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

Thomas Piketty (PSE)  Emmanuel Saez (Berkeley and NBER)  
Stefanie Stantcheva (MIT)

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

1. **Standard supply side** channel (Lindsey (1987), Feldstein (1995))
How do taxes affect the top 1% share and top incomes? Three narratives

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

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

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

1. **Standard supply side** channel (Lindsey (1987), Feldstein (1995))
2. **Avoidance and income shifting** (Slemrod (1996), Slemrod and Kopczuk (2002), Reynolds (2007))
3. **Compensation bargaining** and rent-extraction
Introduction: Goal of the Paper

This paper:

- Simple model capturing all three responses
- Derives optimal tax formula as a function of the three elasticities
- Takes a first pass at an empirical analysis
  - using long-term evidence for the US
  - using international evidence for 18 OECD countries since 1975
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

Illustrative Empirical results:

- Large total elasticity of $e = e_1 + e_2 + e_3 = 0.5$ (strong correlation between top tax rates and income)
- US 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

$\Rightarrow e_3 \approx 0.3 \Rightarrow t = 83\%$ (compared to 57\% in pure real supply side scenario).
Outline of the talk

1. Standard model with real supply-side response
2. Tax avoidance and income shifting responses
   - Pure Avoidance Model
   - Income Shifting Model
3. Bargaining and rent-seeking responses
4. Empirical evidence
   - US evidence
   - International evidence
   - Summary of scenarios
5. Conclusion
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Standard Model with Real Supply Side Responses

Mirrlees Model for top income tax: Individual response

- $z$: taxable income
- Consider a constant tax rate $\tau$ for $z \geq \bar{z}$.
- 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: $e_1 = \frac{dz}{d(1-\tau)} \frac{(1-\tau)}{z}$.
Social welfare across agents of type $i$:

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

subject to:

$$\int T(z_i) \, dv(i) \geq T_0 \quad [p]$$

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 $a = z/(z - \bar{z}) > 1$. 
Standard Model with Real Supply Side Responses
Calibrating the formula (Diamond and Saez (2011))

- $a = 1.5$ for the US, $a \approx 2$ for Continental Europe
- $e_1$ hard to determine (Giertz, Saez and Slemrod (2011))
  - $e_1 = 0.25 \Rightarrow \tau^* = 73\%$

- Effective rate in US 42.5%, Europe reaches 60%.
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  2. $e_1 = 0.50 \Rightarrow \tau^* = 57\%$

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  1. $e_1 = 0.25 \Rightarrow \tau^* = 73\%$
  2. $e_1 = 0.50 \Rightarrow \tau^* = 57\%$
  3. $e_1 = 1 \Rightarrow \tau^* = 40\%$
- Effective rate in US 42.5%, Europe reaches 60%.
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Tax Avoidance and Income Shifting Responses

**Definition:** changes in reported income due to changes in form of compensation but not in its total level (keeping econ output constant)

**Examples:** (Slemrod and Kopczuk (2002), Slemrod (1996))

- Shift to fringe benefits or deferred compensation (stock-options, future pensions)
- Increased consumption within firm (better offices, vacations as business travel, private use of corporate jets)
- Shifting profits from individual income tax base to corporate tax base (change in business organization)
- Re-characterization of ordinary income into tax favored capital gains
- Offshore accounts.

Unlike fundamental preferences, government can (potentially) affect evasion opportunities
Real income: \( y \)

Sheltered income: \( x \) (taxed at \( t \))

Taxable income \( z = y - x \) (taxed at \( \tau > t \))

Cost of sheltering income \( d_i(x) \), increasing and convex (sheltered income less valuable and pure waste)

Utility

\[
    u_i(c, y, x) = c - h_i(y) - d_i(x)
\]

with \( c = (1 - \tau) y + (\tau - t) x + R \) (\( R \) is virtual income \( \tau \bar{z} - T(\bar{z}) \)).

Solutions: \( h'_i(y) = 1 - \tau \Rightarrow y_i = y_i(1 - \tau) \) and \( d'_i(x) = \tau - t \Rightarrow x_i = x_i(\tau - t) \).
Tax Avoidance and Income Shifting Responses

Pure tax avoidance model: Elasticities

- Standard supply side elasticity $e_1$: 
  \[ e_1 = \frac{dy}{d(1-\tau)} \frac{1-\tau}{y} \]

- Avoidance "elasticiy", $e_2$: define $s$ as the fraction of behavioral response due to evasion: 
  \[ s = \frac{dx/d(\tau-t)}{dz/d(1-\tau)} \]

  \[ e_2 = \frac{dx}{d(\tau-t)} \frac{1-\tau}{z} \]

- Total elasticity, $e$, at $t$ constant:
  \[ e = \frac{\partial z}{\partial (1-\tau)} \frac{1-\tau}{z} \]

Note that $e = \frac{y}{z} e_1 + e_2 = \frac{e_2}{s}$.
Tax Avoidance and Income Shifting Responses

Pure tax avoidance model: optimal tax

Theorem

(Partial optimum) For a given $t$, the optimal tax rate is

$$\tau^* = \frac{1 + tae_2}{1 + ae}$$

Theorem

(Full Optimum): If sheltering occurs only within top bracket,

$$t^* = \tau^* = \frac{1}{1 + ae}$$

($t$ becomes irrelevant).
If $t = 0$, standard model (irrelevant whether response of taxable income comes from real supply side or avoidance (Feldstein (1999)).

If $t > 0$, fiscal externality. Government can improve efficiency with $\tau = t$

$\Rightarrow$ only limiting factor is then real elasticity $e_1$.

Not all avoidance opportunities costless to remove

- Some are creations of tax system itself; should be removed: exemption of fringe benefits, tax-exempt local bonds
- Real and costly hurdles: informal economy (developing countries), off-shore evasion, lobbying and political constraints

$\Rightarrow$ but modern economies should be able to minimize avoidance
Not all shifting purely wasteful → Ramsey taxation considerations

Two sources of income, labor, $y_L$ (taxed at $\tau_L$ above $\bar{z}$) and capital $y_K$ (taxed at $\tau_K$). 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 $c = R + (1 - \tau_L)z_L + (1 - \tau_L)z_K + (\tau_L - \tau_K)x$
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 they react along the avoidance margin.
- Define \( a_L = \frac{z_L}{z_L - z} \) and \( a = \frac{z_L + z_K}{z_L + z_K - z} \).
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, $\tau_K = \tau_L = \frac{1}{1+ae_L}$ where

$$\bar{e} = \frac{y_L}{y_L+y_K} e_L + \frac{y_K}{y_L+y_K} e_K$$

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 $\tau_L$ and $\tau_K$ closer together, even if $e_L$ and $e_K$ very different.
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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)

Compensation Bargaining Response

Model Setup

- Individual $i$ receives fraction $\eta$ 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
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 $e = \frac{\nu}{z} e_1 + e_3$. 

[Thomas Piketty (PSE), Emmanuel Saez (Berkeley and NBER), Stefanie Stantcheva (MIT)]

Three Elasticities
Compensation Bargaining Response

Optimal tax

- $s$ can be negative, leading to $e_3$ negative. Happens if $\eta$ 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

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

$\tau^*$ decreases with the real elasticity $e_1$ and total elasticity $e$, increases with overpayment $z/y$ and with the bargaining弹性 $e_3$.

*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!

- **Trickle up:** If top earners overpaid, lowering tax $\tau$ 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 $\tau$ transfers resources to lower earners
  - e.g.: if Japan has implicit caps on pay (social norms) optimal $\tau$ could be lower
Compensation Bargaining
Open questions and discussion

- **Regulation versus taxation?** Should the government rather directly regulate pay?
- **Differentiated taxation** across sectors with different degrees of rent extraction? Hard to measure and to avoid shifting.
- **Non uniform external effects:** Who bears cost from bargaining? If other high earners, social cost (and taxes) are lower (Rothschild and Scheuer (2011)).
Putting the three elasticities together

Total response = Real economic + Avoidance + Bargaining =

\[ e = \left( \frac{y}{z} \right) e_1 + e_2 + e_3 \]

If start with no rents \((y = z)\) \(e = e_1 + e_2 + e_3\)

For a given \(t\) (tax on sheltered income) optimal tax rate is

\[ \tau^* = \frac{1 + tae_2 + ae_3}{1 + a(e_1 + e_2 + e_3)} \]

If \(t\) can be optimized as well, avoidance elasticity irrelevant:

\[ \tau^* = t = \frac{1 + ae_3}{1 + a(e_1 + e_3)} \]

If weight \(g < 1\) on top earners, then

\[ \tau^* = \frac{1 - g + tae_2 + ae_3}{1 - g + a(e_1 + e_2 + e_3)} \]
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A. Top 1% Income Shares and Top MTR

Marginal Tax Rates (%)

Top 1% Income Shares (%)

Year

Top 1% Share
Top 1% (excl. KG)
Top MTR
MTR K gains

Empirical Evidence: US

Thomas Piketty (PSE), Emmanuel Saez (Berkeley and NBER), Stefanie Stantcheva (MIT) ()

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

<table>
<thead>
<tr>
<th></th>
<th>Income excluding capital gains</th>
<th>Income including capital gains</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td><strong>A. 1975-1979 vs. 2004-2008 Comparison</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Marginal Tax Rate (MTR)</td>
<td>1975-9 70%</td>
<td>2004-8 35%</td>
</tr>
<tr>
<td></td>
<td>1975-9 8.0%</td>
<td>2004-8 9.1%</td>
</tr>
<tr>
<td></td>
<td>2004-8 17.7%</td>
<td></td>
</tr>
<tr>
<td>Elasticity estimate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta \log (\text{top 1% share}) / \Delta \log (1-\text{Top MTR})$</td>
<td>1.03</td>
<td>1.12</td>
</tr>
<tr>
<td><strong>B. Elasticity estimation (1913-2008):</strong></td>
<td>$\log(\text{share}) = a + e \log(1-\text{Top MTR}) + c \text{time} + \varepsilon$</td>
<td></td>
</tr>
<tr>
<td>No time trend</td>
<td>0.25</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Linear time trend</td>
<td>0.30</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>96</td>
<td>96</td>
</tr>
</tbody>
</table>
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))

  \[ \Rightarrow e_2 \text{ small in long-run } \Rightarrow e_1 + e_3 \text{ large} \]
B. Top 1% and Bottom 99% Income Growth
Table 1: US Evidence on Top Tax Rates, Top Income Shares, and Income Growth

<table>
<thead>
<tr>
<th></th>
<th>Income excluding capital gains</th>
<th>Income including capital gains (to control for tax)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>C. Effect of Top MTR on income growth (1913-2008): log(income) = a + b<em>log(1-Top MTR) + c</em>time + ε</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top 1% real income</td>
<td>0.265</td>
<td>0.261</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Bottom 99% real income</td>
<td>-0.080</td>
<td>-0.076</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>Average real income</td>
<td>-0.027</td>
<td>-0.027</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>96</td>
<td>96</td>
</tr>
</tbody>
</table>
Separate $e_1$ from $e_3$ by examining effect of $(1 - \text{top tax rate})$ 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

Data

- Data from 18 OECD countries 1975-2009
- 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?
A. Top 1% Share and Top Marginal Tax Rate in 1975-9

Weak negative correlation $e = 0.33$.
B. Top 1% Share and Top Marginal Tax Rate in 2004-8

Strong negative correlation, elasticity.
Top 1% share and top tax rates 1975-2009

A. Changes Top 1% Share and Top Marginal Tax Rate

Change in Top 1% Income Share (points)

Change in Top Marginal Tax Rate (points)

-40 -30 -20 -10 0 10

Countries: US, UK, Norway, Australia, Canada, Portugal, Ireland, Italy, NZ, Sweden, France, Denmark, Spain, Germany, Netherlands, Switzerland.
### Table 2: International Evidence on Top Tax Rates, Top Income Shares, and Income Growth

#### A. Effect of the Top Marginal Income Tax Rate on Top 1% Income Share

<table>
<thead>
<tr>
<th>Regression: $\log(\text{Top 1% share}) = a + e \log(1-\text{Top MTR}) + \varepsilon$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elasticity in 1975-9</td>
</tr>
<tr>
<td>(0.148)</td>
</tr>
<tr>
<td>Elasticity in 2004-8</td>
</tr>
<tr>
<td>(0.381)</td>
</tr>
<tr>
<td>Number of obs.</td>
</tr>
</tbody>
</table>

#### A2. Cross Country Changes from 1975-9 to 2004-8:

<table>
<thead>
<tr>
<th>Regression: $\Delta \log(\text{Top 1% share}) = a + e \Delta \log(1-\text{Top MTR}) + \varepsilon$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elasticity</td>
</tr>
<tr>
<td>(0.144)</td>
</tr>
<tr>
<td>Number of observations</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Regression: $\log(\text{Top 1% share}) = a + e \log(1-\text{Top MTR}) + \varepsilon$</th>
</tr>
</thead>
<tbody>
<tr>
<td>No controls</td>
</tr>
<tr>
<td>(0.034)</td>
</tr>
<tr>
<td>Time trend control</td>
</tr>
<tr>
<td>(0.039)</td>
</tr>
<tr>
<td>Country fixed effects</td>
</tr>
<tr>
<td>(0.029)</td>
</tr>
<tr>
<td>Number of observations</td>
</tr>
</tbody>
</table>
Top tax rates and average growth 1975-2009

B. Growth and Change in Top Marginal Tax Rate

GDP per capita real annual growth (%) vs. Change in Top Marginal Tax Rate (points)

Countries included:
- Portugal
- Norway
- Japan
- Finland
- US
- Italy
- Australia
- Netherlands
- Denmark
- Canada
- France
- NZ
- Switzerland
- UK
- Ireland
- Germany
- Spain
- Australia
- Canada
- Netherlands
- Denmark
- France
- Switzerland

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

Regression: \( \log(\text{real GDP per capita}) = a + b\log(1-\text{Top MTR}) + c\text{time} + \varepsilon \)

<table>
<thead>
<tr>
<th>No country fixed effects</th>
<th>0.027</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.036)</td>
</tr>
<tr>
<td>Country fixed effects</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>518</td>
</tr>
</tbody>
</table>

\( \Rightarrow \) Weak and positive

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

Given \( e \approx 0.5 \), \( e_3 \geq 0.3 \)
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
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))
Empirical Evidence: 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
- \( e_1 = 0.5 \)
- \( e_2 = 0.0 \)
- \( e_3 = 0.0 \)

Scenario 2: Tax avoidance effects
(a) current narrow tax base
- \( e_1 = 0.2 \)
- \( e_2 = 0.3 \)
- \( e_3 = 0.0 \)
(b) after base broadening
- \( e_1 = 0.2 \)
- \( e_2 = 0.1 \)
- \( e_3 = 0.0 \)

Scenario 3: Compensation bargaining effects
- \( e_1 = 0.2 \)
- \( e_2 = 0.0 \)
- \( e_3 = 0.3 \)

Optimal top tax rate \( \tau^* = \frac{(1+tae_2 + ae_3)/(1+ae)}{1.5} \)

Pareto coefficient \( a = 1.5 \)
Alternative tax rate \( t = 20\% \)

Scenario 1
- \( \tau^* = 57\% \)

Scenario 2
(a) \( e_2 = 0.3 \)
(b) \( e_2 = 0.1 \)
- \( \tau^* = 62\% \)
- \( \tau^* = 71\% \)

Scenario 3
- \( \tau^* = 83\% \)
Empirical Evidence: Scenarios

Table 3: Synthesis of Various Scenarios

<table>
<thead>
<tr>
<th>Scenario 1: Standard supply side tax effects</th>
<th>Scenario 2: Tax</th>
<th>Scenario 3: Compensating bargaining effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_1 = 0.5$</td>
<td>$e_1 = 0.2$</td>
<td></td>
</tr>
<tr>
<td>$e_2 = 0.0$</td>
<td>$e_2 = 0.0$</td>
<td></td>
</tr>
<tr>
<td>$e_3 = 0.0$</td>
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<td>$e_3 = 0.3$</td>
</tr>
</tbody>
</table>

International evidence not in favor

No big changes in hours worked at the top (Moffitt and Wilhelm (2000))

Optimal top tax rate $\tau^* = (1 + tae_2 + ae_3)/(1 + ae)$

Pareto coefficient $a = 1.5$

Alternative tax rate $t = 20$

Scenario 1

$\tau^* = 57\%$

Scenario 2

(a) $e_2 = 0.3$    (b) $e_2 = 0.1$

$\tau^* = 62\%$    $\tau^* = 71\%$

Scenario 3

$\tau^* = 83\%$
Table 3: Synthesis of Various Scenarios

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

Scenario 1: Standard supply side tax effects

$e_1 = 0.5$

Scenario 2: Tax avoidance effects

(a) current narrow tax base

$e_1 = 0.2$

(b) after base broadening

$e_1 = 0.2$

Scenario 3: Compensation bargaining effects

$c = 1.5$

$t = 20$

International evidence neither (measured growth should have increased if hidden income reported after tax decreases)

US evidence not supportive

Scenario 1

$\tau^* = 57\%$

Scenario 2

(a) $e_2 = 0.3$

(b) $e_2 = 0.1$

Scenario 3

$\tau^* = 83\%$
### Table 3: Synthesis of Various Scenarios

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<td>Suggests institutional setup of country matters</td>
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#### Scenario 1
- $\tau^* = 57\%$

#### Scenario 2
- $\tau^* = 62\%$
- $\tau^* = 71\%$

#### Scenario 3
- $\tau^* = 83\%$

**Hard to estimate empirically**

**Suggests institutional setup of country matters**
- In Europe and Japan may be hard to bargain for higher pays at the top
- In English speaking countries, Reagan and Thatcher revolutions changed mindsets
Outline of the talk

1. Standard model with real supply-side response
2. Tax avoidance and income shifting responses
   - Pure Avoidance Model
   - Income Shifting Model
3. Bargaining and rent-seeking responses
4. Empirical evidence
   - US evidence
   - International evidence
   - Summary of scenarios
5. Conclusion
Conclusion

- Derived optimal tax formula as function of three elasticities: taxable income elasticity no longer a sufficient statistic.
- Empirical analysis suggested 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.
  - Hard to convincingly establish bargaining channel, but empirical evidence not inconsistent with it

Future work (some in progress!) needed to quantify compensation channel
Real Supply Side Responses: Optimal tax rate derivation

Equivalent to maximizing top tax revenue:

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

FOC:

\[ \frac{z - \bar{z} - \tau}{z} \frac{dz}{d(1 - \tau)} = 0 \]

\[ \frac{z - \bar{z}}{z} (1 - \tau) - \tau \frac{dz}{dz} \frac{1 - \tau}{z} = 0 \]

\[ \frac{\tau}{1 - \tau} e_1 = \frac{1}{\alpha} \]
Avoidance Responses: Optimal tax rate derivation

Equivalent to maximizing top tax revenue:

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

FOC for a fixed \( t \):

\[
\begin{align*}
  z - \bar{z} - \tau \frac{dz}{d(1 - \tau)} + t \frac{dx}{d(\tau - t)} &= 0 \\
  z - \bar{z} - \tau \frac{dz}{d(1 - \tau)} + st \frac{\partial z}{\partial (1 - \tau)} &= 0 \\
  \tau - ts \frac{1}{1 - \tau} e &= \frac{1}{a}
\end{align*}
\]

FOC with respect to \( t \): using that \( z = y - x \)

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

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

\[ T = \tau (y + b - \bar{z}) - NE(b) \]

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

\[
\begin{align*}
y + b - \bar{z} - \tau \frac{dy}{d(1-\tau)} - \tau \frac{db}{d(1-\tau)} + \tau \frac{db}{d(1-\tau)} &= 0 \\
\tau \left( \frac{dy}{d(1-\tau)} + \frac{db}{d(1-\tau)} \right) - \tau \frac{db}{d(1-\tau)} &= z - \bar{z} \\
\left[ \tau - s \right] \frac{dz}{d(1-\tau)} &= z - \bar{z} \\
\left[ \tau - s \right] \frac{e}{1-\tau} &= \frac{z - \bar{z}}{z} = \frac{1}{a}
\end{align*}
\]

can also be rearranged using the fact that \( e_3 = se \).