Unemployment Risk and the Distribution of Assets

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Question

The broad purpose of this paper:

- **How does the distribution of assets affect job search decisions?**

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  2. What is optimal level of government-provided unemployment insurance (UI) as a function of asset ?

Motivation
Model Ingredients

- Unemployment risk as source of income uncertainty
- Two sources of market incompleteness:
  1. Uninsurable Unemployment Risk
  2. Job search
- Heterogeneous asset holdings
- Access to asset markets $\Rightarrow$ consumption smoothing
- But role of precautionary savings
- How UI affects LM outcome?
  - Incentive effects: reservation wage, effort
- The needs to smooth consumption and job search behavior

The Mechanism

The Labor Market as an Insurance Mechanism

- Heterogeneous firms: high productivity firms
  - Have higher opportunity cost of unfilled job
  - Post high wages
- Risk averse workers self-insure w/ wage-unemployment bundle
- Different asset holdings affect job search decision
- UI: asst distribution, consumption smoothing, firms entry

Related Literature

- Partial Equilibrium
  - Danforth (1979)
  - Hopenhayn-Nicolini (1992)
  - Shimer-Werning (2007, 2008)
- General Equilibrium
  - Acemoglu-Shimer (1999): homogeneous assets; CARA; focus on firm investment and job creation
  - Golosov-Menzio-Maziero (2011): homogenous agents, private job search decision
- Quantitative
  - Aiyagari (1994)
  - Krusell, Mukoyama, Sahin (2010)
  - ...

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$\Rightarrow$ New: asset distribution, two sided heterogeneity

The Model

Population, preferences and technology

- Time is discrete and agents discount the future at rate β.
- There is a continuum of risk averse workers (employed/unemployed) with asset levels $a \in \mathcal{A} = [\underline{a}, \overline{a}] \subset \mathbb{R}_+$
- There is a continuum of risk neutral firms with productivities $y \in \mathcal{Y} = \left[\underline{y}, \overline{y}\right] \subset \mathbb{R}_+$
- r is return to saving.
- τ is a proportional tax on wage and UI is tax financed

The Model

Matching:

- Search is Directed
- Firm y: announce w and workers apply for different firms.
- Firm-to-worker ratio: θ in each submarket.
- Matching prob: $q(\theta); q' > 0, q'' < 0$; firms $m(\theta) = \frac{q(\theta)}{\theta}$
- Separation with exogenous probability $\lambda \in (0, 1)$

Workers

- Unemployed

$$U(a) = \max_{a',\theta} \left\{ u(c_u) + \beta \left[q(\theta) E(a', w) + (1 - q(\theta)) U(a') \right] \right\}$$

$$\text{s.t:} \quad c_u + a' = (1 + r)a + b$$

$$a' \geq 0$$

- Employed

$$E(a, w) = \max_{a'} \left\{ u(c_e) + \beta[\lambda U(a') + (1 - \lambda) E(a', w)] \right\}$$

$$\text{s.t:} \quad c_e + a' = (1 + r)a + (1 - \tau)w$$

$$a' \geq 0$$

Firms

- The value of posting a vacancy

$$V(y) = -k + \max_{w} \beta[m(\theta)J(y,w) + (1 - m(\theta))V(y)]\}$$

- The value of a filled job

$$J(y,w) = f(y) - w + \beta[\lambda V(y) + (1-\lambda)J(y,w)]$$

Equilibrium

Definition

An equilibrium is a pair of market clearing distributions $(P(y, w), Q(a, a', y, w))$ such that:

1. Worker optimality: $(a, a', y, w) \in \text{supp } Q$ only if (y, p) maximizes $U(a, a', y, w), E(a, a', y, w)$;
2. Firm optimality: $(y, w) \in \text{supp } P$ only if w maximizes $V(y)$;

- Monotone matching (positive) $\mu : \mathcal{A} \to \mathcal{Y}$. Market Clearing:

$$\int_{a}^{\overline{a}} \theta(y) f(a) da = \int_{\mu(a)}^{\overline{y}} g(y) dy.$$

Solution

- Substitute $J(y, w)$ into $V(y)$
- Substitute wage from firm problem into worker problem.
- $\phi(a, y, V)$ is a matching problem.

$$\Phi(a, y, V) = \max_{a', \theta, y} \left\{ u(c_u) + \beta \left[q(\theta) E(a', w) + (1 - q(\theta)) \Phi(a') \right] \right\}$$

Where:

$$\begin{aligned} c_u &= (1 + r)a + b - a' \\ c_e &= (1 + r)a + (1 - \tau)w - a' \\ w &= f(y) - \frac{1 - \beta(1 - \lambda)}{m(\theta)} \Big[(1 - \beta(1 - m(\theta)))V + k \Big] \end{aligned}$$

Solution

- FOCs:
  - Consumption smoothing
  - Optimal job search
  - Optimal allocation
- Supermodularity of Φ:

$$\frac{d^2}{dady}\Phi = \Phi_{ay} + \Phi_{Vy}\frac{\partial V}{\partial y} = \Phi_{ay} - \frac{\Phi_y}{\Phi_V}\Phi_{Va} > 0$$

  - Higher a apply to higher y $\iff$ Φ supermodular.

Assets - Productivity allocation

Proposition

Workers with higher initial asset levels a will apply for higher wage jobs provided

$$\frac{E_{a'}(a', w) - \Phi_{a'}(a')}{E(a', w) - \Phi(a')} < \frac{E_{a',w}(a', w)}{E_w(a', w)} \qquad (\mathbf{U}_\infty)$$

Proposition

Under condition $(\mathbf{U}_\infty)$ and for a given worker with assets a, the job productivity y decreases in the duration of unemployment.

Assets – Productivity allocation

Under condition $\mathbf{U}_\infty$

- High asset workers ($a \uparrow$):
  1. apply for high productivity jobs ($y \uparrow$)
  2. earn higher wages ($w \uparrow$)
  3. have higher unemployment ($\theta \downarrow \Rightarrow q(\theta) \downarrow$)
  4. have higher expected consumption ($c \uparrow$)
  5. have higher expected utility ($U \uparrow$)
- High productivity firms ($y \uparrow$):
  1. post higher wages ($w \uparrow$)
  2. attract higher asset workers ($a \uparrow$)
  3. have higher expected profits ($\pi \uparrow$)
  4. fill vacancies faster ($\theta \downarrow \Rightarrow m(\theta) \uparrow$)

Equilibrium Properties

Under condition $\mathbf{U}_\infty$

- High asset holders have higher risk tolerance
- High productivity firms want to hire with high probability
  $\Rightarrow$ post high wage

$\Rightarrow$ natural complementarily between assets and productivity

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$\Rightarrow$ natural complementarily between assets and productivity

But, there is no technological complementarity

Calibration

- One period is set to be 6 weeks.
- $a \in \mathcal{A} = [0, 300]$ and $y \in \mathcal{Y} = [100, 200]$
- $u(c) = log(c)$, $f(y) = y$, $q(\theta) = \theta(1 + \theta^{\gamma})^{\frac{1}{\gamma}}$

Parameter	Definition	Value
β	discount factor	0.99
r	interest rate	0.005
b	unemployment benefit	60
k	cost of vacancy	50
λ	Probability of Separation	0.03
γ	elasticity of matching fn	1.2

Characterization of the Steady State

u(%)	$avg(\theta)$	$avg(w)$
4.7%	1.11	148.22

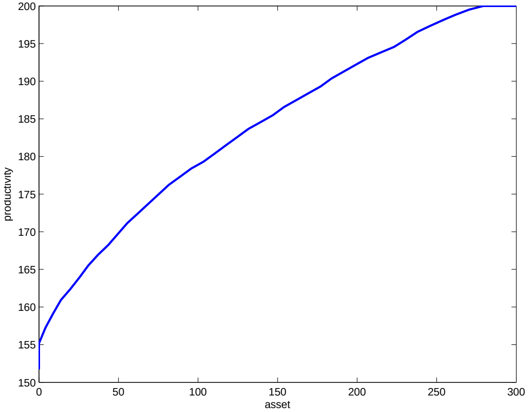


Figure : Allocation of firms and workers in labour market

Probability of job finding and Wage

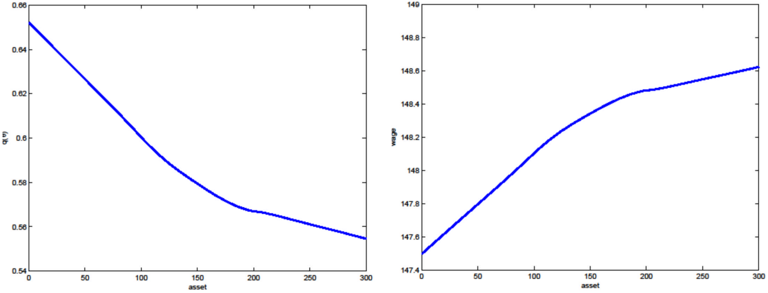


Figure : probability of job finding and wage as a function of asset

Value of workers and firms

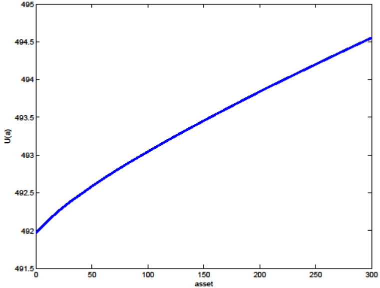


Figure : The value of unemployed workers as a function of asset and firms as a function of productivity

Distribution of asset and productivity

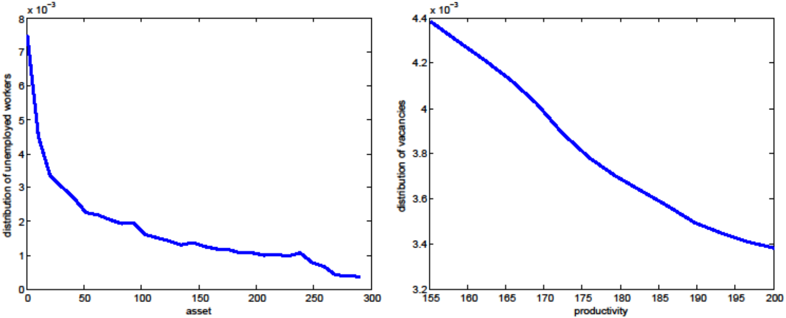
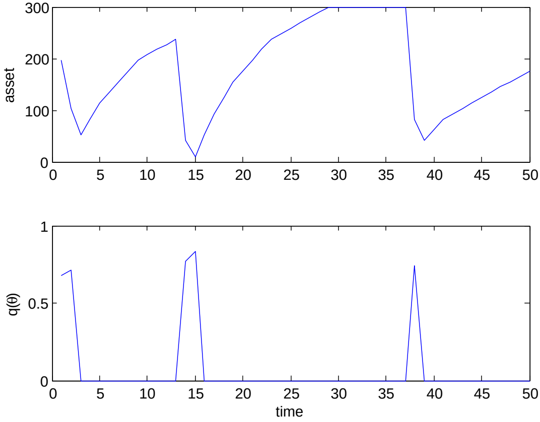


Figure : Distribution of workers and firms

Simulation



300
200
100
0
asset
0 5 10 15 20 25 30 35 40 45 50
1
0.5
0
q(θ)
0 5 10 15 20 25 30 35 40 45 50
time

Welfare Effects of UI

Is UI welfare improving?

1. Consumption
2. Allocation and probability of job finding
3. Firms entry

Welfare Effects of UI

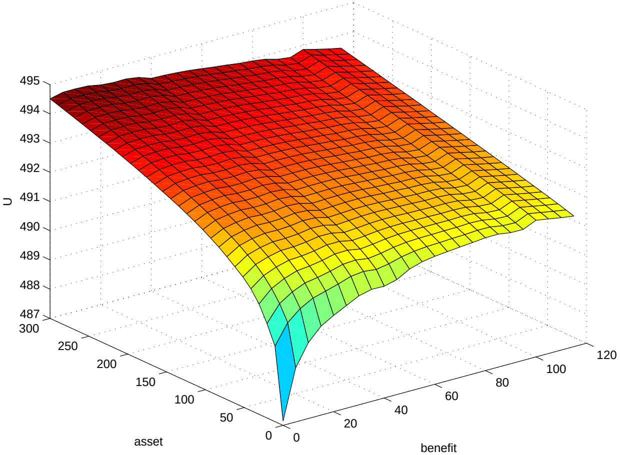
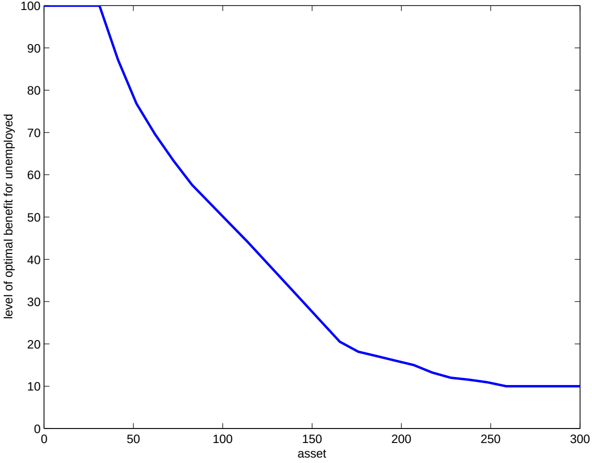


Figure : The value of unemployment

Optimal UI and asset holding



Consumption

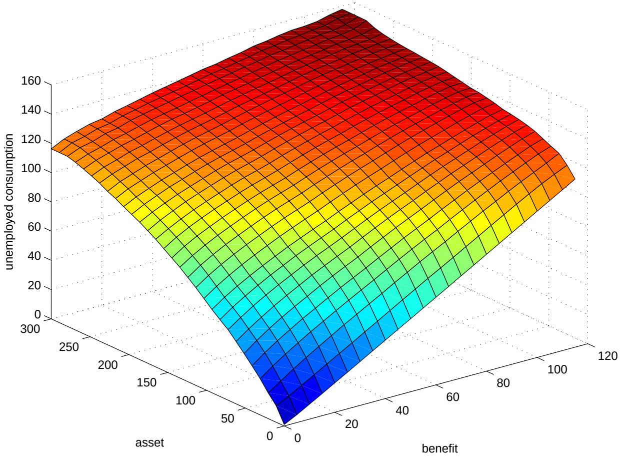


Figure : Consumption of unemployed workers

Allocation

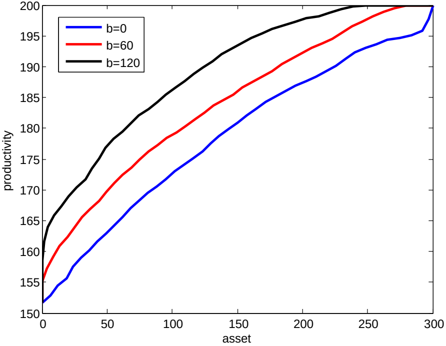


Figure : Change in allocation of asset holders to firms of different productivities

Probability of job finding

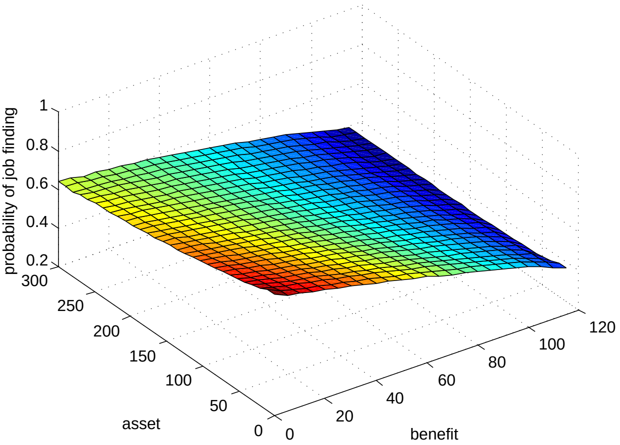


Figure : Probability of job finding as a function of asset and unemployment benefit

Unemployment and Firms entry

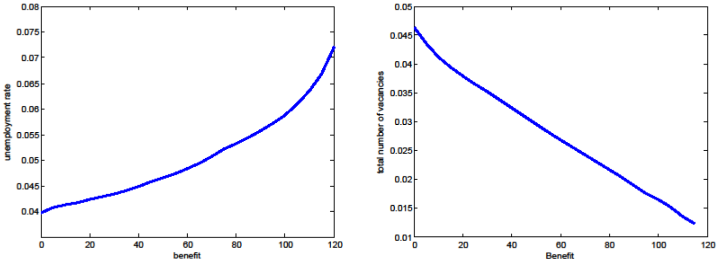


Figure : Unemployment rate and total vacancies as a function of unemployment benefit

Comparison

Aiyagari(1994)

- The employment process is exogenously given
- UI and taxes are nondistortionary
- Welfare is monotonically increasing in benefit

Krusell et al(2010)

- Frictional labour market, Nash bargaining, homogenous firms
- Same probability of job finding for all workers
- Asset distribution does not play any role

Conclusion

- Interaction: search frictions, unemployment risk
- Wage/productivity increasing in assets

$\Rightarrow$ Assets affect wage inequality

- UI: interaction of consumption smoothing, distribution and firms entry
- Productivity and labour-market outcomes

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Appendix

Assets – Productivity allocation

Proposition

Workers with higher initial asset levels a will apply for more productive jobs provided

$$\frac{u'(c_e) - u'(Ra')}{u(c_e) - u(Ra')} < \frac{u''(c_e)}{u'(c_e)} \tag{U}$$

- Within HARA, condition (**U**) is equivalent to DARA:
  - $<$ CRRA – log
  - $=$ CARA – risk neutrality
  - $>$ quadratic
- DARA, $\frac{u''}{u'} < 0$ (or positive risk prudence $u''' > 0$):
  - sufficient for small w

Related empirical literature

- Silvio (AER-2006), Card, Chetty, and Weber (QJE-2007), and Lentz (RED-2009): document that higher asset holdings lead to prolonged job search
- Chetty (JPE-2008) shows that the elasticity of the job finding rate with respect to unemployment benefits decreases with liquid wealth
- Browning and Crossley (JPE-2001) show that unemployment insurance improves consumption smoothing for poor agents, but not for rich ones

Weighted average value of unemployment