VIEWING JOB-SEEKERS’ RESERVATION WAGES AND ACCEPTANCE DECISIONS THROUGH THE LENS OF SEARCH THEORY

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Key Issues in Empirical Labor-Market Search Modeling

High dispersion in wages among observationally similar workers

But high transition rates from unemployment to employment suggest job-seekers are not choosy

Job-ladder model with effective on-the-job search helps a lot, but does not go all the way
Important recent contributions, among many

- RSW, *Journal of Economic Lit*, 2005
- Bontemps, Jolivet, Postel-Vinay, Robin, et Turon, in various combinations
- Hornstein, Krusell, and Violante, *AER*, 2011
A number of papers in the literature claim that the (on-the-job search) model is successful in simultaneously matching both the wage distribution and labor-market transition data (see, e.g., Christian Bontemps, Robin, and van den Berg 2000; Jolivet, Postel-Vinay, and Robin 2006) ... the exercise is incomplete because it neglects the implications of the joint estimates of $F(w)$ and of the transition parameters for the relative value of nonmarket time $z$. The key additional “test” that we are advocating would thus entail using the estimated $F(w)$ in the reservation-wage equation and, given an estimate of $w^*$, backing out the implied value for $z$. In light of our results, we maintain that $z$ would be often negative or close to zero.
WHAT THIS PAPER DOES

Using a new body of data, I construct an account of a labor market with on-the-job search where

1. The log-standard deviation of the distribution of wages offered to an individual job-seeker is 0.13, far below the dispersion of wages in the cross section but far above the tiny dispersion that HKV associate with the traditional search model

2. The reservation wage for unemployed job-seekers implied by their acceptance decisions is 76 percent of their average earnings and unemployment compensation, in line with estimates from preferences and UI rates and far above the low levels implied by earlier work on on-the-job search

3. Reported reservation wages are biased a moderate amount above actual reservation wages
6,000 job-seekers in New Jersey who were unemployed in September 2009

Weekly data for several months on reservation wages, job offers, and acceptance

Administrative data on wages just prior to becoming unemployed
Survey

Reservation wage:
“Suppose someone offered you a job today. What is the lowest wage or salary you would accept (before deductions) for the type of work you are looking for?”

Offers:
“In the last 7 days, did you receive any job offers? If yes, how many?”
Offer rate

The respondents received a total of 2,626 offers in 39,201 reported weeks of job search.

The ratio of the two, 0.067, is a reasonable estimate of the overall weekly rate of receipt of job offers.
Acceptance rate

62.5 percent of respondents who had received offers had accepted them

16.8 percent had rejected

20.7 percent had not yet decided

On the assumption that the undecideds will split in the same proportion as those who had decided, the acceptance rate is $\frac{62.5}{62.5 + 16.8} = 78.8$ percent
### Frequencies of Acceptance and Offered Wage Relative to Reported Reservation Wage

<table>
<thead>
<tr>
<th>Offered Wage Condition</th>
<th>Accepted offer</th>
<th>Rejected offer</th>
<th>All offers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered wage no less than reservation wage</td>
<td>0.48</td>
<td>0.07</td>
<td>0.54</td>
</tr>
<tr>
<td>Offered wage below reservation wage</td>
<td>0.31</td>
<td>0.15</td>
<td>0.46</td>
</tr>
<tr>
<td>All offers</td>
<td>0.79</td>
<td>0.21</td>
<td></td>
</tr>
</tbody>
</table>
### Five Moments of the Distribution of the Ratio of the Reservation Wage to the Prior Wage

<table>
<thead>
<tr>
<th>Moment</th>
<th>Source in Krueger and Müller (2011a)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp of mean log wage ratio</td>
<td>Table 4.2, col. 2</td>
<td>0.90</td>
</tr>
<tr>
<td>Mean wage ratio</td>
<td>Table 4.1</td>
<td>0.99</td>
</tr>
<tr>
<td>25th percentile of wage ratio</td>
<td>Text, p. 17</td>
<td>0.70</td>
</tr>
<tr>
<td>Median wage ratio</td>
<td>Text, p. 17</td>
<td>0.91</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
I use the term “offer” to describe a job-seeker’s encounter with a definite opportunity to take a job.

The job-seeker’s decision problem, upon finding a job opportunity with a joint surplus, is the same whether
(1) the employer is making a take-it-or-leave-it offer
(2) the parties make a Nash bargain
(3) they engage in alternating-offer bargaining

In the bargaining cases, the job-seeker knows in advance what the bargain will be, so the job-seeker decides whether to engage in bargaining just as he would faced with a firm offer.
Acceptance decision given wage offer and reservation wage

Model I: A job-seeker accepts all jobs paying at least the reservation wage and rejects all others.
## Actual and Fitted Probabilities

<table>
<thead>
<tr>
<th>Wage offer</th>
<th>Name</th>
<th>Action</th>
<th>Actual fraction</th>
<th>Model I</th>
</tr>
</thead>
<tbody>
<tr>
<td>No less than reservation wage</td>
<td>PAH</td>
<td>Accept</td>
<td>0.48</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>PRH</td>
<td>Reject</td>
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<td>0</td>
</tr>
<tr>
<td>Below reservation wage</td>
<td>PAL</td>
<td>Accept</td>
<td>0.31</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>PRL</td>
<td>Reject</td>
<td>0.15</td>
<td>0.46</td>
</tr>
</tbody>
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Acceptance decision given wage offer and reservation wage

**Model II:** job-seekers make their acceptance decisions as if reservation wages reported in the survey were 12 percent higher than the actual value.

Wage offers come from a log-normal distribution with log-standard deviation of 0.13 and zero log-mean.

Zero mean is a normalization.

Stand by for explanation of $\sigma = 0.13$. 
Events

A: $w \geq w^*$

R: not A

H: $w \geq w^R = \gamma w^*$

L: not H
Event Space for Model II

PRL  PAL  PAH

\[ w^* \quad \gamma w^* \]
Probabilities from Model II

$$PAH = 1 - \Phi \left( \frac{\log w^* + \log \gamma}{\sigma} \right),$$

$$PRH = 0,$$

$$PAL = \Phi \left( \frac{\log w^* + \log \gamma}{\sigma} \right) - \Phi \left( \frac{\log w^*}{\sigma} \right),$$

$$PRL = \Phi \left( \frac{\log w^*}{\sigma} \right).$$
## Actual and Fitted Probabilities

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### Parameters

- $\gamma$, bias in $w^R$: 1.12
- $\sigma_R$, log standard deviation of $w^R/w^*$: 0
Acceptance decision given wage offer and reservation wage

Model III: job-seekers make their acceptance decisions as if the reported reservation wage is a log-normal random variable with log-standard deviation 0.29 and mean 1.08 times the actual reservation wage.

Again, wage offers come from a log-normal distribution with log-standard deviation of 0.13 and zero log-mean.
**Events**

A: \( w \geq w^* \)

R: not A

H: \( w \geq w^R \sim LN (\log w^* + \log \gamma, \sigma^2_R) \)

L: not H
Event Space for Model III

\[ \log w^R - \log w^* \]

\[ L: \log w < \log w^R \]

\[ H: \log w \geq \log w^R \]

\[ \log w - \log w^* \]

Accept: \[ \log w \geq \log w^* \]

Reject: \[ \log w < \log w^* \]
The triangles AH and AL involve integrals of the generic form

\[
\int_{y=0}^{\infty} \int_{x=0}^{y} d\Phi \left( \frac{x - \mu_x}{\sigma_x} \right) d\Phi \left( \frac{y - \mu_y}{\sigma_y} \right),
\]

which don’t seem to have a closed form
## Actual and Fitted Probabilities

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<tr>
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<th>Action</th>
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<th>Model III</th>
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<tr>
<th>Parameter</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma$, bias in reported reservation wage</td>
<td>1.12</td>
<td>1.08</td>
<td></td>
</tr>
<tr>
<td>$\sigma_{R}$, log standard deviation of $w^{R}/w^*$</td>
<td>0.0</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>$w^{*}$, actual reservation wage</td>
<td>0.90</td>
<td>0.90</td>
<td></td>
</tr>
</tbody>
</table>
**The simple job-ladder model**

Search is at least as efficient on the job as while unemployed

Thus no real-option problem for the job seeker

While unemployed, take every job that becomes available that beats the flow value of unemployment

While employed, take every job that beats the current job
**Strategy**

Build a job-ladder model to match the 5 moments of the reservation wage/prior wage ratio and the $2 \times 2$ distribution of acceptance choices and wage offers v. reservation wages.

First, use the personal transition matrix to solve for the stationary distribution of wages, to get the distribution of the prior wage.

Second, view the respondents in the survey as coming from a mixture of propensities to overstate reservation wages, as revealed in the acceptance/reservation wage study just presented.

Find the log-standard deviation $\sigma$ of the offer distribution and the log-standard deviation of the reported reservation wage $\sigma_R$ to match the data.
Wage, $w$, is a personal state variable, with $w = w^*$ for the unemployed

Acceptance rate: $a(w) = 1 - F(w)$

Separation rate: $\delta(w) = 1 - (1 - s)(1 - \lambda a(w))$
Transitions while unemployed

\[ T(w'|w^*) = \begin{align*} &\text{with probability mass } 1 - \lambda a(w^*) \text{ at } w' = w^* \\
&\text{(remain unemployed)} \\
&\quad = \lambda(F(w') - F(w^*)) \text{ for } w' > w^* \text{ (take a job)}. \end{align*} \]
Transitions while employed

\[ T(w' | w) = \text{probability mass } s \text{ at } w' = w^* \text{ (fall off ladder)} \]
\[ = \text{probability mass } 1 - \delta(w) \text{ at } w' = w > w^* \]

(stay at same wage)
\[ = (1 - s)\lambda(F(w') - F(w)) \text{ for } w' > w \text{ (move up)}. \]
Stationary or invariant distribution, $Q$

$$Q(w') = \int_{w=0}^{\infty} T(w'|w) dQ(w)$$

$$q_j = Q(w_j) - Q(w_{j-1}) = \sum_i (T(w_j|\bar{w}_i) - T(w_{j-1}|\bar{w}_i)) q_i$$

$q' = \text{bottom row of } [(\text{all but last column of } T - I), \iota]^{-1}$

$$Q_E(w) = \frac{Q(w)}{1 - Q(w^*)} \text{ for } w > w^* 0 \text{ otherwise}$$
Distribution of the Wage
DISTRIBUTION OF THE RATIO OF THE RES WAGE TO THE PRIOR WAGE

Define

\[ \omega = \frac{w^R}{w} \]

Note that this ratio removes the effect of personal productivity known by both worker and employer—arguably a better solution than using residuals from wage regressions.

We already have the distributions of the numerator and denominator, taken to be independent.

Distribution of the ratio is a convolution.
\[ \Pr \left[ \frac{w^R}{w} \leq \omega \right] = \Pr \left[ w^R - \omega w \leq 0 \right] = \int_0^\infty \left( 1 - Q_E \left( \frac{w^R}{\omega} \right) \right) dF^R(w^R), \]

Approximated as

\[ \sum_i (1 - Q_E(\bar{w}_i)) \left( \Phi \left( \frac{\log \tilde{\omega} + \log w_{i+1}}{\sigma_R} \right) - \Phi \left( \frac{\log \tilde{\omega} + \log w_i}{\sigma_R} \right) \right) \]

where \( \tilde{\omega} = \frac{\omega}{\gamma w^*} \)
Calibration

\[ \lambda = 0.067 \text{ per week} \]

\[ a = 0.79 \]

\[ s = \frac{u\lambda a}{1 - u} = 0.0052 \text{ per week} \]

\[ w^* = e^{\sigma \Phi^{-1}(1-a)} = e^{0.13\Phi^{-1}(1-0.79)} = 0.90 \]
DISPERSION

The value of the log-standard deviation of the wage-offer distribution that implies the same dispersion of the reported reservation $w^R$ from (1) the study of acceptance v. reservation wages discussed a while ago and (2) the matching of moments of $\omega$, the ratio of the reported reservation wage to the wage in the prior job, is

$$\sigma = 0.13$$

Note that the two studies use the same data on reservation wages but distinct data for actual and offered wages—administrative data for actual wages and self-reported offered wages.
The dispersion in wages across jobs for the same person found here is far below the cross-sectional dispersion implied by wage regressions.

Most of the dispersion in $\omega$ comes from cross-sectional variation in $w^R/w^*$; its log-standard deviation is 0.29.
### Fitted Values of the Moments of the Ratio of the Reservation Wage to the Prior Wage

<table>
<thead>
<tr>
<th>Moment</th>
<th>Actual value</th>
<th>Fitted moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp of mean log wage ratio</td>
<td>0.90</td>
<td>0.89</td>
</tr>
<tr>
<td>Mean wage ratio</td>
<td>0.99</td>
<td>0.94</td>
</tr>
<tr>
<td>25th percentile of wage ratio</td>
<td>0.70</td>
<td>0.71</td>
</tr>
<tr>
<td>Median wage ratio</td>
<td>0.91</td>
<td>0.89</td>
</tr>
<tr>
<td>75th percentile of wage ratio</td>
<td>1.07</td>
<td>1.12</td>
</tr>
</tbody>
</table>
# Estimates of Actual Res Wage and Bias in Reported Res Wage

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th></th>
<th>Model II</th>
<th>Model III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual reservation wage</td>
<td>$w^*$</td>
<td>Acceptance v. reservation wage</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
<tr>
<td>Bias in reported reservation wage</td>
<td>$\gamma$</td>
<td>Moments of reservation wage divided by prior wage</td>
<td>1.12</td>
<td>1.08</td>
<td>1.18</td>
</tr>
</tbody>
</table>
Implied value of $z$

Flow value of unemployment = reservation wage of unemployed $= w^* = 0.90$

Average wage = 1.25
Unemployment = 9 percent
Benefit replacement rate = 25 percent
Average income $= 0.09 \times 0.25 \times 1.25 + 0.91 \times 1.25 = 1.17$

$z = \text{ratio of flow value of unemployment to average income}
= 0.76$

Pretty close to Hall-Milgrom (2008) figure of 0.71
Conclusions

Results tell a story about search that fits the relevant facts well

Implied dispersion of the wage offer distribution is moderate—not as tight as HKV suggest for the traditional model

Implied flow value of unemployment is reasonable, whereas earlier work on the job-ladder model implied unreasonable aversion to unemployment