Friedrich-Alexander-Universität
Erlangen-Nürnberg

Selective Hiring and Welfare Analysis in Labor Market Models

Christian Merkl* and Thijs van Rens**

***University of Erlangen-Nuremberg and Kiel Institute**
**** CREI and Universitat Pompeu Fabra**

European Summer Symposium in International Macroeconomics (ESSIM)

Motivation

- 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

Preview: Consequences of Selectivity

- 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.

Roadmap

1. Some Motivating Micro-Evidence
2. Model Environment
3. Equilibrium Unemployment
4. Welfare Analysis
5. Application: Optimal Unemployment Insurance

Selective Hiring: Evidence

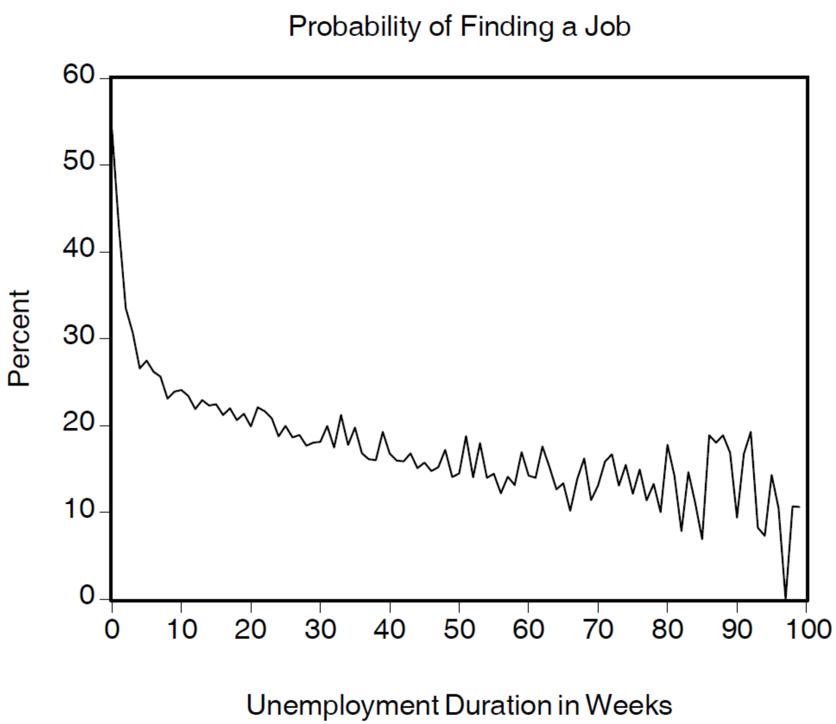


Figure 3: This figure shows the average probability of an unemployed worker becoming employed in the following month as a function of her unemployment duration, 1976 to 2000. Data are our calculations from the CPS.

Source: Abraham and Shimer 2001.

Further Evidence

- 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 ε_{it}
  - Job destruction: exogenous separation rate λ

Friedrich-Alexander-Universität Erlangen-Nürnberg

- 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: $f\left(\tilde{\varepsilon}_t\right)$

Model Environment

- Labor market constraints:

$$n_t = (1-\lambda)\, n_{t-1} + f(\tilde{\varepsilon}_t)\, s_t = (1-\lambda)\,(1 - f(\tilde{\varepsilon}_t))\, n_{t-1} + f(\tilde{\varepsilon}_t)$$

- Resource constraint:

$$\int_{-\infty}^{\infty} c_{it}\, dG = y_t n_t - [1 - (1-\lambda)\, n_{t-1}]\, f(\tilde{\varepsilon}_t)\,(K + H(\tilde{\varepsilon}_t))$$

Model Environment: Efficiency 1

- Social planner maximizes

$$E_0 \sum_{t=0}^{\infty} \beta^t \int_{-\infty}^{\infty} \mathcal{U}\left(c_{it}\right) dG$$

subject to the goods and labor market constraints.

- Two conditions:

1) Efficient consumption:

$$c_{it} = c_t \text{ for all } i$$

Model Environment: Efficiency 2

2) Efficient job creation:

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

Private value

Social value

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:

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

Efficient Wage Setting

Social Planner:

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

Decentralized:

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

Decentralizing efficient job creation:

$$w_t = (1 - \lambda) E_t \left[Q_{t,t+1} f\left(\tilde{\varepsilon}_{t+1}\right) \left(\tilde{\varepsilon}_{t+1} - H\left(\tilde{\varepsilon}_{t+1}\right)\right) \right]$$

Job-Finding Rate

Job-finding rate of an individual worker:

$$f_{it} = \begin{cases} 1 \text{ if } \varepsilon_{it} \leq \tilde{\varepsilon}_t \\ 0 \text{ if } \varepsilon_{it} > \tilde{\varepsilon}_t \end{cases}$$

Aggregate job-finding rate:

$$f\left(\tilde{\varepsilon}_t\right) = \frac{\int_{-\infty}^{\infty} f_{it} s_{it} dG}{\int_{-\infty}^{\infty} s_{it} dG}$$

Random Hiring

Random hiring: training costs iid

Aggregate job-finding rate:

$$f^{\mathrm{RH}}\left(\tilde{\varepsilon}_t\right)=\frac{\int_{-\infty}^{\bar{\varepsilon}_t} 1 \cdot s_t \cdot dG+\int_{\bar{\varepsilon}_t}^{\infty} 0 \cdot s_t \cdot dG}{\int_{-\infty}^{\infty} s_t \cdot dG}=G\left(\tilde{\varepsilon}_t\right)$$

Steady state unemployment:

$$\bar{u}^{\mathrm{RH}}=\frac{\lambda\left[1-G\left(\tilde{\varepsilon}\right)\right]}{\lambda\left[1-G\left(\tilde{\varepsilon}\right)\right]+G\left(\tilde{\varepsilon}\right)}$$

Random Hiring and Search and Matching

Random hiring:

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

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 if:

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

← Elasticity of the matching function wrt u

➡ Framework to think about the selectivity of hiring, while maintaining the insights from S&M models!

Selective Hiring

Selective hiring: training costs are fixed over time

$$f^{\mathrm{SH}}\left(\tilde{\varepsilon}\right)=\frac{\int_{-\infty}^{\bar{\varepsilon}}1\cdot\lambda\cdot dG+\int_{\tilde{\varepsilon}}^{\infty}0\cdot 1\cdot dG}{\int_{-\infty}^{\bar{\varepsilon}}\lambda\cdot dG+\int_{\tilde{\varepsilon}}^{\infty}1\cdot dG}=\frac{\lambda G\left(\tilde{\varepsilon}\right)}{\lambda G\left(\tilde{\varepsilon}\right)+1-G\left(\tilde{\varepsilon}\right)}$$

$$\bar{u}^{\mathrm{SH}}=1-G\left(\tilde{\varepsilon}\right)$$

→

- 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.

Selective Hiring vs. Random Hiring: Welfare Implications

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:

$$u_i^{\mathrm{SH}} = \begin{cases} 0 \text{ if } \varepsilon_i \leq \tilde{\varepsilon} \\ 1 \text{ if } \varepsilon_i > \tilde{\varepsilon} \end{cases}$$

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

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

→Government role: unemployment insurance across workers

→ “Missing market” for insurance: Being a “bad worker” is uninsurable.

Application: Optimal Unemployment Insurance

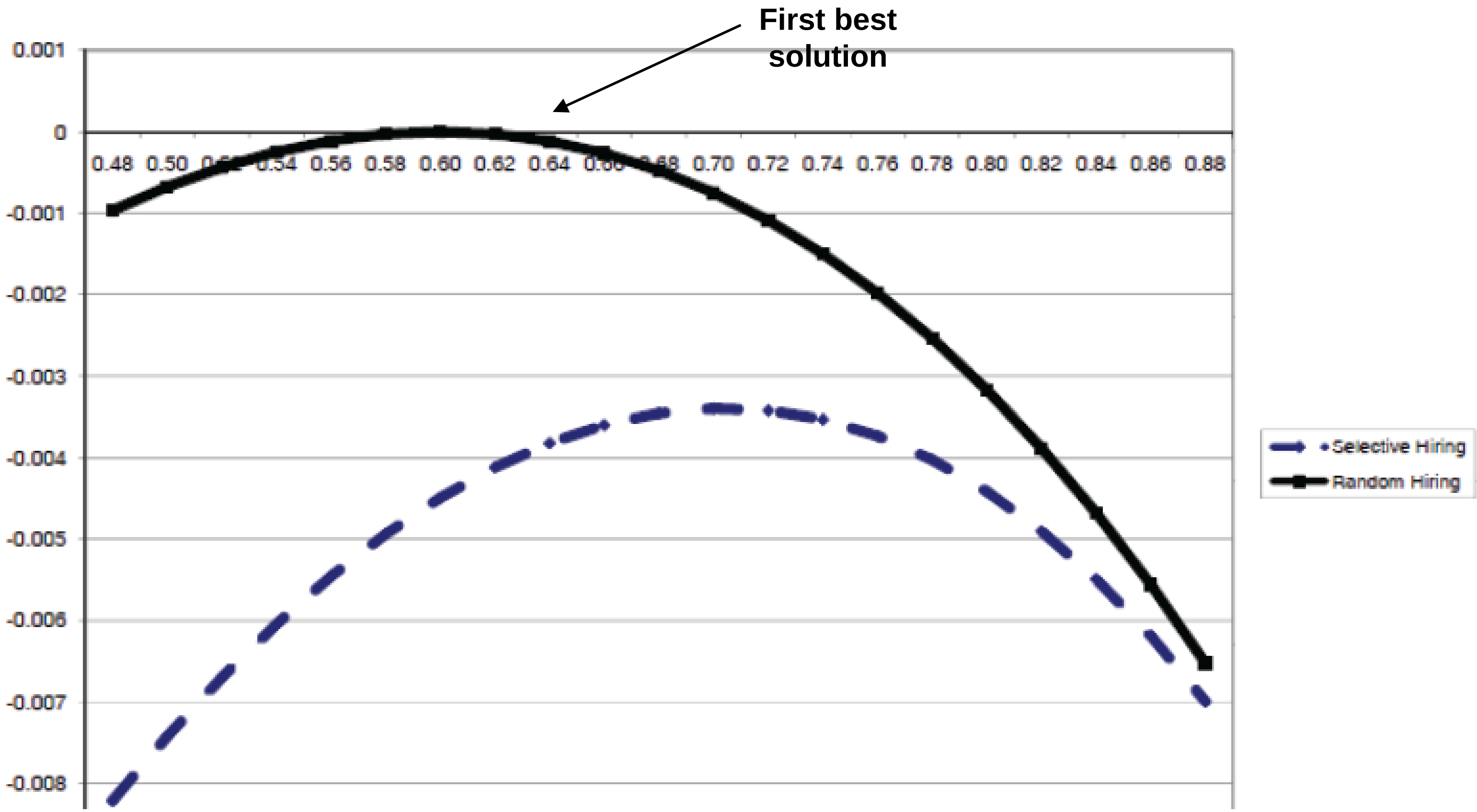
- Ramsey problem
- Government chooses unemployment benefits (financed by lump-sum taxes) to maximize the welfare in the economy
    - subject to the economy's competitive equilibrium equations.
    - subject to a balanced budget constraint.
- Numerical illustration for steady state results.

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).

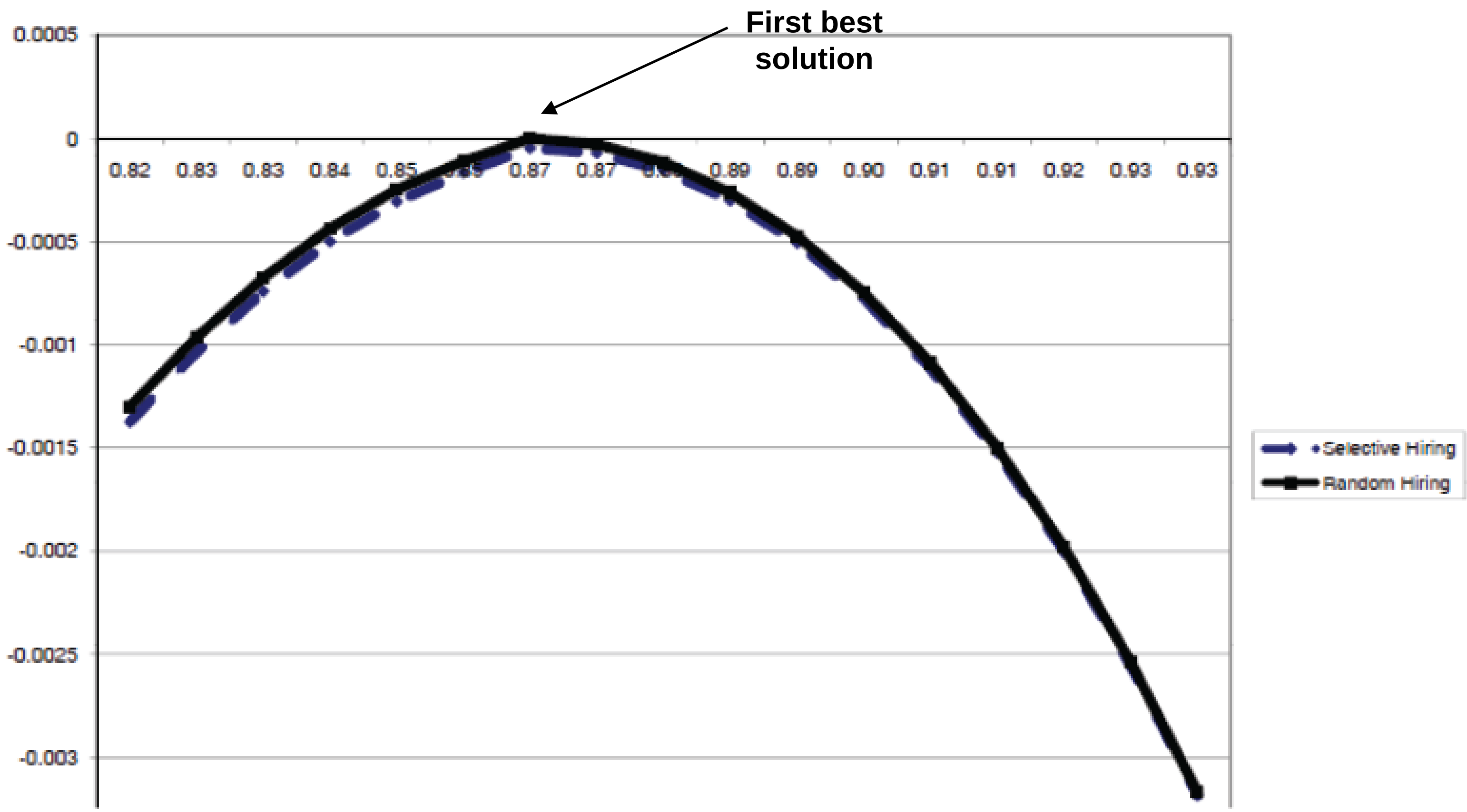
Numerical Illustration: High bargaining power

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



Numerical Illustration: Low Bargaining Power

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



Summary

- 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

Friedrich-Alexander-Universität Erlangen-Nürnberg

Outlook:

Cost of Business Cycles

- Selective hiring
- Economy without aggregate shocks → some workers never employed, others at all times
- Economy with shocks and concave utility → some workers with low utility become employed

→ Potential gains of business cycle fluctuations