drop in the job-finding rate. All three variables are expressed as percentages of a constant labor force.

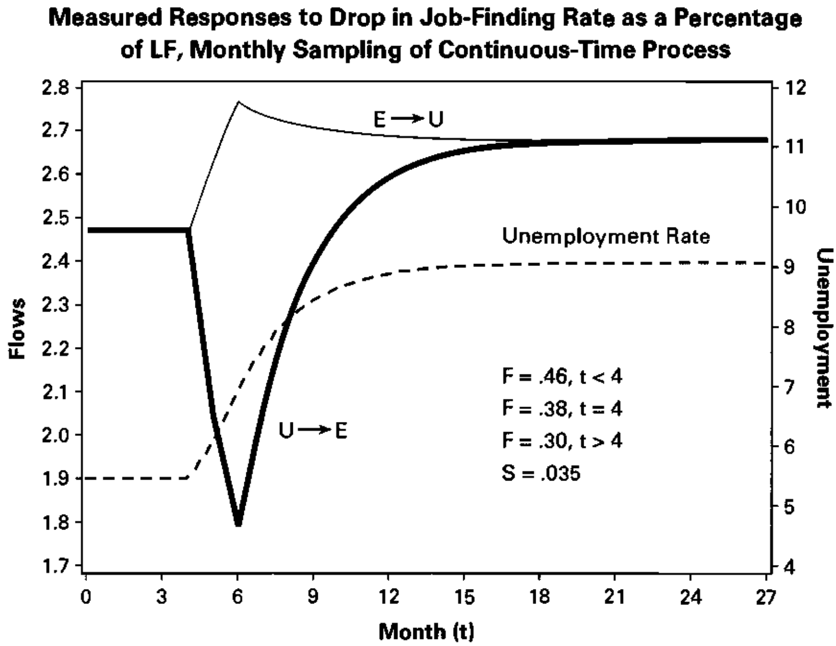

Figure 2.17
Measured Responses to Drop in Job-Finding Rate as a Percentage of Labor Force, Monthly Sampling of Continuous-Time Process

In generating these response paths, I consider a two-state system that starts at a steady state with a monthly job-finding probability of .46 and a monthly job separation probability of .035, the mean values in the postwar U.S. economy according to Shimer's estimates. As seen in figure 2.17, a drop in the job-finding probability to .30 raises the unemployment rate from about 5 percent to about 9 percent. In constructing the figure, I rely on Shimer's careful analysis of time aggregation to simulate measured flows given monthly sampling of a continuous-time process.[3] In this way, I capture the measured rise in E → U flows associated with a drop in the job-finding probability and a greater likelihood that a job-losing worker is unemployed at the sampling date.

Figure 2.17 illustrates two points. First, the large drop in the job-finding rate triggers a modest rise of roughly 10 percent in the measured E → U flows, much smaller than the observed rise in major recessions. Thus, the time aggregation effect, while undoubtedly present in the data, is too weak to account for the recessionary rise in E → U flows documented by Blanchard and Diamond and other researchers. To explain this rise, it is essential to posit a sharp rise in the job separations rate. Second, the hypothetical drop in the job-finding rate leads to a decline in measured U → E flows on impact and in the near-term aftermath. This hypothetical response path is dramatically at odds with the evidence. To explain the evidence, it is again necessary to posit a sharp rise in the separations rate. In fact, the two-state system can simultaneously generate large increases in E → U and U → E flows by combining a sizable drop in the job-finding rate with a sizable rise in the separations rate.

These observations about the cyclical behavior of unemployment inflows and outflows provide another indication that something is amiss in Hall's characterization of the job separations rate. Either the separations rate exhibits considerable countercyclical variation, contrary to Hall's claim, or the propensity of separated workers to become unemployed rises sharply in recessions. A lower job-finding rate does not, by itself, raise measured unemployment inflows by nearly enough to explain the data.

Cyclical Variation in Quits, Layoffs, and the Composition of Job Separations

A long line of empirical research—dating back at least to Slichter (1921) and Woytinksy (1942) and including more recent contributions by Akerlof et al. (1988) and others—stresses the pro-cyclical behavior of quits and the countercyclical behavior of layoffs. JOLTS data show the same pattern, but the decline in quits and the rise in layoffs are small in the recent recession, as Hall notes. Of course, the recent recession also involves a mild employment contraction, which may account for the modest movements in quit and layoff rates.

Figure 2.18, reproduced from Davis, Faberman, and Haltiwanger (2005), provides some evidence on this point. The figure plots the layoff-separation ratio against the net employment growth rate in the manufacturing sector for the recent period covered by JOLTS and for the 1947 to 1981 period covered by the BLS Manufacturing Turnover Data (MTD).[4] A quadratic polynomial in the net growth rate is separately fit to the observations from each data set. The figure shows that layoffs account for a larger (smaller) fraction of separations when the employment growth rate is low (high). The layoff-separation ratio varies widely, ranging from less than .2 to more than .7. The sensitivity of the layoff-separation ratio to the net growth rate is nearly identical in the JOLTS and the MTD, but the range of net growth rate observa-

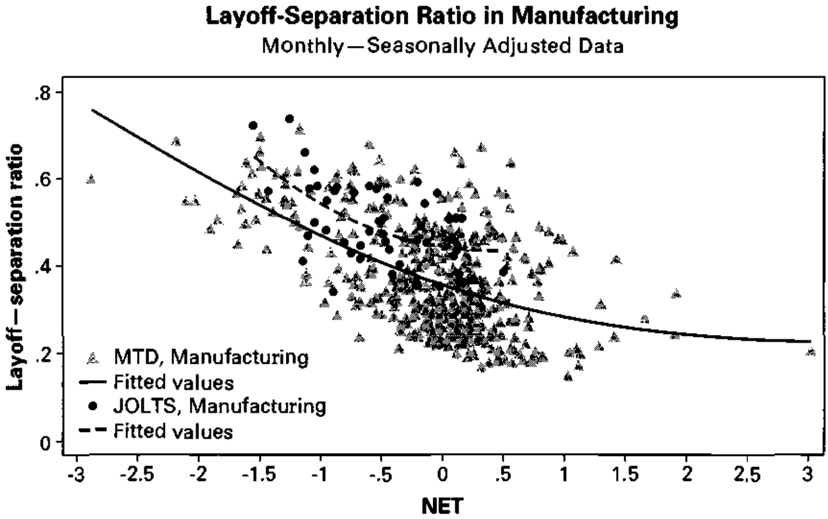

Figure 2.18
Layoff-Separation Ratio in Manufacturing, Monthly, Seasonally Adjusted Data
Note: Fitted values from quadratic polynomial in NET.

tions is much narrower in the JOLTS. That is, figure 2.18 indicates that the period covered by JOLTS exhibits modest variation in the layoff-separation ratio because employment growth fluctuates in a narrow range during the JOLTS sample period.

Another BLS data set provides additional evidence on the behavior of layoffs before, during, and after the 2001 recession. The Mass Layoff Statistics (MLS) report monthly data for mass layoff actions—episodes in which an establishment has at least fifty initial claims for unemployment insurance during a five-week period. The MLS reports the number of such actions and the number of unemployment insurance claimants involved in these actions. This number is a much narrower measure of layoffs than the JOLTS measure, but the concept of mass layoff actions is closer to the worker displacement events that are associated with large and persistent earnings losses for laid-off workers.[5]

Figure 2.19 reproduces a BLS chart for the number of claimants involved in mass layoff actions from June 2000 to May 2005.[6] MLS data for the five years prior to June 2000 show that the number of mass layoff claimants fluctuates in the range of roughly 100,000 to 150,000 per month, except for a single month in 1998. Hence, the sustained upsurge in mass layoff claimants that begins in November 2000 is unlike any other episode in the eleven years covered by the MLS.

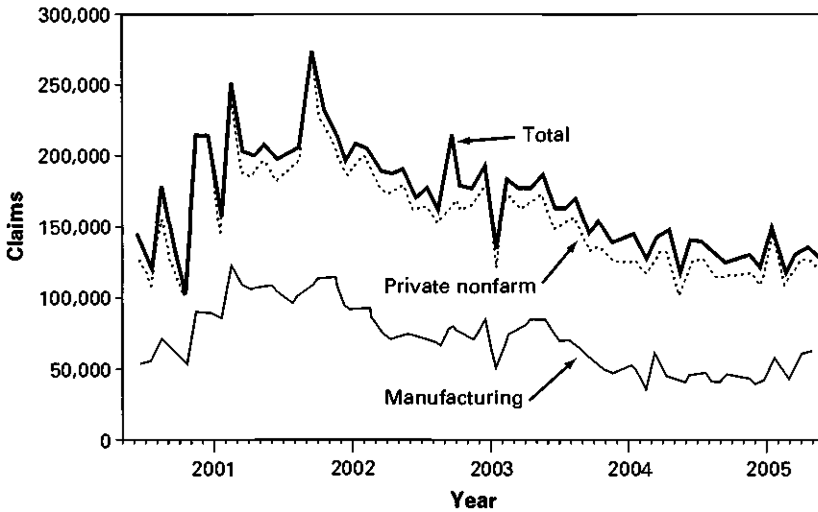

Figure 2.19
Mass Layoff Initial Claims, Seasonally Adjusted, June 2000 to May 2005

These data support the view that recessions, including the mild recession of 2001, bring a wave of additional layoffs. Figure 2.19 also shows that the manufacturing sector accounts for a disproportionate share of these additional layoffs, in line with the traditional view of recessions.

Boisjoly et al. (1998) provide evidence on the cyclical nature of layoff rates using data from the Panel Study of Income Dynamics. They consider male household heads, 25–59 years old, with at least one year of tenure on the job and at least 1,000 hours of work in the previous year. Their figures 2.16 and 2.17, which cover the period from 1968 to 1992, show that layoff rates for these workers rise by roughly 50–100 percent in recessions. Many authors have produced evidence of large countercyclical movements in layoff rates by examining Current Population Survey (CPS) data on unemployment inflows by reason for unemployment and worker flows out of employment by reason. See, for example, Davis, Haltiwanger, and Schuh (1996, chapter 6) and Bleakley et al. (1999).

The Cyclical Behavior of Job Destruction Rates

A decline in the common component of plant-level employment growth raises the job destruction rate and lowers the job creation rate. If the common component were the whole story behind cyclical movements in job creation and destruction, then the two series would exhibit similar variability over time. In fact, the shape of the cross-sectional growth rate density changes over the cycle in a way that accentuates the job destruction rise in downturns. Davis and Haltiwanger (1989, 1990) and Foote (1998) provide evidence on this point. As Foote (1998, p. 818) put it, an aggregate employment contraction involves "an increase in the number of firms making large downward adjustments, with comparatively little change in the number of firms making positive adjustments or none at all."[7]

One way to see this point is to compare the job destruction series generated by the common component of plant-level growth to the actual job destruction series. I carry out this comparison along the lines suggested by Hall's equation (2). First, I fit the empirical distribution of plant-level growth rates, $F(\varepsilon)$ in Hall's notation, to quarterly plant-level data in the Longitudinal Research Database for the 1972 to 1993 period. There are more than 4 million plant-level observations, so it is easy to obtain precise estimates of $F(\varepsilon)$ using simple nonparametric methods. Next, given the average empirical distribution $F(\varepsilon)$, I feed through the realized time series of aggregate net employment growth rates, z_t. This procedure yields a simulated job destruction series, $\hat{d}_t$ in Hall's notation, which I compare to the actual job destruction series in figure 2.20.[8] Figure 2.21 reports an analogous comparison for job creation.

Figure 2.20 shows that the simulated destruction series understates the observed job destruction spike in all four recessions, more so in the deeper contractions of 1973–1974 and 1981–1982. Likewise, figure 2.21 shows that the simulated creation series overstates the decline in actual job creation in recessions. The variance ratio, Var(JD)/Var(JC), is 1.04 in the simulated data and 2.26 in the actual data. Thus, the asymmetry in the cyclical behavior of job creation and destruction is not captured by movements in the common component of plant-level employment growth.

The Connection Between Job Destruction and Layoffs

Job destruction is closely associated with layoffs and worker displacement. Several pieces of evidence support this claim. For example, Bleakley et al. (1999) show that major job destruction spikes in the manufacturing sector coincide with spikes in the flow of manufacturing workers out of employment. This pattern is apparent in one of their charts, reproduced here as figure 2.22. The lower curve in figure 2.22

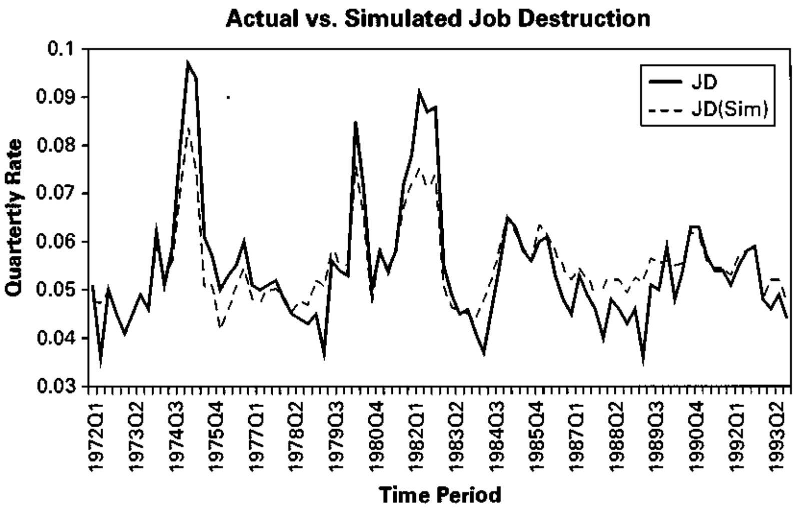

Figure 2.20
Actual Versus Simulated Job Destruction

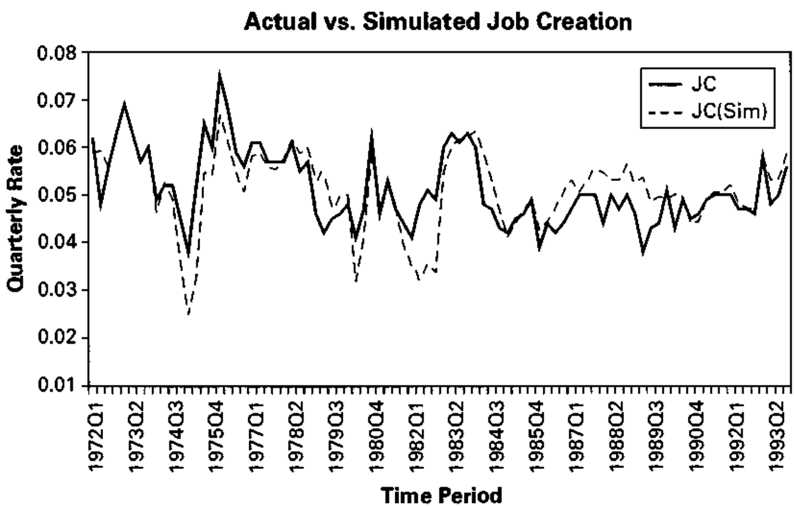

Figure 2.21
Actual Versus Simulated Job Creation

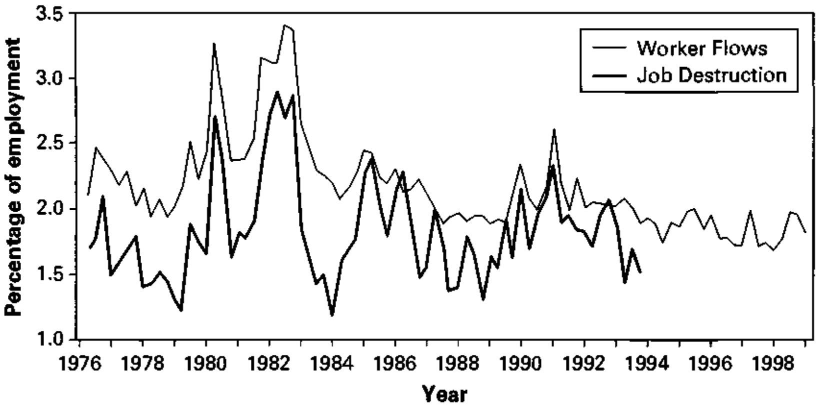

Figure 2.22
Worker and Job Flows in Manufacturing: Worker Flows Out of Employment Versus Job Destruction

shows the quarterly job destruction rate in the U.S. manufacturing sector, as calculated from the LRD by Davis, Haltiwanger, and Schuh (1996) and expressed at a monthly rate. The upper curve shows the monthly exit rate from manufacturing employment to unemployment or out of the labor force, as calculated from CPS gross flows data by Bleakley et al. The two curves mirror one another closely in the three recession episodes.[9]

The JOLTS data afford new opportunities to investigate the relationship between job and worker flows. Pursuing this line of investigation, Davis, Faberman, and Haltiwanger (2005) show in their figure 2.12 a tight link between job destruction and layoffs in the cross-section of JOLTS establishments. Their table 2.3 reports a monthly time-series regression of the JOLTS layoff rate on JOLTS-based job creation and destruction rates. The estimated regression coefficients are −.02 on the creation rate and .59 on the destruction rate, with a standard error of about .06 for both coefficients. The adjusted R-squared value for the regression is .76. This time-series regression implies that the layoff rate is highly sensitive to the job destruction rate. In short, the JOLTS data show a close connection between job destruction and layoffs over time at the aggregate level and in the cross section of establishment-level observations.

This JOLTS-based evidence also provides additional support for the view that layoff rates fluctuate in a strongly countercyclical manner. In particular, the JOLTS times-series regression implies fifty-nine additional layoffs for each 100 destroyed jobs. By all available evidence, the job destruction rate rises in recessions, sharply so in the manufacturing sector.

The Quit-Layoff Distinction

There is a large body of research on the wage, earnings, and employment outcomes associated with quits and layoffs. As I now discuss, this research provides good reasons to question Hall's focus on the total job separations rate and his decision to downplay the quit-layoff distinction.

Layoffs are associated with greater unemployment incidence and longer unemployment spells than quits. For example, Leighton and Mincer (1982) find that laid-off workers are twice as likely as quits to become unemployed in the National Longitudinal Survey of men. Similarly, McLaughlin (1990) finds higher unemployment incidence for laid-off workers in the Panel Study of Income Dynamics. Mincer (1986) finds that two-thirds of layoffs among white men result in unemployment as compared to one-third of quits. Conditional on unemployment, mean spell length is nearly twice as long for laid-off workers in Mincer's study. Similarly, CPS data show that monthly escape rates from unemployment are 10–15 percentage points lower for permanent layoffs than for quits. See figure 6.8 in Davis, Haltiwanger, and Schuh (1996) and figure 2.19 in Bleakley et al. (1999).

Many laid-off workers experience large and persistent earnings losses, apparently as a direct consequence of job loss. The evidence on this point is most dramatic and compelling for prime-age workers who lose high-tenure jobs in mass layoff events. These job losers experience large, persistent declines in earnings relative to their previous earnings and relative to the earnings of observationally similar workers who are not laid off. Jacobson, Lalonde, and Sullivan (1993) provide one of the best and best-known studies of this phenomenon. Stevens (1997) finds that an initial displacement event raises a worker's incidence of job loss for several years thereafter. Similarly, Ruhm (1991) finds that displaced workers experience higher unemployment rates for at least four years after the initial job loss event. Topel (1990) presents evidence that earnings losses (relative to pre-displacement levels) are smaller and less persistent for job losers with lower tenure.

Summarizing the evidence on the quit-layoff distinction: laid-off workers are more likely to become unemployed, they have lower exit rates from unemployment, they experience less employment stability following an initial displacement event, they often experience a large and persistent decline in earnings, and the loss in earnings is bigger and more persistent for job losers with higher tenure. As I have also discussed, the incidence of layoffs fluctuates in a strongly countercyclical manner. In short, laid-off workers experience significantly worse labor market outcomes, and recessions bring many more laid-off workers.

There are many competing interpretations for these and other systematic outcome differences between quits and layoffs. One view interprets all separations (and retentions) as efficient outcomes in the sense that they maximize the joint surplus of employer and worker. According to this view, quits and layoffs are mere labels that lack deeper economic significance. McLaughlin (1990, 1991) provides the most detailed development of this view. Another view, articulated by Hall and Lazear (1984), stresses two-sided information asymmetries that preclude fully efficient separation outcomes in bilateral employment relationships. According to this view, second-best solutions to informational problems lead to real wage rigidity and the excess sensitivity of quits and layoffs to labor demand.[10] Other interpretations of the quit-layoff distinction stress legal and institutional constraints on compensation and separations, negative effects of wage cuts on employee morale and productivity (Bewley 1999), adverse selection effects on quits and workforce quality induced by wage cuts (Weiss 1990), and insider-outsider conflicts that lead to inefficient wage structures and rigid separation policies (Lindbeck and Snower 2002).

Many of these other interpretations of the quit-layoff distinction depart, implicitly or explicitly, from a strictly bilateral perspective on compensation, separations, and other aspects of the employment relationship. Collective bargaining provides an obvious example. Aside from collective bargaining and legal constraints, employers often rely on wage policies—rather than individually bargained wages—to determine compensation and influence turnover. These policies specify wages as a function of seniority, credentials, and position within an organization, and concerns about internal pay structure loom large. Such "multilateral" compensation policies offer greater scope for a meaningful distinction between quits and layoffs than the bilateral perspective that pervades equilibrium search theories. It is a challenge to incorporate multilateral aspects of compensation and turnover and departures from bilateral efficiency into equilibrium search models. My impression is that equilibrium search theories have, for the most part, steered clear of these issues for reasons of analytical simplicity rather than evidence that they are unimportant.

Unemployment and Earnings Losses in Equilibrium Search Models

In the class of equilibrium search models with efficient separations and homogeneous workers and jobs, the impact of job loss and unemployment on lifetime earnings is rather modest. More to the point, the earnings losses in these models are much smaller than the estimated impact of job loss in the empirical literature on displaced workers. Simple back-of-the envelope calculations serve to illustrate these points.

First, consider the impact of job loss and unemployment in the theory. Make the following assumptions:

1. An expected working life of forty years with 5.5 percent of time spent unemployed.
2. A flat wage profile.
3. Job loss brings one month of unemployment, followed by a return to employment at the job-finding rate of .46 per month.
4. No unemployment benefits.
5. An annual discount rate of 3 percent.

Given these assumptions, the negative income effect associated with unemployment amounts to 0.8 percent of expected lifetime earnings in present value terms. If jobless benefits are available for the first six months of an unemployment spell at a replacement rate of 40 percent, then the negative income effect shrinks to 0.5 percent of lifetime earnings. If, instead, we assume that the job-finding rate is only .30 per month, then the negative income effect of unemployment amounts to 1.2 percent of lifetime earnings in the case of no unemployment benefits, and 0.8 percent in the case with unemployment benefits. If anything, these numbers overstate the impact of job loss in this class of models because I have ignored other sources of implicit income during unemployment and because I have assumed that job loss always entails at least one month of unemployment.

Now consider the impact of job loss in the empirical literature on displaced workers. I draw on the estimated earnings impact of job loss in the study by Jacobson, Lalonde, and Sullivan (1993). They consider a mass-layoff sample of workers with job tenure of six or more years and who lose jobs during the early and mid-1980s. Their sample contains job separators from establishments in Pennsylvania that, within a year of separation, have employment levels at least 30 percent below their maximum levels in the late 1970s. They further require that the employer have at least fifty employees in 1979, and that separators have positive earnings (in Pennsylvania) during each calendar year. They find that mean earnings fall by 50 percent in the quarter of displacement, then recover by roughly half over the following six quarters. Five years after displacement, mean earnings remain 25 percent below pre-displacement levels.

Based on this evidence, consider an illustrative calculation in which displacement brings a 40 percent earnings reduction in year 1, a 30 percent reduction in year 2, and a 25 percent reduction in years 3 to 6. This time profile of lost earnings implies that job displacement lowers the present value of lifetime earnings by roughly 8 to 18 percent, depending on whether and when earnings return to baseline after year 6 and assuming that the displacement event occurs at the midpoint of the working life. Thus, the estimated earnings losses associated with worker displacement in the study by Jacobson, Lalonde, and Sullivan are an order of magnitude larger than the losses implied by the class of equilibrium search models with efficient separations and homogeneous workers and jobs. See Den Haan, Ramey, and Watson (2000) for a much fuller analysis of whether equilibrium search models can explain the empirical evidence on displaced workers.

My illustrative calculations highlight the wide gulf between equilibrium search models with efficient separations and the empirical evidence on the earnings effects of job loss and worker displacement. One might respond that this class of models has focused on unemployment fluctuations and labor market flows, not the earnings losses associated with job loss. No doubt, this focus is a useful one in many respects. But this focus is too narrow to address many of the most important questions associated with job loss and cyclical fluctuations in the labor market.

Concluding Remarks

Let me summarize my main points:

1. Although he overstates the case, Hall rightly stresses the pro-cyclical behavior of the job-finding rate in his account of unemployment rate

fluctuations. Progress in research on the economics of the job-finding rate can significantly improve our understanding of unemployment behavior.

2. Hall understates the extent of countercyclical movements in the job separations rate. More important, his focus on the total separations rate is misplaced in my view. Layoffs are strongly countercyclical, and quits are strongly pro-cyclical. Laid-off workers become unemployed at a higher rate, experience longer unemployment spells, and have inferior post-separation earnings paths.

3. Explaining the cyclical behavior of unemployment inflows and outflows requires a leading role for countercyclical movements in the job separations rate or the propensity of separated workers to become unemployed.

4. Job destruction and layoffs are closely connected in the micro cross section and over time at the aggregate level. Mass layoff events associated with rapid job destruction involve large and persistent earnings losses for many of the job losers.

5. The quit-layoff distinction, the efficiency of separations, and empirical evidence on the earnings losses of displaced workers are troublesome issues for equilibrium search theories of unemployment and labor market flows. Attention to these issues is essential if these theories are to provide a broad analytical treatment of labor market fluctuations and their consequences.

Endnotes

1. Sampling variability is one potentially important source of attenuation bias. In this regard, the precision of the establishment survey measures is not the key issue. Rather, the issue is whether the establishment survey accurately mimics industry-level growth rates for the much smaller set of establishments sampled in the JOLTS. In addition, there are discrepancies between the establishment survey and the JOLTS that do not appear to be the result of sampling variability. These discrepancies are apparent even at the aggregate level. For example, the establishment survey shows a net private sector employment decline of −1.35 percent from December 2000 to September 2004. In contrast, the cumulated difference between hires and separations in the JOLTS over this period amounts to an increase of 0.88 percent of December 2000 employment. (These calculations make use of data not seasonally adjusted and downloaded from the BLS web site on July 29, 2005. I have made a small adjustment to the JOLTS data to account for differences in the within-month timing of the two surveys.)

2. A partial list includes Darby, Haltiwanger, and Plant (1986); Davis (1987); Blanchard and Diamond (1990); Davis, Haltiwanger, and Schuh (1996); and Bleakley et al. (1999).

3. Footnote 5 on page 10 of Shimer (2005b) displays the relevant state equations.

4. The Manufacturing Turnover Data were discontinued in 1981.

5. For example, see Jacobson, Lalonde, and Sullivan (1993).

6. Downloaded from the BLS web site on July 21, 2005.

7. While Davis and Haltiwanger (1989, 1990) and Foote (1998) reach similar conclusions about the cyclical behavior of the cross-sectional growth rate distribution, the topic merits further study. Davis and Haltiwanger consider the U.S. manufacturing sector only, and Foote considers a single state, Michigan.

8. An issue that arises in executing this procedure is how to handle the large mass point in the empirical distribution at a growth rate of zero. This mass point is present at all stages of the business cycle, and its size does not vary systematically with the cycle. In calculating the simulated job creation and destruction series, I let the zero mass point vary in size over time exactly as it does in the data, but I do not shift its location.

9. The analysis in Bleakley et al. also indicates that much of the comovement in the two series reflects temporary layoffs, i.e., separations of workers who expect to be recalled to their former jobs. Temporary layoffs are another aspect of heterogeneity in the character of job separations.

10. Although not focused on the quit-layoff distinction, Ramey and Watson (1997) develop a different theory of inefficient separations that does not rely on wage rigidity.

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Comment

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The main theme of Robert Hall's paper is that cyclical fluctuations in unemployment are driven almost entirely by fluctuations in the job-finding rate, as opposed to fluctuations in the separation rate from employment, and that we do not yet have a satisfactory theory for why the job-finding rate is so variable. Hall's review of recent attempts to build a theory of fluctuations in job-finding rates is interesting and valuable, and I won't say anything more about it. This comment deals mainly with Hall's analysis of the empirical evidence on fluctuations in the separation rate.

As Hall points out, his reading of the data runs counter to what many economists had previously believed. Darby, Haltiwanger, and Plant (1986) asked whether cyclical fluctuations in the stock of unemployed workers are caused mainly by fluctuations in the inflow or by fluctuations in the outflow. They concluded, "The main proximate determinant of changes in the unemployment rate is variations in the level and distribution of inflows into unemployment." Blanchard and Diamond (1990) analyzed fluctuations in employment and reached a similar conclusion: "The amplitude of fluctuations in the flow out of employment is larger than that of the flow into employment.... Reduced employment in recessions results more from high rates of job destruction than low rates of job creation." Davis, Haltiwanger, and Schuh (1996) concurred: "[U]nemployment inflows and employment outflows account for most of the cyclical variation in employment and unemployment. During recessions, unemployment inflows and employment outflows rise dramatically. Unemployment outflows and employment inflows also rise during recessions, but by less than their counterparts and not until later in a recession."

More recently, however, Shimer (2005b) argued, as Hall does, that this view is wrong: "Throughout the time period [1948 to 2004], the

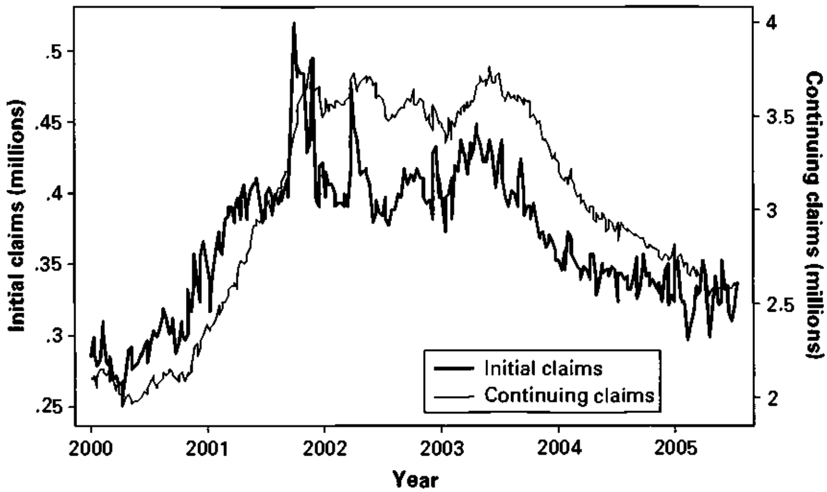

Figure 2.23
Weekly UI Claims, Seasonally Adjusted

job finding probability is strongly procyclical, while the separation probability was weakly countercyclical until the mid 1980s and more recently has been acyclic through two downturns in the labor market. These findings sharply contradict the conventional wisdom that fluctuations in the separation probability (or in job destruction) are the key to understanding the business cycle."

To help put this argument in perspective, it is useful to consider two unemployment indicators for the most recent recession. The first is weekly claims for unemployment insurance (UI), shown in figure 2.23. The second, shown in figure 2.24, is the Job Openings and Labor Turnover Survey (JOLTS) series on total separations (the numerator of the separation rate in Hall's figure 2.1). Initial UI claims almost doubled at the start of the recession, confirming the conventional view. Separations also rose but not by very much, confirming Hall's view.

As we know (largely from reading Hall's papers), data on labor market flows are complicated, and it is easy to get confused.[1] Workers who file initial UI claims have just been separated from their jobs. So how can there be a dramatic rise in initial UI claims without much movement in the separation rate?

Separations are workers who leave the payroll. As Hall points out, there is no implication that these workers becomes unemployed (and in fact most of them don't). Hall argues that the sharp increase in the

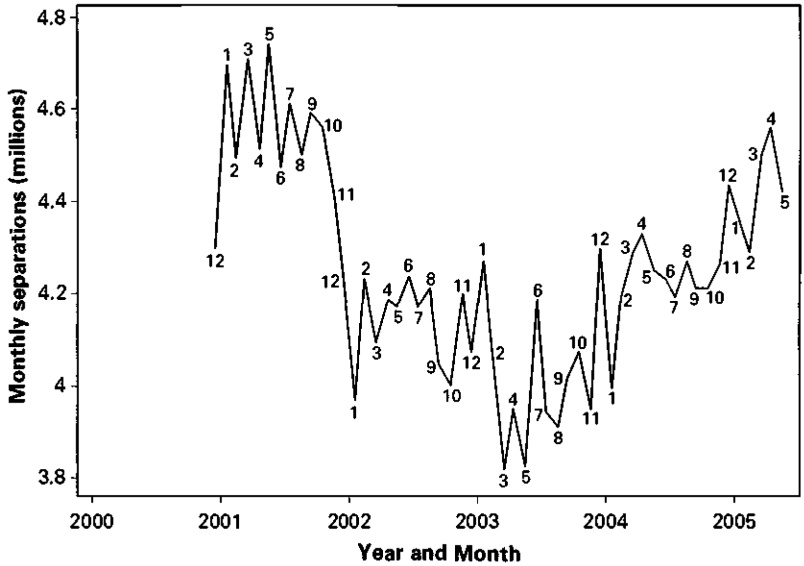

Figure 2.24
Total Separations (JOLTS)

number of separated workers who become unemployed at the start of a recession is largely offset by a decrease in the number of workers who move from one job to another.[2]

But why should we be concerned with the separation rate rather than the transition rate from employment to unemployment (the EU rate)? After all, the rate at which workers change jobs doesn't (directly) contribute to unemployment fluctuations (or to employment fluctuations). Hall suggests that a decrease in the job-changing rate indicates that the job-finding probability has fallen. Suppose the separation rate is constant. Some workers who are separated immediately find new jobs. Others are unemployed for a while. If the job-finding probability falls, more of the separated workers will be unemployed. It will seem that an increase in the inflow to unemployment is responsible for the rise in unemployment (and it is indeed a proximate cause). But it is not that people are being dumped out of jobs at an unusual rate.

This is a nice theory, but it is not clear that it has anything to do with the facts. If the theory is right, one might expect to see a drop in the job-finding probability at the very beginning of a recession, followed by an increase in the EU rate. The recent UI data are shown in figure 2.25. The exit rate from the pool of UI claimants seems like a reasonable

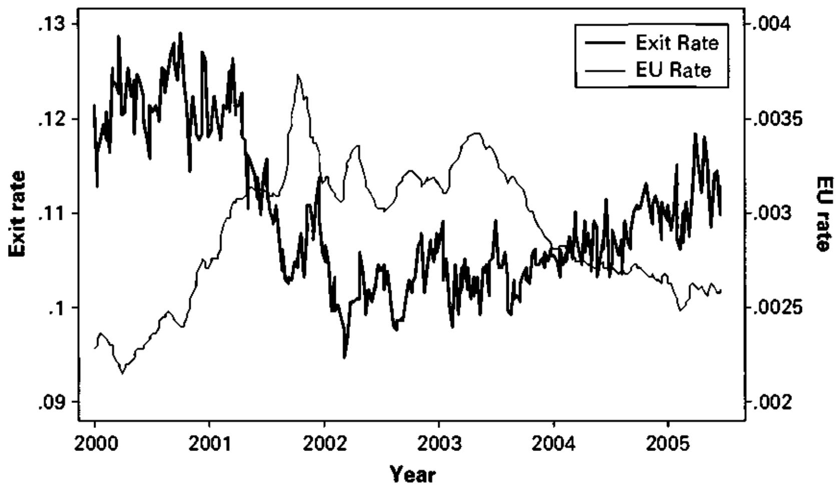

Figure 2.25
UI Entry and Exit Rates, 7-Week Moving Averages

indicator of the job-finding probability because the number of exits due to benefit exhaustion is small, and it seems unlikely that many people leave the labor force while they are still eligible for benefits. By this measure, the job-finding probability clearly fell in the recession (from about 12 percent to about 10 percent, per week). But this drop did not precede the rise in the E → U rate (initial claims as a proportion of covered employment). Instead, the E → U rate started to rise some months before the UI exit rate started to fall at the start of the recession.

Hall describes the evidence for an acyclical separation rate as reasonably compelling but not strong.[3] The main problem with this evidence arises because the Job Openings and Labor Turnover Survey did not begin until December 2000 (several months after the most recent recession began, according to figure 2.23). What about the evidence on the job-finding rate? This is presented in figure 2.9, and summarized by saying, "The job-finding rate is highly cyclical—it plunges in every recession." The job-finding rate is the number of workers hired in a month divided by the number of people looking for jobs. Figure 2.26 shows these two series separately, using Hall's data (the series in Hall's figure 2.9 is the ratio of the two series in figure 2.26). Since data on hires are not available before the start of the JOLTS series, Hall predicts the number of hires from observed employment growth, using the JOLTS data to estimate the coefficients in the prediction formula. Since data on the number of people looking for jobs are not available either,

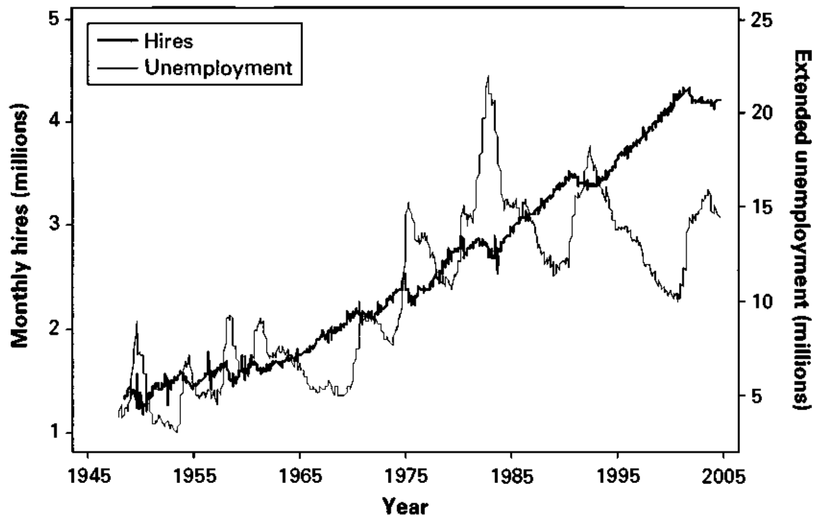

Figure 2.26
Hires and Extended Unemployment

Hall uses the number of unemployed people, expanded to include the (predicted) number of discouraged workers and "marginally attached" workers.

It is clear from figure 2.26 why Hall's estimated job-finding rate plunges in every recession: it is essentially a trend divided by the unemployment rate. As Hall emphasizes, one cannot understand unemployment fluctuations without understanding why the number of workers hired each month changes very little in response to big changes in the number of people unemployed. This is a quantitative issue, first raised by Shimer (2005a). The Mortensen-Pissarides model does predict a decrease in the job-finding rate in response to a reduction in productivity, but for plausible parameter values, the magnitude of the response is tiny relative to the variations seen in the data.

In summary, Hall's analysis of the separation rate raises an interesting question about why the flow of workers changing jobs decreases in a recession, while the flow leaving jobs and becoming unemployed increases. Unless one believes that this is driven by changes in the job-finding probability, there is nothing in the paper that overturns the conventional wisdom about the proximate causes of unemployment volatility. But Hall makes a persuasive case that a full understanding of unemployment fluctuations requires a better theory of fluctuations in the job-finding probability.

Endnotes

1. In the standard model of worker flows, there are three states (employed, unemployed, and out of the labor market), with six flows between these states. Taking the flows as a fraction of the stocks in either the source state or the destination state yields twelve rates of flow (for example, the entry rate to unemployment is the number of newly unemployed workers, as a proportion of the unemployment stock). Both the job-finding rate and the separation rate are mongrels, which are not included in this set of twelve rates of flow. The job-finding rate is the flow into employment, as a proportion of the stock of people looking for work. The separation rate is the flow of people leaving employers' payrolls, as a proportion of the employment stock. And even if we knew all of these rates, we would still not have enough information to determine the rates of job destruction and job creation.

2. Shimer (2005b) defines the separation probability as the probability that a worker who is employed now will not be employed next period. So when Shimer says that the separation probability is acyclical, and Hall says that the separation rate is acyclical, they are contradicting each other. This makes it even easier to get confused.

3. Oracles are known for making statements like this.

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Discussion

Many participants tried to reconcile previous theories of labor markets with Robert Hall's new view of labor markets during a recession.

Daron Acemoglu wondered why the old literature on job flows shows convincingly that quit rates fall and layoff rates rise during recessions, yet Hall's analysis using the Job Openings and Labor Turnover Survey (JOLTS) data suggests that, in the 2001 recession, the magnitude of these changes was very small.

Mark Gertler noted that the evidence in Hall's paper and Steve Davis's comment indicates that for the last two recessions, variation in the hiring rate is responsible for most of the action in unemployment. Yet for the recessions of the 1970s and 1980s, layoffs were more important. Gertler posed the question: what will happen in the future? If the United States returns to recessions with big contractions in manufacturing, will layoffs once again become the more important determinant of unemployment? Bob Hall replied that *quantitatively*, it is correct that layoffs played a larger role in the earlier recessions. But *qualitatively*, separations cannot be numerically important. The observed amount of employment decline that occurred in the earlier recessions puts a bound on separations. Referring to figure 2.2, which displays an approximation of separation rates for years before the JOLTS data is available, Hall reiterated that, even assuming that all employment decline is separations, that can generate only 30 or 40 basis points a month.

Andrew Levin agreed with Gertler that the recent recessions look different from past recessions and attributed the difference to different kinds of shocks. He provided a comparison between the 1981–1982 recession and the 2001 recession. The 1981–1982 recession was perhaps caused by a large shift in monetary policy that raised real interest rates. Vector autoregression (VAR) analysis done by Levin and colleagues shows that, as a result, auto sales and housing construction took big hits. In contrast, during the most recent recession, monetary policy was easing as much as possible, bringing down real interest rates and causing auto sales and construction to remain strong. So it should not be surprising, Levin concluded, that the recent recessions look different from the earlier recessions. Hall cautioned, however, that this notion that "every recession has its own personality" turns out to be completely false in the labor market. All postwar recessions look remarkably alike in terms of employment changes (for example, a 14 percent decline in employment in durables, a 5 percent decline in construction, a 2 percent increase in government).

Other comments were related to modeling strategies in light of this new view of labor markets. Valery Ramey suggested that a reasonable model should make separations endogenous. Hall agreed with this in principle but cautioned that if separations become the driving force of recessions, then you lose the tremendous decline in recruiting effort (vacancies, help-wanted advertising) that is actually seen in the data. To get realistic fluctuations in this recruiting effort, there cannot be too many bargains available to firms in the form of recently separated workers. Although methodologically endogenous separation is desirable, in terms of matching the data, it may be problematic.

Andrew Levin pushed the notion of endogenous separations further by suggesting that models that endogenize separation might also endogenize the components of separation: quits and layoffs. During a recession, even if the separation rate is constant, fewer people may be quitting if they know it is more difficult to find a job, and more people may be involuntarily laid off. Levin suggested that a model that includes these two components may be a fruitful path for future labor market research. Hall enthusiastically agreed with this, noting that the traditional work by Diamond, Mortensen, and Pissarides focuses on an efficient separation between worker and firm. How this split comes about (whether a separation is a quit or a layoff is not always clear) questions how the mechanism that governs the efficient employment relationship actually works.

And finally, an observation was made that the distinguishing feature of labor markets in the United States is the churning process. According to the JOLTS data, about one-third of all workers separate. So perhaps all of this discussion about the cyclical variation in unemployment is second order.