Estimating a Life Cycle Model with Unemployment and Human Capital Depreciation

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20 min presentation for Sargent's RG

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Introduction

This paper uses German and American micro data to estimate a life-cycle model with search unemployment.

- individual human capital stock depends on the employment history
- the specific institutional arrangements are modeled for each country
- policy experiments are conducted based on the estimated model

Model Set-up

- agents live for L periods
- can be either employed or unemployed during the first $L^R - 1$ periods ($L^R < L$)
- employees never quit, but face the constant probability λ of being laid off every period
- unemployed workers receive job offers at the Poisson rate ω
- gross wage in period j is determined by job specific quality m and individual skill level q: $w_j = \chi m_j q_j$
- skill depreciates by a factor $1 - \delta_u$ per unemployed period and increases by the factor $1 + \delta_e$ per employed period
- skill depreciates by a factor $1 - \delta_f$ when laid off

Recursive formulation of the agent's problem

$$V_j(a_j, s_j, q_j, m_j, \Omega_j) = \max_{a_{j+1}, \underline{m}_j} \{u_j(c_j) + \beta E_j V_{j+1}(a_{j+1}, s_{j+1}, q_{j+1}, m_{j+1}, \Omega_{j+1})\}$$

$$s.t \quad a_{j+1} = R(a_j + y_j - c_j), \; a_{L+1} = 0$$

where

$$u_j(c) = \begin{cases} f_j^{\phi} \ln c & \text{if } \gamma = 1 \\ f_j^{\phi} \frac{c^{1-\gamma} - 1}{1-\gamma} & \text{otherwise} \end{cases}$$

$$\ln m \sim N(-\frac{1}{2}\sigma_m^2, \sigma_m^2)$$

Included components of net income y

- wage
- social security contribution
- income tax
- earned income credit (U.S.)
- benefits
  - child benefit (Germany)
  - unemployment compensation
  - unemployment assistance (Germany)
  - social assistance (Germany)
  - food stamps (U.S.)
  - pensions
  - supplemental security income (U.S.)

Estimation

- Data sets used
  - German: German Socio-Economic Panel Study (GSOEP)
  - Unite States: Panel Study of Income Dynamics (PSID)
- Estimation strategy: simulated methods of moments
- conditional moments to match
  - mean gross labour income
  - mean weeks unemployed per year
  - growth of mean consumption

Parameters To Be Estimated

Table 1: Parameters to be estimated

parameter	meaning	estimated in stage
δ_e	growth rate of skills during employment	1 (sample moment)
δ_u	skill loss per period during unemployment	2
δ_f	skill decline at job loss	2
λ	job destruction rate	1 (sample moment)
ω	job offer rate	2
σ_m	standard deviation of log match quality	2
β	discount rate	2
γ	relative risk aversion	2 [a]
ϕ	elasticity of utility w.r.t. family size	1 (OLS)
r	real interest rate	1 (macro data)
χ	scale parameter	2

[a] constrained to equal 3.0; see appendix.

Estimation Results

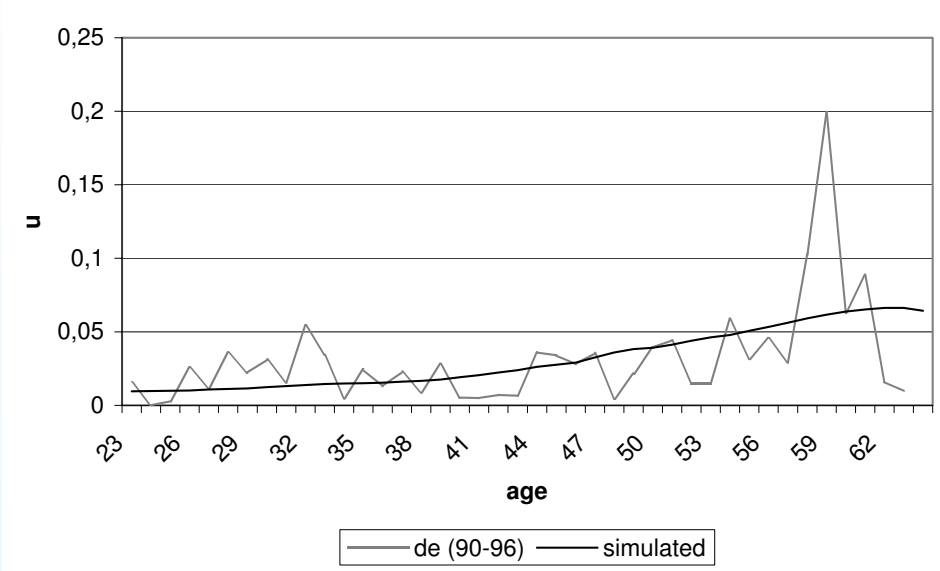
Table 2: Estimation results (standard deviations in parenthesis)

parameter	Germany	United States
δ_e [per annum]	0.016	0.027
	(0.002)	(0.003)
δ_u [per annum]	0.091	-0.023
	(0.031)	(0.019)
δ_f	0.208	0.240
	(0.013)	(0.040)
λ [per annum]	0.040	0.065
	(0.003)	(0.003)
ω [per month]	23.37	23.88
	(1.719)	(20.44)
σ_m	0.112	0.019
	(0.019)	(0.008)
β [per annum]	0.880	0.985
	(0.005)	(0.049)
γ	3.0 [a]	3.0 [a]
ϕ/γ	0.468	0.349
	(0.038)	(0.019)
r [per annum]	0.033	0.014
	(0.012)	(0.009)
χ	1981	1231
	(70.52)	(101.9)

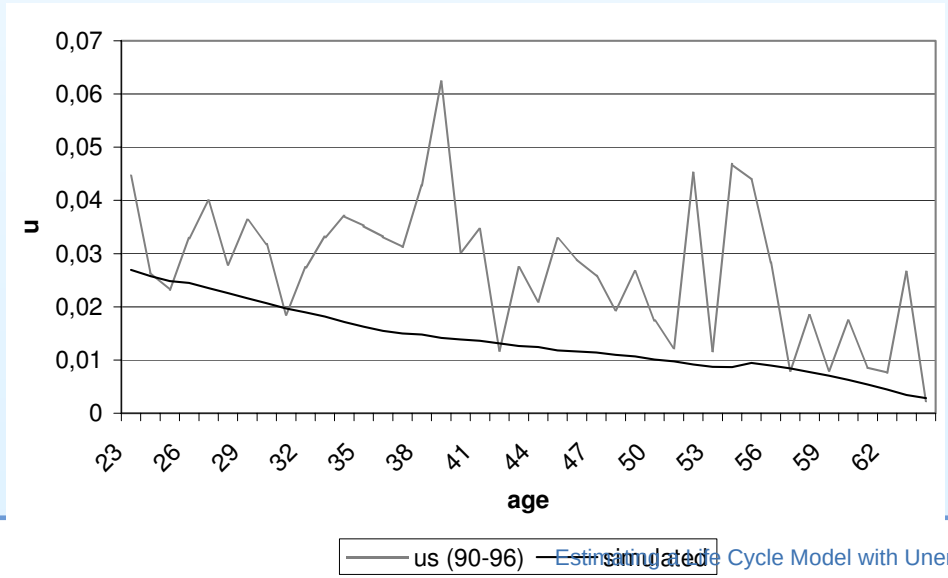
[a] by constraint

Model Performance

gure 1: Empirical and simulated unemployment rates by age.



(a) Germany



Reservation match quality and hazard rates

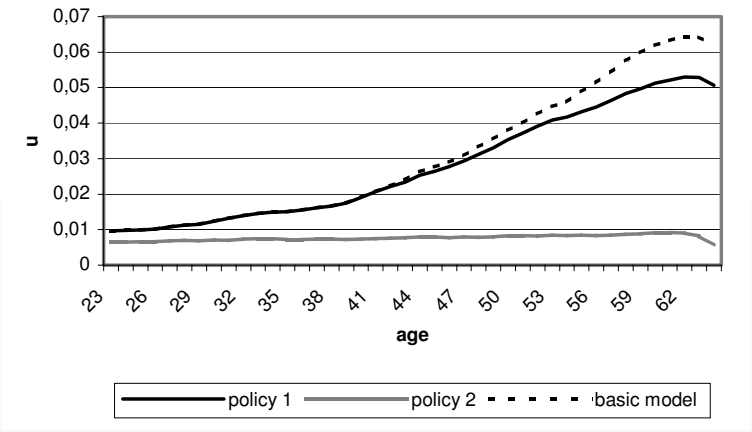
(a1) reservation match, Germany

(a2) hazard rate, Germany

(b1) reservation match, US

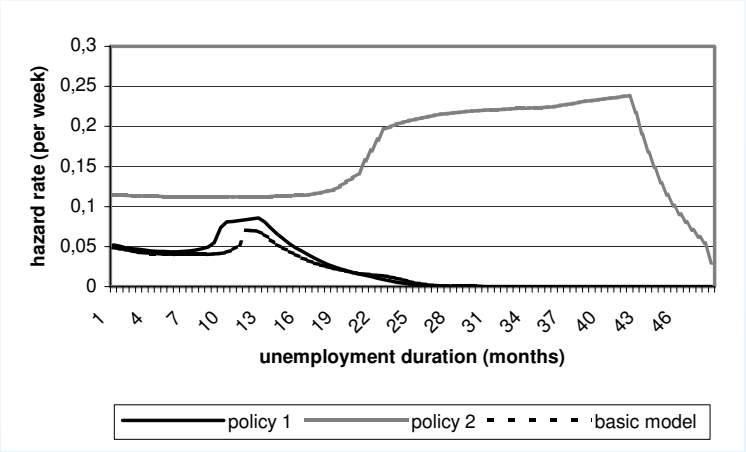
(b2) hazard rate, US

Policy experiments for Germany



(a) unemployment rates

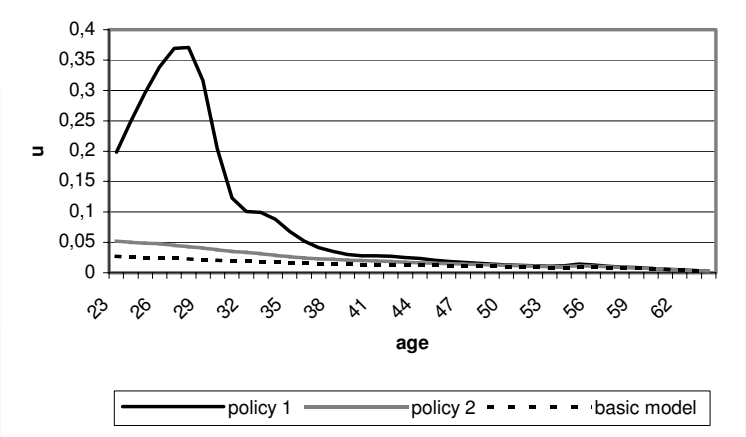
(b) hazard rates (age 30)



(c) hazard rates (age 45)

(d) hazard rates (age 60)

Policy experiments for the U.S.



(a) unemployment rates

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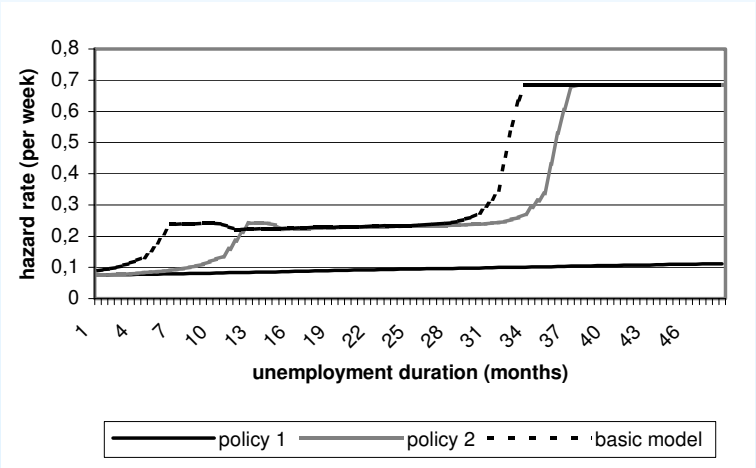
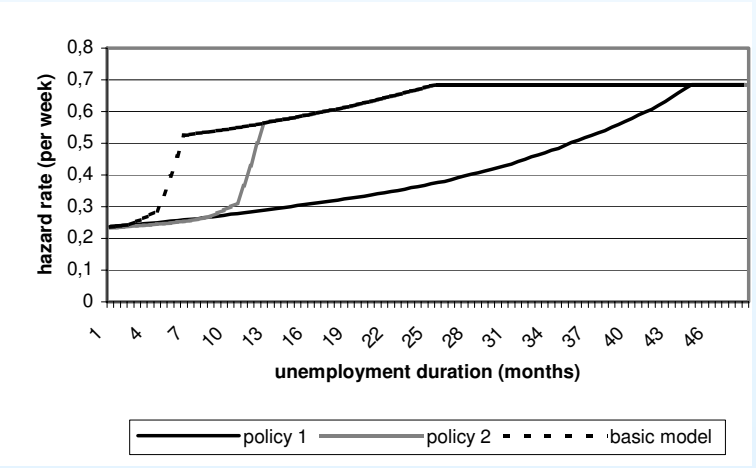


(c) hazard rates (age 45)



(d) hazard rates (age 60)