Search and Work in Optimal Welfare Programs

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Labour Markets and the Welfare State
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Introduction

• Social expenditures on labor market programs targeted to poor/out-of-work in OECD countries: 1.7% of GDP in 2009
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- Social expenditures on labor market programs targeted to poor/out-of-work in OECD countries: 1.7% of GDP in 2009

- Programs include a mix of policy instruments
  - Social Assistance
  - Unemployment Insurance (≠ degrees of monitoring)
  - Job-search Assistance (training and placement)
  - Transitional Work: “stepping stone” to private sector job
  - Mandatory Work: “work in exchange for welfare”
  - Training
  - Earnings subsidies/re-employment incentives
Question and language

**Broad question**: how to optimally design a welfare program
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- A policy is a prescription of an activity (search, work, train, or rest) to the participant, with an associated conditional transfer

- A welfare program is a government expenditure program that combines different policies

- An optimal welfare program maximizes the unemployed agent ex-ante utility, for a given level of government expenditures

Focus: how to combine search-based & work-based policies
Approach

- Dynamic contracting framework
  - hidden actions (as in the optimal UI literature)
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  - human capital
  - additional technologies $\rightarrow$ activity of the participant $\rightarrow$ policy
Approach

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  ▶ hidden actions (as in the optimal UI literature)
  ▶ human capital
  ▶ additional technologies → activity of the participant → policy

• Solution to the insurance-incentive trade off:
  ▶ Optimal sequence of policies along the unemployment spell
  ▶ Optimal sequence of payments
    – benefits during unemployment
    – subsidies/taxes upon re-employment
1. Economic Environment
Preferences, endowments and markets

• Agent is infinitely lived, discounts future at rate $\beta$

• Intra-period utility: $u(c) - e \cdot a$
  
  ▶ Separable in consumption $c$ and effort $a \in \{0, 1\}$
  
  ▶ $u(\cdot)$ increasing, strictly concave, smooth, unbounded below, and $u^{-1}$ has convex first derivative (Newman, 2007)
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• Agent endowed with initial human capital $h_0$

• Zero initial wealth, no access to insurance/credit markets
Production technologies

- Primary production (private sector)
  - Output is $\omega(h)$, $\omega$ increasing in $h$
  - Access to this technology is frictional
  - It is an absorbing state
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• Work activity requires effort $a = 1$ to be productive
Private search technology (for primary job)

- Three stages:

1. **Applications**: \( a \cdot \eta(h) \), with \( \eta(h) \) available job opportunities

2. **Contact**: probability \( \mu \) of being recontacted by firm

3. **Hire**: upon contact, prob. \( \theta(r) \) of being retained by firm, where worker’s action \( r \in \{0, 1\} \) and \( \theta(1) = \theta > \theta(0) = 0 \)

\[ \Rightarrow \text{Job finding probability: } \pi(h, a, r) = \theta(r)[1 - (1 - \mu)^a \cdot \eta(h)] \]
Assisted search technology (for primary job)

• At cost $\kappa$, agency takes over search on behalf of participant
  
  ▶ Participant saves her search effort
  
  ▶ Agency sends out $\min \{\eta(h), \eta\}$ applications

• Hire still subject to worker’s retention action $r$

⇒ Job finding probability: $\lambda(h, r) = \theta(r)[1 - (1 - \mu)^{\min\{\eta(h), \eta\}}]$
Human capital depreciation

• Human capital *depreciates deterministically at rate* $\delta$:
Human capital depreciation

- Human capital **depreciates deterministically at rate** $\delta$:
  - wage depreciation since $\omega_h > 0$
  - decline in hazard rate since $\eta_h > 0$
Human capital depreciation

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  ▶ decline in hazard rate since $\eta_h > 0$

• Only primary employment stops depreciation

• Extension: training technology rebuilds human capital
Information structure

- **Observable and contractible:**
  - Initial type $h_0$
  - Work effort and output of production
  - Consumption
Information structure

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  - Initial type $h_0$
  - Work effort and output of production
  - Consumption

• **Private information** of the agent and under her control:
  - Job-search effort
  - Retention action following a firm-worker contact
2. **Contract**
Principal-Agent relationship

The risk-neutral planner/government offers a contract that minimizes its expenditures, subject to delivering to the agent a given level of utility.
Principal-Agent relationship

The risk-neutral planner/government offers a contract that minimizes its expenditures, subject to delivering to the agent a given level of utility.

At every node, the contract specifies:

- **Activity**: private search, assisted search, secondary prod., rest
- **IC recommendations** on the effort level $a$ and retention action $r$
- **Consumption** level:
  - welfare benefits during unemployment
  - wage taxes/subsidies during employment
Options of contract as policies of welfare program

• Combination of prescriptions on effort \(a\), retention action \((r = 1)\), and use of technologies leads to five policy instruments:

  ▶ **UI**: Unemployment Insurance (private search, \(a = 1\))

  ▶ **JA**: Job-search Assistance (assisted search, \(a = 0\))

  ▶ **MW**: Mandatory Work (secondary production, \(a = 1\))

  ▶ **TW**: Transitional Work (sec. prod. + assisted search, \(a = 1\))

  ▶ **SA**: Social Assistance (no use of technology, \(a = 0\))
Recursive formulation

- **State variables:**
  1. human capital $h \leftrightarrow$ duration $d$
  2. continuation utility $U$ promised by the contract
Recursive formulation

• State variables:

1. human capital \( h \) \( \iff \) duration \( d \)

2. continuation utility \( U \) promised by the contract

• Initial conditions: \((h_0, U_0)\)

• For every pair \((h, U)\), the planner solves:

\[
V(U, h) = \max \{ V^{UI}(U, h), V^{JA}(U, h), V^{TW}(U, h), V^{MW}(U, h), V^{SA}(U, h) \}
\]

from \( V \) to \( V \) (concave) through lotteries
Unemployment Insurance (UI)

• The planner elicits search effort and retention action:

\[
V^{UI}(U, h) = \max_{c, U^s, U^f} -c + \beta \left[ \pi(h)W(U^s, h') + (1 - \pi(h))V(U^f, h') \right]
\]

subject to :

\[
u(c) - e + \beta[\pi(h)U^s + (1 - \pi(h))U^f] \geq u(c) + \beta U^f \quad (IC - S)
\]

\[
U^s \geq U^f \quad (IC - R)
\]

\[
U = u(c) - e + \beta \left[ \pi(h)U^s + (1 - \pi(h))U^f \right] \quad (PK)
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\[
h' = (1 - \delta)h
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\]

subject to:

\[
U^s - U^f \geq \frac{e}{\beta \pi(h)} \quad (IC - S)
\]

\[
U^s \geq U^f \quad (IC - R)
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\[
U = u(c) - e + \beta \left[ \pi(h)U^s + (1 - \pi(h))U^f \right] \quad (PK)
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Job-search Assistance (JA)

• The planner pays $\kappa$ to save on effort and elicits retention action:

$$V^{J\!A}(U, h) = \max_{c, U^s, U^f} -c - \kappa + \beta \left[ \lambda(\pi) W(U^s, h') + (1 - \lambda(\pi)) V(U^f, h') \right]$$

subject to:

$$U^s \geq U^f \quad (IC - R)$$

$$U = u(c) + \beta \left[ \lambda(\pi) U^s + (1 - \lambda(\pi)) U^f \right] \quad (PK)$$

$$h' = (1 - \delta) h$$
3. PARAMETERIZATION
## Parameterization

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preferences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility function</td>
<td>$u(c)$</td>
<td>log</td>
<td>Pavoni and Violante (2007)</td>
</tr>
<tr>
<td>Discount factor</td>
<td>$\beta$</td>
<td>0.9959</td>
<td>Annual interest rate 5 pct</td>
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<tr>
<td>Disutility from effort</td>
<td>$e$</td>
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<td>Various sources</td>
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<td><strong>Labor market</strong></td>
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<tr>
<td>Initial monthly earnings</td>
<td>$h_0$</td>
<td>$1,000$</td>
<td>NEWWS</td>
</tr>
<tr>
<td>Job search hazard</td>
<td>$\pi(h)$</td>
<td>Weibull</td>
<td>Monthly CPS (1995-1996)</td>
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<tr>
<td>Monthly depreciation</td>
<td>$\delta$</td>
<td>0.0135</td>
<td>Various sources</td>
</tr>
<tr>
<td><strong>Assisted search</strong></td>
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<tr>
<td>Job search hazard</td>
<td>$\lambda$</td>
<td>0.23</td>
<td>NEWWS, and Cebi and Woodbury (2011)</td>
</tr>
<tr>
<td>Administrative cost</td>
<td>$\kappa$</td>
<td>0.23</td>
<td>NEWWS, and Kirby et al. (2002)</td>
</tr>
<tr>
<td><strong>Secondary production</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Output net of costs</td>
<td>$\omega$</td>
<td>0.521</td>
<td>NEWWS, and Kirby et al. (2002)</td>
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</table>
4. RESULTS
Policy space
Policy space as phase diagram

Optimal Policies in the (U,h) Space

- UI
- JA
- TW
- MW

Promised Utility (U)

Human Capital (h)

11 10 9 8 7 6 5 4

Pavoni-Setty-Violante, "Search and Work in Optimal Welfare Programs"
Benefits and Wage Subsidies

Payments (replacement ratio)

Subsidy/tax upon re-employment

Pavoni-Setty-Violante, "Search and Work in Optimal Welfare Programs"
5. JOB-SEARCH MONITORING
Policy Space

Optimal Policies in the (U,h) Space

Promised Utility (U)

Human Capital (h)

JM

JA

UI

TW

SA

MW

Pavoni-Setty-Violante, "Search and Work in Optimal Welfare Programs"
Lessons

Policy: combination of technology and participant’s effort/actions

1. Estimation of technology parameters (costs and returns) is critical
   - without high effort, biased estimates
   - randomization useful
   - diff-in-diff does not measure returns of technology

2. Search-based vs work-based programs, depending on generosity
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4. For example, wage subsidy key for the success of “low-effort" interventions which could lead to employment (like JA)
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Digression: \( u^{-1} \) convex first derivative?

- \( \frac{1}{u'} \) is the marginal cost to the planner of promising an additional unit of utility \( U \) to the agent.

- **Definition [incentive cost]**: extra cost in units of consumption of promising the agent a state-contingent utility lottery delivering \( U \) necessary to satisfy IC, relative to the cost of promising \( U \) with certainty.

- If \( \frac{1}{u'} \) is convex, then the incentive cost is increasing in \( U \).

- CARA or CRRA (\( \gamma > 1/2 \)) \( \Rightarrow \frac{1}{u'} \) convex.
Markets

- **Benchmark model**: agents have no access to insurance and credit markets
Markets

- **Benchmark model**: agents have no access to insurance and credit markets

- **Extension**: agents can save with return $q^{-1} = \beta^{-1}$ but face a no-borrowing constraint

  - Same optimal contract as in the benchmark can be implemented with one additional instrument:

    - a linear *interest rate tax* large enough to keep the agent always at the borrowing constraint.
Social Assistance (SA)

- The worker is asked to rest, as the planner requires no effort in this period

- Pure income assistance policy:

\[
V^{SA}(U, h) = \max_{c,U^f} -c + \beta V(U^f, h')
\]

subject to:

\[
U = u(c) + \beta U^f
\]

\[
h' = (1 - \delta)h
\]

Pavoni-Setty-Violante, "Search and Work in Optimal Welfare Programs"
Mandatory Work (MW)

- The planner allocates the worker to the secondary production and elicits work effort:

\[ V^{MW}(U, h) = \max_{c,U^f} \omega - c + \beta V(U^f, h') \]

subject to:

\[ U = u(c) - e + \beta U^f \quad (PK) \]

\[ h' = (1 - \delta)h \]
Transitional Work (TW)

- The planner combines secondary production with matching and elicits work effort and retention action:

\[
V^{TW}(U, h) = \max_{c, U^f, U^s} \omega - c - \kappa + \beta [\lambda(h)W(U^s, h') + (1 - \lambda(h))V(U^f, h')]
\]

subject to:

\[
U^s \geq U^f \quad (IC - R)
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Economic forces in the choice of policies

- **Effort compensation cost** (UI, TW, MW, & EMP): increasing in $U$
Economic forces in the choice of policies

- Effort compensation cost (UI, TW, MW, & EMP): increasing in $U$
- Returns to search (UI): increasing in $h$ through $(\omega, \pi)$
- Returns to matching (JA & TW): increasing in $h$ through $\omega$
Economic forces in the choice of policies

- **Effort compensation cost** (UI, TW, MW, & EMP): increasing in $U$
- **Returns to search** (UI): increasing in $h$ through $(\omega, \pi)$
- **Returns to matching** (JA & TW): increasing in $h$ through $\omega$
- **Incentive costs**
  
  \[
  \text{Search (UI): } U^s(U) - U^f(U) \geq \frac{\varepsilon}{\beta \pi(h)} \quad (\text{IC-S})
  \]
  
  \[
  \text{Retention (JA & TW): } U^s(U) \geq U^f(U) \quad (\text{IC-R})
  \]
  
  - **IC-S costs decreasing in $h$**
  - **Both IC-S and IC-R costs increasing in $U$**
Application: United States

• Federal legislation attributes to States power to administer/design welfare programs

• *National Evaluation of Welfare-to-Work Strategies (NEWWS)*: government-sponsored large-scale longitudinal study based on random assignment of 40,000 individuals between 1991-1999 in seven distinct U.S. locations

• Two sets of WTW programs with different features:
  - Labor Force Attachment (LFA): emphasis on work
  - Human Capital Developm. (HCD): emphasis on training