Selective Hiring and Welfare Analysis in Labor Market Models

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• Labor market in this paper: heterogeneity of training costs.

• Why? Our framework nests two interesting cases:
  • Standard search and matching model (“random hiring”)
  • “Selective hiring”

• Welfare analysis: Toy model → analytical results

• Simple application: optimal unemployment benefits
• Unemployment is very costly under selective hiring, as the unemployment risk is spread unequally.

• Consumption risk is uninsurable.

• Unemployment benefits as important government instrument (beyond implementing first best job creation) to insure the “unborn.”

• Welfare in selective hiring economy always lower than under first best.
1. Some Motivating Micro-Evidence
2. Model Environment
3. Equilibrium Unemployment
4. Welfare Analysis
5. Application: Optimal Unemployment Insurance
Figure 3: This figure shows the average probability of an unemployed worker becoming employed in the following month as a function of her unemployment duration, 1976 to 2000. Data are our calculations from the CPS.

• Unemployed are less skilled than employed (education level, experience, ...)
• Skill composition of (un-)employed is countercyclical (Solon, Barsky and Parker 1994, Mueller 2010)
• Workers with intrinsically lower job-finding rate are overrepresented in the data (e.g., Barnichon and Figura, 2011, Hornstein 2011).
Model Environment

- Continuum of heterogeneous workers \( i \)
- Fixed training costs per worker: \( K \)
- Random training costs component: \( \varepsilon_{it} \sim G \)
- Production per period: \( y \)
- Labor market
  - Job creation: driven by idiosyncratic training costs \( \varepsilon_{it} \)
  - Job destruction: exogenous separation rate \( \lambda \)
• A worker with low training costs is more profitable / generates more social value than a worker with high training costs.
• Decision margin (for decentralized economy or social planner): choose cutoff $\tilde{\varepsilon}_t$
• Hire a worker if $\varepsilon_{it} < \tilde{\varepsilon}_t$
• Do not hire a worker if $\varepsilon_{it} > \tilde{\varepsilon}_t$.
• Resulting job-finding rate: $f(\tilde{\varepsilon}_t)$
• Labor market constraints:

\[ n_t = (1 - \lambda) n_{t-1} + f(\tilde{e}_t) \]

\[ s_t = (1 - \lambda)(1 - f(\tilde{e}_t)) n_{t-1} + f(\tilde{e}_t) \]

• Resource constraint:

\[
\int_{-\infty}^{\infty} c_{it} dG = y_t n_t - [1 - (1 - \lambda) n_{t-1}] f(\tilde{e}_t) (K + H(\tilde{e}_t))
\]
• Social planner maximizes

\[ E_0 \sum_{t=0}^{\infty} \beta^t \int_{-\infty}^{\infty} U(c_{it}) dG \]

subject to the goods and labor market constraints.

• Two conditions:

1) Efficient consumption:

\[ c_{it} = c_t \text{ for all } i \]
2) Efficient job creation:

\[ K + \tilde{\varepsilon}_t = y_t + (1 - \lambda) E_t [Q_{t,t+1} \{ K + \tilde{\varepsilon}_{t+1} - f(\tilde{\varepsilon}_{t+1})(\tilde{\varepsilon}_{t+1} - H(\tilde{\varepsilon}_{t+1}))\}] \]
Equilibrium Unemployment: Firm Side

Max. \[ E_0 \sum_{t=0}^{\infty} Q_{0,t} \left[ (y_t - w_t) n_t - f(\tilde{\varepsilon}_t) s_t (K + H(\tilde{\varepsilon}_t)) \right] \]

s.t. \[ n_t = (1 - \lambda) n_{t-1} + f(\tilde{\varepsilon}_t) s_t \]

s is exogenous for the atomistic firm!

Optimal job-creation condition in the decentralized economy:

\[ K + \tilde{\varepsilon}_t = y_t - w_t + (1 - \lambda) E_t [Q_{t,t+1} (K + \tilde{\varepsilon}_{t+1})] \]
Social Planner:

\[ K + \tilde{c}_t = y_t + (1 - \lambda) E_t \left[ Q_{t,t+1} \left\{ K + \tilde{c}_{t+1} - f(\tilde{c}_{t+1})(\tilde{c}_{t+1} - H(\tilde{c}_{t+1})) \right\} \right] \]

Decentralized:

\[ K + \tilde{c}_t = y_t - w_t + (1 - \lambda) E_t \left[ Q_{t,t+1} (K + \tilde{c}_{t+1}) \right] \]

Decentralizing efficient job creation:

\[ w_t = (1 - \lambda) E_t \left[ Q_{t,t+1} f(\tilde{c}_{t+1})(\tilde{c}_{t+1} - H(\tilde{c}_{t+1})) \right] \]
Job-finding rate of an individual worker:

\[ f_{it} = \begin{cases} 
1 & \text{if } \varepsilon_{it} \leq \bar{\varepsilon}_t \\
0 & \text{if } \varepsilon_{it} > \bar{\varepsilon}_t 
\end{cases} \]

Aggregate job-finding rate:

\[ f(\bar{\varepsilon}_t) = \frac{\int_{-\infty}^{\infty} f_{it}s_{it}dG}{\int_{-\infty}^{\infty} s_{it}dG} \]
Random hiring: training costs iid

Aggregate job-finding rate:

\[ f^\text{RH} (\tilde{\varepsilon}_t) = \frac{\int_{-\infty}^{\tilde{\varepsilon}_t} 1 \cdot s_t \cdot dG + \int_{\tilde{\varepsilon}_t}^{\infty} 0 \cdot s_t \cdot dG}{\int_{-\infty}^{\infty} s_t \cdot dG} = G'(\tilde{\varepsilon}_t) \]

Steady state unemployment:

\[ \bar{u}^\text{RH} = \frac{\lambda [1 - G'(\tilde{\varepsilon})]}{\lambda [1 - G'(\tilde{\varepsilon})] + G(\tilde{\varepsilon})} \]
Random Hiring and Search and Matching

Random hiring:

\[ K + \tilde{\varepsilon}_t = y_t - w_t + (1 - \lambda) E_t [Q_{t,t+1} (K + \tilde{\varepsilon}_{t+1})] \]

Compare to search and matching:

\[ K + \frac{k}{q_t} = y_t - w_t + (1 - \lambda) E_t \left[ Q_{t,t+1} \left( K + \frac{k}{q_{t+1}} \right) \right] \]

**Conditions identical it:**

\[ f_t = \left( \frac{\tilde{\varepsilon}_t}{k} \right)^{\frac{1-\mu}{\mu}} \]

Framework to think about the selectivity of hiring, while maintaining the insights from S&M models!
Selective hiring: training costs are fixed over time

\[
\tilde{f}^{SH}(\tilde{x}) = \frac{\int_{-\infty}^{\tilde{x}} 1 \cdot \lambda \cdot dG + \int_{\tilde{x}}^{\infty} 0 \cdot 1 \cdot dG}{\int_{-\infty}^{\tilde{x}} \lambda \cdot dG + \int_{\tilde{x}}^{\infty} 1 \cdot dG} = \frac{\lambda G(\tilde{x})}{\lambda G(\tilde{x}) + 1 - G(\tilde{x})}
\]

\[
\tilde{u}^{SH} = 1 - G(\tilde{x})
\]

- A macroeconomist would calibrate these models to match standard statistics (e.g., the steady state job-finding and the unemployment rates).
- In this case, the macro-predictions would be very similar.
- But these models would have very different micro-predictions.
Under complete markets and no aggregate shocks:

\[ c_{it} = c_i \text{ for all } i \text{ and } t \]

When we assume that economic agents are born with zero assets:

\[ c_i = E_0 m_{it} = u_i b + (1 - u_i) w + \pi \]

→ Without aggregate shocks, consumption depends exclusively on unconditional unemployment risk.
Selective Hiring vs. Random Hiring: Welfare Implications

Unemployment risk under selective hiring:

\[
\begin{array}{l}
\nu_i^{SH} = \\
0 \text{ if } \varepsilon_i \leq \bar{\varepsilon} \\
1 \text{ if } \varepsilon_i > \bar{\varepsilon}
\end{array}
\]

Thus (assuming that wages are at the efficient level):

\[
\mathcal{W}^{SH} = u\mathcal{U}(b + \pi) + (1 - u)\mathcal{U}(w + \pi) \leq \mathcal{U}(u(b + \pi) + (1 - u)(w + \pi)) = \mathcal{W}^{RH}
\]

→ Government role: unemployment insurance across workers

→ “Missing market” for insurance: Being a “bad worker” is uninsurable.
Application: Optimal Unemployment Insurance

• Ramsey problem

• Government chooses unemployment benefits (financed by lump-sum taxes) to maximize the welfare in the economy
  • subject to the economy’s competitive equilibrium equations.
  • subject to a balanced budget constraint.

• Numerical illustration for steady state results.
Application: Illustrative Parametrization

- Separation rate: 0.1
- Uniform distribution with support [-4,4]
- Aggregate productivity: 1
- Log-Utility
- Reference point: first best economy.
  - Target job-finding rate of 0.5 (→ n=0.91)
  - → Set K=1
  - Wage that decentralizes efficiency: 0.9
- Wage rule: \( w = \phi y + (1 - \phi) b \)
- Two cases: High and low bargaining power (\( \phi = 0.75 \) and 0.25).
Numerical Illustration: High bargaining power

Figure 1. Welfare as a function of unemployment benefits, $\phi = 0.75$

First best solution
Numerical Illustration: Low Bargaining Power

Figure 2. Welfare as a function of unemployment benefits, $\phi = 0.25$

First best solution
• New framework, which nests random and selective hiring.

• Random hiring = search and matching

• Selective hiring: unemployment is spread unequally and the welfare costs are larger
Outlook:

Cost of Business Cycles

• Selective hiring

• Economy without aggregate shocks $\rightarrow$ some workers never employed, others at all times

• Economy with shocks and concave utility $\rightarrow$ some workers with low utility become employed

$\rightarrow$ Potential gains of business cycle fluctuations