Accounting for the U.S. Earnings and Wealth Inequality

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JPE,2003

20 min presentation for Sargent's RG

10/18/05

Key Features

- mix the main features of the dynastic and life cycle models
- model explicitly the U.S. Social Security system
- calibrate the model economy to the distribution (Lorenz curves) of U.S. earnings and wealth

Households

- a continuum of households
- l units of disposable time each period
- working-age households ($\mathcal{E}$):
  - uninsured idiosyncratic shock to efficiency labor units
  - positive probability of *retiring*
- retire households ($\mathcal{R}$):
  - zero efficiency labor units
  - positive probability of *dying*
- when a retired household dies, it is replaced by a working-age descendant.
- household inherits the estate of the previous member of its dynasty at the beginning of the first period of its working life
- utility: $E\left[\sum_{t=0}^{\infty}\beta^t\left(\frac{c_t^{1-\delta_1}}{1-\delta_1}+\chi\frac{(l-l_t)^{1-\delta_2}}{1-\delta_2}\right)|s_0\right]$

Assumptions on Shock Process

- The joint age and endowment of efficiency labor units shock $s \in S = \mathcal{E} \bigcup \mathcal{R} = \{1, 2, ..., J\} \bigcup \{J+1, J+2, ..., 2J\}$

$$\Gamma_{SS} = \begin{pmatrix} \Gamma_{\mathcal{E}\mathcal{E}} & \Gamma_{\mathcal{E}\mathcal{R}} \\ \Gamma_{\mathcal{R}\mathcal{E}} & \Gamma_{\mathcal{R}\mathcal{R}} \end{pmatrix}$$

- every working-age household faces the same probability of retiring: $\Gamma_{\mathcal{E}\mathcal{R}} = p_{l\varrho}\mathbf{I}$
- every retired household faces the same probability of dying: $\Gamma_{\mathcal{R}\mathcal{R}} = p_{\varrho\varrho}\mathbf{I}$
- $\Gamma_{\mathcal{R}\mathcal{E}}$ is controlled by two other parameters ϕ_1, ϕ_2
- in the paper, $J = 4$, so we have $4^2 + 1 + 1 + 2 - 4 = 16$ parameters to be determined for Γ_{SS}

Technology, Government and Market Arrangements

- Technology
  - CRS aggregate production: $Y = K^{\theta} L^{1-\theta}$
  - capital depreciates at rate δ
- Government
  - income tax: $\tau(y_t) = a_0[y - (y^{-a1} + a_2)^{-1/a_2}] + a_3 y$
  - estate tax:

$$\tau_E(z) = \begin{cases} 0 & \text{for } z \leq \underline{z} \\ \tau_E(z - \underline{z}) & \text{for } z > \underline{z} \end{cases}$$

  - public transfer $\omega(s_t)$
  - government spending G
- Market Arrangement
  - household cannot borrow

Household's problem

$$v(s,a) = \max_{c\geq 0, z\in A, 0\leq l\leq \bar{l}} \{u(c, \bar{l}-l) + \beta \sum_{s'\in S} \Gamma_{ss'} v[s', a'(z)]\} \quad (1)$$

$$s.t \quad c + (z) = y - \tau(y) + a \quad (2)$$

$$y = ar + e(s)lw + \omega(s) \quad (3)$$

$$a'(z) = \begin{cases} z - \tau_E(z) & \text{if } s \in \mathcal{R} \text{ and } s' \in \mathcal{E} \\ z & \text{otherwise} \end{cases} \quad (4)$$

Equilibrium

A *stationary equilbirium* is a value function $v(s,a)$; household policies $c(s,a), z(s,a), l(s,a)$; government policies $\tau(y)$, $\tau_E(z)$, $\omega(s)$, G; a stationary probability measure of households, x; factor prices, (r,w); and aggregates K, L, T, Tr, s.t.

- $K = \int a dx$; $L = \int l(s,a)e(s)dx$; $Tr = \int \omega(s)dx$
  $T = \int \tau(y)dx + \int \xi_{s\in\mathcal{R}} \cdot (\Sigma_{s'\in\mathcal{E}}\Gamma_{s,s'}) \cdot \tau_E(z) \cdot z(s,a)dx$
- Given x, K, L, r, w, the household policy solves the households' decision problem described (1)-(4)
- $r = f_1(K,L) - \delta$, $w = f_2(K,L)$
- goods market clears:
  $\int [c(s,a) + z(s,a)]dx + G = f(K,L) + (1-\delta)K$
- government b.c. satisfied: $G + Tr = T$
- the measure of households is stationary: $x(B) =$
  $\int_B (\int_{S,\mathcal{A}} \{\xi_{z(s,a)}\xi_{s\bar{\in}\mathcal{R}\vee s'\bar{\in}\mathcal{E}} + \xi_{[1-\tau_E z]z(s,a)}\xi_{s\in\mathcal{R}\wedge s'\in\mathcal{E}}\}\Gamma s, s'dx)dzds'$

Targets

U.S. Economy Satistics the Model Economy Try to Mimic

	Variables	Num. of targets
macro aggregates	$\frac{K}{Y} = 3.13$, $\frac{I}{Y} = 18.6\%$ $\frac{G}{Y} = 20.2\%$, $\frac{Tr}{Y} = 4.9\%$	5
leisure and consum.	$\frac{l}{\bar{l}} = .3 \;\; \sigma_1 = 1.5 \;\; \frac{CV_c}{CV_l} = 3$	4
expected durations	$D_w = 45$, $D_r = 18$	2
earning ratios	$\frac{l_{[41,60]}}{l_{[20,40]}} = 1.3$	1
earning correlation	$\rho = 0.4$	1
income tax	a_0, a_1, a_2, a_3	4
estate tax	$\underline{z} = 10\bar{y}$, $\frac{Revenue}{GDP} = 0.2$	2
normalization	$l(1) = 1$, $\Gamma_{\varepsilon\varepsilon}$	5
Gini, lorenz curve		15

Calibrated Parameter Values

PARAMETER VALUES FOR THE BENCHMARK MODEL ECONOMY

	Parameter	Value
Preferences:		
Time discount factor	β	.924
Curvature of consumption	σ_1	1.500
Curvature of leisure	σ_2	1.016
Relative share of consumption and leisure	χ	1.138
Productive time	ℓ	3.200
Age and employment process:		
Common probability of retiring	p_{ee}	.022
Common probability of dying	$1 - p_{ee}$	.066
Earnings life cycle controller	ϕ_1	.969
Intergenerational earnings persistence controller	ϕ_2	.525
Technology:		
Capital share	θ	.376
Capital depreciation rate	δ	.059
Government policy:		
Government expenditures	G	.296
Normalized transfers to retirees	ω	.696
Income tax function parameters	a_0	.258
	a_1	.768
	a_2	.491
	a_3	.144
Estate tax function parameters:		
Tax-exempt level	$\underline{z}$	14.101
Marginal tax rate	τ_E	.160

Transition Prob Matrix and Efficiency Labor Units

TRANSITION PROBABILITIES OF THE PROCESS ON THE ENDOWMENT OF EFFICIENCY LABOR UNITS FOR WORKING-AGE HOUSEHOLDS THAT REMAIN AT WORKING AGE ONE PERIOD LATER, $\mathbf{\Gamma}_{\varepsilon\varepsilon}$ (%)

	To s'			
From s	$s' = 1$	$s' = 2$	$s' = 3$	$s' = 4$
$s = 1$	96.24	1.14	.39	.006
$s = 2$	3.07	94.33	.37	.000
$s = 3$	1.50	.43	95.82	.020
$s = 4$	10.66	.49	6.11	80.51

RELATIVE ENDOWMENTS OF EFFICIENCY LABOR UNITS, $e(s)$, AND THE STATIONARY DISTRIBUTION OF WORKING-AGE HOUSEHOLDS, $\boldsymbol{\gamma}^*_\varepsilon$

	$s = 1$	$s = 2$	$s = 3$	$s = 4$
$e(s)$	1.00	3.15	9.78	1,061.00
$\boldsymbol{\gamma}^*_\varepsilon$ (%)	61.11	22.35	16.50	.0389

Findings 1

VALUES OF THE TARGETED RATIOS AND AGGREGATES IN THE UNITED STATES AND IN THE BENCHMARK MODEL ECONOMIES

	K/Y (1)	I/Y (2)	G/Y (3)	Tr/Y (4)	T_E/Y (5)	h (6)	CV_c/CV_l (7)	$e_{40/20}$ (8)	$\rho(f, s)$ (9)
Target (United States)	3.13	18.6%	20.2%	4.9%	.20%	30.0%	3.00	1.30	.40
Benchmark	3.06	18.1%	20.8%	4.4%	.20%	31.2%	3.25	1.09	.25

NOTE.—Variable h (col. 6) denotes the average share of disposable time allocated to the market. The statistic CV_c/CV_l (col. 7) is the ratio of the coefficients of variation of consumption and of hours worked.

Findings 2

DISTRIBUTIONS OF EARNINGS AND OF WEALTH IN THE UNITED STATES AND IN THE BENCHMARK MODEL ECONOMIES (%)

		Quintile					Top Groups (Percentile)		
Economy	Gini	First	Second	Third	Fourth	Fifth	90th–95th	95th–99th	99th–100th
				A. Distributions of Earnings					
United States	.63	−.40	3.19	12.49	23.33	61.39	12.38	16.37	14.76
Benchmark	.63	.00	3.74	14.59	15.99	65.68	15.15	17.65	14.93
				B. Distributions of Wealth					
United States	.78	−.39	1.74	5.72	13.43	79.49	12.62	23.95	29.55
Benchmark	.79	.21	1.21	1.93	14.68	81.97	16.97	18.21	29.85

Findings 3

DISTRIBUTIONS OF CONSUMPTION IN THE UNITED STATES AND IN THE BENCHMARK MODEL ECONOMIES (%)

		Quintile					Top Groups (Percentile)		
Economy	Gini	First	Second	Third	Fourth	Fifth	90th–95th	95th–99th	99th–100th
United States:									
Nondurables	.32	6.87	12.27	17.27	23.33	40.27	9.71	10.30	4.83
Nondurables+*	.30	7.19	12.96	17.80	23.77	38.28	9.43	9.69	3.77
Benchmark:									
Wealthiest 1% excluded	.40	5.23	12.96	13.55	20.41	47.85	12.77	14.89	3.83
Entire sample	.46	4.68	11.58	12.07	18.68	52.99	12.82	13.45	11.94

* Includes imputed services of consumer durables.

Robustness and Policy Experiment

Two Robustness Exercises:

- mimic the observed intergenerational correlation of earnings while allowing earnings to display no life cycle profile
- mimic the observed life cycle earnings ratio while allowing earnings to display no intergenerational correlation

One Policy Experiment:

- abolishing estate taxation

Discussion

Problems ?

- the implied risk-free interest rate
  $r = \theta \frac{Y}{K} - \delta = 6.11\%$
- $\beta = 0.924$ vs. 0.96
  $\delta = 0.059$ vs. 0.075