Recruiting Intensity during and after the Great Recession: National and Industry Evidence

Steven J. Davis, R. Jason Faberman, and John C. Haltiwanger*

** Davis: Booth School of Business, University of Chicago, 5807 South Woodlawn Avenue, Chicago, IL 60637 (Steven.Davis@chicagobooth.edu). Faberman: Federal Reserve Bank of Chicago, 230 S. LaSalle St., Chicago, IL, 60604 (jfaberman@frbchi.org). Haltiwanger: Department of Economics, University of Maryland, College Park, MD 20742 (Haltiwan@econ.umd.edu).* *We thank Taft Foster for excellent research assistance. The views expressed here are those of the authors and do not reflect those of the Federal Reserve Bank of Chicago or the Federal Reserve System.*

The number of unemployed persons per vacancy more than tripled during the 2008-09 recession. The ratio fell after July 2009 but remains more than double its pre-recession level as of September 2011. According to the standard matching function in labor search theory, this path for the ratio of unemployment to vacancies implies a similar path for the fill rate of vacant job positions. The actual job-filling rate, however, does not conform to the path implied by standard theory. Our recent work (Davis, Faberman, and Haltiwanger, 2010) accounts for part of the gap between actual and implied fill-rate movements using a generalized matching function that incorporates a role for recruiting intensity per vacancy. [1] "Recruiting intensity" is shorthand for the other instruments employers use to influence the pace of new hires – e.g., advertising expenditures, screening methods, hiring standards, and the attractiveness of compensation packages. These instruments affect the number and quality of applicants per vacancy, the speed of applicant processing, and the acceptance rate of job offers. Conditional on the vacancy-to-unemployment ratio, a higher recruiting intensity per vacancy raises the fill rate.

[1] Davis (2011) accounts for an additional part of the gap by further generalizing the matching function to capture a role for search intensity per unemployed person. Other researchers explore the role of mismatch in the breakdown of the standard matching function and recent instability in the Beveridge curve. See, for example, Michael Elsby, Bart Hobijn, and Ayşegül Şahin (2010), Regis Barnichon and Andrew Figura (2011), Şahin, Jae Song, Giorgio Topa, and Gianluca Violante (2011), and Benedikt Herz and Thijs van Rens (2011).

In our earlier work, we measure the U.S. job-filling rate and construct a national index for the recruiting intensity per vacancy. In this paper, we consider national and industry-level movements in the fill rate and recruiting intensity. We find that Construction and a few other industries play disproportionately large roles in the national movements of these two series. In other words, industries differ greatly in the cyclical behavior of job-filling rates and recruiting intensity. The results also imply that our index of recruiting intensity per vacancy captures some important features of employment fluctuations that are not captured by the vacancy-unemployment ratio, the standard summary measure of labor market tightness.

I. Data and Measurement

The Job Openings and Labor Turnover Survey (JOLTS) samples about 16,000 establishments per month and yields data on employment, the number of hires and separations during the month, and the number of vacancies on the last business day of the month. We use JOLTS micro data from December 2000 to June 2011 and published JOLTS statistics through September 2011. Our earlier work (Davis, Faberman, and Haltiwanger, 2010; henceforth DFH) develops a method to estimate the daily job-filling rate using JOLTS data. Here, we apply the DFH method to estimate national, industry and regional job-filling rates.

Using JOLTS micro data, DFH document a powerful cross-sectional relationship between the job-filling rate and the gross hires rate. Specifically, the log of the job-filling rate rises strongly with the log of the gross hires rate in the cross section of establishments. As DFH discuss, there are two ways to reconcile this empirical relationship with standard search theory. One is to posit increasing returns to scale in the employer-level hiring technology, so that it becomes easier for an employer to fill any given vacancy the higher its vacancy rate. A second way is for recruiting intensity per vacancy to co-vary positively with the vacancy rate in the cross

section. DFH develop evidence of constant returns in the hiring technology and specify the generalized matching function accordingly.

The resulting generalized matching function yields an aggregate job-filling rate

(1) $$f_t = \mu(v/u)_t^{-\alpha} q_t^{1-\alpha}$$

where f_t is the job-filling rate, μ is a matching efficiency parameter, $-\alpha$ is the elasticity of the fill rate with respect to the vacancy-unemployment, or *v-u*, ratio, and q_t is the vacancy-weighted mean of the employer-level recruiting intensity per vacancy in month *t*. As DFH discuss, cross-sectional evidence supports a recruiting intensity specification given by $\ln q_t = \varepsilon \ln H_t$, where ε is the empirical elasticity of the fill rate with respect to the gross hires rate. DFH construct a national recruiting intensity index using data on the aggregate gross hires rate and an empirical elasticity of $\varepsilon = 0.82$. They show that the resulting fill rate given by (1) more closely tracks the observed fill rate than the one implied by the standard matching function with no role for q_t. Incorporating a role for the recruiting intensity index also improves the stability of the Beveridge Curve and leads to a better fit to data on the job-finding rate for unemployed workers.

Motivated by the greater ability of the generalized matching function to account for the cross-sectional and time-series evidence, we construct an index of recruiting intensity per vacancy for each industry, letting the elasticity ε vary by industry. We use the experienced unemployed from the Current Population Survey (CPS) along with JOLTS vacancy data to compute the industry *v-u* ratios by month. An unpublished appendix presents regional time series for recruiting intensity and the job-filling rate.

II. Recruiting Intensity and Job Filling since the Great Recession

Figure 1 plots national time series for the job-filling rate and recruiting intensity per vacancy. The job-filling rate rose sharply, from 4.4 percent per day in December 2007 to a peak

of 6.6 percent per day in August of 2009. It fell steadily thereafter, though it remains above pre-recession levels at 4.8 percent per day as of September 2011. Recruiting intensity per vacancy fell sharply during the Great Recession, declining by over 21 percent between December 2007 and its trough. It remains 11 percent below its pre-recession level as of September 2011.

Table 1 reports the contribution of selected industries to changes in the national job-filling rate and recruiting intensity index during the recession and recovery periods. Relative to its average value in 2007Q4, the job-filling rate rose 39 percent during the recession and fell 21 percent between 2009Q2 and 2011Q2.[2] The construction industry accounts for more than 40 percent of the swings in the national job-filling rate during and after the recession, despite making up less than 5 percent of employment. Manufacturing also accounts for a disproportionately large share of movements in the national job-filling rate, but the effect is not as dramatic as for construction. Relative to 2007Q4, recruiting intensity per vacancy fell by 22 percent during the recession but rose only 6 percent from 2009Q2 to 2011Q2. Construction plays almost no role in the national drop in recruiting intensity during the recession, while the leisure and hospitality sector play a major role. Professional business services, manufacturing and construction account for most of the (small) post-recession increase in recruiting intensity.

Certain industries are notable for their lack of contribution. For instance, despite making up nearly 15 percent of employment and expanding throughout the recession, health and education services account for very modest shares of movements in the fill rate and the recruiting intensity index. The government sector also plays a disproportionately small role; in fact, recruiting intensity per vacancy in government fell during the recovery even as national recruiting intensity rose. This pattern is consistent with anecdotal evidence of wage freezes and hiring slowdowns in the government sector since 2009.

[2] We report results for quarterly averages in Table 1, because the monthly industry-level data are noisy.

Figure 2 plots three-month moving averages of the cross-industry variance in the logs of the job-filling rate, recruiting intensity per vacancy, and *v*-*u* ratio. We weight industries in proportion to employment in computing these variance measures. The cross-industry dispersion of job-filling rates rose during the Great Recession, from about 8 to 16 log points, then fell in a rather erratic manner during the recovery to stand at10 log points in September 2011. The dispersion in the *v*-*u* ratio behaves similarly in the recession but declines rapidly in the recovery period to stand at 14 log points in September 2011, about the same as its pre-recession value. These two cross-industry dispersion measures behave similarly to closely related measures of "mismatch" in the labor market developed by Şahin et al. (2011).

In contrast to the patterns for the job-filling rate and *v*-*u* ratio, the cross-industry dispersion in recruiting intensity per vacancy is roughly constant before and during the Great Recession. Following the end of the recession, dispersion in recruiting intensity actually *rose* as dispersion in job-filling and market tightness fell. The cross-industry dispersion of recruiting intensity rose from14 log points in mid 2009 and 11 log points in early 2010 to about 18 log points in September 2011. The distinct pattern of dispersion in recruiting intensity is another indication that it picks up aspects of labor market fluctuations not captured by the *v*-*u* ratio.

Figure 3 plots industry changes in the log job-filling rate and log recruiting intensity per vacancy against changes in the log *v*-*u* ratio in the recession and recovery periods. The left panel shows that both periods exhibit strong negative relationships between industry-level changes in the fill rate and changes in the *v*-*u* ratio. The slope of the relationship between the fill rate and tightness is -0.49 during the recession and -0.28 afterward. Each slope is statistically significant at the 5 percent level, but the difference between them is not.

The right panel of Figure 3 shows that changes in recruiting intensity are essentially unrelated to changes in the vacancy-unemployment ratio during the recession. Following the recession, however, a tight positive relationship holds between the two. The increase in the slope is large (from 0.04 to 0.31) and, despite the small sample, statistically significant at the 5% level.

The patterns in Figure 3 are broadly consistent with the generalized matching function that underlies (1) but inconsistent with the standard matching function. To see these points, consider the case with a uniform matching function elasticity across industries. Take natural logs and time differences in the industry-level counterparts to (1) to obtain

$$\frac{\Delta \ln f_{it}}{\Delta \ln(v/u)_{it}} = (1-\alpha)\frac{\Delta \ln q_{it}}{\Delta \ln(v/u)_{it}} - \alpha. \tag{2}$$

There is no role for recruiting intensity per vacancy in the standard matching function, so the first term on the right side of (2) vanishes. This feature of the standard matching function is at odds with the strong positive slope in Figure 3(b) for the post-recession period. Moreover, the standard matching function implies a time-invariant negative relationship between the numerator and denominator on the left side of (2). With its small number of data points as a caveat, our sample produces mild evidence against this time-invariance implication as well, as noted above.

The generalized matching function implies a more subtle restriction on the empirical relations in Figure 3, as encapsulated by (2). For the recession period, Figure 3 gives estimates $\Delta \ln f/\Delta \ln(v/u) = -0.49$ and $\Delta \ln q/\Delta \ln(v/u) = 0.04$. Plugging these values into (2) and solving yields $\alpha = 0.51$. For the post-recession period, we have $\Delta \ln q/\Delta \ln(v/u) = 0.31$ from Figure 3(b). Plugging into (2) and evaluating at $\alpha = 0.51$ implies a value of -0.35 for $\Delta \ln f/\Delta \ln(v/u)$, close to the actual post-recession value of -0.28. Thus, the evidence in Figure 3 is consistent with restriction (2) and the underlying generalized matching function.

In summary, Table 1 and Figures 2 and 3 highlight large differences across industries in the cyclical behavior of job-filling rates and recruiting intensity per vacancy. The evidence in Figure 3 is inconsistent with the standard matching function but broadly consistent with a generalized matching function that includes an important role for fluctuations in recruiting intensity per vacancy. An open question is what drives the pronounced industry-specific variation in job filling and recruiting intensity. We do not address that question here, but our analysis suggests that it warrants attention in future research.

III. Concluding Remarks

We find large differences across industries in the evolution of job-filling rates and recruiting intensity during and after the Great Recession. Construction makes up less than 5 percent of aggregate employment but accounts for more than 40 percent of the large upward and downward swings in the national job-filling rate over the past four years. Leisure and hospitality makes up 10 percent of employment but accounts for nearly a quarter of the drop in recruiting intensity per vacancy during the recession. While government, health and education jointly account for nearly a third of employment, their contribution to national movements in job filling and recruiting intensity is quite modest – less than 5 percent of the large swings in the job-filling rate, for example. The employment-weighted cross-industry variance of log job-filling rates more than doubled during the Great Recession but has returned to nearly pre-recession levels as of September 2011. The cross-industry dispersion of recruiting intensity, however, remains elevated compared to pre-recession levels.

Like the earlier work in DFH on which we build, this paper points to an important role for recruiting intensity in the cyclical relationship among hires, vacancies and unemployment. We note, however, that data limitations require an indirect approach to the measurement of

recruiting intensity per vacancy. There is a need to develop data that would support more direct measures. A natural approach is to expand existing surveys, such as the JOLTS, to inquire about the instruments and methods that employers use to recruit new hires. A simple suggestion that avoids undue respondent burden is to include a list of recruitment methods on the survey instrument and to ask respondents with vacancies to check off the ones they use – screening of unsolicited applications, word of mouth, referrals from existing employees, help-wanted advertisements in print media, web postings, the use of employment agencies, internships, evaluation of temp workers, and so on.

References

Barnichon, Regis and Andrew Figura. 2011. "What Drives Matching Efficiency? A Tale of Decomposition and Dispersion." Federal Reserve Board of Governors Working Paper No. 2011-10.

Davis, Steven J. 2011. Comment on "Job Search, Emotional Well-Being and Job Finding in a Period of Mass Unemployment." *Brookings Papers on Economic Activity*, David H. Romer and Justin Wolfers (eds.), Spring: 58-78.

Davis, Steven J., R. Jason Faberman, and John C. Haltiwanger. 2010. "The Establishment-Level Behavior of Vacancies and Hiring." National Bureau of Economic Research Working Paper No. 16265.

Elsby, Michael W. L., Bart Hobijn, and Ayşegül Şahin. 2010. "The Labor Market in the Great Recession." In *Brookings Papers on Economic Activity*, David H. Romer and Justin Wolfers (eds.), Spring: 1-48.

Şahin, Ayşegül, Jae Song, Giorgio Topa, and Gianluca Violante. 2011. "Measuring Mismatch in the U.S. Labor Market." Unpublished.

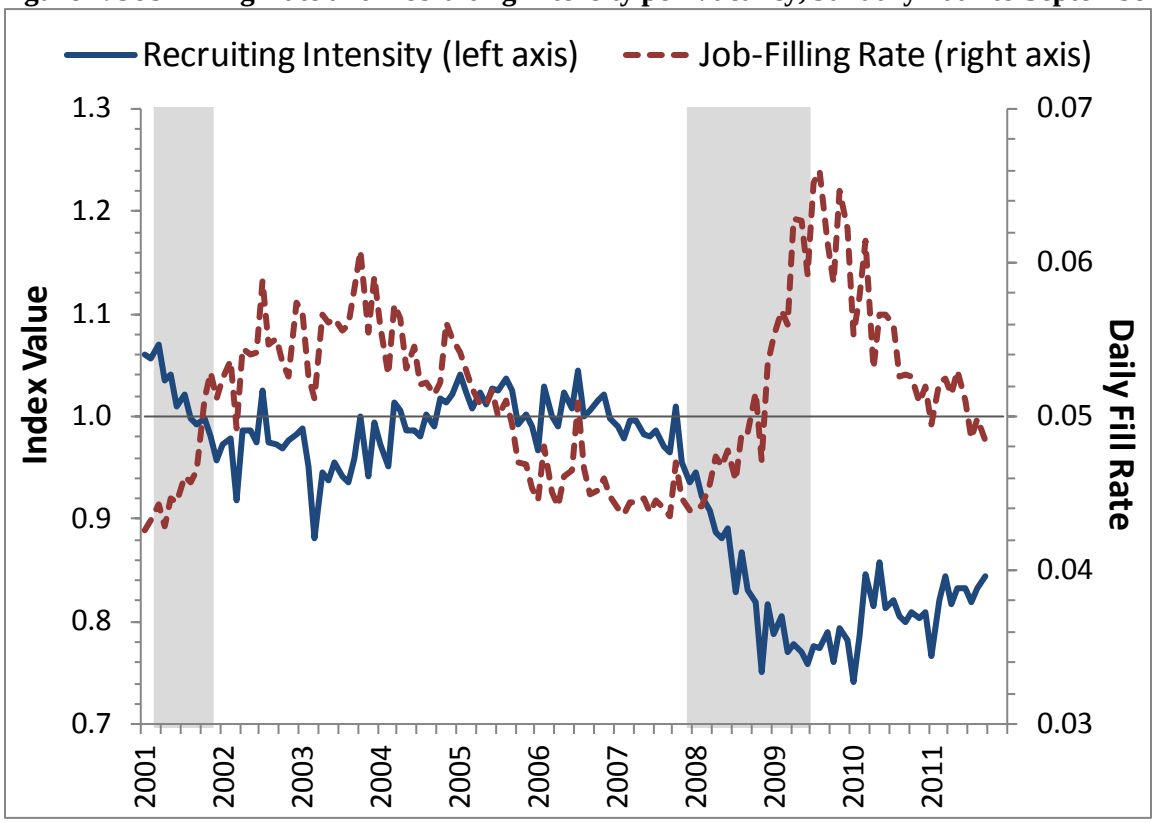
Herz, Benedikt, and Thijs Van Rens. 2011. "Structural Unemployment." Unpublished.

Table 1. Contributions to Changes in the Job-Filling Rates and Recruiting Intensity per Vacancy

		Job-Filling Rate		*Recruiting Intensity*	
	Employment Share, 2007:4	**2007:4 – 2009:2**	**2009:2 – 2011:2**	**2007:4 – 2009:2**	**2009:2 – 2011:2**
Percent Change, Relative to 2007Q4		39.0	-22.0	-21.8	5.9
Selected Industry		*Contribution to National Change, Percent*			
Construction	4.7	43.0	41.9	2.4	27.6
Manufacturing	9.0	12.5	16.2	11.6	22.3
Professional & Business Services	12.6	8.9	5.0	14.2	44.2
Leisure & Hospitality	10.1	9.4	4.6	24.1	8.9
Health and Education	14.6	4.6	3.6	7.2	-0.6
Government	17.4	1.6	4.3	6.2	-15.6

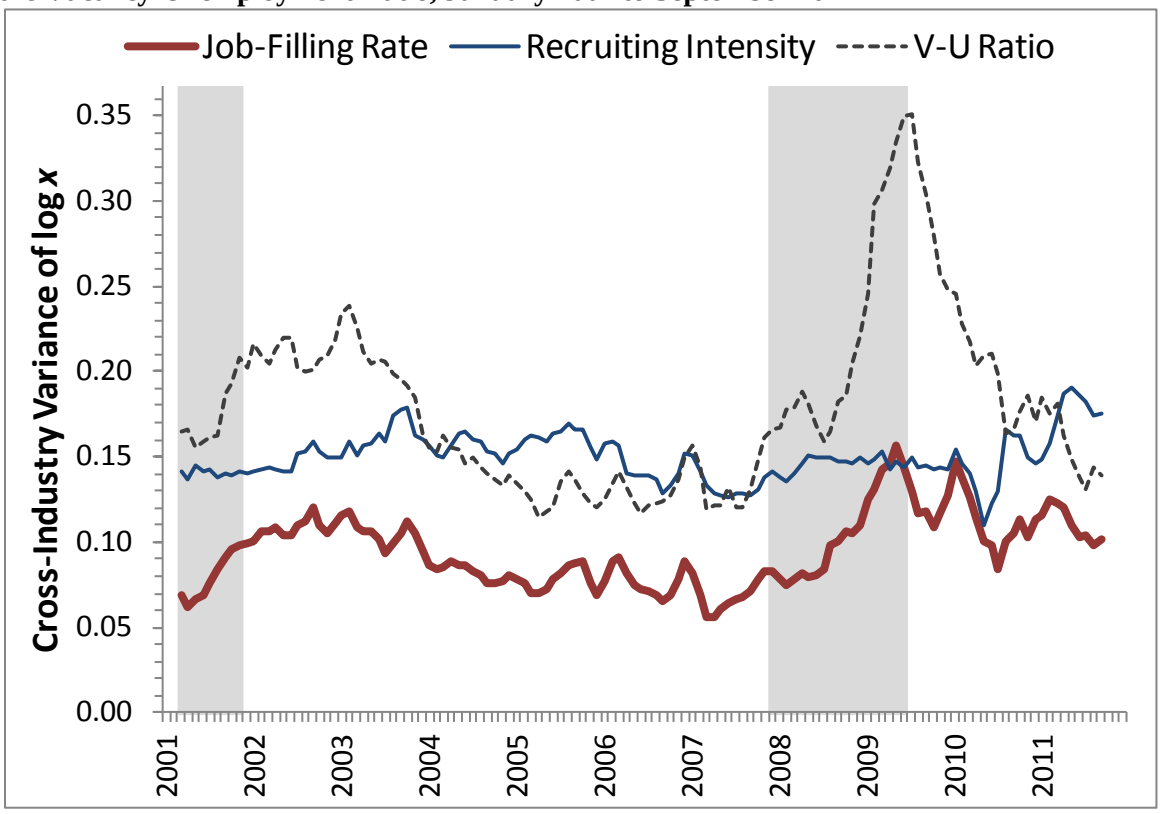
Source: Authors' calculations using JOLTS micro data. See text and DFH for descriptions of how we calculate the job-filling rate and recruiting intensity per vacancy.

Figure 1. Job-Filling Rate and Recruiting Intensity per Vacancy, January 2001 to September 2011



Source: Authors' calculations using JOLTS micro data. See text and DFH for descriptions of how we calculate the job-filling rate and recruiting intensity per vacancy. Recruiting intensity is scaled so that its 2004-07 average equals one. Shaded areas represent NBER recession dates.

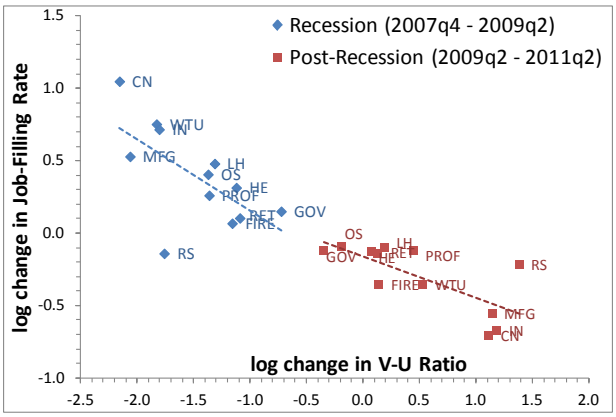
Figure 2. Across-Industry Dispersion in the Job-Filling Rate, Recruiting Intensity per Vacancy, and the Vacancy-Unemployment Ratio, January 2001 to September 2011



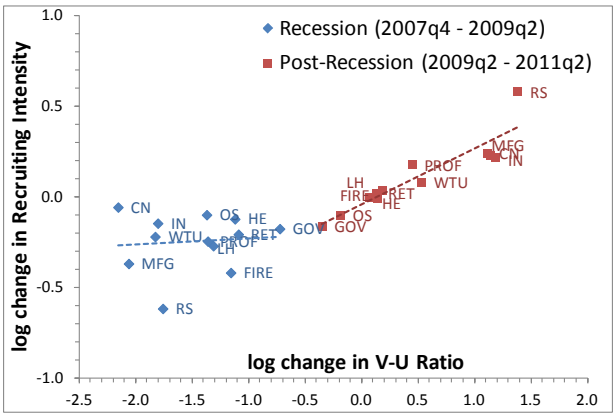
Source: Authors' calculations using JOLTS micro data. Figure depicts the variance across 12 NAICS sectors of the log of the listed variable, weighted by each industry's employment share. See text for descriptions of how the job-filling rate and recruiting intensity are calculated. Shaded areas represent NBER recession dates.

Figure 3: The Relation between Industry Changes in Job Filling, Recruiting Intensity Per Vacancy, and the Vacancy-Unemployment Ratio

(a) Job-Filling Rate vs. Vacancy-Unemployment Ratio



(b) Recruiting Intensity vs. Vacancy-Unemployment Ratio



Source: Authors' calculations using JOLTS micro data. Industry abbreviations are: RS – resources, CN – construction, MFG – manufacturing, WTU – wholesale, transport, and utilities, RET – retail trade, IN – information, FIRE – finance, insurance, and real estate, PROF – professional and business services, HE – health and education, LH – leisure and hospitality, OS – other services, GOV – government. See text for descriptions of how we calculate the job-filling rate and recruiting intensity per vacancy.