Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities

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Introduction

- Top 1% share of income has surged in US and English-speaking countries (less so in Europe and Japan)
- ... while top tax rates have declined
- Possible explanations?
  - Market-driven skill-biased change (but why only some countries?)
  - Institution-driven (tolerance for pay and social norms change)
  - Taxes? (but through what channel?)

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How do taxes affect the top 1% share and top incomes? Three narratives

1. Standard supply side channel (Lindsey (1987), Feldstein (1995))

This paper:

- Simple model capturing all three responses
- Derives optimal tax formula as a function of the three elasticities
- Empirical analysis
  - Macro evidence: long-term evidence for the US and international evidence for 18 OECD countries since 1975
  - Micro evidence on CEO pay in the US

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2. Avoidance and income shifting (Slemrod (1996), Slemrod and Kopczuk (2002), Reynolds (2007))

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2. Avoidance and income shifting (Slemrod (1996), Slemrod and Kopczuk (2002), Reynolds (2007))
3. Compensation bargaining and rent-extraction

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Introduction: Results of the Paper

Main theoretical results:

- Sole limiting factor is real supply-side (first) elasticity - avoidance (second) elasticity should be minimized
- Compensation bargaining (third) elasticity tends to increase taxes, potentially a lot.

Macro and micro empirical results:

- Suggestive macro evidence:
  - Large total elasticity $e = e_1 + e_2 + e_3 = 0.5$ in 18 OECD countries.
  - US long-term evidence: avoidance channel is not full story $\Rightarrow e_2 < 0.1$
  - No correlation between top tax rates and growth: $\Rightarrow e_1$ small at the top, $\Rightarrow e_3 \simeq 0.3 \Rightarrow t = 83\%$ potentially (57% in pure supply side).
- Micro evidence on CEO pay and bargaining:
  - CEOs are rewarded for "non-deserved" luck income
  - Sensitivity of pay to luck income diminishes with top tax rates more than sensitivity of pay for performance

Outline of the talk

1. Standard model with real supply-side response
2. Income shifting model
3. Bargaining and rent-seeking responses
4. Empirical evidence
   - Macro: long-term US evidence
   - Macro: International evidence
   - Micro evidence on CEO pay
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Standard Model with Real Supply Side Responses

- z: taxable income
- Consider a constant tax rate τ for $z \geq \overline{z}$.
- Utility (no income effects):

$$u_i(c, z) = c - h_i(z)$$

  with $c = z - T(z)$, disposable income and $h_i()$ cost of effort, increasing and convex.
- Individual optimization: $h_i'(z_i) = (1-\tau) \Rightarrow z_i = z_i(1-\tau)$
- Aggregating over all individuals: $z = z(1-\tau)$.
- First elasticity: $e_1 = \frac{dz}{d(1-\tau)} \frac{(1-\tau)}{z}$.

Standard Model with Real Supply Side Responses

- Social welfare across agents of type i :

$$W = \int G(u_i)\, dv(i)$$

s.t.: $\int T(z_i)\, dv(i) \geq T_0 \; [p]$

- Marginal social welfare weight: $g_i = \frac{G'(u_i)}{p}$
- Optimal tax rate with $g = 0$ at the top (revenue maximizing rate):

$$\tau^* = \frac{1}{1 + ae_1}$$

with $a = z/(z - \overline{z}) > 1$.

- **Calibration** (Diamond and Saez (2011)): $a = 1.5$ (US) , $a \approx 2$ (EU).
  $e_1 = 0.25 \;\Rightarrow\; \tau^* = 73\%$
  $e_1 = 1 \;\Rightarrow\; \tau^* = 40\%$.

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Income Shifting Responses

- Pure avoidance model in the paper. But not all shifting purely wasteful $\rightarrow$ Ramsey taxation considerations
- Two sources of income, labor, y_L (taxed at τ_L above $\overline{z}$) and capital y_K (taxed at τ_K). Produced at respective costs $h_{Li}(y_L)$ and $h_{Ki}(y_K)$.
- Can shift x from labor to capital income at cost $d_i(x)$
- Taxable incomes: $z_L = y_L - x$, $z_K = y_K + x$
- Utility:

$$u_i(c, y_L, y_K, x) = c - h_{Li}(y_L) - h_{Ki}(y_K) - d_i(x)$$

where $c = R + (1 - \tau_L) z_L + (1 - \tau_L) z_K + (\tau_L - \tau_K) x$

Tax Avoidance and Income Shifting Responses

Income Shifting

- Solutions: $h'_{Li}(y_L) = 1 - \tau_L, \;\; h'_{Ki}(y_K) = 1 - \tau_K$ and $d'_i(x) = (\tau_L - \tau_K)$
- Aggregating over all taxpayers:
  - $y_L = y_L(1 - \tau_L)$, with elasticity e_L
  - $y_K = y_K(1 - \tau_K)$, with elasticity e_K
  - $x = x(\tau_L - \tau_K)$, increasing in $\Delta\tau := \tau_L - \tau_K$.
- Reported incomes z_L and z_K more elastic than real incomes since react also along avoidance margin.
- Define $a_L = \frac{z_L}{z_L - \overline{z}}$ and $a = \frac{z_L + z_K}{z_L + z_K - \overline{z}}$

Tax Avoidance and Income Shifting Responses

Income Shifting

Theorem

Without shifting, optimal rates are $\tau_K^* = 1/(1+e_K)$, $\tau_L^* = 1/(1+ae_L)$ *and* $\tau_L > \tau_K$ *iff* $a_L e_L < e_K$ *(standard Ramsey result)*

Theorem

With infinite shifting elasticity, $\tau_K = \tau_L = \frac{1}{1+a\overline{e}}$ *where* $\overline{e} = \frac{y_L}{y_L+y_K} e_L + \frac{y_K}{y_L+y_K} e_K$

Theorem

In general, if $a_L e_L < e_K$, *then* $1/(1+ae_L) \geq \tau_L > \tau_K \geq 1/(1+e_K)$. *And if* $a_L e_L > e_K$, *inequality reversed.*

Shifting brings τ_L and τ_K closer together, even if e_L and e_K very different.

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Compensation Bargaining Response

Literature Review

- Pay need not equal marginal productivity
  - Entrenchment, bargaining $\Rightarrow$ overpay
  - Social norms, intolerance for high pay $\Rightarrow$ underpay
- Few taxation papers with imperfect labor markets. Typically focus on restoring efficiency: Fuest and Huber (1997), Aronsson and Sjogren (2004)
- Some look at redistribution: Hungerbuehler et. al. (2006), Stantcheva (2011), Rothschild and Scheuer (2012)

Compensation Bargaining Response

Model Setup

- Individual i receives fraction η of his actual product y: $z = \eta y = y + b$ where bargained earnings are $b = (\eta - 1)\, y$
- Individual utility:

$$u^i(c, \eta, y) = c - h_i(y) - k_i(\eta)$$

  where $k_i(\eta)$ increasing and convex.
- $E(b)$: average bargaining in the economy.
- Important simplifying assumption:
  - any gain/loss from bargaining hits everyone in the economy uniformly (discussion later).
  - paper presents simple bargaining model where bargaining is at expense of profits and firms are uniformly owned by everyone
  - government's demogrant $T(0)$ can fully absorb the bargaining gain or loss

Compensation Bargaining Response

Individual behavior

- Individual optimization leads to:
  $h_i'(y) = (1-\tau)\eta$
  $k_i'(\eta) = (1-\tau)y$
- Defines the aggregate functions
  $y = y(1-\tau)$
  $\eta = \eta(1-\tau)$
  $b = b(1-\tau)$
  as increasing functions of the net-of-tax rate.

Compensation Bargaining Response

Elasticities

- Supply side elasticity e_1: as before $e_1 = \frac{dy}{d(1-\tau)} \frac{1-\tau}{y}$
- Bargaining "elasticity", e_3 : define s as fraction of behavioral response due to bargaining: $s = \frac{db/d(1-\tau)}{dz/d(1-\tau)}$

$$e_3 = \frac{db}{d(1-\tau)} \frac{1-\tau}{z}$$

Total elasticity: e :

$$e = \frac{\partial z}{\partial (1-\tau)} \frac{1-\tau}{z} = \frac{e_3}{s}$$

Note that $e = \frac{y}{z} e_1 + e_3$.

Compensation Bargaining Response

Optimal tax

- s can be negative, leading to e_3 negative, if η sufficiently small ($\eta \leq \frac{e_1}{e_1+e_\eta}$)
- s and hence e_3 always positive if individuals are overpaid ($\eta > 1$)

Theorem

The optimal tax rate is

$$\tau^* = \frac{1 + ae_3}{1 + ae} = 1 - \frac{a\,(y/z)\,e_1}{1 + ae}$$

τ^* decreases with the real elasticity e_1 and total elasticity e, increases with overpayment z/y and with the bargaining elasticity e_3.
If top earners are overpaid, $\tau^* > 1/\,(1 + ae_1)$.

Compensation Bargaining

Optimal tax: Comments

- **Implementing formula** requires knowing, in addition to total e, *either* e_3 or e_1 and (y/z). Hard (but see empirical section)!
- **Trickle up:** If top earners overpaid, lowering tax τ extracts resources from lower earners.
  - If $e = 1$, and $y = z$, optimal tax in pure supply side case is 40%.
  - If $e_1 = 0.5$, starting from $y = z$, optimal tax is 70%.
  - If paid twice their marginal product, optimal rate is 85%.
- **Trickle down:** If top earners underpaid, lowering tax τ transfers resources to lower earners.
  - e.g.: if Japan has implicit caps on pay (social norms), optimal τ could be lower.

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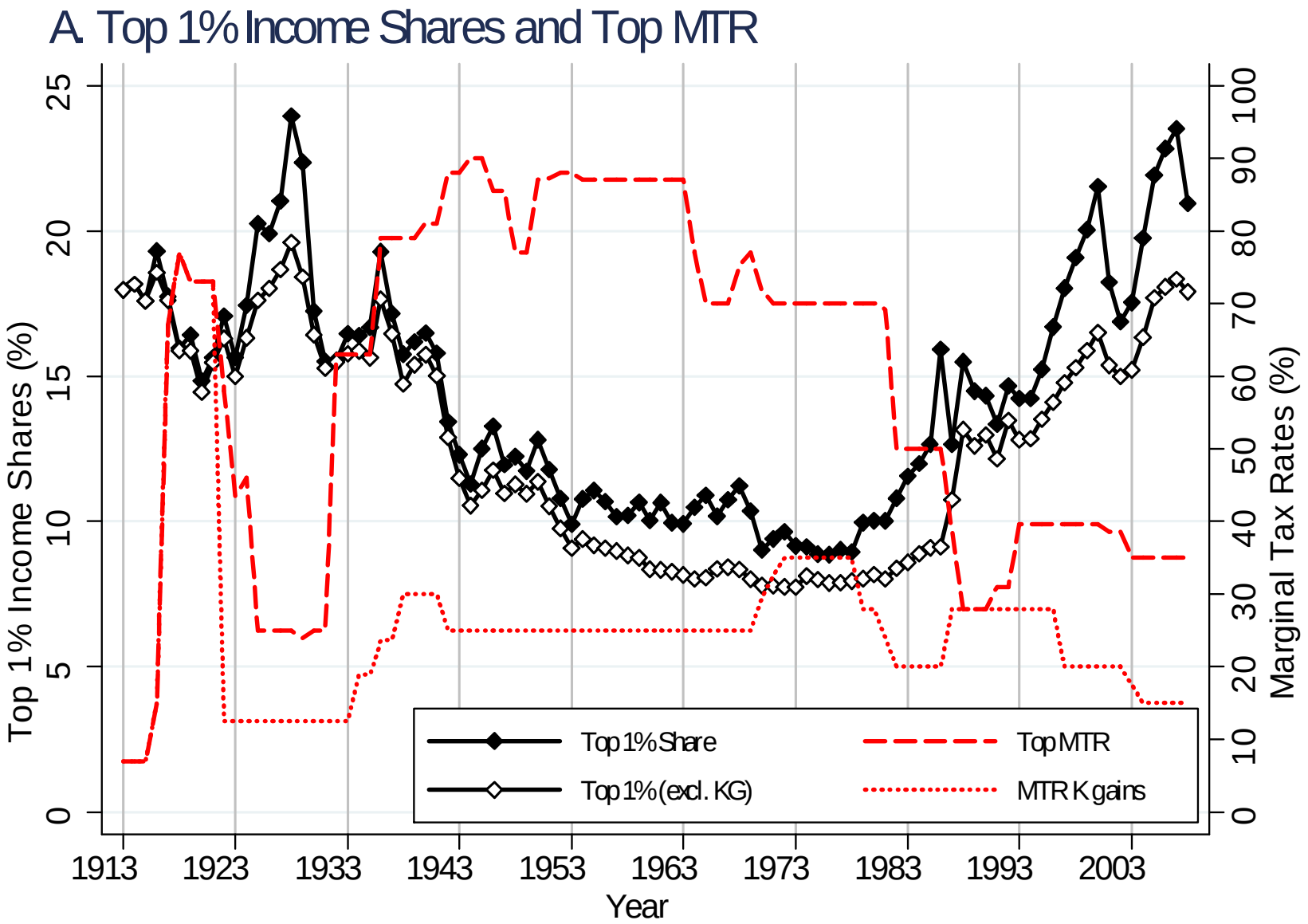
Empirical Evidence: US

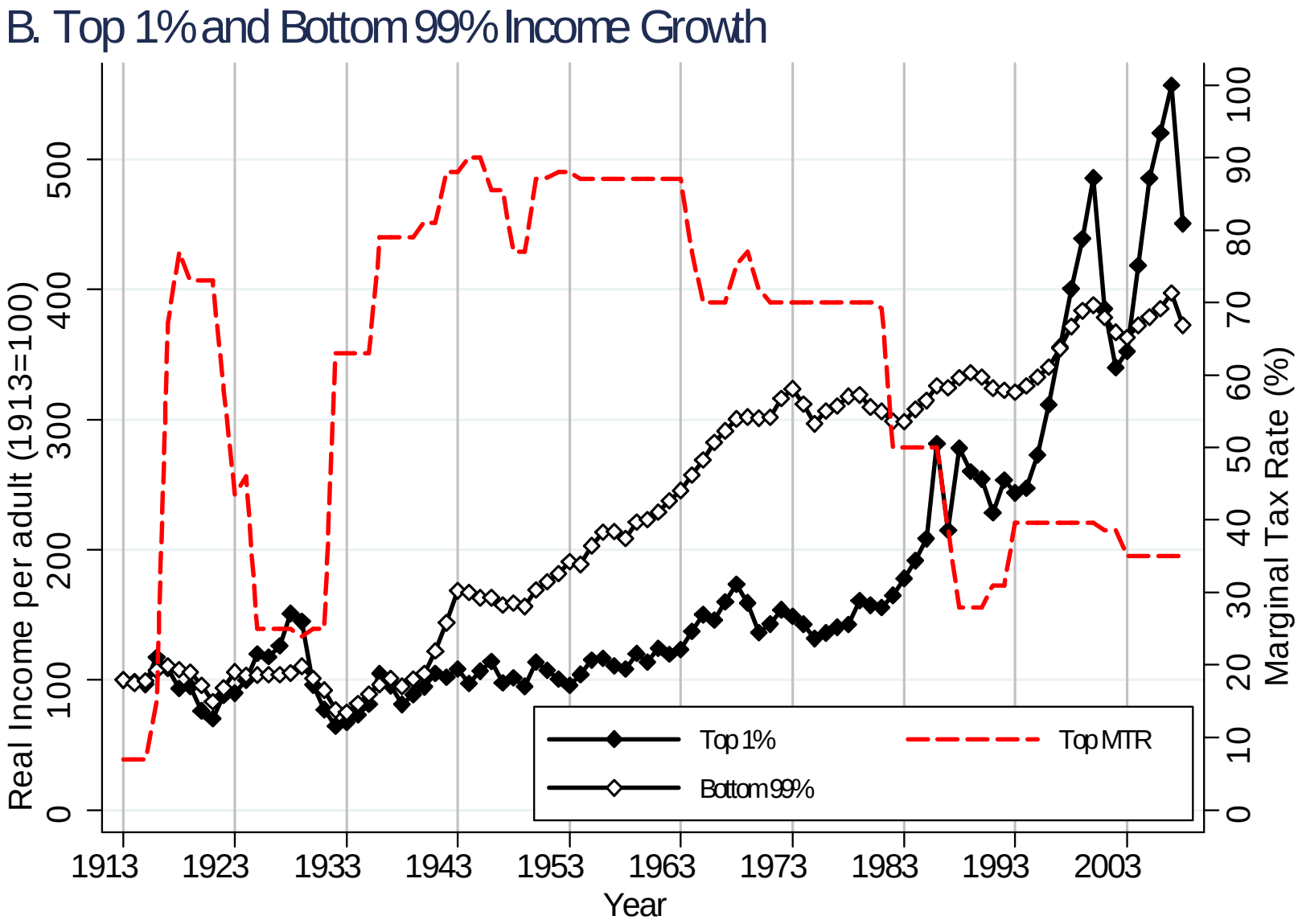


Empirical Evidence: US

Table 1: US Evidence on Top Tax Rates, Top Income Shares, and Income Growth

		Income excluding capital gains	Income including capital gains
		(1)	(2)
A. 1975-1979 vs. 2004-2008 Comparison			
Top Marginal Tax Rate (MTR)	1975-9	70%	70%
	2004-8	35%	35%
Top 1% Income Share	1975-9	8.0%	9.1%
	2004-8	17.7%	21.8%
Elasticity estimate:			
Δ log (top 1% share) / Δ log (1-Top MTR)		1.03	1.12
B. Elasticity estimation (1913-2008): log(share) = a + e*log(1-Top MTR) + c*time + ε			
No time trend		0.25	0.26
		(0.07)	(0.06)
Linear time trend		0.30	0.29
		(0.06)	(0.05)
Number of observations		96	96

Empirical Evidence: US



Empirical Evidence: US

Table 1: US Evidence on Top Tax Rates, Top Income Shares, and Income Growth

	Income excluding capital gains	Income including capital gains (to control for tax
	(1)	(2)
C. Effect of Top MTR on income growth (1913-2008): log(income) = a + b*log(1-Top MTR) + c*time + ε		
Top 1% real income	0.265	0.261
	(0.047)	(0.041)
Bottom 99% real income	-0.080	-0.076
	(0.040)	(0.039)
Average real income	-0.027	-0.027
	(0.018)	(0.034)
Number of observations	96	96

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Empirical Evidence: International

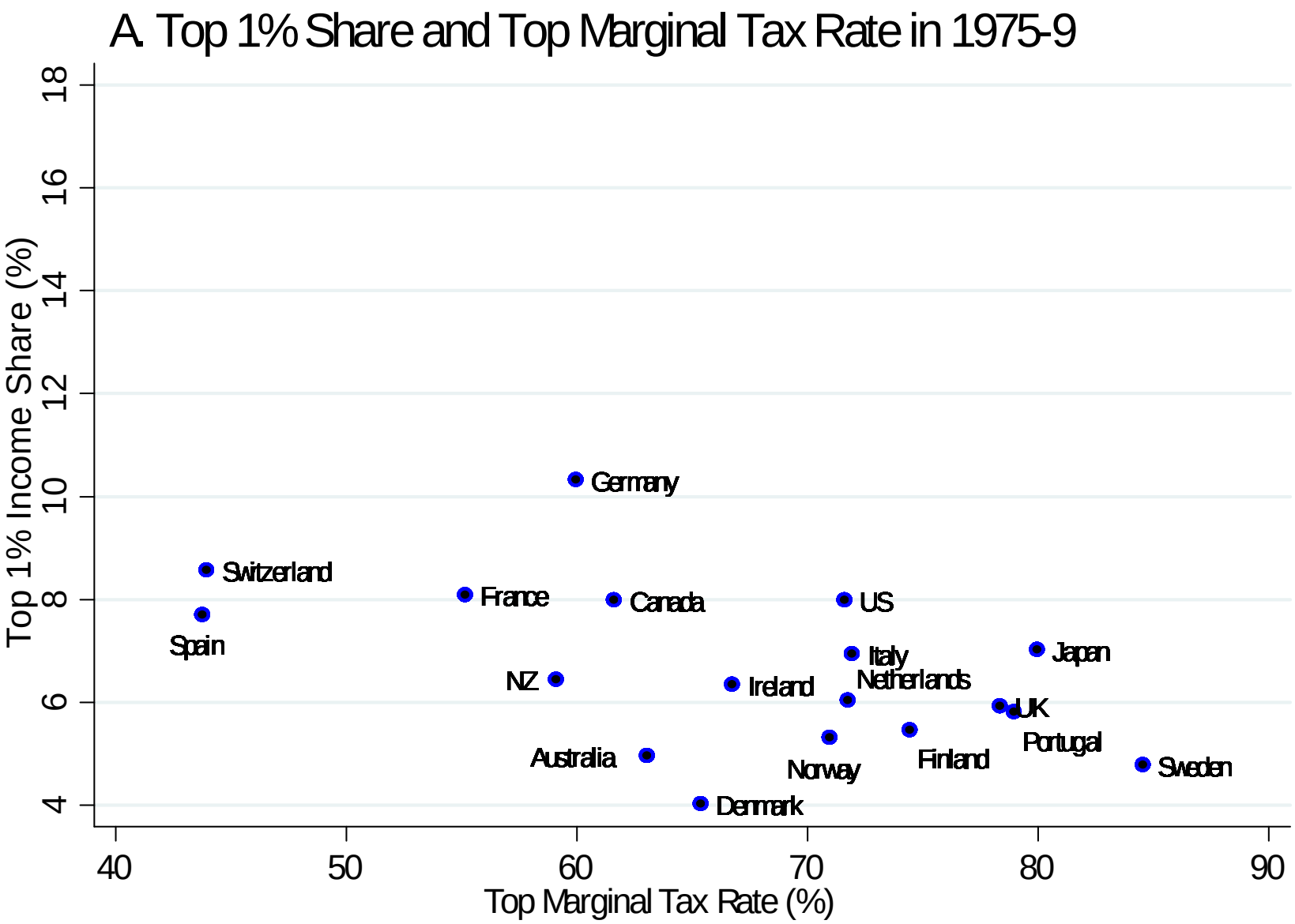
Data

- Data from **18 OECD countries 1975-2010**
- Construct marginal top tax rates (income tax (national+local), robustness check adds payroll + consumption taxes)
- Top Income Shares from **World Top Incomes Database**

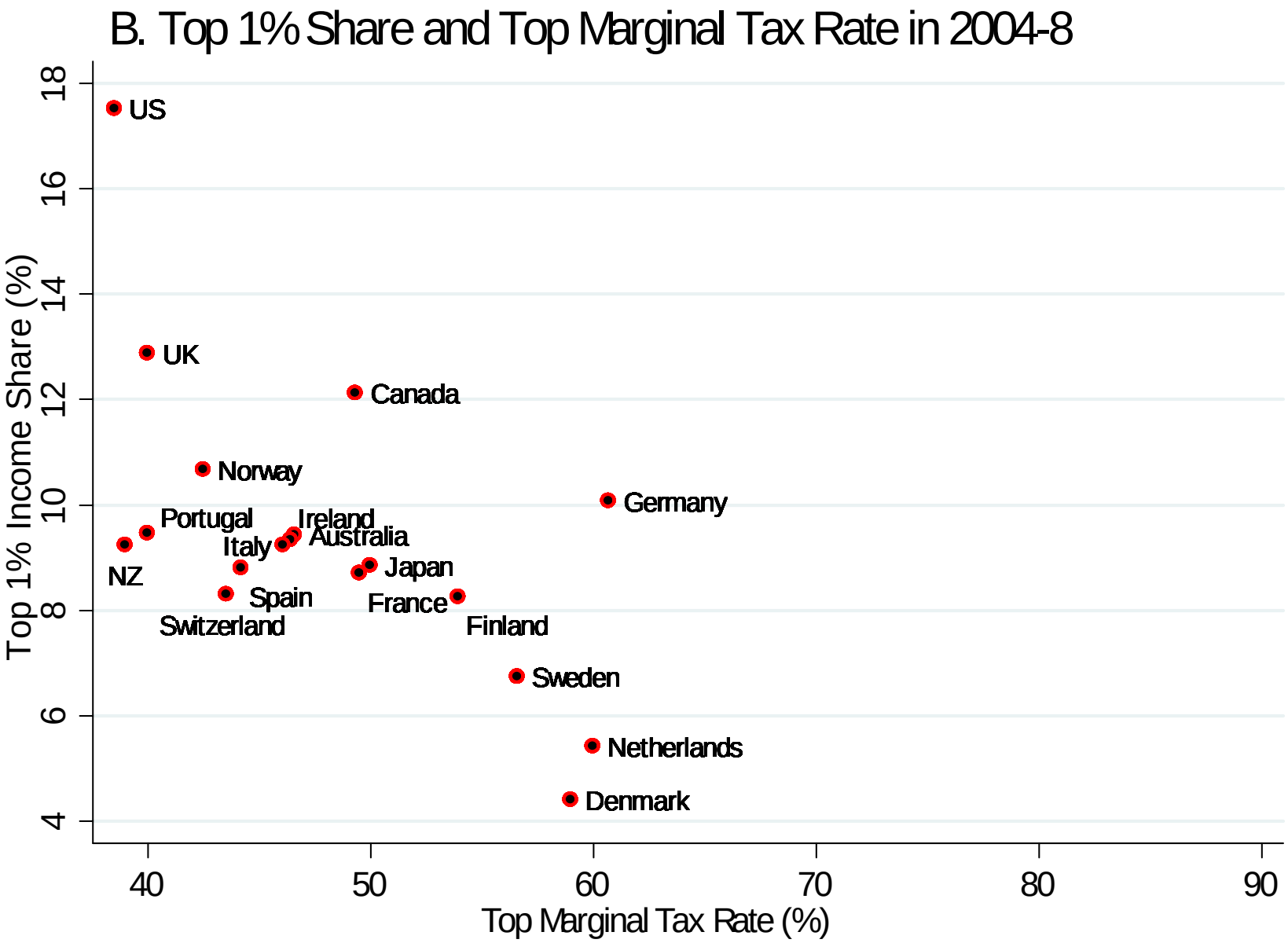
Questions

- Effect of top tax rates on top 1% share?
- Effect of top tax rates on growth?

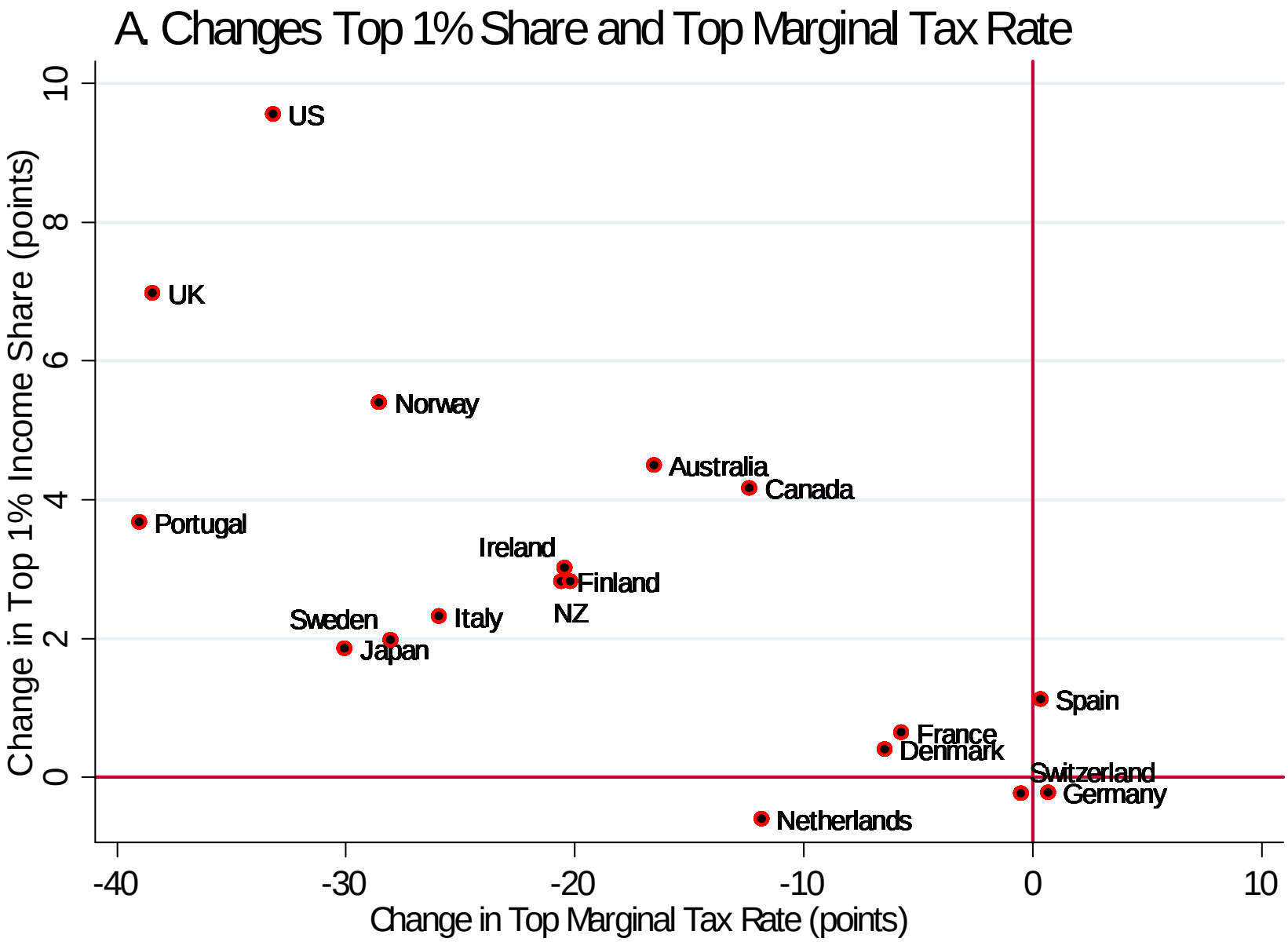
Top 1% share and top tax rates around 1975



Top 1% share and top tax rates around 2009



Top 1% share and top tax rates 1975-2009

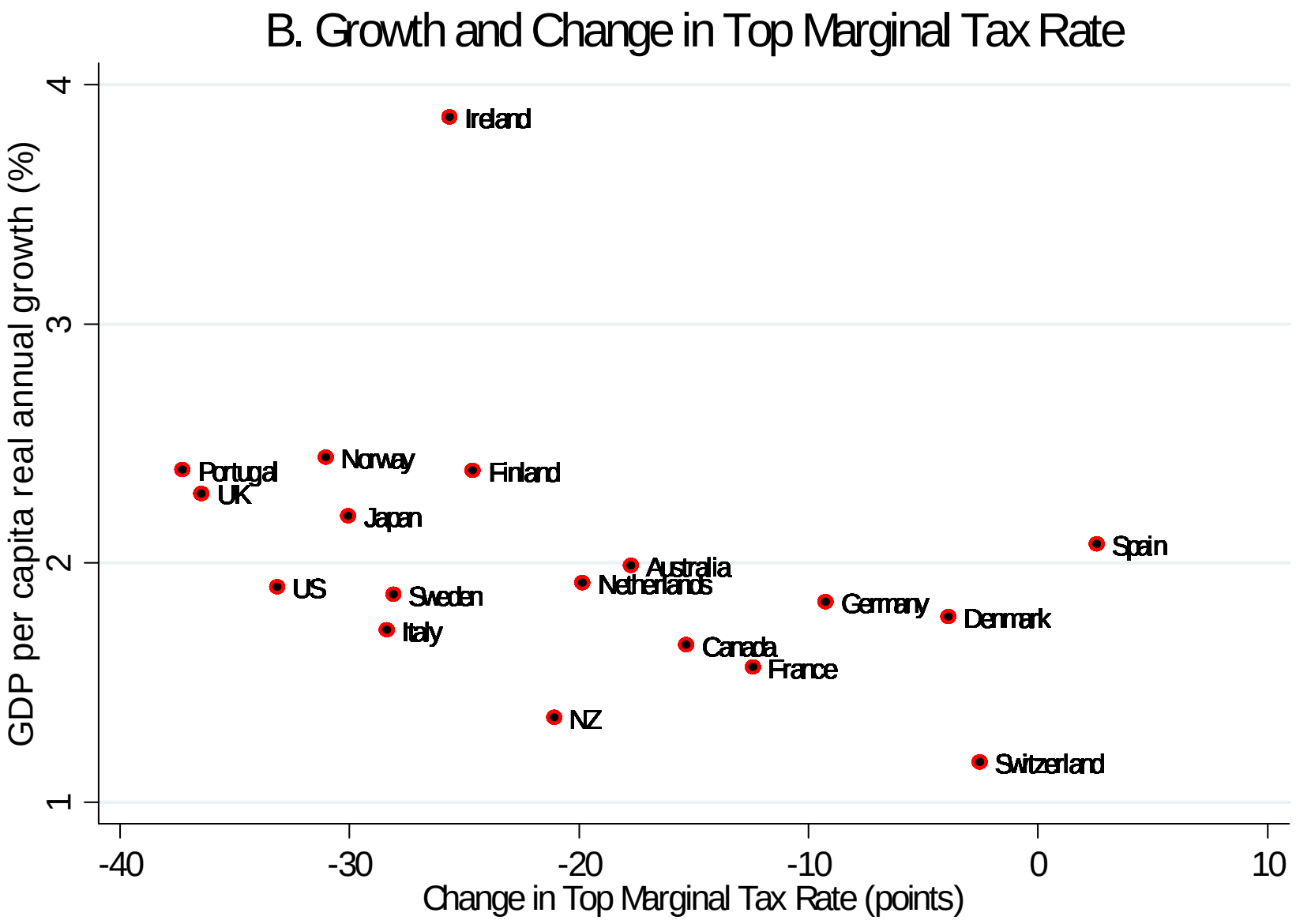


Top tax rates and Top 1% Income share

Table 2: International Evidence on Top Income Elasticities

A. Effect of the Top Marginal Income Tax Rate on Top 1% Income Share	
A1. Cross Country Cross-Sectional Comparisons:	
Regression: log(Top 1% share) = a + e*log(1-Top MTR) + ε	
Elasticity in 1975-9	0.332
	(0.147)
Elasticity in 2004-8	1.482
	(0.393)
Number of obs.	18
A2. Cross Country Changes from 1975-9 to 2004-8:	
Regression: Δ log(Top 1% share) = a + e*Δ log(1-Top MTR) + ε	
Elasticity	0.526
	(0.151)
Number of observations	18
A3. Full Time Series analysis (1975-2008):	
Regression: log(Top 1% share) = a + e*log(1-Top MTR) + ε	
No controls	0.603
	(0.034)
Time trend control	0.508
	(0.038)
Country fixed effects	0.505
	(0.028)
Number of observations	557

Top tax rates and average growth 1975-2009



Top tax rates and average growth 1975-2009

B. Effect of the Top Marginal Income Tax Rate on real GDP per capita

Regression: log(real GDP per capita) = a + b*log(1-Top MTR) + c*log(real GDP per capita in 1975) + e

No other controls	-0.0034
	(0.013)
Adding time*log(real GDP per capita in 1975) control	-0.0289
	(0.012)
Further adding country fixed effects	0.0146
	(0.012)
Number of observations	648

$\Rightarrow$ No or significantly negative

Using Growth effect = top 1% share $\times$ e_1 and effect $\leq$ 0.02 $\Rightarrow$ $e_1 \leq 0.2$

Given $e \approx 0.5$, $e_3 \geq 0.3$

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Microevidence on Bargaining: Luck Income

- Bargaining b = extracting "not deserved" pay/more than marginal product.
  - For example: being rewarded for luck (Bertand and Mullainathan (2001)).
- We ask two questions:
  1. Is there pay for luck/bargaining?
  2. If yes, does it decrease with top tax rates as predicted by bargaining model?

Microevidence on Bargaining: Model

- Let p be observed performance measure:

$$p = a + \delta p_{luck} + \varepsilon$$

  a: effort, p_{luck}: observable "luck" component, δ: sensitivity of performance measure to luck, ε: unobservable random noise
- With optimal (linear) contract (Holmstrom and Milgrom (1987)): Total pay $z = \alpha + \beta (p - \delta p_{luck}) = \alpha + \beta (a + \varepsilon) = y$ "real product" and $b = 0$ $(\eta = 1)$.
- With bargaining and non-optimal contract: $z = y + \beta_{luck} (\delta p_{luck}) = y + b$.

Microevidence on Bargaining: Empirical Strategy

- Effect of general performance on pay (OLS):

$$pay_{it} = \beta * p_{it} + \gamma_i + \chi_t + \alpha_X * X_{it} + \varepsilon_{it}$$

pay_{it}: CEO pay in firm i at time t, p_{it}: performance measure, γ_i: firm FE, χ_t: time FE, X_{it}: CEO controls (age, tenure).

- Effect of luck performance on pay (IV):
  1. **Stage**: Effect of luck on performance measure

$$p_{it} = b * p_{luck,it} + g_i + c_t + \alpha_X * X_{it} + e_{it} \tag{1}$$

     $p_{luck,it}$: luck measure (asset-weighted average industry performance). Part of performance due to (observable) luck $\hat{p}_{it}$ = prediction from (1).
  2. **Stage**: Estimate sensitivity of pay to predictable changes in p_{it}:

$$y_{it} = \beta_{luck} * \hat{p}_{it} + \gamma_i + \chi_t + \alpha_X * X_{it} + \varepsilon_{it}$$

If $\beta_{luck} \neq 0$: pay for luck.
If $\beta_{luck} \geq \beta$: no filtering at all of luck component.

Microevidence on Bargaining: Empirical Strategy

- Efffect of top tax rates on general pay for performance (OLS):

$$pay_{it} = \beta * p_{it} + \beta^{tax} * p_{it} * MTR_t + \gamma_i + \chi_t + \alpha_X * X_{it} + \varepsilon_{it}$$

  where MTR_t: top marginal income tax rate.
- Effect of tax rates on reward for luck, β^{tax}_{luck}: IV using $\hat{p}_{it}$ and $\hat{p}_{it} * MTR_t$ as instruments for p_{it} and $p_{it} * MTR_t$.
- Remarks:
  - Higher taxes may reduce pay for performance in general: consider β^{tax}_{luck} *relative* to β^{tax}.
  - Higher taxes may make performance measure more sensitive to luck: taken care of by 2SLS approach (instrumenting also interaction term $p_{it} * MTR_t$).

Microevidence on Bargaining: Luck and performance measures

- Performance measures:
  1. Net Income
  2. Return on Equity
  3. Shareholder Wealth (log)
- Measure of pay: Total Pay and Cash pay (total pay could be driven by options' value gains with industry performance)
- Measure of luck: Mean asset-weighted performance of other firms in industry.
- Data: Forbes 800 + Execucomp, COMPUSTAT-CRSP.
- Years: **1970-2011** - includes high tax period (pre-1987) and low tax period (post-1987).

Microevidence on Bargaining: Is there pay for luck?

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Cash Pay		**Log Total Pay**		**Log Cash Pay**		**Log Total Pay**		**Log Cash Pay**	
VARIABLES	**General**	**Luck**	**General**	**Luck**	**General**	**Luck**	**General**	**Luck**	**General**	**Luck**
Net Income	0.28***	0.32***								
	[0.01]	[0.071]								
ROE			3.48***	6.88***	2.33***	4.45***				
			[0.128]	[0.664]	[0.094]	[0.477]				
Log Shareholder Wealth							0.30***	0.31***	0.19***	0.17***
							[0.009]	[0.05]	[0.006]	[0.037]
Obs	8,552	8,382	8,535	8,370	8,535	8,370	8,479	8,303	8,479	8,303
R sq	0.24	0.771	0.399	0.746	0.358	0.806	0.432	0.779	0.381	0.823
Firms	913		909		909		913		913	

Standard Errors in parenthesis

Did pay for luck increase in low tax Period post 1987?

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Cash Pay		Log Total Pay		Log Cash Pay		Log Total Pay		Log Cash Pay	
VARIABLES	General	Luck	General	Luck	General	Luck	General	Luck	General	Luck
PANEL A: High Tax Period (1970 - 1986)										
Net Income	0.28***	0.32***								
	[0.01]	[0.071]								
ROE			3.48***	6.88***	2.33***	4.45***				
			[0.128]	[0.664]	[0.094]	[0.477]				
Log Shareholder Wealth							0.30***	0.31***	0.19***	0.17***
							[0.009]	[0.05]	[0.006]	[0.037]
PANEL B: Low Tax Period (1987 - 2010)										
Net Income	0.33***	1.27*								
	[0.03]	[0.75]								
ROE			3.74***	12.12***	1.54***	6.17***				
			[0.207]	[1.823]	[0.171]	[1.41]				
Log Shareholder Wealth							0.47***	0.44**	0.20***	-0.43**
							[0.019]	[0.222]	[0.016]	[0.217]

Standard Errors in brackets

Does bargaining respond to taxes?

	[1]	[2]	[3]	[4]	[5]	[6]
	Cash Pay		Log Total Pay		Log Total Pay	
VARIABLES	General	Luck	General	Luck	General	Luck
Top MTR	-272.24***	-280.30***	-2.45***	-2.26***	2.30***	5.69***
	[10.45]	[26.64]	[0.06]	[0.11]	[0.17]	[0.41]
Net Income	0.66***	0.84***				
	[0.03]	[0.17]				
Net Income*Top MTR	-0.65***	0.36				
	[0.07]	[0.37]				
ROE			5.08***	19.98***		
			[0.36]	[1.42]		
ROE*Top MTR			-4.06***	-14.02***		
			[0.72]	[1.77]		
Log Shareholder Wealth					0.80***	1.24***
					[0.02]	[0.04]
Log Shareholder Wealth*Top MTR					-0.64***	-1.14***
					[0.03]	[0.07]
Obs	13,771	13,767	13,751	13,751	13,676	13,659
R sq	0.17	0.45	0.31	0.48	0.47	0.70
Firms	1,035		1,031		1,028	

Microevidence on Bargaining: Results

- Incomplete filtering of luck component in CEO pay: $\beta_{luck} \neq 0$.
- Pay for luck is large and almost no filtering: $\beta_{luck} \geq \beta$.
- Top tax rates decrease pay for luck more than general pay for performance, consistent with bargaining model.

Microevidence on Bargaining: Discussion (I)

Could pay for luck be consistent with optimal contracting view?

- CEO human capital value increasing in industry performance? But pay responds more to increases than decreases in industry performance; CEO turnover countercyclical (BM).
- Is CEO incentivized to predict luck shocks? But why reward average performance (2SLS uses no between firm variation) and why reward less when MTR higher?
- Maybe not bargaining but impossibility to filter out luck?
  - Badly governed firms exhibit more pay for luck (BM and our results - not shown for sake of time).
  - Still means there is a lot of "non-deserved" pay!

Microevidence on Bargaining: Discussion (II)

Work in progress

- **Effect of governance** variables interacted with taxes (compensation regulations, shareholder power and board independence measures used from RiskMetrics).
- **International** CEO compensation data (BoardEx) to repeat pay for luck analysis.

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Conclusion

- Presented simple model capturing
  1. Standard supply side responses
  2. Tax avoidance responses
  3. Compensation bargaining responses
- Derived optimal tax formula as function of three elasticities: taxable income elasticity no longer a sufficient statistic.
- Empirical analysis suggests that
  - Top income share very sensitive to top tax rates $\Rightarrow$ overall elasticity e is large
  - Standard real supply side and avoidance channels both seem insufficient.
  - There seems to be pay for luck income and it decreases with top marginal income tax rates, as predicted by bargaining model.

Conclusion: Scenarios

Table 3: Synthesis of Various Scenarios

Total elasticity $e = e_1 + e_2 + e_3 =$	0.5

Scenario 1: Standard supply side tax effects		Scenario 2: Tax avoidance effects		Scenario 3: Compensation bargaining effects	
		(a) current narrow tax base	(b) after base broadening		
$e_1 =$	0.5	$e_1 = 0.2$	$e_1 = 0.2$	$e_1 =$	0.2
$e_2 =$	0.0	$e_2 = 0.3$	$e_2 = 0.1$	$e_2 =$	0.0
$e_3 =$	0.0	$e_3 = 0.0$	$e_3 = 0.0$	$e_3 =$	0.3

Optimal top tax rate $\tau^* = (1+ tae_2 + ae_3)/(1+ae)$	
Pareto coefficient a =	1.5
Alternative tax rate t =	20%

Scenario 1		Scenario 2		Scenario 3	
		(a) e_2=0.3	(b) e_2=0.1		
$\tau^* =$	57%	$\tau^* = 62$ %	$\tau^* = 71$ %	$\tau^* =$	83%

Real Supply Side Responses: Optimal tax rate derivation

Equivalent to maximizing top tax revenue:

$$T = \tau \left[z \left(1 - \tau \right) - \overline{z} \right]$$

FOC:

$$\begin{aligned} z - \overline{z} - \tau \frac{dz}{d\left(1-\tau\right)} &= 0 \\ \frac{z - \overline{z}}{z} \left(1 - \tau\right) - \tau \frac{dz}{d\left(1-\tau\right)} \frac{1-\tau}{z} &= 0 \\ \frac{\tau}{1-\tau} e_1 &= \frac{1}{a} \end{aligned}$$

Avoidance Responses: Optimal tax rate derivation

Equivalent to maximizing top tax revenue:

$$T = \tau\left[z - \overline{z}\right] + tx$$

FOC for a fixed t :

$$\begin{aligned} z - \overline{z} - \tau\frac{dz}{d\left(1-\tau\right)} + t\frac{dx}{d\left(\tau - t\right)} &= 0 \\ z - \overline{z} - \tau\frac{dz}{d\left(1-\tau\right)} + st\frac{\partial z}{\partial\left(1-\tau\right)} &= 0 \\ \frac{\tau - ts}{1-\tau}e &= \frac{1}{a} \end{aligned}$$

FOC with respect to t : using that $z = y - x$

$$x + \left[\tau - t\right]\frac{dx}{d\left(\tau - t\right)} = 0$$

Since $x \geq 0$ and $\tau \geq t$, this can only hold if $\tau = t$ and $x = x\left(0\right) = 0$.

Optimal Tax Derivation: Compensation Channel

Equivalent to maximizing revenue from the top bracket net of bargaining cost (incurred by all N agents in the economy).

$$T = \tau\left(y + b - \overline{z}\right) - NE\left(b\right)$$

If τ triggers a change in b, then that change is reflected one-to-one in $NE\left(b\right)$. Hence $\frac{db}{d(1-\tau)} = \frac{NdE(b)}{d(1-\tau)}$. Hence the FOC for τ is:

$$y + b - \overline{z} - \tau\frac{dy}{d\left(1-\tau\right)} - \tau\frac{db}{d\left(1-\tau\right)} + \tau\frac{db}{d\left(1-\tau\right)} = 0$$

$$\begin{aligned}
\tau\left(\frac{dy}{d\left(1-\tau\right)} + \frac{db}{d\left(1-\tau\right)}\right) - \tau\frac{db}{d\left(1-\tau\right)} &= z - \overline{z} \\
\left[\tau - s\right]\frac{dz}{d\left(1-\tau\right)} &= z - \overline{z} \\
\frac{\left[\tau - s\right]}{1-\tau}e &= \frac{z-\overline{z}}{z} = \frac{1}{a}
\end{aligned}$$

can also be rearranged using the fact that $e_3 = se$

Empirical Evidence: US

Total effect and avoidance channel

- Strong correlation between top income shares and top tax rates

$$\Rightarrow e \text{ is large}$$

- Almost same for income series including capital gains: shifting is not full story (in short run, a lot of shifting effects, Auerbach (1988), Gordon and Slemrod (2000))
- Other types of tax-exempt compensation ignored here, BUT seems they increased despite tax rates falling
  - Off-shore accounts have not decreased (Zucman (2011))
  - Perks: would have had to be huge in 70s to account for full effect Median CEO pay pre-1970s was \$0.75 (Frydman and Saks (2010)); lower than perks reported in the press today! (Yermack (2006))

$$\Rightarrow e_2 \text{ small in long-run} \Rightarrow e_1 + e_3 \text{ large}$$

Empirical Evidence: US

- Separate e_1 from e_3 by examining effect of $(1 - \textit{top tax rate})$ on growth of bottom 99%.
  - Strong positive effect on top 1% income growth
  - Negative effect on bottom 99% income growth, zero effect on overall average growth
- Suggests real elasticity $e_1 \approx 0$.
- Problem is validity of this simple OLS: growth could have slowed down for other reasons (and top 1% did not suffer because of tax cuts).

Empirical Evidence: International

Discussion of the results I

Macro estimates rely on strong identifying assumptions

- Countries could cut top tax rates when growth expected to slow down (Anglo-saxon countries in 70s?)
- Social norms and tolerance for inequality can drive both top incomes and taxes
- Yet, European countries cut back work hours, which should have reduced their growth more

Empirical Evidence: International

Discussion of the results II

Micro evidence from corporate econ literature confirms hypothesis of non competitively set pay at top:

- Hidden parts of compensation packages and effect of disclosure rules (Bebchuk and Fried (2004), Kuhnen and Zwiebel (2009))
- Reward for positive outcomes outside of CEOs control; no punishment for bad outcomes (Bertrand and Mullainathan (2001))
- Pay decreases when board control increases (Chhaochharia and Grinstein (2009))
- Malpractice widespread, options backdating, spring loading (Yermack (1997), Lie (2005))