How Do Income and Bequest Taxes Affect Income Inequality? The Role of Parental Transfers

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Motivation

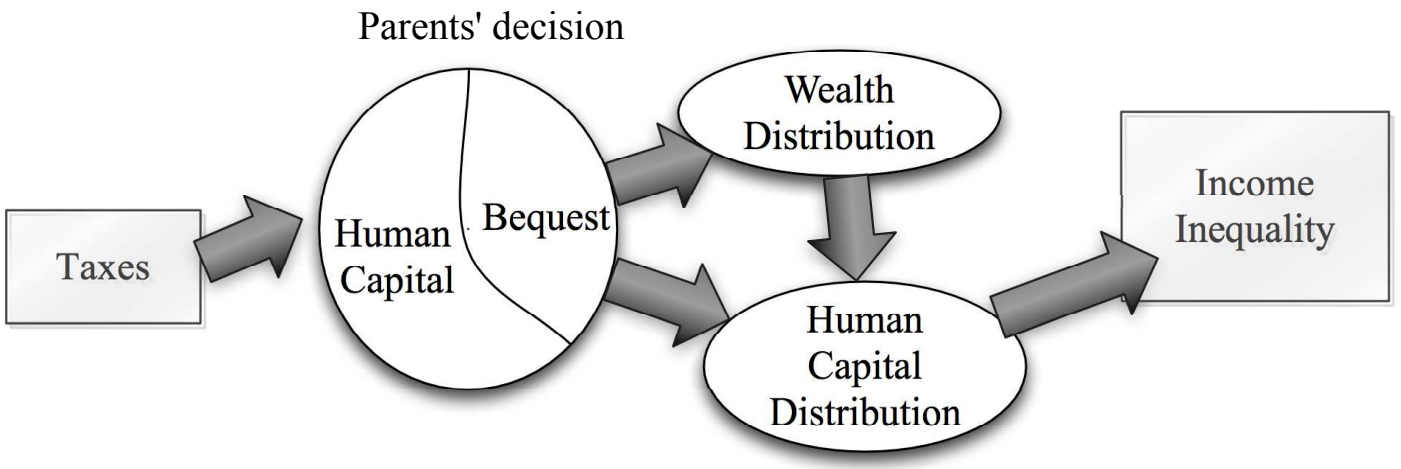
- Taxes affects parental transfers. Parental transfers include education, gifts and bequests.
  - Investment in schooling: Hendricks (2001); Heckman (1999).
  - Financial bequests and inter vivos giving. Bernheim et al. (2004).
- In the literature the analysis focus on the single types of transfers.
- We consider tax effects on parents' joint decisions on the allocation of transfer.
  - Becker and Tomes (1986)
  - Brown et al. (2006); Laitner and Ohlsson (2001); Nordblom and Ohlsson (2010)

Question

- Questions
  - How taxes (income and bequest) affect allocation and amount of transfers?
  - How taxes affect income inequality?
- Estimate the effects of income and bequest taxation on income inequality
  - Income taxation is **positively** related to *Gini*; bequest is negatively related to *Gini* while **insignificant**.
- Develop a theoretical model to explain findings
  - Calibrate the model based on U.S. data.
  - By conducting numerical experiments, we find model predictions are consistent with the empirical findings.

Model Mechanism

- Taxes affect parents' decisions on the educational expenditure and assets transfer.
- Education distribution is related to income inequality. (O'Neill (1995); Gregorio and Lee (2003))



Empirical Background

- Estimate the effects of each type of taxation on income distribution.
- Data: 20 OECD countries for the period 1980 to 2008.
- Follow the empirical strategy in Kneller and Bleaney (1999),

$$G_{it} = \alpha + \sum_{j=1}^{k} \beta_j \, Y_{jit} + \gamma_R R_{it} + \sum_{p=1}^{m} \gamma_p X_{pit} + u_{it}.$$

- G_{it} is the *Gini* coefficient.
- X_{pit}: revenue from each taxation (% of GDP).
- R_{it}: total tax revenue (% of GDP)
- Y_j is the conditioning (non-fiscal) variables, found in Barro-type regression (Barro (2000)).
  ex: $g_{GDP}, g_{population}$, investment ratio, fertility rate $\ln y, (\ln y)^2$, Human Capital

Empirical Findings

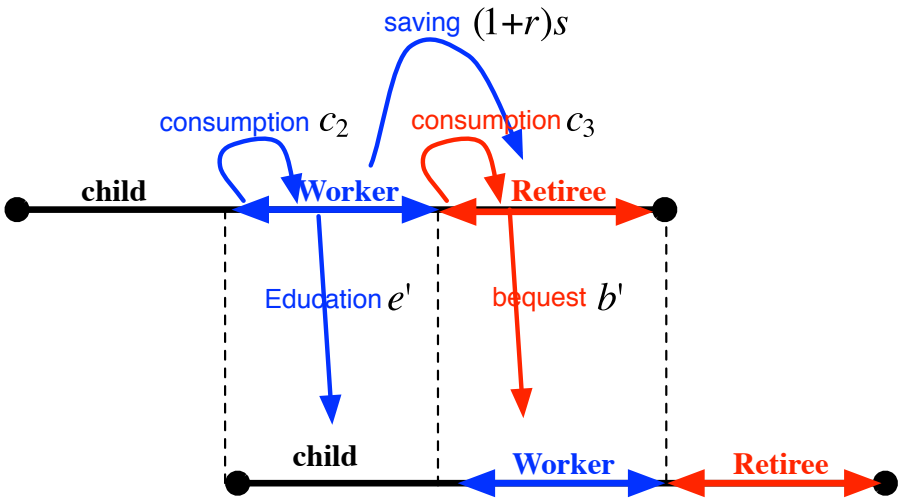
- Income taxation is positively related to *Gini*; bequest is negatively related to *Gini* while insignificant.
  - Model 1: Taxations.
  - Model 2: Taxations + $\{g_{GDP}, g_{population},$ investment ratio, fertility rate$\}$
  - Model 3: Variables in model 2 + $\{\ln y, (\ln y)^2,$ Human Capital$\}$, y: GDP

Table 2: Panel Regression for Income Inequality

	(1)	(2)	(3)
Income taxation	0.994	0.873	0.923
	(2.83)***	(2.40)**	(2.40)**
Bequest taxation	-0.047	-0.716	-1.714
	(-0.01)	(-0.16)	(-0.36)

The model

- A three-period life cycle-overlapping generation model with heterogeneous agents. Each generation is altruistically linked towards their descendants.
- Agents' decision-making during life cycle:



- Worker: consumption c_2, education expenditure e', saving s
- Retirees: consumption c_3, bequests (and gifts) b'

Model Assumptions

- Agents's wealth I comes from labor income w^h and parents' bequests transfer b.
- Individual faces idiosyncratic labor supply shocks l.
- Agents receive labor income w^h by renting effective human capital hl in the market
  - Returns on human capital is **risky**:
- Agents human capital is linearly depends on parents' educational expenses. $h = a^h e + h_0$.
- There exists an **upper bound** of human capital investments: tertiary education.
- Agents preference: CRRA utility function.

The Model - Workers' Problem

Agents' maximization problem in the working period:

$$V_2(I) = \max_{\{c_2, e', s\}} u(c_2) + \beta E\left\{u(c_3) + \beta_c B(I')\right\}, \quad (1)$$

$$s.t.\ I \geq c_2 + s + e' \quad (2)$$

$$s \geq 0 \quad (3)$$

$$e' \leq \overline{e} \quad (4)$$

- Agents wealth : $I = w^h + (1 - \tau_b)b + T$.
- Agents income $w^h \equiv (1 - \tau_w)whl$, l is characterized as *i.i.d.* with bounded support $[\underline{l}, \overline{l}]$.
- Agents human capital $h = a^h e + h_0$.

The Model - Retiree's Problem

Agents' maximization problem in the retired period:

$$
\begin{aligned}
V_3(s, w^{h'}) &= \max_{\{c_3, b'\}} \left\{ u(c_3) + \beta_c B(I') \right\}, && (5)\\
s.t.\ (1+r)s + T &\geq c_3 + b', && (6)\\
I' &= w^{h'} + (1-\tau_b)b' + T && (7)\\
b &\geq 0. && (8)
\end{aligned}
$$

- r: world interest rates. (small open economy)
- b': bequests

The Model

- A representative firm maximizes profit:

$$K^{\alpha} H^{1-\alpha} - wH - rK.$$

- Government budget constraint is balanced:

$$\tau_w wH + \tau_b B = G + T. \tag{9}$$

Equilibrium

- Aggregates:

$$\int_0^1 l^j \, dj = 1,$$

$$H = \int_0^1 h^j \, l^j \, dj,$$

$$B = \int_0^1 b^j \, dj,$$

$$K = \int_0^1 s^j \, dj + K^w.$$

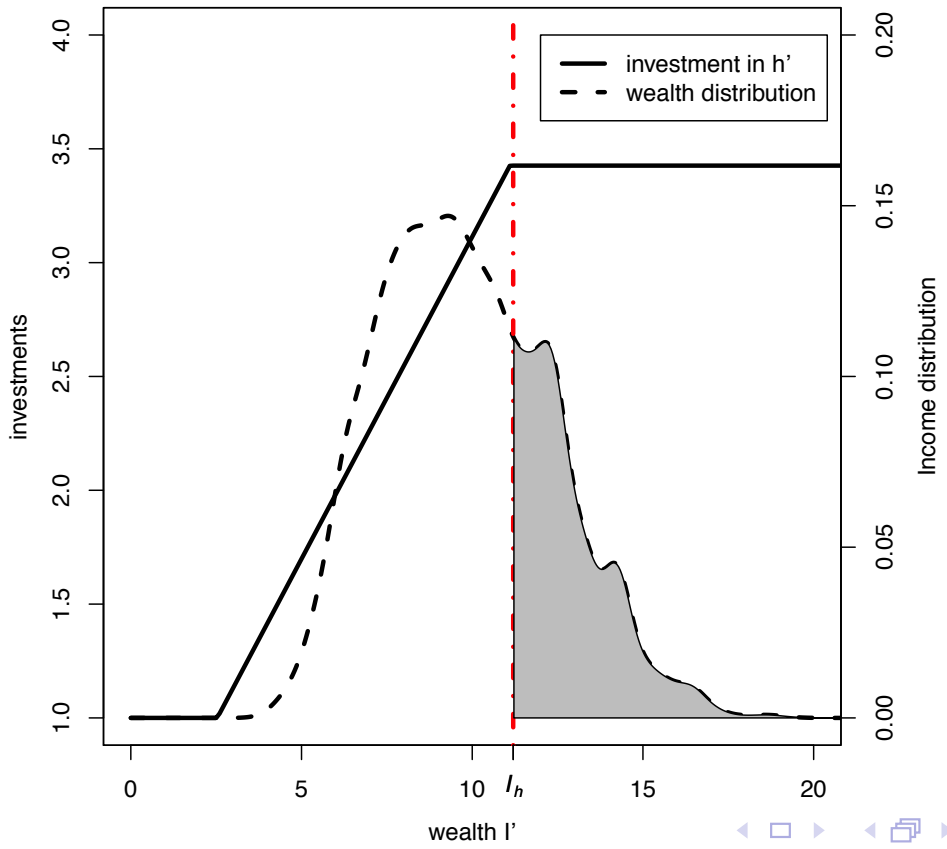
- A stationary competitive equilibrium exists.
  - invariant distributions of wealth, income and human capital.

Model implications

- Parents' decisions on the allocations of transfers resemble portfolio choice problem between the risky and risk-free assets.
- Education spending (as a proportion of wealth ϕ_h) is independent of wealth, but depends on agents' **degree of risk aversion**, **asset riskiness** and the **risk premium**.
- Taxes effects:
  - Income tax rate (τ_w) $\uparrow$, transfer allocation on education $\downarrow$, bequest $\uparrow$.
  - Bequest tax rate (τ_b) $\uparrow$, transfer allocation on education $\uparrow$, bequest $\downarrow$.
- Distribution of income is mainly affected by the distribution of human capital.

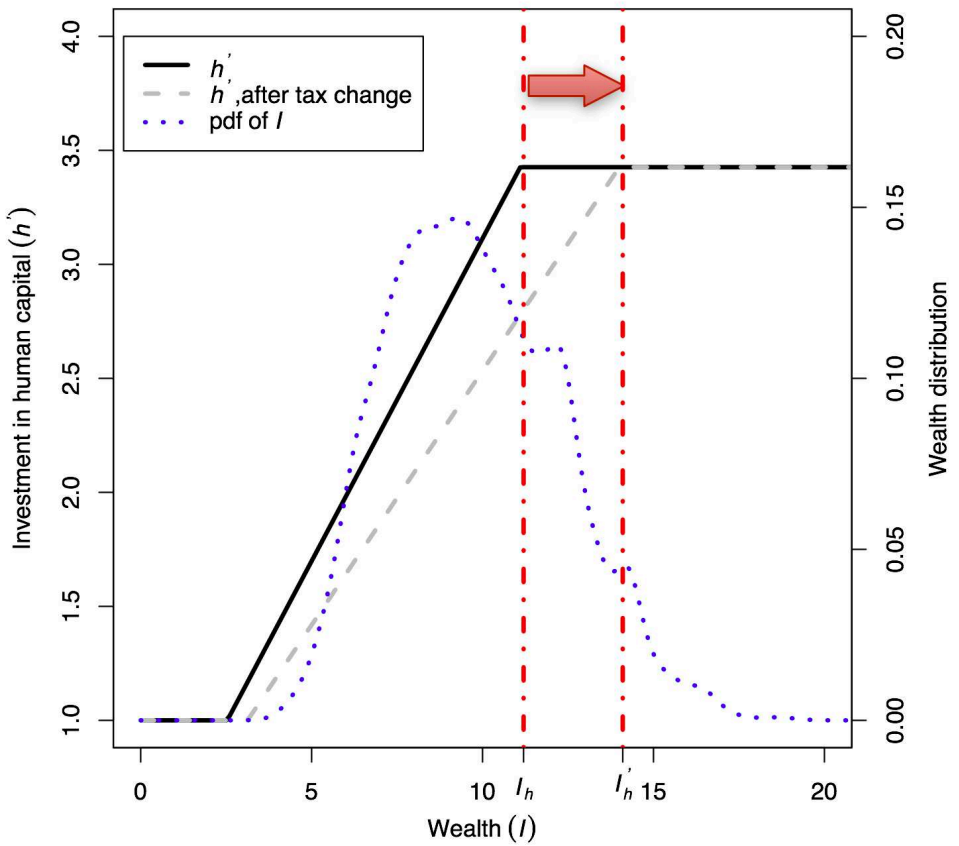
Distributions and parents' decisions

- Distribution of income, wealth, and human capital.
- Income (human capital) inequality is affected by
  - Proportion of people obtaining college education, related to the wealth threshold I_h.
  - Human capital distribution, determined by wealth distribution.



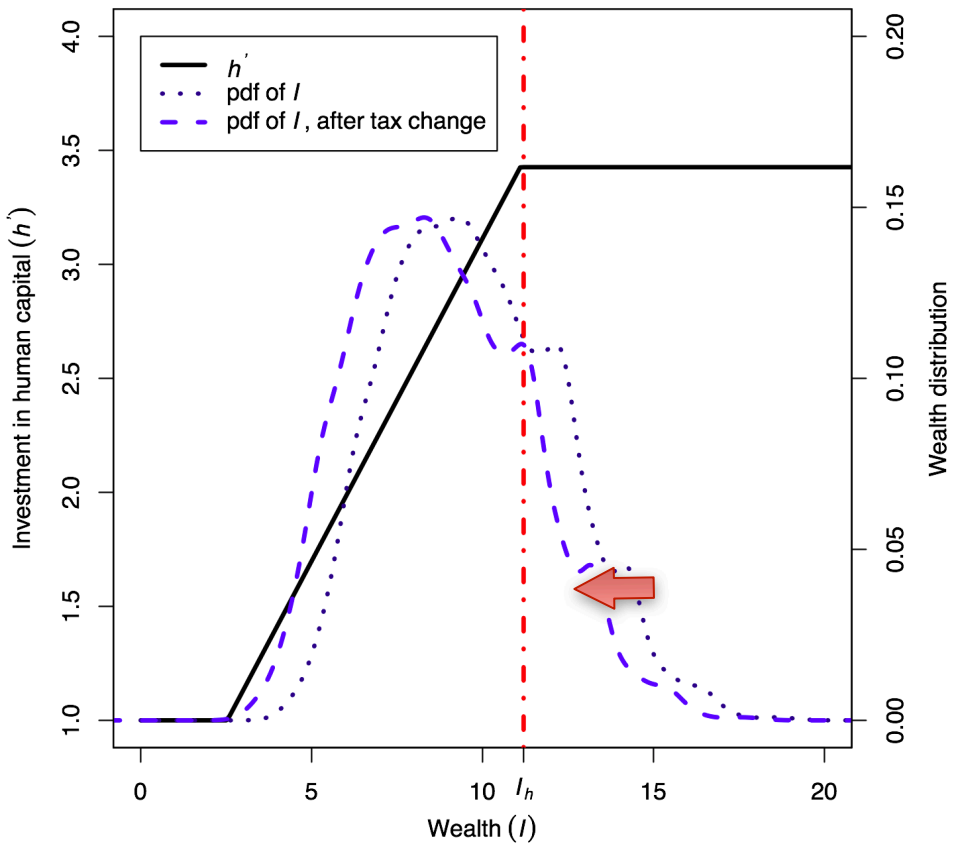
Allocation of Transfers and Income Gini

- If parents decrease the allocation of transfers on human capital investment (when $\tau_b \downarrow$ or $\tau_w \uparrow$)
  - The fraction of workers obtain college degree decrease.
  - Income Gini increases.



Amount of transfers and Income Gini

- If parents decrease the amount of assets transfers. (when tax rates increase)
  - The wealth distribution shift leftward.
  - Income Gini increase.

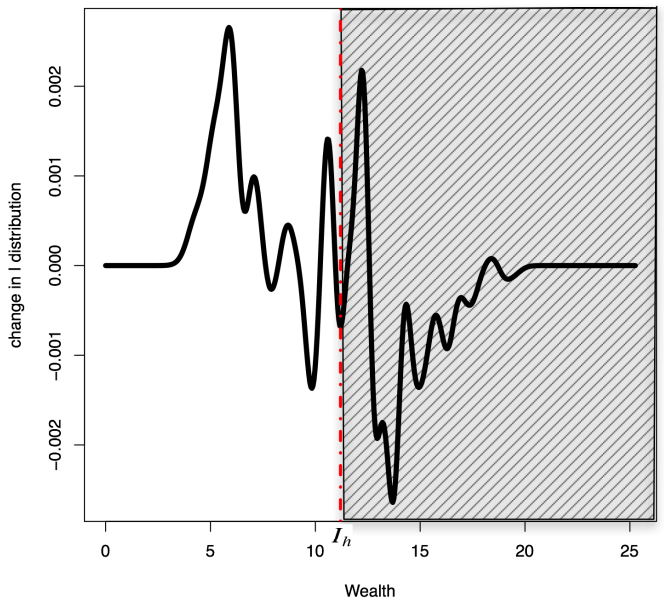


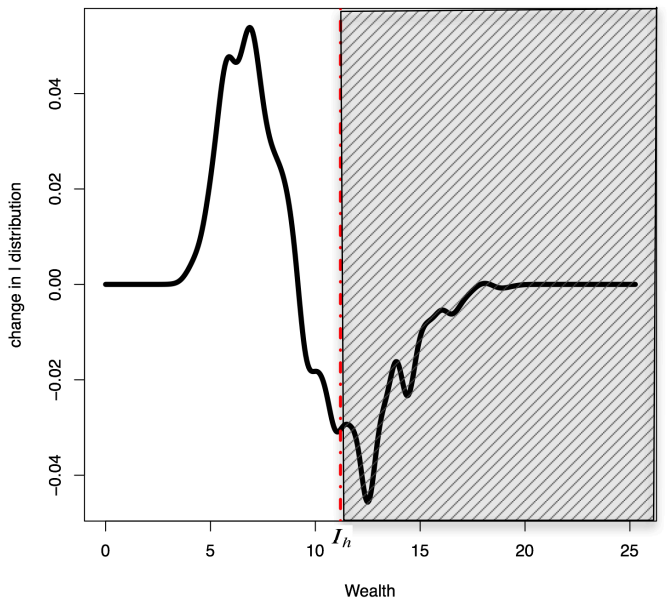
Tax effects on the wealth distribution

- Tax effects on the quantity of transfers depend on parents' wealth level.
  - The change of wealth distribution is not simply rightward/leftward shifting.
- Another effects: change the spread of wealth distribution.
  - If agents' wealth incorporate higher proportion of risky assets $\Rightarrow$ wealth dispersion increases.
  - Income Gini increases.

Tax effects on the spread of wealth distribution

- τ_b increases, parents tend to invest more on human capital.
  - the *risk* of next generations' wealth increases.
  - The spread of wealth distribution increases.
- τ_w creates the opposite effects.





Tax effects on parents transfer allocation

- I_h: wealth threshold
- ϕ_h: proportion of wealth spending on education
- EI': offspring's expected wealth

Table : Tax effects

	Portfolio choice		Wealth distribution	
	ϕ_h	I_h	EI'	Dispersion of I'
τ_b	$+$	$-$	$-$	$+$
Effects on $Gini_i$	$-$		$+$	$+$
τ_w	$-$	$+$	$-$	$-$
Effects on $Gini_i$	$+$		$+$	$-$

Calibrations

- Baseline case parameters are pinned down by targeting U.S. data.
- One period as 25 years.
- Parameters of technology, preference: follow the standard value in the literature.
- Risks of human capital: from the estimates of Palacios-Huerta (2003); yearly return follows log-normal distribution.

$$\log r_i^{1,h} \sim N(0.09, 0.076).$$

- Policy parameters: income and bequest tax rates (τ_w, τ_b) are pinned down by the ratio of labor income to gdp and the ratio of bequest and gift to gdp

Parameters and data targets

Parameters		value	source and target
Capital share	α	0.33	standard value in the literature
Discount factor (period)	β	0.96^{25}	standard value in the literature
World interest rate (annually)	$\overline{r}$	1/0.96	standard value in the literature
RRA of utility function	γ_c	2	standard value in the literature
RRA of child value function	γ_B	2	assume curvature is the same as utility function
Maximum human capital	$\overline{e}$	0.3145	the wage ratio between workers with college degree and high school is 2.578
Bequest tax	τ_b	0.176	Proportion of inheritance and gift taxation to GDP is 0.25% (U.S. 2008)
Wage tax	τ_w	0.032	Proportion of income taxation to total GDP is 11.8% (U.S. 2008)
Initial human capital	h_0	1	
Child value discount variable	β_c	3.058	target: fraction of workers with education above college degree(9.27% 2010)

Numerical exercise

- In the empirical strategy, to examine a particular tax effects, we control for the aggregate tax expenditure and the size of other taxation.
- To make the experiments results can be comparable with the coefficient in the regression results, the ratios of
  - total tax revenue to total output
  - alternative tax revenue to total output

  have to keep in the *baseline* level.

Numerical exercise

- To see the effects of each taxation,numerical exercises are designed as follows:
  - Income taxation: increase τ_w, and let τ_b, T to be adjusted.
  - Bequest taxation: increase τ_b, and transfers back the excess tax revenue.
- We design the government transfers in two ways.
  - T_a, workers and retirees all receive the transfer,
  - T_r, only retirees receive the transfer.

  This is used to examine how strong the effects from wealth transfer.

Results

Table : Experiment Results

Experiment		Details	$\Delta Gini_i/\Delta tax$		$\Delta h/h$
			Model	Data	
τ_w	(1)	$\tau_w \uparrow 5\%$	0.824	0.994 (1) 0.873 (2)	-3.2%
	(2)	$\tau_w \uparrow 10\%$	0.763	0.923 (3)	-6.5%
τ_b	(1)	$\tau_b = 1.5 \times \tau_b^*,\ T_a$	0.051	-0.047 (1)	0.05%
	(2)	$\tau_b = 1.5 \times \tau_b^*,\ T_r$	0.013	-0.716 (2)	0.07%
	(3)	$\tau_b = 2 \times \tau_b^*,\ T_a$	-0.006	-1.714 (3)	0.13%
	(4)	$\tau_b = 2 \times \tau_b^*,\ T_r$	-0.042		0.16%

Results

- Model predictions on income taxation effects are consistent with empirical evidence.
- The effects of bequest taxes depends on the level of tax rate change and transfer mechanism.
  - If $\Delta\tau_b$ is large, equality effects $>$ dispersion effect
  - If the transfer T apply to retirees only, equality effects $>$ dispersion effect
- Income tax harms human capital accumulation, bequests tax promote human capital accumulation. (Grossmann and Poutvaara (2009))

Conclusion

- Data shows that found that income taxation is positively associated with income inequality, while the effects from bequest taxation is not significant.
- We provided theoretical model to explain our empirical findings through the mechanism of intergenerational transfer.
- Future work:
  - progressive taxation

Data

Table 1: Definition of Tax Variables

Variable	Functional Classification
Income taxation	Individual taxation on income, profit and capital gains
Bequest taxation	Estate, inheritance and gift taxation
Social security taxation	Social security contribution from employees, employers, self-employed, and non-employed
Consumption taxation	Taxation on goods and services
Other tax revenues	Corporate taxation on income, profit and capital gains; Property taxation excluding bequest

Note: Functional classifications refer to the classifications given in their OECD data source.

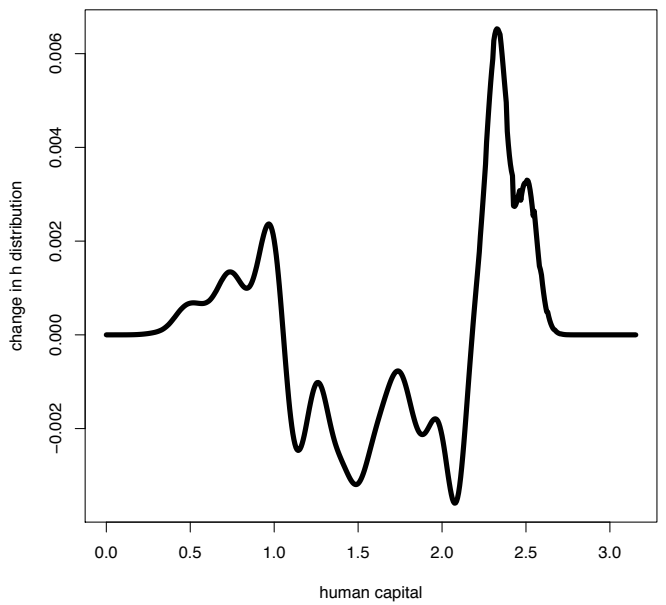
Data

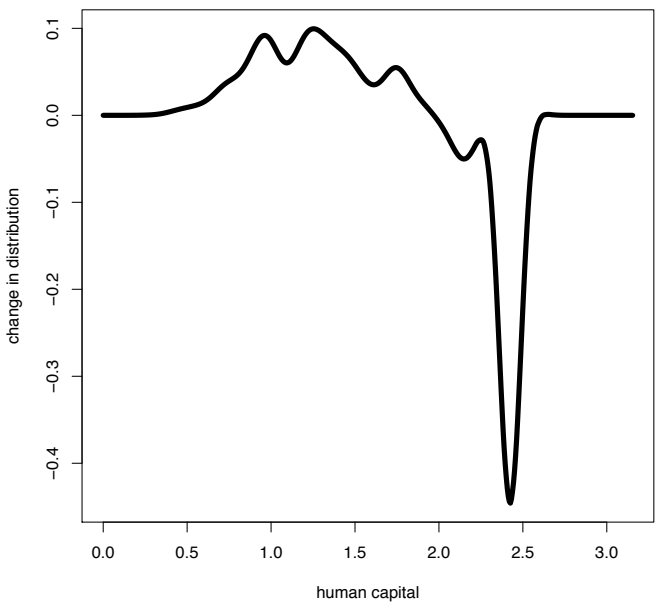
Table A1: Definition of Condtioning Variables

Variable	Definition or Measurement
Income inequality	Gini coefficient
GDP per capita	US dollars, current prices and PPPs
Real GDP growth rate	Annual growth rate (%)
Investment ratio	Gross fixed capital formation (as % of GDP)
Population growth rate	Annual growth rate of total population (%)
Fertility rate	Number of children per women
Human Capital	Average years of school attainment for the population aged 25 and over

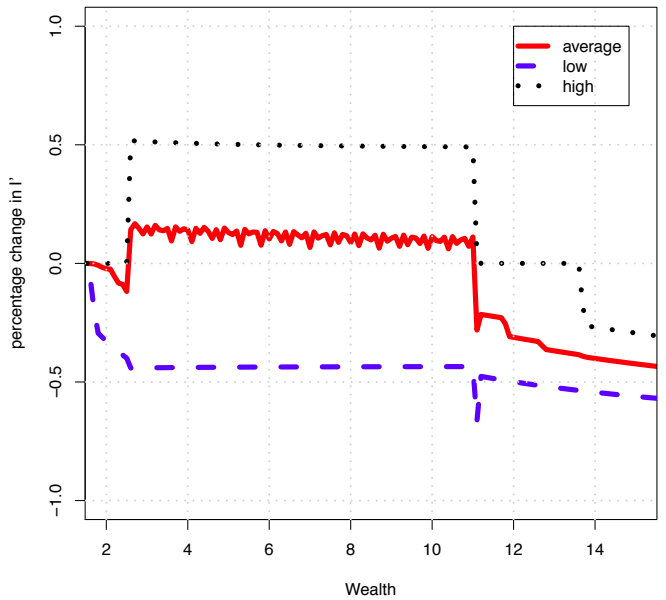
Note: GDP per capita and average years of school attainment are measured at the beginning of each period.

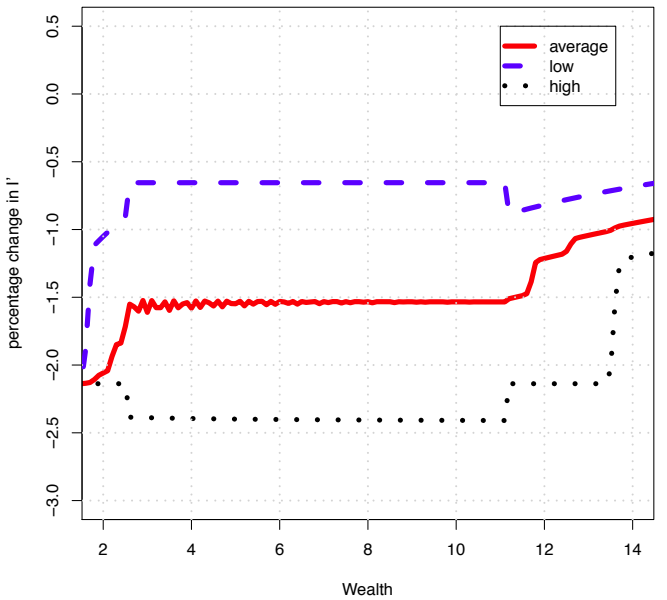
Tax effects on the spread of human capital distribution





Tax effects on the wealth evolution





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