# Wage Risk and Employment Risk over the Life Cycle

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# Motivation

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- Why care?
  - Different risks are mitigated by different insurance opportunities
  - Different risks induce different savings and labor supply responses
  - Value of welfare programs depend on relative importance of risks
  - Policies may induce labor supply responses

# Roadmap

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2. Estimate magnitude of different risks using PSID and SIPP, accounting for choices
3. Calculate welfare cost of each source of risk
4. Assess value of 3 welfare programs:
   - Unemployment Insurance
   - Disability Insurance
   - Food Stamps

# Wages and Shocks

$$\log w_{it} = d_t^{ed} + x'_{it}\psi^{ed} + u_{it} + e_{it} + a_{ij(t_0)}$$

- $d_t^{ed}$ : skill premium for education group
- $x'_{it}$ : individual characteristics, age
- $u_{it}$ : permanent component
  - $u_{it} = u_{it-1} + \zeta_{it}$
- $e_{it}$ : transitory component
  - IID measurement error
- $a_{ij(t_0)}$ : firm-worker match component
  - $j(t_0)$ : index of firm that worker joined in $t \leq t_0$
  - constant over life of firm-worker relationship
  - $\xi_{it+1} = a_{ij(t+1)} - a_{ij(t_0)}$ : wage growth due to firm mobility

# Job Destruction and Arrival

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**Decisions if Employed**

- quit to unemployment
- stay/move if new offer received
- savings/consumption decision

**Decisions if Unemployed**

- accept/reject job offer if received
- savings/consumption decision
- apply for disability insurance if applicable

# Individual Optimization

**Demographics** Discrete time, quarterly period, work for 40 years (22-62), 10 years retirement, certain death

**Preferences** $U(c_t, P_t) = \frac{(c_t \exp\{\eta P_t\})^{1-\gamma}}{1-\gamma}$

**Budget Constraint**

$$\begin{aligned} R^{-1}A_{it+1} + c_{it} &= A_{it} + [w_{it}h(1-\tau_w) - F]P_{it} \\ &\quad + [D_{it}E_{it}^{DI} + B_{it}E_{it}^{UI}(1 - E_{it}^{DI})](1 - P_{it}) \\ &\quad + T_{it}E_{it}^{FS} \end{aligned}$$

- No borrowing: $A_{it+1} \geq 0$

**State Variables**

- Employed: $A_{it}, u_{it}, a_{ij(t_0)}$, age
- Unemployed, not on disability: $A_{it}, u_{it}, DI_{it}^{elig}$, age
- Unemployed, on disability: $A_{it}, D_{it}$, age

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- Eligibility:
  - negative productivity shock
  - unemployed in previous quarter (one application per unemployment spell)
  - at least age 50
- 50% probability of successful application
- if successful, disability becomes absorbing state, payment is concave function of permanent wage
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**Universal Means-Tested Program (FS)**

- income test $y_{it}$ = earnings, UI, DI (after tax)
- $T_{it} = \bar{T} - 0.3 y_{it}$ if $y_{it} \leq \underline{y}$

# Estimation of Wage Parameters

$$\log w_{it} = d_t^{ed} + x'_{it}\psi^{ed} + u_{it} + e_{it} + a_{ij(t_0)}$$

- 3 step estimation using SIPP and PSID:
  1. latent utility model (probits) for participation and mobility
  2. estimate coefficients on wage using adjustments from selection equation - $d_t^{ed}, \psi^{ed}$
  3. method of moments to identify variances of unobserved terms - $u_{it}, e_{it}, a_{ij(t_0)}$
- exclusion restrictions: unearned household income, state-level index of generosity of unemployment insurance, industry dummies

# Wage Estimation Results

| | Whole sample (1) | Low education (2) | High education (3) | Neglect selections (4) | Neglect mobility (5) | Neglect participation (6) |
|---|---|---|---|---|---|---|
| $\sigma_\zeta$ | 0.114 | 0.104 | 0.116 | 0.147 | 0.149 | 0.111 |
| | (0.016) | (0.032) | (0.015) | (0.013) | (0.013) | (0.016) |
| | [0%] | [0%] | [0%] | [0%] | [0%] | [0%] |
| $\sigma_e$ | 0.085 | 0.081 | 0.087 | 0.085 | 0.085 | 0.085 |
| | (0.008) | (0.017) | (0.009) | (0.008) | (0.008) | (0.008) |
| | [0%] | [0%] | [0%] | [0%] | [0%] | [0%] |
| $\sigma_a$ | 0.213 | 0.208 | 0.215 | | | 0.209 |
| | (0.013) | (0.026) | (0.019) | | | (0.012) |
| | [0%] | [0%] | [0%] | | | [0%] |
| $\rho_{\zeta\pi}$ | 0.217 | 0.193 | −0.164 | | 0.376 | |
| | (0.184) | (0.193) | (0.269) | | (0.146) | |
| | [8.8%] | [15.6%] | [61.6%] | | [0%] | |
| $\rho_{\zeta\mu}$ | −0.497 | −0.901 | −0.500 | | | −0.713 |
| | (0.330) | (0.506) | (0.409) | | | (0.292) |
| | [4.4%] | [1.2%] | [19.2%] | | | [0.8%] |
| $\rho_{\xi\pi}$ | 0.273 | 0.508 | −0.416 | | | |
| | (0.252) | (0.346) | (0.790) | | | |
| | [19.2%] | [3.6%] | [67.6%] | | | |
| $\rho_{\xi\pi_{-1}}$ | −0.250 | −0.253 | 0.098 | | | |
| | (0.189) | (0.225) | (0.653) | | | |
| | [1.6%] | [10%] | [95.6%] | | | |
| $\rho_{\xi\mu}$ | 0.210 | 0.314 | 0.242 | | | 0.302 |
| | (0.166) | (0.298) | (0.228) | | | (0.152) |
| | [11.6%] | [8%] | [20.8%] | | | [2%] |

# Calibrated and Fixed Parameters

## Labor Market Frictions

- choose $\delta, \lambda^n, \lambda^e, F, \eta$ to match:
  - participation rates in four age groups
  - median unemployment duration in four age groups

## Other Parameters

- $\gamma = 1.5$
- $r = \frac{1}{\beta} - 1 = 0.015$

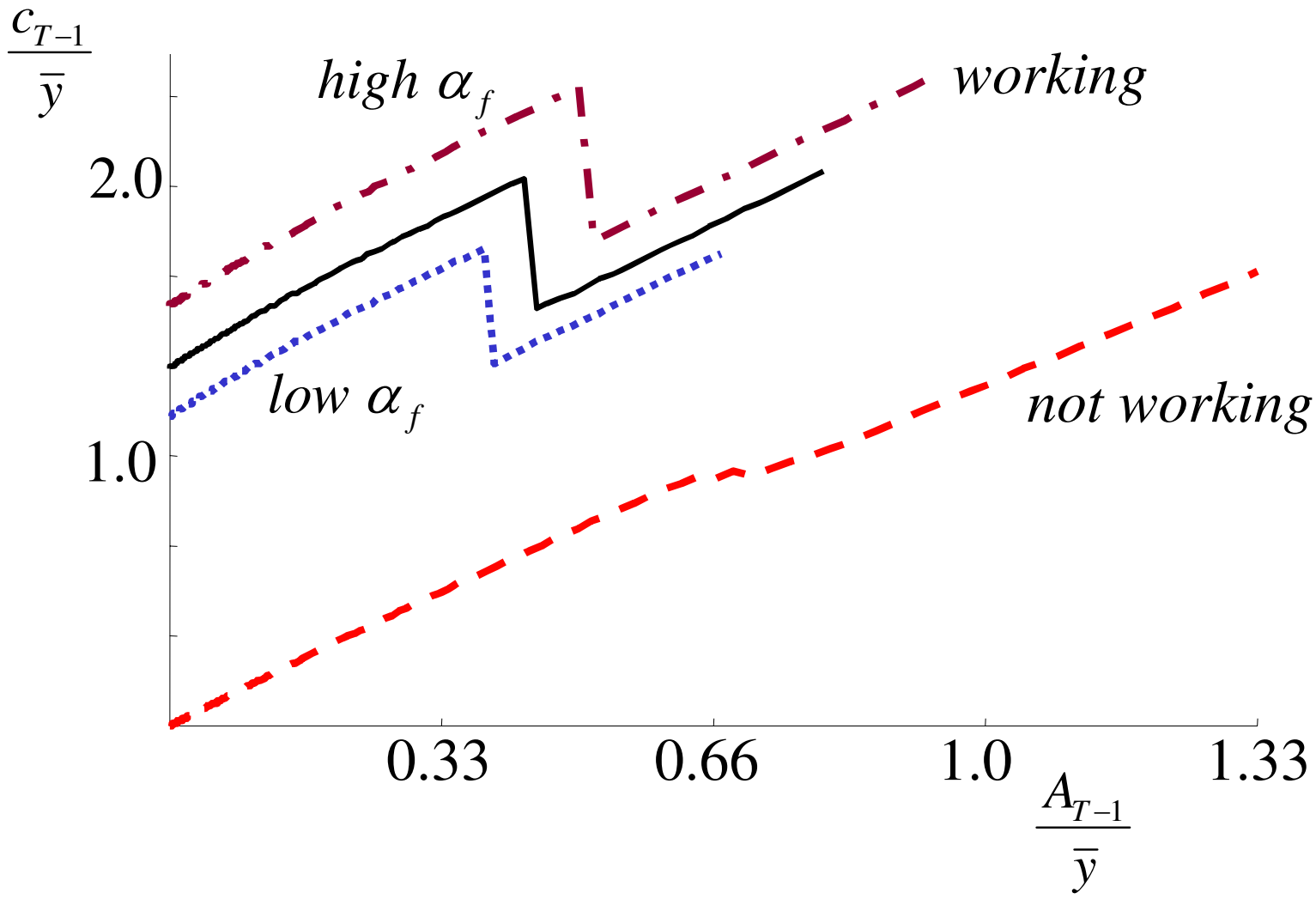
# Calibration Results

| Parameter | High Education | Low Education |
|---|---|---|
| Job destruction rate $\delta$ | 0.021 | 0.044 |
| Job arrival rate - Unemployed $\lambda^n$ | 0.87 | 0.79 |
| Job arrival rate - Employed $\lambda^e$ | 0.77 | 0.73 |
| Fixed cost of work $F$ | 0.46 | 0.39 |
| Disutility of participation $\eta$ | $-0.30$ | |

Note: The values of $\delta$, $\lambda^n$ and $\lambda^e$ are given as quarterly rates. We impose that the utility cost of participation $\eta$ is the same across education groups.

The value of the fixed cost $F$
for each education group is expressed as a ratio to average earnings of that group at age 22.

# Non-monotonic Policy Functions



# Welfare Costs of Different Risks

- set $\tau_w$ to balance budget within education groups
- partial equm - measure costs for "small" changes in risk

| | High Education | | Low Education | |
|---|---|---|---|---|
| *Scenario* | *Elasticity of consumption willing to pay ($\Delta_W$)* | *Elasticity of Output* | *Elasticity of consumption willing to pay ($\Delta_W$)* | *Elasticity of Output* |
| Productivity risk: $\sigma_\zeta$ | $-0.490$ | $-0.014$ | $-0.340$ | $-0.077$ |
| Job Destruction: $\delta$ | $-0.074$ | $-0.116$ | $-0.087$ | $-0.180$ |
| Unempl. arrival rate: $\lambda^n$ | 0.026 | 0.013 | 0.026 | 0.038 |
| On-the-job arrival: $\lambda^e$ | 0.097 | 0.104 | 0.074 | 0.115 |
| Firm heterogeneity: $\sigma_a$ | 0.396 | 0.425 | 0.279 | 0.365 |
| Productivity risk without mobility | $-0.607$ | $-0.08$ | $-0.394$ | $-0.241$ |

# Welfare Benefit of Insurance

- measure value of channeling the proceeds from a 1% deficit into each program

| | High Education | Low Education |
|---|---|---|
| *Scenario* | *Elasticity of consumption willing to pay* ($\pi$) | *Elasticity of consumption willing to pay* ($\pi$) |
| Unemp. Insurance | 0.170 | 0.227 |
| Food stamps | 0.253 | 0.399 |
| Disability Insurance | 0.070 | 0.127 |
| Tax Change | -0.070 | -0.151 |