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The Labor Market in the Great Recession

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Since the onset of the recession in December 2007, labor market conditions in the United States have deteriorated dramatically. The depth and duration of the decline in economic activity have led many to refer to the downturn as the *Great Recession*. What is less clear is whether the severity of this downturn reflects the unprecedented depth of the 2007 recession, or whether it signals that the workings and dynamics of the labor market have changed. In this paper, we document the adjustment of the labor market during the recession, and place it in the broader context of previous postwar downturns. What emerges is a picture of labor market dynamics with two key recurring themes:

1. From the perspective of a wide range of labor market outcomes, the 2007 recession represents the deepest downturn in the labor market in the postwar era.
2. Nevertheless, the nature of labor market adjustment in the current recession displays a remarkable resemblance to that observed in past severe recessions.

These broad conclusions arise from a detailed investigation of the behavior of labor market stocks and flows over the course of the downturn. Our point of departure in section 1 is to document the evolution of key labor market indicators—unemployment, employment, labor force participation, and hours—during the recession. No matter what indicator of labor market activity we consider, the deterioration of labor market conditions during the 2007 recession is the worst on record since the late 1940s. Rates of unemployment among all the major subgroups of the labor market have reached postwar highs. From the perspective of the labor market, the 2007 recession is truly a Great Recession.

As noted above, we nonetheless observe that many dimensions of the evolution of these key indicators mirror those seen in past recessions. Labor force participation has declined mildly, reflecting the modest procyclicality observed in many postwar recessions; the relative contributions of the intensive and extensive margins to the decline in total labor input typify the conventional one third hours to two thirds bodies split observed in the past; and the constellation of demographic groups most affected—young, male, less-educated, workers from ethnic minorities—is reminiscent of previous downturns.

It is well-known that changes in aggregate unemployment in the United States mask substantial variation in underlying worker flows, a point emphasized by Blanchard and Diamond (1990).

Reflecting this, in section 2 we delve further into the sources of increased unemployment by analyzing the behavior of unemployment flows during the recession. This reveals that both increased unemployment inflows as well as declines in the rate at which workers flow out of the unemployment pool play crucial roles in accounting for the recent upswing in unemployment. As in previous severe recessions, the initial ramp-up in unemployment was accompanied by a sharp rise in inflows. In contrast to the claims of recent literature on unemployment flows (Hall, 2005; Shimer, 2007), elevated rates of inflow in times of recession appear not to be a relic of past downturns, but rather a distinctive feature of severe recessions, both old and new. The behavior of the outflow also mirrors that observed in past deep recessions: As the wave of inflows has receded in the latter stages of the current recession, the outflow rate has continued to fall. However, reflecting the distinctive severity of the downturn, recent data has seen the outflow rate reach a postwar low.

Digging deeper into measures of unemployment flows among labor force groups yields an important message on the sources of disparate trends in unemployment across labor force groups: Greater levels and cyclical sensitivity of joblessness among young, low-skilled minority workers, both in this and in previous downturns, are driven predominantly by differences in rates of entry into unemployment across these groups. In sharp contrast, a striking feature of unemployment exit rates is a remarkable uniformity in their cyclical behavior across labor force groups—the declines in outflow rates during this and prior recessions are truly an aggregate phenomenon.

In the remainder of section 2, we take advantage of a unique opportunity to assess the role of labor turnover in the recession since it is the first full upswing in unemployment covered by the new Job Openings and Labor Turnover Survey (JOLTS). This reveals some stark findings. In contrast to the behavior of unemployment inflows, rates of separation of workers from employers have not risen in the 2007 recession. This is suggestive of a hypothesis noted by Hall (2005): that increases in unemployment inflows may have little to do with increased rates of job loss, but merely are a symptom of declining rates of job finding among potential job-to-job movers. Deeper analysis of JOLTS data reveal a more nuanced account: Increased inflows into unemployment are driven predominantly by a change in the *composition* of separations toward layoffs, who are very likely to become unemployed, and away from quits, who are very likely to flow to a new job upon separation. Job loss has played a key role in driving increased unemployment in the recession.

We close our analysis in section 3 with an assessment of the outlook for the recovery of the labor market in the wake of the current downturn. Motivated by the recent subsidence of inflows into unemployment and the historic declines in the exit rate from unemployment, we emphasize the importance of a rebound in the outflow rate for future reductions in unemployment. After reviewing recent literature on the modern economics of labor market recovery, we highlight a potential cause for concern that has developed in recent data. The postwar U.S. labor market has been characterized by two remarkably stable aggregate relationships: the negative comovement of unemployment and vacancies—the Beveridge curve—and the positive association between the outflow rate from unemployment and the vacancy-unemployment ratio, a point noted by Shimer (2005). The latter half of 2009 has witnessed a break from these relations, with unemployment rising higher than implied by the historical Beveridge curve, and the outflow rate from unemployment falling significantly below the path implied by the past relation with the vacancy-unemployment ratio.

The resemblance of these trends to the similar breakdown in match efficiency that accompanied the European unemployment problem of the 1980s raises the concern of persistent unemployment, or hysteresis, in U.S. unemployment going forward. We consider a range of possible sources that might lead to hysteresis, including sectoral mismatch, disproportionate reductions in the unemployment outflow rates of the long-term unemployed, and persistence in unemployment brought about by reductions in the rate of worker flows, what Blanchard (2000) has termed *sclerosis*. We conclude that recent data provide little evidence for any of these possible drivers of persistent unemployment.

1. Basic Facts about the Labor Market in the 2007 Recession

The recession that started in December 2007 has been severe according to many measures, not least in terms of its effect on the labor market. In this section, we review the recent behavior of some of the main aggregate measures of labor market outcomes, and place the deterioration in labor market conditions of the current downturn in the broader historical context of previous postwar recessions.

1.1 Unemployment, Employment, Labor Force Participation and Hours

The main labor market indicator that we will focus on for much of this paper is the unemployment rate. To set the stage, Figure 1 displays the published time series for the civilian unemployment rate from Current Population Survey data. The current recession is a very prominent feature of this series. Unemployment rose from a pre-recession minimum of 4.5 percent to reach 10 percent in the most recently available data. This increase—5.5 percentage points—is the largest postwar upswing in the unemployment rate. It dwarfs the rise in joblessness in the two most recent recessions in 1990 and 2001, when in each case unemployment rose by approximately 2.5 percentage points. It dominates even the severe recession of 1973/4 (4.25 percentage points) as well as the combined effects of the double recession of the early 1980s (5 percentage points). There is little doubt that the present downturn is the deepest postwar recession from the perspective of the labor market.

In what follows, we will delve deeper into the anatomy of the rise in unemployment in the present downturn. But it is helpful at this point to place the increase in joblessness in the broader context of other related labor market indicators. We consider two sets of measures: First, the relation between the rise in unemployment and the decline in employment during the downturn; and second, the role of declines in employment relative to hours per worker in accounting for the contraction in total labor input.

The decline in employment. The unemployment rate at a given point in time u_t can be related to the level of employment E_t, and the labor force L_t, via the simple identity $u_t = 1 - (E_t/L_t)$. This identity suggests a simple metric for gauging the relative roles of variation in employment and labor force participation in accounting for the recent upswing in unemployment, since

$$du_t = (1 - u_t)[d \log L_t - d \log E_t] \qquad (1)$$

This has a simple message: The increase in the unemployment rate over the course of a recession can be decomposed into parts accounted for by logarithmic variation in labor force participation and employment respectively.

This exercise is performed in Figure 2. It plots published time series for the employment-population ratio and the labor force participation rate from the Current Population Survey, normalized to equal 100 for the most recent data in 2009. Figure 2 has two related messages. First, the largest postwar upswing in the unemployment rate observed in Figure 1 is mirrored by the largest postwar contraction in employment: Employment has declined by approximately 7 percentage points since the start of the recession, dominating the severe recession of the mid 1970s, as well as the joint effects of the double recession of the early 1980s.

A second message of Figure 2 is that, rather than contributing to the rise in unemployment, a reduction in labor force participation of around 1.5 percentage points has muted the rise in joblessness in the current recession. Figure 2 also reveals that the current recession is no exception in this respect: Almost all of the downturns prior to 2007 also exhibit a mild procyclicality of labor force participation, a point noted at least since Okun (1962).

An interesting aspect of the response of labor force participation in this recession is that it seems to have had two stages. Daly, Hobijn, and Kwok (2009) emphasized that during the first part of the recession the labor force participation rate remained unexpectedly high. After that, from May through November 2009, the labor force participation rate fell by 0.9 percentage points, its steepest decline since the 1950s.

Unemployment and GDP (*Okun's Law*). One of the most robust aggregate statistical relationships for the U.S. economy is the negative comovement between changes in the unemployment rate and growth in GDP—Okun's (1962) Law. Figure 3 displays a version of Okun's Law for each cycle since 1957, differentiating between deep and mild recessions. Changes in the unemployment rate and output growth are plotted as four-quarter differences to smooth out noise that is apparent in, for example, quarter-to-quarter changes.

Cycles progress along clockwise loops in the Okun diagram, moving first northwest and then southeast. Unemployment recovers more slowly than output growth—the loop in Figure 3—reflecting the well-known property of unemployment being lagging indicator. In broad terms, the slope coefficient of -0.3 estimated by Okun (1962) still provides a remarkably good overall summary of the relation between output and unemployment across these cycles.

The Okun's Law relationship does differ across cycles, however, but appears to do so in a systematic way. The severe recessions of 1957, 1973 and 1981 are characterized by a relatively stable negative relationship between output growth and changes in unemployment, with a slope coefficient lying between -0.25 and -0.35. In sharp contrast, the mild recessions of 1969 and 2001 display a very different relationship, with unemployment rising in the absence of major declines in GDP growth.

In addition to confirming the 2007 recession to be the deepest postwar recession, Figure 3 adds that this is equally true of output as it is of unemployment—the current downturn has reached the farthest northwest in the Okun diagram of all recessions. Second, as we have noted of other dimensions of this recession, the adjustment of the labor market is again by no means an outlier in terms of past recessions: Okun's Law in the current downturn has progressed in a manner reminiscent of the severe recession of 1973. While unemployment has risen faster in the early stages of the present downturn, the labor market adjusted more in the later stages of the ramp-up in unemployment in 1973.[1]

Hours vs. bodies. The evidence presented thus far has pertained solely to measures of the number of persons in or out of work, and not to the number of hours worked per employed person. Here we summarize the behavior of each of these measures, and identify their relative importance in driving the contraction in total labor input during the current downturn. Our point of departure is another simple accounting identity, namely that total labor input H_t is the product of employment E_t and hours per worker h_t. It follows that the logarithmic decline in total hours worked during the recession may be decomposed into the sum of the respective logarithmic declines in E_t and h_t.

Figure 4 performs this simple accounting exercise using data on employment and weekly hours per worker in the nonfarm business sector from the Bureau of Labor Statistics' *Labor Productivity and Costs* program.[2] It plots the cumulative log declines in employment and hours per worker for each postwar recessionary downturn in total labor input.[3] Total labor input has declined by 10 log points in the current recession, again more than in any other postwar recession.

An interesting aspect of Figure 4 is that, while the 2007 recession is conspicuous in its severity, the adjustment of the labor market bears an important resemblance to that observed in prior recessions. Figure 4 highlights this on two dimensions. First, we observe that reductions in hours per worker prevail in the early stages of the recession, with contractions in employment becoming dominant later on. Second, Figure 3 reiterates the message of Figure 2 that employment has fallen

[1] For a detailed analysis of Okun's Law, see Gordon (2010).

[2] The BLS series identifiers used for employment and weekly hours per worker are respectively PRS85006013 and PRS85006023. In constructing these series, the BLS combines data from the Current Employment Statistics and the Current Population Survey. Employment here includes both payroll employees as well as self-employed and unpaid family workers.

[3] The recession dates used for constructing Figure 4 differ slightly from the official NBER recession dates. They correspond to the quarters around the NBER recession dates over which total hours worked are observed to decline.

by 7 log points, but additionally reveals that hours per worker have contracted by 3 log points. Thus, there has been something close to a 70:30 bodies/hours split to the decline in total labor input over the course of the 2007 recession. This pattern of labor adjustment is remarkably reminiscent of the conventional wisdom since at least Okun (1962) that around two-thirds of the cyclical variation in labor input is accounted for by the extensive margin. Reiterating this point, Figure 4 reveals that, across all postwar recessions, variation in employment accounts for between 40 and 80 percent of declines in total hours.

1.2 Who has been hit hardest?

Underlying the acute surge in joblessness documented in Figures 1 through 4 is a rich degree of heterogeneity in the structure of unemployment across different groups in the labor force. Our point of departure is to document this heterogeneity in the experience of unemployment across groups in the labor force. We focus on four dimensions of heterogeneity: gender, age, race and educational attainment.[4] Figure 5 plots individual unemployment series for each of these demographic groups using data from the Current Population Survey.[5] A casual examination of this figure shows that male, younger, less educated workers, as well as individuals from ethnic minorities, are both more likely to experience unemployment, but also face steeper rises in joblessness during recessions. This echoes the findings of an abundant literature that has documented differences in the cyclical sensitivity of different demographic groups (see Clark and Summers, 1981, Gomme, Rogerson, Rupert, and Wright, 2004, Kydland, 1984, Mincer 1991, for example).

To assess the quantitative importance of these differences, we compute each group's contribution to the increase in the unemployment rate for the last five downturns. Note that the aggregate unemployment rate at a point in time u_t can be expressed as a weighted sum of unemployment rates for specific groups u_{jt}, with weights ω_{jt} given by each group j's respective labor force share:

[4] Thanks to Henry Farber for drawing to our attention the importance of education composition for understanding unemployment trends in the current recession. For more details, see Farber and Western (2010).

[5] Published Current Population Survey time series on unemployment and labor force participation are available from 1948 by age and gender, and from 1973 by race. Published series on unemployment by education group are available only from 1992 due to a change in the recording of educational attainment. Consequently, we constructed seasonally unadjusted measures for unemployment by education using CPS monthly microdata which are available back to 1976. These series were then seasonally adjusted using the Census' X12 procedure.

$$u_t = \sum_j \omega_{jt} u_{jt}. \tag{2}$$

It follows that the change in the unemployment rate from time t to $t + \tau$ can be written simply as

$$u_{t+\tau} - u_t = \sum_j \left[\omega_{jt+\tau} u_{jt+\tau} - \omega_{jt} u_{jt}\right]. \tag{3}$$

This allows us to compute the contribution of the increase in group j's unemployment rate to aggregate unemployment as:[6]

$$\mu_j = \frac{\omega_{jt+\tau} u_{jt+\tau} - \omega_{jt} u_{jt}}{u_{t+\tau} - u_t}. \tag{4}$$

If unemployment increases uniformly across different subgroups of the labor market, then μ_j would be approximately equal to the labor force share of each group, ω_{jt}. On the other hand, if $\mu_j > \omega_{jt}$, group j's unemployment has been hit harder relative to its share of the labor force.

Table 1 reports the results of this decomposition for the last five downturns. The results confirm the visual impression of Figure 4. Younger, less educated workers, as well as individuals from ethnic minorities were hit harder by the current recession. The shares of the increase in unemployment accounted for by each of these groups have exceeded their respective labor force shares. In particular, men have accounted for 64 percent of the 5.2 percentage point rise in the unemployment rate. Şahin, Song, and Hobijn (2009) show that this can be traced to the fact that industries in which male workers are concentrated, such as construction and durable goods manufacturing, are particularly sensitive to the cycle. The current recession has favored older workers while younger workers suffered relatively more. The recession also had differential effect on different education groups. While they constitute one third of the labor force, workers with a college degree have accounted for only 21% of the increase in the unemployment rate.

How does this pattern compare with the previous downturns? In all five recessions we consider, male, younger, less educated workers, as well as individuals from ethnic minorities were hit harder than average during the recession. The current downturn is no exception in terms of the groups that have been affected more than average.

[6] If the labor force shares were constant from time t to $t + \tau$, then the change in the unemployment rate would equal a share-weighted sum of the changes in the unemployment rates by group, with weights given by each group's respective labor force share. Our calculations take into account the change in the labor force shares but we find that this effect is small.

1.3 Accounting for the Composition of the Labor Force

This heterogeneity in the experience of unemployment across labor force groups matters for an assessment of joblessness in the current recession. Recent decades have witnessed dramatic changes in the composition of the labor force: The age structure of the labor force has become older since the 1980s as the baby boom generation has aged, a point emphasized by Shimer (1998, 2001); gender composition has moved toward females as women increasingly have entered the labor force; racial composition has been altered by large upward trends in immigration, especially of Hispanic workers; and individuals in the current labor market are more educated than their counterparts in the past. Accounting for such compositional changes can paint a different picture of aggregate unemployment trends because, as emphasized by Figure 5, these different labor force groups are systematically more or less likely to experience spells of unemployment.

Equation (2) suggests a simple method for controlling for the impact of changes in labor force composition on trends in aggregate unemployment, by fixing the labor force shares to their level at some reference date and tracing out the implied composition-adjusted unemployment series. Figure 6 implements this exercise using the most recent labor force shares to construct composition-adjusted series. It focuses on the same four dimensions of heterogeneity as Figure 5: age, gender, race and education. Figure 6 adjusts for the full interaction of each of these sources using monthly Current Population Survey microdata from 1976 on. This reveals a stark finding: Accounting for compositional changes leads to a substantial downward revision of past unemployment rates. While published statistics suggest that current unemployment has not exceeded the postwar high of 11 percent in 1982, Figure 6 reveals that, holding labor force shares at their 2009 levels, the 1982 jobless peak was a full percentage point below the present unemployment rate of 10 percent.

Panels (a) through (d) of Figure 7 unpack this result by adjusting for the composition of each demographic group individually.[7] These reveal that, while changing gender composition has not greatly affected the picture of aggregate unemployment, labor force composition by age, race and education has played a key role. The aging of the baby boom generation and the increase in educational attainment since the 1980s has shifted the structure of the labor force toward older and

[7] Published Current Population Survey time series on unemployment and labor force participation are available from 1948 by age and gender, and from 1973 by race. We supplement these with series by education group constructed using monthly Current Population Survey microdata from 1976 on. Published time series by educational attainment are available only back to 1992 due to a change in the coding of education.

better educated workers who face lower unemployment rates on average (Panels (b) and (d)). It is these trends that are driving the overall result depicted in Figure 6. However, a partially offsetting force is the influx of immigrants since the 1970s that has led to a greater fraction of Hispanic workers in the labor force, who in turn are more likely to experience an unemployment spell (Panel (c)).

2. Labor market flows in the recession

A defining characteristic of the U.S. labor market is that it is in a state of continual flux. Even when the aggregate economy is in a tranquil state, many workers flow in and out of employment and unemployment. In times of recession, these flows come into focus all the more as proximate determinants of increases in joblessness, and provide a richer view of the adjustment of the labor market: Does unemployment rise as a result of increased inflows as workers lose their jobs? Or does it rise because unemployed workers increasingly fail to find new jobs? Or is it some combination of the two?

Based partly on the shallow downturns of 1990 and 2001, recent research has argued that the nature of labor market adjustment in times of recession has radically shifted in recent years. Hall (2005) states that "In the modern U.S. economy, recessions do not begin with a burst of layoffs." Echoing this, in his study of unemployment flows, Shimer (2007) concludes that "Fluctuations in the employment exit probability are quantitatively irrelevant during the last two decades."[8] Instead, increased unemployment duration, or a decline in the rate at which workers flow out of the unemployment pool, is argued to drive the entirety of contemporary unemployment variation.

In contrast, a long line of research on labor market flows prior to the last two recessions came to the conclusion that cyclical ramp-ups in unemployment are driven by both margins.[9] More recent work has revived this conclusion, and identified a clear pattern to unemployment flows in times of recession: Increases in unemployment are preceded by sharp rises in unemployment inflows,

[8] Shimer (2007) uses the term "employment exit probability" to refer to the probability of entering unemployment. We do not use this terminology because employment exit can be taken to mean a flow from employment to either unemployment or nonparticipation, of which the latter does not involve an inflow into unemployment, and may even be taken to mean any separation from employment, which would also include job-to-job flows.

[9] See, among others, Perry (1972), Marston (1976), Blanchard and Diamond (1990), and Baker (1992).

followed by more prolonged periods of elevated unemployment duration.[10] The conclusion of that literature pointed towards cyclical ramp-ups in unemployment being driven by both margins, with inflows being relatively more dominant early on in recessions.

The current downturn provides an opportunity to assess these conclusions: Is a diminished role of job loss a feature of modern recessions, or of shallow recessions? To get a sense for this, we explore updated estimates of unemployment transitions from a variety of data sources.

2.1 The Ins and Outs of Unemployment in the Current Recession

A first glimpse of the dynamics of unemployment flows can be obtained from published time series from the Current Population Survey. Shimer (2007) describes a method that uses monthly series on the number employed, the number unemployed, and the number unemployed for fewer than five weeks to infer the rates at which workers enter unemployment, and unemployed workers exit unemployment. His point of departure is the following simple description of the evolution of the unemployment stock U_t over time:

$$dU/dt = s_t(L_t - U_t) - f_t U_t, \tag{5}$$

where s_t and f_t are respectively the inflow and outflow rates, L_t is the labor force, and t indexes months.[11]

The goal of the analysis is to relate variation in the unemployment rate $u_t = U_t/L_t$ to variation in the flow hazards s_t and f_t. To that end, we first need estimates of these flow rates. Following Shimer (2007), we compute the monthly outflow probability,

$$F_t = 1 - [(U_{t+1} - U_{t+1}^{<1})/U_t], \tag{6}$$

where $U_{t+1}^{<1}$ is the stock of workers who report having been unemployed for less than one month.[12] Intuitively, the term inside the brackets is the fraction of the unemployed in month t that remains

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[10] See Braun, De Bock, and DiCecio (2006); Davis (2006); Elsby, Michaels, and Solon (2009); Fujita and Ramey (2009); Kennan (2006); and Yashiv (2008).

[11] An implicit assumption underlying equation (5) is that all inflows into unemployment originate from employment, $L_t - U_t$. In fact, as we will see in what follows, a substantial fraction of inflows originate from nonparticipation in the U.S. We relax this simplifying assumption in section 2.3 below.

[12] As noted by Polivka and Miller (1998) and Abraham and Shimer (2001), the published time series on short term unemployment from the Bureau of Labor Statistics displays a discontinuous decline following the Current Population Survey redesign in 1994, as a result of a change in the way unemployment duration was recorded. Conveniently, the pre-redesign duration question continued

unemployed the next month, the complement of which is the monthly outflow probability. This can then be mapped into a Poisson outflow hazard rate $f_t = -\log(1 - F_t)$.

Obtaining an estimate of the inflow rate is slightly more involved. Assuming that the flow hazards, s_t and f_t, and the labor force, L_t, are constant between surveys, one can solve equation (1) forward one month to obtain:

$$U_{t+1} = \lambda_t U_t^* + (1 - \lambda_t) U_t. \tag{7}$$

Here unemployment is a weighted average of the flow steady state level of unemployment $U_t^* = s_t L_t / (s_t + f_t)$ and last month's unemployment U_t, with weight given by the monthly rate of convergence to steady state, $\lambda_t = 1 - e^{-(s_t + f_t)}$. Since we observe the labor force and unemployment stocks in each month, and with an estimate of the outflow rate f_t in hand, equation (7) is a nonlinear equation that can be solved for the inflow rate s_t. As emphasized by Shimer (2007), this procedure for estimating s_t implicitly corrects for a time aggregation bias arising from inflows within a given month exiting prior to the next month's survey.

Figure 8 plots quarterly averages of the estimated monthly time series for the rates of inflow to and outflow from unemployment, using the most recent Current Population Survey data up to 2009 Q3. Figure 8 highlights a number of interesting properties of the dynamics of unemployment flows in past recessions. First, as emphasized in the entirety of research on unemployment flows, both old and new, the outflow rate from unemployment is markedly procyclical, exhibiting systematic and prolonged downswings in all recessions. Second, the inflow rate into unemployment is countercyclical, exhibiting sharp upswings at the onset of all recessions that tend to subside quickly by the end of the recession. Third, the response of unemployment inflows in the relatively mild recessions that began in 1990 and 2001 appears to be muted in comparison to other episodes, a point that echoes the recent conclusions of Hall (2005, 2007) and Shimer (2007).

At this point, we can return to the question that motivated this part of our analysis: To what extent is the cyclical ramp up in unemployment accounted for by changes in these flow hazard rates? Elsby, Michaels and Solon (2009) provide a simple method for answering this question. Their point of departure is an observation that has been noted by many analysts of U.S. unemployment

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to be asked for approximately ¼ of the sample (the first and fifth "rotation groups"). We correct the published post redesign series for short term unemployment by rescaling it by a factor of 1.16—the average post-redesign ratio of the short term unemployment share in the first and fifth rotation groups vs. the full sample.

flows: That the unemployment rate in the U.S. is very closely approximated by its flow steady state value, that is

$$u_t \equiv U_t/L_t \approx u_t^* \equiv s_t/(s_t + f_t).\text{[13]} \quad (8)$$

Equation (8) is useful for our purposes because it provides a link between variation in the unemployment stock and variation in the constituent flow hazard rates. Elsby, Michaels and Solon (2009) show that simple log differentiation of this approximate relation implies:

$$\Delta u_t \approx \beta_{t-1}[\Delta \log s_t - \Delta \log f_t], \text{ where } \beta_{t-1} = u_{t-1}(1 - u_{t-1}). \quad (9)$$

Equation (9) has a simple message: In order to compare changes in inflow and outflow rates on an equal footing with respect to changes in unemployment, all one need do is compare the logarithmic variation in each of the flow hazards.

The results from applying this decomposition of unemployment variation for each postwar recession are depicted in Figure 9. We identify start and end dates for each recessionary ramp-up in unemployment since 1948, and compute the cumulative logarithmic difference in inflow and outflow rates relative to their respective start of recession values. In many ways, the message of Figure 9 confirms the qualitative picture suggested in Figure 8: In all recessions, inflows account for a substantial fraction of unemployment variation early on in the downturn, and then subside in the latter stages of the recession. In contrast, the contribution of the outflow rate becomes more dominant as each recession progresses.

For our current focus, there are two noteworthy aspects of Figures 8 and 9. First, mirroring the conclusions of Section 1 on labor market stocks, the behavior of unemployment flows in the initial stages of the current downturn bears a striking resemblance to the dynamics of unemployment flows in past severe recessions. The early quarters of the current ramp-up in unemployment are characterized by a wave of inflows that has since receded partially. The contribution of the inflow rate is almost identical to that observed in the 1974 downturn. Thus, returning to the question that motivated this analysis, sharp spikes in the rate of inflow into unemployment appear to be a feature of severe recessions, rather than of modern ones.

[13] To see why this is so, note that the sum of the inflow and outflow rates $s_t + f_t$ typically exceeds 0.5 on a monthly basis in the U.S. An implication is that the rate of convergence to flow steady state λ_t in equation (8) above tends to be very high in practice.

A second key message of Figures 8 and 9 is that they also shed light on what's new about the current downturn. Figure 8 reveals that the unemployment outflow rate has fallen to an historic low of 24 percent in 2009 Q3. This is not just a consequence of the secular trend toward declining outflow hazards shown in Figure 8: Figure 9 shows that the exit rate has fallen by over 80 log points in the current downturn, more than in any of its postwar counterparts, echoing the conclusion of Section 1 that this is the deepest postwar downturn in labor market outcomes. We return to this phenomenon in Section 3, when we discuss its implications for a recovery.

2.2 Digging Deeper: Unemployment Flows by Labor Force Group

In Section 1.2 we saw that unemployment rates have differed substantially across different demographic groups during the 2007 recession, with some groups being hit harder by the downturn than others. We now look deeper into the sources of this heterogeneity by examining unemployment flows across groups.

We focus on the same four dimensions of heterogeneity as in Section 1.2. Estimation of the flow hazards for each labor force group mirrors the aggregate analysis above.[14] Figure 10 displays the series for the inflow and outflow hazards for each group. They are plotted as twelve-month moving averages to smooth out noise induced by the greater sampling variance that accompanies these more disaggregated series. In accordance with the message of equation (5), the flow hazards are drawn on log scales.

Figure 10 has a rich set of implications for the structure of joblessness across groups. Perhaps its most prominent feature is the remarkable uniformity in both the levels and cyclical behavior of outflow rates across groups. Most striking are the series by education group, for which the exit rates are virtually indistinguishable since 1976. In the current recession, the log decline in outflow hazards has been almost identical across groups. Reductions in the outflow rate that accompany

[14] The Bureau of Labor Statistics publishes seasonally unadjusted estimates of unemployment by duration starting from the mid 1970s by gender, age and race. As in Section 1.2 above, for education groups we use CPS monthly microdata files from January 1976 on to construct measures of unemployed less than five weeks, unemployed and employed by education groups. We then seasonally adjust the raw data using the Census' X12 procedure, and compute the monthly outflow and inflow rates using the analogues to equations (3) and (4) that hold for each group. As before, we also correct for discontinuities in the series for short-term unemployment by group induced by the redesign of the Current Population Survey in 1994. To correct these series, we use CPS microdata to obtain correction factors of 1.153 for men, and 1.159 for women; 1.175 for ages 16-24, 1.141 for ages 25-54, and 1.125 for ages 55 and over; 1.144 for whites, 1.212 for blacks, and 1.159 for Hispanics; 1.170 for less than 12 years, 1.158 for 12 years, 1.140 for 13-15 years, and 1.139 for 16 years of education and over.

recessions, from both a qualitative and a quantitative perspective, are truly an *aggregate* phenomenon.

In stark contrast, there are large differences in rates of inflow into unemployment across groups. Comparison of these with the heterogeneity of unemployment across groups in Figure 5 reveals a close link: The same groups that face high unemployment rates—young, less-educated workers from ethnic minorities—also face markedly high rates of entry into unemployment. The message of this comparison is that the bulk of the large differences in the level of unemployment across groups observed in Figure 5 are driven by differences in each group's propensity to enter unemployment, rather than differences in the duration of their spells. [15]

In addition to revealing large differences in the levels of unemployment across groups, Figure 5 also demonstrated that some groups face greater increases in unemployment in times of recession. What can account for this? Well, recalling equation (5) above, we can write the change in group j's unemployment rate as

$$\Delta u_{j,t} \approx \beta_{j,t-1}\left[\Delta \log s_{j,t} - \Delta \log f_{j,t}\right], \text{ where } \beta_{j,t-1} = u_{j,t-1}\left(1 - u_{j,t-1}\right). \tag{10}$$

One possibility, then, is that these groups simply faced larger logarithmic changes in their constituent flow hazards. Inspection of Figure 10 reveals that this is precisely what accounts for the surge in the unemployment of men relative to women in the current recession: While male and female outflow rates have been essentially identical, men have faced a much larger increase in inflows, a point emphasized by Şahin, Song, and Hobijn (2009).[16]

But this is not the whole story. For age, race and education groups, there is little difference in the cyclicality of unemployment flows, and whatever differences exist tend to predict the opposite of the pattern depicted in Figure 5. For example, outflow rates among young workers aged 16 to 24 have fallen just as much as for older workers, and their inflow rates have hardly risen in the recession. Yet, in Figure 5, the unemployment rate among 16 to 24 year-olds rose by an astonishing 9 percentage points.

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[15] These findings resonate the findings of Bils, Chang, and Kim (2009) and Mincer (1991).

[16] Şahin, Song, and Hobijn (2009) delve deeper into this phenomenon using longitudinally-linked monthly CPS microdata to estimate labor market flows between unemployment, employment and nonparticipation. Consistent with Figure 10, they find that, for men, the employment to unemployment transition rate increased more than it did for women, while unemployment to employment transition rate declined proportionally across gender groups.

The answer lies in equation (10) above: For values of the group-specific unemployment rates $u_{j,t}$ observed in Figure 5 (i.e. lying below one half), $\beta_{j,t-1}$ is increasing in $u_{j,t-1}$. Thus, the higher the unemployment rate faced by an individual group, the greater the responsiveness of the group's unemployment rate to changes in its constituent flow hazards. Intuitively, equation (10) implies that changes in the flow hazards have a logarithmic influence on unemployment: A doubling of, for example, the inflow hazard, leads to an almost doubling of the unemployment rate. The higher is that unemployment rate, then, the more cyclically sensitive is an individual group's rate of joblessness.

Inspection of Figure 10 reveals that this observation can account entirely for the greater cyclical sensitivity of unemployment among youth, ethnic minorities and the less-educated in the current, and indeed all recessions over the sample period. Combining this with our earlier observation that the bulk of the differences in unemployment levels, and thereby of β_j, across groups can be attributed to differences in rates of entry into unemployment yields an interesting implication: The majority of the variation in both the levels and the cyclical sensitivity of group unemployment rates can be accounted for by differences in the level of inflow rates across groups.

2.3 The Role of Job Loss in the Recession

The previous sections have shown that unemployment inflows are a proximate driving force of the increase unemployment in the current recession, and that they play an important role in accounting for cross sectional differences in the level and cyclicality of unemployment across groups. It is tempting to conclude that this constitutes evidence that job loss has played a key role in the 2007 recession. In this section, we delve deeper into this observation to uncover the mechanisms that can account for these elevated inflow rates.

We address two important conceptual distinctions. First, as mentioned above, estimates of the unemployment inflow rate, s_t in equation (7), are based on the implicit assumption that all inflows into the unemployment pool originate from employment rather than nonparticipation. In fact, around 40 percent of the unemployment stock is accounted for by individuals (re-)entering the labor force. Consequently, estimates of s_t conflate two economically distinct driving forces for entry into unemployment: flows from nonparticipation brought about by the process of labor force entry, and flows from employment to unemployment that are associated with elevated rates of job loss.

Second, job loss is often taken to mean a separation from an employer rather than an inflow into the unemployment pool, the distinction being that workers can, and frequently do, line up new jobs without an intervening unemployment spell, a point that has been made since Mattila (1974), and more recently by Fallick and Fleischman (2004) and Nagypál (2008). In what follows, we bring to bear a range of additional data that speak to these distinctions.

Unemployment Inflows by Reason. It is possible to distinguish among different sources of unemployment flows using publicly available monthly time series on the number unemployed by reason for unemployment, and the number unemployed for fewer than five weeks by reason from the Current Population Survey. We focus on three main reasons for unemployment: job losers (layoffs), job leavers (quits), and labor force entrants.[17] An important benefit of this distinction is that the former two categories originate from employment, while the latter originates from nonparticipation. This allows us to identify employment to unemployment flows.

Elsby, Michaels and Solon (2009) describe how these data can be used to infer estimates of unemployment flows by reason for unemployment.[18] Figure 11 plots estimates of the inflow rates by reason. As emphasized by Elsby et al., all of the observed countercyclicality in the aggregate inflow rate noted above is driven by a markedly countercyclical layoff inflow rate. The quit inflow rate is comparatively very low and mildly *pro*cyclical, thereby dampening the observed countercyclicality of aggregate inflows. In addition, inflows due to labor force entry are essentially acyclical, further moderating the rise in the aggregate inflow rate in times of recession.

The impression of Figure 11, one that is fast becoming a unifying theme of the present paper, is that the behavior of inflows by reason in the current downturn is again very reminiscent of past recessions. The behavior of the layoff inflow rate in particular suggests a simple partitioning of recessionary episodes: Deep recessions, such as those starting in 1974, the Volcker disinflation period of the early 1980s, and the present downturn are characterized by markedly elevated layoff

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[17] It is possible to further decompose job losers into temporary vs. permanent layoffs, and labor force entrants into new entrants and reentrants. We do not distinguish among these principally because the redesign of the Current Population Survey in 1994 led to substantial changes in the definition of these subgroups, and associated discontinuities in the respective time series. See Polivka and Miller (1998) for more details.

[18] There is a slight difference between the methods used by Elsby, Michaels and Solon (2009) to compute inflow rates by reason for unemployment and that used by Shimer (2007) to compute the aggregate inflow rate. Elsby et al. use a discrete time correction for time aggregation bias, while Shimer uses a continuous time correction. Results in Elsby et al. suggest this difference is not quantitatively important.

inflow rates; milder recessions, such as those starting in 1969, 1990 and 2001, are typified by a more modest increase in inflows due to layoffs. Again, the message of the 2007 recession is that severe modern recessions share many of the characteristics of deep recessions in the past.

Evidence from Labor Turnover. The fact that unemployment inflows have risen markedly in the current recession, and that layoff inflows have dominated that trend, is suggestive of job loss playing a key role in driving cyclical rises in unemployment. But it is not necessarily conclusive. As noted by Hall (2005), elevated rates of inflow into unemployment need not be the outcome of elevated rates of separation from employers: Increased inflows in times of recession can occur if workers increasingly are unable to line up new jobs immediately upon separation. Under this alternative hypothesis, countercyclical inflows are a symptom of declining rates of job finding among potential job-to-job movers, rather than elevated rates of job loss.

The current recession provides a unique opportunity to assess these competing hypotheses—it is the first full recession covered by the new Job Openings and Labor Turnover Survey (JOLTS).[19] This is crucial for our present purpose because it provides a representative measure of the rate at which employed workers separate from their employers in the U.S.

More formally, denote the separation rate from employers by σ_t, and the employment to unemployment inflow rate by s_t^{eu}. Note that a measure of the latter is given by the sum of the layoff and quit inflow rates presented above, $s_t^{eu} = s_{l,t} + s_{q,t}$. It follows that we can relate σ_t and s_t^{eu} simply according to:

$$s_t^{eu} = p_t \sigma_t, \tag{11}$$

where p_t denotes the probability that a worker who separates from her employer in month *t* subsequently flows into unemployment.

Figure 12 plots the time series for σ_t and s_t^{eu}, and reveals a stark set of facts. First, there is a substantial difference between the separation rate and the employment-to-unemployment transition rate, a fact that is suggestive of the abundance of job-to-job transitions in the U.S. economy, as emphasized by Fallick and Fleischman (2004) and Nagypál (2008). Second, while the employment to unemployment inflow rate has increased in the current downturn, the total rate of separation of

[19] JOLTS data are available only back to December 2000. Because of this, they miss part of the ramp-up in unemployment in the 2001 recession.

workers from employers has, if anything, fallen slightly. At first blush, then, it would seem that the elevated rates of inflow into unemployment during the current recession are driven wholly by reductions in the rate at which workers line up new jobs. The results of Figure 12 would seem to provide ample support for Hall's (2005) hypothesis.

We argue that such a conclusion would be premature. It has long been recognized that the relatively modest cyclical behavior of total separations masks substantial cyclicality in its constituent elements—quits and layoffs. Moreover, these tend to display markedly opposite cyclical patterns: The quit rate from employers moves *pro*cyclically, while the layoff rate moves *counter*cyclically.[20] Figure 13 plots economy-wide layoff and quit rates from JOLTS for the current downturn and reveals that, as with unemployment flows, the behavior of labor turnover in the current recession is again remarkably consistent with historical trends in these series.

Accounting for the distinction between quits and layoffs allows a more detailed investigation of the relationship between separations and unemployment inflows than in equation (9) above. The employment to unemployment transition rate can be decomposed as follows:

$$s_t^{eu} = p_{l,t}\sigma_{l,t} + p_{q,t}\sigma_{q,t} = \underbrace{\left[\omega_t p_{l,t} + (1-\omega_t)p_{q,t}\right]}_{p_t}\sigma_t, \tag{12}$$

where subscripts l and q respectively denote layoffs and quits, $\sigma = \sigma_l + \sigma_q$ is the aggregate separation rate, and $\omega = \sigma_l/\sigma$ is the share of layoffs in aggregate separations. Equation (12) highlights an additional channel by which employment to unemployment transitions may increase: through changes in the *composition* of separations that occur during recessions, ω.

Figure 13 clarifies this point. The first panel depicts the quit separation rate σ_q from JOLTS along with the quit inflow hazard into unemployment s_q derived from CPS data using the method described in the previous section. At all points in time, workers who quit their previous job face a very low probability of subsequently entering unemployment— p_q averages just 16 percent over the sample period. Job-to-job flows drive an important wedge between separations and unemployment inflows due to quits. It is for this reason that quits account for only a small fraction of unemployment inflows. In addition, the implied series for p_q displays no cyclical pattern: it has fallen steadily from approximately 20 percent in 2001 to 14 percent in 2009. These two

[20] See, for example Slichter (1919); Woytinsky (1942); Akerlof et al. (1988); Anderson and Meyer (1994).

observations—that p_q is small, and that it has not risen in the current downturn—account for why the contribution of quits to increased unemployment inflows is not significant in the current downturn.

A quite different story holds for layoffs. The second panel of Figure 13 reveals that, at all points in time, workers laid off from their previous jobs face a very high probability of entering unemployment— p_l averages 91 percent since 2001. Job-to-job flows do not appear to be prevalent among laid-off workers. Moreover, while the gap between the separation and inflow rates for layoffs closed in the early periods of the current downturn, the rise in p_l accounts for only a small fraction of the overall rise in unemployment inflows, perhaps one-quarter of the overall rise in the layoff inflow rate.

Figure 13 therefore paints a coherent picture of the rise in unemployment inflows during the recession. As suggested by Hall (2005), elevated rates of entry into unemployment are not driven by increases in the overall rate at which workers separate from employers. But they also are not simply an artifact of declines in the rate at which separated workers line up new jobs. Instead, a more nuanced picture emerges: Increased inflows into unemployment can be traced to a shift in the composition of separations during the recession away from quits, who face a small chance of flowing into unemployment at all times, and toward layoffs, who are very likely to flow into unemployment.

3. Outlook for recovery in the labor market

Until now, we have concentrated on analyzing the behavior of labor market stocks and flows associated with the rise in unemployment in the 2007 recession. In this section, we turn to the prospects for the labor market going forward.

Our point of departure is to return to Figure 8 which displays the behavior of unemployment flows during each postwar recession. Two features of Figure 8 provide a first glimpse of the central features that will guide the recovery. First, since the spike in the inflow rate has largely subsided, the key to any decline in unemployment in the future is a recovery of the outflow rate. Second, the decline in the outflow rate that has accompanied the 2007 recession has been much more severe than in past recessions. Thus, the recovery of the outflow rate is all the more salient in the present downturn for the future of the U.S. labor market.

One can think of the relative strength of the rebound in the outflow rate as being determined by two things. First, how many new job openings will be created? Second, for a given increase in the number of vacancies, how quickly does the pool of unemployed find new jobs?

3.1 Vacancy creation

Job creation reflects the overall health of the economy and it is expected that as the aggregate activity recovers, vacancy creation will also start to increase. However, there are many factors that affect the timing and level of vacancy creation during recoveries. Here we focus on the two main competing effects which we anticipate to be most important during this recovery.

On the up side is the additional strength in vacancy creation due to the alleviation of the credit constraints that resulted from the financial crisis. Moreover, since the resolution of the financial crisis is likely to cause a substantial decline in aggregate and individual uncertainty, firms' willingness to hire could increase significantly, reversing the decline in employment at a relatively fast pace. In particular, it implies a drastic reduction in the probability of a detrimental aggregate economic outcome. As Bernanke (1983) points out, such a reduction in the probability of "bad news" will increase the likelihood that firms make the decisions to invest and hire[21], which are costly to reverse.

On the downside, there is a potentially large amount of unused capacity in terms of labor input in the economy that firms can tap into before needing to hire additional workers. This effect could cause the firms to wait to create new jobs. A conventional source of unused productive potential consists of existing employees that are not being used at full capacity, either because they work only part-time or because they work fulltime but at a lower productivity level. The unemployment rate only captures the people that are out of work who would like to work. It does not include the workers who are working part-time but would prefer to work fulltime; those who are part-time

[21] Bernanke (1983) solely focuses on irreversible investment decisions made by firms. Bentolila and Bertola (1990) and Bloom (2009) consider the effect of uncertainty on hiring and firing decisions that are costly to reverse. The problem with the latter two papers is that the structure of uncertainty in these papers would imply that firms would be more reluctant to lay people off in uncertain times. This seems to contradict, or at least suggest that the increase in uncertainty was not the main driving force behind, our observation that the labor demand response in the 2007 recession was relatively strong compared to other recessions.

employed for economic reasons. The latter category currently makes up 6.7 percent of those employed. Daly, Hobijn, and Kwok (2009), among others, have argued that the pace of hiring relative to output growth during the recovery could be slowed down because firms first increase the hours of those who are already employed but only part-time before they actually hire additional workers.

3.2 Match efficiency and the Beveridge Curve

An important concern for the strength of the recovery is that, even if firms create new jobs, it will be harder to match workers with the appropriate job openings. The main reason for this concern is depicted in Figures 14 and 15.[22] Figure 14 illustrates the relationship between the cyclical components of vacancies and the unemployment rate, i.e. the Beveridge curve. Observations in the plot are classified in terms of 'not during a recession', 'during a recession before 2007', and 'during the 2007 recession.' The bold dashed line is the regression line based on all observations before 2008 and the light dashed lines delimit the 90% confidence interval around this regression line. As noted by Shimer (2005), historically there has been a remarkably stable negative association between job openings and the unemployment rate. As can be seen from the figure, during the fall of 2009 the unemployment rate has been higher than would be implied by the historical Beveridge curve.

Figure 15 delves further into the sources of this deviation from past trends. It plots the cyclical components of the outflow rate, f_t, and the ratio of the number of vacancies to the number of unemployed persons, often referred to as labor market tightness. Shimer (2005) refers to the remarkably stable positive relationship as the matching function. Figure 15 reveals that the recent divergence from the Beveridge curve can be traced to the outflow rate being substantially lower than would be suggested by the matching function relationship observed over much of the postwar period. The substantial decline in the outflow rate witnessed in the latter part of 2009 in Figure 8 therefore represents a significant outlier in the context of the historical matching function

[22] Figures 14 and 15 are updated versions of Figures 4 and 6 in Shimer (2005). For expositional purposes we plot monthly rather than quarterly data. To account for this change in frequency, we use a value of 2700000 for the smoothing parameter of the Hodrick-Prescott filter which is used to filter the trend in log levels of all variables. This corresponds to the value that Shimer (2005) uses corrected for the change in frequency using the factor for stock variables derived by Ravn and Uhlig (2002). The vacancy series is based on Barnichon (2009).

The breakdown of the Beveridge curve and matching function relations in Figures 14 and 15 is evocative of the similar breakdown in match efficiency that occurred during the European unemployment problem of the 1980s and 1990s (see, for example, Figure 11 in Layard, Nickell, and Jackman, 1991). This raises the concern that the U.S. economy will be plagued by the persistently high unemployment rates that these European economies experienced well into the 1990s—so-called *hysteresis*. In practice, hysteresis can arise through a number of channels. We highlight a few of these possibilities here, and provide a sense of their relevance in the current downturn.

Mismatch. One potential reason for a persistent reduction in match efficiency is a mismatch between the skills and the skill requirements of job openings. For example, Groshen and Potter (2003) have argued that the jobless recoveries after the 1990 and 2001 recessions were in large part due to structural reallocation of workers across sectors in the economy. They claim that this reallocation led to a mismatch in skill-mix that resulted in a slower adjustment of the labor market than in previous recessions. More recently, Phelps (2008) has reiterated this concern in relation to construction and finance workers in the 2007 recession. Related to this argument, Aaronson, Rissman, and Sullivan (2004) pointed out that there did not seem to be a higher need to reallocate labor across sectors in the 1990 and 2001 recessions, which were accompanied by jobless recoveries, than during earlier ones. Valletta and Cleary (2009) find the same for the 2007 recession.

This reallocation argument suggests that workers that were employed in sectors in structural decline will have a harder time finding jobs than other workers. That is, it implies a divergence in outflow rates from unemployment between those who previously were employed in industries in structural decline versus those of other workers. Figure 16 addresses this question. It shows the unemployment outflow hazard rates conditional on the industry in which a person was employed at the start of the unemployment spell. If anything, we have actually seen a convergence of these outflow rates rather than the divergence implied by the structural reallocation argument.

Besides a mismatch in skills, an additional concern is the potential emergence of geographical disparities in the location of workers and job openings. This has come into focus in the current recession amid concerns that job applicants are more reluctant now, given the decline in house prices that accompanied the recession, to apply for and accept jobs that are not within commuting distance from their current residence and would require them to sell their homes. For example, Ferreira, Gyourko and Tracy (2009) find that homeowners with negative equity are less likely to move by using data from American Housing Survey for 1985-2005. Their results cannot be easily extrapolated to the current recession but still point to a potentially important negative effect of housing-related problems on the labor market recovery since geographic mobility is an important part of adjustment to shocks in the U.S. labor market as emphasized by Blanchard and Katz (1992).

Duration dependence. Associated with the record rise in the unemployment rate has been a surge in long-term unemployment—the fraction of the labor force that has been unemployed for more than six months has increased by a staggering 3.5 percentage points to a postwar high of 3.8 percent, more than one percentage point higher than the previous peak in 1983. Likewise, average unemployment duration has risen to an historic high of nearly 29 weeks, the mirror image of the historic low in the unemployment exit rate noted in section 2.

A pervasive feature of unemployment flows in the U.S. is that average rates of outflow from unemployment decline with the duration of unemployment spells—so-called negative duration dependence—a point noted since Kaitz (1970), and made more recently by Shimer (2008).[23] In the context of the surge in long-term unemployment encountered in the present recession, it is tempting to hypothesize that the long-term unemployed have increasingly become disenfranchised from the labor market. Several explanations have been proposed for such an outcome, including the depreciation of skills of the unemployed (Pissarides, 1992; Ljungqvist and Sargent, 1998); the ranking of job applicants by the duration of their unemployment spell (Blanchard and Diamond, 1994); and statistical discrimination by employers against the long-term unemployed (Lockwood, 1991). The concern is that such forces will turn those who were once cyclically unemployed into a pool of structurally long-term unemployed.

If the recent declines in the outflow rate were driven by such an effect, then we would expect to observe an increase in the duration dependence of the unemployment outflow rates. That is, we would see a higher decline in labor market opportunities, and thus in their unemployment outflow rate, for those with longer unemployment spells who have been experienced a higher depreciation of their actual, or perceived, skills.

[23] As noted by Kaitz (1970), this may take the form of "spurious" duration dependence that arises from dynamic selection (Salant, 1977), or "true" duration dependence whereby the accumulation of unemployment duration has a causal effect on exit rates.

Figure 17 addresses this by presenting time series for a range of alternative measures of the outflow rate based on the unemployment experiences of workers with different unemployment durations. Specifically, analogous to equation (6), we compute the probability that an unemployed worker exits unemployment within d months,

$$F_t^{<d} = 1 - \left(U_{t+d} - U_{t+d}^{<d}\right)/U_t, \tag{13}$$

where $U_t^{<d}$ is the number unemployed for fewer than d months. As before, the associated outflow hazards are given by, $f_t^{<d} = -\log\left(1 - F_t^{<d}\right)/d$. Negative duration dependence in outflow rates is implied if $f_t^{<d}$ is declining in d. To see why, note that as d rises, the outflow probability $F_t^{<d}$ is computed from a sample of unemployed workers with increasing weight on the long duration unemployed.[24] If the latter face lower exit rates, the associated hazards will decline with d.

Figure 17 plots the hazards for exiting unemployment within d months, $f_t^{<d}$, using available published Current Population Survey time series for $U_t^{<d}$ for d equal to 1, 2, 3, 6, and 12 months. Series are plotted on a log scale. Consistent with the literature on negative duration dependence in unemployment exit rates, the hazards for exiting unemployment decline over increasing duration windows. More important for the hypothesis under discussion, there is no evidence that exit rates have fallen disproportionately among the high duration unemployed in any postwar recession. Rather, just as we saw in Section 2.2 on unemployment flows by group, the cyclicality of outflow rates displays an extraordinary regularity across duration groups. In sum, there appears to be little evidence to suggest that elevated rates of joblessness are a symptom of diminished employment opportunities of the long-term unemployed in this, or any other recession.[25]

Sclerosis. An additional potential source of hysteresis relates to the effects of depressed unemployment flows on the rate of adjustment of unemployment—what Bentolila and Bertola (1990) and Blanchard (2000) have referred to as *sclerosis* in the European context. This point is clarified by equation (7) above. There, reductions in the pace of worker reallocation, $s_t + f_t$, lead to reductions in the responsiveness of unemployment to changes in flow steady-state unemployment,

[24] See Elsby, Hobijn and Şahin (2009) for an extended discussion of duration dependence of outflow hazard rates.

[25] Interestingly, this conclusion mirrors the results of Machin and Manning (1999) in their detailed analysis of the long-term unemployment problem in Europe. In their words: "while the longterm unemployed do leave unemployment at a slower rate than the shortterm unemployed, this has always been the case and their relative outflow rate has not fallen over time."

$u_t^* = s_t/(s_t + f_t)$. This matters for the recovery of unemployment in the wake of the current recession: A by-product of the historically low outflow rate reached during the 2007 recession is that the rate of convergence of unemployment to its flow steady state, λ_t in equation (7), also has arrived at a postwar low. Thus, even if firms start to hire again, the outflow rate rebounds, and flow steady-state unemployment recovers, the actual unemployment rate may exhibit a delayed reaction.

Quantitatively, however, these effects are likely to be small. While the current monthly outflow rate of 0.24 is very low by historical U.S. standards, it remains very high relative to the standards of the European unemployment problem of the 1980s, when monthly outflow rates fell below 0.08 in many European economies.[26] To put this in perspective, the half-life of a deviation of unemployment from flow steady state, which stood at a little over one month prior to the current downturn in the U.S., has risen to just under three months in recent data for the U.S., but is not even close to the values of nine months to a year experienced in Europe in 1980s and early 1990s.[27]

Temporary declines in match efficiency. The above discussion suggests that there is little evidence that the breakdown in match efficiency in the current recession can be traced to the sources of hysteresis.

One particularly salient reason for a temporary decline in match efficiency relates to the temporary extension of Emergency Unemployment Compensation (EUC) that was passed in November 2009. This lengthening of the expected duration of unemployment benefits will tend to place short-run downward pressures on the unemployment outflow rate seen in Figure 15 for a number of reasons. First, those searching for a job while receiving benefits may become more selective about which job offers they accept. Second, those workers who would otherwise have flowed out of the labor force may decide to postpone leaving it to receive the extended benefits.

In addition to the EUC, there are two sources of bias that might result in a temporary decline in *measured* match efficiency. A first source of bias is if the measured number of unemployed workers understates the actual number of job seekers. For example, in addition to the 15.2 million unemployed workers, 6.3 million people reported that they would like a job even though they are

[26] Hobijn and Şahin (2009, Table 1) report average duration distributions of unemployment spells, and Elsby, Hobijn and Şahin (2009) document the behavior of inflow and outflow rates over time for a broad number of OECD countries.

[27] These are computed based on the estimates in Elsby, Hobijn and Şahin (2009, Figure 3).

classified as not in the labor force in December 2009.[28] Hence, what might appear as a decline in match efficiency could actually reflect an understatement of the number of the unemployed.

A second source of bias arises from a symmetric argument for the measurement of vacancies—the measured stock of vacancies may overstate the true number of job openings in the economy. Evidence from microdata on vacancies presented by Davis, Faberman, and Haltiwanger (2009, figure 5) suggests that establishments whose employment levels do not grow nevertheless post vacancies. They estimate that these firms have a vacancy rate of about 2 percent of employment. Interestingly, this is about equal to the aggregate vacancy rate observed during the second half of 2009. This suggests that a substantial part of the vacancies reported in the latter half of 2009 may not associated with job-creation, but rather with a minimum level of vacancy postings that exists no matter what the level of net job growth. As a result of these two sources of bias, the current vacancy to unemployment ratio may simply overstate labor market tightness, resulting in the imputed decrease in match efficiency in Figure 15.

Taken together, our analysis of the decline in match efficiency observed in the latter stages of the current recession provides little evidence for the prospect of hysteresis driven by structural changes in the U.S. labor market. On the other hand, there are reasons to believe that the recent weakening of match efficiency is reflective of temporary phenomena that will recede as the economy recovers.

4. Conclusion

Our detailed analysis of the adjustment of the labor market in the current downturn reveals it to be the deepest deterioration in labor market outcomes on record in the postwar era. Every indicator of labor market activity suggests that the recession has been unique both in its depth and duration. Rates of joblessness among all groups in the labor market have reached historic postwar highs. There is little doubt that it is a *Great Recession*.

Nonetheless, our analysis suggests that many of the features of labor market dynamics in the Great Recession are strikingly similar to those seen in earlier recessions. This is true of the behavior of employment and labor force participation rate, the use of the intensive vs. extensive margins in

[28] See Krusell, Mukoyama, Rogerson and Şahin (2009) for an alternative unemployment rate that treats this group as unemployed.

the adjustment of labor input, and in terms of the demographic groups most affected, with young, male, less-educated, workers from ethnic minorities being hit harder.

Delving further into the role of unemployment flows in the recession reveals that, as in prior deep recessions, increased joblessness in the downturn can be traced to both increased rates of inflow, as well as increased duration, with inflows being relatively more important early on in the downturn. This suggests that the more modest response of unemployment inflows in the 1990 and 2001 recessions is a feature of mild recessions, rather than modern ones.

Further analysis of worker turnover data from the new Job Openings and Labor Turnover Survey provides a unique perspective on the driving forces of job loss in the 2007 recession. Increased inflows into unemployment have been driven predominantly by a change in the composition of separations toward layoffs, who are very likely to become unemployed, and away from quits, who are very likely to flow to a new job upon separation. Thus, job loss has played a key role in driving increased unemployment in the recession.

What still remains an open issue is how the recovery in the labor market will shape up. It is tempting to think that, since the recession is strikingly similar to the deep recessions of 1970s and 80s, the recovery is likely to be similar as well. However, there are reasons to think that labor market changes that have taken place in the last two decades will render such sharp reversals in the labor market less likely. For example, there has been a decline in firms' willingness to use temporary layoffs, eliminating the possibility of increasing employment at low cost. In addition, the sharp recovery following the 1980s recession may have been aided by the reversal of the disinflationary monetary policy that instigated the recession in the first place, a feature the current recession does not share.

There are also reasons to imagine that several factors that have been proposed to account for the jobless recoveries of 1990-91 and 2001 recessions are absent during this downturn. Willems and van Wijnbergen (2009) argue that labor hoarding can explain the jobless recoveries following the 1990 and 2001 recessions. Labor hoarding is more likely in case of shallow recessions, but is much less likely to have occurred during the current deep recession, which has exhibited sharp rises in rates of job loss. Similarly, Van Rens (2004) and Koenders and Rogerson (2005) have argued that a possible reason for the jobless recoveries that followed the previous two recessions is that firms used these recessions as an opportunity to improve their organizational efficiency and productivity.

As a result, firms could generate output growth during the recovery without substantially expanding their labor inputs. As Koenders and Rogerson (2005) point out, the amount of untapped productive potential that firms could extract through restructuring is increasing in the length and strength of the expansion before the start of the recession. Since the 2002 to 2007 expansion was neither exceptionally long nor very strong, it seems that the forces that might have cause limited hiring after the 1990 and 2001 recessions are much less likely to have a large and persistent effect during this recovery.

Looking ahead, our analysis suggests that several factors might place downward pressure on the rate at which people flow out of unemployment in the first year of the recovery, and thus pose an upward risk for the unemployment rate. These seem likely to reflect temporary factors that slow down vacancy creation and increase labor market frictions. Hence, a tentative expectation would be that the first part of this recovery will appear relatively jobless, but will then strengthen significantly compared to the previous two recessions. Our view seems to be in line with forecasts: Figure 18 depicts a version of Okun's Law during recoveries. It plots cumulative changes in the unemployment rate versus GDP growth for the 10 quarters following the GDP trough by recession, as well as the forecast[29] for the current recovery. The current forecast reflects the expectation that the onset of the recovery is relatively jobless, like in 1991, but that the unemployment rate will decline relatively quickly starting in the second half of 2010.

[29] The particular forecast we use is the December 7th 2009 forecast of Macroeconomic Advisors, which is in line with that of other forecasters but covers a longer forecast horizon. This forecast is very similar to the December 10th, 2009 Blue Chip consensus forecast.

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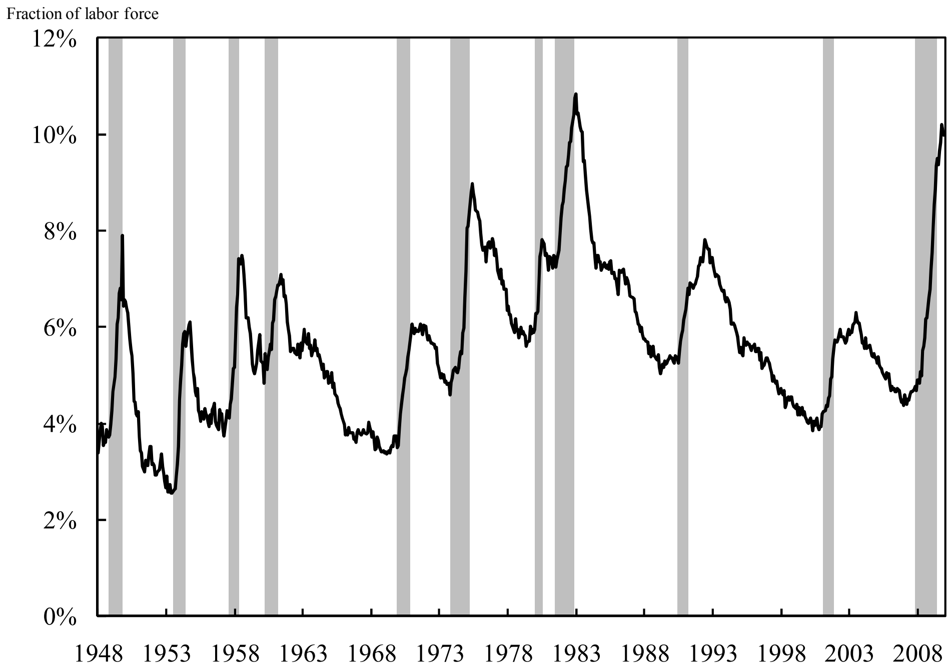
Table 1. Decomposition of Increased Unemployment into Shares Accounted for by Labor Force Groups

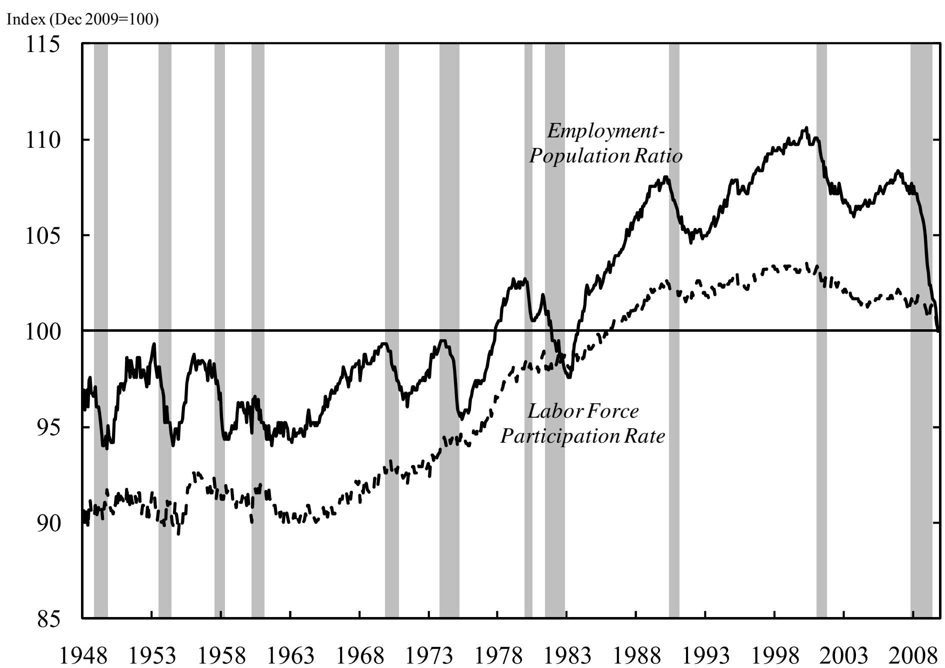
		1980		1981-1982		1990-1991		2001		Current	
Change in unemployment rate		1.9%		3.3%		2.3%		2.2%		5.2%	
Gender	Male	0.80	(0.58)	0.66	(0.57)	0.61	(0.55)	0.61	(0.54)	0.64	(0.54)
	Female	0.20	(0.42)	0.34	(0.43)	0.39	(0.45)	0.39	(0.46)	0.36	(0.46)
Age	16-24	0.32	(0.24)	0.24	(0.24)	0.22	(0.18)	0.22	(0.16)	0.20	(0.15)
	25-54	0.65	(0.61)	0.68	(0.61)	0.68	(0.70)	0.66	(0.71)	0.66	(0.68)
	55+	0.03	(0.15)	0.08	(0.15)	0.10	(0.12)	0.12	(0.13)	0.14	(0.17)
Education	Less than High School	0.24	(0.21)	0.25	(0.19)	0.24	(0.13)	0.12	(0.10)	0.15	(0.10)
	High School	0.53	(0.38)	0.48	(0.39)	0.34	(0.38)	0.28	(0.31)	0.36	(0.30)
	Some College	0.18	(0.19)	0.15	(0.19)	0.31	(0.22)	0.33	(0.28)	0.28	(0.27)
	College or Higher	0.05	(0.22)	0.12	(0.23)	0.11	(0.27)	0.27	(0.31)	0.21	(0.33)
Race	White	0.86	(0.90)	0.81	(0.90)	0.69	(0.82)	0.64	(0.75)	0.66	(0.73)
	Black	0.14	(0.10)	0.19	(0.10)	0.16	(0.10)	0.18	(0.10)	0.13	(0.10)
	Hispanic	---		---		0.15	(0.08)	0.13	(0.11)	0.18	(0.13)
	Asian	---		---		---		0.05	(0.04)	0.03	(0.04)

Figure 1. Unemployment Rate, 1948-2009



Source: Bureau of Labor Statistics. Seasonally adjusted monthly data

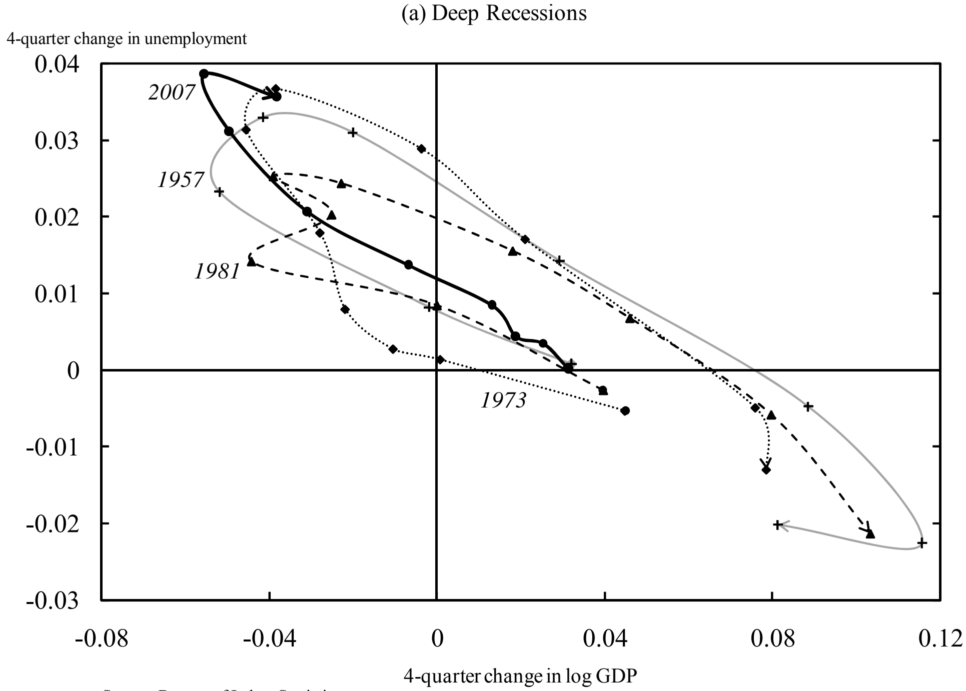
Figure 2. Normalized Employment and Labor Force Participation, 1948-2009



Source: Bureau of Labor Statistics

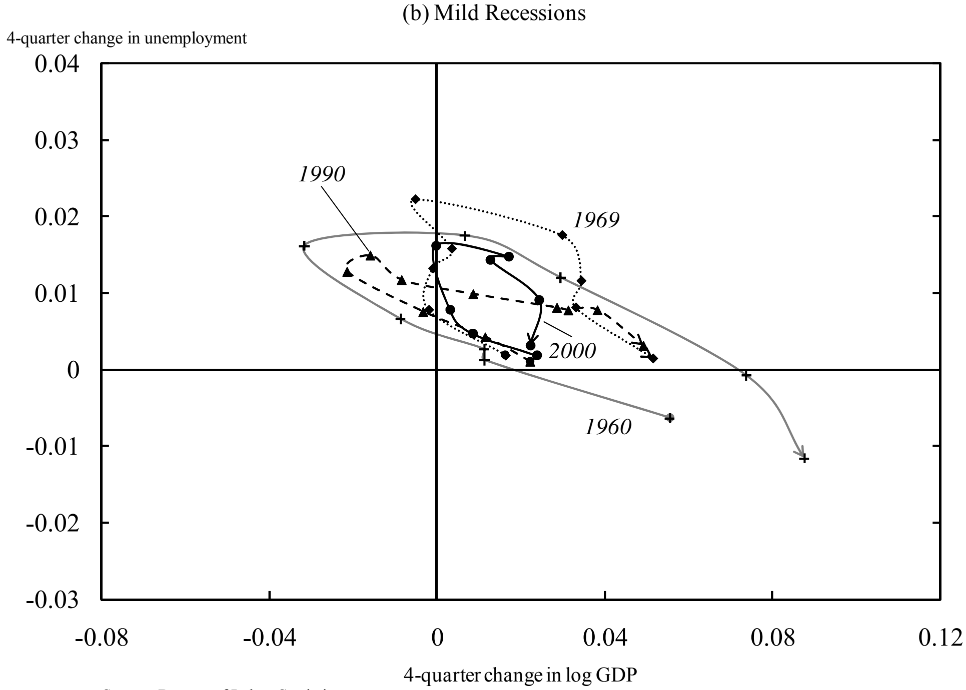
Figure 3. Okun's Law by Recession

(a) Deep Recessions



Source: Bureau of Labor Statistics

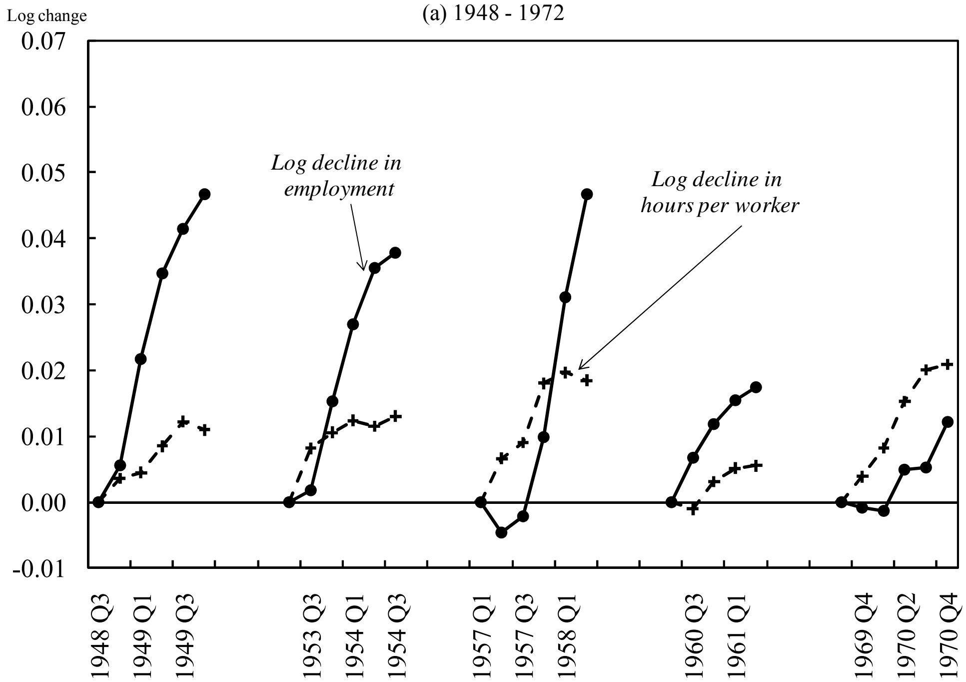
(b) Mild Recessions



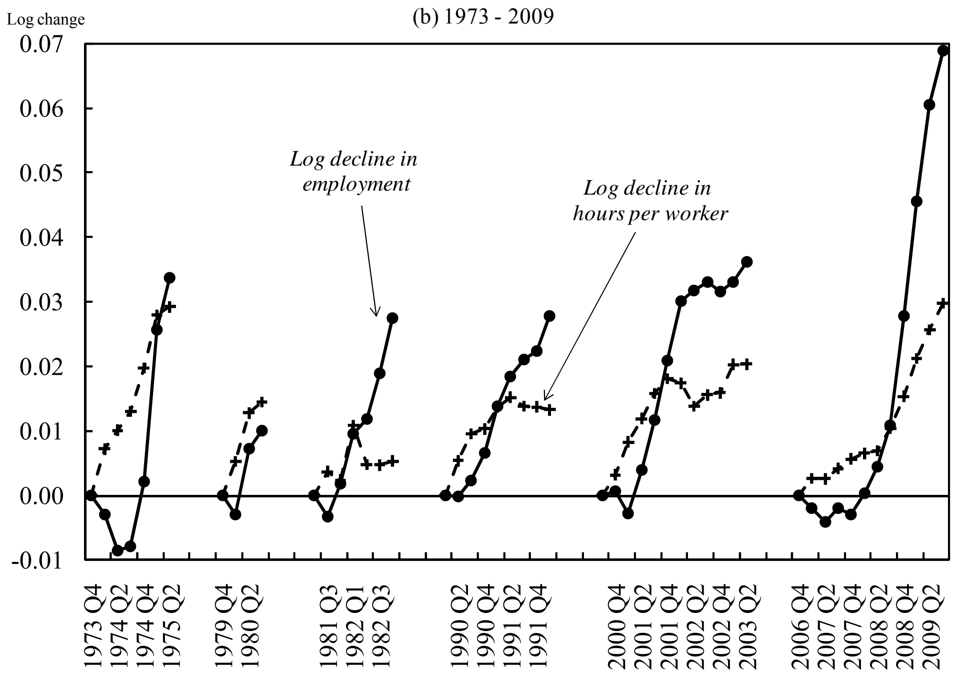
Source: Bureau of Labor Statistics

Figure 4. Hours vs. Bodies by Recession, 1948-2009

Cumulative log decline in employment and weekly hours per worker



Source: Bureau of Labor Statistics, Labor Productivity and Costs employment and weekly hours series.



Source: Bureau of Labor Statistics, Labor Productivity and Costs employment and weekly hours series.

Figure 5. Unemployment by Demographic and Education Groups

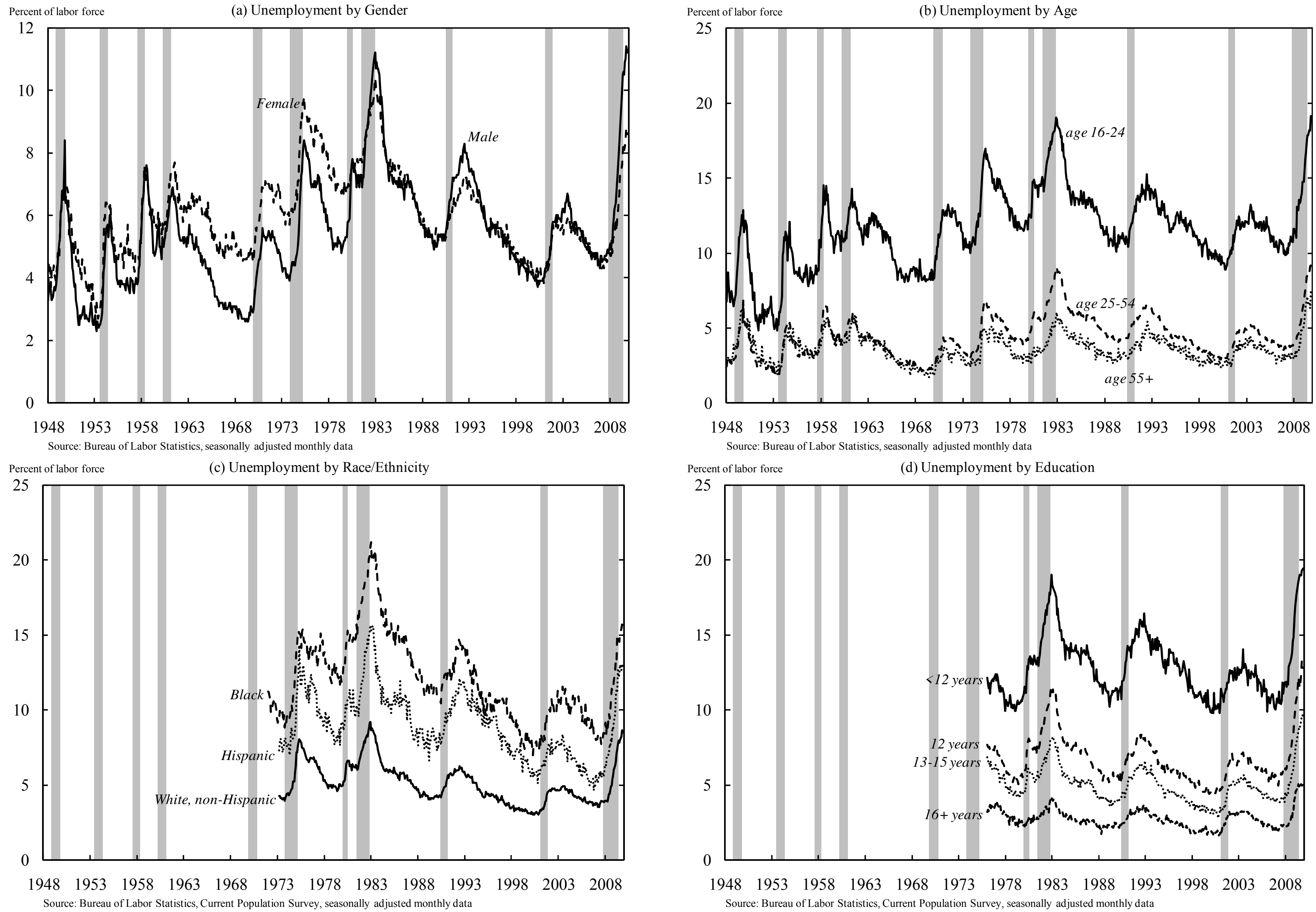
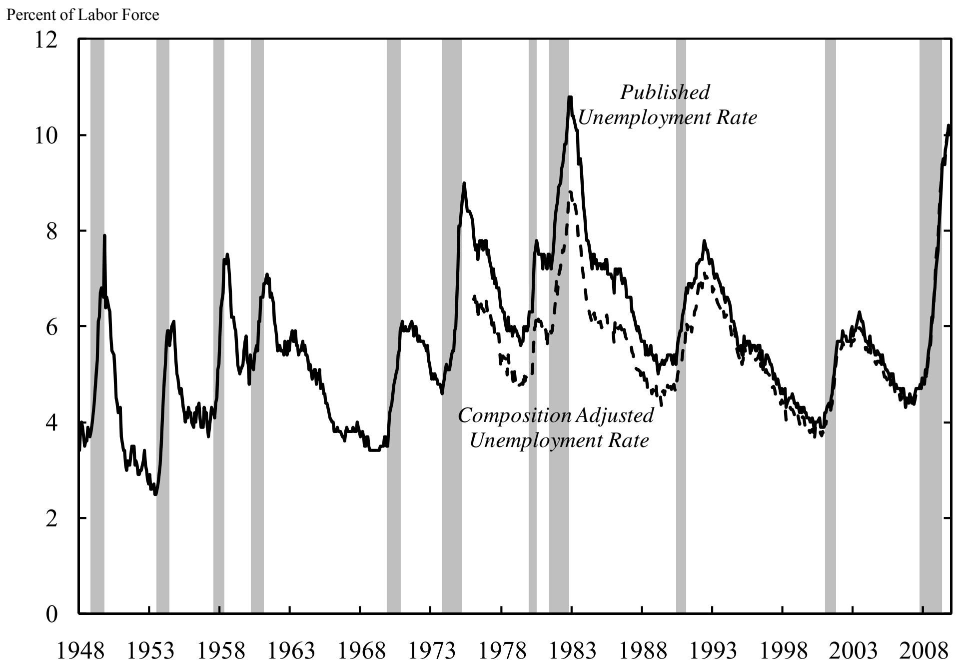


Figure 6. Composition-Adjusted Unemployment Rate



Source: Bureau of Labor Statistics, Current Population Survey. Adjusted for full age, gender, race, and education interactions

Figure 7. Compostion-Adjusted Unemployment by Demographic and Education Groups

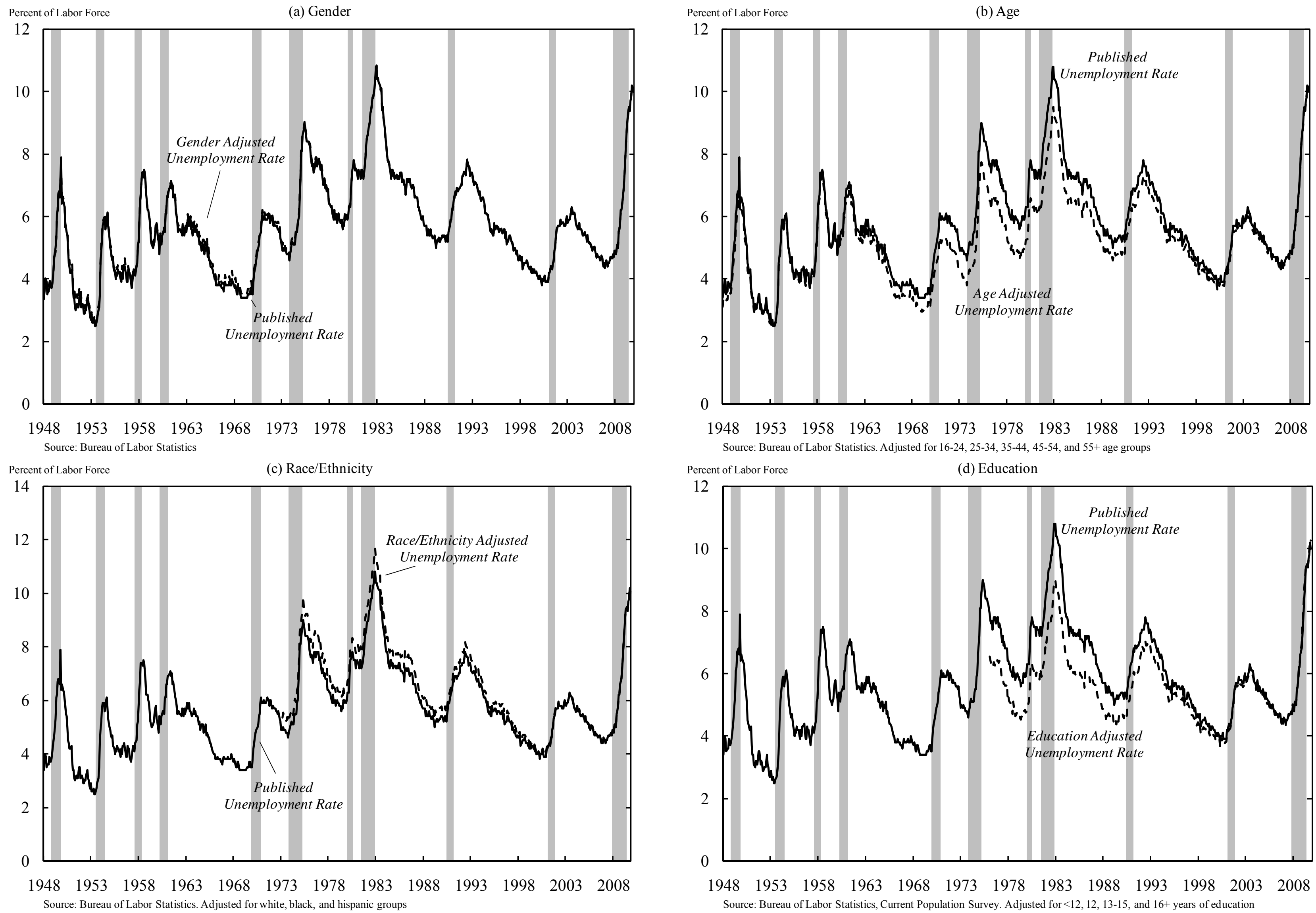
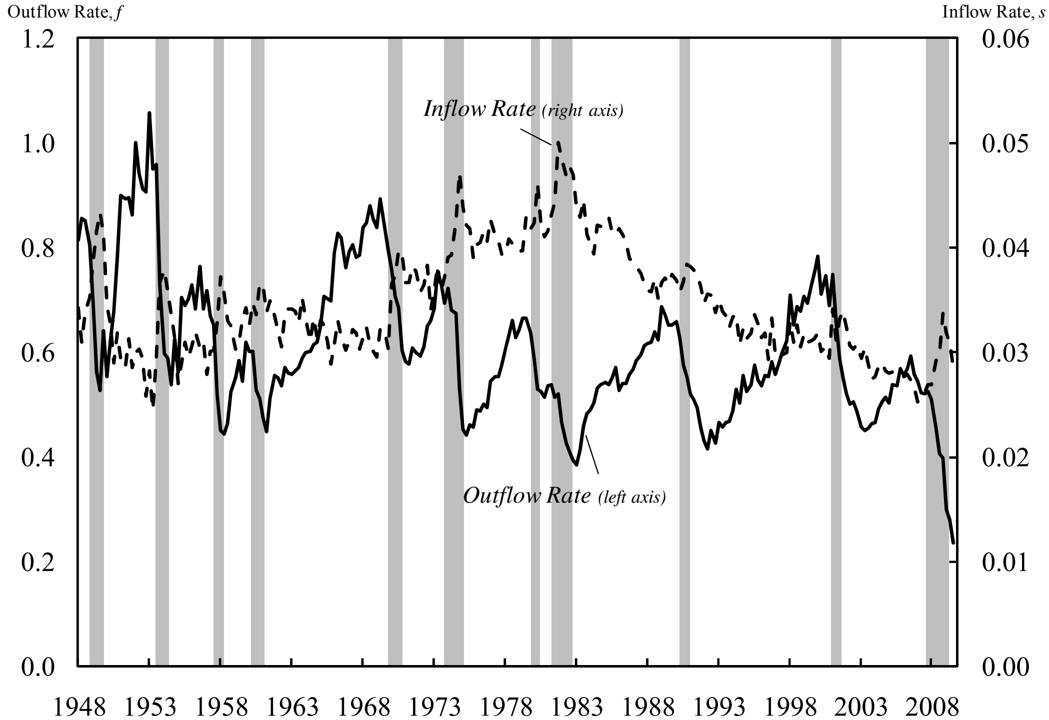


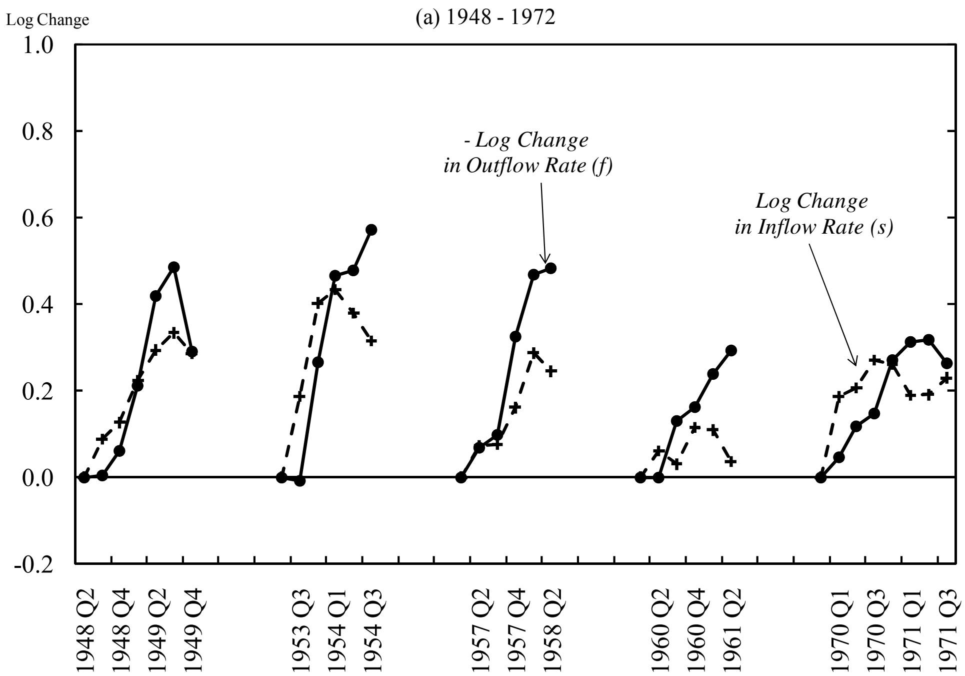
Figure 8. Unemployment Inflow and Outflow Rates



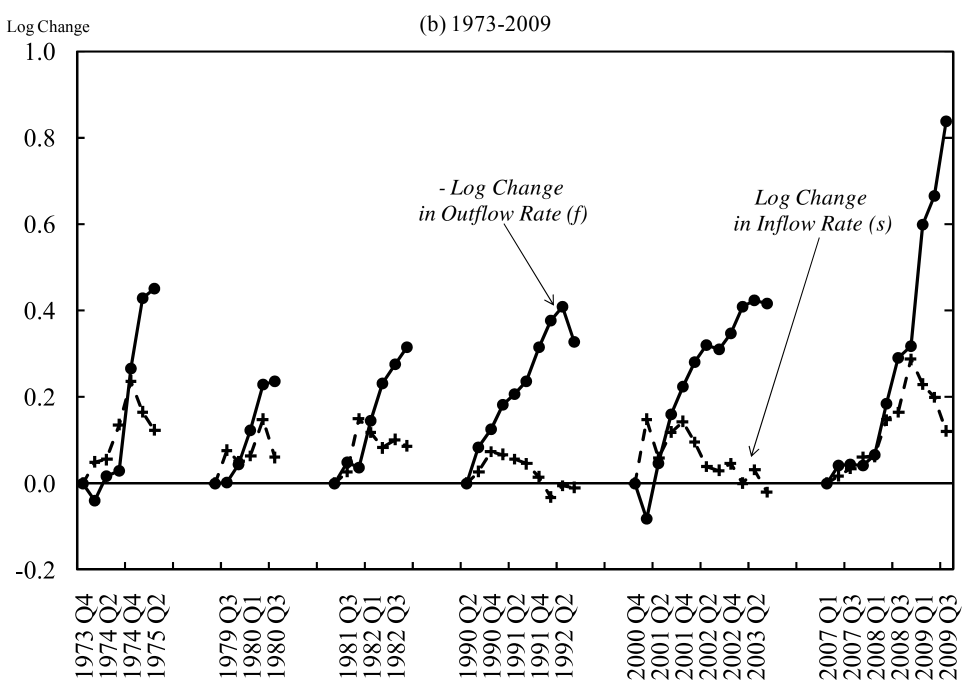
Source: Bureau of Labor Statistics and authors' calculations. Quarterly averages of monthly data.

Figure 9. Contributions of Inflow and Outflow Rates by Recession, 1948-2007

Cumulative log change in hazards since the start of unemployment ramp up



Source: Bureau of Labor Statistics and authors' calculations.



Source: Bureau of Labor Statistics and authors' calculations.

Figure 10. Unemployment Flows by Demographic and Educational Groups

12-month moving averages of seasonally adjusted monthly data

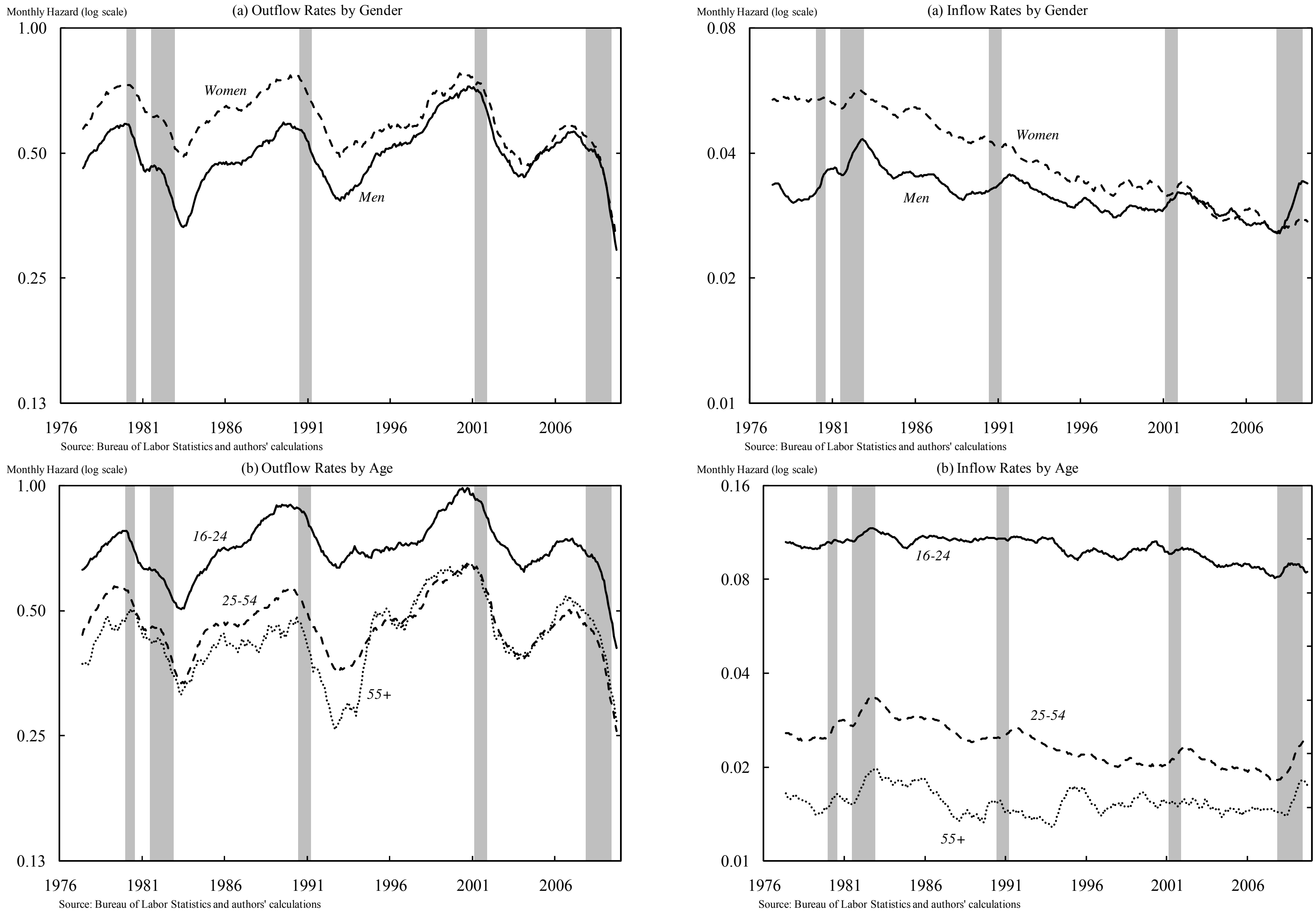


Figure 10 - continued. Unemployment Flows by Demographic and Educational Groups

12-month moving averages of seasonally adjusted monthly data

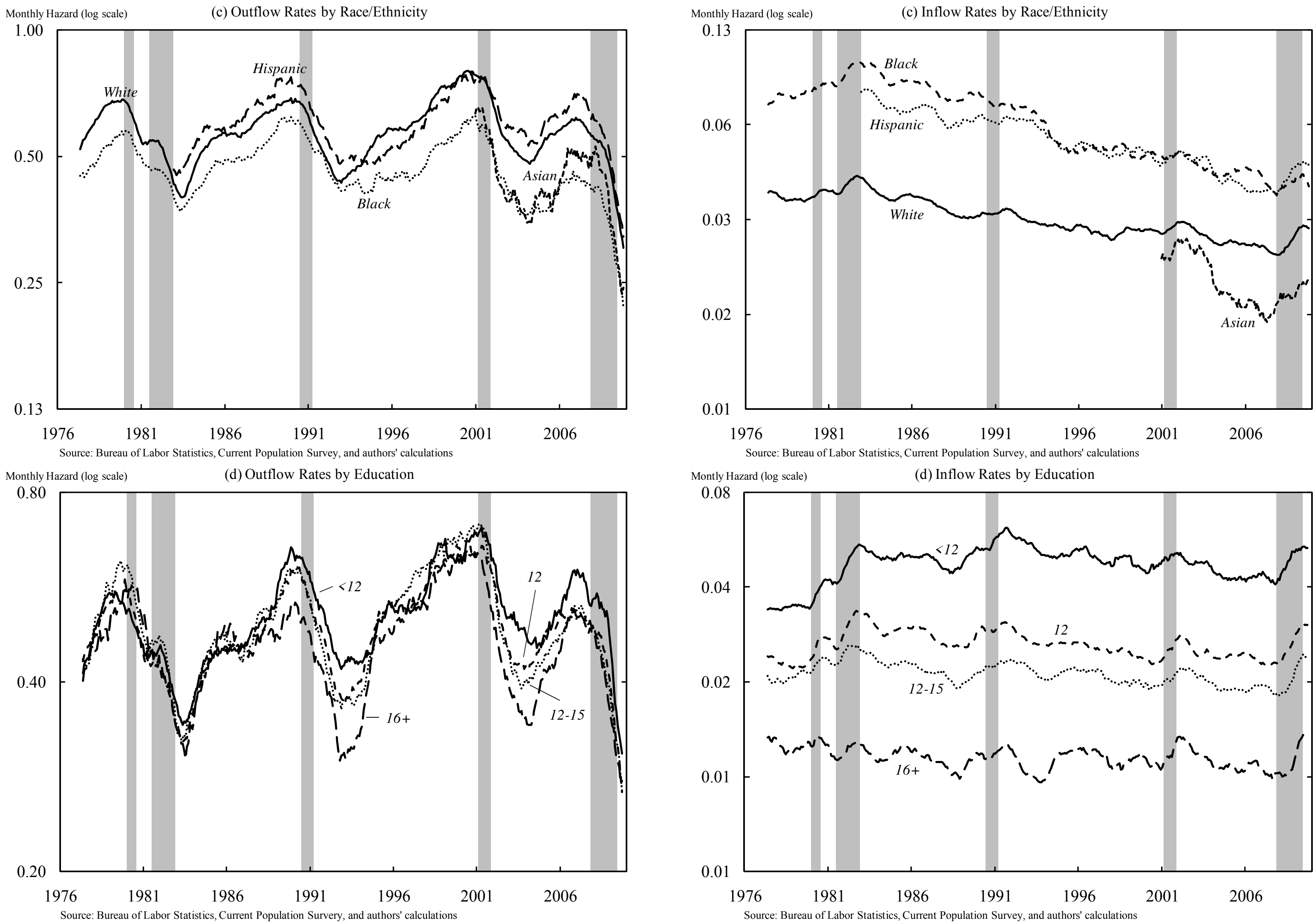
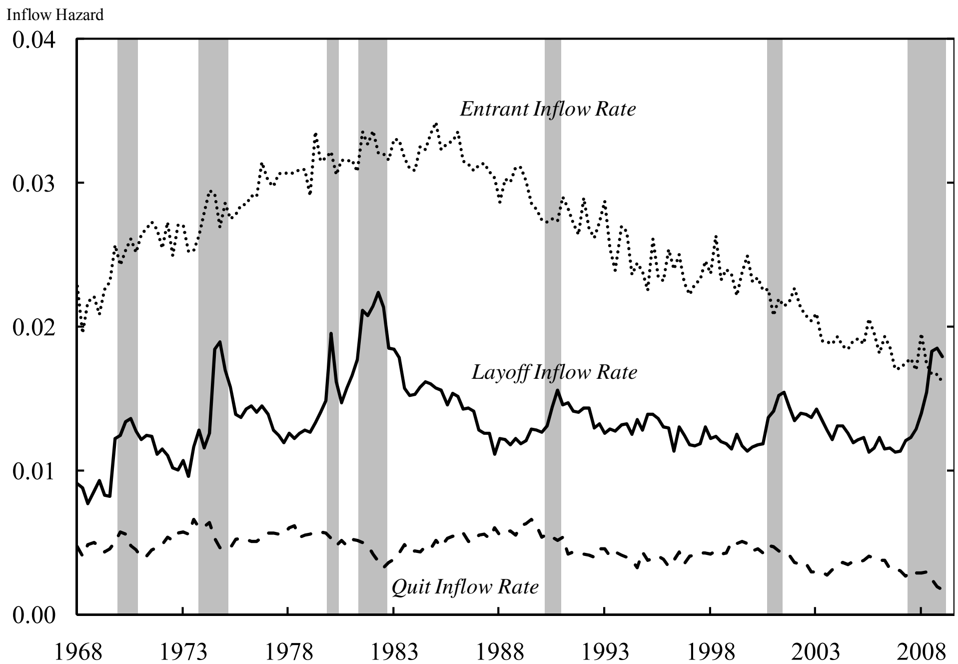
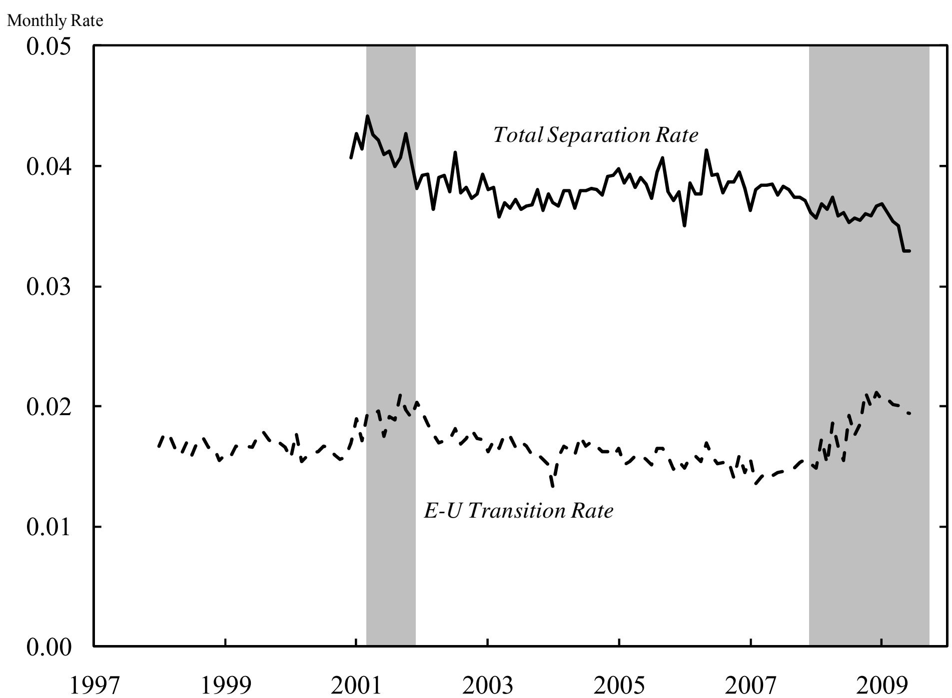


Figure 11. Unemployment Flows by Reason for Unemployment



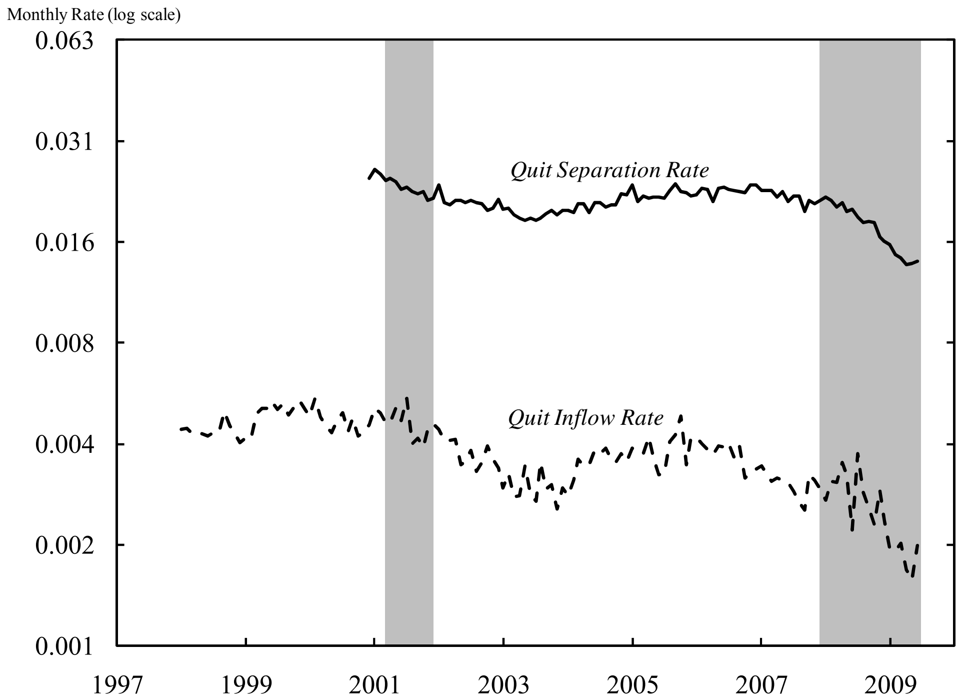
Source: Bureau of Labor Statistics and authors' calculations based on Elsby, Michaels, and Solon (2009)

Figure 12. Separation vs. Employment to Unemployment Transition Rates

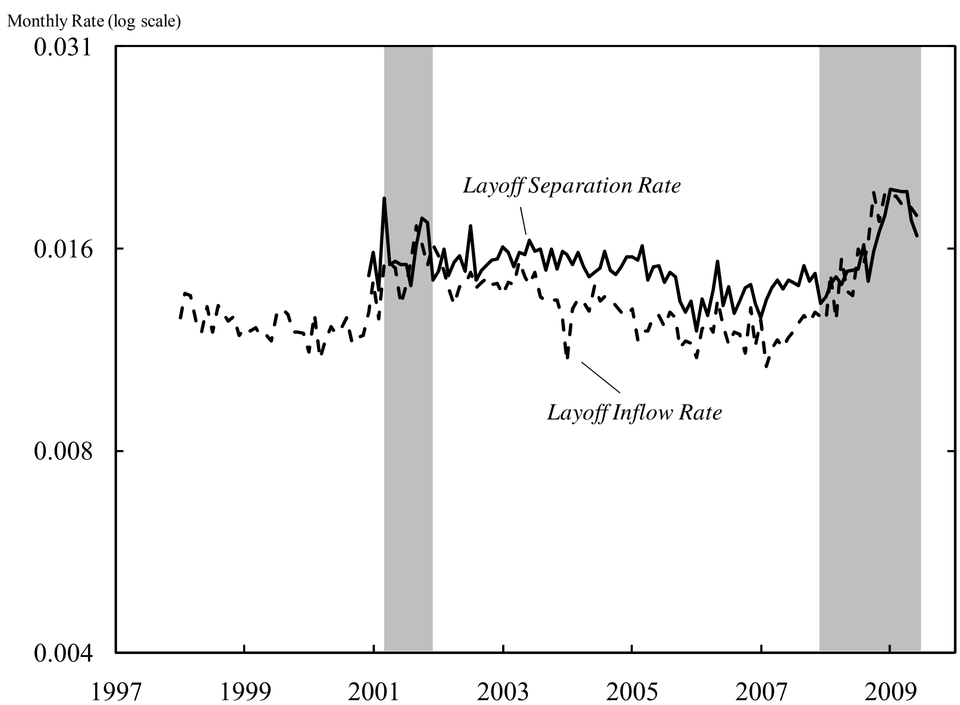


Source: Bureau of Labor Statistics and authors' calculations. Monthly rates based on CPS and JOLTS data

Figure 13. Separation and Unemployment Inflow Rates: Quits vs. Layoffs

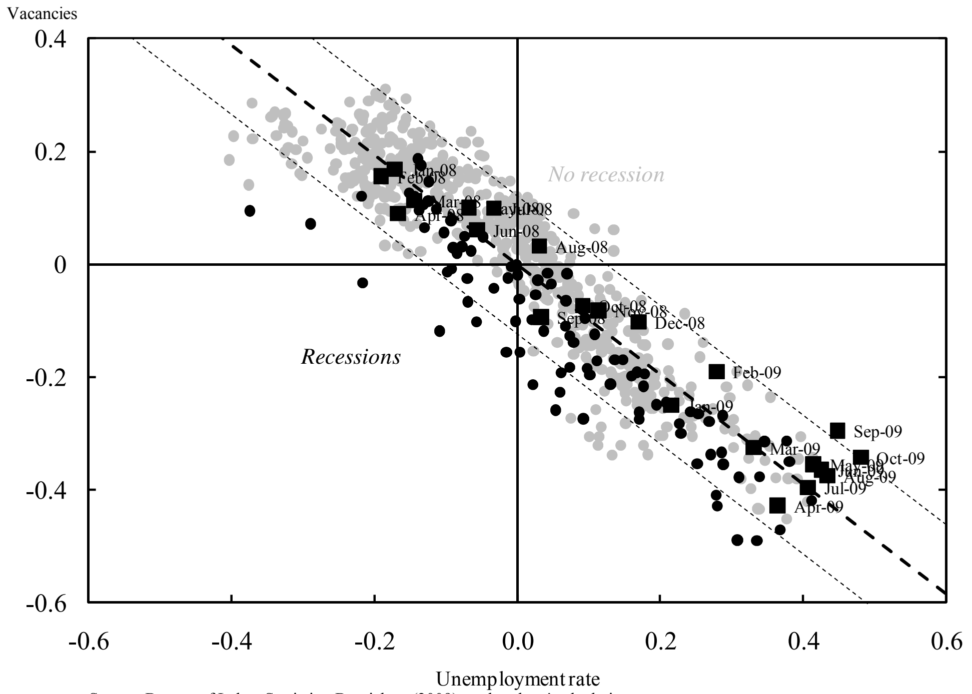


Source: Bureau of Labor Statistics and authors' calculations. Computed from CPS and JOLTS data.



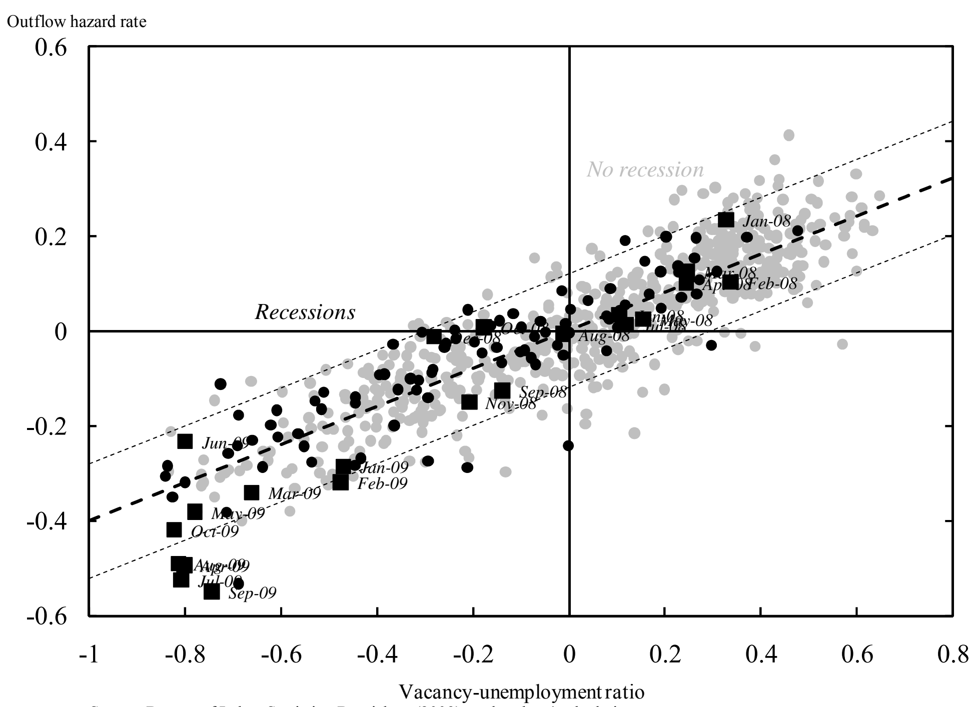
Source: Bureau of Labor Statistics and authors' calculations. Computed from CPS and JOLTS data.

Figure 14. The Beveridge Curve



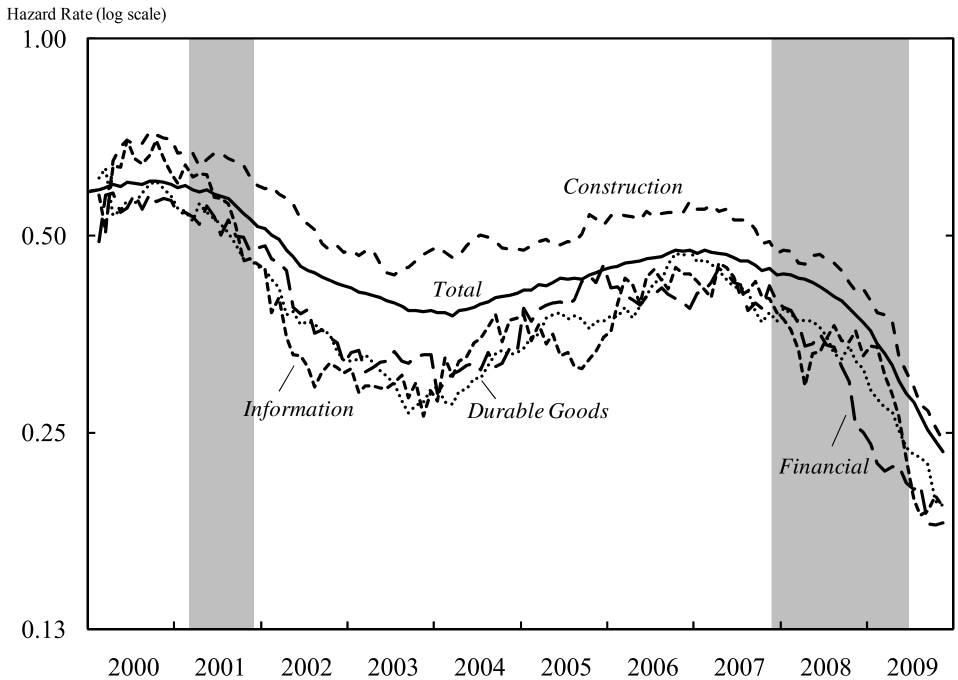
Source: Bureau of Labor Statistics, Barnichon (2009), and authors' calculations

Figure 15. The Matching Function



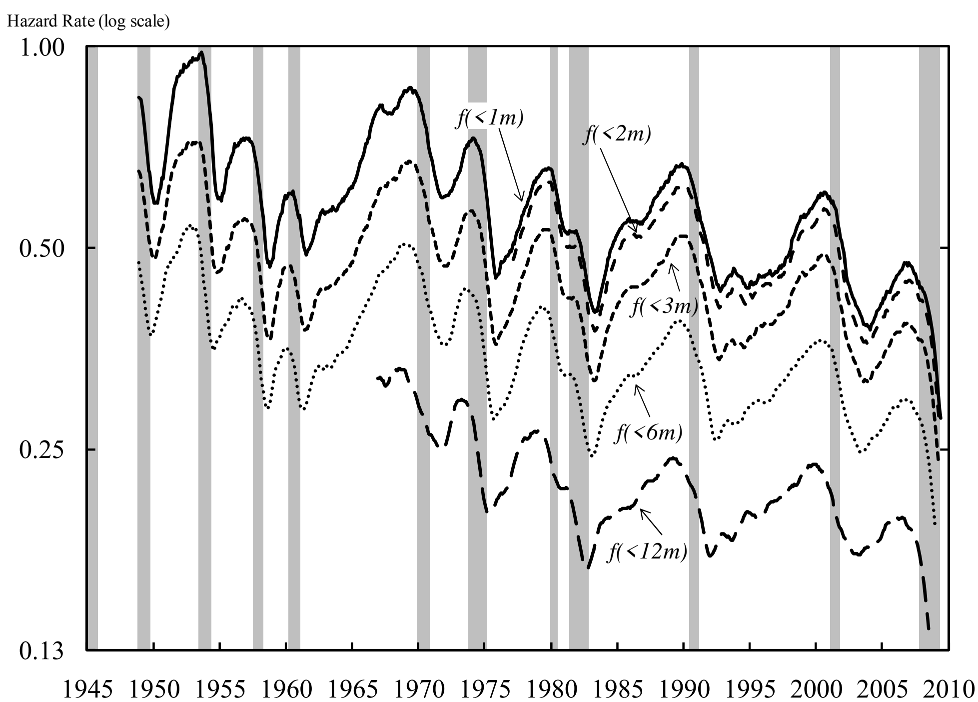
Source: Bureau of Labor Statistics, Barnichon (2009), and authors' calculations

Figure 16. Unemployment Outflow Rates by Industry where Person was Employed at Start of Spell



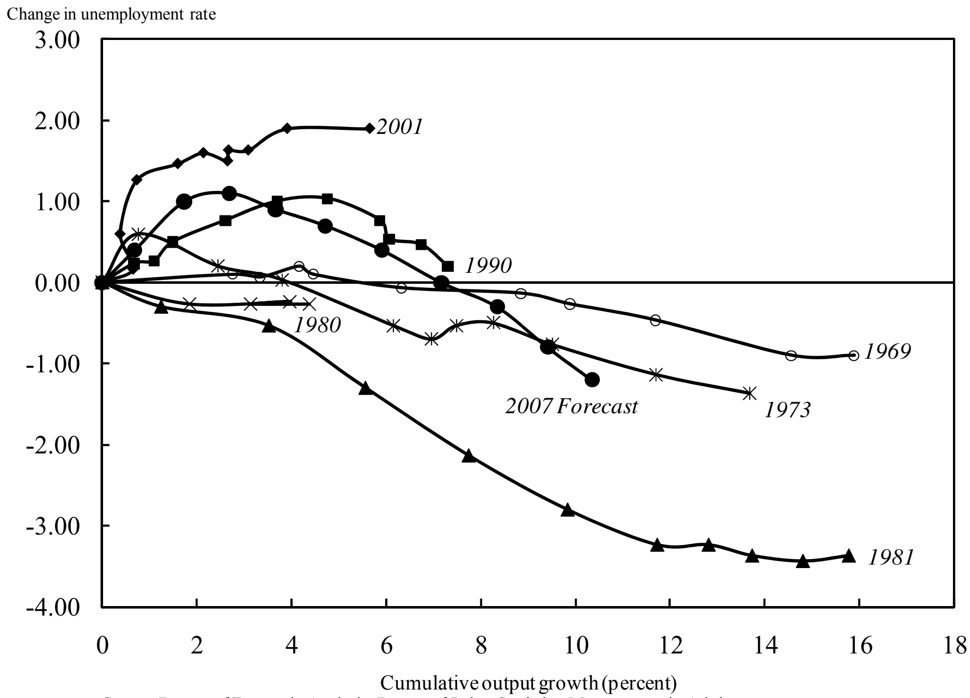
Source: Bureau of Labor Statistics and authors' calculations, 12-month moving averages of non-seasonally adjusted data

Figure 17. Hazard Rates for Exiting Unemployment within *d* Months.



Source: Bureau of Labor Statistics and author's calculations.

Figure 18. Cumulative Okun's Law in Recoveries



Source: Bureau of Economic Analysis, Bureau of Labor Statistics, Macroeconomic Advisers