Variation in Tax Policy & Structure of Income Tax Changes

Graphs by Year

Average Change in Tax Liability as Share of AGI

1982

1991

1993

2003

AGI Percentile

Owen Zidar (Chicago Booth)

Tax Cuts for Whom?

December 1, 2014

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Research Questions

How does the composition of income tax changes affect subsequent output and employment?

- Do tax cuts for high income taxpayers generate more employment and output growth than equivalently sized tax cuts for low and moderate income taxpayers?
- What is equity-efficiency tradeoff of tax changes for different groups?

Why?

1. Traditional PF: Labor supply effects via marginal tax rates
2. Macro: Effects on Aggregate Demand
This paper

Quantifies the importance of the distribution of tax changes for their overall impact on economic activity

- **New data** using tax returns from NBER TAXSIM
- **New variation** from federal tax shocks $\times$ variation in income distribution across states
The positive relationship between tax cuts and employment growth is largely driven by tax cuts for lower-income groups.

The effect of tax cuts for the top 10% on employment growth is small:

- Holds at both the state and federal level
- Not confounded by changes in progressive spending, state trends, prior economic conditions
1. **Conceptual Framework:** Aggregate demand effects due to redistribution from savers to constrained/less patient borrowers

2. **Empirical Approach:**
   - Regional: variation in income distribution across states
   - Supplemental National Evidence (Romer & Romer AER 2010 disaggregated by income group)

3. **Data:** Historical returns & counterfactuals from NBER TAXSIM

4. **Results**
   - Raw Bivariate Relationship in National Data
   - State-Level: Two-Year Effects
   - State-Level: Dynamic Effects
   - State-Level: Effects across the income distribution
   - National Evidence on Mechanisms
Relevant Literature

- **Little direct evidence likely due to empirical issues:** endogeneity, simultaneity, and observability

- **Macro:**
  - **Empirical:** Romer & Romer (AER 2010). Mertens & Ravn (AER 2013)

- **Consumption responses to Taxes and Transfers**
  - **Minimum Wage** Aaronson, Agarwal, and French (AER 2012)
I. Conceptual Framework

Overview

- Agents with different MPCs because some constrained or myopic
- Consider lump sum redistribution $-\Delta T_b = \Delta T_s$
- Increases aggregate consumption because $c_{b,t} \uparrow$ and $c_{s,t} \downarrow$
- In standard new Keynesian framework, higher consumption $\Rightarrow$ increased output, $L^D$, and employment
II. Econometric Model

Effects of Tax Changes for Different Groups

- Two-Year Effects
  - Identification
  - Threats to Validity
- Effects Across the Income Distribution
- Dynamic Effects
- National Effects
II. Two-Year Effects of Tax Changes for Different Groups

Specification:

\[
\frac{Y_{s,t} - Y_{s,t-2}}{Y_{s,t-2}} = \alpha_s + \delta_t + \beta^{B90} \left( \frac{Tax_{s,t}^{B90} - Tax_{s,t-2}^{B90}}{Y_{s,t-2}} \right) + \beta^{T10} \left( \frac{Tax_{s,t}^{T10} - Tax_{s,t-2}^{T10}}{Y_{s,t-2}} \right) + \varepsilon_{s,t}
\]

Identifying Assumption:

\[\mathbb{E}(\varepsilon_{s,t} | \alpha_s, \delta_t, \Delta T_{s,t}^{B90}, \Delta T_{s,t}^{T10}) = 0 \text{ where } \Delta T_{s,t}^{g} \equiv \left( \frac{Tax_{s,t}^{g} - Tax_{s,t-2}^{g}}{Y_{s,t-2}} \right)\]
II. Threats to Validity

Identifying Assumption:

\[ E(\varepsilon_s, t | \alpha_s, \delta_t, \Delta T_s^{B90}, \Delta T_s^{T10}) = 0 \]

where \[ \Delta T_s^g \equiv \left( \frac{Tax_{s,t}^g - Tax_{s,t-2}^g}{Y_{s,t-2}} \right) \]

Three Key Threats:

1. Endogenous tax changes
2. Progressive Government Spending
3. Prior Economic Conditions and Differential Trends
Ways to Address the Three Key Threats:

1. Endogenous tax changes
   - w.r.t $t$: Romer and Romer (2010) classification of exogenous changes
   - w.r.t $g$: Favero and Giavazzi (2010) Orthogonality Test

2. Progressive Government Spending
   - Control function approach
   - Split Sample

3. Prior Economic Conditions and Differential Trends
   - Event Study to examine pre-periods
   - Event Studies with many specifications to control for trends
   - Placebo of 5 years before event
II. Dynamic Effects of Tax Changes for Different Groups

Specification:

\[ y_{s,t+h} = a_s + d_t + \sum_{g} b^{g,h}_T T^{g}_{s,t} + X'_{s,t} \tilde{\Lambda} + e_{s,t+h} \]

- \( h \in \{-3, -2, \ldots, 3, 4\} \) is the horizon
- \( y_{s,t+h} \) is log employment in year \( t+h \)
- \( b^{g,h}_T \) is the reduced-form effect of a tax change as a share of GDP for group \( g \) in year \( t \) for the specification with horizon \( h \)
II. Effects Across the Income Distribution

Second order approximation of the $\beta(g)$ function is

$$\beta(g) = \theta_0 + \theta_1 g + \theta_2 g^2$$

**Specification:**

$$\Delta Y_{s,t} = \beta_1 \Delta T_{s,t}^1 + \beta_2 \Delta T_{s,t}^2 + \ldots + \beta_{10} \Delta T_{s,t}^{10} + \epsilon_{s,t}$$

$$\Delta Y_{s,t} = (\theta_0 + \theta_1 + \theta_2) \Delta T_{s,t}^1 + (\theta_0 + \theta_1 2 + \theta_2 2^2) \Delta T_{s,t}^2 + \ldots + \epsilon_{s,t}$$

$$\Delta Y_{s,t} = \theta_0 \left( \sum_{g=1}^{10} \Delta T_{s,t}^g \right) + \theta_1 \left( \sum_{g=1}^{10} g \times \Delta T_{s,t}^g \right) + \theta_2 \left( \sum_{g=1}^{10} g^2 \times \Delta T_{s,t}^g \right)$$

$$+ \epsilon_{s,t}$$
II. National Effects of Tax Changes for Different Groups

\[ \Delta Y_t = \sum_{m=m}^{\bar{m}} \left( \gamma_{B90,m} \Delta Tax_{t-m}^{B90} + \gamma_{T10,m} \Delta Tax_{t-m}^{T10} + X'_t \Gamma_m \right) + \nu_t \]

- where \( \Delta Y_t \equiv \ln Y_t - \ln Y_{t-1} \), \( \gamma_{B90,m} \) and \( \gamma_{T10,m} \) are the effects of changes in taxes as a share of GDP at lag \( m \)
- \( Y \in \{ GDP, Consumption, Investment \} \)
- The identifying assumption here is the same as Romer and Romer (2010) plus the additional assumption that progressive spending does not confound the tax shocks
- Test with Favero and Giavazzi (2010) Orthogonality Test
III. Data Overview

National Data: 1945-2011
1. Dependent Variables: Employment (BLS) & macro aggregates (BEA)
2. Independent Variables: SOI, NBER TAXSIM for 1960+, standard controls

State Data: 1980-2007
1. Dependent Variables: Employment data from BLS
2. Independent Variables: NBER TAXSIM and controls (government transfers, state taxes, population data from BEA)
Data: Constructing tax changes

**Tax Change Measure is a function of three things:**

1. Income and deductions from year prior to an exogenous tax change
2. Old tax schedule
3. New tax schedule
Data: Constructing tax changes

**Example:** 1993 Omnibus Budget Reconciliation Act

<table>
<thead>
<tr>
<th>Tax Rate</th>
<th>Min</th>
<th>Max</th>
<th>Tax Rate</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$0</td>
<td>$35,800</td>
<td>15%</td>
<td>$0</td>
<td>$36,900</td>
</tr>
<tr>
<td>28%</td>
<td>$35,800</td>
<td>$86,500</td>
<td>28%</td>
<td>$36,900</td>
<td>$89,150</td>
</tr>
<tr>
<td>31%</td>
<td>$86,500</td>
<td>-</td>
<td>31%</td>
<td>$89,150</td>
<td>$140,000</td>
</tr>
<tr>
<td>36%</td>
<td>$140,000</td>
<td>-</td>
<td>36%</td>
<td>$140,000</td>
<td>$250,000</td>
</tr>
<tr>
<td>39.6%</td>
<td>$250,000</td>
<td>-</td>
<td>39.6%</td>
<td>$250,000</td>
<td>-</td>
</tr>
</tbody>
</table>
Data: Constructing tax changes

Example: 1993 Omnibus Budget Reconciliation Act

- Suppose a taxpayer made $180K in 1992
- Based on the 1992 schedule & her income and deductions in 1992, she would have paid $50,500
- Based on the 1993 schedule & her income and deductions in 1992, she would have paid $54,000
- My measure assigns her a $3,500 tax increase in 1993
Data: Constructing tax changes

I do this calculation for entire sample of NBER returns
Disaggregated Income & Payroll Tax Changes

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Favero and Giavazzi Orthogonality Test: Top 10

![Graph showing tax changes as a share of GDP from 1940 to 2020. The graph compares the top 10% tax shock and its orthogonalized version.]

- Top 10% Tax Shock
- Orthogonalized Top 10% Tax Shock

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<table>
<thead>
<tr>
<th>State Top 10% Share</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.47 – 15.48</td>
<td>9.92</td>
</tr>
<tr>
<td>8.66 – 9.92</td>
<td>7.57</td>
</tr>
<tr>
<td>6.84 – 7.57</td>
<td>3.90</td>
</tr>
</tbody>
</table>

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Tax Cuts for Whom?

December 1, 2014
IV. Results Overview

Raw Bivariate Relationship in National Data: 1950-2010

State Data:
1. Two-year Effects
2. Dynamic Effects
3. Effects across the income distribution
4. Placebos

National Data:
1. Mechanisms: Consumption and Investment
National Effects of Tax Change for Top 10%

Employment Growth over 2 Years vs. Tax Change for Top 10% as % of GDP over 2 Years

- Owen Zidar (Chicago Booth)
National Effects of Residualized Tax Change for Top 10%

Slope = 0.23 (1.02)

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National Effects of Residualized Tax Change for Bot. 90%

![Graph showing the relationship between US Employment Growth over 2 Years and Residualized Tax Changes as % of GDP for Bot. 90% over 2 Years.](image)

Slope = $-1.53 (1.1)$
State-Level Effects of Tax Change for Top 10%

State Employment Growth over 2 Years

Residualized Tax Changes as % of State GDP for Top 10% over 2 Years

Slope = −.1 (.31)

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State-Level Effects of Tax Change for Bottom 90%

\[\text{Slope} = -5.06 (1.43)\]

State Employment Growth over 2 Years

Residualized Tax Changes as % of State GDP for Bot. 90% over 2 Years

\[\text{Slope} = -5.06 (1.43)\]
State-Level Effects of Tax Change for Top 50%

\[ \text{Slope} = -0.36 \pm 0.29 \]

State Employment Growth over 2 Years

Residualized Tax Change as % of State GDP for Top 50% over 2 Years

Slope = -0.36 (0.29)
State-Level Effects of Tax Change for Bottom 50%

Slope = -9.51 (2.39)

State Employment Growth over 2 Years

Residualized Tax Change as % of State GDP for Bot. 50% over 2 Years

Slope = -9.51 (2.39)
<table>
<thead>
<tr>
<th>State Employment Growth</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta T_{s,t}^{Bottom90} )</td>
<td>-2.6**</td>
<td>-2.7***</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(1.0)</td>
<td>(0.9)</td>
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</tr>
<tr>
<td>( \Delta T_{s,t}^{Top10} )</td>
<td>-0.2</td>
<td>-0.2</td>
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<td>(0.2)</td>
<td>(0.1)</td>
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</tr>
<tr>
<td>( \Delta T_{s,t}^{Bottom50} )</td>
<td></td>
<td>-7.1***</td>
<td>-8.2***</td>
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<td>(1.9)</td>
<td>(1.8)</td>
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<tr>
<td>( \Delta T_{s,t}^{Top50} )</td>
<td>-0.3*</td>
<td>-0.3**</td>
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<td>(0.2)</td>
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</tr>
<tr>
<td>( \Delta T_{s,t}^{Bottom30} )</td>
<td></td>
<td></td>
<td>-5.0</td>
<td>-6.7**</td>
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<td></td>
<td>(3.0)</td>
<td>(2.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta T_{s,t}^{Middle40} )</td>
<td></td>
<td>-5.1**</td>
<td>-5.1***</td>
<td></td>
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<td></td>
<td></td>
<td>(2.1)</td>
<td>(1.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta T_{s,t}^{Top30} )</td>
<td>-0.3*</td>
<td>-0.3**</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>(0.2)</td>
<td>(0.1)</td>
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Control for \( \text{GovTransPERCAP}_{s,t} \):

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<th>Y</th>
<th>N</th>
<th>Y</th>
<th>N</th>
<th>Y</th>
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<td>1,247</td>
<td>1,247</td>
<td>1,247</td>
<td>1,247</td>
<td>1,247</td>
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<tr>
<td>R-squared</td>
<td>0.914</td>
<td>0.921</td>
<td>0.915</td>
<td>0.922</td>
<td>0.915</td>
<td>0.922</td>
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<tr>
<td><strong>Bottom - Top:</strong></td>
<td>-2.37**</td>
<td>-2.47**</td>
<td>-6.82***</td>
<td>-7.86***</td>
<td>-4.73</td>
<td>-6.35**</td>
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<tr>
<td></td>
<td>(1.02)</td>
<td>(0.95)</td>
<td>(1.90)</td>
<td>(1.84)</td>
<td>(3.03)</td>
<td>(2.61)</td>
</tr>
</tbody>
</table>
Total Effects Across the Income Distribution

Effect of Tax Shock on Employment Growth

AGI Decile of Recipients

Point Estimate 95% Confidence Interval

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Dynamic Effects of Tax Changes by Group

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Dynamic Effects of Tax Changes by Group

- Bottom 90
- Bottom 50
- Top 10

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Tax Cuts for Whom?

December 1, 2014
Dynamic Effects of Tax Changes by Group with SE

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Tax Cuts for Whom?
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Dynamic Effects of Tax Changes for B90 by Industry

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State Effects of Tax Change for Bottom 90% by UR

\[ \text{State Employment Growth over 2 Years} \]

\[ \text{Residualized Tax Change as \% of State GDP for Bottom 90\% over 2 Years} \]

Slope = \(-2.43\) (0.75)

Slope = \(-7.04\) (1.0)

Low State Unemployment

High State Unemployment

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Effects Across the Income Distribution by State Unemployment Rate

-10  -8  -6  -4  -2  0
Effect of Tax Shock on Employment Growth
0  2  4  6  8  10
AGI Decile of Recipients

Low State Unemployment
High State Unemployment

Owen Zidar (Chicago Booth)
Tax Cuts for Whom?
December 1, 2014
Effects of Tax Change for Bottom 90% by GovTrans

Slope = -6.5 (1.0)

Slope = -3.4 (.83)

State Employment Growth over 2 Years

Residualized Tax Change as % of State GDP for Bottom 90% over 2 Years

Below Annual Median Per Capita Gov. Transfers

Above Annual Median Per Capita Gov. Transfers

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Robustness of Main State-Level Results

Non-Parametric Permutation Tests

- Pretend intervention occurred in each of the other cells of the sample and recompute estimate
- Calculate where actual treatment effect lies in empirical CDF of placebo treatment effects

Additional Placebo Test

- Use outcomes from 5 years before
20 of 500 or 4% exceed the estimate
Distribution of Placebo Estimates: $\beta^{B90} - \beta^{T10}$

26 of 500 or 5.2% exceed the estimate
## PLACEBO Effects for bottom & top

<table>
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<tr>
<th>State Employment Growth$_{t-5}$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta T_{s,t}^{Bottom90}$</td>
<td>-0.3</td>
<td>-0.6</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(1.1)</td>
<td>(1.1)</td>
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</tr>
<tr>
<td>$\Delta T_{s,t}^{Top10}$</td>
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<td>0.1</td>
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<td></td>
<td>(0.3)</td>
<td>(0.3)</td>
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<tr>
<td>$\Delta T_{s,t}^{Bottom50}$</td>
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<td>1.0</td>
<td>1.3</td>
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<td></td>
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<td>(1.6)</td>
<td>(1.7)</td>
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</tr>
<tr>
<td>$\Delta T_{s,t}^{Top50}$</td>
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<td>0.0</td>
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<td>(0.2)</td>
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</tr>
<tr>
<td>$\Delta T_{s,t}^{Bottom30}$</td>
<td></td>
<td></td>
<td>3.7</td>
<td>4.8*</td>
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<td>(2.5)</td>
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<tr>
<td>$\Delta T_{s,t}^{Middle40}$</td>
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### Control for $GovTransPERCAP_{s,t}$

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<td>1,097</td>
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<tr>
<td>R-squared</td>
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<td>0.881</td>
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<td>0.878</td>
<td>0.881</td>
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<tr>
<td><strong>Bottom - Top:</strong></td>
<td>-0.43</td>
<td>-0.70</td>
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<td>3.64</td>
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<tr>
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<td>(1.23)</td>
<td>(1.70)</td>
<td>(1.81)</td>
<td>(2.54)</td>
<td>(2.72)</td>
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### National Effects by Income Group

#### National Employment Growth

<table>
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<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta T ax^{B90}_t$</td>
<td>-0.6 (1.0)</td>
<td>-0.5 (1.1)</td>
<td>-0.6 (0.8)</td>
</tr>
<tr>
<td>$\Delta T ax^{B90}_{t-1}$</td>
<td>-2.4** (1.1)</td>
<td>-2.5** (1.0)</td>
<td>-2.3** (0.9)</td>
</tr>
<tr>
<td>$\Delta T ax^{B90}_{t-2}$</td>
<td>-2.1** (1.0)</td>
<td>-1.4* (0.8)</td>
<td>-1.2 (0.9)</td>
</tr>
<tr>
<td>$\Delta T ax^{T10}_t$</td>
<td>2.2 (1.5)</td>
<td>2.0 (1.7)</td>
<td>1.5 (1.1)</td>
</tr>
<tr>
<td>$\Delta T ax^{T10}_{t-1}$</td>
<td>0.3 (1.5)</td>
<td>-0.4 (1.8)</td>
<td>-0.0 (1.2)</td>
</tr>
<tr>
<td>$\Delta T ax^{T10}_{t-2}$</td>
<td>-0.8 (0.8)</td>
<td>-0.4 (0.6)</td>
<td>-0.3 (0.5)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.2*** (0.3)</td>
<td>0.9*** (0.3)</td>
<td>1.2** (0.6)</td>
</tr>
</tbody>
</table>

Control for $\Delta T ax^{NONINC},t$ and lags
- $Y$ $Y$ $Y$
Control for lagged Employment Growth
- $N$ $Y$ $Y$
Control for Transfers to GDP$_t$ and lags
- $N$ $N$ $Y$

Observations 61 61 61
R-squared 0.258 0.706

**Bottom90 Tax Change:** $\beta_t + \beta_{t-1} + \beta_{t-2}$
-5.12** (2.14)  -4.34** (1.74)  -4.01* (1.95)

**Top10 Tax Change:** $\beta_t + \beta_{t-1} + \beta_{t-2}$
1.69 (2.66)  1.17 (3.15)  1.18 (2.07)

**Bottom - Top:**
-6.81* (4.03)  -5.51 (4.28)  -5.19 (3.31)
Discussion of Effects and Magnitudes vs Existing Results

We find:

- Large effects
- Significantly larger effects for low-income groups
- Effects on C and I, esp. durable consumption

We know:

- Very low savings rates for majority of population
- Roughly similar results to increasing minimum wage [Aaronson, Agarwal, and French (AER 2012)]
- Within the range of local multiplier lit. in terms of cost per job
Conclusion

Summary

1. Construct a new measure of income tax changes
2. Show substantial heterogeneity in effects of fiscal policy
3. Find stimulative effect of income tax cuts are largely from bottom 90% and empirical link between employment growth and tax changes for upper income earners seems weak to negligible

Implications

1. Literature: Provides reduced-form effects that can inform structural regional models with heterogeneous agents
2. Policy: Suggests that letting Bush tax cuts expire for $250K did not have substantial employment consequences over the business cycle