Preliminary Draft: May 17, 2010
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"Rising Unemployment Duration in the United States: Composition or Behavior?"

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ABSTRACT

Existing research suggests that unemployment durations in the United States had been trending upward even before the unprecedented level and duration of unemployment reached in the severe recession that began in December 2007. Researchers have proposed explanations for rising duration based on the changing composition of the labor force and the unemployment pool and increased search duration as a response to widening residual wage inequality. I attempt to disentangle these opposing compositional and behavioral explanations of rising duration using a recently developed econometric framework for the analysis of repeated cross-section ("synthetic cohort") data on unemployment durations. After accounting for changes in the CPS survey and using a more complete and appropriate set of conditioning variables than has been used in past work, the results suggest that the increase in duration has been overstated. To the contrary, duration has declined over the past three decades, including in the recent severe recession.

* I thank Katherine Kuang for outstanding research assistance. I also thank Luojia Hu for estimation advice. The views expressed in this paper are those of the author and should not be attributed to the Federal Reserve Bank of San Francisco or the Federal Reserve System.

"Rising Unemployment Duration in the United States: Composition or Behavior?"

1. Introduction

Unemployment durations in the United States reached historical highs during the most recent recession that began in December 2007, rising well above the level experienced during the 1981-82 recession—even though the unemployment rate reached higher levels in that recession than it has thus far in the latest downturn. An upward trend in U.S. unemployment duration relative to the unemployment rate also has been evident during expansionary periods. Past research on rising U.S. unemployment durations has focused on the changing composition of the labor force (Abraham and Shimer 2002, Aaronson, Mazumder, and Schechter 2010) or the unemployment pool (Valletta 1998). Abraham and Shimer (2002) also pointed to changing behavior by women, in particular higher labor force attachment, as a factor contributing to longer unemployment durations overall. In other recent work, Mukoyama and Sahin (2009) present evidence in favor of a search theoretic, behavioral explanation for rising unemployment duration, based on longer search times as an optimal response to widening residual wage inequality.

If rising duration reflects an optimal search response to widening wage dispersion, then it has little or no implications for social welfare. By contrast, to the extent that an increase in duration reflects other features of the labor market, such as growing skill mismatches, it is consistent with higher welfare costs of cyclical fluctuations arising from an increased burden of uninsurable labor-income risk on workers (Abraham and Shimer 2002). Changes in unemployment duration may also affect wage dynamics and the non-inflationary unemployment rate (the NAIRU), although the direction of this relationship is uncertain (Abraham and Shimer 2002, Campbell and Duca 2004). Proper assessment of the extent and importance of changes in unemployment duration requires analysis of whether duration has changed for an individual with a given set of characteristics facing specific labor market conditions.

I assess the extent of rising duration and attempt to disentangle the opposing compositional and behavioral explanations using a recently developed econometric approach (Güell and Hu 2006) applied to monthly microdata on unemployed individuals from the U.S. Current Population Survey (CPS). Because the CPS is a repeated cross-section rather than a panel, research that uses these data to analyze unemployment duration generally relies on a "synthetic cohort" approach that mimics longitudinal data on individuals by exploiting the observable characteristics of unemployed individuals. This work (e.g., Baker 1992a) typically relies on measures of expected completed unemployment duration for broad sub-samples, which sharply limits the scope for observable individual characteristics to affect estimated patterns in unemployment duration over time.

Building on the expected duration approach, Güell and Hu (2006) developed generalized method of moments and maximum likelihood estimators that rely on variation in unemployment duration and characteristics measured at the individual level rather than the group level. Unlike past methodologies applied to the analysis of unemployment spells in repeated cross-sections, their method enables direct estimation of the influence of detailed individual characteristics and duration dependence, in addition to measures of aggregate economic conditions and other time-varying factors, in the determination of unemployment duration. They applied their method to data from the

Spanish Labor Force Survey to analyze the impact of the introduction of fixed-term contracts in the mid-1980s.

I adapt the Güell and Hu (2006) framework to the U.S. setting, using CPS microdata for the period 1976-2009. This framework enables direct tests of the competing explanations for rising U.S. unemployment durations through more precise measurement of unemployment transitions and a more comprehensive conditioning framework that was enabled by prior approaches. I use this framework to analyze changes over time in expected unemployment duration, including comparison of the latest recession to the recession of the early 1980s.

The data are described in Section 2, along with descriptive displays of unemployment patterns over the sample frame, which include constructed estimates of expected completed duration and unemployment entry rates. Section 2 also discusses adjustments for major changes in survey methodology implemented in 1994 that substantially affect the comparison of measured duration before and after the redesign. Section 3 discusses my implementation of the Güell and Hu estimation framework. Section 4 discusses the specifics of the empirical specification, including the choice of controls for aggregate economic conditions, followed by presentation of the estimation results. An increase in duration over my sample frame is largely attributable to survey redesign effects and changes in the characteristics of unemployed individuals. Conditional on aggregate labor demand, as measured by payroll employment growth at the state level, duration has declined rather than increased, including when unemployment durations are compared between the recent severe recession and the severe recession of the early 1980s.

2. Measuring U.S. Unemployment Duration

2.1 CPS Data

The data used in this study are constructed from the monthly survey records from the U.S. Current Population Survey (CPS) for the period January 1976 through December 2009.[1] Observations were pulled for all individuals identified as unemployed in the survey, age 16 and older. Some of the analyses presented below rely on classification of individuals by their reason for unemployment. The reasons identified in the survey fall into five categories: job losers, for whom the survey distinguishes between those on temporary layoff (i.e., those expecting recall to the firm from which they were laid off) and permanent job losers (permanent layoffs, firings, or completion of temporary jobs); voluntary job leavers; re-entrants to the labor force; and new entrants to the labor force. All of the analyses below incorporate the CPS sampling weights, which are designed to yield monthly samples that are representative of the broader U.S. population.

In the CPS microdata, unemployment duration is measured as the duration of ongoing (interrupted) spells at the time of the survey, rather than completed duration for individuals who have exited unemployment. This variable is used for the calculation of the BLS's oft-cited "average duration" and "median duration" series, plus the related series that represent the proportion of individuals whose duration falls within specific intervals (e.g., less than 5 weeks, greater than 26 weeks, etc.). These series based on interrupted spell durations are subject to well-known biases with respect to measurement of expected duration for an individual entering unemployment, including underestimation of its cyclical elasticity (Sider 1985, Carlson and Horrigan 1983, Horrigan 1987).

[1] The data files were obtained from Unicon Research Corporation (data through 2006) and the Census Bureau's "DataFerrett" web site.

Given the biases in measured duration based on interrupted spells, and also given the structure of the Güell and Hu estimator and its reliance on continuation probabilities (see Section 3), I focus the descriptive analyses on a measure of expected completed duration for an individual entering unemployment in a particular month (e.g., Sider 1985, Baker 1992a). This measure of expected duration is formed based on counts of individuals within duration intervals that correspond to the monthly sampling window for the CPS survey. These counts are used to define and estimate continuation probabilities between adjacent duration categories for "synthetic cohorts" of individuals. The continuation probabilities are then aggregated using standardized formulas to calculate the expected completed duration of unemployment for an individual entering unemployment in a particular month, under the assumption that the continuation probabilities remain the same. This method is described in detail in Appendix A.

Figure 1 shows the unemployment rate, the BLS average duration series, and the measure of expected completed duration, for the complete sample period of 1976-2009.[2] After a substantial increase in the early 1980s, a downward trend in the unemployment rate is evident until it spikes again in 2008-2009. Average duration typically exceeds expected duration, with the notable exception of the most recent recession. Compared with average duration, the expected duration series exhibits greater cyclical sensitivity and its movements are timed more closely to the business cycle (see also Horrigan 1987).

[2] Following past practice (e.g., Sider 1985), I multiplied estimates of expected duration in months by 4.3 to obtain expected duration in weeks for the charts.

2.2 Adjustment for survey redesign

An important issue for these data is the impact of a major redesign of the basic monthly CPS survey that was introduced beginning in January 1994. In addition to extensive conversion to computerized administration, the survey questionnaire was altered to accommodate dependent interviewing. In particular, following the redesign, rather than posing the duration question to all unemployed respondents, duration for individuals identified as unemployed in consecutive survey months is calculated automatically by incrementing the previously reported duration by the number of elapsed weeks between the two survey reference periods.[3] In addition, after the re-design, respondents were given the option of reporting unemployment duration in months or years rather than weeks ("flexible reporting periodicity"), although they are explicitly asked for duration in weeks if they report four or fewer months of unemployment.

Using data from a parallel survey administered in 1992-1993, Polivka and Miller (1998; "PM") found that the new survey design generated a trend break in the measured duration of unemployment, increasing it relative to its measurement using the earlier survey design.[4] In particular, PM found that the proportions of those unemployed for less than 5 weeks and for 15 weeks or more fell by about 17% and rose by about 17%, respectively (with essentially no change in the proportion reporting 5-14 weeks). The increase in reported durations appears to be largely due to the introduction of dependent interviewing, because the switch to flexible reporting periodicity does not imply a clear

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[3] Due to the rotation group structure of the CPS sample, households and individuals are in the sample for four months, out for eight, and then back in for four. This limited panel structure enables selected panel analyses, such as analysis of labor force transitions, but precludes complete analysis of individual unemployment durations in a panel setting.

[4] The redesign also altered the calculation of unemployment shares by reason, primarily by increasing the share of re-entrants and reducing the share of new entrants.

bias in reported durations (Abraham and Shimer 2002). PM developed adjustment factors which can be used to mitigate the influence of the redesign on measured unemployment durations; in addition to the published factors, they have made available similar adjustment factors for more narrowly defined population sub-groups. However, their adjustment factors apply to aggregate duration series, not to individual unemployment durations from the microdata, rendering them unsuitable for use in my setting.

Abraham and Shimer (2002; "AS") provide an alternative perspective and approach, which exploits the CPS's rotating sample design (see footnote 3 above). Rather than adjusting aggregate duration estimates, they restricted their analyses to the CPS "incoming rotation groups" (IRGs). The incoming rotation groups are either new respondent units or units that are rotating back into the interview sample after eight months out. Because the IRG records do not have consecutive prior-month duration values that can be incremented to obtain duration estimates in the current month, reported unemployment durations for the IRGs are unaffected by the introduction of dependent interviewing in the redesigned survey,

The AS correction (restricting the sample to the IRGs) is straightforward to apply when using the CPS microdata, as in my setting. Moreover, it performs quite well in capturing the full range of survey redesign effects on duration that are reflected in the PM adjustment factors. This can be seen in Figure 2, which displays the expected duration series based on the unadjusted data, along with the corresponding series based on the PM and AS adjustment (in this chart and subsequent ones, the series are expressed as annual averages of non-seasonally adjusted monthly values). The PM multiplicative adjustment factors are intended to adjust the pre-redesign observations to be equivalent to the post-redesign observations. Because the AS adjustment by necessity does the opposite—it adjusts the post-redesign observations to be comparable to the pre-redesign observations—in the figure, the inverse of the PM multiplicative factors was applied to the post-redesign observations.

As expected, in Figure 2 the AS and unadjusted lines are quite close prior to 1994, reflecting little or no systematic reporting differences between the IRGs and other rotation groups. From 1994 forward, both adjusted series lie noticeably below the unadjusted series, consistent with the adjusted series' neutralization of the increase in measured duration caused by the redesign. Most importantly, the adjusted series are nearly identical to one another, suggesting that the impact of the redesign on measured durations is almost entirely the result of the switch to dependent interviewing: if the switch to flexible reporting periodicity systematically affected measured durations, the estimates based on the PM adjustments, which account for it, would depart noticeably from the estimates based on the AS adjustment. The impact of the adjustments is substantial, averaging about 1-2 weeks (about 10-15% of the unadjusted base value) during 1994-2008 and increasing to about 4.5 weeks in 2009 (about 15% of the unadjusted base value).

Figure 3 is similar in construction to Figure 2 but focuses on unemployment entry rates rather than expected duration. The entry rates are calculated as the ratio of newly unemployed individuals (duration<5 weeks) to the labor force, calculated monthly and then averaged on an annual basis. As is well-known (e.g., Mukoyama and Sahin 2009), unemployment entry rates have been declining since the early 1980s. Figure 3 shows that the decline in entries is less pronounced when the series are adjusted for the reduction in the measured share of very short unemployment spells caused by the 1994 survey redesign. As in Figure 2, the alternative adjustment methods yield nearly identical series values from 1994 forward.

Because the AS adjustment performs admirably for capturing the full redesign effects on reported durations, and because it is suitable for use with microdata, much of the subsequent analysiss in this paper will use the AS adjustment, by restricting the analysis samples to the IRGs.[5] This reduces the sample size by one-fourth, from a range of about 2200 to 8100 observations per month down to about 550 to 2000 observations per month (depending on the unemployment rate).[6]

2.3 Descriptives: unemployment duration and entry over time

To gain a better handle on the patterns in unemployment duration and entry over time, Figures 4-7 display the duration and entry series by sex and reason for unemployment.

Figure 4 shows the measure of expected completed duration by sex. Duration for men exceeded that for women early in the sample frame, but the series converged over time as women's labor force attachment strengthened. By the late 1990s, expected

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[5] This approach is followed purely for the sake of consistent measurement over time. As discussed by Polivka and Miller, the CPS redesign was specifically intended to overcome reporting inconsistencies in the pre-1994 survey and as such is likely to have improved the accuracy of reported unemployment durations (at least for the three-quarters of the sample that are not in the IRGs). The need for consistent measurement over time in my setting dictates reliance on observations that are less reliably measured at a point in time (after 1994). Researchers who have no need to compare the pre- and post-redesign periods should use the redesigned survey data as is.

[6] For subsequent calculations that involve comparisons with published labor force or population totals, the IRG samples are upweighted by a factor of 4.

duration was very similar for men and women, and this pattern continued into the most recent recession, with a nearly identical duration spike observed for the two groups in 2008-09. The chart is consistent with the view that to the extent it exists, rising overall duration primarily is a result of rising labor force attachment and duration for women (Abraham and Shimer 2002, Aaronson et al. 2010). Figure 5 indicates that the overall decline in unemployment entry rates from Figure 3 was restricted to women, which also is consistent with rising labor force attachment for women

Figures 6 and 7 display expected completed duration and entry rates by reason for unemployment (job losers, job leavers, and entrants). Figure 6 shows that expected duration for involuntary job losers substantially exceeded that for job leavers (quits) and labor market entrants early in the sample frame. However, the job losers duration series largely converged with the other series later in the sample frame and in fact was noticeably below duration for job leavers in 2009. Figure 7 indicates that declining overall entry rates (from Figure 3) were largely driven by declining rates of labor market entrance into unemployment, consistent with greater declines for women than for men (Figure 5).

3. Econometric Approach: Conditional Analysis of Synthetic Panels

The econometric approach used for the formal analyses of unemployment duration is adapted from Güell and Hu (2006; henceforth "GH"). Past analyses of cyclical patterns and trends in U.S. unemployment duration have taken one of two approaches: (i) examination of aggregate series based on interrupted spell durations, such as the average duration of unemployment or unemployment shares by duration category (e.g., Abraham and Shimer 2002, Mukoyama and Sahin 2009, Aaronson et. al 2010); (ii) use of the expected duration series (based on monthly continuation probabilities; see Appendix A) calculated at the aggregate level or for broad population sub-groups (e.g., Sider 1984, Baker 1992a). These methods preclude the joint incorporation of detailed individual characteristics and duration dependence into the analysis. GH developed generalized method of moments (GMM) and maximum likelihood (ML) approaches that enable estimation of detailed covariate effects on unemployment duration at the individual level, along with estimation of the conditional effects of duration dependence and the impact of time-varying factors such as labor market conditions.

GH focused on developing and implementing their GMM approach over the ML approach because of the former's broad applicability. As they note, their ML approach is difficult to implement in the case of grouped duration data with uneven duration categories that do not necessarily correspond to the survey sampling window. However, because unemployment durations are reported on a continuous weekly basis in the CPS data that I use, and because the CPS is consistently sampled on a monthly basis, these constraints do not apply. As such, I use GH's ML approach (see their section 2.4).

Intuitively, the estimator is implemented by arranging separate base and continuation samples across the full range of unemployment duration intervals. For example, base and continuation sample pairings will consist of individuals unemployed for 0 to 4 weeks in month *t-1* paired with those unemployed for 5-8 weeks in month *t*, 5 to 8 weeks in month *t-1* paired with 9-12 weeks in month *t*, 13-26 weeks in month *t-3* paired with 27-39 weeks in month *t*, etc. The characteristics of the continuation samples are compared with those of the base samples: the declines in sample sizes between the base and continuation samples across different duration intervals reflects baseline duration dependence, which is recovered in the estimates; and differences in the distribution of characteristics between the base and continuation samples are used to infer the effects of the measured variables.[7] In the analysis, the separate base/continuation sample pairs can be combined and separately identified, to provide estimates for the complete distribution of durations, or stratified and analyzed separately. As noted by GH, the estimator is valid under the assumption that the members of the base and continuation groups are sampled from the same population, which is a feature of the stratified cross-sectional sampling used for the monthly CPS.[8]

More formally, let y represent an indicator for whether an individual defined by characteristics X remains unemployed between consecutive months $t=0$ and $t=1$, which also represent the base and continuation samples in this derivation (the procedure generalizes identically to alternative duration intervals and spacings). We are interested in the conditional distribution of y, or $P(y=1|X)$. We do not observe y but instead observe $\tilde{y}$, which identifies whether an observation belongs to the $t=0$ or $t=1$ sample. If m_0 and m_1 represent the respective sample sizes (weighted using the survey weights), then the joint distribution of the observed variables X and $\tilde{y}$ is:

[7] GH note that this approach follows from the choice based sampling framework of Manski and Lerman (1977): unemployment continuation probabilities are interpreted as reflecting the "choice" to stay unemployed.
[8] This assumption holds only for observed features of the population, such as age, education, etc. The GH framework abstracts from unobserved heterogeneity, which cannot be accounted for using synthetic cohorts (unlike a true panel with repeat observations on unemployment spells).

$$P(X = x, \tilde{y} = 1) = \frac{m_1}{(m_0 + m_1)} P(X = x | y = 1)$$

$$= \frac{m_1}{(m_0 + m_1)} \frac{P(y = 1 | X = x) P(X = x)}{P(y = 1)}$$

Manipulation based on Bayes' rule and the dichotomous definition of $\tilde{y}$ yields:

$$P(\tilde{y} = 1 | X = x) = \frac{P(X = x, \tilde{y} = 1)}{P(X = x)} = \frac{P(X = x, \tilde{y} = 1)}{P(X = x, \tilde{y} = 0) + P(X = x, \tilde{y} = 1)}$$

$$= \frac{1}{1 + \frac{m_0}{m_1} \frac{P(y = 1)}{P(y = 1 | X = x)}}$$

$$= \frac{1}{1 + \alpha \frac{1}{P(y = 1 | X = x)}}$$

where $\alpha = (m_0/m_1)P(y=1)$. Assuming a logit specification for P(y=1|X=x) yields an equation that can be estimated by maximum likelihood:

$$P(\tilde{y} = 1 | X = x) = \frac{1}{1 + \alpha \frac{1 + \exp(x\beta)}{\exp(x\beta)}} = \frac{\exp(x\beta)}{\alpha + (1 + \alpha)\exp(x\beta)} \qquad (1)$$

Equation (1) is essentially a logit equation for observing whether a particular observation is in the base or continuation sample, with the incorporation of a rescaling factor α. While α can in principal be estimated as part of the ML routine, an estimate can instead be calculated directly from the CPS data and used in the log-likelihood function, which supports more rapid convergence of the estimates. In particular, the estimate of P(y=1) in the data is $m_1/(m_0+m_1)$, which yields $\alpha = m_0/(m_0+m_1)$. For the estimates presented in the next section, I use the value of α calculated in this manner, averaged over the relevant estimation sample (hence across all continuation groups), as a constant in the ML routine based on equation (1).[9]

For the estimates reported in the next section, the base and continuation categories are defined to match the duration intervals used for the earlier calculation of expected completed duration, which in turn are designed to produce reliable estimates by generating cohort sizes that are sufficiently large within each interval (see Appendix A). The specific set of base/continuation pairs is defined as follows (along with the shortened "month/quarter/year" identifiers that will be used for listing results in the tables):

$f_1(t)$: 5-8 weeks in month t, <5 weeks in (t-1) ("Months 1-2")
$f_2(t)$: 9-12 weeks in month t, 5-8 weeks in (t-1) ("Months 2-3")
$f_3(t)$: 13-16 weeks in month t, 9-12 weeks in (t-1) ("Months 3-4")
$f_4(t)$: 27-39 weeks in month t, 13-26 weeks in (t-3) ("Quarters 2-3")
$f_5(t)$: 53-78 weeks in month t, 27-52 weeks in (t-6) ("Quarters 3/4-5/6")
$f_6(t)$: 100+ weeks in month t, 53-99 weeks in (t-12) ("Years 2-3+")

In addition to forming the basis for estimation, these continuation pairs are used to identify duration dependence, through inclusion of parameters that identify shifts in continuation probabilities across the categories (conditional on other controls). The empirical equations also include factors that vary over time, specifically a measure of

[9] This approach to the parameter α is clearly unsatisfactory and will be modified in revised versions of the manuscript. At a minimum, by treating α as a constant, the procedure ignores sampling variance that should affect the standard errors of the estimates, although probably by a very small amount.

aggregate economic conditions (as discussed in the next section) and in most instances a time trend.[10]

4. Empirical Framework and Results

4.1 Model

Before turning to the results, some narrow aspects of the empirical specification require discussion. The question being addressed is: conditional on individual characteristics and the business cycle (aggregate labor market conditions), has the expected duration of unemployment for a newly unemployed individual changed? Defining controls for individual characteristics (age, education, etc.) is straightforward. However, proper conditioning on the business cycle and its impact on aggregate labor market conditions involves departures from past practice. Some of the past work on rising unemployment duration has measured duration relative to the unemployment rate, which suggests an empirical specification that uses the unemployment rate as a cyclical control.[11] The downward trend in unemployment duration (Figure 1) suggests that alternative controls should be employed: when measured relative to the unemployment rate, duration can show an upward trend even though an individual with a particular set of characteristics entering unemployment is not facing any increase in expected duration. Indeed, the downward trend in unemployment arises largely from declining entry rates

[10] The primary practical difficulty in implementing this estimator is the need for identification of observations across the dual dimensions of cohorts and calendar time, for proper matching of time-varying factors such as aggregate conditions.

[11] Sider (1985) used the deviation from trend growth in the index of industrial production as his cyclical control. Baker (1992a) used the unemployment rate as a cyclical indicator in his models of expected duration, but he focused narrowly on cyclical patterns in duration rather than changes over time.

(Figures 1 and 3), which are likely driven by factors that are independent of the determinants of expected duration.

More directly, controlling for the unemployment rate in a duration equation introduces endogeneity. To see this, note that in steady-state, the number of unemployed individuals (U) can be expressed as the product of the incidence of unemployment, f(0), and the expected duration for a newly unemployed individual, D (Sider 1985, Valletta 1998): $U = f(0)^{*} D$. Dividing through by the labor force yields the unemployment rate as the product of the entry rate (newly unemployed divided by the labor force) and expected duration. Thus, expected duration and the unemployment rate are mechanically related, and as such the unemployment rate does not belong in empirical models of unemployment duration.

More appropriate controls for aggregate labor market conditions can be derived from data sources that are independent of factors that determine the unemployment rate and duration. I use a measure of growth in payroll employment obtained from the BLS's monthly establishment survey, which is distinct from the monthly household survey (the CPS) that is used to collect unemployment data. In particular, I use payroll employment growth at the state level, seasonally adjusted and measured over 3 months at an annual rate, as my primary measure of aggregate labor market conditions that affect unemployment duration (with some comparisons to aggregate national employment growth provided below).[12] Because the complete set of individual states only were

[12] Employment growth annualized over the 3-month period ending in the observation month is used to represent aggregate economic conditions for each of the unemployment continuation pairs, regardless of the lag structure used to construct the pair (e.g., 1-month lags versus 12-month lags). Future drafts will explore improvements to this variable based on better matches between the period used to construct employment growth and the underlying lag structure for each continuation pair.

identified in the CPS beginning in 1977, and because the base and continuation sample pairings that I use require lags of up to 12 months, the analyses below reflect an initial sample year of 1978 (rather than 1977, as in the displays of expected completed duration).

4.2 Results I: Full Sample frame

Table 1 lists estimation results for models that span the sample frame and use alternative controls for aggregate labor market conditions. In this and all subsequent regression tables, the estimated coefficients represent the variable's impact on continuation probabilities for unemployment: positive coefficients indicate that the variable increases continuation rates and unemployment duration, and negative coefficients indicate that the variable decreases continuation rates and duration. It is important to note that unemployment continuation rates and their opposite, exit rates, are determined by flows from unemployment to employment or out of the labor force. These separate flows are not distinguished in the analyses, and as such the separate impacts of the covariates on these flows are not identified.[13]

The first two columns of Table 1 identify the upward trend in unemployment duration that has been alluded to in other research (these columns do not adjust for survey redesign or individual characteristics). Conditional on the unemployment rate, a large and precisely estimated upward time trend is evident, which is somewhat larger for the full sample period (column 1) than the same period excluding the recent severe recession, through 2007 (column 2). Because of the possible excess weight placed on the recent

[13] See Elsby, Michaels, and Solon (2009) and Aaronson et al. (2010) for recent examples of related analyses using labor market flows data.

recessionary outlier period, subsequent analyses will focus on the period through 2007, with a separate analysis of the recent recession (see the next sub-section). The time trend coefficient has been scaled so that represents the cumulative trend effect from the start to the end of each sample frame. The estimated increase in continuation probabilities and expected duration over time is large, equal approximately to the difference in continuation rates between young workers (age 16-24) and workers age 45-54 (age has the largest impact of any individual covariates; these coefficients are not shown in Table 1 but are listed in columns 4-8 of Appendix Table 1).[14]

Columns 3-6 of Table 1 illustrate the impact of this paper's primary methodological modifications on the estimated trend. In column 3, accounting for the survey redesign by restricting the sample to the incoming rotation groups (IRG's) cuts the time trend nearly in half (similar to the findings of Abraham and Shimer 2002). The inclusion of individual characteristics in column 4, which represents the primary methodological innovation of the GH approach, further reduces the estimated trend by more than half, leaving it at less than one-fourth of its column 2 value. In columns 5 and 6, replacement of the unemployment rate with no cyclical control or the measure of state employment growth reverses the trend effect to negative and significant, implying that unemployment duration has in fact been falling on an independent basis or relative to an exogenous indicator of aggregate labor market conditions. This finding is maintained when state employment growth is replaced by national growth in column 7. The time effect is converted to a miniscule but statistically significant positive effect when the last

[14] Subsequent drafts of this paper will provide more precise magnitude assessments in terms of expected completed duration.

two years of data are included (2008-2009), again emphasizing the need to analyze the recent recessionary episode separately.

Table 2 displays results for separate samples for men and women, for the 1978-2007 period (IRG's only to adjust for survey redesign) and for the 1978-1993 and 1994-2007 sub-periods (all observations). Because the early and later sub-periods are restricted to the pre-redesign and post-redesign survey months, changes over time within the sub-periods are not affected by the redesign. The results indicate that the negative trend in duration is restricted to the early sample period for women and men, with essentially no change evident for after 1994. These results for women in particular are inconsistent with the view that changing behavior by female job seekers has contributed to an increase in unemployment duration.

4.3 Results II: Comparison of latest recession with the early 1980s

Recall the spike in unemployment duration in 2008-2009 from Figures 1 and 2. This sharp increase has raised concerns that the United States may be developing a severe long-term unemployment problem, perhaps resulting in part from the historically unprecedented extensions of unemployment insurance payments.[15]

The results reported in Table 3 address these issues by estimating the ML models of unemployment continuation probabilities with the sample restricted to the severe recessionary periods of the early 1980s and recent years. To maximize comparability of economic conditions across the two episodes, the sample is restricted to the period from the pre-recession unemployment trough to the peak in expected duration (measured on a

[15] As of late 2009, UI benefits were available for up to 99 weeks in some states, compared with the normal benefit duration of 26 weeks and past extensions of up to 52 weeks; see Aaronson et. al (2010), Valletta and Kuang (2010).

3-month moving average basis) for the two episodes; the exact dates are July 1981–July 1983 and May 2007-July 2009.

The comparison between the recent and earlier recession is captured by the coefficient on an indicator variable for whether the observation is from the recent period. This coefficient indicates that conditional on the characteristics of unemployed individuals and aggregate labor market conditions, durations have been shorter in the recent recession than in the earlier episode, especially for men. Exceptionally weak labor demand during the recent recession plays an important role in this finding: cumulative losses in national payroll employment reached 6.1% in the recent recession, versus 3.1% in the early 1980s recession. However, the results are similar when the state employment growth variable is excluded from the equation (albeit with an estimated coefficient on the recent recession dummy that is smaller in absolute value that that reported in the table).

4.4 Results III: by Reason for Unemployment

Table 4 displays results for the continuation models for the 1978-2007 period by reason for unemployment, grouped into job losers (temporary layoffs and permanent job losers), job leavers, and labor force entrants (new entrants and re-entrants); for each reason for unemployment, the equations are estimated separately for women and men. Conditional continuation rates (hence expected duration) show a pronounced downward trend for female and especially male job losers, with a somewhat smaller downward trend evident for job leavers. For labor force entrants, duration has been trending slightly down for men but has been flat for women, perhaps because rising labor force attachment by women, which reduces their labor force exit rates when unemployed, has offset other factors operating to reduce their durations over time

5. Summary and Discussion

When subjected to proper data adjustment, and conditioned on individual covariates and an appropriate control for aggregate labor market conditions, U.S. unemployment data generally reveal a decline rather than an increase in unemployment continuation rates and duration over the period 1976-2009. In addition, the empirical model suggests that unemployment durations in the recent severe recession, although high, are not out of line with durations observed in the early 1980s recession, and in fact appear to be shorter on a conditional basis. These findings suggest that there has been little or no change in the behavior of unemployed individuals over the past three decades, including a limited impact of the historically unprecedented extensions of unemployment insurance benefits over the past 2 years.

Beyond these substantive findings, the framework used here provides an indication of potentially broad applicability of the methods developed by Güell and Hu (2006) for the estimation of conditional models of continuation probabilities using repeated cross-sections. The specific application used here adhered closely to their original application to unemployment durations, albeit with data for a different country (the United States rather than Spain). However, their framework is likely to be useful in other contexts for which data on repeated cross-sections are common, such as for health and mortality outcomes and population demographics.

Appendix A: Data Adjustments and Calculation of Expected Completed Duration

This appendix describes assorted data handling issues and the construction of the expected completed unemployment duration series (Figures 1, 2, 4, and 6).

Digit preference and top-coding

To account for "digit preference" in the CPS unemployment duration data—the tendency for respondents to report durations as multiples of one month or half-years (i.e., multiples of 4 or 26)—I follow previous analysts by allocating a fixed share of bunched (heaped) observations to the next monthly interval. Due to greater heaping observed following the 1994 survey redesign, I expanded the set of recoded durations relative to those chosen by analysts who used pre-redesign data. In particular, I allocated 50 percent of respondents reporting the following durations of unemployment to the next weekly value: 4, 8, 12, 16, 20, 26, 30, 39, 43, 52, 56, and 78 weeks. I also reset 50 percent of the responses of 99 weeks to 100 weeks (after imposition of the top code adjustment described in the next paragraph). Sider (1985) and Baker (1992b) report that the estimated level of expected completed duration is sensitive to the allocation rule but cyclical variation is not.

The CPS duration variable was top-coded at 99 weeks through 1993. For time-series consistency in analyses that combine data from the periods before and after the 1994 redesign, I imposed this top-code on the post-1993 data as well. This constraint makes little difference for estimates of expected completed duration because: (i) the continuation probabilities are estimated by grouping the data for individuals with durations longer than 99 weeks (see discussion below); (ii) only a small number of observations (2-4%) are recorded as unemployed longer than 99 weeks after 1993, with durations recorded up to 124 weeks (in 2007; the incidence of respondents reporting more than 99 weeks of unemployment was smaller in the severe recession year of 2009 than it was in 1984-85, 1993-94, and 2004).

Calculation of Expected Completed Duration

The CPS survey collects information on the length of existing unemployment spells up to the date of the survey. The average duration measure formed from these data (and published by the BLS) will not in general correspond to the expected duration of a completed spell for a new entrant to unemployment, particularly under changing labor market conditions such as rising unemployment (i.e., "nonsteady state" conditions). The general nonsteady-state approach to estimating expected completed duration using grouped duration data is a "synthetic cohort" approach (see Kaitz 1970, Perry 1972, Sider 1985, Baker 1992a).[1] This approach relies on the estimation of monthly continuation rates—i.e., the probabilities that an unemployment spell will continue from one month to the next. These rates in general will vary over the length of a spell due to individual heterogeneity or underlying duration dependence, and they also will vary from month to month as economic conditions change.

My application of the synthetic cohort approach to obtain nonparametric estimates of expected completed duration from grouped duration data follows M. Baker (1992a); see G. Baker and Trivedi (1985) for a more general overview. We begin with continuation probabilities, defined as the conditional probability that individuals whose

[1] This is a "synthetic cohort" approach in that with a rotating monthly sample such as the CPS, the estimate of unemployment continuation probabilities is formed by comparing different groups over time, rather than by following the same individuals through time.

unemployment spell has lasted *(j-1)* months at time *(t-1)* will remain unemployed into the next period:

$$f_j(t) = \frac{n(j,t)}{n(j-1,t-1)} \qquad \text{(A1)}$$

where *n(.)* represents the sampled number of individuals unemployed for a given number of months at the time of a particular monthly survey. In a rotating sample survey such as the CPS, the sample used to calculate the numerator and denominator differs, but under the assumption that each monthly sample represents the target U.S. population (as the CPS is constructed), this expression provides an estimate of the continuation probability for a fixed representative cohort.

The product of the continuation probabilities represents the empirical survivor function, or the proportion of individuals entering unemployment at time *(t-j)* who remain unemployed at time *t*:

$$G_j(t) = f_0(t) f_1(t) f_2(t) f_3(t) \ldots f_j(t) \qquad \text{(A2)}$$

In this expression, $f_0(t)$ is the continuation probability for the entering cohort, which is defined identically as one. Assuming that the duration intervals are not all identical (e.g., not all one month), the expected completed duration in a particular month *t*, *D(t)*, is estimated as:

$$D(t) = 1 + \sum_{j=1}^{m} G_j(T_j) * (T_j - T_{j-1}) \qquad \text{(A3)}$$

where the *T's* represent duration intervals (measured in units of the monthly sampling window) and T_m is the maximum duration measured or used.

Empirical implementation requires setting the width and number of duration intervals used for estimation. I follow Baker (1992a) in using 6 unequally spaced duration intervals and corresponding continuation probabilities; the intervals are designed to produce reliable estimates by generating cohort sizes that are sufficiently large within each interval:

$f_1(t)$: 5-8 weeks in month t to <5 weeks in (t-1)
$f_2(t)$: 9-12 weeks in month t to 5-8 weeks in (t-1)
$f_3(t)$: 13-16 weeks in month t to 9-12 weeks in (t-1)
$f_4(t)$: 27-39 weeks in month t to 13-26 weeks in (t-3)
$f_5(t)$: 53-78 weeks in month t to 27-52 weeks in (t-6)
$f_6(t)$: 100+ weeks in month t to 53-99 weeks in (t-12)

Note the variation in duration intervals for $f_4(t)$-$f_6(t)$, which must be incorporated into the duration estimate based on equation (3). Then the expected completed duration is formed as:

$$D(t) = 1 + f_1 + f_2 f_1 + f_3 f_2 f_1 + 3 f_4 f_3 f_2 f_1 + 6 f_5 f_4 f_3 f_2 f_1 + 12 f_6 f_5 f_4 f_3 f_2 f_1 \qquad \text{(A4)}$$

where the time identifier (t) has been suppressed on the right-hand side of (4) for simplicity. D(t) is defined as the expected duration of unemployment (in months) for a cohort that enters unemployment at *t* and faces current economic conditions throughout the unemployment spells of cohort members.[2] For the charts displayed in this paper, I estimated expected completed duration for the full sample and for various groups (by sex and reason for unemployment); estimation by group proceeds by first restricting the unemployment sample to the specified group, than estimating expected completed duration as described above.

[2] To relax the assumption that current economic conditions continue throughout cohort members' spells, Corak and Heisz (1996) propose and estimate a forward-looking nonsteady-state estimator, which reflects the evolution of continuation probabilities into the future for individuals entering unemployment in the current month. They find that their estimator has desirable properties relative to the standard backward-looking nonsteady-state estimator.

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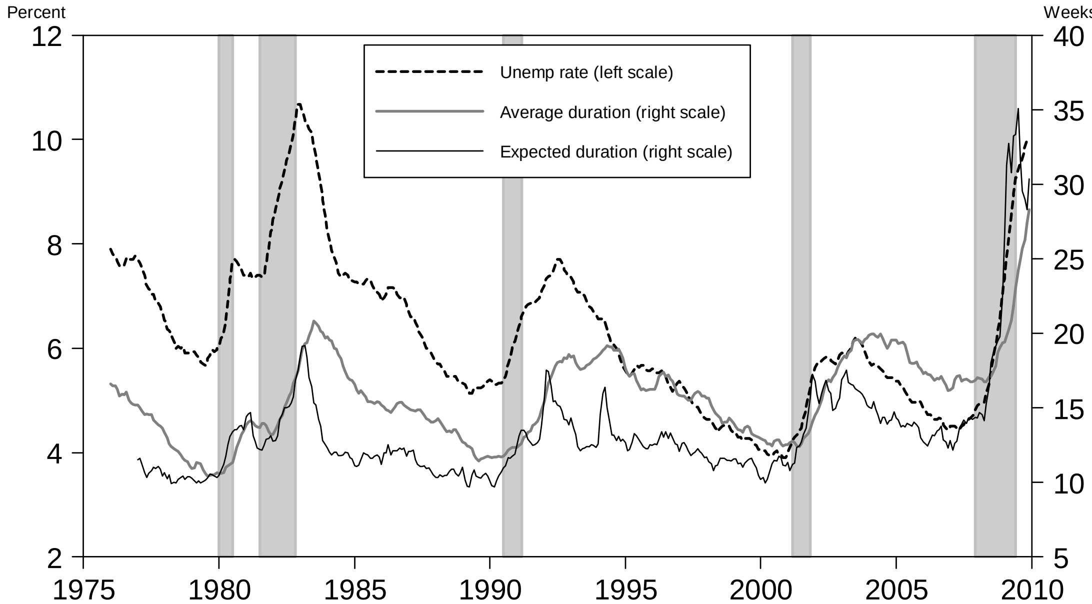
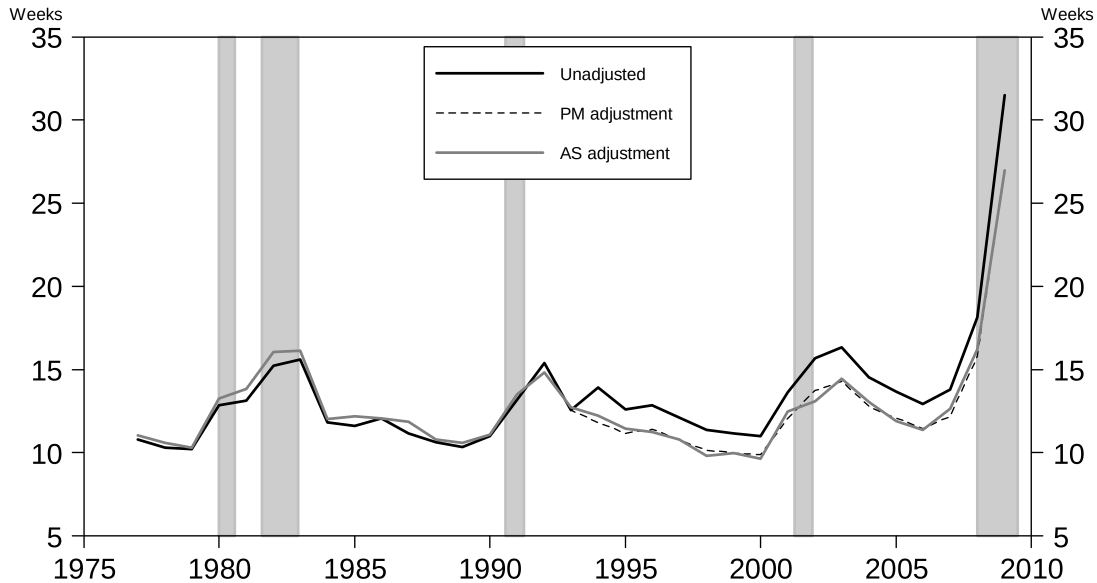
Figure 1. Unemployment Rate and Duration



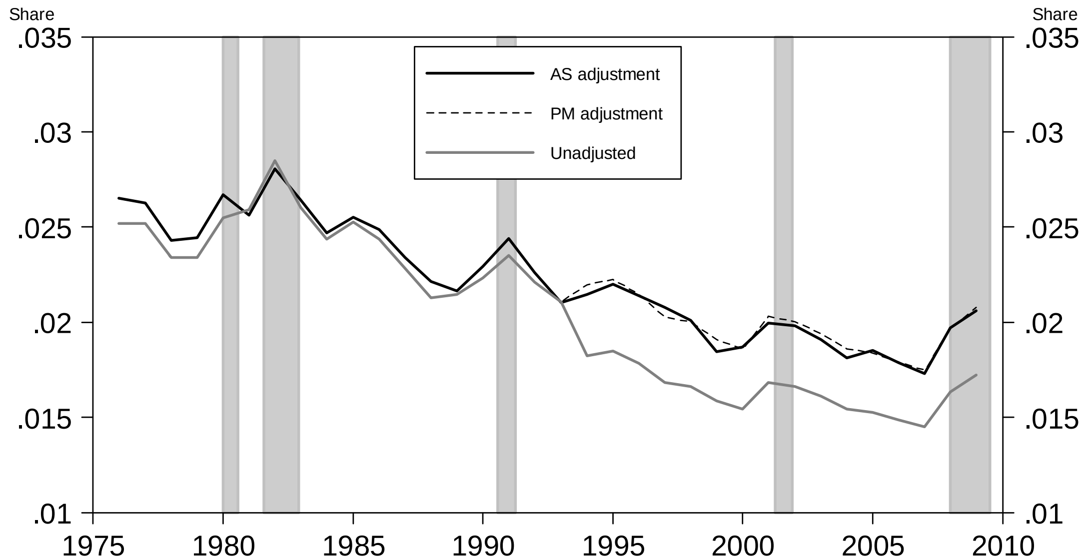
Note: Sources are BLS for the unemployment rate and average duration and author's calculations of expected completed duration from CPS microdata (see Appendix A). Monthly values, seasonally adjusted (3-month moving average for expected duration). Shaded areas denote NBER recession dates (latest trough tentatively dated 6/09).

Figure 2. Expected Completed Duration (adjusted)

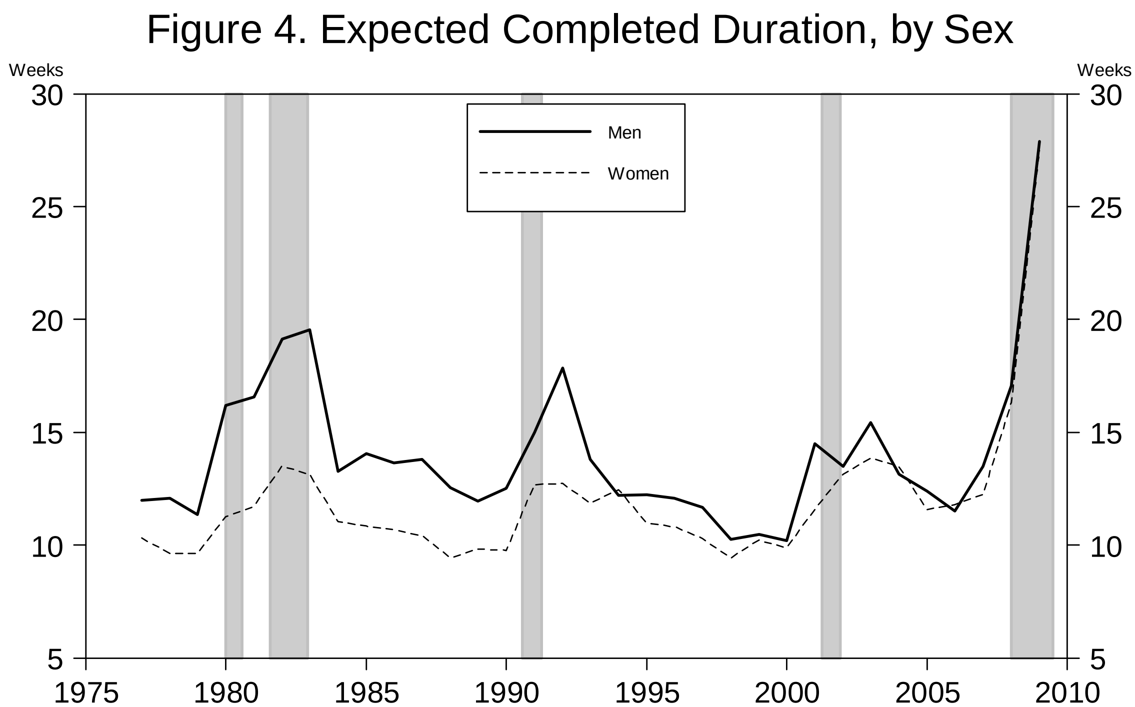


Note: Author's calculations of expected duration from CPS microdata; all series corrected for digit preference (see Appendix A for methods). Unadjusted line uses CPS microdata. The PM line applies the Polivka-Miller multiplicative adjustment factors to the series values for 1994 forward. The AS line uses the Abraham-Shimer retriction to incoming rotation groups (see text). Annual averages of monthly values. Shaded areas denote NBER recession dates.

Figure 3. Unemployment Entry Rates (adjusted)

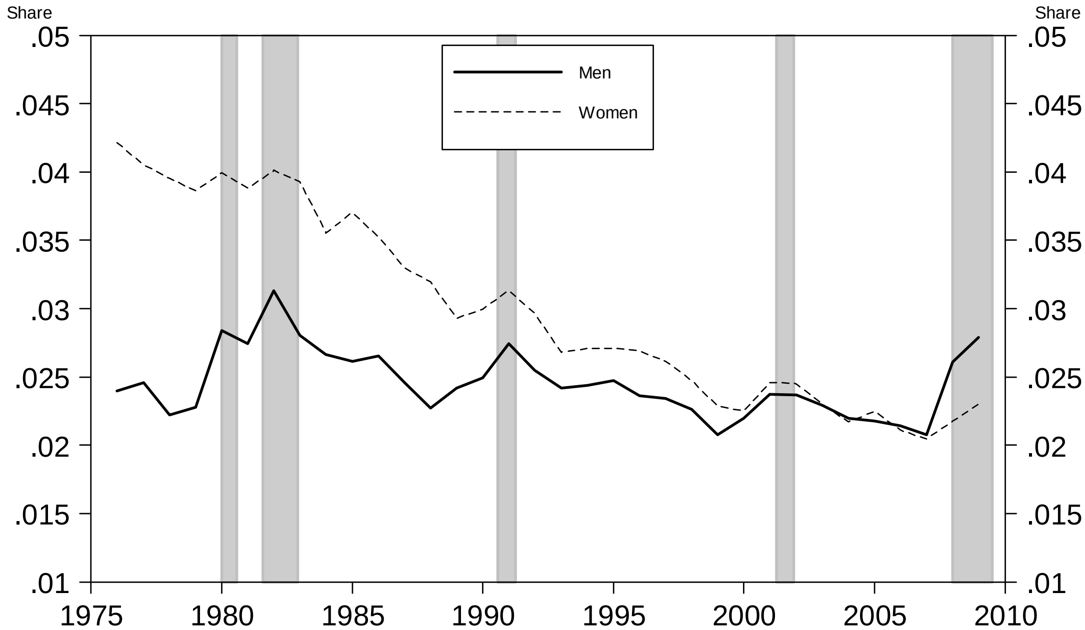


Note: Author's calculations of the monthly number of newly unemployed individuals as a share of the labor force; all series corrected for digit preference (see Appendix A for methods). Unadjusted line uses CPS microdata. The PM line applies the Polivka-Miller multiplicative adjustment factors to the series values for 1994 forward. The AS line uses the Abraham-Shimer restriction to incoming rotation groups (see text). Annual averages of monthly values. Shaded areas denote NBER recession dates.



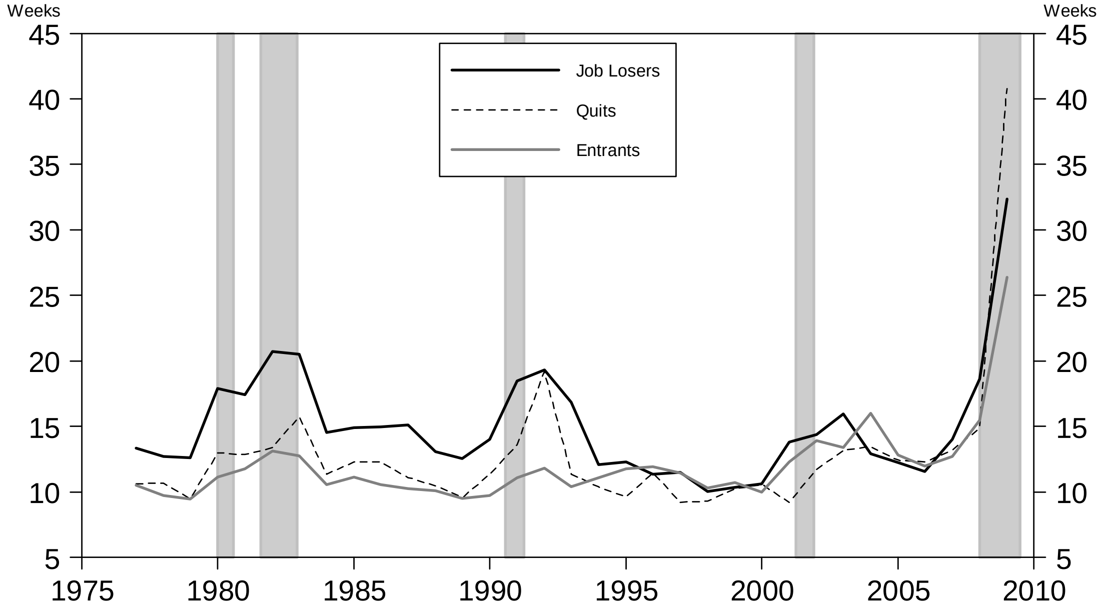
Note: Author's calculations of expected duration from CPS microdata, corrected for digit preference preference and using the AS restriction to incoming rotation groups. Annual averages of monthly values. Shaded areas denote NBER recession dates.

Figure 5. Unemployment Entry Rates, by Sex



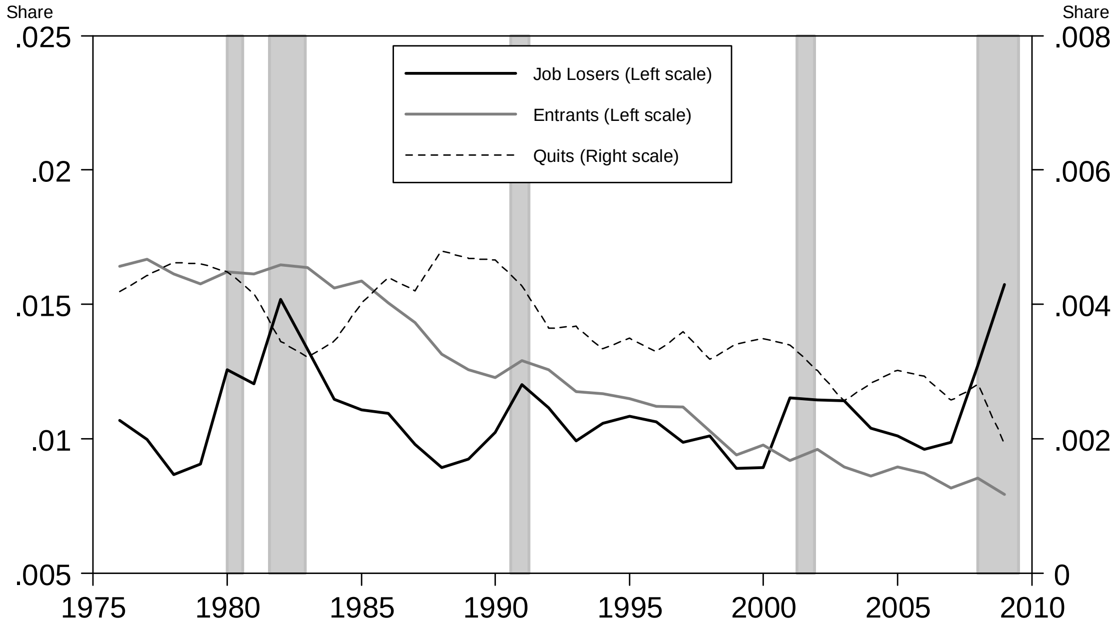
Note: Author's calculations of the monthly number of newly unemployed individuals as a share of the labor force (by sex), corrected for digit preference and using the AS restriction to incoming rotation groups. Annual averages of monthly values. Shaded areas denote NBER recesstion dates.

Figure 6. Expected Completed Duration, by Reason



Note: Author's calculations of expected copmleted duration from CPS microdata, corrected for digit preference and using the AS restriction to incoming rotation groups. Annual averages of monthly values. 1994 value for Entrants is interpolated (to account for survey redesign effects). Shaded areas denote NBER recession dates.

Figure 7. Unemployment Entry Rates, by Reason



Note: Author's calculations of the monthly number of newly unemployed individuals as a share of the total labor force, corrected for digit preference and using the AS restriction to incoming rotation groups. Annual averages of monthly values. Shaded areas denote NBER recession dates.

Table 1: ML Estimates (alternative samples and cyclical/individual controls)

VARIABLES	(1) Full sample, 1978-2009	(2) Full sample, 1978-2007	(3) IRGs, 1978-2007	(4) IRGs, 1978-2007	(5) IRGs, 1978-2007	(6) IRGs, 1978-2007	(7) IRGs, 1978-2007	(8) IRGs, 1978-2009
Time (sample length)	0.507**	0.440**	0.243**	0.101**	-0.228**	-0.252**	-0.256**	0.0888**
	(0.00940)	(0.0114)	(0.0224)	(0.0230)	(0.0180)	(0.0181)	(0.0182)	(0.00892)
Unemployment rate	0.0964**	0.0913**	0.101**	0.0952**	--	--	--	--
	(0.00177)	(0.00217)	(0.00434)	(0.00436)				
d(state employment)	--	--	--	--	--	-2.962**	--	-3.582**
						(0.167)		(0.0785)
d(national employment)	--	--	--	--	--	--	-2.669**	--
							(0.246)	
Individual characteristics	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Duration months 1-2	-1.383**	-1.304**	-1.312**	-0.975**	-0.229**	-0.170**	-0.172**	-0.317**
	(0.0159)	(0.0194)	(0.0386)	(0.0448)	(0.0296)	(0.0298)	(0.0300)	(0.0145)
Duration months 2-3	-1.288**	-1.221**	-1.178**	-0.866**	-0.115**	-0.0589	-0.0594	-0.243**
	(0.0164)	(0.0198)	(0.0395)	(0.0455)	(0.0306)	(0.0308)	(0.0311)	(0.0149)
Duration months 3-4	-1.224**	-1.145**	-1.152**	-0.863**	-0.108**	-0.0533	-0.0534	-0.191**
	(0.0171)	(0.0205)	(0.0407)	(0.0465)	(0.0319)	(0.0322)	(0.0324)	(0.0156)
Duration quarters 2-3	-2.148**	-2.095**	-1.980**	-1.729**	-0.961**	-0.909**	-0.905**	-1.135**
	(0.0170)	(0.0203)	(0.0405)	(0.0461)	(0.0302)	(0.0304)	(0.0307)	(0.0147)
Duration quarters 3/4-5/6	-1.934**	-1.885**	-1.916**	-1.691**	-0.915**	-0.858**	-0.855**	-0.932**
	(0.0178)	(0.0211)	(0.0420)	(0.0474)	(0.0316)	(0.0319)	(0.0322)	(0.0155)
Duration years 2-3+	-1.072**	-1.024**	-0.710**	-0.512**	0.249**	0.314**	0.316**	-0.106**
	(0.0203)	(0.0232)	(0.0480)	(0.0522)	(0.0393)	(0.0395)	(0.0398)	(0.0182)
Observations	2404248	2239776	572576	567283	567283	567283	567283	2382746

** p<0.01, * p<0.05

Note: The time-trend coefficient is scaled up by sample length. See Appendix Table 1 for the list of other controls (and complete results). Robust standard errors in parentheses.

Table 2: ML Estimates (for women and men)

	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	IRGs, 1978-2007	Full sample, 1978-1993	Full sample, 1994-2007	IRGs, 1978-2007	Full sample, 1978-1993	Full sample, 1994-2007
Time (sample length)	-0.134**	-0.120**	0.0507*	-0.361**	-0.182**	-0.00136
	(0.0260)	(0.0165)	(0.0217)	(0.0252)	(0.0157)	(0.0207)
d(state employment)	-2.576**	-2.396**	-2.265**	-3.268**	-2.817**	-2.859**
	(0.241)	(0.134)	(0.321)	(0.233)	(0.124)	(0.304)
Individual characteristics	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Duration months 1-2	-0.379**	-0.321**	-0.408**	-0.0749	-0.0340	-0.359**
	(0.0420)	(0.0270)	(0.0359)	(0.0409)	(0.0262)	(0.0334)
Duration months 2-3	-0.228**	-0.362**	-0.157**	-0.00447	-0.161**	-0.0870*
	(0.0436)	(0.0275)	(0.0369)	(0.0423)	(0.0266)	(0.0345)
Duration months 3-4	-0.260**	-0.214**	-0.242**	0.0326	0.0138	-0.167**
	(0.0455)	(0.0291)	(0.0383)	(0.0443)	(0.0280)	(0.0359)
Duration quarters 2-3	-1.065**	-1.275**	-1.061**	-0.864**	-1.089**	-1.068**
	(0.0435)	(0.0277)	(0.0363)	(0.0415)	(0.0262)	(0.0338)
Duration quarters 3/4-5/6	-1.058**	-1.021**	-1.075**	-0.781**	-0.797**	-0.873**
	(0.0463)	(0.0299)	(0.0379)	(0.0432)	(0.0274)	(0.0351)
Duration years 2-3+	0.0168	-0.142**	-0.419**	0.449**	0.380**	-0.363**
	(0.0592)	(0.0377)	(0.0436)	(0.0526)	(0.0330)	(0.0389)
Observations	261344	632019	379230	305939	775038	431987

** p<0.01, * p<0.05

Note: The time-trend coefficient is scaled up by sample length. See Appendix Table 1 for the complete list of control variables. Robust standard errors in parentheses.

Table 3: ML Estimates, 1981-83 vs. 2007-09 (IRGs only)

	(1)	(2)	(3)
VARIABLES	All	Women	Men
2007-09 dummy	-0.230**	-0.0991*	-0.337**
	(0.0285)	(0.0422)	(0.0391)
d(state employment)	-5.502**	-5.394**	-5.634**
	(0.349)	(0.510)	(0.478)
Individual characteristics	**Yes**	**Yes**	**Yes**
Duration months 1-2	-0.622**	-0.813**	-0.519**
	(0.0673)	(0.0969)	(0.0900)
Duration months 2-3	-0.457**	-0.584**	-0.408**
	(0.0697)	(0.100)	(0.0933)
Duration months 3-4	-0.431**	-0.695**	-0.272**
	(0.0727)	(0.105)	(0.0983)
Duration quarters 2-3	-1.227**	-1.368**	-1.170**
	(0.0684)	(0.0996)	(0.0911)
Duration quarters 3/4-5/6	-1.138**	-1.367**	-1.025**
	(0.0710)	(0.104)	(0.0946)
Duration years 2-3+	0.455**	0.224	0.557**
	(0.121)	(0.182)	(0.159)
Observations	261344	632019	379230

** $p<0.01$, * $p<0.05$

Note: Sample periods bracketed by the unemployment trough (measured monthly) and expected duration peak (3-month moving average values) around the 1981-1982 and 2008-09 recessions (exact dates are 7/81-7/83 and 5/07-7/09) . See Appendix Table 1 for the complete list of control variables. Robust standard errors in parentheses.

Table 4: ML Estimates, by Reason for Unemployment (for women and men)
(1978-2007, IRG's only)

	Job Losers		Job Leavers		Entrants	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Women	Men	Women	Men	Women	Men
Time (sample length)	-0.419**	-0.566**	-0.193**	-0.371**	0.0219	-0.119**
	(0.0442)	(0.0350)	(0.0720)	(0.0753)	(0.0366)	(0.0428)
d(state employment)	-3.449**	-3.528**	-3.058**	-4.700**	-1.637**	-2.262**
	(0.430)	(0.314)	(0.681)	(0.731)	(0.326)	(0.405)
Individual characteristics	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Duration months 1-2	-0.286**	0.0281	-0.237*	-0.0190	-0.483**	-0.146
	(0.0661)	(0.0519)	(0.121)	(0.130)	(0.0642)	(0.0868)
Duration months 2-3	-0.0115	0.178**	-0.110	0.0831	-0.418**	-0.232**
	(0.0696)	(0.0543)	(0.124)	(0.135)	(0.0662)	(0.0883)
Duration months 3-4	-0.0895	0.213**	-0.118	0.127	-0.466**	-0.226*
	(0.0720)	(0.0571)	(0.130)	(0.141)	(0.0689)	(0.0914)
Duration quarters 2-3	-1.041**	-0.818**	-0.986**	-0.755**	-1.157**	-0.896**
	(0.0667)	(0.0522)	(0.126)	(0.132)	(0.0674)	(0.0887)
Duration quarters 3/4-5/6	-1.264**	-0.757**	-1.076**	-0.640**	-0.905**	-0.804**
	(0.0705)	(0.0543)	(0.137)	(0.139)	(0.0712)	(0.0910)
Duration years 2-3+	-0.499**	0.251**	0.126	0.567**	0.380**	0.886**
	(0.0852)	(0.0628)	(0.187)	(0.181)	(0.0954)	(0.117)
Observations	96350	176017	33678	33107	131316	96815

** p<0.01, * p<0.05
Note: The time-trend coefficient is scaled up by sample length. See Appendix Table 1 for the complete list of control variables. Robust standard errors in parentheses.

Appendix Table 1: Complete Estimates from Table 1

VARIABLES	(1) Full sample, 1978-2009	(2) Full sample, 1978-2007	(3) IRGs, 1978-2007	(4) IRGs, 1978-2007	(5) IRGs, 1978-2007	(6) IRGs, 1978-2007	(7) IRGs, 1978-2007	(8) IRGs, 1978-2009
Time (sample length)	0.507**	0.440**	0.243**	0.101**	-0.228**	-0.252**	-0.256**	0.0888**
	(0.00940)	(0.0114)	(0.0224)	(0.0230)	(0.0180)	(0.0181)	(0.0182)	(0.00892)
Unemployment rate	0.0964**	0.0913**	0.101**	0.0952**	--	--	--	--
	(0.00177)	(0.00217)	(0.00434)	(0.00436)				
d(state employment)	--	--	--	--	--	-2.962**	--	-3.582**
						(0.167)		(0.0785)
d(national employment)	--	--	--	--	--	--	-2.669**	--
							(0.246)	
Duration months 1-2	-1.383**	-1.304**	-1.312**	-0.975**	-0.229**	-0.170**	-0.172**	-0.317**
	(0.0159)	(0.0194)	(0.0386)	(0.0448)	(0.0296)	(0.0298)	(0.0300)	(0.0145)
Duration months 2-3	-1.288**	-1.221**	-1.178**	-0.866**	-0.115**	-0.0589	-0.0594	-0.243**
	(0.0164)	(0.0198)	(0.0395)	(0.0455)	(0.0306)	(0.0308)	(0.0311)	(0.0149)
Duration months 3-4	-1.224**	-1.145**	-1.152**	-0.863**	-0.108**	-0.0533	-0.0534	-0.191**
	(0.0171)	(0.0205)	(0.0407)	(0.0465)	(0.0319)	(0.0322)	(0.0324)	(0.0156)
Duration quarters 2-3	-2.148**	-2.095**	-1.980**	-1.729**	-0.961**	-0.909**	-0.905**	-1.135**
	(0.0170)	(0.0203)	(0.0405)	(0.0461)	(0.0302)	(0.0304)	(0.0307)	(0.0147)
Duration quarters 3/4-5/6	-1.934**	-1.885**	-1.916**	-1.691**	-0.915**	-0.858**	-0.855**	-0.932**
	(0.0178)	(0.0211)	(0.0420)	(0.0474)	(0.0316)	(0.0319)	(0.0322)	(0.0155)
Duration years 2-3+	-1.072**	-1.024**	-0.710**	-0.512**	0.249**	0.314**	0.316**	-0.106**
	(0.0203)	(0.0232)	(0.0480)	(0.0522)	(0.0393)	(0.0395)	(0.0398)	(0.0182)

(continued)

Appendix Table 1 (continued)

VARIABLES	(1) Full sample, 1978-2009	(2) Full sample, 1978-2007	(3) IRGs, 1978-2007	(4) IRGs, 1978-2007	(5) IRGs, 1978-2007	(6) IRGs, 1978-2007	(7) IRGs, 1978-2007	(8) IRGs, 1978-2009
Age 16-19	--	--	--	-0.550**	-0.552**	-0.550**	-0.550**	-0.512**
				(0.0217)	(0.0216)	(0.0216)	(0.0216)	(0.0105)
Age 20-24	--	--	--	-0.361**	-0.356**	-0.358**	-0.356**	-0.335**
				(0.0204)	(0.0203)	(0.0204)	(0.0203)	(0.00986)
Age 25-34	--	--	--	-0.201**	-0.195**	-0.197**	-0.195**	-0.189**
				(0.0187)	(0.0187)	(0.0187)	(0.0187)	(0.00899)
Age 35-44	--	--	--	-0.0841**	-0.0832**	-0.0829**	-0.0821**	-0.0851**
				(0.0196)	(0.0196)	(0.0196)	(0.0196)	(0.00942)
Age 55-64	--	--	--	0.0200	0.0209	0.0222	0.0215	0.0392**
				(0.0258)	(0.0258)	(0.0258)	(0.0258)	(0.0123)
Age 65+	--	--	--	-0.115**	-0.127**	-0.121**	-0.125**	-0.0787**
				(0.0438)	(0.0436)	(0.0437)	(0.0436)	(0.0208)
Education: HS degree	--	--	--	0.0292*	0.0361**	0.0340**	0.0349**	0.0346**
				(0.0128)	(0.0128)	(0.0128)	(0.0128)	(0.00635)
Some college	--	--	--	-0.0333*	-0.0366*	-0.0329*	-0.0344*	-0.0440**
				(0.0147)	(0.0147)	(0.0147)	(0.0147)	(0.00721)
College degree	--	--	--	0.0597**	0.0624**	0.0632**	0.0615**	0.0378**
				(0.0223)	(0.0223)	(0.0223)	(0.0223)	(0.0108)
Graduate degree	--	--	--	0.0882**	0.0785**	0.0833**	0.0802**	0.0591**
				(0.0297)	(0.0297)	(0.0297)	(0.0297)	(0.0143)
Married	--	--	--	-0.0436**	-0.0380*	-0.0423**	-0.0393*	-0.0657**
				(0.0158)	(0.0158)	(0.0158)	(0.0158)	(0.00766)
Female	--	--	--	-0.105**	-0.108**	-0.105**	-0.107**	-0.103**
				(0.0135)	(0.0135)	(0.0135)	(0.0135)	(0.00664)
Female*married	--	--	--	-0.0746**	-0.0797**	-0.0745**	-0.0781**	-0.0502**
				(0.0207)	(0.0207)	(0.0207)	(0.0207)	(0.0101)

(continued)

Appendix Table 1 (continued)

VARIABLES	(1) Full sample, 1978-2009	(2) Full sample, 1978-2007	(3) IRGs, 1978-2007	(4) IRGs, 1978-2007	(5) IRGs, 1978-2007	(6) IRGs, 1978-2007	(7) IRGs, 1978-2007	(8) IRGs, 1978-2009
Race/ethnic: Black	--	--	--	0.220**	0.211**	0.217**	0.213**	0.206**
				(0.0137)	(0.0137)	(0.0137)	(0.0137)	(0.00675)
Hispanic	--	--	--	0.0611**	0.0560**	0.0678**	0.0582**	0.0591**
				(0.0173)	(0.0173)	(0.0173)	(0.0173)	(0.00836)
Other	--	--	--	0.126**	0.127**	0.132**	0.128**	0.115**
				(0.0252)	(0.0251)	(0.0251)	(0.0251)	(0.0121)
Military veteran	--	--	--	-0.00455	-0.00480	-0.00161	-0.00425	0.00368
				(0.0186)	(0.0185)	(0.0185)	(0.0185)	(0.00903)
Lives in MSA (urban)	--	--	--	0.0734**	0.0705**	0.0647**	0.0701**	0.0568**
				(0.0115)	(0.0114)	(0.0115)	(0.0114)	(0.00566)
Observations	2404248	2239776	572576	567283	567283	567283	567283	2382746
	.	.	.	.	.	.	.	.

** p<0.01, * p<0.05

Note: Includes month dummies; coefficients not shown. The time-trend coefficient is scaled up by sample length. Omitted categories are age 45-54, education <high school degree, white. Robust standard errors in parentheses.