Employment Inequality:
Why Do the Low-Skilled Work Less Now?

Erin L. Wolcott
Middlebury College
January 6, 2019

This material is based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-1144086.
Widening Employment Gap

Men, ages 25–54, excluding institutionalized. ‘College’ is one year or more. Census (solid) demographically adjusted for age; matched–CPS (dashed).
Why?

1. **Supply Shift**
   - Disability insurance (Barnichon and Figura, 2015)
   - Video games (Aguiar et al. 2017)
   - Health (Krueger, 2017; Case and Deaton, 2017)

2. **Demand Shift**
   - Automation (Autor et al. 1998; Acemoglu and Restrepo, 2017)
   - Trade (Autor et al. 2013; Pierce and Schott, 2016)

3. **Search Frictions**
   - Search frictions important feature of the labor (Blanchard and Diamond, 1989; Davis et al. 2013; Hornstein & Kudlyak, 2016)
   - Not looked at for this question
This Paper Decomposes Role of Each Channel

- **Document novel empirical finding**
  - Since 1970s high-skilled labor market became tighter

- **Build labor search model**
  - Heterogeneous permanent characteristic (ability, wealth)
  - College choice

- **Main findings:**
  - Supply shift no effect
  - Demand shift large effect
  - Search frictions go the wrong way
Merge Datasets to Document Tightness by Skill

1. **Vacancy data by occupation**
   - BLS pilot study, 4 “representative” states, 1979
   - Hobijn and Perkowski (2016) data, 2005-2013

2. **Job-seekers by education**
   - IPUMS-CPS
   - Men, ages 25-54

- **Link datasets classifying occupations by education**
  - $z \equiv$ share of employed men with some college
  - $z^* \equiv$ cutoff for high-skill
  - Baseline $z^* = 0.6$
Labor Market Tightness

- **Unemployment Measure:**
  \[
  \theta^u_j = \frac{V_j}{U_j}
  \]

- **Nonemployment Measure:**
  \[
  \theta^n_j = \frac{V_j}{U_j + NLF_j}
  \]

where \( j \in \{ \text{Non-college (L), College(H)} \} \)
Men, ages 25–54. Data from Florida, Massachusetts, Texas, Utah for March, June, (September). Sources: BLS, CPS. A vacancy is classified as college if over 60% of men employed in that occupation have at least one year of college.
Labor Market Tightness in 1979

Ten thousands Men, ages 25–54. Data from Florida, Massachusetts, Texas, Utah for March, June, (September). Sources: BLS, CPS. A vacancy is classified as college if over 60% of men employed in that occupation have at least one year of college.
Men, ages 25–54. Data is averaged over March, June, September for all U.S. states. Sources: Hobijn (2012), CPS. A vacancy is classified as college if over 60% of men employed in that occupation have at least one year of college.
Men, ages 25–54. Data is averaged over March, June, September for all U.S. states. Sources: Hobijn and Perkowski (2016), CPS. A vacancy is classified as college if over 60% of men employed in that occupation have at least one year of college.
## Divergence of Labor Market Tightness

<table>
<thead>
<tr>
<th>Measure</th>
<th>Year</th>
<th>$\theta_H$</th>
<th>$\theta_L$</th>
<th>Percent Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonemployment</td>
<td>1979</td>
<td>0.44</td>
<td>0.73</td>
<td>-40</td>
</tr>
<tr>
<td>Nonemployment</td>
<td>2007</td>
<td>1.03</td>
<td>0.37</td>
<td>177</td>
</tr>
<tr>
<td>Unemployment</td>
<td>1979</td>
<td>1.22</td>
<td>2.71</td>
<td>-55</td>
</tr>
<tr>
<td>Unemployment</td>
<td>2007</td>
<td>3.68</td>
<td>1.56</td>
<td>136</td>
</tr>
</tbody>
</table>

- Low-skilled labor market slightly tighter in 1970s
- High-skilled labor market substantially tighter in 2000s
Model: Production Technology

- Ability \( x \in \{x_1 < x_2 < \ldots < x_M\} \) approximately log-normal

- The occupation-specific production function per worker is:

\[
y_{jt}(x) = \begin{cases} 
A_L & \text{if } j = L \\
A_H x & \text{if } j = H 
\end{cases}
\]

↑ key demand shifters

- \( A_L \) and \( A_H \) technology in low- and high-skilled jobs
Job finding rate $f_{jt}(\theta) = \phi_j \theta_{jt}(x)^{1-\alpha}$

Search friction parameter $\uparrow$

Exogenous separation rates $\delta_j \in (0, 1)$
Value of being nonemployed:

\[ N_{jt}(x) = \max \left[ N_{Lt}^c(x), N_{Ht}^c(x) \right] \]

\[ N_{jt}^c(x) = b_j + \beta \left[ f_{jt}(\theta) W_{jt+1}(x) + (1 - f_{jt}(\theta)) N_{jt+1}(x) \right] \]

↑ key supply shifters
Summary of Structural Framework

- **Labor Search Model:**
  - Supply shifters $b_j$
  - Demand shifters $A_j$
  - Search friction parameters $\phi_j$
  - Exogenous separation rates $\delta_j$

- **Next Steps:**
  - Calibrate two steady states: 1979 and 2007
  - Target moments, one of which is labor market tightness
  - Uncover how structural parameters changed
  - How does each channel contribute to employment rate gap?
Disentangling the Mechanisms

1. Matching Efficiency:
   \[ \phi_j = \frac{f_j}{\theta_j^{1-\alpha}} \]

2. Value of Leisure and Automation/Trade:
   Two equations:
   - Job creation curve
   - Wage equation
   Two unknowns:
   - Value of leisure \( b_j \)
   - Labor-augmenting technology \( A_j \)

3. Ability Parameters
   - Recall \( x \in \{x_1 < x_2 < \ldots < x_M\} \) approximately log-normal
   - Choose \( \mu_x \) and \( \sigma_x \) to match share of college prime-age men
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>discount factor</td>
<td>0.9967</td>
<td>monthly rate</td>
</tr>
<tr>
<td>$\alpha_{j,t}$</td>
<td>matching elasticity</td>
<td>0.62</td>
<td>Veracierto (2011)</td>
</tr>
<tr>
<td>$\pi_{j,t}$</td>
<td>bargaining weight</td>
<td>0.62</td>
<td>Hosios condition</td>
</tr>
<tr>
<td>$\kappa_{L,t}$</td>
<td>vacancy posting cost</td>
<td>0.5</td>
<td>share of 1979 offer wages</td>
</tr>
<tr>
<td>$\delta_{L,79}$</td>
<td>separation rate</td>
<td>0.0223</td>
<td>CPS</td>
</tr>
<tr>
<td>$\delta_{L,07}$</td>
<td>separation rate</td>
<td>0.0326</td>
<td>CPS</td>
</tr>
<tr>
<td>$\delta_{H,79}$</td>
<td>separation rate</td>
<td>0.0121</td>
<td>CPS</td>
</tr>
<tr>
<td>$\delta_{H,07}$</td>
<td>separation rate</td>
<td>0.0162</td>
<td>CPS</td>
</tr>
<tr>
<td>$\phi_{L,79}$</td>
<td>match efficiency</td>
<td>0.1892</td>
<td>CPS job finding rate = 0.1679</td>
</tr>
<tr>
<td>$\phi_{L,07}$</td>
<td>match efficiency</td>
<td>0.2118</td>
<td>CPS job finding rate = 0.1451</td>
</tr>
<tr>
<td>$\phi_{H,79}$</td>
<td>match efficiency</td>
<td>0.2698</td>
<td>CPS job finding rate = 0.1975</td>
</tr>
<tr>
<td>$\phi_{H,07}$</td>
<td>match efficiency</td>
<td>0.1590</td>
<td>CPS job finding rate = 0.1608</td>
</tr>
<tr>
<td>$b_{L,79}$</td>
<td>value of leisure</td>
<td>0.31</td>
<td>calibrated</td>
</tr>
<tr>
<td>$b_{L,07}$</td>
<td>value of leisure</td>
<td>0.26</td>
<td>calibrated</td>
</tr>
<tr>
<td>$b_{H,79}$</td>
<td>value of leisure</td>
<td>0.61</td>
<td>calibrated</td>
</tr>
<tr>
<td>$b_{H,07}$</td>
<td>value of leisure</td>
<td>0.60</td>
<td>calibrated</td>
</tr>
<tr>
<td>$A_{L,79}$</td>
<td>technology</td>
<td>1.06</td>
<td>calibrated</td>
</tr>
<tr>
<td>$A_{L,07}$</td>
<td>technology</td>
<td>0.68</td>
<td>calibrated</td>
</tr>
<tr>
<td>$A_{H,79}$</td>
<td>technology</td>
<td>0.64</td>
<td>calibrated</td>
</tr>
<tr>
<td>$A_{H,07}$</td>
<td>technology</td>
<td>1.13</td>
<td>calibrated</td>
</tr>
<tr>
<td>$\mu_x$</td>
<td>mean ability</td>
<td>0.36</td>
<td>calibrated</td>
</tr>
<tr>
<td>$\sigma_x$</td>
<td>standard dev of ability</td>
<td>0.144</td>
<td>calibrated</td>
</tr>
</tbody>
</table>
## Targeted Moments

<table>
<thead>
<tr>
<th>Moment</th>
<th>Explanation</th>
<th>Year</th>
<th>Model</th>
<th>Data</th>
<th>Model Gap</th>
<th>Data Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\theta_{L,79}$</td>
<td>L tightness</td>
<td>1979</td>
<td>0.73</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{\theta}_{H,79}$</td>
<td>H tightness</td>
<td>1979</td>
<td>0.43</td>
<td>0.44</td>
<td>-40%</td>
<td>-40%</td>
</tr>
<tr>
<td>$\theta_{L,07}$</td>
<td>L tightness</td>
<td>2007</td>
<td>0.37</td>
<td>0.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{\theta}_{H,07}$</td>
<td>H tightness</td>
<td>2007</td>
<td>1.06</td>
<td>1.03</td>
<td>187%</td>
<td>177%</td>
</tr>
<tr>
<td>$\omega_{L,79}$</td>
<td>L wages</td>
<td>1979</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{\omega}_{H,79}$</td>
<td>H wages</td>
<td>1979</td>
<td>1.00</td>
<td>1.00</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>$\omega_{L,07}$</td>
<td>L wages</td>
<td>2007</td>
<td>0.63</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{\omega}_{H,07}$</td>
<td>H wages</td>
<td>2007</td>
<td>1.60</td>
<td>1.60</td>
<td>149%</td>
<td>154%</td>
</tr>
</tbody>
</table>

\[
\frac{100 \times (M - \xi)}{M} \quad \text{H share} \quad 1979 \quad 40\% \quad 43\%
\]

\[
\frac{100 \times (M - \xi)}{M} \quad \text{H share} \quad 2007 \quad 90\% \quad 56\%
\]
## Non-Targeted Moments

<table>
<thead>
<tr>
<th>Moment</th>
<th>Explanation</th>
<th>Year</th>
<th>Model</th>
<th>Data</th>
<th>Model Gap</th>
<th>Data Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_{L,79}$</td>
<td>L employment rate</td>
<td>1979</td>
<td>88%</td>
<td>89%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{e}_{H,79}$</td>
<td>H employment rate</td>
<td>1979</td>
<td>94%</td>
<td>95%</td>
<td>5.9 pp</td>
<td>5.4 pp</td>
</tr>
<tr>
<td>$e_{L,07}$</td>
<td>L employment rate</td>
<td>2007</td>
<td>82%</td>
<td>83%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{e}_{H,07}$</td>
<td>H employment rate</td>
<td>2007</td>
<td>91%</td>
<td>92%</td>
<td>9.2 pp</td>
<td>8.8 pp</td>
</tr>
</tbody>
</table>

**Difference**

<table>
<thead>
<tr>
<th></th>
<th>3.3 pp</th>
<th>3.4 pp</th>
</tr>
</thead>
</table>


Counterfactuals

Channels individually turned on (in light blue)
Robustness

- Different education cutoffs
- Alternative vacancy data
- Matching efficiency with unemployment measure
- Bargaining power greater for high-skilled
- Vacancy posting costs greater for high-skilled
- No college choice: college share fixed at 40%
Conclusion

- Why are lower skilled men not working today?
- Document since 1970s high-skilled labor market tighter
- Build search model and calibrate to empirical finding
- Main findings:
  - Supply shift no effect
  - Demand shift large effect
  - Search frictions go the wrong way
Employment Gap: Disaggregated

Demand Shift Evidence: Widening Wage Gap

Men, ages 25–54, excluding armed forces. 3–year moving average. Sources: CPS, FRED.
Baseline Vacancy Categories, $z^* = 0.6$

<table>
<thead>
<tr>
<th>BLS Pilot Vacancy Data</th>
<th>Hobijn and Perkowski (2016) Vacancy Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2-digit 1977 SOC)</td>
<td>(2-digit 2000 SOC)</td>
</tr>
</tbody>
</table>

### High-Skilled Occupations

- Executive, Administrative & Managerial
- Engineers & Architects
- Natural Scientists & Mathematicians
- Social Scientists, Social Workers, Religious Workers & Lawyers
- Teachers, Librarians & Counselors
- Health Diagnosing & Treating Practitioners
- RNs, Pharmacists, Dietitians, Therapists & Physicians Assistants
- Writers, Entertainers, Artists & Athletes
- Health Technologists & Technicians
- Management
- Business and Financial Operations
- Computer & Mathematical Science
- Architecture and Engineering
- Life, Physical & Social Science
- Community and Social Services
- Legal
- Education, Training & Library
- Arts, Design, Entertainment, Sports & Media
- Healthcare Practitioners & Technical
- Healthcare Support
- Protective Service
- Personal Care & Service
- Sales & Related
- Office & Administrative Support
- Installation, Maintenance & Repair

### Low-Skilled Occupations

- Marketing & Sales
- Clerical Occupations
- Service Occupations
- Construction & Extractive Occupations
- Agricultural, Forestry, Fishers & Hunters
- Transportation & Material Moving
- Construction & Extraction
- Food Production & Serving Related
- Building & Grounds Cleaning & Maintenance
- Farming, Fishing, and Forestry
- Mechanics & Repairers
- Production Work Occupations
- Material Handlers, Equipment Cleaners & Laborers
## Labor Market Tightness by State in 1979

<table>
<thead>
<tr>
<th>State</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida</td>
<td>-30%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>-37%</td>
</tr>
<tr>
<td>Texas</td>
<td>-44%</td>
</tr>
<tr>
<td>Utah</td>
<td>-82%</td>
</tr>
</tbody>
</table>
## Divergence of Labor Market Tightness

**Hobijn and Perkowski (2016) and CPS Data**

<table>
<thead>
<tr>
<th>Year*</th>
<th>$\theta_H$</th>
<th>$\theta_L$</th>
<th>Percent Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.848</td>
<td>0.314</td>
<td>170</td>
</tr>
<tr>
<td>2006</td>
<td>0.898</td>
<td>0.395</td>
<td>128</td>
</tr>
<tr>
<td>2007</td>
<td>1.026</td>
<td>0.370</td>
<td>177</td>
</tr>
<tr>
<td>2008</td>
<td>0.805</td>
<td>0.266</td>
<td>203</td>
</tr>
<tr>
<td>2009</td>
<td>0.386</td>
<td>0.100</td>
<td>286</td>
</tr>
<tr>
<td>2010</td>
<td>0.466</td>
<td>0.127</td>
<td>268</td>
</tr>
<tr>
<td>2011</td>
<td>0.458</td>
<td>0.158</td>
<td>191</td>
</tr>
<tr>
<td>2012</td>
<td>0.579</td>
<td>0.204</td>
<td>184</td>
</tr>
<tr>
<td>2013</td>
<td>0.581</td>
<td>0.278</td>
<td>135</td>
</tr>
</tbody>
</table>

*Vacancy and non-employment data are the average over 3 months in the second quarter of the reference year.*
## Labor Market Tightness Including Women

<table>
<thead>
<tr>
<th>Measure</th>
<th>Year</th>
<th>$\theta_H$</th>
<th>$\theta_L$</th>
<th>Percent Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment</td>
<td>1979</td>
<td>0.5891</td>
<td>1.0574</td>
<td>-44.3</td>
</tr>
<tr>
<td>Unemployment</td>
<td>2007</td>
<td>1.7888</td>
<td>0.8768</td>
<td>104</td>
</tr>
</tbody>
</table>

- Low-skilled labor market slightly tighter in 1970s
- High-skilled labor market substantially tighter in 2000s
Regardless of the cutoff, tightness gap is larger today.
Robustness to Education Cutoff

\[ z^* = 0.5 \]

\[ z^* = 0.65 \]
Robustness to Alternative Tightness Data

**Tightness Gap**

Percent difference between high- and low-skilled labor market tightness (vacancies/nonemployed). Nonemployed are men 25–54, excluding institutionalized. Source: IPUMS.

**Counterfactuals**

Channels individually turned on (in light blue)

- Data
- Full Model
- Labor Supply
- Labor Demand
- Search Frictions
- Separations

Employment Gap Change (percentage points)
### Robustness to Unemployment Tightness Measure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\phi_{L,79}$</td>
<td>match efficiency</td>
<td>0.2674</td>
<td>CPS finding rate = 0.2732</td>
</tr>
<tr>
<td>$\phi_{L,07}$</td>
<td>match efficiency</td>
<td>0.2952</td>
<td>CPS finding rate = 0.2808</td>
</tr>
<tr>
<td>$\phi_{H,79}$</td>
<td>match efficiency</td>
<td>0.3602</td>
<td>CPS finding rate = 0.2946</td>
</tr>
<tr>
<td>$\phi_{H,07}$</td>
<td>match efficiency</td>
<td>0.2214</td>
<td>CPS finding rate = 0.2762</td>
</tr>
</tbody>
</table>

![Employment Gap Change (percentage points) with Channels individually turned on (in light blue)](image-url)
Robustness to Bargaining Power Parameters

π_L = 0.52, π_H = 0.72
Robustness to Posting Cost Parameters

\[ \kappa_L = 0.3, \kappa_H = 0.7 \]
Robustness to College Share Fixed at 40 Percent