Wealth Inequality and Intergenerational Links

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U.S. wealth and earnings distributions

Percentage held by the top	1%	5%	20%	40%	80%	Percent with zero or negative
Wealth	28	49	75	89	99	6-15
Gross Earnings	6	19	48	72	98	7.7

Swedish wealth and earnings distributions

Percentage held by the top	1%	5%	20%	40%	80%	Percent with zero or negative
Wealth	17	37	75	99	100	30
Gross Earnings	4	15	42	68	98	7.6

Some more facts

- Earnings and wealth are unequally distributed and concentrated.
- Wealth is much more concentrated than earnings.
- Some of this inequality is due to life-cycle.
- In the aggregate, a large fraction of wealth is transmitted across generations rather than accumulated out of life-cycle savings.
- Rich people (with high lifetime income) keep lots of assets as they age.

Questions

- Are intergenerational links quantitatively important to explain household saving behavior and wealth concentration?
- If yes, which ones? Do voluntary or involuntary bequests matter?
- Is the same saving model valid for other countries?
- Consider Sweden: country in which there is less inequality and the government redistributes more than in the U.S.?

Related Literature

Dynasty models

- Krusell and Smith (1997).
- Castañeda, Díaz–Giménez and Ríos–Rull (1998)
- Quadrini (1997).

OLG models

- Huggett (1996).
- Gokhale et al. (1998)
- Heer (1999)

Elements of the model

- OLG;
- lifetime and income uncertainty;
- parents are altruistic;
- children partially inherit parents' productivity.

Why?

- Age structure generates inequality;
- Motives to save: precautionary, life cycle, bequests.
  poor people: life–cycle component of savings;
  rich: inheritance.
- Also differences due to different family backgrounds.

Key elements of the model

Simplified model of the household: 1 parent and children.

- continuum of agents born each period (5 years)
- live up to 90 years of age. Prob. of dying depends on age
- 20 year old people consume, work and pay taxes
- 25 year old people procreate
- exogenous number of children, total population grows at a constant rate over time
- inherit once in a lifetime, at a random date
- exogenous income process
- after retirement the agent does not work and receives social security benefits

Preferences

- Period utility from consumption:

$$u(c_t) = \frac{c_t^{1-\sigma}}{1-\sigma}$$

- Bequest motive: "Warm glow altruism"
  $\phi(b)$

Technology

- Observe parental productivity when one's parent is 40 and use it to infer expected bequest distribution.
- Workers experience productivity shocks $y_t(s)$.
  - After age 20 it evolves stochastically according to Q_y.
  - Initial level at 20 is inherited from parent's productivity (at 40) according to Q_{yh}.
  - Exogenous age-efficiency profile, ϵ_t, during working years.
- One asset: capital.
- The household faces a borrowing constraint.

Government

The government taxes:

- Labor, capital income and estates

To finance:

- Exogenous public expenditure;
- Social security transfers to the retired agents. Retirees each period receive a lump sum transfer from the government.

Prices

- US: a "closed economy", Cobb-Douglas production function.
- Sweden: an "open economy", the net interest rate is given by the U.S. one.

The Agent's Recursive Problem

State variables:

- age t;
- assets from last period a_t;
- current productivity y_t;
- yp_t: parent's prod. at 40 until child inherits and zero thereafter.
  $yp_t > 0 \Rightarrow$ make inference on bequests;
  $yp_t = 0 \Rightarrow$ distinguish orphans.

Life cycle structure

Four subperiods in the agent's life:

- from 20 to 30 years of age;
- from 35 to 55 years old;
- 60 years old;
- from 65 to 85;

(i) 20 to 30 years old: person works, survives for certain until next period and does not expect to inherit soon ($\Rightarrow yp' = yp$).

$$V(t, a, y, yp) = \max_{c,a'}\left\{u(c) + \beta E_t V(t+1, a', y', yp)\right\} \tag{1}$$

subject to:

$$c \leq \left[1 + r\,(1 - \tau_a)\right] a + (1 - \tau_l)\,\epsilon_t\, y \tag{2}$$

$$a' = \left[1 + r\,(1 - \tau_a)\right] a - c + (1 - \tau_l)\,\epsilon_t\, y \tag{3}$$

(ii) 35 to 55: worker survives into next period, parent may die and leave a bequest.

$$V(t,a,y,yp) = \max_{c,a'}\Big\{u(c) + \beta E_t V(t+1,a',y',yp')\Big\} \quad (4)$$

subject to (2) and:

$$a' = \Big[1 + r\,(1-\tau_a)\Big]\, a - c + (1-\tau_l)\,\epsilon_t\, y + b'\, I_{yp>0}\, I_{yp'=0} \quad (5)$$

$I_{yp>0}$ indicator fn: 1 if $yp > 0$.

$$yp' = \begin{cases} yp & \text{with probability } \alpha_{t+5} \\ 0 & \text{with probability } (1-\alpha_{t+5}) \end{cases} \quad (6)$$

$\mu_b(t,yp)$: cond. distr. of b', bequest net of taxes a person expects if parent dies.

(iii) age 60: next period the agent retires. He faces a positive prob. of dying.

$b(a') \equiv a' - \tau_b \cdot \max(0, a' - ex_b)$.

$$V(t, a, y, yp) = \max_{c,a'} \Big\{ u(c) + \alpha_t \beta E_t V(t+1, a') + (1-\alpha_t)\phi(b(a')) \Big\} \quad (7)$$

$$\phi(b) = \phi_1 \left(1 + \frac{b}{\phi_2}\right)^{1-\sigma} \quad (8)$$

subject to (2, 5 and 6).

(iv) age 65 to 85: the agent is retired and does not expect to inherit.

$$V(t,a) = \max_{c,a'} \Big\{ u(c) + \alpha_t \beta V(t+1, a') + (1-\alpha_t)\, \phi(b(a')) \Big\} \quad (9)$$

subject to (5) and:

$$c \leq \Big[1 + r\,(1-\tau_a)\Big] a + p \quad (10)$$

$$a' = \Big[1 + r\,(1-\tau_a)\Big] a - c + p \quad (11)$$

p: pension payment from the government. $V(T+1, a) = \phi(b(a))$.

Transition Function

- Use agents' policy fns and exogenous Markov processes to
  - get a transition function that maps the time s distribution of the state variables in the population, $m(\cdot; s)$, into the distribution for next period $m(\cdot; s+1)$.
- Focus on stationary equilibria (constant transition function M^* and its invariant distribution m^*).

A stationary equilibrium (part I) is:

- an interest rate r,
- allocations $c(x), a(x)$,
- government policy, $(\tau_a, \tau_l, \tau_b, ex_b, p)$,
- family of prob. distr. for bequests $\mu_b(x; \cdot)$,
- const. distr. of people over x: $m^*(x)$,

such that, given r, and government policy:

A stationary equilibrium (part II) is:

- $c(x)$ and $a(x)$ solve individual max. problem given bequest distr.
- the gvt b.c. balances at each period

$$g = \int \Big[\tau_a \, r \, a + \tau_l \epsilon_t \, y I_{t<t_r} - p \, I_{t \geq t_r} \\ + \tau_b (1 - \alpha_{t-1}) \cdot \max(0, a' - ex_b) \Big] dm^*(x) \tag{12}$$

- m^* is an invariant distribution for this economy
- U.S.: $\frac{(r+\delta)\,K}{(r+\delta)\,K + w\,L} = \alpha$.
  Normalizations: $w = 1$, L is fraction of working age people.
  Sweden:small open economy, so r is taken as exogenous.
- family of expected beq. distr. $\mu_b(\cdot; t, y_p)$ is consistent with the bequests left by parents

The Algorithm

- Solve backward the agents' value functions, starting from T: next period the agent is dead for sure hence derives utility only from bequests
- compute the invariant distribution
- iterate on the government budget
- iterate on bequests

The model economy for the U.S.

Parameter	Value	US Economy, Source(s)
α_t	*	Bell Wade Goss (1992)
ϵ_t	*	Hansen (1993)
σ	1.5	Attanasio et al (1995)
n	1.2%	Econ. Rep. Pres. (1998)
g	19% of GDP	Econ. Rep. Pres. (1998)
τ_a	20%	Kotlikoff et Al. (1997)
r	6%	see text
p	40% avg inc.	Kotlikoff et al (1997)
Q_y	+	Huggett (1996), Lillard et al. (1978)
Q_{yh}	+	Zimmerman (1992)

Parameter	Value	US Economy, Source (s)
τ_b	10%	see text
ex_b	40 * median earn.	see text
β	.95–.97	capital-output ratio
ϕ_1	-9.5	interg. transfers share
ϕ_2	11.6	match 1 moment of bequest distr.

The model economy for Sweden

Sweden has:

- less income inequality
  $\Rightarrow$ less idiosyncratic earnings uncertainty
- more generous social security system
- higher average tax rates on earnings, capital income and estates.

Parameter	Value	Sweden, Chosen to Match
α_t	*	Stat. Yearbook Sweden (1997)
ϵ_t	*	as U.S.
β	.95–.97	as U.S.
σ	1.5	as U.S.
ϕ_1	-9.5	as U.S.
n	.8%	OECD Ec. Surveys, Sweden (1998)
g	25% GDP	OECD Ec. Surveys, Sweden (1998)
τ_a	30%	OECD Ec. Surveys, Sweden (1998)
r	6.86%	see text
p	50% avg inc.	OECD Ec. Surveys, Sweden (1998)
Q_y	+	see text
Q_{yh}	+	Zimmerman (1992)

Parameter	Value	Sweden, Chosen to Match
τ_b	15%	see text
ex_b	10 * avg earn.	see text
ϕ_2	3.3	"altruism", see text

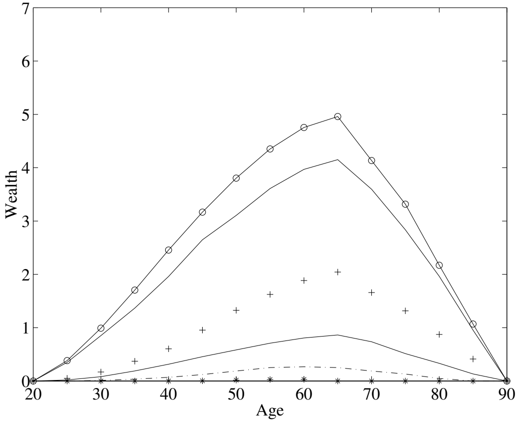
Experiments

Add sequentially key elements to model economies:

- Age structure and income uncertainty
  OLG, no intergenerational links.
  Accidental bequests:
    - redistributed equally to people alive
    - given to the deceased's children
- Add bequest motive:
  OLG + bequest motive
- Add productivity link:
  OLG + bequest motive + productivity inheritance

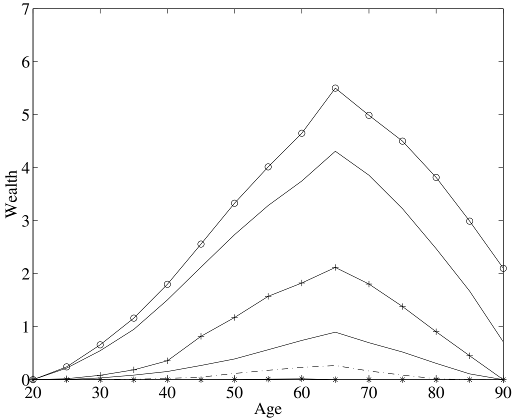
Beq/Wealth Ratio	Wealth Gini	Percentage wealth in the top 1%	5%	20%	40%	60%	% ≤ 0 Wealth
U.S. data							
.60	.78	29	53	80	93	98	5.8-15.0
No intergenerational links, equal bequests to all							
.67	.67	7	27	69	90	98	17
No intergenerational links, unequal bequests to children							
.38	.68	7	27	69	91	99	17
One link: productivity inheritance							
.38	.69	8	29	70	92	99	17
One link: parent's bequest motive							
.55	.74	14	37	76	95	100	19
Both links: parent's bequest motive and productivity inheritance							
.60	.76	18	42	79	95	100	19

U.S. wealth .1, .3, .5, .7, .9, .95 quantiles, by age



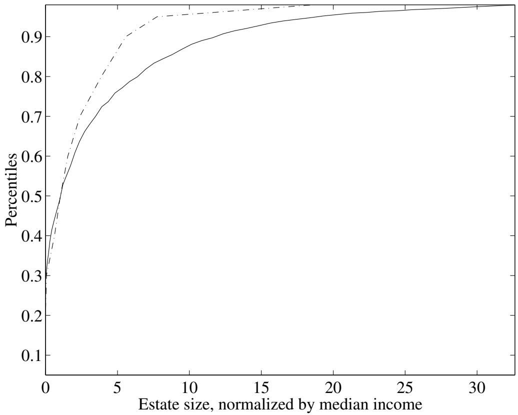
No links, equal bequests to all.

U.S. wealth .1, .3, .5, .7, .9, .95 quantiles, by age.



Bequest motive only.

Cumulative distribution of estates



Solid=model, dash-dot=AHEAD data.

Expected bequest distribution at 40, model

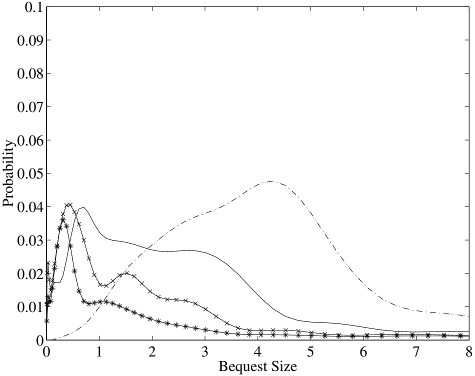


Figure: U.S.

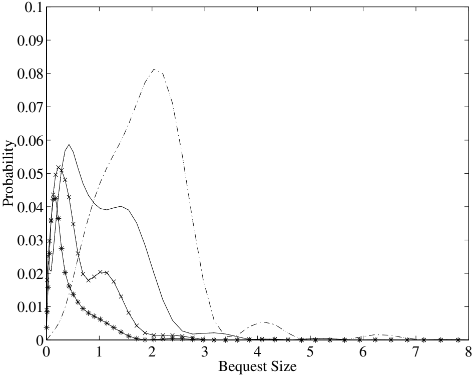
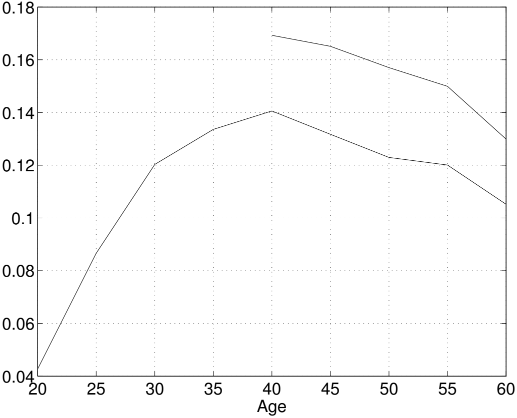


Figure: Sweden

Saving rate conditional on inheritance expectation



U.S. calibration. Bequest motive only.

Wealth quantiles: .1, .25, .5, .75, .85, .95, US calib.

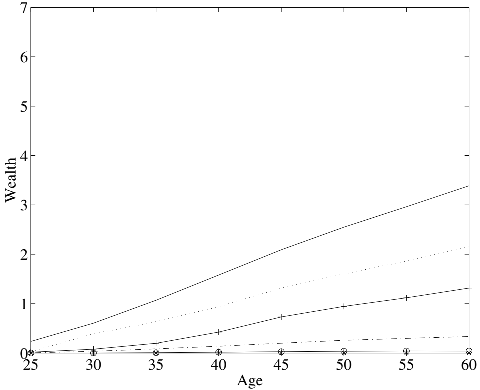


Figure: Conditional on not having inherited.

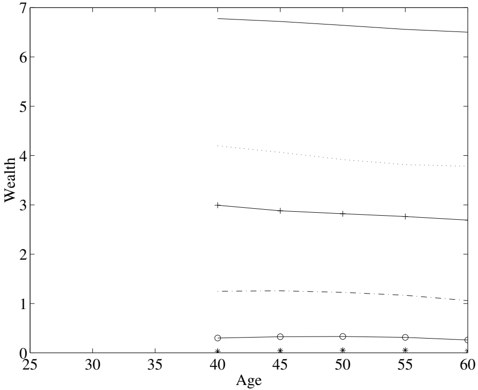


Figure: Conditional on having inherited.

Beq/Wealth Ratio	Wealth Gini	Percentage wealth in the top 1%	5%	20%	40%	60%	% ≤ 0 Wealth
Swedish data							
$> .51$	.73	17	37	75	99	100	30
No intergenerational links, equal bequests to all							
.73	.64	5	23	64	89	100	24
No intergenerational links, unequal bequests to children							
.38	.67	6	25	67	91	100	26
One link: bequest motive							
.76	.71	8	29	73	95	100	30
Both links: bequest motive and productivity inheritance							
.77	.73	9	31	75	95	100	30

Conclusions

- Accidental bequests do not help explain wealth concentration. Voluntary bequests do.
- Transmission of productivity across generations increases some more the concentration.
- Bequest motive → life–cycle accumulation profile more consistent with the U.S. data.
- U.S.-Sweden comparison → intergenerational links important also in economies where redistribution programs are more prominent and there is less inequality. Disincentives to save.