Wealth inequality, family background, and estate taxation

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- "I have continuously supported reforming the estate tax, but a complete repeal is fiscally irresponsible, and serves to benefit only mega multi-millionaires while harming our economy..." Bart Stupak, district of Michigan.

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  - Individual level: parental background and initial conditions are empirically important (Keane and Wolpin (1997), Heatcote, Storesletten, Violante (2005), Huggett, Ventura and Yaron (2011), Solon...)

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  - Individual level: parental background and initial conditions are empirically important (Keane and Wolpin (1997), Heatcote, Storesletten, Violante (2005), Huggett, Ventura and Yaron (2011), Solon...)
  - Aggregate level: large amount of wealth (both wealth and human capital) transmitted across generations (Kotlikoff and Summers (1981) vs. Modigliani (1988), Gale and Scholz (1994)).

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- Bequest motives + inheritance of ability across generations.

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- How does parental background matter in our framework?
  - It affects one's initial earnings (persistent) and hence lifetime earnings.
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- How does parental background matter in our framework?
  - It affects one's initial earnings (persistent) and hence lifetime earnings.
  - It affects the bequest that the person is going to receive, hence lifetime resources.
- An earnings process that allows for high earnings risk for top earners. (Guvenen et al. (2014) and (2015), DeBacker et al. (2015), Panousi et al. (2015)).

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  - Aggregate capital accumulation.
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  - Parental background as a source of inequality.
  - Welfare ex-ante and conditional on one's initial earnings.

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  - Wealth inequality.
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  - Welfare ex-ante and conditional on one's initial earnings.
- Study robustness of results to modeling the bequest motive.
  - Qualitative literature stresses importance of specific bequest motive in affecting results.
  - It is still unclear how we should best model bequest motives.

Literature, wealth inequality

- Mechanisms that keep the saving rate of the rich high and thus generate wealth inequality.
  - Intergenerational links (bequest motives and trasmission of human capital). De Nardi (2004), De Nardi and Yang (2014), and Nishiyama (2002).
  - High earnings risk for the top earners. Castañeda et al. (2003).
  - Heterogenous patience. Krusell and Smith (1998).
  - Entrepreneurship, borrowing constraints, and risky returns. Quadrini (1999), Cagetti and De Nardi (2006).

Literature, wealth inequality and estate taxation

- Entrepreneurship + altruism: Cagetti and De Nardi (2009).
- High earnings risk for the top earners + altruism: Castañeda et al. (2003).

$\Rightarrow$ Abolishing estate taxation: relatively small aggregate and distributional effects.

Model key elements

- OLG general equilibrium model.
- Intergenerational transfer of bequests and human capital.

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- OLG general equilibrium model.
- Intergenerational transfer of bequests and human capital.
- Exogenous earnings profile (with earnings shocks).
- Government taxes, expenditure, and social security system.
- No aggregate shocks nor changes over time (stationary equilibrium). Focus on the 1990s period.

Representative firm

- Neoclassical production function: $F(K; L) = K^{\alpha} L^{1-\alpha}$.
- Physical capital depreciates at rate δ.
- Factor prices equal marginal products.

Government

- Tax rate on labor income: τ_l.
- Tax rate on capital income: τ_a.
- Tax rate on bequest: τ_b on estate above exemption level: x_b.
- Government spending: g.

Government

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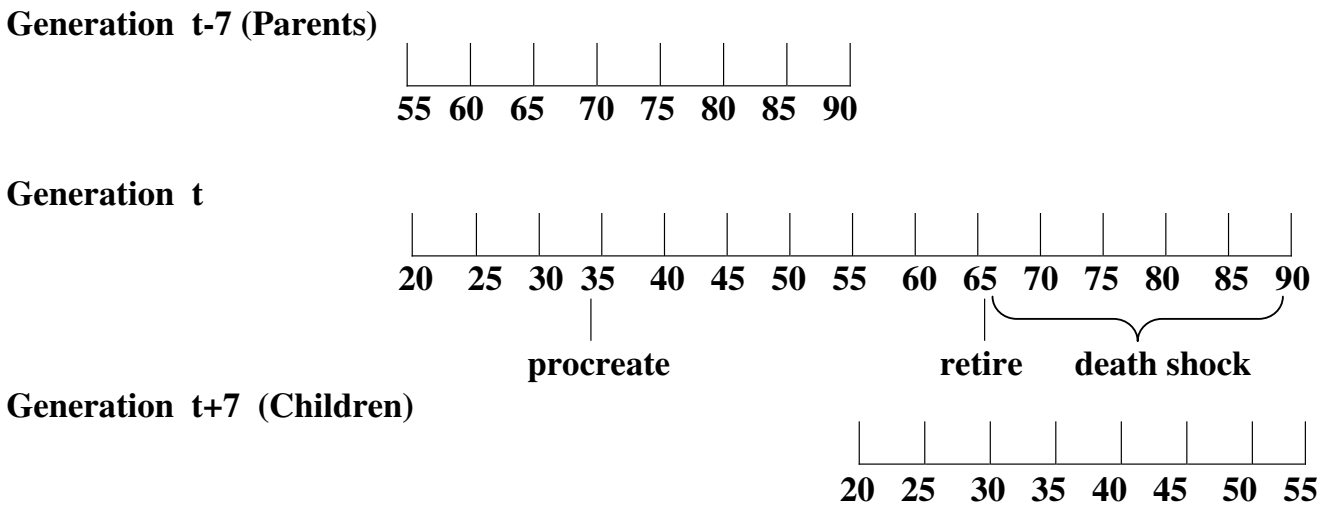
- Tax rate on capital income: τ_a.
- Tax rate on bequest: τ_b on estate above exemption level: x_b.
- Government spending: g.
- Pay-as-you-go system; tax rate of τ_s and pension linked to income history $P(\widetilde{y})$.

Demographics

- Constant population growth: n.
- 1 period = 5 years.



Household preferences

- Discount factor: β.
- Period utility from consumption: $\frac{c_t^{1-\sigma}}{1-\sigma}$.
- utility from bequest:

$$\phi(b'_k) = \phi_1 \left[(b'_k + \phi_2)^{1-\sigma} - 1 \right].$$

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$$\phi(b'_k) = \phi_1 \left[(b'_k + \phi_2)^{1-\sigma} - 1 \right].$$

- Gross bequest model: set $b'_k = b'_g$.
- Net bequest model: set $b'_k = b'_n = b'_g - \tau_b * \max(b'_g - x_b, 0)$.

Household earnings process

- Deterministic age-efficiency profile: ϵ_t.
- Shocks: z_t^i, $AR(1)$ process, as Castañeda et al. (2003).
  - Three levels from PSID.
  - Fourth level: high earnings, high volatility state.

  PSID captures dynamics well for most of population but misses really high earners, who also face high earnings volatility.
  $\Rightarrow$ Model for levels of z_t^i
- Total productivity: $y_t^i = e^{z_t^i + \epsilon_t}$

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  $\Rightarrow$ Model for levels of z_t^i
- Total productivity: $y_t^i = e^{z_t^i + \epsilon_t}$
- Labor productivity inheritance process:
  $z_1^j = \rho_h z_8^i + \nu^j, \ \nu^j \sim N(0, \sigma_h^2)$

Household's recursive problems

- Household's State Variables
  - t : Age.
  - a : Net worth from previous period.
  - z : Current earnings shock.
  - $\widetilde{y}$: Annual accumulated earnings, up to a social security cap, $\widetilde{y_c}$, used to compute Social Security payments.

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  - S_p : Parental state variables $S_p = (a_p, z_p, \widetilde{y_p})$.
- Three cases
  - Working age agents without parents (already inherited)
  - Working age agents with parents alive
  - Retired agents

Working age agents who have already inherited

$$V_w^I(t,a,z,\widetilde{y}) = \max_{c,a'}\left\{ U(c) + \beta E\left[V^I(t+1,a',z',\widetilde{y'})\right] \right\}, \quad (1)$$

$$\begin{aligned} c + a' &= (1-\tau_I)wy - \tau_s \min(wy, 5\widetilde{y_c}) + [1 + r(1-\tau_a)]a, & (2)\\ a' &\geq 0, & (3)\\ \widetilde{y'} &= \left[(t-1)\widetilde{y} + \min(wy/5, \widetilde{y_c})\right]/t, & (4) \end{aligned}$$

.

Working age agents with parents alive

$$V_w(t,a,z,\widetilde{y},S_p) = \max_{c,a'}\Big\{ U(c) + \beta p_{t+7} E\big[V_w(t+1,a',z',\widetilde{y}',S_p') + \beta(1-p_{t+7})E\big[V_w'(t+1,a'+b_n'/N,z',\widetilde{y}')\big]\Big\},$$

subject to

$$c + a' = (1-\tau_l)wy - \tau_s \min(wy, 5\widetilde{y_c}) + [1 + r(1-\tau_a)]a, \quad (5)$$

$$a' \geq 0, \quad (6)$$

$$\widetilde{y}' = \big[(t-1)\widetilde{y} + \min(wy/5, \widetilde{y_c})\big]/t, \quad (7)$$

$$\widetilde{y_p'} = \begin{cases} \big[(t+6)\widetilde{y_p} + \min((wy_p/5, \widetilde{y_c})\big]/(t+7) & \text{if } t < 3 \\ \widetilde{y_p} & \text{otherwise} \end{cases} \quad (8)$$

$$b_n' = b_n'(S_p), \quad (9)$$

Retired agents

$$V_r(t, a, \widetilde{y}) = \max_{c, a'} \left\{ U(c) + \beta p_t V_r(t+1, a', \widetilde{y}) + (1 - p_t)\phi(b'_k) \right\}, \tag{10}$$

subject to

$$a' \geq 0, \tag{11}$$

$$c + a' = [1 + r(1 - \tau_a)]a + (1 - \tau_l)P(\widetilde{y}) \tag{12}$$

Exogenous Parameters

	Parameters		Value
Demographics	n	annual population growth	1.2%
	p_t	survival probability	see text
Preferences	γ	risk aversion coefficient	1.5
Labor earnings	ϵ_t	age-efficiency profile	see text
	ρ_h	AR(1) coef. of prod. inherit. process	0.40
	σ_h^2	innovation of prod. inherit. process	0.37

Exogenous parameters

	Parameters		Value
Production	α	capital income share	0.36
	δ	depreciation	6.0%
Government policy	τ_a	capital income tax	20%
	$P(\widetilde{y})$	Social Security benefit	see text
	τ_s	Social Security tax	12.0%

Labor income process

- 4 earnings states: low, middle, high, and super-high, $[1.0, 3.15, 9.78, 1,061]$ (from Castañeda et al.)

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- Transition matrix for lowest three grid points based on PSID.

Labor income process

- 4 earnings states: low, middle, high, and super-high, $[1.0, 3.15, 9.78, 1,061]$ (from Castañeda et al.)
- Transition matrix for lowest three grid points based on PSID.
- Pick remaining six elements of our $4x4$ transition matrix Q_y.

		Percentile (%)					
	Gini	1	5	20	40	60	80
SCF	0.63	14.76	31.13	61.39	84.72	97.21	100.00
All models	0.62	14.64	31.93	62.45	84.05	93.00	100.00

Table : Percentage of earnings in the top percentiles.

Labor income process

Transition matrix for Q_y

$$\begin{bmatrix} 0.8239 & 0.1733 & 0.0027 & 0.000070 \\ 0.2171 & 0.6399 & 0.1428 & 0.000196 \\ 0.0067 & 0.2599 & 0.7332 & 0.000198 \\ 0.1117 & 0.0000 & 0.0794 & 0.808958 \end{bmatrix}.$$

The transition matrix for Q_{yh}

$$\begin{bmatrix} 0.8272 & 0.1704 & 0.0024 & 0.0000000000 \\ 0.5748 & 0.4056 & 0.0196 & 0.0000000000 \\ 0.2890 & 0.6173 & 0.0937 & 0.0000000005 \\ 0.0001 & 0.0387 & 0.9599 & 0.0012647506 \end{bmatrix}.$$

$\Rightarrow$ Initial prob. distribution of earnings: [65% 33% 2% 0.00007%].
Fraction of sup-rich income goes up to 0.04% at age 60.

Benchmark: remaining parameters to match

Parameters		Benchmark	Gross Bequests	No Bequest Motives
β	discount factor	0.9454	0.9455	0.9525
ϕ_1	bequest utility	-5.4473	-6.1561	0.0000
ϕ_2	bequest shifter	1095K	1376K	0.0000
τ_b	estate tax	21.43%	21.30%	62.94%
x_b	estate exem	756K	786K	745K
τ_l	labor tax	19.20%	19.20%	19.20%

Moment	Data	Benchmark	Gross Bequests	No Bequest Motives
Wealth/output	3.10	3.10	3.10	3.11
Bequest/wealth	0.88-1.18%	0.88%	0.88%	0.58%
90th perc. bequests	4.34	4.51	4.29	4.71
% estates taxed	2.0%	1.92%	1.92%	2.04%
Estate tax/output	0.33%	0.33%	0.33%	0.32%
Gvt spending/output	18%	18.00%	18.00%	18.00%

- Match effective estate taxation

Calibration of various models

- Re-calibrate gross bequest motive model to target same moments.
- No bequest motive model, calibrate what it can match.
  - $\Rightarrow$ Bequest/wealth ratio too low (0.58 compared to 0.88%).
  - $\Rightarrow$ Does not generate very large estates observed in the data.
  - $\Rightarrow$ Estate tax rate is 64%.

Wealth inequality

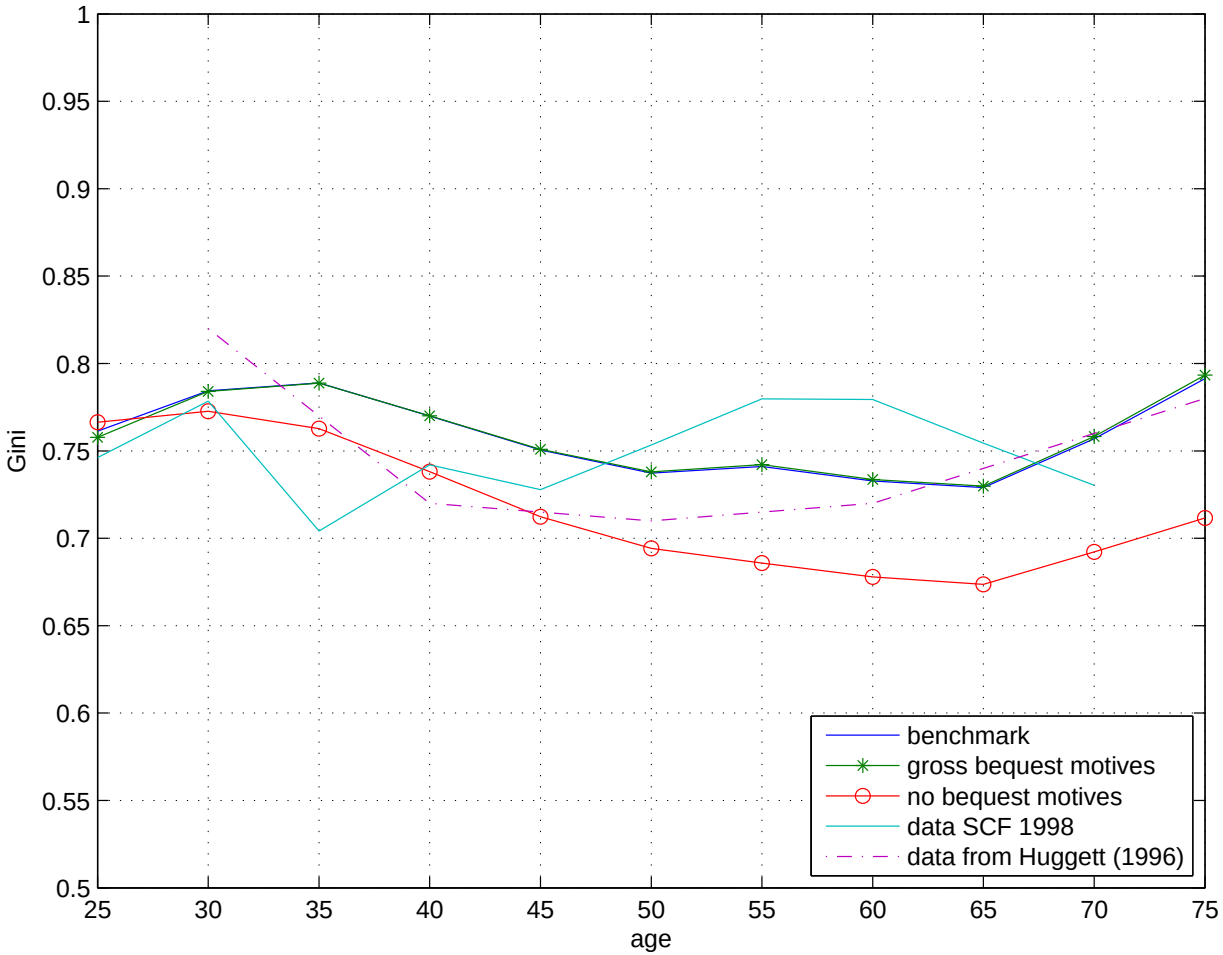
- Models with bequest motives fit distribution of wealth well.

		Percentile (%)					
	Gini	1	5	20	40	60	80
1998 SCF	0.80	34.7	57.8	69.1	81.7	93.9	98.9
Benchmark	0.80	35.2	51.9	66.1	82.9	95.3	99.6
Gross bequests	0.80	35.3	52.1	66.3	83.0	95.3	99.6
No beq. motives	0.76	25.8	44.1	59.7	78.5	93.5	99.1

Table : Percentage of total wealth held by households in the top percentiles.

Gini by age

- Models with bequest motives closer to observed Gini by age.



Tax incidence

Wealth Percentile	Age	Capital tax	Labor tax	Estate Tax	Total tax
0-1%	64.26	35.79	7.74	98.84	15.65
1-5%	61.80	18.14	7.66	1.16	9.86
5-10%	59.18	14.94	8.87	0.00	10.05

Table : Percentage of the total for a given tax paid by a selected wealth percentile.

- Labor income tax burden is more evenly distributed than the capital income tax.
- Estate tax burden is the most unevenly distributed.

Family background

- Parental background is very important.

	Moving to parent's earnings		
Parent's earnings	1st	2nd	3rd
Bequests only			
2nd	0.06	-	-
3rd	0.57	0.42	-
4th	14.87	14.71	13.98
Bequests + human capital inheritance			
2nd	0.06	-	-
3rd	5.59	5.43	-
4th	35.71	35.50	28.41

Table : Asset compensation required for moving from a parental background level to another, normalized as a fraction of average income.

Policy experiments

Benchmark (net bequest motive)

- Vary two key margins of estate taxation:
  - Marginal tax rate τ_b.
  - Estate tax threshold x_b.
- Adjust
  - Capital income τ_a.
  - Labor income tax τ_l.

Gross bequest motive.

Fully altruistic dynastic models.

Policy experiments

Study the effects of each reform on

- Aggregate capital and output.
- Wealth inequality.
- Importance of parental background.
- Welfare.

Aggregate Effects, Adjusting the Capital Income Tax

τ_b	x_b	τ_a	K	Y	r	wage
Net bequest model, changing the estate tax rate						
0.00	–	21.6%	+0.71%	+0.25%	5.580	0.490
0.21	756K	20.0%	3.100	1.000	5.622	0.489
0.40	756K	18.7%	-0.59%	-0.21%	5.658	0.488
0.60	756K	17.0%	-0.53%	-0.19%	5.654	0.488
Net bequest model, changing estate tax rate and exemption level						
0.55	675K	17.4%	-0.74%	-0.27%	6.667	0.488

- $\uparrow$ estate taxation $\Rightarrow \downarrow$ aggregate capital and income, up to $\tau_b = 50\%$.
- Statutory tax policy minimizes aggregate capital among all of the tax configurations that we have tried.

Distributional effects, adjusting the capital income tax

				Percentile (%)			
τ_b	x_b	τ_a	Gini	1	5	20	40
Net bequest model, change the estate tax rate							
0.00	–	0.216	0.811	36.91	53.34	67.28	83.61
0.21	756K	0.200	0.804	35.15	51.90	66.09	82.89
0.40	756K	0.187	0.798	33.78	50.71	65.10	82.27
0.60	756K	0.170	0.793	32.83	49.82	64.27	81.67
Net bequest model, year 2000 statutory estate tax							
0.55	675K	0.174	0.794	32.99	49.98	64.43	81.74

- The share of wealth held by the richest is monotonically decreasing in the estate tax rate.
- Statutory tax policy reduces wealth concentration.

Importance of parental background effects

Parent's earnings	Moving to parent's earnings 1st	2nd	3rd
Benchmark			
2nd	0.06	-	-
3rd	5.59	5.43	-
4th	35.71	35.50	28.41
Net bequest model, year 2000 statutory estate tax			
2nd	0.07	-	-
3rd	5.46	5.29	-
4th	33.70	33.52	26.73

- Born to a family with the 4th parental background less important.
- Other group of people are barely affected.

Welfare effects, going to year 2000 statutory estate tax

All	Initial Earnings 1st	2nd	3rd	4th	Fraction Gaining
Partial equilibrium					
Net bequest motive, capital income tax ↓					
0.015	0.004	0.027	0.134	-77.277	0.961
General equilibrium					
Net bequest motive, capital income tax ↓					
0.005	-0.003	0.013	0.115	-75.100	0.384

- PE: Majority of the population gains ($> 95\%$).
- PE: Average gains for 1st, 2nd, 3rd productivity levels, loss for 4th.
- GE: ↓ wage rate ⇒ welfare loss. ↑ interest rate ⇒ welfare gain of the savers.

Aggregate effects, comparing capital and labor income tax

τ_b	x_b	r	wage	τ_a	K	Y
Net bequest model, changing capital income tax						
0.00	–	5.580	0.490	0.216	3.122	1.003
0.21	756K	5.622	0.489	0.200	3.100	1.000
0.40	756K	5.658	0.488	0.187	3.082	0.998
Net bequest model, changing labor income tax						
0.00	–	5.531	0.492	0.196	3.148	1.006
0.21	756K	5.622	0.489	0.192	3.100	1.000
0.40	756K	5.697	0.487	0.189	3.061	0.996

- Very similar effects on the aggregates with capital and labor income tax adjustments.

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Net bequest model, changing labor income tax							
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0.21	756K	0.192	0.804	35.15	51.90	66.09	82.89
0.40	756K	0.189	0.799	33.79	50.78	65.20	82.36

- Very similar effects on inequality with capital and labor income tax adjustments.

Importance of parental background, comparing capital and labor income tax

	Moving to parent's earnings		
Parent's earnings	1st	2nd	3rd
Benchmark			
2nd	0.06	-	-
3rd	5.59	5.43	-
4th	35.71	35.50	28.41
Net bequest model, changing capital tax			
2nd	0.07	-	-
3rd	5.46	5.29	-
4th	33.70	33.52	26.73
Net bequest model, changing labor tax			
2nd	0.06	-	-
3rd	5.53	5.38	-
4th	34.15	33.98	27.12

- Very similar effects on the importance of parental background with capital and labor income tax adjustments.

Welfare effects, going to year 2000 statutory estate tax

All	Initial Earnings 1st	2nd	3rd	4th	Fraction Gaining
Partial equilibrium					
Net bequest motive, capital income tax ↓					
0.015	0.004	0.027	0.134	-77.277	0.961
Net bequest motive, labor income tax ↓					
0.045	0.027	0.073	0.162	-89.250	0.990
General equilibrium					
Net bequest motive, capital income tax ↓					
0.005	-0.003	0.013	0.115	-75.100	0.384
Net bequest motive, labor income tax ↓					
0.020	0.009	0.035	0.111	-83.343	0.981

- GE: Cutting labor income tax is much better for most from a welfare standpoint.

Aggregate effects, comparing net and gross bequest motives

τ_b	x_b	r	wage	τ_a	K	Y
Net bequest model, changing capital income tax						
0.00	–	5.580	0.490	0.216	3.122	1.003
0.21	756K	5.622	0.489	0.200	3.100	1.000
0.40	756K	5.658	0.488	0.187	3.082	0.998
Gross bequest model, changing capital income tax						
0.00	–	5.560	0.491	0.215	3.133	1.004
0.21	786K	5.622	0.489	0.200	3.100	1.000
0.40	786K	5.669	0.488	0.188	3.076	0.997

- Very similar effects on the aggregates with utility from net and gross bequests.

Distributional effects, comparing net and gross bequest motives

				Percentile (%)			
τ_b	x_b	τ_a	Gini	1	5	20	40
Net bequest model, year 2000 statutory estate tax							
0.55	675K	0.174	0.794	32.99	49.98	64.43	81.74
Gross bequest model, year 2000 statutory estate tax							
0.55	675K	0.179	0.792	32.39	49.57	64.15	81.59

- Very similar effects on inequality with utility from net and gross bequests.

Importance of parental background effects, comparing net and gross bequest motives

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Parent's earnings	1st	2nd	3rd
Benchmark			
Net bequest model, year 2000 statutory estate tax			
2nd	0.07	-	-
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Gross bequest model, year 2000 statutory estate tax			
2nd	0.07	-	-
3rd	5.43	5.27	-
4th	33.65	33.47	26.71

- Very similar effects on the importance of parental background with gross and net bequest models.

Welfare Effects, going to year 2000 estate statutory taxation

All	Initial Earnings 1st	2nd	3rd	4th	Fraction Gaining
General equilibrium					
Net bequest motive, capital income tax ↓					
0.005	-0.003	0.013	0.115	-75.100	0.384
Net bequest motive, labor income tax ↓					
0.020	0.009	0.035	0.111	-83.343	0.981
Gross bequest motive, capital income tax ↓					
-0.008	-0.011	-0.008	0.070	-60.013	0.097
Gross bequest motive, labor income tax ↓					
0.005	-0.001	0.012	0.070	-67.207	0.457

- Rich people with wealth in the utility function lose less.
- Fraction gaining and overall welfare higher when labor tax is lowered as estate tax is increased.

Comparison with the literature

- Models with completely altruistic agents: Cagetti and De Nardi (2009), Castañeda et al. (2003)
- Similar results: abolishing estate taxation leads to:
  - $\uparrow 0.7 - 1.5\%$ of aggregate capital
  - $\uparrow 0.1 - 0.6\%$ of aggregate output
  - $\uparrow$ 1.0-1.7 percentage point in wealth by the richest 1%.

Tax burden Effects, going to year 2000 statutory

Wealth Percentile	Age	Capital tax	Labor tax	Estate tax	Total tax
Benchmark					
0-1%	64.26	1.69	1.26	0.395	3.35
1-5%	61.80	0.21	0.31	0.001	0.53
Changing the capital income tax ↓					
0-1%	64.52	1.39	1.25	1.034	3.67
1-5%	61.70	0.19	0.31	0.006	0.51
Changing the labor income tax ↓					
0-1%	64.36	1.60	1.21	1.020	3.83
1-5%	61.79	0.22	0.30	0.006	0.52

- Estate tax revenue by the richest 1% increases substantially.
- Total tax increase as well, especially when adjusting labor tax.

Conclusions

- Changing the estate tax rate, and in particular $\uparrow$
  - $\downarrow$ output and wealth.
  - $\downarrow$ inequality.
  - $\downarrow$ role of family background.
  - Welfare gains and benefits depend on tax used to balance the government budget constraint.
  - Aggregate, distributional, and parental background effects are very small, but the welfare effects from redistribution are large.
- Results surprisingly robust to bequest motive assumed + mechanisms driving wealth inequality.