A Theory of Optimal Inheritance Taxation

Thomas Piketty and Emmanuel Saez
(Econometrica 2013)

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MOTIVATION: research question and approach

What is the optimal tax on bequests?

- Dynastic interpretation of Chamley-Judd: Zero inheritance tax
- Two period models (parents work and consume, children only consume)
  - with earnings tax: inheritance tax useless to increase welfare [Atkinson and Stiglitz, 1976]
  - accounting children utility: subsidy on bequests increases welfare [Farhi and Werning, 2010]
- Piketty and Saez, 2013 (p. 1852)
  " *(...) different – yet difficult to test – assumptions for bequest behavior lead to different formulas and magnitudes.*"
  - Keep analysis general regarding bequest preferences
  - Derive general but estimable deterministic tax formula

PAPER: structure

1. Introduction
2. Optimal inheritance tax with bequests in the utility:
   $V_t = u(c_t, l_t, \underline{b}_t)$
3. Optimal inheritance tax in the dynastic (Barro-Becker) model:
   $V_t = u(c_t, l_t) + \delta V_{t+1}$
4. Numerical calibration of the optimal tax
5. Conclusion and extensions
6. Appendix (proofs)
7. Supplement (more proofs and calibrations)

- Difference in optimal inheritance tax between 2 and 3 is minor
- I will focus on 2 and 4 (and briefly comment on 3)

MODEL: bequests in the utility

- There are $0, 1, ..., t, ...$ generations, each with measure one
- Problem of individual *it* (of dynasty i, living in t) is

$$\max_{c_{ti}, l_{ti}, b_{t+1i} \geq 0} V^{ti}\left(c_{ti}, l_{ti}, Rb_{t+1i}(1-\tau_{Bt+1})\right)$$

$$\text{s.t.} \qquad c_{ti} + b_{t+1i} = Rb_{ti}(1-\tau_{Bt}) + w_{ti} l_{ti}(1-\tau_{Lt}) + E_t$$

  where

  - $\underline{b} = Rb_{t+1i}(1-\tau_{Bt+1})$ is net-of-tax capitalized bequest
  - government chooses (E, τ_L, τ_B) to satisfy $E_t = \tau_{Bt} Rb_t + \tau_{Lt} y_{Lt}$
  - b_t is aggregate bequests received (for generation t)
  - y_{Lt} is aggregate labor income (for generation t)
  - b_{0i} and R are exogenously given
  - w_{ti} and $V^{ti}(\underset{+}{c}, \underset{-}{l}, \underset{+}{\underline{b}})$ are from arbitrary ergodic distribution

- FOC $[b_{t+1}]$ $\quad \frac{V_c^{ti}}{V_{\underline{b}}^{ti}} = R(1-\tau_{Bt+1}) \quad$ if $b_{t+1i} > 0$

MODEL: steady state equilibrium

With

- ergodicity condition for w_{ti} and V^{ti}
- constant taxes and grants

the economy converges to a unique ergodic ss equilibrium which

- features utility maximizing hhs
- is independent of b_{0i}, y_{L0i}
- is characterized by a distribution of b_{ti}, y_{Lti}
- permits heterogenous random parental preferences and abilities

- The proof (not very intuitive) is in the WP version of 2012
- There, some elements differ (e.g. wealth is argument of V)

MODEL: welfare function

Long-run ss social welfare function (SWF)

$$\max_{\tau_L,\tau_B} \int_i \omega_{ti} V^{ti}\left(Rb_{ti}(1-\tau_B)+w_{ti}l_{ti}(1-\tau_L)+E-b_{t+1i}, l_{ti}, Rb_{t+1i}(1-\tau_B)\right)$$

$$\text{s.t.} \qquad E = \tau_B R b_t + \tau_L y_{Lt}$$

where

- $\omega_{ti} \geq 0$ are Pareto weights
- taking E as fixed, τ_L and τ_B are linked to meet the gov bc
- SWF is constant in ergodic equilibrium
- SWF allows accounting for social preferences about distributions

MODEL: deriving the optimal inheritance tax

- Define ti's social marginal welfare weight (with $\int_i g_{ti} = 1$)

$$g_{ti} = \frac{\omega_{ti} V_c^{ti}}{\int_j \omega_{tj} V_c^{tj}}$$

- Capture behavioral response by long-run tax elasticities (given E)

$$e_B = \frac{\frac{db_t}{b_t}}{\frac{d(1-\tau_B)}{1-\tau_B}} \qquad e_L = \frac{\frac{dy_{Lt}}{y_{Lt}}}{\frac{d(1-\tau_L)}{1-\tau_L}}$$

- Define distributional parameters

$$\overline{b}^{rec} = \frac{\int_i g_{ti} b_{ti}}{b_t} \qquad \overline{b}^{left} = \frac{\int_i g_{ti} b_{t+1i}}{b_{t+1}} \qquad \overline{y}_L = \frac{\int_i g_{ti} y_{Lti}}{y_{Lt}}$$

MODEL: deriving the optimal inheritance tax - cont'd

- Which τ_B maximizes SWF?
  - take τ_L and $dE = 0$ as given and consider $d\tau_B > 0$
  - budget balance $Rb_t d\tau_B + \tau_B Rdb_t + y_{Lt} d\tau_{Lt} + \tau_{Lt} dy_{Lt} = 0$
  - using elasticities $Rb_t d\tau_B(1 - e_B \frac{\tau_b}{1-\tau_B}) = -d\tau_L y_{Lt}(1 - e_L \frac{\tau_L}{1-\tau_L})$
- Effect of $d\tau_B > 0, d\tau_L < 0$ on SWF?
  - use EV (hh variables are optimal)
  - know that at optimal τ_B: $dSWF = 0$
  - use FOC of hh problem
  - use above elasticity representation to write $d\tau_L$
  - define
    - bequest-received elasticity $e_{Bti} = \frac{db_{ti}}{b_{ti}} / \frac{d(1-\tau_B)}{(1-\tau_B)}$ (to write db_{ti})
    - e_B as bequest weighted population average of e_{Bti}

MODEL: deriving the optimal inheritance tax - cont'd

- Obtain SWF expression for joint effects of $d\tau_B, d\tau_L$ on indvidual ti

$$0 = \int_i g_{ti} \left(-d\tau_B R b_{ti}(1 + e_{Bti}) + \frac{\frac{1-e_B\tau_B}{1-\tau_B}}{\frac{1-e_L\tau_L}{1-\tau_L}} \frac{y_{Lti}}{y_{Lt}} R b_t d\tau_B - \frac{d\tau_B}{1-\tau_B} b_{t+1i} \right)$$

  − bequests received
  + reduced labor income tax
  − bequest left

- Eliminate integral and individual variables
  - use distributional parameters
  - correspondingly, define $\hat{e}_B$ as average e_{Bti} weighted by $g_{ti} b_{ti}$

$$0 = -\overline{b}^{rec}(1 + \hat{e}_B) + \frac{\frac{1-e_B\tau_B}{1-\tau_B}}{\frac{1-e_L\tau_L}{1-\tau_L}} \overline{y}_L - \frac{\overline{b}^{left}}{R(1-\tau_B)}$$

- solving for τ_B ...

MODEL: the optimal inheritance tax nests special cases

$$\tau_B = \frac{1 - \left(1 - \frac{e_L \tau_L}{1-\tau_L}\right)\left(\frac{\overline{b}^{rec}}{\overline{y}_L}(1+\hat{e}_B) + \frac{1}{R}\frac{\overline{b}^{left}}{\overline{y}_L}\right)}{1 + e_B - \left(1 - \frac{e_L \tau_L}{1-\tau_L}\right)\frac{\overline{b}^{rec}}{\overline{y}_L}(1+\hat{e}_B)} \tag{1}$$

1. Social discounting with generational discount rate $\Delta \leq 1$
   - With balanced budget and open economy: replace R by ΔR
   - With government debt and
     - open economy: ss exists iff $\Delta R = 1$ ("modified golden rule")
     - closed economy: replace $\Delta R = 1$ (proof uses endogenous capital stock)
2. Growth
   - with G > 1 labor augmenting growth: replace R by R/G
   - with social discounting: replace ΔR by $\Delta R G^{-\gamma}$
   - in closed economy: modified golden rule is $\Delta R G^{-\gamma} = 1$

MODEL: the optimal inheritance tax nests special cases

$$\tau_B = \frac{1 - \left(1 - \frac{e_L \tau_L}{1-\tau_L}\right)\left(\frac{\overline{b}^{rec}}{\overline{y}_L}(1+\hat{e}_B) + \frac{1}{R}\frac{\overline{b}^{left}}{\overline{y}_L}\right)}{1 + e_B - \left(1 - \frac{e_L \tau_L}{1-\tau_L}\right)\frac{\overline{b}^{rec}}{\overline{y}_L}(1+\hat{e}_B)} \quad (1)$$

3. "Meritocratic Rawlsian" redistributive preferences
   - bequest receivers $g_{ti} = 0$; zero-receivers $g_{ti} = g > 0$ $\quad (\Rightarrow \overline{b}^{rec} = 0)$
   - $\overline{y}_L, \overline{b}^{left}$: use ratios of zero-receiver average to population average
4. Accidental bequests or wealth lovers
   - Define $V(c, l, b, \underline{b})$ and $\nu_{ti} = R(1 - \tau_{Bt+1})V^{ti}_{\underline{b}}/V^{ti}_c$
   - Replace $\overline{b}^{left}$ by $\nu \overline{b}^{left}$

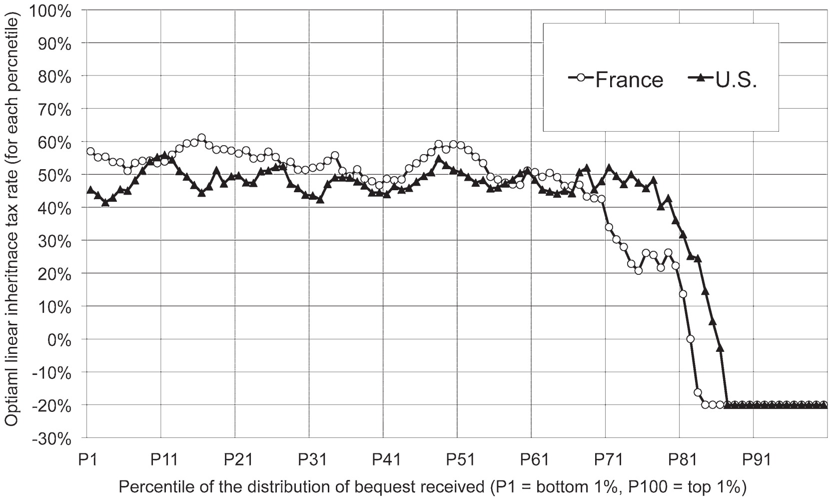
MODEL: benchmark calibration

- PS use 2010 French and US hh data to calibrate tax formula (2)

$$\tau_B = \frac{1 - \left(1 - \frac{e_L \tau_L}{1-\tau_L}\right)\left(\frac{\overline{b}^{rec}}{\overline{y}_L}(1+\hat{e}_B) + \frac{\nu}{R/G}\frac{\overline{b}^{left}}{\overline{y}_L}\right)}{1 + e_B - \left(1 - \frac{e_L \tau_L}{1-\tau_L}\right)\frac{\overline{b}^{rec}}{\overline{y}_L}(1+\hat{e}_B)} \tag{2}$$

- Parameters
  - $e_B = \hat{e}_B = e_L = 0.2$
  - $\tau_L = 30\%$
  - $\nu = 1$
  - $R/G = e^{(r-g)H} = 1.82$
    - $r - g = 2\%$
    - $H = 30$ years with H: generation length
    - (WP: "generational rate of return" is $R = e^{rH}$)
- From datasets: distributional parameters $\overline{b}^{rec}, \overline{b}^{left}, \overline{y}_L$
  - uniform g_{ti} on percentiles of bequests received distribution
  - data from individuals age ≥ 70

BENCHMARK CALIBRATION: results



- Why is τ_B relatively stable up to the 70% percentile?
  - this group receives and leaves almost no bequests
  - but has close to average (labor) earnings
    $\Rightarrow$ large inheritance tax lowers labor tax burden

BENCHMARK CALIBRATION: sensitivity

TABLE I

OPTIMAL INHERITANCE TAX RATE τ_B CALIBRATIONS[a]

	Elasticity $e_B = 0$ (Low-End Estimate)		Elasticity $e_B = 0.2$ (Middle-End Estimate)		Elasticity $e_B = 0.5$ (High-End Estimate)		Elasticity $e_B = 1$ (Extreme Estimate)	
	France (1)	U.S. (2)	France (3)	U.S. (4)	France (5)	U.S. (6)	France (7)	U.S. (8)
0. Basic Specification: Optimal Tax for Zero Receivers (Bottom 50%), $r-g=2\%$ ($R/G=1.82$), $\nu=70\%$, $e_L=0.2$, No Exemption (Linear Tax τ_B)								
P0–50, $r-g=2\%$, $\nu=70\%$, $e_L=0.2$	76%	70%	63%	59%	50%	47%	38%	35%
1. Optimal Linear Tax Rate for Other Groups by Percentile of Bequests Received								
P50–70	75%	70%	62%	59%	48%	47 %	35%	35%
P70–90	45%	60%	31%	46%	16%	31%	2%	17%
P90–95	−283%	−43%	−330%	−84%	−376%	−126%	−423%	−167%
2. Sensitivity to Capitalization Factor $R/G = e^{(r-g)H}$								
$r-g=0\%$ ($R/G=1$) or dynamic efficiency	56%	46%	46%	38%	37%	31%	28%	23%
$r-g=3\%$ ($R/G=2.46$)	82%	78%	68%	65%	55%	52%	41%	39%
3. Sensitivity to Bequests Motives ν								
$\nu=1$ (100% bequest motives)	65%	58%	54%	48%	43%	39%	33%	29%
$\nu=0$ (no bequest motives)	100%	100%	83%	83%	67%	67%	50%	50%
4. Sensitivity to Labor Income Elasticity e_L								
$e_L=0$	73%	68%	61%	56%	49%	45%	37%	34%
$e_L=0.5$	79%	75%	66%	62%	53%	50%	40%	37%
5. Optimal Linear Tax Rate in Rentier Society (France 1872–1937) for Zero Receivers (Bottom 80%) With $b^{left}=25\%$ and $\tau_L=15\%$								
P0–80, $r-g=2\%$, $\nu=70\%$, $e_L=0.2$	90%		75%		60%		45%	
6. Optimal Top Tax Rate Above Positive Exemption Amount for Zero Receivers (Bottom 50%)								
Exemption amount: 500,000	88%	73%	65%	58%	46%	44%	32%	31%
Exemption amount: 1,000,000	92%	73%	66%	57%	46%	43%	30%	31%

[a]This table presents simulations of the optimal inheritance tax rate τ_B using formula (17) from the main text for France and the United States and various parameter values. In formula (17), we use $\tau_L = 30\%$ (labor income tax rate), except in Panel 5. Parameters $b^{received}$, b^{left}, y_L are obtained from the survey data (SCF 2010 for the U.S., Enquête Patrimoine 2010 for France, and Piketty, Postel-Vinay, and Rosenthal (2011) for panel 5).

- Even for $e_B = 1$ tax stays at 35% for low receivers
- Same for giving zero welfare weight to high receivers
- (There is no exploration of τ_L)

A REMINDER: historical top inheritance tax rates

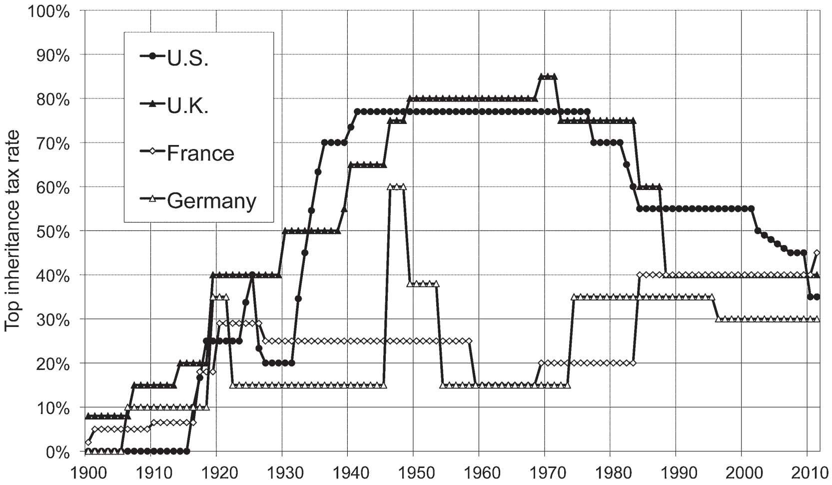


FIGURE 3.—Observed top inheritance tax rates 1900–2011.

SOME TAKE-AWAYS

1. There is no one-size-fits-all optimal inheritance tax
   - subsidy benefits top bequest receivers, tax bottom receivers
   - current inheritance tax rates reflect top receivers' preferences

2. A strong result
   "(...) dynamic efficiency considerations (i.e. optimal capital accumulation) are conceptually orthogonal to cross-sectional redistribution considerations. (...) there are distributional reasons pushing for inheritance taxation, as well as distortionary effects pushing in the other direction, resulting in an ***equity-efficiency trade-off that is largely independent from aggregate capital accumulation*** *issues"* (p. 1862)
   - $\tau_B > 0$ distorts individual not aggregate intertemporal margin
   - equity-efficiency tradeoff is due to cross-sectional elasticities

3. Atkinson-Stiglitz collapses b/c heterogeneity is two-dimensional

EARLIER FINDINGS: Farhi and Werning 2010

- FW 2010 features two generation dynasties where
  - parents receive no bequests, work and consume: $U^i(u(c, \underline{b}), l)$ weakly separable, with u homogeneous of degree 1
  - children receive bequests, do not work but consume
  - positive welfare weight on children: optimal bequest tax < 0
- PS claim to nest FW 2010 by assuming parent-children pairs
  - with u homogeneous of degree 1: $\overline{b}^{left} = \overline{y}_L$
  - τ_B, τ_L have same effect on labor supply: shifting implies $e_L = 0$
  - assume $\Delta R = 1$ ("dynamic efficiency")
  - welfare weight only on parents: $\overline{b}^{rec} = 0 \quad (1) \Rightarrow \tau_B = 0$
  - welfare weight also on children: $\overline{b}^{rec} > 0 \quad (1) \Rightarrow \tau_B < 0$
- A critical feature of FW 2010
  - inequality is one-dimensional
    - parent ability maps child consumption
    - no generation receives and leaves bequest

  $\Rightarrow$ no role for inheritance taxation for redistributive purposes

EARLIER FINDINGS: Chamley-Judd, 1985/86

- dynastic utility: most ss equilibrium results carry through
- optimal tax formula almost identical (discount stream of $\bar{b}^{rec}$)
- BUT: $e_B = \infty$ when stochastic shocks vanish
- optimal $\tau_B = 0$ even with all welfare weight on zero receivers

CONCLUSION - AND SOME THOUGHTS

- optimal inheritance tax is positive even with labor taxes
- inheritance taxation suffers from an equity-efficiency trade-off
- dynamic efficiency issues are orthogonal to inheritance taxation
- preference for redistribution (wealth equality) governs size of tax

1. How general is the result with capitalized bequests?
   Put differently: Are capital and bequests (always) the same?
2. How much does the ergodicity assumption restrict preferences?
   PS do not discuss it so this remains opaque (at least to me)
3. What if positive real-world taxes are due to time-inconsistency?
   PS consider full commitment and so miss out on this aspect