*Economic Quarterly—Volume 100, Number 1—First Quarter 2014—Pages 1–21*

# Measuring Resource Utilization in the Labor Market

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The U.S. unemployment rate increased substantially following the Great Recession, reaching close to 10 percent in the fourth quarter of 2009. As of December 2014, the unemployment rate has declined by more than 4 percentage points, faster than many policymakers forecasted at the time. As unemployment rates declined, labor force participation rates also declined by about 2 percentage points. This has raised doubts on the ability of the unemployment rate alone to accurately represent the state of resource utilization in the labor market.[1] Broader measures than the standard unemployment rate may therefore be needed to indicate resource utilization in the labor market.

In this article, we briefly review the extended unemployment measures of the Bureau of Labor Statistics (BLS), which capture individuals not usually counted as unemployed. Importantly, these measures of unemployment assign the same weight to all nonemployed individuals included in the measures despite there being substantial differences in labor force attachment among the nonemployed. For example, those nonemployed who are actively searching for work usually have a higher transition rate to employment than those who express a desire to work but do not actively engage in job search activities. Presumably these

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[1] See, for example, Appelbaum (2014) or Yellen (2014).

persistent differences in transition rates reflect differences in the degree of labor force attachment.

We therefore proceed to construct an alternative measure of labor utilization—a nonemployment index—that accounts for differences in labor market attachment among nonemployed individuals. Our approach builds on recent advances in our understanding of how individuals transition between labor market states, identifying labor market attachment with observed average transition rates to employment. Since we weight nonemployed individuals by their relative transition rates to employment, our measure can cover all nonemployed individuals, and we are not forced to draw arbitrary distinctions on who is to be included in the set of nonemployed individuals as is necessary even for the usual BLS extended measures of unemployment.

Even though broader measures of resource utilization, that is, the extended BLS measures and our nonemployment index, may better reflect the "true" state of the labor market, the standard unemployment rate may still represent a valid signal of the cyclical state of the labor market.[2] We find that prior to the Great Recession the standard unemployment rate and broader measures of unemployment are indeed moving closely together. Thus, the broader measures of resource utilization and the more narrow standard unemployment rate provide the same signal about the labor market prior to 2007.

After the Great Recession, however, there appears to be a break in the relationship between the standard unemployment rate and the broader measures of resource underutilization. Whether this break implies that the standard unemployment rate understates or overstates the true degree of resource underutilization in the labor market after the Great Recession does however depend on the measure of "true" resource underutilization. If one believes that the BLS measure—the extended unemployment rate U6, which includes the marginally attached and those working part time for economic reasons—best reflects the true state of the labor market, then the standard unemployment rate understates how much labor in the labor market is idle after 2007. If, however, we believe that the nonemployed should be weighted by their workforce attachment, then the standard unemployment rate overstated true resource underutilization for most of the post-2007 period and provides a more or less accurate representation of labor resource underutilization as of 2014.

[2] For instance, the extended unemployment rate U6, which includes the marginally attached and those working part time for economic reasons, is by construction always greater than the standard unemployment rate (U3). Even if U6 more accurately captures the totality of all labor resources that are underutilized in the labor market, it is possible that U3 provides a good indication of the state of the business cycle in the labor market.

Our analysis thus shows that the standard unemployment rate will not always accurately reflect "true" underlying resource underutilization. In particular, taking the nonemployment index as a "true" measure of labor resource underutilization, the discrepancy (or lack thereof) between the signal and the true measure depends on the composition of the nonemployed population by their degree of work attachment.

More than 30 years ago, Flinn and Heckman (1983) pointed out that the distinction between those being unemployed and those being out of the labor force is not clear cut but a matter of degree. Recently, and mostly in the context of estimating matching efficiency of the labor market, Veracierto (2011), Diamond (2013), Elsby, Hobijn, and Şahin (2013), and Hall and Schulhofer-Wohl (2013) have argued that it is important to account for the job seekers out of the labor force in addition to the unemployed. Furthermore, Hornstein (2012) and Krueger, Cramer, and Cho (2014) have argued that even within the group of unemployed the pattern of long-term unemployment suggests significant differences in employability.[3] Kroft et al. (2013) explore how differences in transition rates to employment across unemployed with different unemployment duration and those out of the labor force (OLF) shaped the evolution of the U.S. labor market over the Great Recession. To our knowledge, our nonemployment index is the first measure that consistently aggregates different categories of the nonemployed using observed differences in employability. Similar measures of labor market resource utilization were constructed for the United Kingdom (see Jones, Joyce, and Thomas [2003]; and Schweitzer [2003]).

This article is structured as follows. We first characterize differences in workforce attachment among the nonemployed in terms of their average transition rates to employment. We then review the various (extended) unemployment rates constructed by the BLS and construct an alternative index of nonemployment that weights its components according to their workforce attachment. Finally, we evaluate the quality of the standard unemployment rate as a signal for broader measures of nonemployment.

## 1. HETEROGENEITY OF NONEMPLOYMENT

### The BLS Classification Scheme

Among the most widely reported statistics from the BLS are the shares of the working-age population who are currently employed, unemployed,

[3] Recent resume audit studies (Kroft, Lange, and Notowidigdo 2013; Erikson and Rooth 2014) confirm differences in employability between the short-term and long-term unemployed.

**Table 1 Nonemployment by BLS Categories**

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | Share of Working-Age Population | | | Employment Probability | | |
| | 1994–2013 | 2007 | 2010 | 1994–2013 | 2007 | 2010 |
| | | | Unemployed | | | |
| Short-term | 3.0 | 2.5 | 3.5 | 28.0 | 29.7 | 21.8 |
| Long-term | 1.0 | 0.5 | 2.7 | 14.4 | 15.5 | 10.3 |
| | | | OLF, Want a Job | | | |
| Marginally attached, discouraged | 0.2 | 0.2 | 0.5 | 13.1 | 16.5 | 10.7 |
| Marginally attached, other | 0.4 | 0.3 | 0.3 | 12.7 | 14.9 | 10.2 |
| Other | 1.8 | 1.5 | 1.7 | 14.5 | 15.7 | 12.1 |
| | | | OLF, Do Not Want a Job | | | |
| Other, in school | 4.1 | 4.5 | 5.0 | 8.5 | 8.2 | 6.2 |
| Other, not in school | 7.4 | 7.2 | 7.0 | 7.5 | 8.1 | 6.9 |
| Disabled | 4.6 | 4.8 | 5.2 | 1.7 | 1.7 | 1.4 |
| Retired | 15.4 | 15.2 | 15.4 | 1.4 | 1.5 | 1.4 |

Notes: Share of working-age population and employment transition probability in percent.

and OLF. These shares are estimated using responses from the monthly Current Population Survey (CPS). A nonemployed respondent is counted as unemployed if she has been actively looking for work in the month preceding the survey week. Those neither employed nor actively looking for work are classified as OLF. Starting with the comprehensive revision of the CPS in 1994, the BLS provides additional detail on the labor market attachment of the nonemployed based on survey responses as to why an individual is not actively looking for work. The average population shares for the different nonemployment categories in the CPS are listed in Table 1, columns 1 through 3. We report these shares for the period 1994–2014 and the years 2007 and 2010, that is, the year prior to the Great Recession and the year when unemployment reached its peak.

The unemployed can be subdivided based on their reported length of unemployment. Short-term unemployment (STU) covers those who have been unemployed for 26 or fewer weeks, while long-term unemployment (LTU) encompasses those who have been unemployed for more than 26 weeks. On average, only one-fourth of all unemployed report

more than 26 weeks of unemployment in any one month, but the share of LTU increased to close to one-half following the Great Recession.[4]

The unemployed represent only one-tenth of those without employment. The remaining nine-tenths are OLF.

Over nine-tenths of those OLF do not want a job. Among these individuals we can distinguish between those who are retired, disabled, currently in school, and the remainder. On average, the retired and disabled account for about two-thirds of those who do not want work. Following the Great Recession we saw a noticeable increase in the disabled and those attending school.

While most OLF do not want a job, a little less than one-tenth declare that they do want to work, even though they did not actively look for work in the previous month. Those in this group who want a job, are available for work, and searched for work within the last year (not the last month) are classified as marginally attached. On average, about one-fourth of those who want work are marginally attached, and there are twice as many unemployed as there are marginally attached respondents. Those marginally attached who did not search for a job during the last month because they were discouraged over job prospects are classified as discouraged. On average, discouraged individuals make up about one-third of the marginally attached, but following the recession their share increased noticeably.

### Transition Rates to Employment

We are motivated to examine broader unemployment concepts since the distinction between unemployment and OLF is not as sharp as one would think. In fact, from month to month, roughly twice as many individuals transition from OLF as opposed to unemployment to employment. We now show that the transition rates to employment are indeed positive for all nonemployed, but that there is also substantial heterogeneity in transition rates among the nonemployed. We also show that the pattern of average transition rates to employment among the nonemployed seems to be consistent with the self-reported labor market attachment.

We first use the CPS microdata to construct transition probabilities from nonemployment to employment using the short rotating four-month panels in the CPS. In any month we observe the labor market status in the current and following month for three-fourths of

[4] That the share of LTU has been exceptionally high since 2007 is also evident from the fact that the average share of LTU for the period from 1948–2007 was a mere 15 percent.

the sample. Based on the responses to the CPS questions, we group the nonemployed into the nine nonemployment segments discussed above: the two duration segments of the unemployed, the three segments of OLF who want a job (marginally attached, discouraged, other), and the four segments of OLF who do not want a job (retired, disabled, in school, not in school). We then construct the transition probabilities into employment for each segment by matching the individual records from the CPS microdata month to month.[5] The transition probability from a particular segment of nonemployment to employment is the fraction of that segment that exits to employment from one month to the next.

Table 1, columns 4 through 6, show annual averages of the monthly probabilities of becoming employed for the two unemployment segments and seven OLF segments averaged across 1994–2014, and for the years 2007 and 2010. The probability of becoming employed differs substantially among these groups. The probability is highest for the short-term unemployed: On average they have a 30 percent chance of finding a job within a month. Next are the long-term unemployed and those OLF individuals who want a job: They are about half as likely to become employed as are the STU.[6] Then there is the group of those who do not want a job but who are neither retired nor disabled: They are only one-fourth as likely to become employed as are the STU. Finally, there is the group of retired and disabled who are less than one-tenth as likely to become employed as are the STU.[7]

In recessions the employment probabilities tend to fall for all groups, but the ranking of the different groups in terms of their transition probabilities to employment remains the same.[8] Furthermore, the ranking of employment probabilities coincides with the desire to work as stated in the survey: Those who actively search tend to have higher transition rates to employment than those who want to work but do not actively look for work, and those who want to work have higher transition rates than those who do not want to work.

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[5] Our matching procedure follows the algorithms described in Madrian and Lefgren (1999) and Shimer (2012) The CPS microdata fields are available at http://thedataweb.rm.census.gov/ftp/cps_ftp.html#cpsbasic.

[6] Note that the employment transition rates among the marginally attached OLF do not differ much. In particular, there is no reason to single out discouraged workers based on the likelihood of becoming employed again.

[7] See also Fujita (2014).

[8] See Kudlyak and Lange (2014) for graphs of annual averages of monthly job finding rates for the years 1994 to 2013.

**Classification by Labor Force Status Histories**

The decomposition of the OLF nonemployed as to why they are not actively looking for work is only available since 1994.[9] This is unfortunate since the Great Recession is an exceptional event for the period since 1994, and we therefore cannot tell whether broader measures of labor market resource utilization performed differently during the Great Recession than at other times of stress in the labor market. We therefore consider an alternative measure of the labor force attachment of the nonemployed that is based on individuals' observed labor market histories and that can be constructed for the time period since 1976. This longer time period contains the recessions of the early 1980s when standard measures of unemployment were of a magnitude similar to the Great Recession.

For the period since 1976, Kudlyak and Lange (2014) use the panel feature of the CPS to construct labor market segments based on respondents' labor force status (LFS) histories, that is, their status as employed, unemployed, or OLF in the current month and the preceding two months. They define classes of LFS histories based on the status in the current month, and whether the current status of a nonemployed individual differs from the status in the preceding two months in particular, if the nonemployed was employed (see Table 2). Conditional on this decomposition of the nonemployed for each segment, Kudlyak and Lange (2014) calculate the probability of being employed in the next month. They find significant and persistent differences in the employment probabilities for these segments.

In Table 2 we report the average population shares and employment transition probabilities of the nonemployed for the Kudlyak and Lange (2014) decomposition.[10] The population shares of the nonemployed segments with different LFS histories for the full sample period, 1976–2014, and the post-1994 subsample are very similar. Nonemployed individuals who were employed in at least one of the previous two months have the highest chance of being employed again. For this group, active search increases the probability of reemployment somewhat but not much. Next are the nonemployed who have no recent

[9] Prior to 1994, only individuals who were about to exit the sample were asked about their desire to work. Thus, the job-finding probabilities for the OLF segments by desire to work cannot be constructed prior to 1994.

[10] We should note that there is month-to-month attrition in the CPS sample that is in addition to the outgoing rotation groups. Since the population shares of currently unemployed and OLF in the subsample with complete three-month LFS histories are not the same as the population shares in the full sample, cf Tables 1 and 2, this attrition does not appear to be completely random.

**Table 2 Nonemployment by Labor Force Status Histories**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| | Share of Working-Age Population | | | | Employment Probability | | | |
| | 1976–2014 | 1994–2014 | 2007 | 2010 | 1976–2014 | 1994–2014 | 2007 | 2010 |
| | Currently Unemployed | | | | | | | |
| Recent employment | 1.3 | 1.2 | 1.1 | 1.4 | 38.8 | 39.2 | 40.7 | 34.2 |
| No recent employment | 1.1 | 1.1 | 0.8 | 1.5 | 17.1 | 16.0 | 17.2 | 9.6 |
| Continuously unemployed | 1.4 | 1.3 | 0.8 | 2.8 | 17.7 | 17.2 | 19.0 | 11.0 |
| | Currently OLF | | | | | | | |
| Recent employment | 2.9 | 2.8 | 3.0 | 2.6 | 27.7 | 27.1 | 27.8 | 27.6 |
| No recent employment | 1.3 | 1.3 | 1.0 | 1.9 | 9.6 | 9.5 | 9.6 | 7.1 |
| Continuously OLF | 30.9 | 30.2 | 30.4 | 31.1 | 2.0 | 1.8 | 1.8 | 1.5 |

Notes: The first set of rows covers those nonemployed who are unemployed in the current month and the second set covers those nonemployed who are OLF in the current month. For each group, the first row (Recent employment) denotes those who have been employed at least once in the previous two months; the second row denotes those who have not been employed in any of the previous two months but also not unemployed/OLF in both months; and the last row denotes those who have been unemployed/OLF in both of the previous two months. The share of working-age population and the employment probability are in percent.

employment experience but are actively looking for work: Having no recent work experience reduces the employment probability by more than half. Finally, there are the nonemployed who are not actively looking for work and have no recent employment experience: They are less than one-fourth as likely to find work. Similar to the BLS classification by reason of nonemployment, the employment transition rates decline significantly in a recession, for example from 2007 to 2010 following the Great Recession, but the relative rankings remain constant.[11]

Our evidence from employment transition rates suggests that clear distinctions between being in and out of the labor force are not possible and might not be useful for determining the degree of labor utilization. This conclusion emerges for both methods of measuring labor force attachment. For example, for the BLS classification by reason of nonemployment, those who are OLF but want to work have essentially the same employment probabilities as the long-term unemployed, yet only the latter are included in the standard unemployment rate. Similarly for the Kudlyak and Lange (2014) classification based on LFS histories, even though those nonemployed who are OLF with some recent employment experience are more likely to become employed than those who are unemployed with no recent employment experience, the latter and not the former are included in the standard definition of the unemployment rate.

## 2. MEASURES OF RESOURCE UTILIZATION

The most widely used measure of resource utilization in the labor market is the unemployment rate, U3 to be precise. The unemployment rate is defined as the share of the unemployed, that is, those nonemployed who are actively looking for work, in the labor force where the latter is the sum of the employed and unemployed. We now briefly review the BLS extended measures of unemployment that broaden the set of the potentially employable working-age population, but weight all of these potentially employable equally. Since we have argued above that labor force attachment for the nonemployed is a matter of degree rather than satisfying a simple in or out criteria, we then propose two alternative indices of nonemployment that quantify the degree of labor force attachment. These indices include all nonemployed members of the working age population but weight the nonemployed according to their average employment transition rate.

[11] Again, see Kudlyak and Lange (2014) for time series of annual averages of the transition rates.

### Extended Unemployment Rates from the BLS

The BLS constructs extended measures of unemployment that move subgroups from OLF to unemployed. In particular, the U4 rate adds discouraged workers from the marginally attached, and the U5 rate includes all marginally attached. The corresponding unemployment rates are defined as before with appropriately adjusted labor force measures. In addition, the BLS publishes the U6 rate, which includes those employed who are working part time for economic reasons (PTfER) in the unemployment rate.[12] These individuals, sometimes referred to as involuntary part-time workers, would have preferred to work full time but had to work part time because they did not find full-time work or because their hours had been reduced to part-time work. Including these employed among the unemployed is usually motivated by the argument that, like the unemployed, they are not employed as much as they would like to be. For each of these extended measures of unemployment, the group that is added receives the same weight as the unemployed who are part of U3.[13]

### Nonemployment Rates Adjusted for Labor Market Attachment

We now construct a nonemployment index (NEI) that is more comprehensive than the unemployment rate but also accounts for the fact that not all nonemployed are equally attached to the labor market. Our proposed NEI is a weighted average of the population shares of the various subgroups among the unemployed and OLF, where the weight for each subgroup is given by the sample average of its employment transition rate relative to the group with the highest transition rate. Our index thus measures the effectively available labor resources in units of the group with the strongest labor market attachment.[14] We use sample

[12] Unlike for U4 and U5, adding those working PTfER does not increase the labor force in the definition of the unemployment rate.

[13] Bregger and Haugen (1995) provide a short history of the BLS extended measures of unemployment.

[14] Our procedure to adjust available nonemployed for their effective labor market attachment is similar to the quality adjustment of employment, where one uses relative wages as measures of relative labor efficiency. These quality-adjusted employment measures have a long tradition in labor economics. For example Katz and Murphy (1992) use this method to generate efficiency units of labor supply by education group. In addition to weighting the nonemployed by their relative job finding rate, one can consider the quality of jobs that different segments of the nonemployed find. This investigation is beyond the scope of the article.

averages of the transition rates to ensure that the variation in the index over time is not driven by cyclical changes in relative transition rates.

We construct two versions of the NEI. The first version uses the BLS classifications of nonemployment for the period from 1994 on, NEI1 for short, and the second version uses the Kudlyak and Lange (2014) classification scheme based on LFS histories from 1976 on, NEI2 for short. Employment transition rates are defined relative to the short-term unemployed for the BLS classification and relative to the unemployed with some employment in the previous two months for the LFS history classification.

For each NEI we also construct a version that incorporates those working part time for economic reasons. We weight this group by the product of its relative transition probability to full-time employment and its "underutilization" rate. Analogous to the weighting of the nonemployed, we normalize the transition rate relative to the highest employment transition rate among the group of the nonemployed. The underutilization rate is defined as the ratio of the difference of the average weekly hours worked by those working full time and the average weekly hours worked by those working part time for economic reasons to the average weekly hours worked by those working full time.

Using the CPS microdata from January 1994 to December 2013, we find that the average monthly transition probability from involuntary part-time work to full-time work is 0.30, about the same as the employment transition rate of the short-term unemployed. The average work week of those working PTfER is 22.9 hours, about half of the work week of those working full time, which is 44.5 hours.[15] Those working part time for economic reasons therefore receive a weight of about one-half in the nonemployment index.[16]

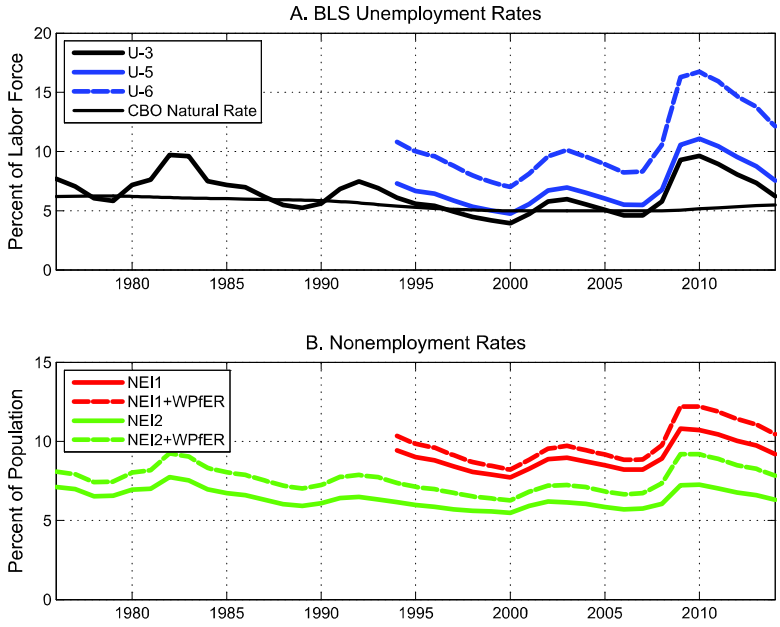
## A First Look at Resource Utilization, 1976–2014

The qualitative features of the standard unemployment rate, the extended unemployment rates, and the nonemployment rates are essentially the same: They rise and fall together and all increase more

[15] For these calculations we use reported "actual total" hours worked. Alternatively, we could use "usual total" hours worked, or "total" or "usual" hours worked at the primary job. For these various hours measures, the implied weight on those working part time for economic reasons in the nonemployment index then ranges from 0.133 to 0.145. Thus our choice of "hours worked" definition maximizes the weight for those working part time for economic reasons.

[16] Hornstein, Kudlyak, and Lange (2014) and Hornstein et al. (2014) use an ad hoc weight of 0.5 for those working part time for economic reasons. This weighting choice also follows the pre-1994 BLS definition for U6, Bregger and Haugen (1995).

**Figure 1 Measures of Labor Market Resource Utilization**




Notes: The series are annual averages of monthly unemployment rates and nonemployment rates. The BLS unemployment rates in Panel A are the standard U3 unemployment rate for the period 1976–2014, black line, and the extended unemployment rates, U5 (solid blue) and U6 (dashed blue) for the period 1994–2014. The extended rate U5 includes unemployed and marginally attached workers, and U6 includes unemployed and marginally attached and those working part time for economic reasons. The thin black line is the CBO natural rate of unemployment. The nonemployment rates in Panel B are our alternative measures based on BLS nonemployment categories for 1994–2014, red solid line, and LFS histories for 1976–2014, green solid line. The corresponding dashed lines include weighted employed who are working part time for economic reasons.

following the Great Recession than they did during the 2001 recession. The standard unemployment rate U3 and the two extended unemployment rates U5 and U6 are displayed in the top panel of Figure 1, and the two nonemployment indices, with and without PTfER, are displayed in the bottom panel of Figure 1. The rates differ in their levels and to some extent in their volatility.

It is common to assume that because of frictions in the labor market there will always be some unemployment in the economy. In other words, there is a natural rate of unemployment and policy should only be concerned with deviations from that natural rate. For the standard U3 unemployment rate, the most frequently referenced estimate of the natural rate is provided by the Congressional Budget Office (CBO), the thin black line in the top panel of Figure 1. The CBO has the natural rate increasing from about 5.2 percent in 1950, to 6.2 percent in the late 1970s, from where it declines to 5 percent by 2000, and then increases again to 5.5 following the Great Recession. According to the CBO, the natural rate is essentially 5 percent with some upward allowance made when actual unemployment is high.

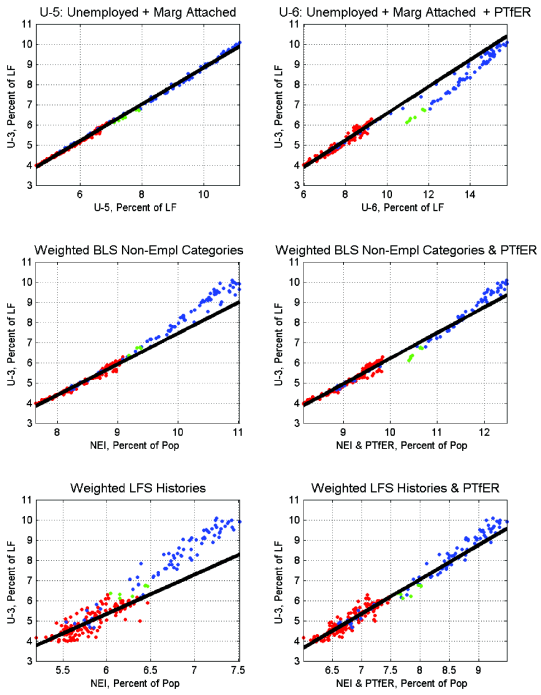
By construction, the extended unemployment and nonemployment rates are higher than the standard unemployment rate, but similar to the standard unemployment rate, therefore one could define natural rates that stay close to the respective lower bounds of these broader utilization measures. Rather than constructing these alternative natural rates, in the following we will study how well the standard unemployment rate does as a signal for the broader utilization measures. This approach is motivated by the fact that prior to the Great Recession the standard unemployment rate was widely accepted as the relevant measure of labor market utilization. If, following the Great Recession, we now believe that a broader utilization measure is more appropriate, we would like to know how closely the standard unemployment rate was correlated with the broader measure prior to 2007 and in what way the relation between the standard unemployment rate and the broader measure broke down after 2007.

## 3. NARROW AND BROAD MEASURES OF UNEMPLOYMENT AFTER 2007

Pointing to the exceptionally large increase of discouraged workers and those working PTfER after the Great Recession, it is often argued that the standard unemployment rate understates the degree of resource underutilization for this period. We now argue that while this may be true for the BLS measure U6, for nonemployment measures that account for differences in workforce attachment the standard unemployment rate actually overstates "true" unemployment for this period.

In Figure 2 we plot monthly data of the standard unemployment rate U3 against various broader measures of unemployment for the

**Figure 2 The Unemployment Rate as a Signal of Labor Market Utilization, 1994–2014**




Notes: All panels plot the standard unemployment rate U3 on the vertical axis against alternative measures of labor market utilization on the horizontal axis. In the first column the alternative measures are on the first row the extended BLS unemployment rate U5, on the second row the NEI based on weighted BLS nonemployment categories, and on the third row the NEI based on weighted LFS histories. The second column adds those working part time for economic reasons, unweighted in the first row (U6) and weighted for the NEIs in the second and third rows. The sample period is 1994 to 2014 for monthly data.

period 1994 to 2014.[17] The rows represent our different broad measures of unemployment, U5, NEI1, and NEI2, and the right columns add

[17] Scatterplots for annual averages of the monthly unemployment and nonemployment rates have the same qualitative features, but the structural breaks estimated in Table 3 are no longer statistically significant.

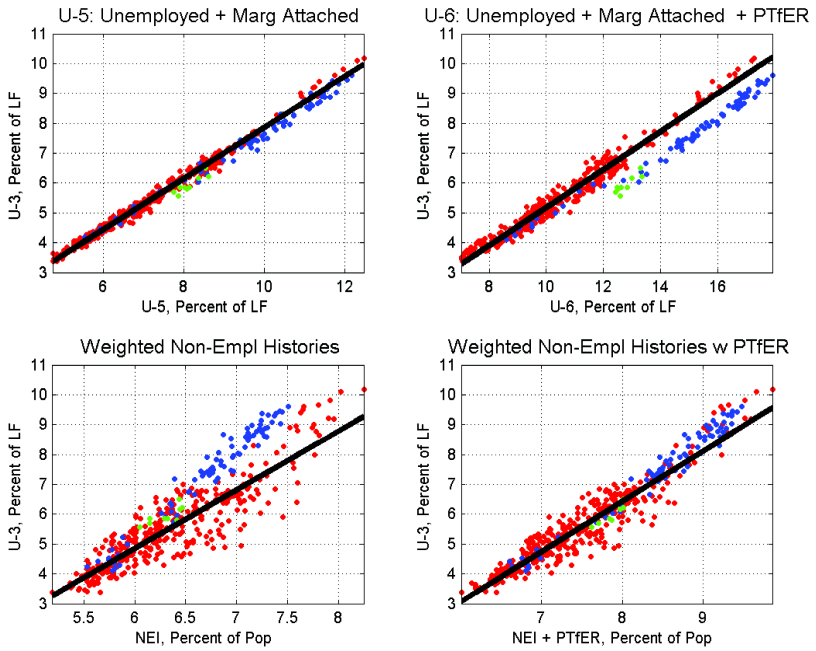
those working PTfER to these broader measures. For each panel we plot the fitted line for a regression of U3 on the relevant broad measure of unemployment for the sample period 1994 to June 2007, represented by the red dots in the different panels. This sample represents the period when presumably there was a close relationship between the standard unemployment rate U3 and the alternative broader measures of unemployment. If the actual U3 unemployment rate for the period after June 2007 is consistently below (above) the fitted line for the pre-2007 sample, then we would say that U3 understates (overstates) true unemployment relative to the pre-2007 relation. For the post-2007 period, we distinguish between the months from July 2007 to December 2013, blue dots, and the year 2014, green dots, the most recent period.

A close relationship between U3 and the extended BLS unemployment rates for the time prior to June 2007 is apparent in the top row of Figure 2, somewhat less so for U6 than for U5. However, for most of the period after June 2007, U3 is consistently below what would have been predicted based on U6 for the pre-2007 period but not so much for U5. Given that including marginally attached workers in U5 does not have much of an impact, the break in U6 is indeed almost exclusively attributable to the exceptional increase of those working PTfER. Since the increase of those working PTfER has persisted into 2014, U3 continues to understate unemployment relative to pre-2007.

Proceeding now to our nonemployment indices we also find a close relationship between them and U3 for the pre-2007 period, somewhat less so for NEI2 based on LFS histories than for NEI1 based on BLS nonemployment categories. Contrary to the extended BLS unemployment rates, we find that for the post-2007 period U3 actually overstates unemployment relative to the NEIs that exclude those working PTfER. This break relative to the pre-2007 relation is due to the exceptionally large increase of long-term unemployment following the Great Recession. Since our NEIs down-weight long-term unemployed significantly relative to short-term unemployed, the NEIs increase less than U3 after the Great Recession. Including those working PTfERs in the NEIs then reduces the overstatement of U3 after 2007, since the exceptional increase in those working PTfER compensates for the exceptional increase in long-term unemployment. As of 2014, however, observations on U3 appear to be consistent with the pre-2007 relationship between U3 and any of our NEI.

The magnitude of nonemployment after 2007 for any of our measures is exceptional relative to the time period from 1994 to 2007. It is therefore not obvious that the relationship between U3 and broader measures of unemployment can be extrapolated from the pre-2007 period. While the extended BLS measures of unemployment and the NEI

**Figure 3 The Unemployment Rate as a Signal of Labor Market Utilization, 1976–2014**




Notes: All panels plot the standard unemployment rate U3 on the vertical axis against alternative measures of labor market utilization on the horizontal axis. In the first column the alternative measures are on the first row—our estimate of the extended BLS unemployment rate (U5), and on the second row the NEI based on weighted LFS histories. The second column adds those working part time for economic reasons, unweighted for U6 and weighted for the NEI. The sample period is 1976 to 2014 for monthly data.

that is based on BLS nonemployment categories are only available from 1994 on, we can construct the NEI that is based on LFS histories for the years from 1976 on, a period that contains unemployment rates that are comparable to the unemployment rates following the Great Recession. In Figure 3 we plot the standard U3 unemployment rate

**Table 3 Post-2007 Bias of the U3 Unemployment Rate**

| | |
|---|---|
| **BLS Extended Unemployment Rates, 1994–2014** | |
| U5 | 0.02 (0.02) |
| U6 | −0.28 (0.05) |
| **NEI Based on BLS Nonemployment Categories, 1994–2014** | |
| Without WPfER | 0.31 (0.05) |
| With WPfER | 0.02 (0.05) |
| **NEI Based on LFS Histories, 1994–2014** | |
| Without WPfER | 0.47 (0.09) |
| With WPfER | −0.15 (0.07) |
| **NEI Based on LFS Histories, 1976–2014** | |
| Without WPfER | 0.96 (0.07) |
| With WPfER | 0.15 (0.05) |

Notes: Coefficients $c$ for a structural break in June 2007 in the OLS regression $U3(t) = a + b * X(t) + c * B(t)$ where $B(t)$ is 1 after June 2007 and 0 before, and $X(t)$ is a broad measure of nonemployment as indicated in the subheaders and row titles. The regression is performed on monthly data. The break coefficients are in percentage points with standard error in parentheses. NEI = nonemployment index as described in the article. WPfER = working part time for economic reasons.

against our versions of the extended BLS unemployment rates and the NEI based on LFS histories for the sample period from 1976 to 2014.[18]

The qualitative features of Figure 3 for the period following the Great Recession are the same as in Figure 2. Relative to the pre-2007 period, the standard unemployment rate U3 understates "true" unemployment for the BLS extended unemployment rates and overstates "true" unemployment for the nonemployment index from 2007 to 2013. More recently, in 2014 U3 has been well in line with the NEIs but it continues to understate unemployment relative to U6.

We can formalize our discussion by simply running a linear regression of the standard unemployment rate U3 on the various broader measures of unemployment for the full sample while allowing for a structural break in the middle of 2007. In Table 3 we report the coefficient of the parallel shift term of the relationship between U3 and the broader measures of unemployment. Relative to the pre-2007 period,

[18] Since information on marginally attached OLF is not available prior to the 1994 comprehensive revision of the CPS, we approximate the marginally attached nonemployed with the LFS history group that is currently OLF and was not employed in the last two months. For the time period from 1994 to 2007 when both series are available, the extended unemployment rates U5 calculated using either the marginally attached or the OLF without recent employment are closely aligned. Following Polivka and Miller (1998), the number of those working PTfER is scaled by a factor of 0.806 prior to the 1994 CPS redesign.

U3 is "understated" by about 0.3 percentage points for the extended BLS U6 unemployment rate, whereas it is "overstated" for the NEIs by up to one percentage point in the case of NEI2 for the sample 1976–2014.

## 4. CONCLUSION

All the measures of resource utilization in the labor market that we review in this article suggest that as of 2014 nonemployment has declined since the peak in 2010. In particular, even though the standard unemployment rate is still above its 2007 level, it has declined significantly. The decline in the standard unemployment rate is occasionally discounted because extended measures of unemployment that include those working part time for economic reasons seem to suggest that, following the Great Recession, the standard unemployment rate has understated "true" unemployment. In our view broader measures of nonemployment need to account for the heterogeneity in workforce attachment of the nonemployed. Extended measures of unemployment rates provided by the BLS do not. We have constructed such alternative measures of nonemployment and find that for most of the years following the Great Recession the standard unemployment rate actually overstated "true" unemployment and that as of 2014 the standard unemployment rate provides a reasonably accurate measure of "true" unemployment.

## APPENDIX

Data for the BLS unemployment rates have been downloaded from Haver. The time series for the CBO estimate of the natural rate of unemployment has been downloaded from FRED. Data for the population shares and employment transition rates for nonemployment by reason and LFS history are from Kudlyak and Lange (2014).

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