The Effect of the Top Marginal Tax Rate on Top Income Inequality

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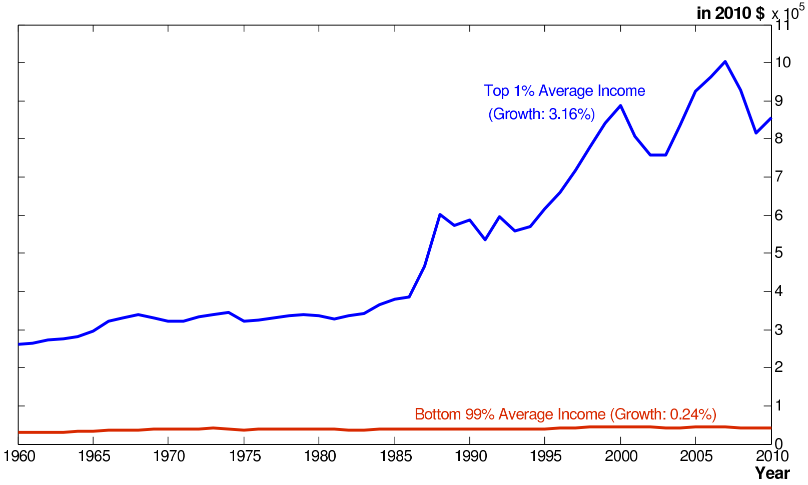
Outline

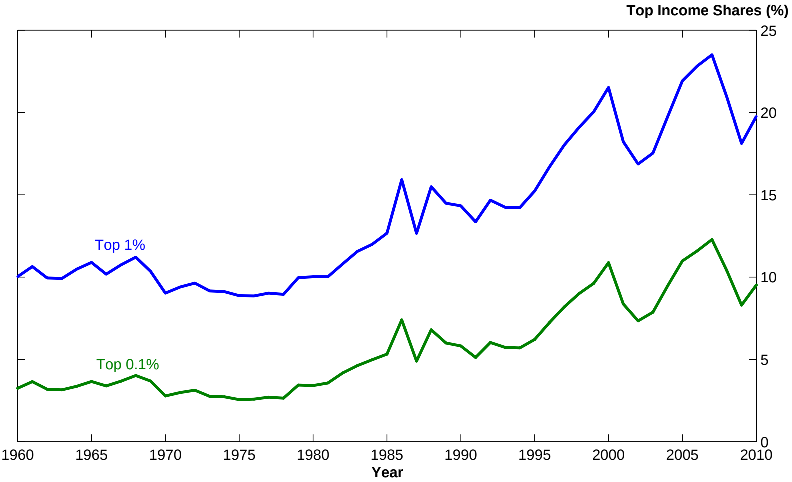
1. Facts
2. Pareto Top Income Distribution
3. Infinite-Horizon with Endogenous Human Capital
4. Quantitative Analysis
5. Concluding Remarks
6. Another Explanation: A Schumpeterian Model of Top Income Inequality

Top 1% vs. Bottom 99%



Source: Piketty and Saez (2003), 2010 data update

Top 1% vs. Bottom 99%



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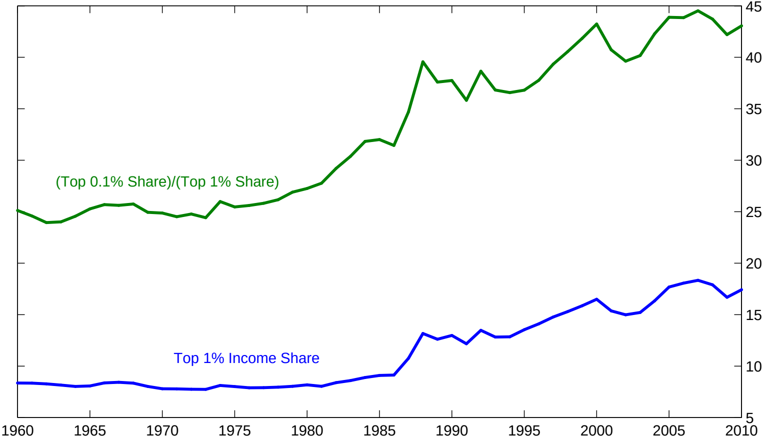
Within the Top 1%



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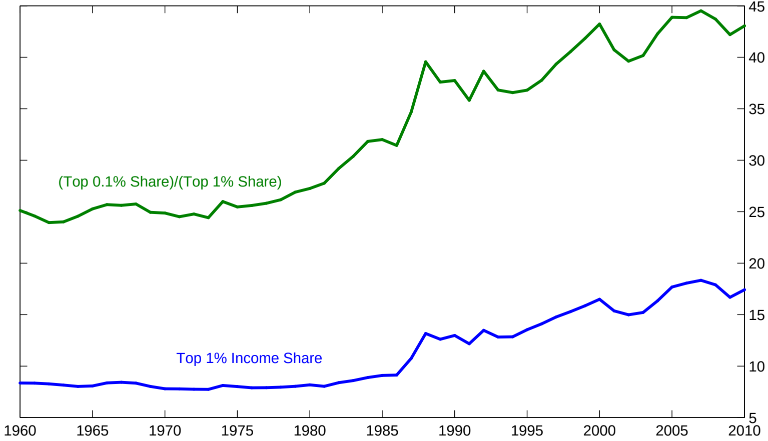
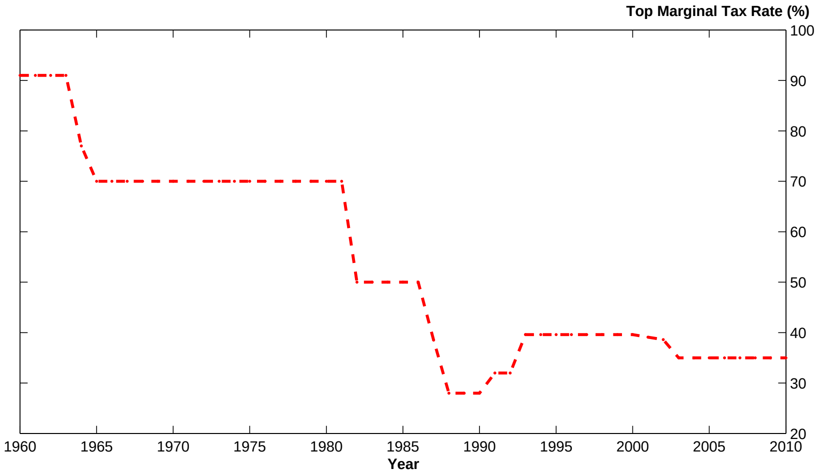


Top Income Inequality: inequality **within** the top income group

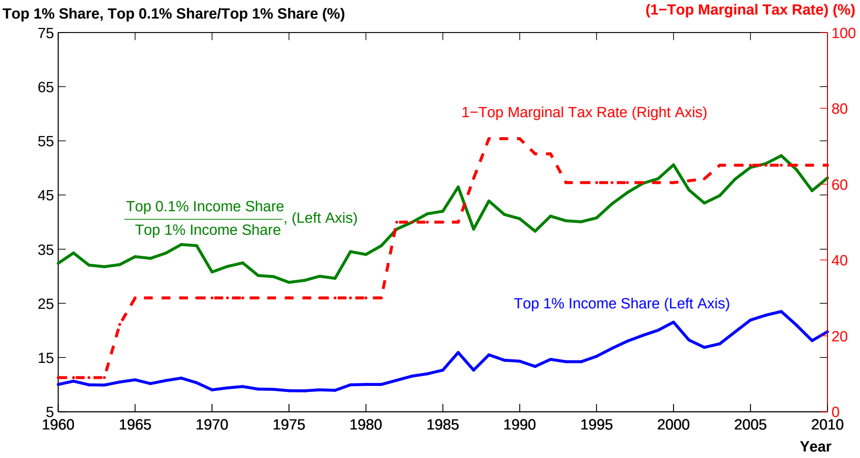
Source: Piketty and Saez (2003), 2010 data update

Top Marginal Tax Rates in the U.S.



Source: Tax Foundation

All Three Together



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Research Questions

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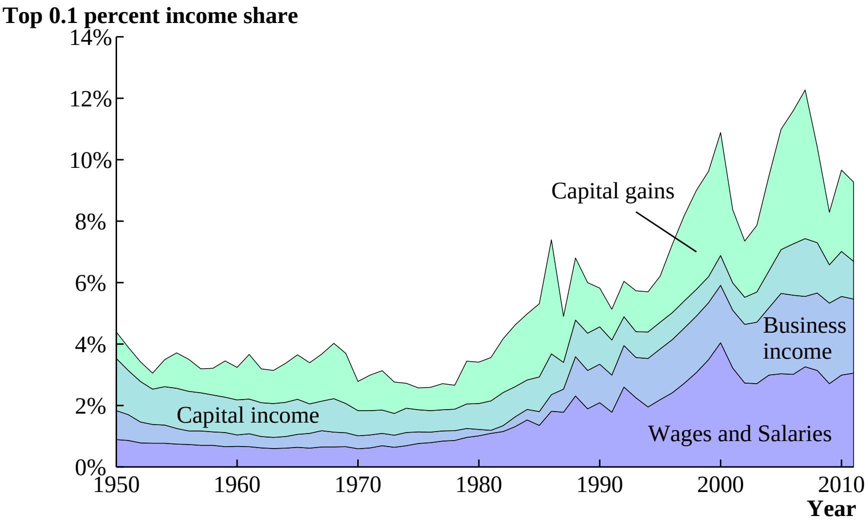
The Composition of the Top 0.1 Percent Income Share



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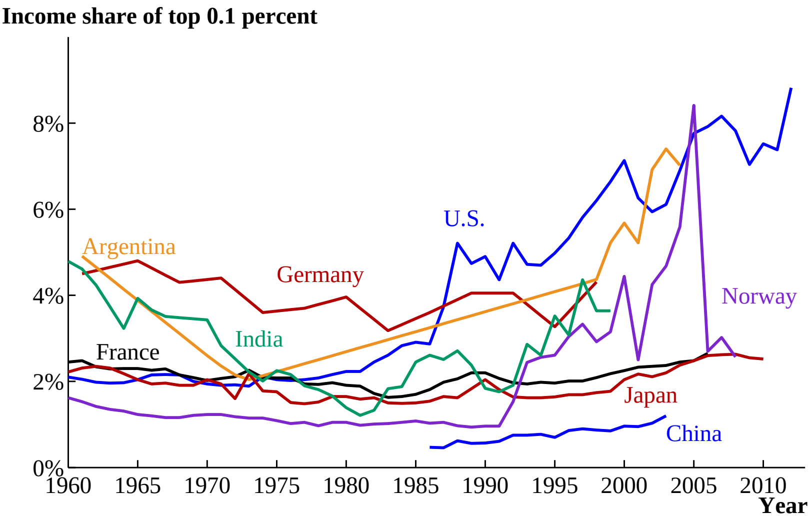
Other Countries?



Source: World Wealth & Income Database

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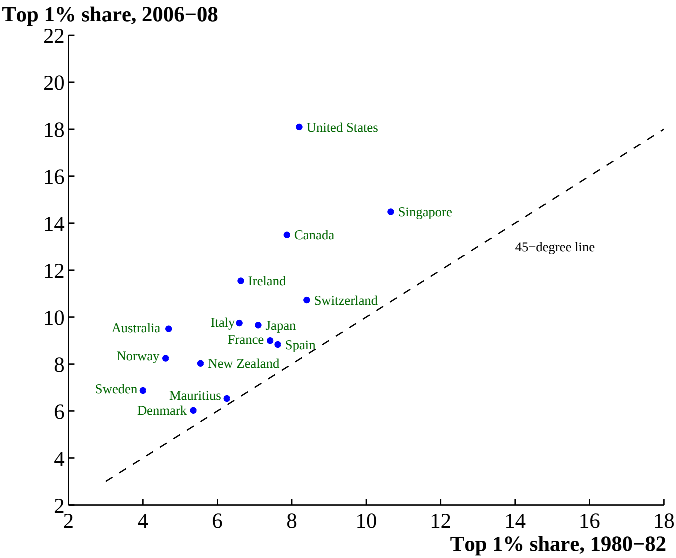

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- Income (excluding capital gains) threshold (2014)
    - 10%: $118,140
    - 1%: $387,810
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- What do they do?

Who’s in the Top 1%

Table 2 -- Percentage of primary taxpayers in top one percent of the distribution of income (excluding capital gains) that are in each occupation

	1979	1993	1997	1999	2001	2002	2003	2004	2005
Executives, managers, supervisors (non-finance)	36.0	33.6	34.5	34.1	31.6	31.3	30.3	30.4	31.0
Medical	16.8	20.4	17.9	15.1	16.5	17.2	17.7	16.7	15.7
Financial professions, including management	7.7	10.6	11.9	13.1	13.5	13.2	13.1	13.6	13.9
Lawyers	7.0	8.9	7.7	7.3	8.3	8.5	8.9	8.8	8.4
Computer, math, engineering, technical (nonfinance)	3.8	3.3	4.2	5.5	5.1	4.9	5.4	4.6	4.6
Not working or deceased	5.2	3.3	4.0	4.2	3.8	4.1	3.5	3.9	4.3
Skilled sales (except finance or real estate)	4.6	4.1	4.5	4.3	4.2	4.1	4.1	4.1	4.2
Blue collar or miscellaneous service	4.2	3.2	3.2	3.2	3.0	3.3	3.2	3.6	3.8
Real estate	1.9	1.4	1.8	2.6	2.6	2.9	2.6	3.1	3.2
Business operations (nonfinance)	2.4	2.2	2.6	2.8	3.3	3.0	2.8	3.3	3.0
Entrepreneur not elsewhere classified	2.7	2.1	2.1	2.1	2.1	1.7	2.1	1.9	2.3
Professors and scientists	1.3	1.8	1.6	1.4	1.8	1.8	1.9	1.8	1.8
Arts, media, sports	1.6	2.0	1.7	2.1	2.0	1.7	2.0	1.7	1.6
Unknown	1.6	1.3	1.0	0.9	0.9	1.0	1.3	1.1	0.9
Government, teachers, social services	0.8	0.9	0.5	0.8	0.5	0.8	0.7	0.8	0.8
Farmers & ranchers	1.8	0.1	0.6	0.4	0.4	0.3	0.4	0.5	0.5
Pilots	0.7	0.8	0.3	0.3	0.4	0.3	0.3	0.2	0.2

Source: Bakija, Cole, and Heim (2012)

Who's in the Top 0.1%

Table 3 -- Percentage of primary taxpayers in top 0.1 percent of the distribution of income (excluding capital gains) that are in each occupation

	1979	1993	1997	1999	2001	2002	2003	2004	2005
Executives, managers, supervisors (non-finance)	48.1	45.7	48.4	47.1	42.6	40.6	40.5	40.9	42.5
Financial professions, including management	11.0	14.1	14.7	16.4	19.1	19.0	17.8	18.7	18.0
Lawyers	7.3	6.5	6.3	5.9	7.1	8.2	8.8	8.0	7.3
Medical	7.9	13.3	6.8	4.4	5.2	6.8	7.6	6.3	5.9
Not working or deceased	5.4	2.5	3.5	3.8	4.0	3.7	3.7	3.8	3.8
Real estate	1.8	1.3	1.8	2.1	2.5	2.9	3.0	3.3	3.7
Entrepreneur not elsewhere classified	3.9	3.0	2.8	2.7	2.8	2.9	3.2	3.0	3.0
Arts, media, sports	2.2	3.3	3.5	3.5	3.3	3.6	3.4	3.3	3.0
Business operations (nonfinance)	1.5	1.7	2.3	2.2	2.7	2.7	2.2	2.7	2.9
Computer, math, engineering, technical (nonfinance)	2.3	2.3	3.1	4.7	4.0	3.0	3.1	3.0	2.9
Other known occupation	2.9	2.1	2.2	2.6	2.5	2.5	2.4	2.5	2.7
Skilled sales (except finance or real estate)	2.2	2.9	2.9	2.6	2.4	2.3	2.3	2.3	2.3
Professors and scientists	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.9	0.9
Farmers & ranchers	1.4	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Unknown	1.4	0.5	0.5	0.9	0.7	0.6	0.8	0.7	0.5

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  - Expansion of the financial sector (Philippon and Reshef (2012), Bell and Van Reenen (2010))
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  - Rent Seeking (Piketty, Saez, and Stantcheva (2011), Rothschild and Scheuer (2011))
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    - Elasticity of taxable income w.r.t. marginal net-of-tax rate ≥ 1 (Lindsey (1987), Feldstein (1995))
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    Saez (2001): top marginal tax rate does *not* affect top income inequality

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- Pareto wealth distribution: Bisin-Benhabib-Zhu (2011), Nirei(2009), Moll (2012), Piketty-Saez (2012), Piketty-Zucman (2014)

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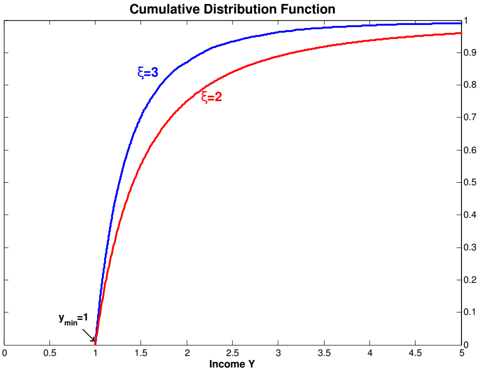

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- $$\frac{\text{(Top 0.1\% Income Share)}}{\text{(Top 1\% Income Share)}} = \frac{\text{(Top 0.01\% Income Share)}}{\text{(Top 0.1\% Income Share)}} = 10^{\frac{1}{\xi}-1}$$

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$\xi \uparrow \rightarrow$ **inequality** $\downarrow$

Power Law Inequality Exponent

- Define "**power law inequality exponent** η"

$$\eta \equiv \frac{1}{\xi}$$

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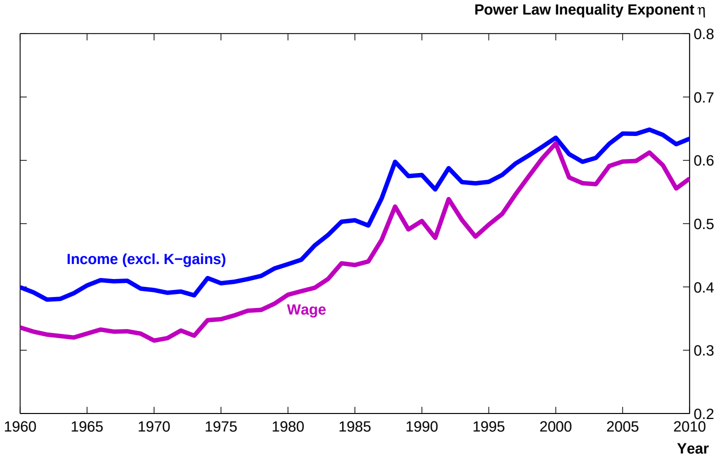
$$\eta \equiv \frac{1}{\xi}$$

- Useful properties
  - $\mathbf{E}[Y] = \left(\frac{1}{1-\eta}\right) y_{\text{min}}$
  - if $X = Y^{\alpha}$, $\eta_X = \alpha\eta_Y$.

Top Inequality in Power Law Inequality Exponent



Calculated from the top shares data in Piketty and Saez (2003) 2010 data update

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- Flow utility: $u(c_t, l_t) = c_t - \frac{1}{\rho} \frac{l_t^{1+\kappa}}{1+\kappa}$
  ($\frac{1}{\kappa}$: elasticity of labor supply w.r.t. take-home rate $(1 - \tau)$)

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$$h_{t+1} = \epsilon_t h_t^{\alpha} e_t^{\gamma}$$

$\epsilon_t > 0$: idiosyncratic i.i.d. shock, $\mathbf{E}[\epsilon_t] < \infty$
e_t: goods investment in human capital, in the consumption unit
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- $h \neq$ schooling

Setting Up the Model

- Optimization:

$$\max_{\{c_t, l_t, e_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t u(c_t, l_t)$$

subject to the budget constraint

$$c_t + e_t = (1-\tau) h_t l_t,$$

human capital accumulation

$$h_{t+1} = \max\{\epsilon_t h_t^{\alpha} e_t^{\gamma}, h_{\text{min}}\},$$

and $c_t > 0$ for $\forall t \in \{1, 2, 3, ..., \infty\}$

Bellman Equation

$$V(h) = \max_{c,l,e} u(c,l) + \beta E[V(h')]$$

subject to

$$\begin{aligned} c + e &= (1-\tau)hl, \\ h' &= \max\{\epsilon h^{\alpha} e^{\gamma}, h_{\text{min}}\}, \\ c &> 0, \end{aligned}$$

where h' denotes the level of the next period's human capital.

Closed-Form Solutions

labor effort: $l(h) = (\rho(1-\tau)h)^{\frac{1}{\kappa}}$,

income: $y(h) = (\rho(1-\tau))^{\frac{1}{\kappa}} h^{1+\frac{1}{\kappa}}$,

HK investment: $e(h) = \left(\beta(1-\alpha)\mathbf{E}[\epsilon^{1+\frac{1}{\kappa}}]X\right)^{\frac{1}{\alpha}} h^{1+\frac{1}{\kappa}}$,

where X is a solution of

$$X = \frac{\alpha}{1-\alpha}\left(\beta(1-\alpha)\mathbf{E}[\epsilon^{1+\frac{1}{\kappa}}]\right)^{\frac{1}{\alpha}} X^{\frac{1}{\alpha}} + \frac{\kappa}{1+\kappa}\rho^{\frac{1}{\kappa}}(1-\tau)^{1+\frac{1}{\kappa}},$$

$$0 < X < \left(\frac{1-\alpha}{\alpha}\rho^{\frac{1}{\kappa}}(1-\tau)^{1+\frac{1}{\kappa}}\right)^{\alpha} / \left(\beta(1-\alpha)\mathbf{E}[\epsilon^{1+\frac{1}{\kappa}}]\right).$$

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Human Capital: Growth

Human Capital:

$$h' = \max\left\{\epsilon\left(\beta(1-\alpha)\mathbf{E}[\epsilon^{1+\frac{1}{\kappa}}]X\right)^{\frac{\gamma}{\alpha}} h, h_{\text{min}}\right\}.$$

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- Level effect on h: $(1-\tau)\uparrow \Rightarrow X\uparrow \Rightarrow h'\uparrow$

Income Growth

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- Level effect on y: $(1-\tau)\uparrow$

$$\Rightarrow y = l(h) \times h = \Bigg(\underbrace{(\rho(1-\tau))^{\frac{1}{\kappa}}}_{\substack{\text{labor supply,} \\ \text{immediate}}} \; \underbrace{h^{\frac{1}{\kappa}} \Bigg) \times h}_{\substack{\text{human capital,} \\ \text{long-run}}}$$

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- Distribution of h and y?

Pareto Generating Proportional Random Growth

From the random growth theory:

If

- $x_{t+1} = \max\{\gamma_t x_t, x_{\text{min}}\}$ for $x_{\text{min}} > 0$, $\gamma_t > 0$, $\mathbf{E}[\gamma_t] < \infty$,
- $\exists\, \xi > 0$ s.t. $\mathbf{E}[\gamma_t^\xi] = 1$,

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$$h' = \max\{\underbrace{\epsilon\left(\beta(1-\alpha)\mathbf{E}[\epsilon^{1+\frac{1}{\kappa}}]X\right)^{\frac{\gamma}{\alpha}}}_{\gamma_t} h, h_{\text{min}}\}$$

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(Power Law Inequality in the Infinite Horizon Model)

If $\exists\ \eta_h > 0$ s.t.

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(Power Law Inequality under the Log-Normal Shock)

- If $\log \epsilon \sim \mathbf{N}(-\sigma^2/2, \sigma^2)$, then η_y and η_h are given by

$$\begin{aligned} \frac{1}{\eta_y} &= \frac{\kappa}{1+\kappa}\left(1 - \frac{\gamma}{\alpha}\frac{\log\left(\beta(1-\alpha)X\right) + \left(1+\frac{1}{\kappa}\right)\sigma^2/(2\kappa)}{\sigma^2/2}\right), \\ \eta_h &= \eta_y/\left(1+\frac{1}{\kappa}\right). \end{aligned}$$

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$$\eta_h = \eta_y / \left(1 + \frac{1}{\kappa}\right).$$

- If $\beta \mathbf{E}[\epsilon^{1+\frac{1}{\kappa}}][\rho^{\frac{1}{\kappa}}(1-\tau)^{1+\frac{1}{\kappa}}]^{1-\alpha} < \frac{\kappa+1}{\kappa+\alpha}$, then an increase in the take-home rate $(1-\tau)$ will raise η_y and η_h.

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  - $\Rightarrow$ Human capital investment $\uparrow$
  - $\Rightarrow$ Growth rate of risky human capital $\uparrow$
  - $\Rightarrow$ $\eta_h \uparrow$ & $\eta_y \uparrow$: heavier, more unequal tail

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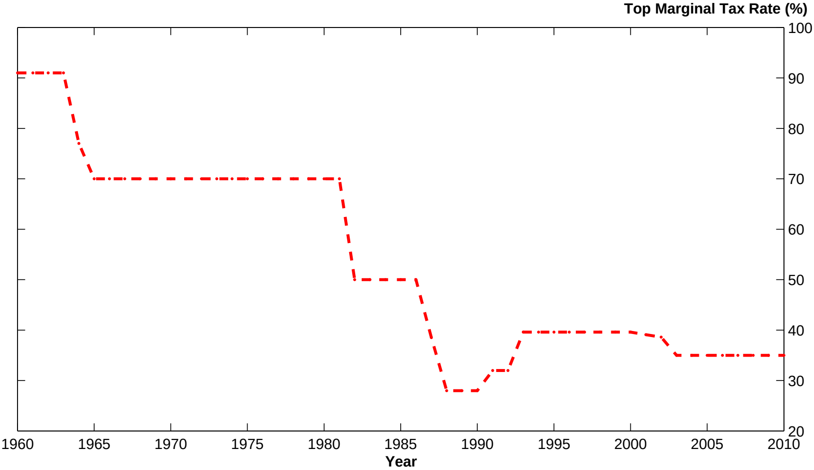
1. Facts
2. Pareto Top Income Distribution
3. Infinite-Horizon with Endogenous Human Capital
4. **Quantitative Analysis**
5. Concluding Remarks
6. Another Explanation: A Schumpeterian Model of Top Income Inequality

Quantitative Analysis

1. **Calibration**
2. Tax Regime Change
3. Myopic Optimization

Top Marginal Tax Rates in the U.S.



Source: Tax Foundation

Parameter Calibration

Assume the steady state at the high-tax regime, $\tau = 0.7$ in 1980

Table: Calibrated Parameter Values

$\kappa = 1.5327$	to match est. of elasticity of top 1% income thhd in Lindsey (1987)
$\alpha = 0.93$	to match η in 1980
$\gamma = 0.0424$	from the parameter restriction $\alpha + \gamma\left(1 + \frac{1}{\kappa}\right) = 1$
$\beta = 0.9957$	$1/(1+r)$, r: real effective federal funds rate in 1971-1980
$\sigma^2 = 0.1539$	std(1-yr Δ(log earning)) $\approx 2 \times$ pop. est.
$\rho = 0.266$	to match the top 1% income threshold in 1980

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Tax Regime Change: Distributional Effect

Transition from high-tax regime to low-tax regime: $\tau = 70\% \rightarrow 40\%$

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Model		Data	
$\eta_{1980} = 0.4359$		$\eta_{1980} = 0.4359$	

Tax Regime Change: Distributional Effect

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Model		Data	
$\eta_{1980} = 0.4359$	30% $\uparrow$	$\eta_{1980} = 0.4359$	
$\tilde{\eta}_{2010} = 0.5216$			

Tax Regime Change: Distributional Effect

Transition from high-tax regime to low-tax regime: $\tau = 70\% \rightarrow 40\%$

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$\eta_{1980} = 0.4359$	30% $\uparrow$	$\eta_{1980} = 0.4359$	45.5% $\uparrow$
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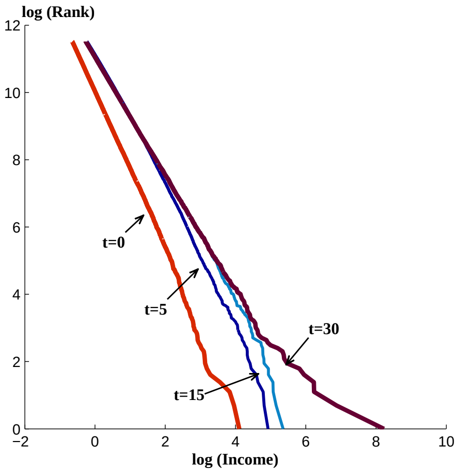
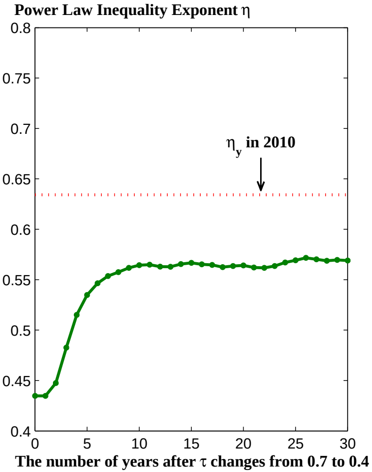
65.9% of the real increase in top income inequality

Tax Regime Change: Transition Dynamics





Tax Regime Change: Top 1% Income Share

Transition from high-tax regime to low-tax regime: $\tau = 70$% $\rightarrow 40$%

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Transition from high-tax regime to low-tax regime: $\tau = 70\% \rightarrow 40\%$

Model		Data	
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Model		Data	
$s_{1980} = 8.18\%$	77.2% $\uparrow$	$s_{1980} = 8.18\%$	113.0% $\uparrow$
$\tilde{s}_{2010} = 14.5\%$		$s_{2010} = 17.42\%$	

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68.4% of the real increase in top 1% income share

Tax Regime Change: Level Effect

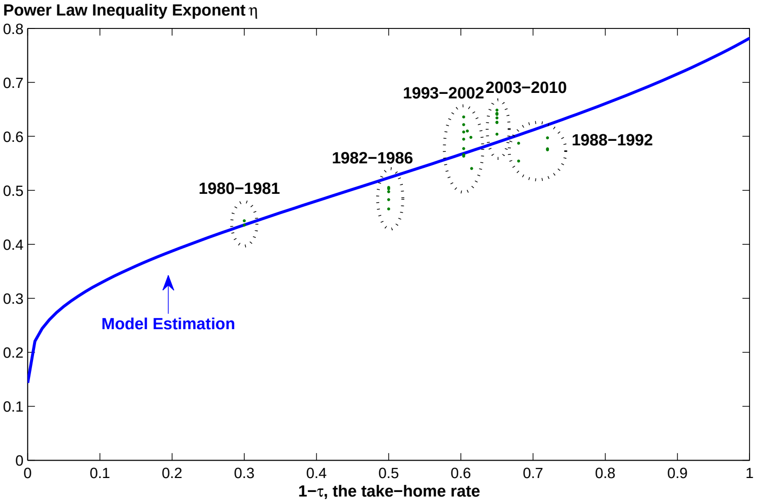
Decomposition of Level Effect:

$\Delta \log($Average Top 1% Income$)$

$$= \Delta \log \left((\rho(1-\tau))^{\frac{1}{\kappa}} \left(\frac{1}{1-\eta_h} h_{\text{min}} \right)^{1+\frac{1}{\kappa}} \right)$$

$$= \underbrace{\frac{1}{\kappa} \Delta \log \rho(1-\tau)}_{\substack{\text{labor response} \\ \text{immediate effect} \\ =0.452,\ 51\%}} + \underbrace{\left(1+\frac{1}{\kappa}\right) \Delta \log \left(\frac{1}{1-\eta_h} \right)}_{\substack{\text{human capital increase} \\ \text{long-run effect} \\ =0.435,\ 49\%}} .$$

Model Implied Relationship: Income



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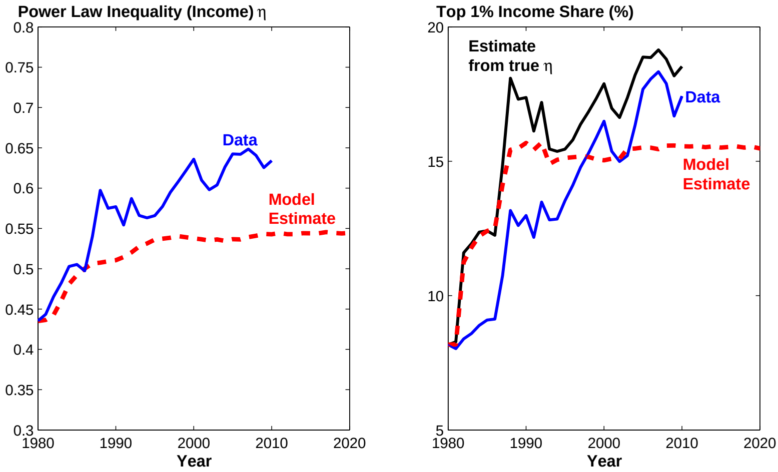

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Our model explains

- 65.9% of the increase in top income inequality from 1980 to 2010
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- Sharp increases in top income share and top income inequality in the U.S. 1980-2010
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  - tax rate $\downarrow$ $\Rightarrow$ top income level $\uparrow$ & top income inequality $\uparrow$
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    - Yes, if the bottom 99% stagnates
    - No, if the increased tax revenue from the top 1% is redistributed

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Why Skill-Biased Technical Change Fails at the Top

- Let $x_i =$ skill and $\bar{w} =$ wage per unit skill

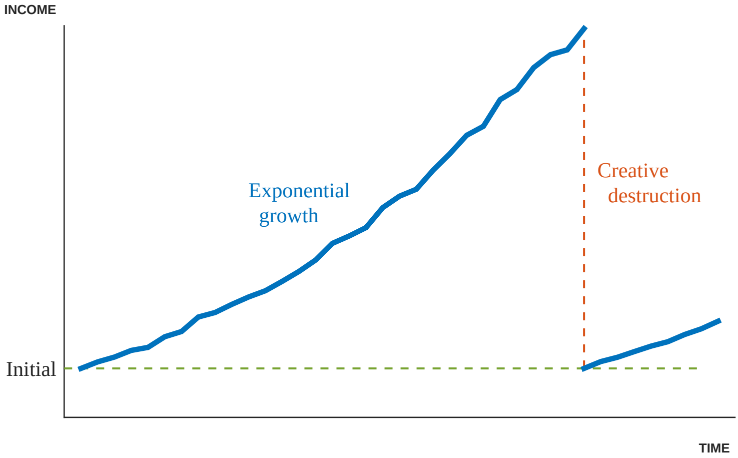
$$y_i = \bar{w} x_i^{\alpha}$$

- if Pr$[x_i > x]^{-1/\eta_x}$, then

$$Pr[y_i > y] = \frac{y}{\bar{w}}^{-1/\eta_y} \text{ where } \eta_y = \alpha \eta_x$$

- That is, y_i is Pareto with inequality parameter η_y
  - SBTC ($\uparrow \bar{w}$) shifts distribution right but η_y unchanged.
  - $\uparrow \alpha$ would raise Pareto inequality
  - Jones and Kim (2014): why is $x \sim$ Pareto, and why $\uparrow \alpha$

Exponential growth with death ⇒ Pareto



Simple Model for Intuition

- Exponential growth often leads to a Pareto distribution.
- Entrepreneurs
  - New entrepreneur ("top earner) earns y_0
  - Income after x years of experience:

$$y(x) = y_0 e^{\mu x}$$

- Poisson "replacement process at rate δ
  - Stationary distribution of experience is exponential

$$Pr[\text{Experience} > x] = e^{-\delta x}$$

What fraction of people have income $> y$?

- Equals fraction with at least $x(y)$ years of experience

$$x(y) = \frac{1}{\mu} \log\left(\frac{y}{y_0}\right)$$

- Therefore

$$\begin{aligned} Pr[\text{Income} > y] &= Pr[\text{Experience} > x(y)] \\ &= e^{-\delta x(y)} \\ &= {\frac{y}{y_0}}^{-\frac{\delta}{\mu}} \end{aligned}$$

- So power law inequality is given by

$$\eta_y = \frac{\mu}{\delta}$$

Intuition

- Why does the Pareto result emerge?
  - Log of income $\propto$ experience (Exponential growth)
  - Experience $\sim$ exponential (Poisson process)
  - Therefore log income is exponential

$$\Rightarrow \text{Income} \sim \text{Pareto!}$$

- A Pareto distribution emerges from exponential growth experienced for an exponentially distributed amount of time.

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- Globalization?
  - $\uparrow \mu \Rightarrow$ More inequality
  - $\uparrow \delta \Rightarrow$ Less inequality
- Preliminary SSA data analysis (from Guvenen et. al (2016)) shows μ didn't change much while $\delta \downarrow$ since 1980s