Individual Earnings Adjustment to Policy
Evidence from the Social Security Earnings Test

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Outline

Introduction

Empirical Framework

Social Security Earnings Test

Data

Pattern and Speed of Adjustment

Mechanisms

Estimating Elasticity and Adjustment Cost

Conclusion
Motivation

- Our project aims to:
  - Estimate speed of earnings adjustment to policy changes
  - Probe mechanisms underlying individuals’ earnings adjustment to policy
  - Estimate mean adjustment cost and earnings elasticity simultaneously
Recent papers have studied how barriers to adjustment:

- Drive heterogeneity in elasticity of earnings with respect to taxes across contexts (Chetty forthcoming *Econometrica*; Chetty, Guren, Manoli, and Weber *NBER Macro Annual* 2012; Chetty, Friedman, and Saez 2011; Chetty, Friedman, Olsen, and Pistaferri *QJE* 2011; Altonji and Paxson *JHR* 1992)
- Govern the welfare implications of taxes (Chetty, Looney, and Kroft *AER* 2009)

How to estimate elasticities if adjustment costs important?

- Examples of barriers: information, difficulty of finding job with desired earnings
  - We follow previous literature in largely not attempting to separate these barriers
Empirical work based on policy changes typically measures short-run earnings responses to policy.

- Long-run responses could be substantially different (larger or smaller) than short-run responses.
- To understand these issues, we must measure the dynamics of adjustment.

Further explore mechanisms underlying earnings adjustment.
Our Context

- We study earnings adjustment to Social Security (SS) Earnings Test (ET)
  - Reduces SS benefits when individuals earn above exempt amount
  - Creates kinks in budget constraint
- We show descriptive evidence documenting how quickly individuals respond (or not) to changes in Earnings Test policy, both across ages and over time, and some of the mechanisms underlying these adjustments
  - Anticipated and unanticipated changes
- We specify a model of earnings adjustment to policy and use the data to estimate mean fixed costs and elasticities in that model
Introduction

Our Context

- Earnings Test is particularly fruitful policy to study
  - Administrative panel data on earnings from Social Security Administration are accurate and have large sample size
  - Large changes in ET policy across groups and over time
- Hard to find variation in taxes that allows for credible estimation of elasticities
  - Kinks in tax schedule helpful (Saez *AEJ* 2010)
  - However, little evidence in U.S. of reaction to kinks other than self-employed, where reaction is largely tax avoidance and evasion (Chetty, Friedman, and Saez 2012)
  - ET creates one of few known kinks in U.S. that influences earnings of non-self-employed (as we show)
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We model the earnings response to a kink following Saez (*AEJ* 2010)
- Also use Chetty, Friedman, Olsen, and Pistaferri (*QJE* 2011)
- Several other recent empirical papers have studied bunching (e.g. Kleven and Waseem 2012; Manoli and Weber 2010)

**Intuition:**
- Piecewise-linear taxation creates discontinuities in marginal tax rate schedule
- At point of discontinuity, marginal net-of-tax rate falls (in progressive schedule)
- For many people, worth it to earn more at the margin at the higher but not lower marginal net-of-tax rate
- This produces “bunching” in the earnings distribution at the discontinuity
- More elastic earnings $\rightarrow$ more people drawn to kink
Characterizing the earnings response

Empirical Framework

After Tax Income $z - T(z)$

Before Tax Income $z$

slope $= 1 - t$

$z^*$ $z^* + \Delta z^*$

$H$, $M$, $L$
Characterizing the earnings response

![Graph showing the relationship between after-tax income and before-tax income, with a focus on the earnings response to policy changes.](image-url)
Empirical Framework

Characterizing the earnings response

![Graph showing earnings response to policy changes.](image-url)
Empirical Framework

Characterizing the earnings response
Characterizing the earnings response
Characterizing the earnings response

Density

Before Tax Income \( z \)

\( z^* \)

\( z^* + \Delta z^* \)
Empirical Strategy

\[ B = H^* - H_+ - H^- \]

Density

Before Tax Income \( z \)

\[ z^* - 2\delta \quad z^* - \delta \quad z^* + \delta \quad z^* + 2\delta \]
Empirical Framework

Estimating Adjustment Dynamics

- We report the amount of bunching, normalized by the counterfactual share of earnings in a neighborhood of the kink.
- We estimate excess bunching on repeated cross sections occurring \( m = 0, 1, 2 \ldots \) years after change in policy that individuals face.
  - Bandwidths: $500, $800
- We look at how excess bunching varies with \( m \).
  - Cleanest evidence probably from kinks disappearing, because we know that there should be no bunching and can measure the amount of time it takes to get to no bunching.
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For earnings above threshold, ET reduces SS benefits at rate $t$
  - Reduction rate and exempt amount vary by age and year
Response widely studied (e.g. Burtless and Moffitt 1985; Friedberg 1998, 2000; Song and Manchester 2007)
For individuals 62-NRA, benefits lost due to ET cause increase in benefits upon claiming
Only since 1972, Delayed Retirement Credit: when NRA+, benefits lost due to ET cause increase in benefits upon claiming
  - Approximately actuarially fair since late 1990s
Literature finds that at least some individuals respond to ET benefit reductions as a tax
  - May treat ET as effective tax: those pre-1972 (NRA+), short expected lifespan, liquidity constraints, misperceive ET
Earnings Test Changes

Earnings test rules over time


1983: ET Eliminated for 70–71 y/o

2000: ET Eliminated for NRA+

Exempt amount, pre–NRA
Exempt amount, NRA+
Tax rate, pre–NRA
Tax rate, NRA+
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Social Security Master Earnings File

- Social Security Administrative Data
- 1% extract of SS numbers
- Complete earnings history 1951-2006 of calendar year earnings for each SSN in sample
  - Not manipulable through deductions, credits, etc.
- Key covariates: earnings, date of birth, when claiming began, SS benefits
- Since 1978, ET has been assessed on earnings in each calendar year, which is the same time frame (i.e. calendar year) as earnings are observed in our data
Longitudinal Employer Household Dynamics (LEHD)

- Linked employer-employee Census administrative data on U.S. workforce in 30 states
  - 90% of workforce because does not include self-employed and some federal employees
- Complete employment history and earnings profile for each worker
- Many of the state panels begin in the early-to-mid 1990s; most recent data 2008
- Do not observe who claims Social Security (over 90% of men claim at ages 65+ (Song and Manchester 2007))
- Use a 20% sample
Focus on ages 62-69 (but sometimes look at other ages)
Social Security claimants (except for placebo tests)
Positive earnings
For results by age, look within a policy regime (e.g. 1983-1989, 1990-1999, 2000-2003)
Pool men and women
## Summary Statistics, SSA Master File: Mean (SD)

<table>
<thead>
<tr>
<th></th>
<th>Ages 18-80</th>
<th>Ages 62-69</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earnings</strong>*</td>
<td>$29,888 (21,897)</td>
<td>$17,671 (20,115)</td>
</tr>
<tr>
<td><strong>Positive Earnings Dummy</strong>*</td>
<td>0.484 (0.285)</td>
<td>0.412 (0.271)</td>
</tr>
<tr>
<td><strong># Obs</strong></td>
<td>24,622,390</td>
<td>1,432,330</td>
</tr>
<tr>
<td><strong># Individuals</strong></td>
<td>1,023,260</td>
<td>473,760</td>
</tr>
</tbody>
</table>

*Based on .1% sample; 2010 dollars
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Pattern and Speed of Adjustment

Results 1: Responses by Age

Distribution of earnings, 59–73 year olds
1% Sample, Claimants, 1990–1999, BW = 800

Real distance to kink (thousands of dollars)
Normalized excess mass at kink, by age
1% Sample, Claimants, 1990–1999, BW = 800

Age
59 61 63 65 67 69 71 73
Normalized excess mass at kink
0.6
0.4
0.2
0
-0.2
-0.4
Summary

- Substantial bunching from 63-69
- Bunching intermediate at age 62
- Complete adjustment by age 70 or 71
- These changes are anticipated (i.e. an individual who knew about the parameters of ET law would have anticipated the changes)
Results 2: ET Elimination in 2000 for 66-69 year olds

Distribution of Earnings, 66–69 year olds
1% Sample, Claimants, 1996–2004, BW = 500

Real earnings (thousands of dollars)
Pattern and Speed of Adjustment

Excess mass at kink, by year, 66–69 year olds
1% Sample, Claimants, 1987–2006, BW = 500

Year
1987 1989 1991 1993 1995 1997 1999 2001 2003 2005
Excess mass at kink
-0.5 0 0.5 1 1.5
After the 2000 elimination of the earnings test, 66-69 year olds show no bunching (react within at most one year; can rule out substantial subsequent bunching).

This change was unanticipated prior to 2000.
Results 3: ET Elimination in 1983 for 70-71 year olds

Distribution of Earnings, 70–71 year olds
1% Sample, Claimants, 1979–1987, BW = 500

Real distance to kink (thousands of dollars)
Excess mass at kink, by year, 70–71 year olds

1% Sample, Claimants, 1978–1989, BW = 500
Summary

- After 1983 elimination of the earnings test for 70-71 year olds, subsequent bunching is very small
- Near-complete adjustment takes two years
- This change was anticipated
Who Adjusts? LEHD 20% sample, 1990-98

Expected % Change in Earnings from Age 69 to Age 70

Earnings at age 69

-10 -5 0 5 10

-13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

0.22 0.15 0.08 0.01

-0.06 -0.07 -0.08 -0.09 -0.1 -0.11 -0.12 -0.13 -0.14 -0.15 -0.16 -0.17 -0.18 -0.19 -0.2 -0.21 -0.22

Individual Earnings Adjustment to Policy
Mechanisms

Across employers? LEHD 20% sample, 1990-98

Prob. of Changing Employers, 69 year olds

Real Distance to Kink (thousands of $)
When individuals respond to the ET, they could change their earnings by:

- Changing employers
- Staying at the same employer but changing their hours worked/earnings

Those at the kink disproportionately adjust within employers:

- Makes sense given fast adjustment
- Amount of bunching positively correlated across industries with percent paid hourly

Suggestive evidence (under some assumptions) that information plays a role: slower ramp-up in bunching ages 61-63, faster ramp-down ages 69-70
Pre-1972

- No Delayed Retirement Credit for NRA+ pre-1972
- Look at bunching by age during the period 1966-1971
- Exempt amount = $1,680
  - Near $10,000 in real terms; exact amount depends on year
- Any earnings above exempt amount → 50% MTR
- Evidence of bunching outside ages subject to Earnings Test!
  - Potentially driven by employers
Normalized excess mass at kink, by age

1% Sample, Claimants, 1966–1971, BW = 800

Age vs. Normalized excess mass at kink

- Age range: 20 to 80
- Normalized excess mass range: -0.5 to 1.5
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Conclusion
Chetty, Friedman, Olson and Pistaferri (2011): fixed cost of adjusting to taxes

- Individuals must incur a cost of $\phi^*$ in order to change earnings

We focus on fixed cost because it is a natural starting point and because of importance in previous literature

- Separately developed strategy to estimate linear marginal cost and fixed cost

Previous literature has documented that adjustment costs are an important driver of elasticity estimates

- Raises question of how to estimate the elasticity in the presence of adjustment costs

Note: We use a static model and assume responses are driven by employees
Consider bunching in a world without adjustment costs:

\[
B = \int_{z^*}^{z^* + \Delta z^*} h_0 (\zeta) \, d\zeta
\]
Estimating Elasticity and Adjustment Cost: Methodology

- Consider bunching in a world without adjustment costs:

\[
B = \int_{z^*}^{z^* + \Delta z^*} h_0 (\zeta) \, d\zeta
\]

- Bunching will now be attenuated due to an adjustment cost:

\[
B = \int_{z}^{z^* + \Delta z^*} h_0 (\zeta) \, d\zeta
\]

- Lowest bunching earnings $z$ implicitly defined by:

\[
u (c^*, z^*; n) - u (c, z; n) \equiv \phi^*
\]

where $z \geq z^*$ is ex ante earnings for lowest buncher

- Estimate system using minimum distance estimator
Estimating Elasticity and Adjustment Cost: Methodology

After Tax Income: $z - T(z)$

Before Tax Income $z$

Slope = $1 - t_0$

$U_n (z_1, t_0)$

$z^*$ $z_1$ $z^* + \Delta z^*$
Estimating Elasticity and Adjustment Cost: Methodology

After Tax Income $z - T(z)$

$slope = 1 - t_0$

$slope = 1 - t_1$

$U_n(z_1, t_0)$

$z^*$ $z_1$ $z^* + \Delta z^*$ Before Tax Income $z$

Individual Earnings Adjustment to Policy
Estimating Elasticity and Adjustment Cost: Methodology

\[ U_n(z_1, t_1) = U_n(z^*, t_1) - \phi^* \]

After Tax Income: \( z - T(z) \)

\[ \text{slope} = 1 - t_0 \]

\[ \text{slope} = 1 - t_1 \]

\( z^* \)
\( z_1 \)
\( z^* + \Delta z^* \)

Before Tax Income: \( z \)
Estimating Elasticity and Adjustment Cost: Methodology

Density

Do Not Adjust to Kink

Adjust to Kink

$z^*$  $z$  $z^* + \Delta z^*$

Before Tax Income $z$
Approximating the integral for bunching with a rectangle, we have:

\[
\frac{B}{h_0}(z^*) \approx z^* + \Delta z^* - z
\]

which provides a system of nonlinear equations to solve in \(e\) and \(\phi^*\).
Estimating Elasticity and Adjustment Cost: Intuition

- Approximating the integral for bunching with a rectangle, we have:

\[
\frac{B}{h_0}(z^*) \approx z^* + \Delta z^* - z
\]

which provides a system of nonlinear equations to solve in \( e \) and \( \phi^* \).

- Using a first-order approximation, we solve for \( z \):

\[
z \approx z^* + \frac{\phi}{dt}
\]

where \( \phi = \phi^*/\lambda \) is the dollar value of the adjustment cost, \( \lambda \) is the Lagrange multiplier on the budget constraint, and \( dt = t_1 - t_0 \).
Estimating Elasticity and Adjustment Cost: Intuition

- Substituting for $\Delta z^*$ for small $dt$, bunching (scaled) will now be:

$$B / h_0 (z^*) \equiv b \approx z^* \frac{dt}{1 - t_0} e - \frac{1}{dt} \phi$$

- $b = B / h (z)$ is scaled bunching at kink point $z^*$, $t_0$ is tax rate to left of kink, and $dt$ is tax rate jump at kink

- With two kinks, we have two variables to estimate ($e$ and $\phi$) and two equations
Estimating Elasticity and Adjustment Cost: Intuition

Substituting for $\Delta z^*$ for small $dt$, bunching (scaled) will now be:

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- $b = \frac{B}{h(z)}$ is scaled bunching at kink point $z^*$, $t_0$ is tax rate to left of kink, and $dt$ is tax rate jump at kink
- With two kinks, we have two variables to estimate ($e$ and $\phi$) and two equations
- Intuition: amount of bunching increases in the elasticity but decreases in the adjustment cost
- With more than two kinks, we are overidentified, and a regression approach may be used
- With a linear marginal cost and a fixed cost, need three kinks to identify the elasticity, marginal cost, and fixed cost
Use data on 66-69-year-olds from 1961-71

- Prior to actuarial adjustment, so ET represents "real" tax
- Exempt amount increased from $1,200 in 1965 to $1,681 in 1968 (in nominal 1965 and 1968 dollars, respectively)
- Elasticity = 0.72 (standard error 0.065)
- Adjustment cost = $1,117.30 (standard error 171.45) in 2010 dollars
- If constrain adjustment cost to be zero: elasticity = 0.34 (standard error 0.013)
Under certain assumptions our linear formula returns the mean population elasticity $\bar{e}$ and population adjustment cost $\bar{\phi}$:

$$b = z^* \frac{dt}{1 - t} \bar{e} - \frac{1}{dt} \bar{\phi}$$

- Assumes joint distribution of $(e, \phi)$ independent of $n$

- Under a more general distribution of $(n, e, \phi)$:
  - Possible to use data from the 1950s when the ET was a 100% tax along with notch methods (Klevin and Waseem 2012)
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Findings

- Vast majority of adjustment occurs within two years
- Employers drive some of response pre-1972, not much post-1972
- 1961-1971: elasticity = 0.72 and adjustment cost = $1,117.30
- If assumed no adjustment cost: elasticity = 0.34
- Those bunching at kink may have different adjustment cost (and elasticity) on average than those away from kink
  - Helps reconcile results showing fast adjustment with results showing substantial adjustment costs
Chetty (2012) shows how to bound structural elasticities using reduced form elasticities and bounds on the utility losses agents tolerate to deviate from their frictionless optimum.

- Our results imply that across the population, the mean utility loss from suboptimal choices is 0.9% of welfare (1.18% when restricting attention to individuals affected by ET kink, i.e. $z \geq z^*$).