Measuring Job-Finding Rates and Matching Efficiency with Heterogeneous Jobseekers

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Basic ideas

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Matching efficiency determines the weights for aggregating jobseekers.
Findings

Jobfinding rates measured over a year rather than only a month give a better picture of the jobfinding process.
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One-year job-finding rates for losers of permanent jobs fell from 70 percent to 52 percent from a peak in 2005 to a trough in 2009 and reached 60 percent in 2012.

Matching efficiency based on one-year jobfinding rates was essentially stable over the years from 2001 through 2012.

The large adverse shift of the conventionally measured Beveridge curve is the result of changes in the composition of the unemployed and the omission of large numbers of jobseekers, not a decline in matching efficiency.
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Matching function

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Most investigators take the function to have constant returns to scale
The job-seeking success hazard associated with $m$ is

$$f = \phi \left( \frac{V}{X} \right) = \frac{m(X, V)}{X} = m \left( 1, \frac{V}{X} \right)$$
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f = \phi \left( \frac{V}{X} \right) = \frac{m(X, V)}{X} = m \left( 1, \frac{V}{X} \right)
\]

\( f \) is the flow rate into new jobs of members of the homogeneous population measured by \( X \).
AGGREGATION OF JOBSEEKERS

Effective number of jobseekers

\[ X = \sum \mu_i \psi_i P_i \]
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Effective number of jobseekers

\[ X = \sum_{i} \mu_i \psi_i P_i \]

Total hires are

\[ H = \sum_{i} H_i \]
Aggregation of jobseekers

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Assumption. Scaled matching hazard function and common pools of vacancies and competing jobseekers:

\[ H_i = \mu_i \psi_i \phi \left( \frac{V}{X} \right) P_i \]
Aggregation Theorem

Let $m$ be the matching function corresponding to the jobseeking success hazard function $\phi$. Then

$$H = m(X, V)$$
**Aggregation Theorem**

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$$H = m(X, V)$$

Proof:

$$H = \sum_i H_i = \sum_i \mu_i \psi_i \phi \left( \frac{V}{X} \right) P_i = \phi \left( \frac{V}{X} \right) X = m(X, V)$$
Comments

We do not consider the distinction between a contact of a jobseeker and employer and the creation of a job match—the matching function takes account of the fact that many contacts do not result in hires.
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Only the product of $\mu_i$ and $\psi_i$ appears in these equations, not the two measures separately—there is no prospect of distinguishing changes in matching efficiency from changes in search propensities.
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Only the product of $\mu_i$ and $\psi_i$ appears in these equations, not the two measures separately—there is no prospect of distinguishing changes in matching efficiency from changes in search propensities.

From this point forward, we define $\gamma_i$ as the product $\mu_i\psi_i$—we refer to $\gamma_i$ as efficiency, but it should be kept in mind that a decline in our measure of efficiency may arise from a decline in the search propensity of a type rather than a decline in the efficiency of the search of those choosing to search.
**Applying Aggregation**

Consensus functional form

\[ H = X^{\eta} V^{1-\eta} \]
Applying aggregation

Consensus functional form

\[ H = X^\eta V^{1-\eta} \]

Solve for job-finding function

\[ \phi \left( \frac{V}{X} \right) = \left( \frac{V}{H} \right)^{\frac{1-\eta}{\eta}} \]
Applying aggregation

Consensus functional form

\[ H = X^\eta V^{1-\eta} \]

Solve for job-finding function

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Job-finding rate

\[ f_{i,t} = \gamma_{i,t} \left( \frac{V_t}{H_t} \right)^{\frac{1-\eta}{\eta}} = \gamma_{i,t} T_t \]
Tightness and efficiency

Tightness measure

\[ T_t = \left( \frac{V_t}{H_t} \right)^{\frac{1-\eta}{\eta}} \]
Tightness and efficiency

Tightness measure

\[ T_t = \left( \frac{V_t}{H_t} \right)^{\frac{1-\eta}{\eta}} \]

Matching efficiency

\[ \gamma_{i,t} = \frac{f_{i,t}}{T_t} \]
TIME SPAN TO MEASURE JOBFINDING

Almost all earlier research uses the monthly jobfinding rate
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Important recent exception is Krueger, et al., who considered spans of up to 13 months, for jobseekers who had been unsuccessful for more than 6 months (long-term unemployed)
TIME SPAN TO MEASURE JOBFINDING

Almost all earlier research uses the monthly jobfinding rate. Important recent exception is Krueger, *et al.*, who considered spans of up to 13 months, for jobseekers who had been unsuccessful for more than 6 months (long-term unemployed). Indirect evidence that jobseekers often take very short jobs, so that jobseeking success does not cumulate—the likelihood that a jobseeker will have a job a year from now is not nearly as high as it would be if the jobseeker had 12 chances for re-employment at jobs that last at least 12 months.
Logit specification for jobfinding rates

\[ f_{i,t,\tau,x} = \frac{\exp (\kappa_{i,t,\tau} + x' \beta_{i,\tau})}{1 + \exp (\kappa_{i,t,\tau} + x' \beta_{i,\tau})} \]

\( \kappa_{i,t,\tau} \) is the time effect at date \( t \) for workers in status \( i \) and a span of \( \tau \) months.
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Data
Monthly CPS for November 1999 through March 2014
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Because the CPS interviews households for four consecutive months, skips the next 8 months, then interviews again for four months, each person covered for every scheduled interview contributes 6 observations spanning single months, 4 spanning two months, 4 spanning 12 months, and one spanning 15 months, to give a few examples.
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In principle, we can study job-seeking spans of one, two, three, nine, 10, 11, 12, 13, 14, and 15 months—for simplicity, we omit the nine-, 10- and 11-month spans and focus on the short spans from one through three months and the long spans from 12 through 15 months.
Labor-market status, not unemployed

1. *Out of labor force*: people who did not satisfy the CPS definition of either employed or unemployed
2. *Working*: employed people
Labor-market status, unemployed for three weeks or less

3. *Recently laid off*: unemployed people who have been on furlough for three weeks or less from an earlier job, with the possibility of recall.

4. *Recently lost permanent job*: people who lost jobs within the previous three weeks, not on layoff or separated from a temporary job, who were working or left military service immediately before they began looking for work.

5. *Temp job recently ended*: unemployed people, not on layoff, whose last jobs were explicitly temporary and ended within the past three weeks or less.

6. *Recently quit*: unemployed people who quit their last jobs within the past three weeks.

7. *Recently entered*: unemployed people who have never worked and who started looking for work within the past three weeks.

8. *Recently re-entered*: unemployed people, who started looking for work within the past three weeks, who were not working or in military service immediately before they began looking for work, but who have worked at some time in the past.

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Labor-market status

Unemployed for 4 to 26 weeks:

  9. On layoff for months
10. Lost permanent job months ago
11. Temp job ended months ago
12. Quit months ago
13. Entered months ago
14. Re-entered months ago
15. *Long-term unemployed*
Variables describing personal characteristics

Indicators for

- female
- married
- six age groups—16–24, 25–34, 35–44, 45–54, 55–64, and 65-plus
- four education groups—less than high school, high school graduate, some college but less than a bachelor’s degree, and bachelor’s or higher degree
- five unemployment duration groups, for the equations describing job-finding conditioned on unemployment of 4 to 26 weeks—categories are 4–8 weeks, 9–13 weeks, 14–17 weeks, 18–21 weeks, and 22–26 weeks.
# Subsequent Employment Probabilities

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Estimating the elasticity of the jobfinding rate with respect to tightness

From earlier,

\[ \log f_{i,t,\tau} = \log \gamma_{i,t,\tau} + \nu_{\tau} \log d_{t} + \epsilon_{i,t,\tau}^{m} \]
Estimating the elasticity of the jobfinding rate with respect to tightness

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We assume that matching efficiency satisfies

\[ \log \gamma_{i,t,\tau} = \alpha_{i,\tau} + \delta_{i,\tau} t + \psi_{i,s} + \xi_{i,t,\tau} \]
Estimating the elasticity of the jobfinding rate with respect to tightness

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We assume that matching efficiency satisfies
\[ \log \gamma_{i,t,\tau} = \alpha_{i,\tau} + \delta_{i,\tau} t + \psi_i + \xi_{i,t,\tau} \]

Thus the estimating equation is
\[ \log f_{i,t,\tau} = \alpha_{i,\tau} + \delta_{i,\tau} t + \psi_i + \nu_\tau \log d_t + \epsilon_{i,t,\tau} \]
with
\[ \epsilon_{i,t,\tau} = \epsilon_{i,t,\tau}^m + \xi_{i,t,\tau} \]
IDENTIFYING ASSUMPTIONS

\[ \mathbb{E} (\varepsilon_{i,t,T} | t) = 0 \]
Identifying Assumptions

\[ E(\epsilon_{i,t,\tau}|t) = 0 \]

\( \epsilon_{i,t,\tau} \) is orthogonal to the log of real GDP.
Number of Monthly Hires, in Thousands, from the JOLTS and the CPS

![Graph showing the number of monthly hires from the JOLTS and CPS from 2001 to 2013.]
NUMBER OF JOB OPENINGS, IN THOUSANDS, FROM JOLTS
Labor-Market Tightness, Calculated from JOLTS
### Estimated Elasticities of Jobfinding with Respect to Market Tightness

<table>
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<tr>
<th>Monthly span of job-finding rate</th>
<th>Include job-to-job movers?</th>
<th>Elasticity with respect to vacancy duration</th>
<th>Implied elasticity of the matching function</th>
<th>Standard error of residuals</th>
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<td>(0.206)</td>
<td>(0.048)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Short</td>
<td>No</td>
<td>1.164</td>
<td>0.462</td>
<td>0.191</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.219)</td>
<td>(0.051)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Long</td>
<td>No</td>
<td>0.411</td>
<td>0.709</td>
<td>0.189</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.237)</td>
<td>(0.134)</td>
<td>(0.016)</td>
</tr>
</tbody>
</table>

Table 5: Estimated Elasticities of Job-finding with Respect to Market Tightness.

Residual matching efficiency

\[ \epsilon_{i,t,\tau} = \log f_{i,t,\tau} - \alpha_{i,\tau} - \delta_{i,\tau} t - \psi_{i,s} - \nu_{\tau} \log d_t \]
Residual Matching Efficiency

(a) Out of labor force

(b) Employed

(c) Recently laid off

(d) Recently lost permanent job

(e) Recently quit

(f) Recently entered

(g) Recently re-entered

(h) On layoff for months

(i) Lost permanent job months ago

(j) Temp job ended months ago

(k) Quit a job months ago

(l) Entered months ago

(m) Re-entered months ago

(n) Long-term unemployed

1–3 months

12–15 months
(d) Recently lost permanent job

Figure 5: Detrended Matching Efficiency, 2001 through 2012, for Selected Initial Statuses

Source: Authors' calculations from Current Population Survey microdata. Annual averages of monthly data. Vertical bars show a range of plus or minus one standard error around point estimates. Measures for 1- to 3-month spans derived from estimates of equation (13) including data including job-to-job transitions.
Overall Matching Efficiency

(a) detrended

(b) including trends

1−3 months, including E−E 1−3 months, excluding E−E 12−15 months, excluding E−E
THE INCIDENCE OF SHORT JOBS

Fatih Guvenen
University of Minnesota

Robert E. Hall
Hoover Institution and Department of Economics, Stanford University

Jae Song
Social Security Administration

June 2015
A short job

is one that lasts no more than a month
A short job is one that lasts no more than a month.

The US has no direct measures of short jobs, but lots of more indirect evidence that they account for a substantial fraction of job outcomes even though an overwhelming fraction of total work effort occurs within jobs lasting many years.
THREE APPROACHES TO MEASURING THE INCIDENCE OF SHORT JOBS

1. Quarterly employer counts from UI records for individual workers
Three approaches to measuring the incidence of short jobs

1. Quarterly employer counts from UI records for individual workers
2. Surveys of tenure
THREE APPROACHES TO MEASURING THE INCIDENCE OF SHORT JOBS

1. Quarterly employer counts from UI records for individual workers

2. Surveys of tenure

3. Annual employer counts from social-security records for individual workers
Measuring the Incidence of Short Jobs from Unemployment-Insurance Records

Unemployment-insurance records provide high-quality job histories at a quarterly frequency—see Hyatt and Spletzer (2015)
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If an employer does not employ a worker in a quarter, does employ the worker in the next quarter, and does not employ the worker in the following quarter, the job is tabulated as a one-quarter job

“The ratio of single quarter jobs to total hires... falls from 38 percent in the late 1990s, to 35 percent in the mid 2000s, to 32 percent in the early 2010s.” (p. 5)
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Inferring the incidence of short jobs

In a continuous-time model, with constant quarterly separation hazard $\delta$ for $0 \leq \tau \leq 1$ and a constant flow of hires during the quarter, the fraction of workers hired during the quarter who separate by the end of the quarter is

$$1 - \frac{1}{\delta} \left( 1 - e^{-\delta} \right)$$

Setting this to 0.35 and solving, yields the quarterly continuous-time separation hazard, $\delta = 0.93$. The monthly separation hazard is $0.93 / 3 = 0.31$ and the fraction who separate within one month of taking a job is $1 - e^{-0.31} = 0.27$. Because separation rates decline rapidly with tenure at low levels of tenure, the actual incidence of jobs that last no more than a month, measured by the UI data, is above 0.27.
Inferring the Incidence of Short Jobs

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Here \( N(\tau) \) is the number reporting \( \tau \) periods of tenure to date and \( H(t - \tau) \) is the number hired earlier who have or would have had tenure \( \tau \) at time \( t \).
Implied Incidence of Short Jobs

Fraction of workers hired in the past 6 months (from JOLTS) who remain employed at the 6-month point of tenure: 0.64
**Implied incidence of short jobs**

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With constant semiannual separation hazard $\delta$, the fraction is

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With constant semiannual separation hazard $\delta$, the fraction is

$$\frac{1}{\delta} \left(1 - e^{-\delta}\right)$$

The implied semiannual separation hazard is $\delta = 0.16$

The implied first-month separation hazard is

$$1 - \exp(-\delta/6) = 0.15$$
ANNUAL JOB COUNTS FROM SOCIAL-SECURITY DATA (WITH FATIH GUVENEN AND JAE SONG)

SSA receives annual data from W-2 filings—this project uses the distribution of the number of jobs (W-2s) across individual workers
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We are not yet cleared to show results from the project.
ILLUSTRATIVE DISTRIBUTION OF THE NUMBER OF JOBS HELD IN ONE YEAR
Assigning a probability to a hypothetical job history

Let \( x_t \) describe the job history of a hypothetical worker over a year. It is one in a period when the worker took a new job and zero otherwise. The worker’s tenure at the beginning of the year is drawn from the ergodic distribution of tenure from above. The probability of the worker’s job history over the year, \( P \), can be calculated recursively as

\[
P_{t+1} = r_{s_{\tau_t}} x_t + (1 - r_{s_{\tau_t}})(1 - x_t),
\]

for all values of \( \tau \) and \( P_0 = g_{\tau} \). Then \( P = P_T \). 10
Calculating the implied distribution of the number of jobs in a year

Let $N(x, \tau) = \sum x(t)$ be the number of jobs for the hypothetical worker starting with tenure $\tau$. The probability $J(N)$ that a worker will have $N$ jobs is the sum of the probabilities of all the $N(x, \tau)$ combinations with $N(x, \tau) = N$. We calculate the $J(N)$ distribution by enumerating all of the possible $\{\tau, x\}$ pairs, calculating $N(x, \tau) = \sum x(t)$ for each pair, and adding the probability $P$ to the appropriate $N$ bucket.
Results

suggest even more jobs lasting less than one month than the other approaches.