

# FRBSF Economic Letter

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## How Much Has Job Matching Efficiency Declined?

Andreas Hornstein and Marianna Kudlyak

During the recession and recovery, hiring has been slower than might be expected considering the large numbers of vacant jobs and unemployed individuals. This raises some concern about structural changes in the process of matching job seekers with employers. However, the standard measures account for only the unemployed and not those who are out of the labor force. Including other non-employed groups in the measured pool of job seekers while adjusting for different job finding rates among these groups shows that the decline in matching efficiency is similar to earlier declines.

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Labor markets are typically slow to adjust, or “frictional.” This means that it takes time for a worker to find a job or for a firm to fill a vacant position because necessary skills, preferences, and compensation need to line up. Modern macroeconomics relies on the framework of Diamond-Mortensen-Pissarides (Pissarides, 2000) to describe how new job matches are made. The framework describes how the combination of job seekers who are looking for jobs and vacant positions that need to be filled, that is, the inputs to the “job matching function,” results in new matches. The extent of labor market frictions is reflected in the efficiency of the job matching process.

During the 2007–09 recession and subsequent recovery, the slow rate at which unemployed individuals found new jobs suggests that the efficiency of the job matching process has deteriorated (Sahin et al., 2014). However, properly assessing changes in the match rate and its implied efficiency requires a closer examination of inputs into the matching process, analogous to the inputs into the production process for the economy’s overall output. The standard approach for assessing the job matching process takes into account only available active job seekers—the unemployed—and assumes that each seeker is equally likely to land a job.

In this *Economic Letter*, we assess the matching efficiency of the U.S. labor market based on a broader characterization of job seekers. Building on the Non-Employment Index (NEI) of Hornstein, Kudlyak, and Lange (2014), we expand the pool of job seekers to include not only active searchers (the unemployed) but also those not actively searching who are out of the labor force (OLF). We also account for the very different rates at which these non-employed groups find jobs. This more comprehensive approach implies smaller estimated declines in matching efficiency during recessions, including the 2007–09 episode, in part because average search effectiveness increases as the number of non-employed people increases.

### Different job finding rates

The search and matching framework used in labor market research characterizes the creation of new hires as a function of the stocks of job seekers and vacancies, and a residual term denoting the aggregate

efficiency of the matching process. Under the standard approach, which includes only the unemployed and assumes equal job finding rates among them, the matching efficiency can be calculated from observing how long it takes for an unemployed person to become employed—known as the employment transition rate—and the ratio of vacancies to unemployment—known as market tightness. The standard approach does not include the OLF among job seekers even though they account for more than two-thirds of all new transitions into employment (Hornstein et al. 2014). A more comprehensive measure of the potential job seeker pool should therefore include all non-employed—the unemployed plus the OLF. However, since the OLF have significantly lower employment transition rates, it's also important to account for the different employment transition rates for each group.

The Non-Employment Index proposed in Hornstein et al. (2014), represents such a measure and differentiates among the unemployed between those who are short-term and long-term unemployed. For the OLF group, it also distinguishes between those who want to work, those who do not want to work because they are disabled or retired, and those who do not want to work for schooling or other reasons. These groups are characterized by large and persistent differences in employment transition rates, and their shares among all non-employed change over time (Kudlyak 2017). During the last two recessions, 2001 and 2007–09, the population share of the non-employed increased primarily because of a contemporaneous increase in unemployment. The increase of long-term unemployment in the 2007–09 recession was especially striking. In the subsequent recovery, unemployment has declined but the working-age share of non-employment has remained elevated because the number of people who are disabled or retired has increased.

The differences in employment transition rates between groups of job seekers capture differences in their search effectiveness. When the composition of job seekers shifts toward groups with typically lower transition rates, the overall number of new hires in the economy, all else being equal, falls. This reduction takes place not because of a deterioration in the aggregate matching efficiency but rather because of a decline in the average search effectiveness. In Hornstein and Kudlyak (2016), we formally show that ignoring differences in job seekers' typical job finding rates leads to conflating changes in overall matching efficiency with changes in average search effectiveness.

### Measuring effective job seeker pool with the non-employment index

Now we estimate the matching efficiency of the labor market using the more generalized pool of job seekers as measured by the NEI, which includes both the unemployed and OLF and allows for differences in search effectiveness.

By definition, the NEI is the weighted sum of all of the non-employed groups. Critically, the weights are designed to account for each group's average employment transition probability. We use the short-term unemployed as the basis for comparison, assigning a weight to other groups based on their relative rates of finding a job. Only the relative weights matter for our purposes. Hence, the short-term unemployed have a weight of one, and the remaining groups have weights of less than one.

By construction, the level of the NEI is larger than the standard measure of unemployment. However, similar to the unemployment rate, it increases during recessions and declines during recoveries. Furthermore, like the unemployment rate, the NEI has returned to its pre-recession lows (Kudlyak 2017).

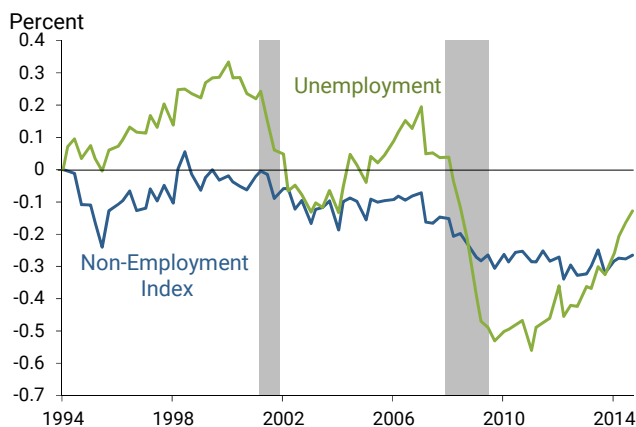
### Matching efficiency and non-employment index

The NEI can be thought of as a composition-adjusted measure of the entire pool of available job seekers. Using this measure of the job seeker pool, we can express changes in the average employment transition rate in the economy as the sum of changes coming from three components: the ratio of vacancies to job seekers (labor market tightness), the average search effectiveness of job seekers, and the remainder that represents aggregate matching efficiency. To illustrate this breakdown in Figure 1, panel A shows the average employment transition rates, panel B shows the market tightness, panel C shows the average search effectiveness, and panel D shows the matching efficiency for the standard measure of (unweighted) unemployment and the NEI. Each panel shows quarterly data for the period January 1994 through December 2016, normalized to zero in 1994.

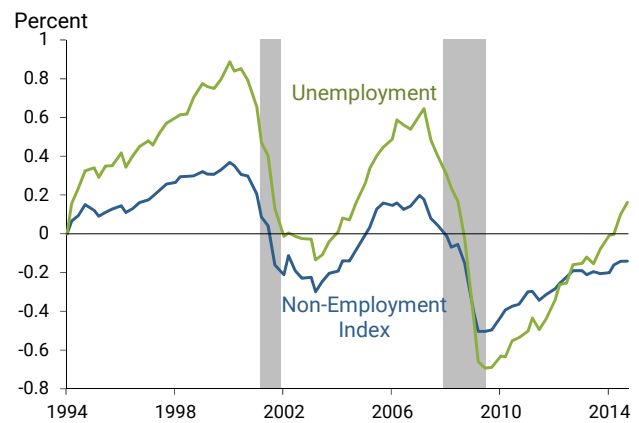
The average employment transition rate declines in recessions and increases in expansions, as shown in panel A. This simply reflects the countercyclical pattern for all of the component transition rates. As we expand the coverage of the search pool from the narrow unemployment measure to the NEI, the average transition rate becomes less volatile. In particular, the average transition rate declines less in recessions.

**Figure 1**  
**Average employment transition rate and its components, unemployment vs. NEI: 1994–2016**

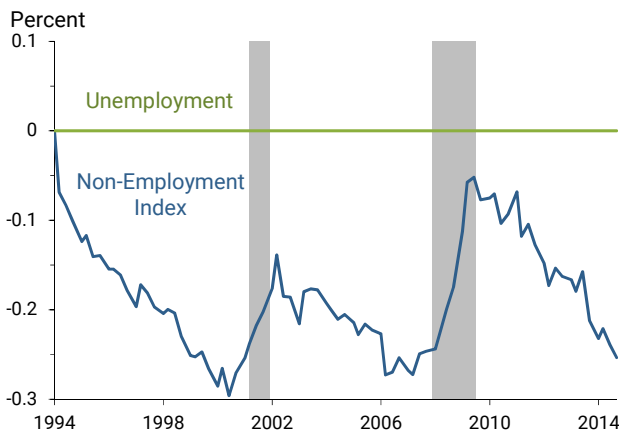
**A. Average transition rate**



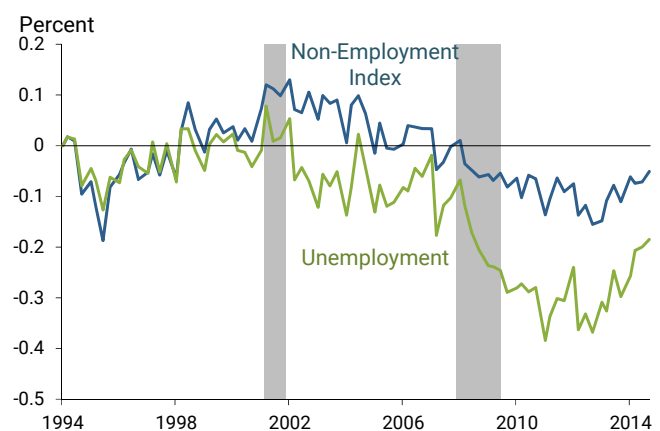
**B. Contribution from market tightness**



**C. Contribution from average search effectiveness**



**D. Contribution from matching efficiency**



Note: Measurements are percent changes normalized to 0 in 1994. Shaded bars reflect NBER recession periods.  
 Source: Authors' calculations using Current Population Survey data from U.S. Census Bureau.

This is because the transition rates of the OLF decline less in recessions relative to the employment transition rates of the unemployed. Furthermore, the unemployed, with highly volatile transition rates, represent a relatively small share of the NEI.

Market tightness has the same cyclical pattern as the average employment transition rate: It declines in recessions and increases in expansions, as shown in panel B. This feature reflects the fact that vacancy postings decline and non-employment increases in recessions (see Barnichon 2010 for the vacancy measure). The volatility of market tightness declines as we expand the coverage of the search pool because the number of non-employed, which includes OLF, is less volatile than the unemployed alone.

In the standard matching framework, the average search effectiveness is constant over time (straight green line in panel C) because this framework assumes that search effectiveness is the same across active job seekers, that is, the unemployed. By incorporating differences in search effectiveness in our generalized matching framework, the average search effectiveness for the NEI measure reflects the composition of the search pool. Note that this measure increases in recessions for two key reasons. First, the share of OLF (do not want work) in total non-employment declines in recessions. Second, both components of OLF (do not want work) receive smaller weights than all other non-employment components in the search pool, which have higher employment transition rates.

Finally, matching efficiency is the residual that, together with market tightness and average search effectiveness, accounts for the movements in average employment transition rates. In panel D, we construct measures of matching efficiency for the NEI and for the standard measure of unemployment. Notice that the decline in market tightness in terms of the standard measure of unemployment accounts for some of the decline in the average transition rate. Nevertheless, with no change in average search effectiveness, a significant decline in matching efficiency is needed to account for the post-2007 decline in the transition rate when we look only at the standard unemployment measure. For the search pool that includes all non-employed, the average employment transition rate is less volatile relative to market tightness, and average search effectiveness increases in recessions. Consequently, the matching efficiency exhibits substantially smaller declines during recessions. We find that the decline in the matching efficiency after 2007–09 is similar to the one in the earlier periods.

## Conclusion

In this *Letter*, we propose a more comprehensive way to measure the efficiency of the matching process between people looking for work and job openings. Expanding the coverage of the pool of job seekers while accounting for the differences in search effectiveness among various non-employed groups reduces the previously measured decline in matching efficiency associated with the 2007-09 recession. In other words, for the broader measure of non-employment that includes all non-employed—the unemployed and those who are out of the labor force—the decline in the efficiency of the U.S. labor market after 2007-09 is similar to the declines measured in earlier periods. The apparent decline reflects a compositional shift in the entire non-employed population towards those out of the labor force who typically experience lower job finding rates.

*Andreas Hornstein is a senior advisor at the Federal Reserve Bank of Richmond.*

*Marianna Kudlyak is a senior economist in the Economic Research Department of the Federal Reserve Bank of San Francisco.*

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