

Labor Supply and Taxable Income Responses to Taxes and Transfers

Economía Pública: Impuestos

Clase 4

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GOALS OF THIS LECTURE

- 1) Cover some empirical studies of **labor supply** and **taxable income** responses to taxation (from earlier to more recent papers)
- 2) Understand key methodologies such as Diff-in-Diffs, RDD, non-linear budget sets and “bunching at kinks/notches” which are useful for a wide range of empirical work
- 3) Critically discuss papers' methodologies and results so as to practice our research skills

ELASTICITY OF TAXABLE INCOME (ETI)

$$\text{Taxable Income} = \text{Ordinary Income} + \text{Realized Capital Gains} - \text{Deductions}$$

⇒ Each component can respond to taxes

Modern public finance literature focuses on taxable income elasticities (ETI) instead of hours/participation elasticities

Two main reasons:

- 1) **Policy:** what matters for policy is the total behavioral response to tax rates (not only hours of work but also occupational choices, avoidance, etc.)
- 2) **Data availability:** taxable income is precisely measured in tax return data

Overview of ETI literature: Saez-Slemrod-Giertz JEL'12

CHANNELS OF TAXABLE INCOME RESPONSES

- (1) Quantitative labor supply responses: hours worked, participation
- (2) Qualitative labor supply responses: effort on the job, type of job, training, education
- (3) Changes in savings and portfolio choice
- (4) Tax avoidance [legal tax minimization]. E.g., legal shifting of income into untaxed or lower-taxed form
- (5) Tax evasion [illegal under-reporting of income]

TAX AVOIDANCE

Behavioral response to income tax comes not only from reduced work effort and economic activity but also from tax avoidance.

Two main forms of tax avoidance:

- 1) **Intertemporal substitution:** Shift income over time to take advantage of tax changes: Example: If tax rates increase next year, shift income from next year into this year
- 2) **Income shifting:** Shift income to another tax base that is taxed less. Example: shift business profits from corporate tax base to the individual tax base if this is tax advantageous

Tax avoidance affects tax revenue through these other tax bases and such revenue effects need to be accounted for in optimal tax analysis (fiscal externalities)

ETI AS A POLICY INSTRUMENT

- ▶ The ETI is not a **structural parameter**. It depends on avoidance and evasion, which depend on the tax and enforcement system (Slemrod and Kopczuk, 2002)
- ▶ The ETI will be low under (i) a **broad tax base** that offers limited opportunity for income shifting, (ii) **rigorous tax enforcement** that offers limited opportunity for evasion
- ▶ If the ETI is very high (Laffer rate very low), what is the best policy response? (i.e., when people are very responsive to income tax)
- ▶ Two possibilities: (i) reduce MTRs, (ii) reduce the ETI.
Optimal policy depends on the mg costs/benefits of (i) and (ii)

Labor supply responses to taxation

Labor supply responses to taxation are of fundamental importance for income tax policy [efficiency costs and optimal tax formulas]

Labor supply responses along many dimensions:

- (a) **Intensive**: hours of work on the job, intensity of work, occupational choice [including education]
- (b) **Extensive**: whether to work or not [e.g., retirement, migration]
- (c) **Short-run** versus **long-run**: long-run response most important for policy but hardest to estimate

STATIC LS MODEL: SETUP (skip)

Baseline model (same as previous lecture): (i) static, (ii) linearized tax system, (iii) pure intensive margin choice, (iv) single hours choice, (v) no frictions

Utility $u(c, l)$ increases with consumption c , and decreases with hours worked l

Individual earns wage w per hour (net of taxes) and has R in non-labor income [e.g., linear tax system with tax rate τ and transfer G]:

$$c = w^p(1 - \tau)l + G$$

Individual solves: $\max_{c, l} u(c, l)$ subject to $c = wl + R$

LABOR SUPPLY BEHAVIOR (skip)

FOC: $w\partial u/\partial c + \partial u/\partial l = 0$ defines uncompensated (Marshallian) labor supply function $l^u(w, R)$

Uncompensated elasticity of labor supply: $\varepsilon^u = (w/l) \cdot \partial l^u / \partial w$ [% change in hours when net wage w increases by 1%]

Income effect parameter: $\eta = w\partial l / \partial R \leq 0$: £ increase in earnings if person receives £1 extra in non-labor income

Compensated (Hicksian) labor supply function $l^c(w, u)$ which minimizes cost $wl - c$ subject to constraint $u(c, l) \geq u$

Compensated elasticity of labor supply: $\varepsilon^c = (w/l) \cdot \partial l^c / \partial w > 0$

Slutsky equation: $\partial l / \partial w = \partial l^c / \partial w + l \partial l / \partial R \Rightarrow \varepsilon^u = \varepsilon^c + \eta$

BASIC CROSS-SECTION ESTIMATION

Data on hours or work, wage rates, non-labor income started becoming available in the 1960s when first micro surveys and computers appeared:

Simple OLS (Ordinary Least Square) regression:

$$l_i = \alpha + \beta w_i + \gamma R_i + X_i \delta + \epsilon_i$$

w_i is the net-of-tax wage rate

R_i measures non-labor income [including spousal earnings for couples]

X_i are demographic controls [age, experience, education, etc.]

β measures uncompensated wage effects, and γ measures income effects [can be converted to ϵ^u, η]

BASIC CROSS-SECTION RESULTS

1. **Male workers** [primary earners when married]

(Pencavel, 1986 survey):

Small effects $\varepsilon^u = 0$, $\eta = -0.1$, $\varepsilon^c = 0.1$ with some variation across estimates

2. **Female workers** [secondary earners when married]

(Killingsworth and Heckman, 1986):

Much larger elasticities on average, with larger variations across studies. Elasticities go from zero to over one. Average around 0.5. Significant income effects as well

Female labor supply elasticities have declined overtime as women become more attached to labor market (Blau-Kahn JOLE'07)

ISSUE WITH OLS REGRESSION:

w_i correlated with tastes for work ϵ_i

$$l_i = \alpha + \beta w_i + \epsilon_i$$

Identification is based on cross-sectional variation in w_i : comparing hours of work of highly skilled individuals (high w_i) to hours of work of low skilled individuals (low w_i)

If highly skilled workers have more taste for work (independent of the wage effect), then ϵ_i is positively correlated with w_i leading to an upward bias in OLS regression

Plausible scenario: hard workers acquire better education and hence have higher wages

Controlling for X_i can help but can't guarantee that we've controlled for all the factors correlated with w_i and tastes for work: **Omitted variable bias (OVB)** \Rightarrow Tax changes provide more compelling identification

Natural Experiment Labor Supply Literature

First, what's *identification*?

Best identification method: exogenously change taxes/transfers with a **randomized experiment** (usually infeasible¹)

Literature exploits variation in taxes/transfers to estimate hours elasticities and participation elasticities

- Large literature in labor/public economics estimates effects of taxes and wages on hours worked and participation
- Let's discuss some estimates from older and more recent literature

¹But check this interesting study by Bergeron-Tourek-Weigel (2021)

Negative Income Tax (NIT) Experiments

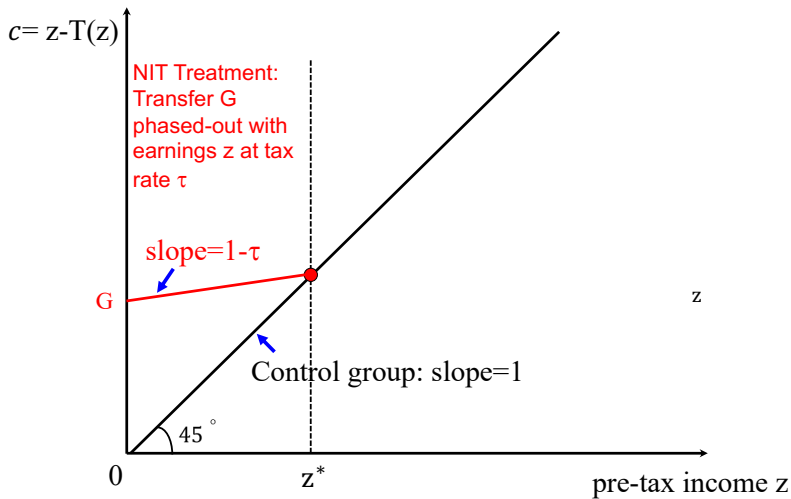
- ▶ NIT experiment conducted in 1960s/70s in Denver, Seattle, and other cities (**randomized experiment**)
- ▶ First major social experiment in U.S. designed to test proposed transfer policy reform
- ▶ Lump-sum transfers G combined with a steep phaseout rate τ (50%-80%) [based on family earnings] for 3 or 5 years.
- ▶ Analysis by Rees (1974), Munnell (1986) book, Ashenfelter and Plant JOLE'90, and others
- ▶ Several groups, with randomization within each; approx. $N = 75$ households in each group

Table 1
Parameters of the 11 Negative Income Tax Programs

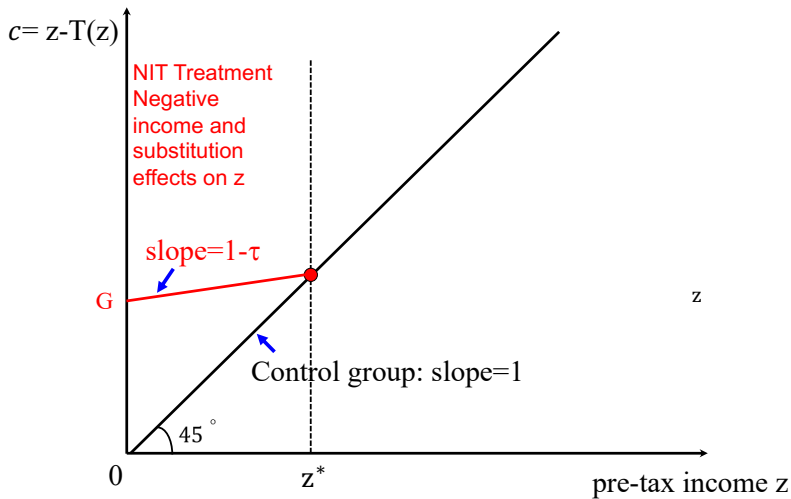
Program Number	G (\$)	τ	Declining Tax Rate	Break-even Income (\$)
1	3,800	.5	No	7,600
2	3,800	.7	No	5,429
3	3,800	.7	Yes	7,367
4	3,800	.8	Yes	5,802
5	4,800	.5	No	9,600
6	4,800	.7	No	6,857
7	4,800	.7	Yes	12,000
8	4,800	.8	Yes	8,000
9	5,600	.5	No	11,200
10	5,600	.7	No	8,000
11	5,600	.8	Yes	10,360

Source: Ashenfelter and Plant (1990), p. 403

Negative Income Tax Experiment



Negative Income Tax Experiment



NIT Experiments: Findings

- 1) Statistically significant labor supply response but small overall
- 2) Implied earnings elasticity for males around 0.1
- 3) Implied earnings elasticity for married women around 0.5
- 4) Response of married women is concentrated along the extensive margin
- 5) Earnings of treated married women who were working before the experiment did not change much

From true experiment to “natural experiments”

Income Effects on Lottery Winners

True experiments are costly to implement and hence rare

However, real economic world (nature) provides variation that can be exploited to estimate behavioral responses \Rightarrow “**Natural Experiments**”

Natural experiments sometimes come very close to true experiments:

- ▶ Imbens, Rubin, Sacerdote AER'01 did a survey of lottery winners and non-winners in Massachusetts matched to Social Security administrative data to estimate income effects
- ▶ Lottery generates random assignment conditional on playing
- ▶ Find significant but relatively small income effects: $\eta = w\partial I/\partial R$ between -0.05 and -0.10
- ▶ Identification threat: differential response-rate among groups

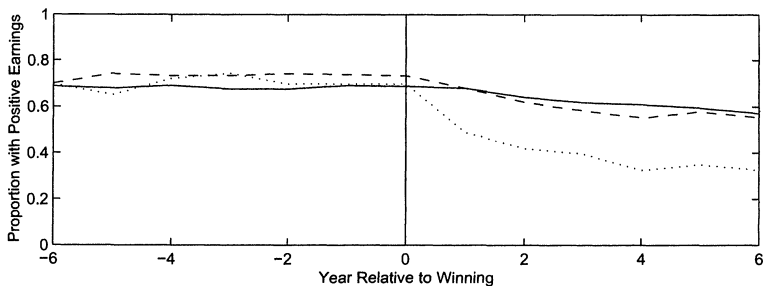


FIGURE 2. PROPORTION WITH POSITIVE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

Note: Solid line = nonwinners; dashed line = winners; dotted line = big winners.

Source: Imbens et al (2001), p. 784

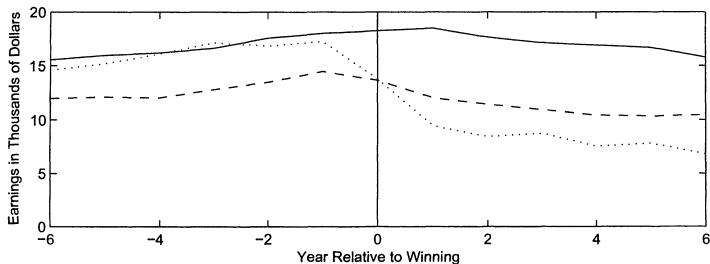


FIGURE 1. AVERAGE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

Note: Solid line = nonwinners; dashed line = winners; dotted line = big winners.

Digression: Diff-in-Diff (DD) Methodology

Two groups: **Treatment** group (T) which faces a change [lottery winners] and **Control** group (C) which does not [non winners]

Compare the evolution of T group (before and after change) to the evolution of the C group (before and after change)

DD identifies the **treatment effect** if the **parallel trend assumption** holds: absent the change, T and C would have evolved in parallel

DD most convincing when groups are very similar to start with

Should always test DD using data from more periods and plot the two time series to check parallel trend assumption

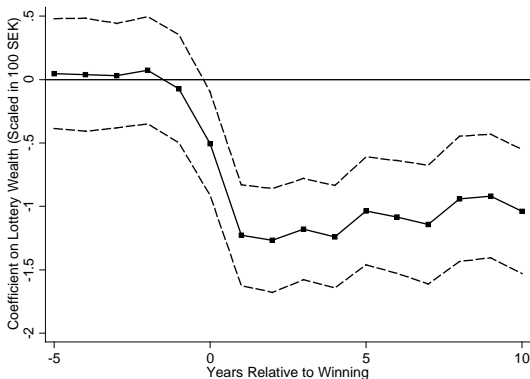
Labor Supply and Lotteries in Sweden

Cesarini et al. AER'17 use Swedish population-wide administrative data with more compelling setting: (1) bank accounts with random prizes (PLS), (2) monthly lottery subscription (Kombi), and (3) TV show participants (Triss)

Key results:

- 1) Effects on both extensive and intensive labor supply margin, time persistent
- 2) Significant but small income effects: $\eta = w\partial l/\partial R \approx -0.1$
- 3) Effects on spouse but not as large as on winner
→ Rejects the **unitary** model of household labor supply:
 $\max u(c_1, c_2, l_1, l_2)$ st $c_1 + c_2 \leq w_1 l_1 + w_2 l_2 + R$
⇒ only household non-labor income R matters

Figure 1: Effect of Wealth on Individual Gross Labor Earnings



Notes: This figure reports estimates obtained from equation (2) estimated in the pooled lottery sample with gross labor earnings as the dependent variable. A coefficient of 1.00 corresponds to an increase in annual labor earnings of 1 SEK for each 100 SEK won. Each year corresponds to a separate regression and the dashed lines show 95% confidence intervals.

Cesarini, Lindqvist, Notowidigdo, Östling NBER WP 2015

TOP INCOME TAX RATE CHANGES

Tax rates change frequently over time. Biggest tax rate changes have happened at the top:

The UK experienced dramatic changes. E.g., Thatcher tax cuts:

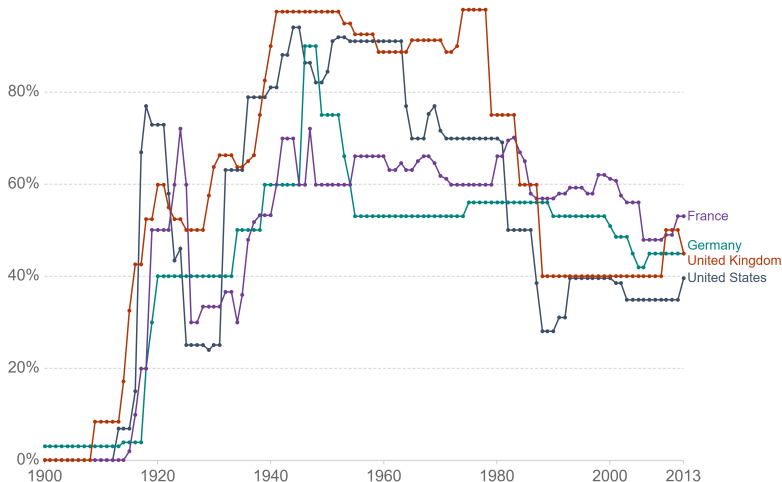
- Top rate ↓ from 83% to 60% in 1979
- and further ↓ to %40 in 1988

The US provides very interesting variation

- Reagan I: ERTA'81: top rate ↓ 70% to 50% (1981-1982)
- Reagan II: TRA'86: top rate ↓ 50% to 28% (1986-1988)
- Clinton: OBRA'93: top rate ↑ 31% to 39.6% (1992-1993)
- Bush: EGTRRA '01: top rate ↓ 39.6% to 35% (2001-2003)
- Obama '13: top rate ↑ 35% to 39.6%+3.8% (2012-2013)
- Trump '17: top rate cut down to 37%+3.8% (2017-2018)

Top marginal income tax rate, 1900 to 2013

Top marginal tax rate of the income tax (i.e. the maximum rate of taxation applied to the highest part of income)



Source: Piketty (2014)

OurWorldInData.org/taxation/ • CC BY

Historically, high MTRs above 80% not unusual (See)

LONG-RUN EVIDENCE IN THE US

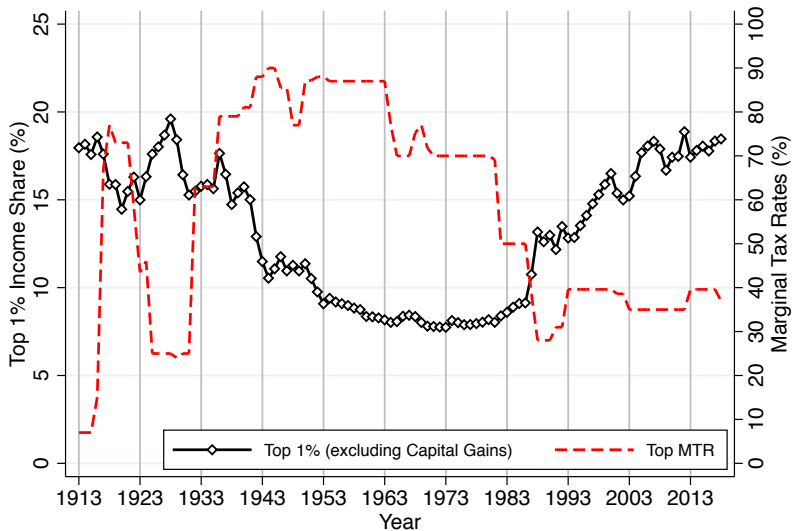
Goal: evaluate whether top **pre-tax** incomes respond to changes in one minus the marginal tax rate (=net-of-tax rate)

Focus on **pre-tax** income before deductions, excluding realized capital gains (because they are taxed at lower separate rate)

Piketty-Saez QJE'03 estimate top income shares since 1913 [IRS tabulations for 1913-1959, IRS micro-files since 1960]

Piketty-Saez-Stantcheva AEJ-EP'14 estimate the effect of top MTR on top income shares in the US since 1913

Top 1% Reported Income Share and Top MTR (US)



LONG-RUN EVIDENCE IN THE US

- 1) Clear correlation between top incomes and top income rates both in several short-run tax reform episodes and in the long-run: estimated elasticities are large (around 0.7 for long-run)
 - 2) Correlation between tax rates and income shares largely absent below the top 1% (such as the next 5%)
 - 3) Top income shares sometimes do not respond to large tax rate cuts [e.g., Kennedy Tax Cuts of early 1960s]
- 2) and 3) suggest that **context matters** (e.g., opportunities to respond/avoid taxes matter). Response unlikely to be due to a universal labor supply elasticity

Key problem: Δ tax correlated with non-tax factors driving top incomes

KLEVEN AND SCHULTZ AEJ-EP'14

Important study finds relatively small TI elasticities in Denmark

Key advantages:

- (a) Use full population of tax returns since 1980 (large sample size, panel structure, many demographic variables, stable inequality)
- (b) A number of reforms changing tax rates differentially across three income brackets and across tax bases (capital income taxed separately from labor income)
 - (a)+(b) \Rightarrow allows to overcome bias from (i) non-tax changes in inequality and (ii) mean reversion
- (c) Show compelling visual DD-evidence of tax responses around the 1987 large reform: Define T and C in year 1986 (pre-reform), follow the same group in years before/after the reform (panel analysis)

Panel B. Labor income: large versus small tax cuts

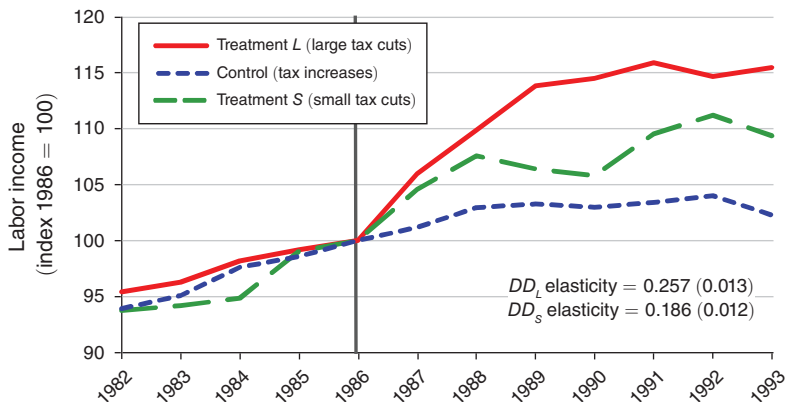


FIGURE 4. GRAPHICAL EVIDENCE ON TAXABLE INCOME RESPONSES TO THE DANISH 1987 REFORM

Panel C. Positive capital income

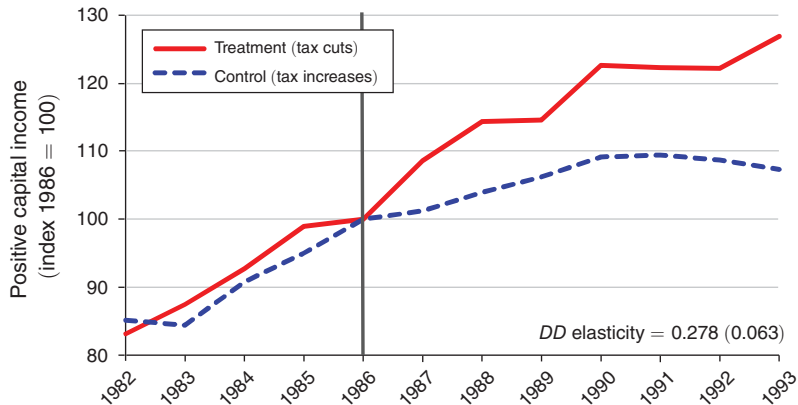


FIGURE 4. GRAPHICAL EVIDENCE ON TAXABLE INCOME RESPONSES TO THE DANISH 1987 REFORM (*Contini*

Key Findings:

- (a) Small labor income elasticities (.05 for wage earners, .10 for self-employed)
- (b) Bigger capital income elasticities (.3)
- (c) Bigger elasticities for larger tax changes (overcome optimization frictions suggested by Chetty et al QJE'11)
- (d) Modest income shifting between labor and capital in Denmark (top rates on labor and capital are carefully aligned)

⇒ Danish tax system optimized to have broad base and few avoidance opportunities. Ensures modest behavioral responses

UK OWNER-MANAGERS

(Miller-Pope-Smith, 2019)

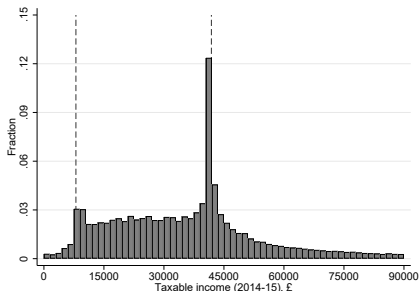
Use linked **UK tax records** to estimate how personal taxes affect the behaviour of company owner-managers (read Section 3!)

Two empirical strategies: (1) bunching at 'higher rate' kink (MTR goes from 20% to 40%); (2) diff-in-diff of policy reform that increased MTR above £100k (since 2010-11)

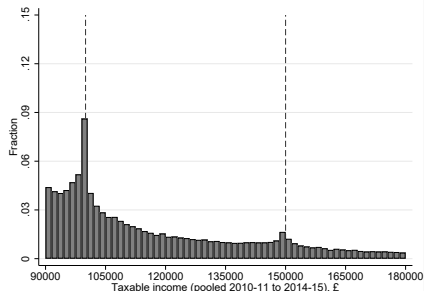
- Responses to MTRs are in line with **intertemporal income shifting**, and not to reductions in real business activity
- Taxable income is shifted across time to (i) smooth income that fluctuates around tax kinks and (ii) to access preferential capital gains tax rates (20% in higher-rate band)
- Also find large tax-induced retained profits; held as cash and equivalent assets \Rightarrow do not lead to higher investment in capital

Figure 3.2: *Distribution of taxable income for company owner-managers*

(a) Income \leq £90,000 (2014-15)



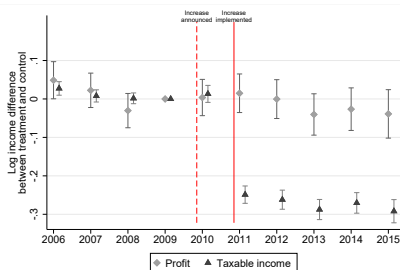
(b) Income $>$ £90,000 (2010-11–2014-15)



Source: Miller, Pope, Smith (2019)

Figure 5.5: *Coefficients from differences-in-differences specification*

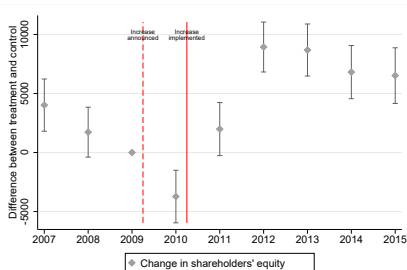
(a) Taxable income and profit



Treatment definition: taxable income between 95000 and 200000.
Control definition: taxable income between 50000 and 95000.

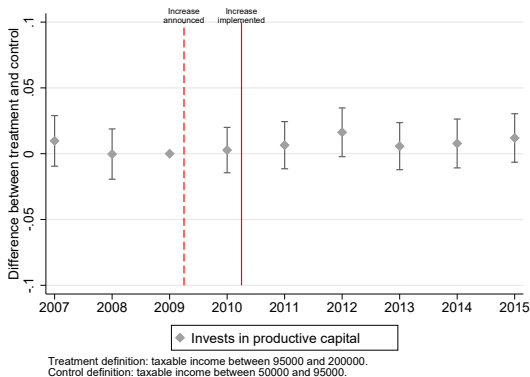
Source: Miller, Pope, Smith (2019)

(b) Shareholder's equity



Treatment definition: taxable income between 95000 and 200000.
Control definition: taxable income between 50000 and 95000.

Figure 5.8: *Coefficient estimates from differences-in-differences specification, investment*



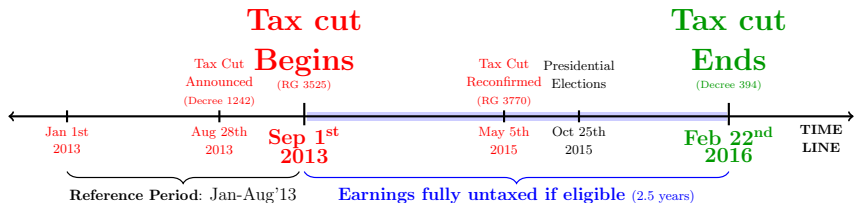
High-wage earners' responses to an 'income tax holiday'

Tortarolo, Cruces, Castillo (2020)

How do high-wage earners respond to a period with no taxes?

- ▶ Argentina's income tax schedule deteriorated in the 2000s (inflation + no indexation) – See lecture 1
- ▶ After losing primary legislative elections, the president wanted to quickly provide a tax relief to income taxpayers
- ▶ Govt exempted a group of wage earners with pre-reform earnings < 15k pesos
- ▶ No taxes for eligible workers for 2.5 years
- ▶ Perfect reform to measure intertemporal LS responses!
- ▶ Findings: a very precise small response from wage earners
 - ▶ Larger responses for overtime hours (albeit small)
 - ▶ Executive workers and switchers are more responsive

Tax variation & data allow for a RDD and DiD analysis



Fully exempt if **wage earnings** \leq **fixed threshold** (\approx p70–p85 untaxed).

Two simple rules:

1. Wage earners in Jan-Aug'13:

{**Highest** monthly wage btw Jan-Aug 2013} \leq AR\$ 15,000

Backward-looking rule that precludes manipulation \implies **RDD**

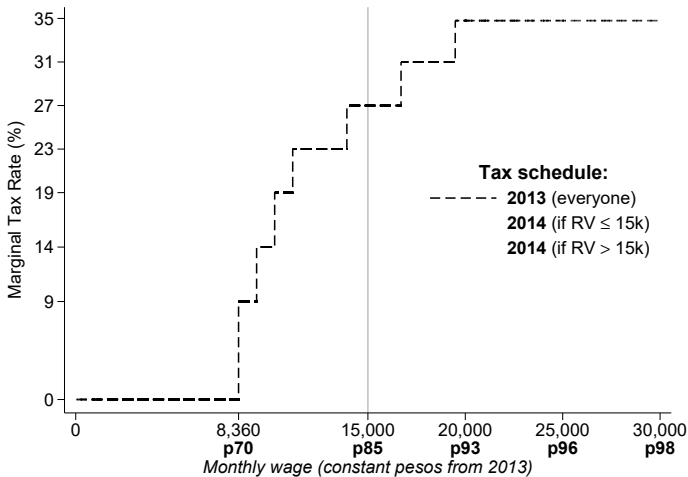
2. Non-wage earners in Jan-Aug'13:

{**First** monthly wage} \leq AR\$ 15,000

Contemporaneous rule subject to manipulation \implies **“notch”**

Theoretical first stage

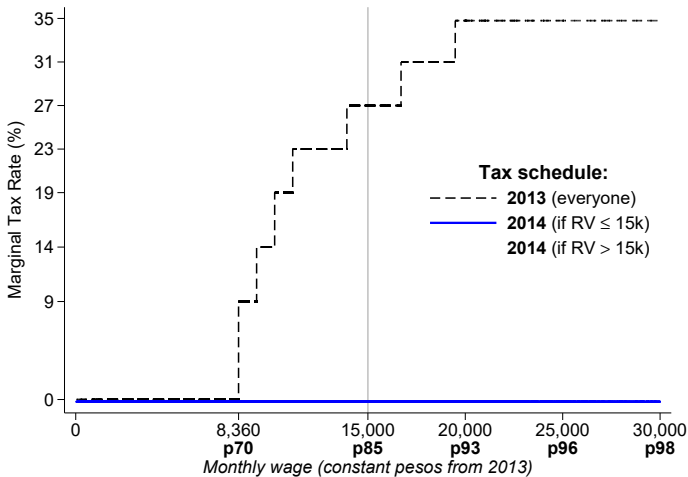
0% MTR & ATR for eligible workers btw Sep'13-Feb'16



(RV = highest monthly wage btw Jan-Aug 2013)

Theoretical first stage

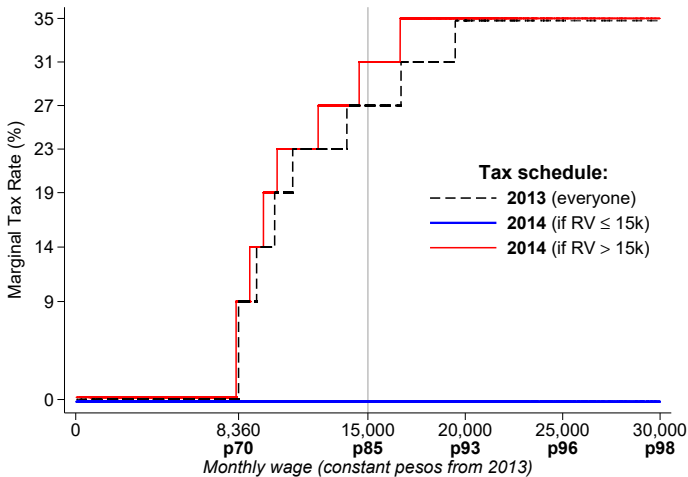
0% MTR & ATR for eligible workers btw Sep'13-Feb'16



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Theoretical first stage

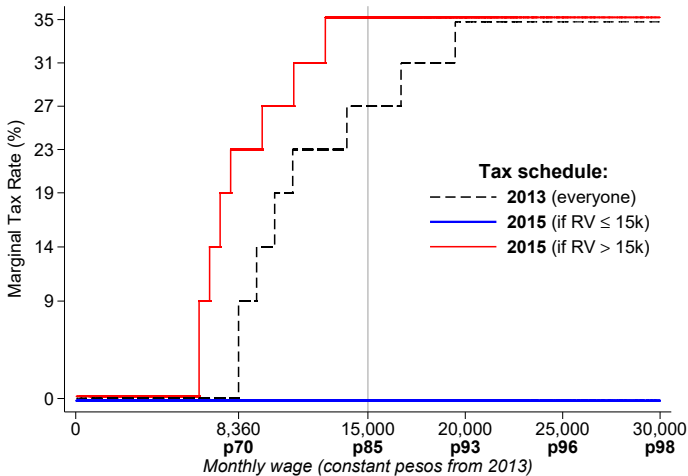
0% MTR & ATR for eligible workers btw Sep'13-Feb'16



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Theoretical first stage

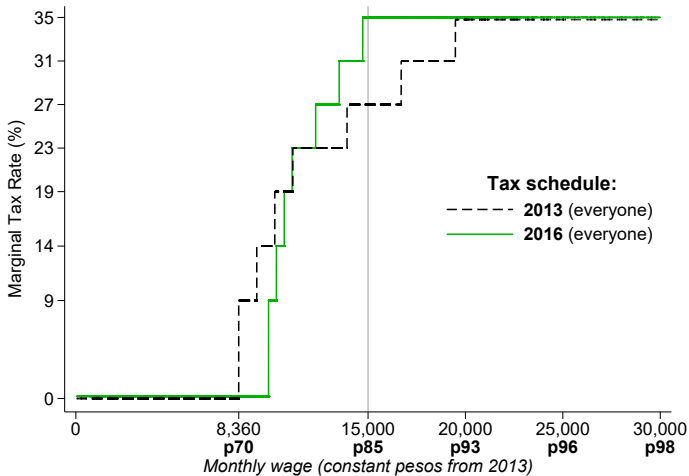
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Theoretical first stage

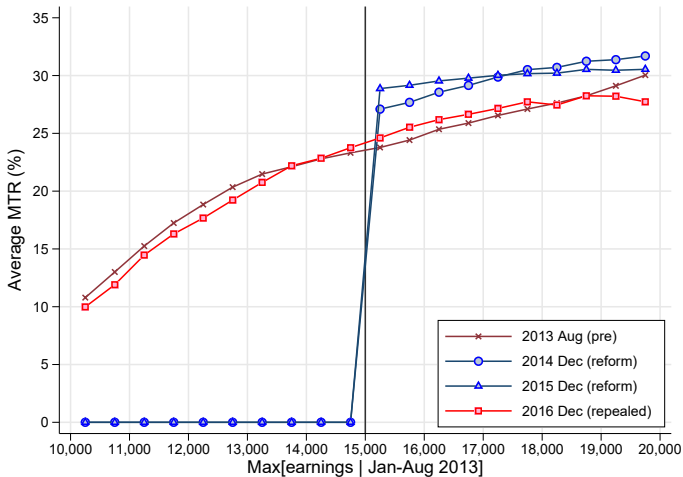
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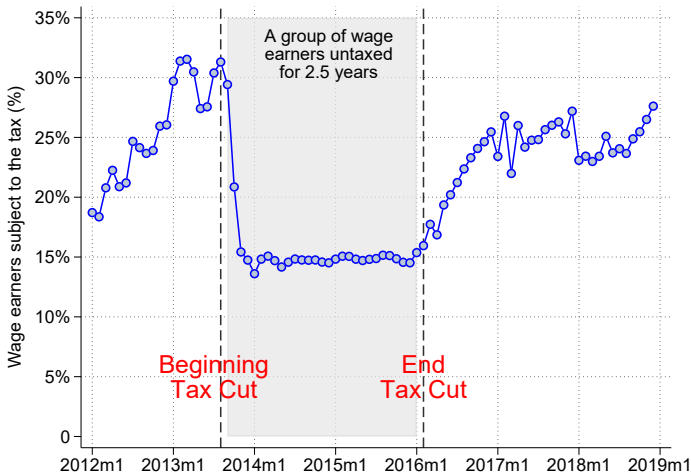
Empirical first stage

Temporary and sharp tax cut, visible in aggregate macro series



Empirical first stage

Temporary and sharp tax cut, visible in aggregate macro series



Tax variation is pretty unique

- ▶ Large/unprecedented tax cut on high-wage earners
 - Tax changes usually small and plagued w/ identification difficulties (e.g., mean reversion)
 - Hard to come up with RDDs in tax research
- ▶ One of the cleanest quasi-randomized experiments to date to study real (intertemporal) responses of upper-wage earners
- ▶ Rich employer-employee administrative data (e.g., observe monthly overtime hours)

Findings

(1) Large and salient decrease in tax rates:

- ↓ MTR from 27% to 0% for single workers (below the threshold)
- ↓ ATR from 7% to 0% for single workers (below the threshold)

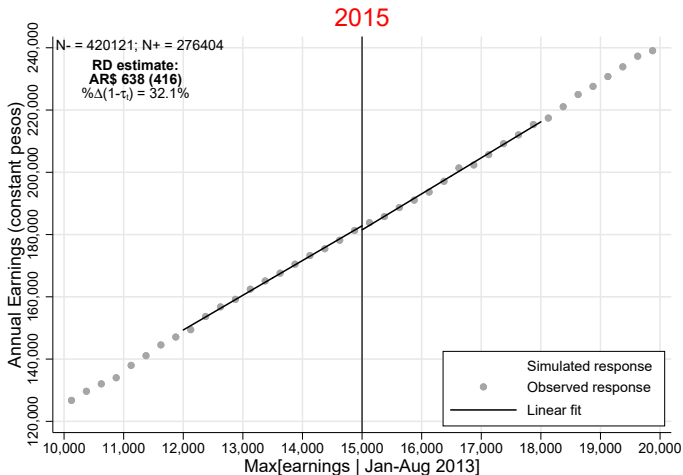
Much bigger than other studies

(2) Very small and precise response of upper-wage earners to a 2.5 year-long income tax cut (hours and monthly wages: $e \sim 0.02$)

(3) Low responses might be driven by **labor demand constraints** and **labor market rigidities** (ej. fixed hours, centralized wage-setting)

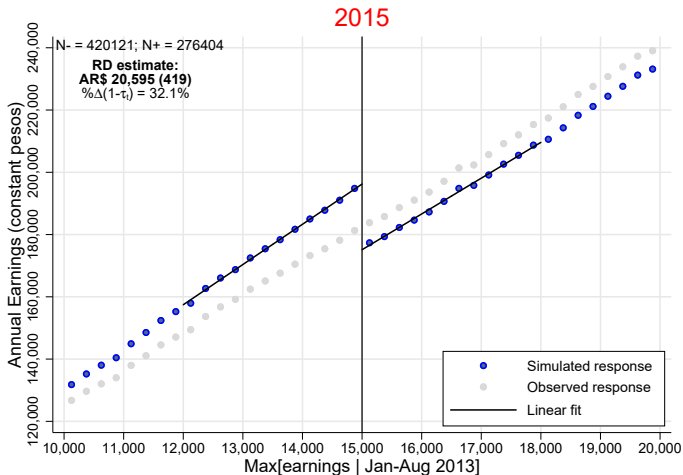
- ▶ overtime hours ($e \sim 0.2$)
- ▶ job switchers ($e \sim 0.1$)
- ▶ managers/executives ($e \sim 0.3$, possibly avoidance)
- ▶ new entrants (enter strategically below 15k; stronger for executives)

Observed response after 2 years



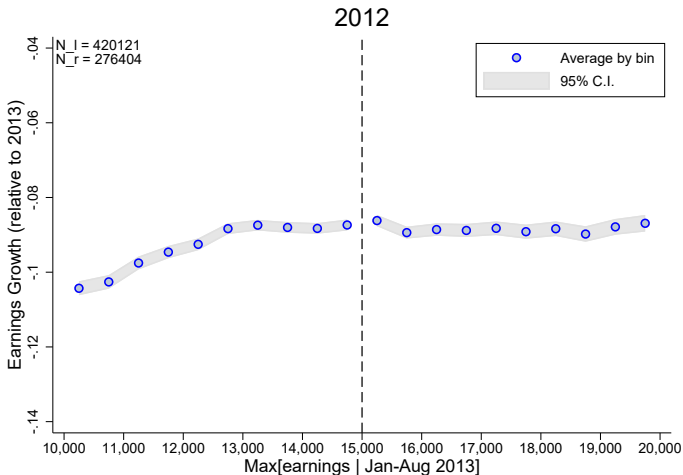
Notes: observed response in gray; simulated response in blue in a frictionless world with $e = 0.3$. Earnings are shifted by $0.3 \times \% \Delta(1 - \tau_{it})$, where τ_{it} is the individual empirical MTR pre and post reform (Aug'13 and Dec'15). 20 equally spaced bins of AR\$ 250 on each side.

Thought experiment (with $e = 0.3$)



Notes: observed response in gray; simulated response in blue in a frictionless world with $e = 0.3$. Earnings are shifted by $0.3 \times \% \Delta(1 - \tau_{it})$, where τ_{it} is the individual empirical MTR pre and post reform (Aug'13 and Dec'15). 20 equally spaced bins of AR\$ 250 on each side.

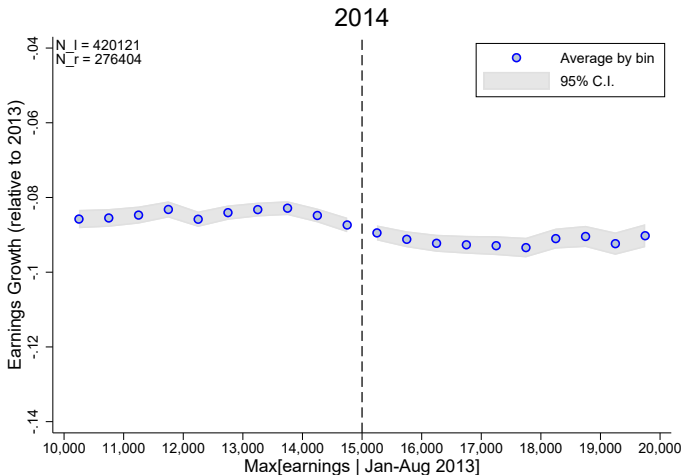
Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500.

Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19%, 39%, 27% and 36%.

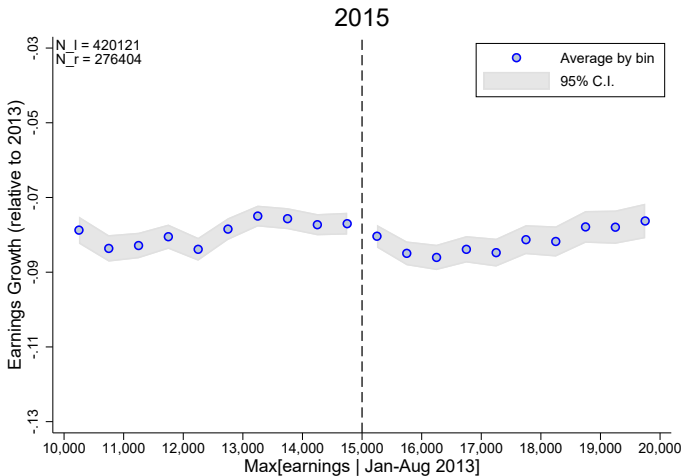
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Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19%, 39%, 27% and 36%.

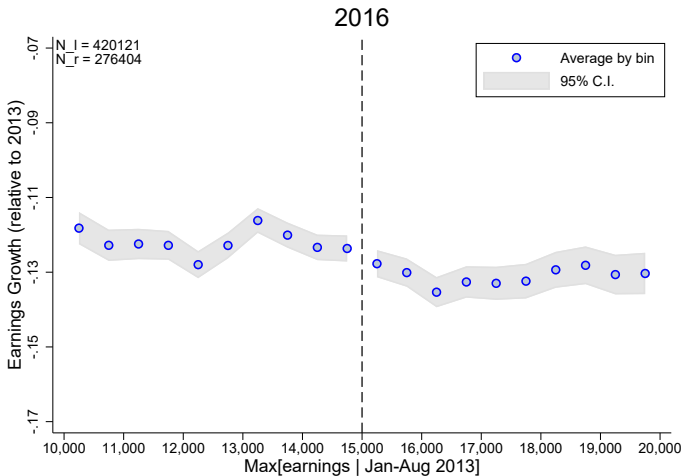
Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500.

Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19%, 39%, 27% and 36%.

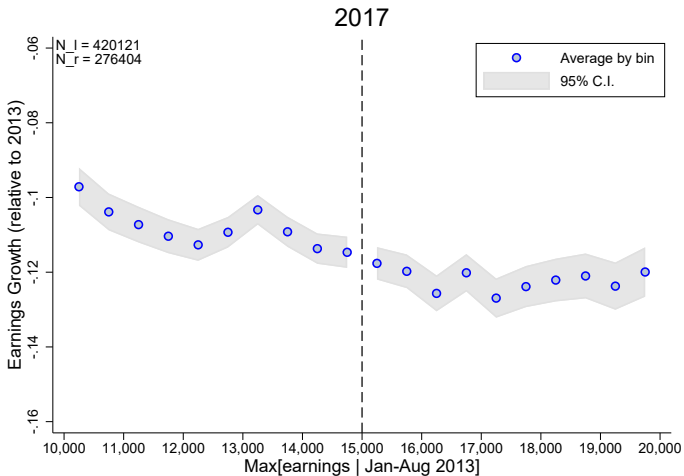
Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500.

Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19%, 39%, 27% and 36%.

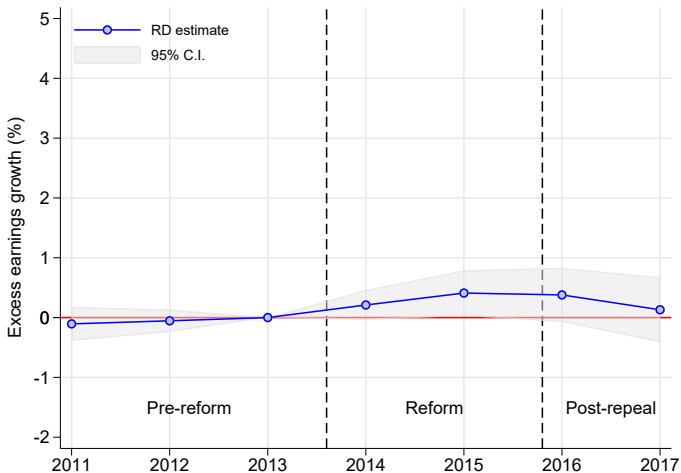
Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500.

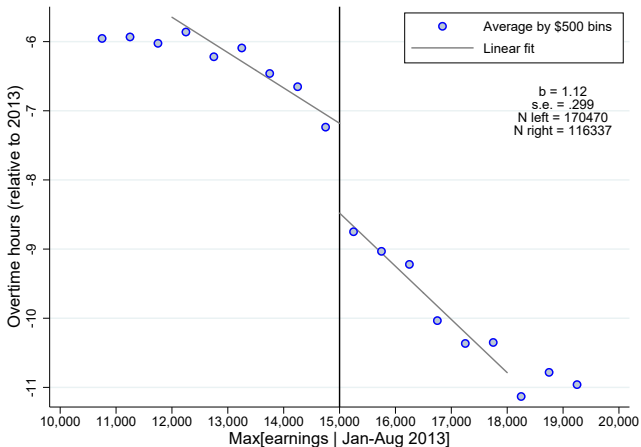
Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19%, 39%, 27% and 36%.

Evolution of RD estimates, 2011-2017



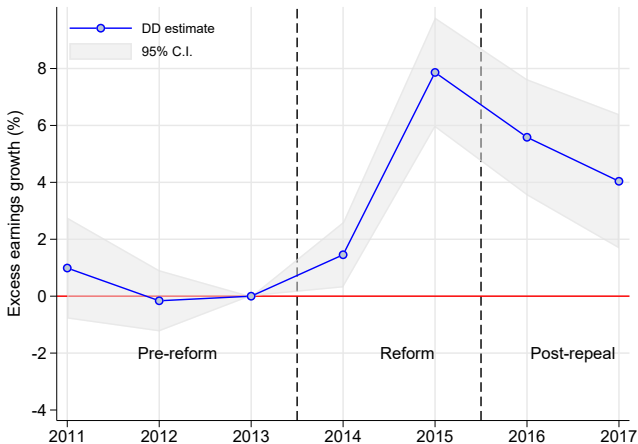
Note: with $e = 0.3$ (thought experiment), excess earnings growth would be 7.5%.

Overtime hours per month (Oct'15 vs Apr'13)



Note: RD estimate where the dependent variable is the absolute difference in overtime hours relative to Apr'13. Averages by bins of the running variable (width AR\$500).

Managers and Executives: earnings growth (DinD)



Note: this figure shows the excess earnings of T vs C group relative to 2013.

T: (10k, 15k]; **C:** (15k, 25k]; **Depvar:** $(y_{i,t} - y_{i,2013})/y_{i,2013}$

INTERNATIONAL MIGRATION

Public debate concern that top skilled individuals move to low tax countries (e.g., in EU) or low tax states (US). Migration concern bigger in public debate than supply-side concern within a country

Optimal top tax rate with migration elasticity of top earners (η_m) and intensive elasticity (e) is: $\tau^* = 1/(1 + a \cdot e + \eta_m)$

⇒ The possibility of migration from top earners can decrease significantly the ability of EU countries to tax high incomes

Interesting variation due to proliferation of special low tax schemes for highly paid foreigners in Europe:

⇒ Kleven et al AER'13 look at **football players** in Europe (highly mobile group, many tax reforms) ⇒ Find significant migration responses to taxes after European football market was de-regulated in '95

⇒ Akcigit-Baslandze-Stantcheva AER'16 look at **innovators** (using patent data) mobility and find significant tax effects for top innovators

US states: Moretti-Wilson AER'17 '19, Rauh-Shyu '19

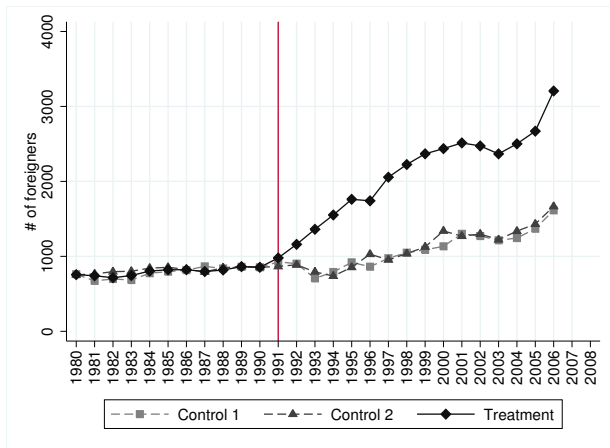
Exploit the 1991 tax scheme in Denmark: immigrants with high earnings ($\geq 103,000$ Euros/year) taxed at flat 25% rate (instead of regular tax with top 59% rate) for 3 years

Use population wide Danish tax data and DD strategy: compare immigrants above eligibility earnings threshold (treatment) to immigrants slightly below threshold (control)

Key finding: Scheme doubles the number of highly paid foreigners in Denmark relative to controls

- ⇒ Elasticity of migration with respect to the net-of-tax rate above one (much larger than the within country elasticity of earnings)
- ⇒ Tax coordination will be key to preserve progressive taxation in the European Union

Figure 3: Total number of foreigners in different income groups



Control 1= annualized income between .8 and .9 of threshold

Control 2= annualized income between .9 and .995 of threshold.

Responses to Low-Income Transfer Programs

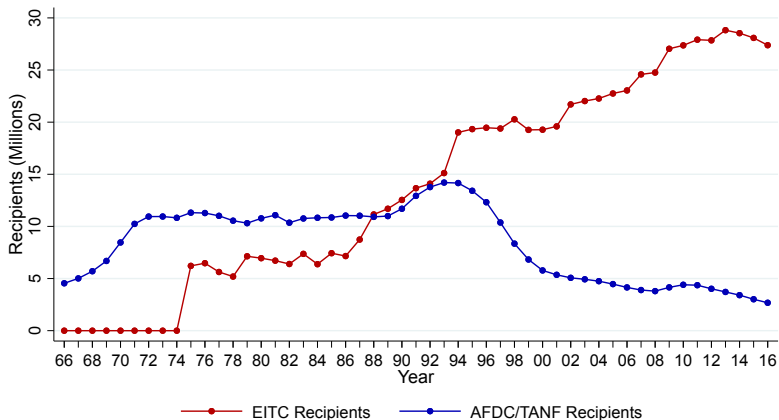
Particular interest in treatment of low incomes in a progressive tax/transfer system: are they responsive to incentives?

Example: 1996 US Welfare Reform

- ▶ Largest change in welfare policy: modified AFDC cash program to provide more incentives to work (renamed TANF)
 - a) Requiring recipients to go to job training or work
 - b) Limiting the duration of benefits (5 year max lifetime)
 - c) Reducing phase out rate of benefits
- ▶ EITC expanded during this period: shift from welfare to “workfare”

Did welfare reform and EITC increase labor supply?

FIGURE 1: LONG-RUN EVOLUTION OF EITC AND CASH WELFARE



Source: Internal Revenue Service (EITC) and Department of Health and Human Services (AFDC/TANF).

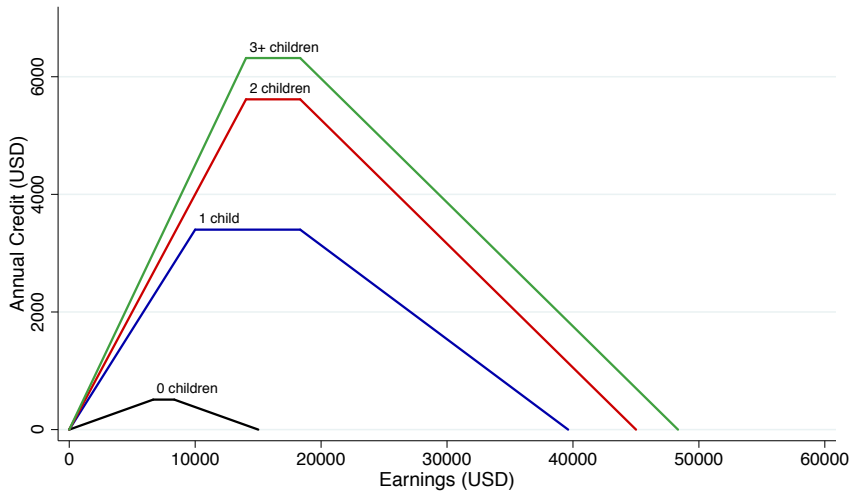
Notes: The red series show the annual number of federal EITC recipients between 1966-2016. The blue series show the average monthly number of Aid to Families with Dependent Children (AFDC) recipients between 1966-1996, and the average monthly number of Temporary Assistance for Needy Families (TANF) recipients between 1997-2016.

Earned Income Tax Credit (EITC) program

The largest US means-tested cash transfer program [\$75bn in 2019, 30m families recipients]. Started small in the 1970s but was expanded in 1986-88, 1994-96, 2008-09

- 1) Eligibility: families with kids and low earnings
- 2) Refundable Tax credit: administered through income tax as annual tax refund received in Feb-April, year $t + 1$ (for earnings in year t)
- 3) EITC has flat pyramid structure with **phase-in** (negative MTR), **plateau** (0 MTR), and **phase-out** (positive MTR)
- 4) Theoretically, EITC should encourage labor force participation (extensive labor supply margin)

EITC Schedule in 2017



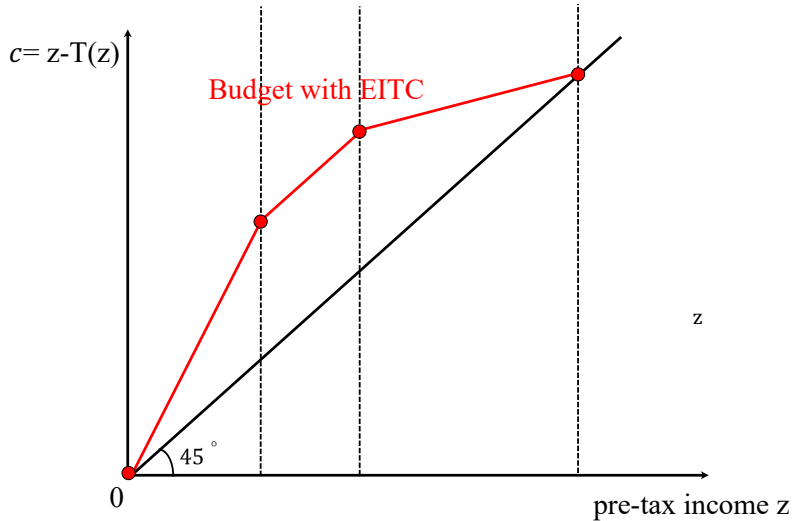
Theoretical Behavioral Responses to the EITC

Extensive margin: EITC makes work more attractive (relative to non-work) \Rightarrow (+) effect on Labor Force Participation

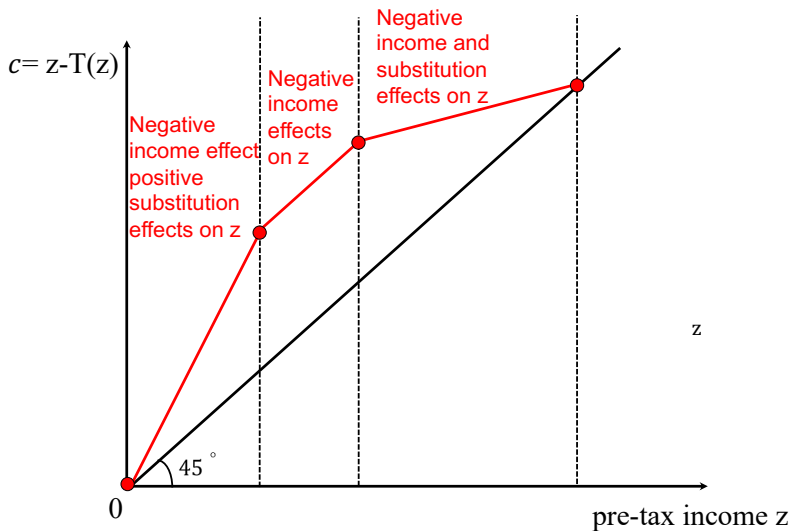
Intensive margin: earnings conditional on working:

- 1) Phase in: (a) Substitution effect: work more due to 40% increase in net wage, (b) Income effect: work less
 \Rightarrow **Net effect**: ambiguous; probably work more
- 2) Plateau: Pure income effect (no change in net wage)
 \Rightarrow **Net effect**: work less
- 3) Phase out: (a) Substitution effect: work less, (b) Income effect: also work less
 \Rightarrow **Net effect**: work less

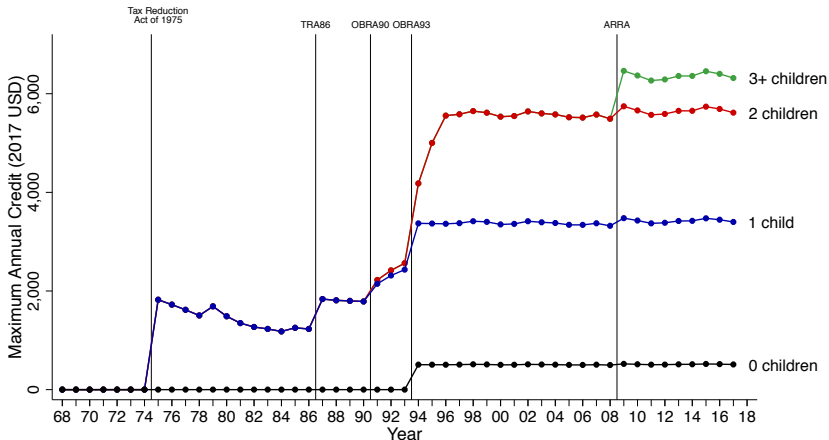
EITC and intensive labor supply



EITC and intensive labor supply



EITC Maximum Credit Over Time



Source: Kleven (2019)

Welfare Reform and EITC Expansion: Labor supply

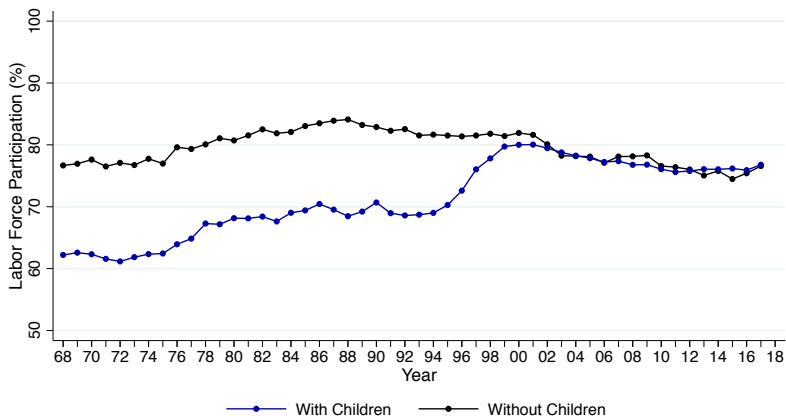
Kleven (2019) looks at the participation of single women (aged 20-50) with kids (treatment) vs without kids (control) in the US

- Large increase in labor force participation of single mothers during the 1990s during welfare reform and EITC expansion
- Unlikely that the EITC can explain it fully because other EITC changes haven't generated such large effects
- Sociological evidence shows that welfare reform “scared” single mothers into working. Single moms in the US were suddenly expected to work
- Maybe a unique combination of EITC reform, welfare reform, economic upturn, and changing social norms lead to this shift

Bastian AEJ-EP'20: 1975 introd of the EITC \uparrow maternal employment by 6% ($\sim 1\text{m}$ mothers; participation elasticity of 0.58)

Labor Force Participation of Single Women

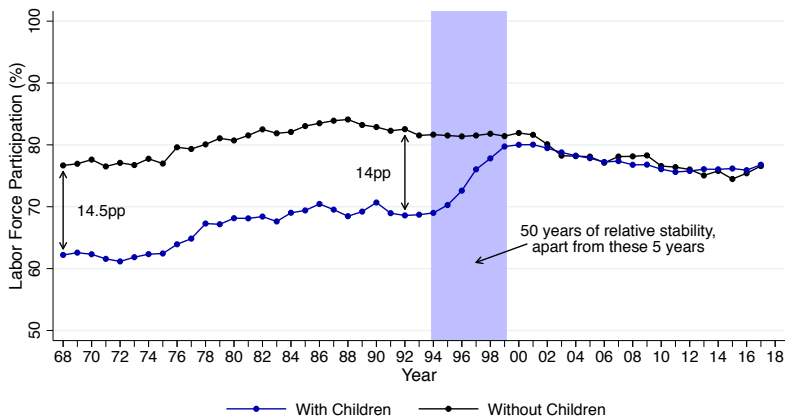
With and Without Children



Source: Kleven (2019)

Labor Force Participation of Single Women

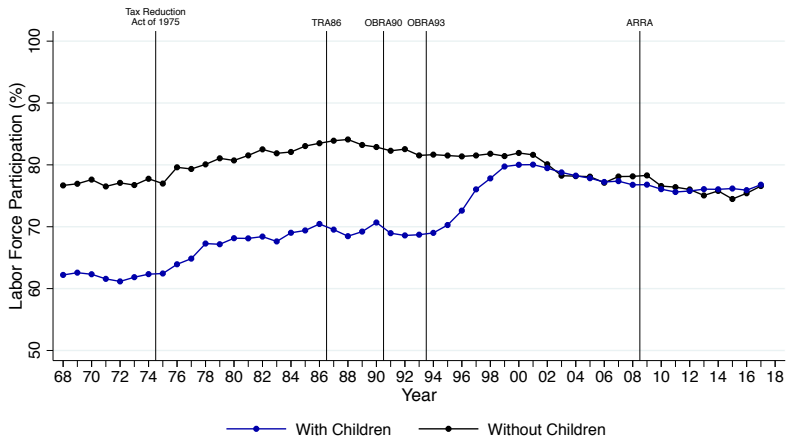
With and Without Children



Source: Kleven (2019)

Labor Force Participation of Single Women

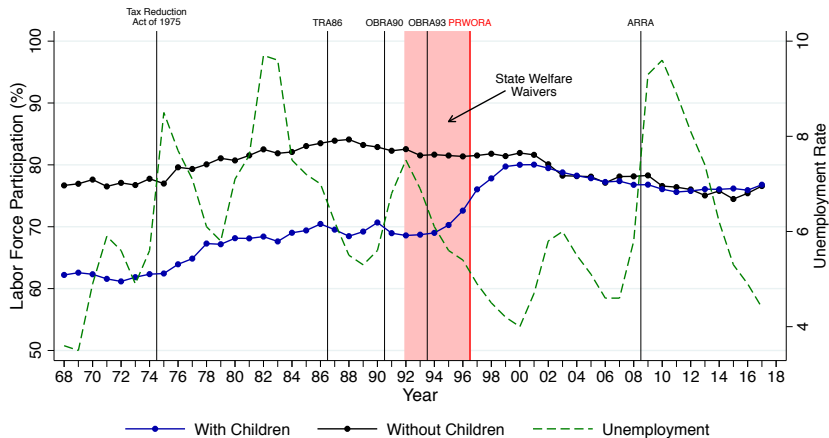
With and Without Children



Source: Kleven (2019)

Labor Force Participation of Single Women

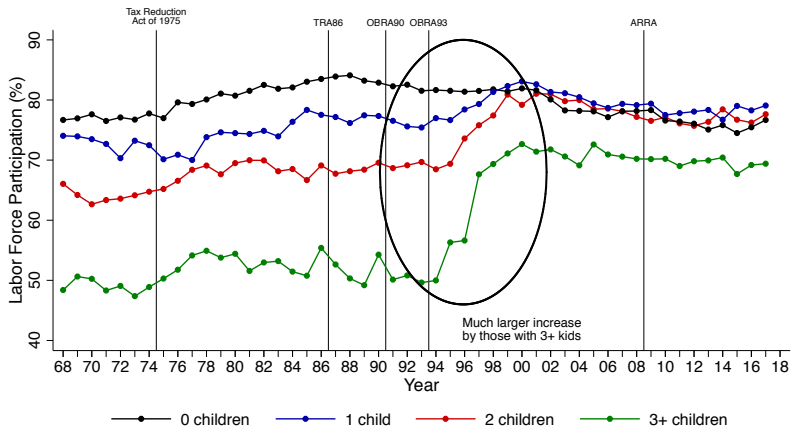
With and Without Children



Source: Kleven (2019)

Labor Force Participation of Single Women

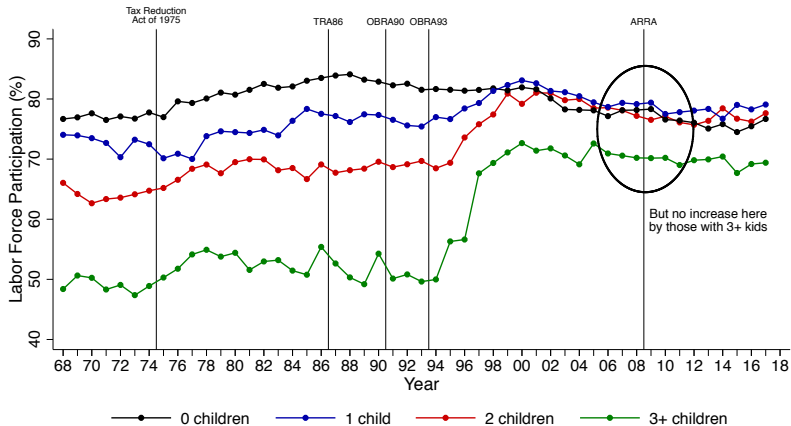
By Number of Children



Source: Kleven (2019)

Labor Force Participation of Single Women

By Number of Children



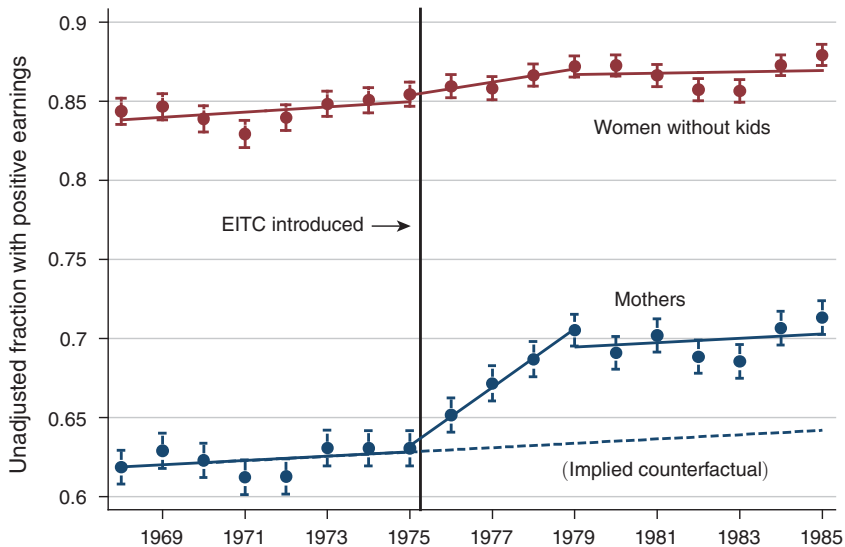
Source: Kleven (2019)

The Rise of Working Mothers and the 1975 EITC

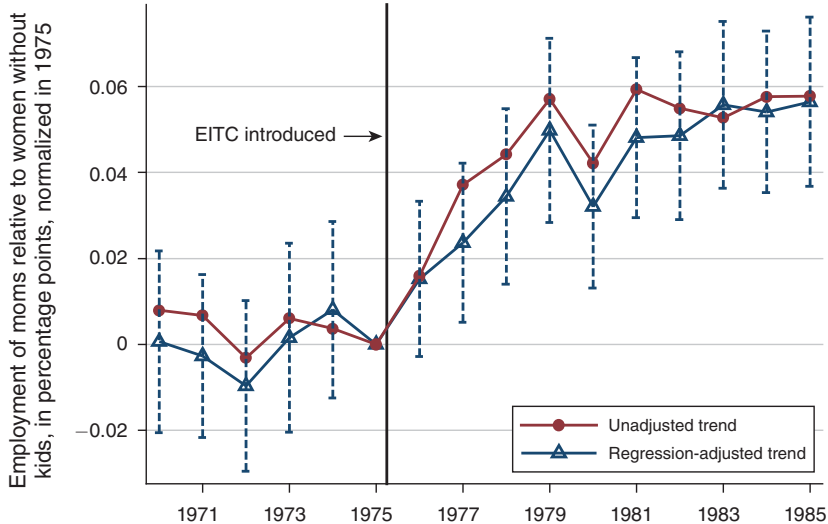
Bastian AEJ-EP'20: 1975 introd of the EITC

- ▶ Uses March Current Population Survey data and a dynamic difference-in-differences (DD) approach
- ▶ ↑ maternal employment by 6% (~1m mothers; participation elasticity of 0.58)
- ▶ Finds suggestive evidence that influx of working mothers affected social attitudes and led to higher approval of working women
- ▶ States with larger EITC responses had larger increases in preferences for gender equality after 1975

Panel A. Unadjusted employment trends (high-impact sample)



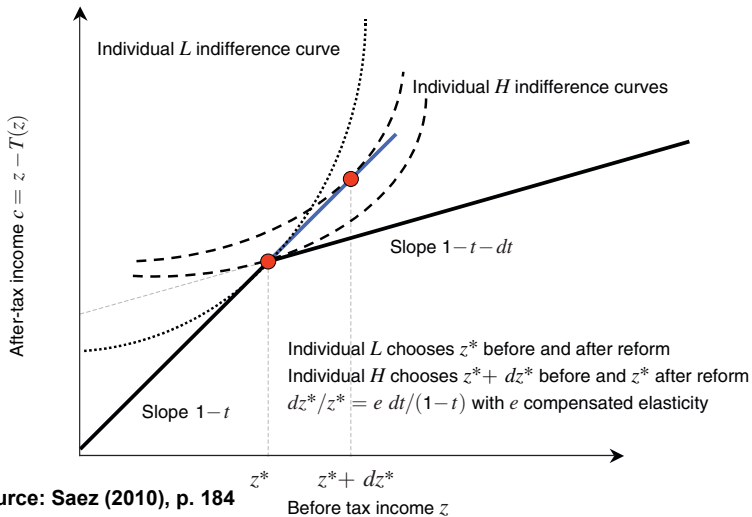
Panel B. Unadjusted and regression-adjusted employment gap



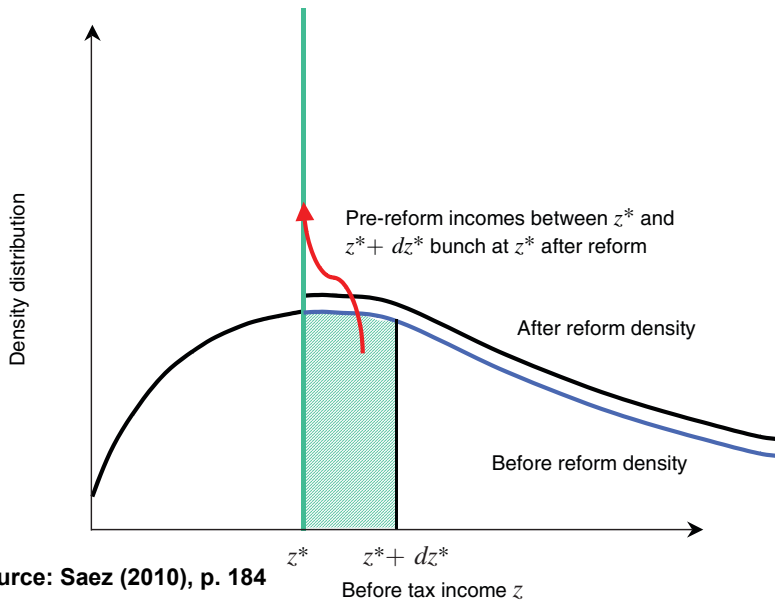
EITC and Intensive Labor Supply Response: Bunching at Kinks

- 1) Basic labor supply theory predicts that we should observe bunching of individuals at the EITC kink points:
 - ▶ Some individuals find it worthwhile to work more when subsidy rate is 40% (2 kids) but not when subsidy rate falls to 0% \Rightarrow Utility maximizing labor supply is to be exactly at the kink
- 2) Amount of bunching is proportional to compensated elasticity
 $\epsilon^c = \frac{dz/z^*}{d\tau/(1-\tau)}$ (excess mass at kink / change in net-of-tax rate): if labor supply is inelastic, then kinks in the budget set are irrelevant and do not create bunching

Panel A. Indifference curves and bunching



Panel B. Density distributions and bunching

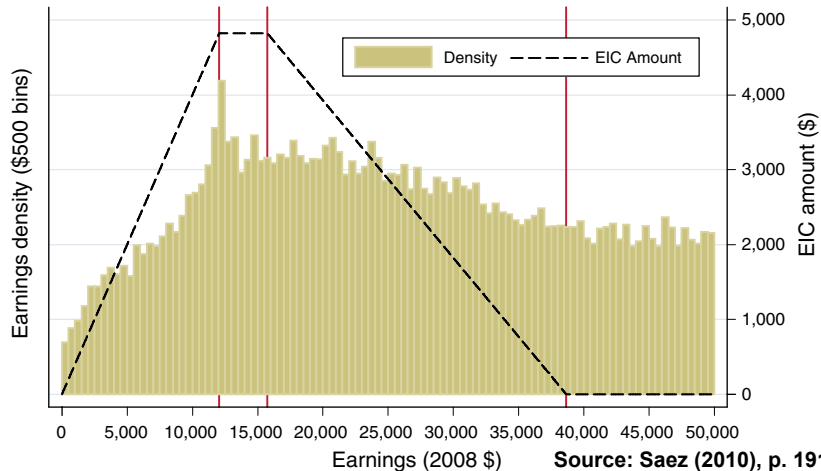


Source: Saez (2010), p. 184

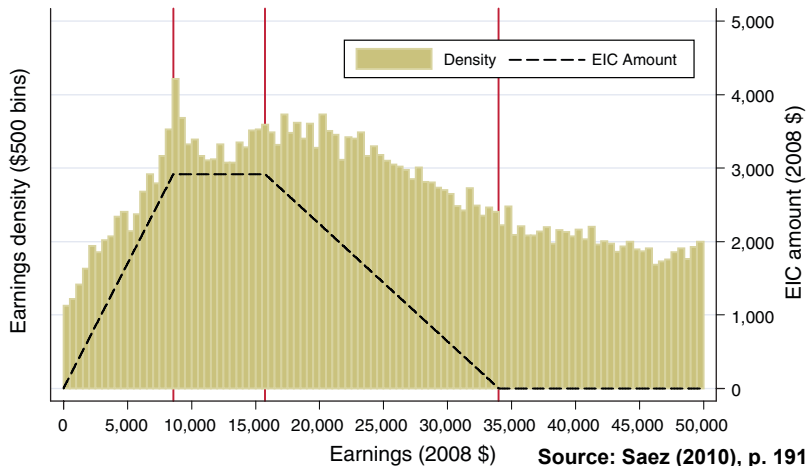
Bunching at Kinks (Saez AEJ-EP'10)

- 1) Uses individual tax return data (IRS public files) from 1960 to 2004
 - 2) Finds bunching around:
 - (a) First kink point of the EITC, especially for self-employed
 - (b) At threshold of the first tax bracket where tax liability starts, especially in the 1960s when this point was very stable
 - 3) However, no bunching observed around all other kink points
- ⇒ Bunching likely due to cheating to maximize tax refund (and not labor supply)

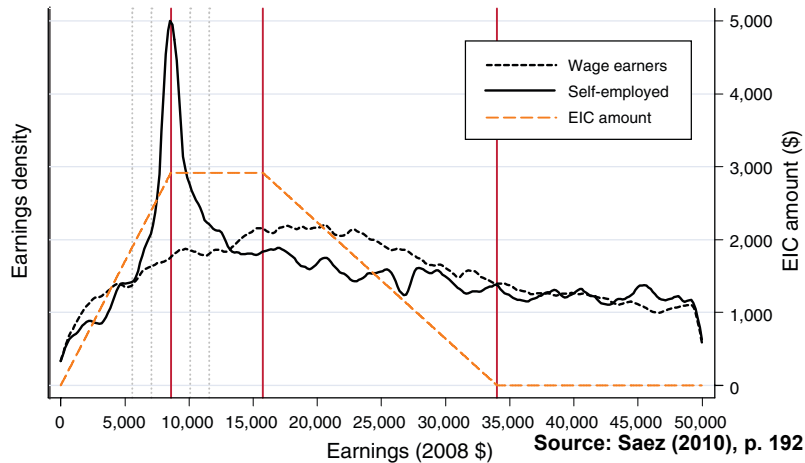
B. Two children or more



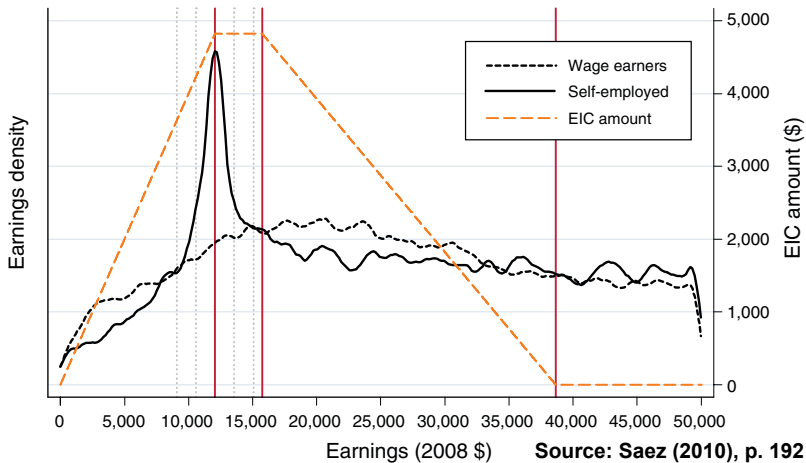
Panel A. One child



Panel A. One child



Panel B. Two or more children



Digression 1: Value of Administrative data

Important development in empirical micro in recent years: shift from survey to admin data (Card-Chetty-Feldstein-Saez'10 and Einav-Levin NBER'13)

Key advantages of admin data:

- 1) Size (often full population available)
- 2) Longitudinal structure (can follow individual across years)
- 3) Ability to match wide variety of data (tax records, payroll records, family records, health outcomes, education records)

Argentina is lagging behind [no data access, hard to match across agencies]

Private sector also generates valuable **big data** (Google, Credit Bureaus, Personnel/health data from large companies, hospitals, etc)

Digression 2: Bunching at Notches

Taxes and transfers sometimes also generate **notches** (=discontinuities) in the budget set

- ▶ **Average Tax Rate** \uparrow discretely: if you earn/report £1 more above the notch, you face the tax rate on your entire income (rather than on the marginal £1 above the threshold, as with MTR)
- ▶ Such discontinuities should create bunching below the notch and gap in density just above the notch

Kleven and Waseem QJE'13 pioneered tax notch analysis in the case of the Pakistani income tax

- ▶ Find evidence of bunching (primarily among self-employed) but size of the response is quantitatively small
- ▶ Unresponsive taxpayers to notches likely due to lack of information

Why not more bunching at kinks? Why are LS responses small?

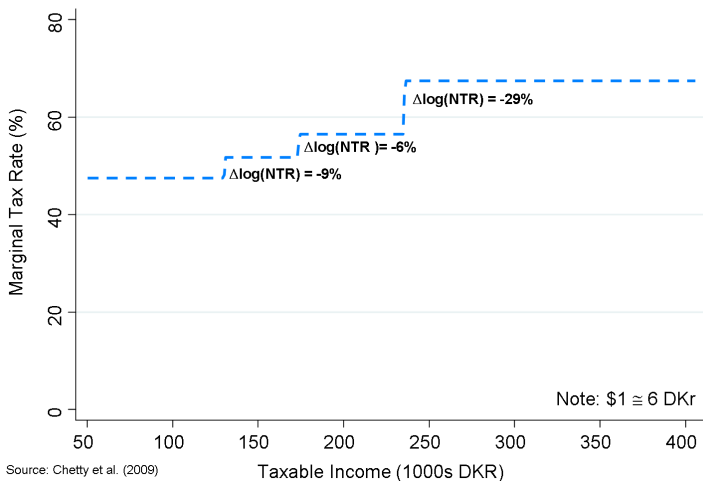
- 1) True intensive elasticity of response may be small
- 2) Randomness in income generation process: Saez (1999) shows that year-to-year income variation too small to erase bunching if elasticity is large
- 3) Frictions: Adjustment costs and institutional constraints (Chetty, Friedman, Olsen, & Pistaferri QJE'11; Kostol & Myhre AER'21)
- 4) Information and salience: Chetty-Friedman-Saez AER'13 show how information about EITC affects bunching at kink point

Chetty, Friedman, Olsen, and Pistaferri QJE'11

Question: How much are elasticity estimates affected by frictions?

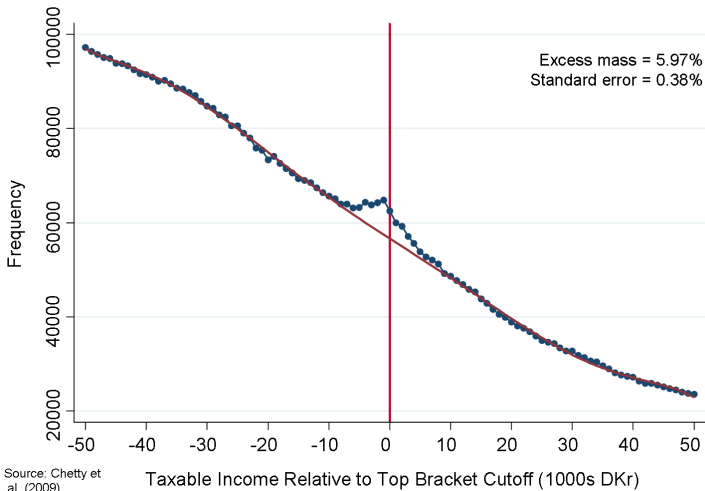
- ▶ If workers face adjustment costs, may not reoptimize in response to tax changes of small size and scope in short run
 - (a) Search costs, costs of acquiring information about taxes
 - (b) Institutional constraints imposed by firms (e.g. 40 hour week) that does not apply to the self-employed or workers with more flexibility (e.g. secondary earners)
- ▶ Chetty et al use matched employer-employee panel data for full population of Denmark
 - ▶ Sample restriction: Wage-earners aged 15-70, 1994-2001
 - ▶ Approximately 2.42 million people per year

Marginal Tax Rates in Denmark in 1995

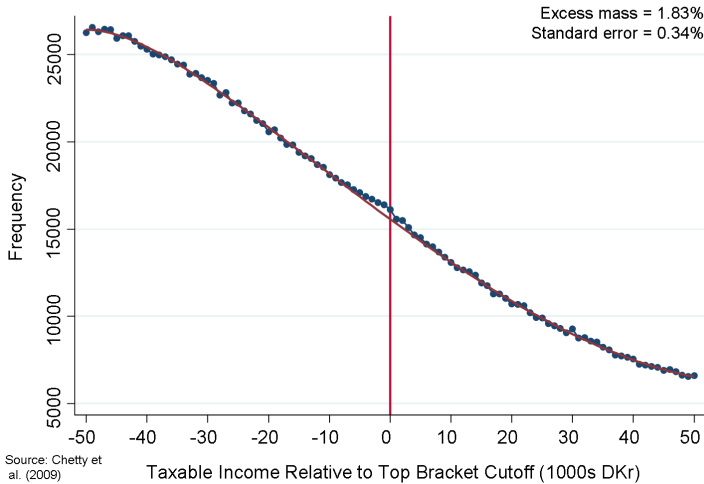


Source: Chetty et al. (2009)

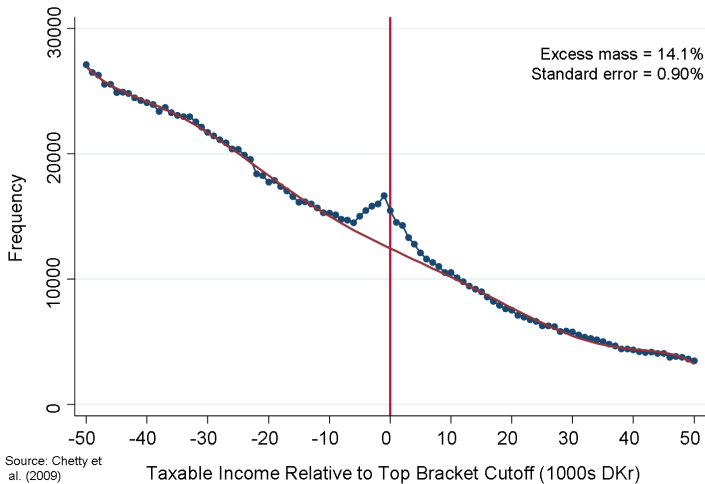
Income Distribution for Wage Earners Around Top Kink (1994-2001)



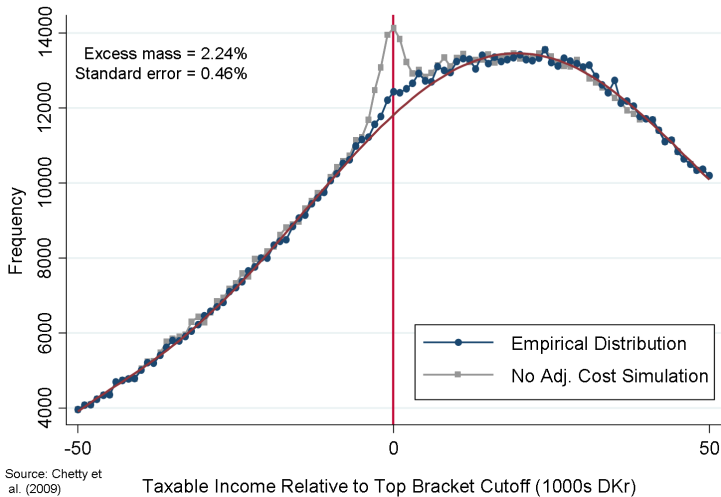
Single Men



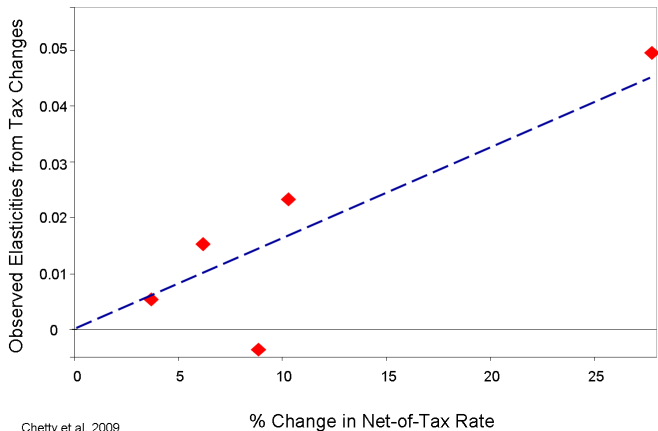
Married Women



Married Women at the Middle Tax: 10% Tax Kink

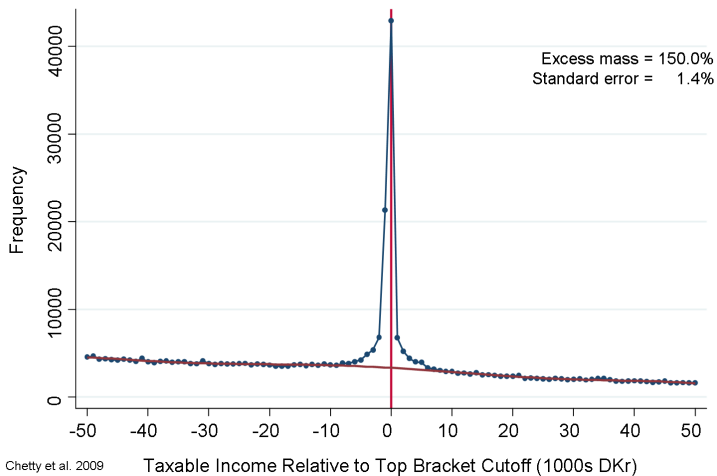


Observed Elasticity vs. Size of Tax Change Married Female Wage Earners

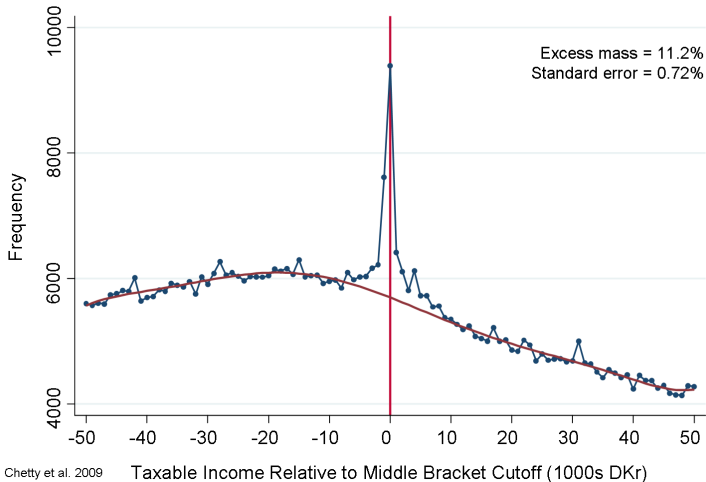


Chetty et al. 2009

Self Employed: Top Kink



Self-Employed: Middle Kink



Chetty et al. QJE'11: Results

- 1) Search costs attenuate observed behavioral responses substantially:
find larger elasticities around large kink points
- 2) Groups with more flexibility respond more (secondary earners, self-employed)
- 3) Overall elasticities estimated from bunching are small in magnitude
(perhaps because frictions prevent full response)

⇒ Bunching methods are good to detect behavioral responses but not necessarily to pin down magnitude of a long-run response to a large tax reform

Kostol & Myhre AER'21

- ▶ Optimization frictions attenuate earnings responses to Δ s in financial incentives (e.g., Chetty 2012 and Kleven and Waseem 2013)
- ▶ Is it due to demand- or supply-side constraints in labor markets?
- ▶ They quantify the relative importance of info about financial incentives vs other types of frictions in shaping earnings responses
 1. Frictions: *notches* in the Norwegian disability insurance (DI) system
→ part-time employed DI recipients in the *dominated region*
 2. Earnings elasticity shaped with info policy? SSA letter informed location and slope of the kink to *some* recipients in May 2015:
Those likely to locate above the kink by Dec'15
 3. Compare bunching around the kink with additional info (treated) to a baseline info case (untreated)
 4. Pin down role of info: compare elast change due to info treatment in 2015 vs structural elast identified from the notch in 2014

Measuring frictions using share of non-optimizers at the *notch*

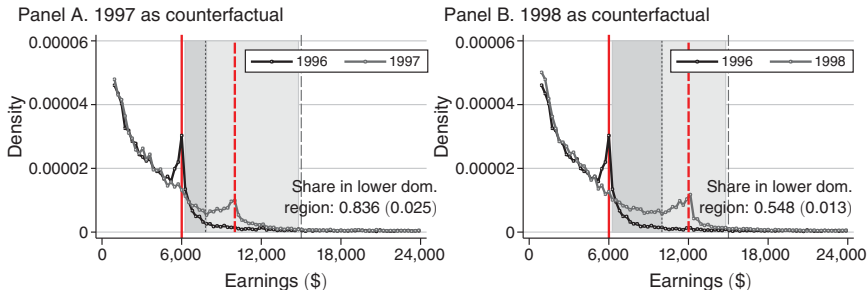


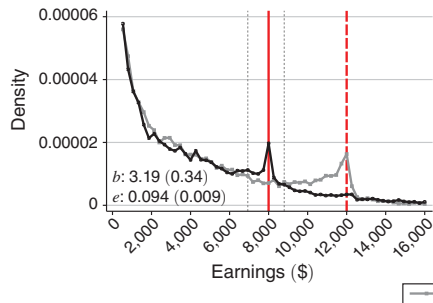
FIGURE 3. ILLUSTRATION OF NONPARAMETRIC APPROACH

Share of nonoptimizers: ratio of cumulated observed bin counts in dominated range to cumulated counterfactual bin counts in dominated range.

- 0.84 (0.55) when using 1997 (1998) as counterfactual

Bunching elasticity at the new *kink* in 2015

Panel A. Notch sample: 2014 versus 2015



Panel B. Kink sample: 2014 versus 2015

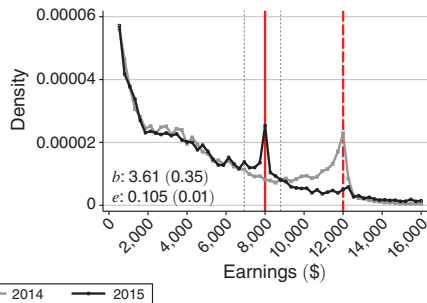


FIGURE 6: NONPARAMETRIC EVIDENCE OF BUNCHING ELASTICITY IN 2015

Non-parametric estimates of the kink elasticity of around 0.1

Structural elasticity: can be inferred from observed earnings response and the share of nonoptimizers (Kleven-Waseem'13) = 0.286. Frictions attenuate it by ~70%

Info letter led to sharper Bunching among the informed

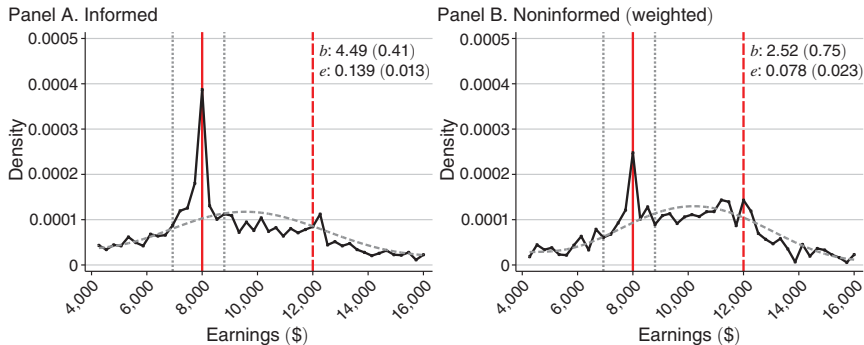


FIGURE 9: EARNINGS DISTRIBUTIONS AROUND THE SGA THRESHOLD IN 2015

Bunching at new kink (vertical solid line) is significantly sharper among the treated than the untreated whose earnings are more likely to remain around the old threshold

Misperceptions of the tax-benefit schedule account for +30% of total frictions

EITC Empirical Studies

Some evidence of response along extensive margin but little evidence of response along intensive margin (except for self-employed)

⇒ Possibly due to **lack of understanding of the program**

Qualitative surveys show that:

Low income families know about EITC and understand that they get a tax refund if they work

However very few families know whether tax refund increases or decreases with earnings

Confusion might be good for the govt as EITC induces work along participation margin without discouraging work along intensive margin (Liebman-Zeckhauser '04, Rees-Taubinsky '16)

Chetty, Friedman, Saez AER'13 EITC information

Use US population-wide tax return data since 1996

1) Substantial heterogeneity fraction of EITC recipients bunching (using self-employment) across geographical areas

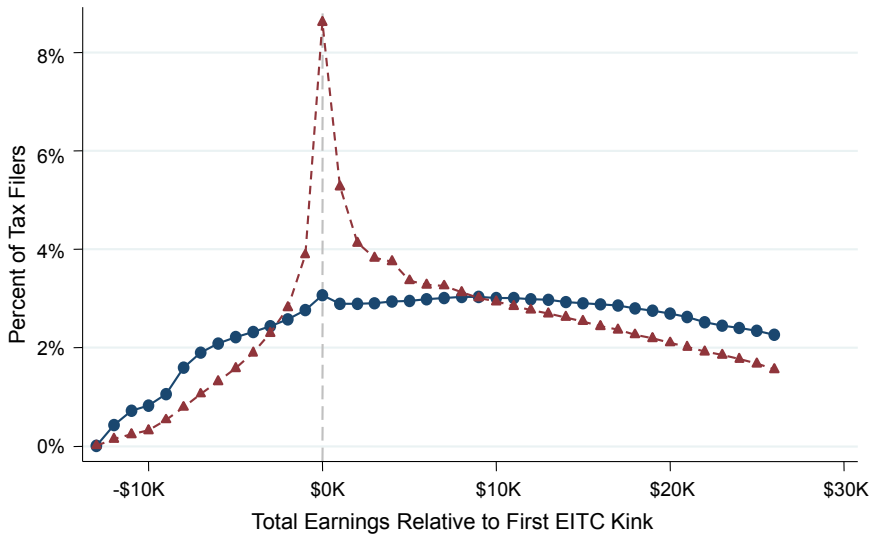
⇒ Information about EITC varies across areas

2) Places with high self-employment EITC bunching display **wage earnings** distribution more concentrated around plateau

⇒ Evidence of wage earnings response to EITC along intensive margin

3) Omitted variable test: use birth of first child to test causal effect of EITC on wage earnings

Earnings Distributions in Lowest and Highest Bunching Deciles



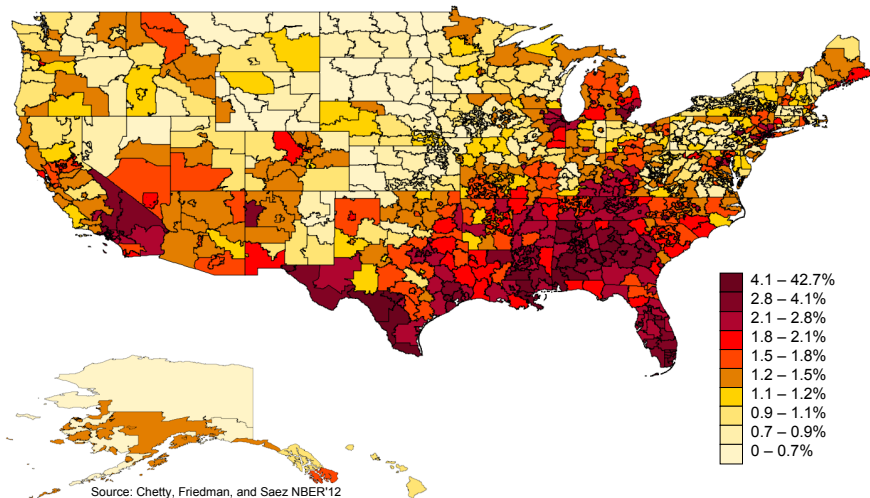
Source: Chetty, Friedman, and Saez NBER'12

Lowest Bunching Decile

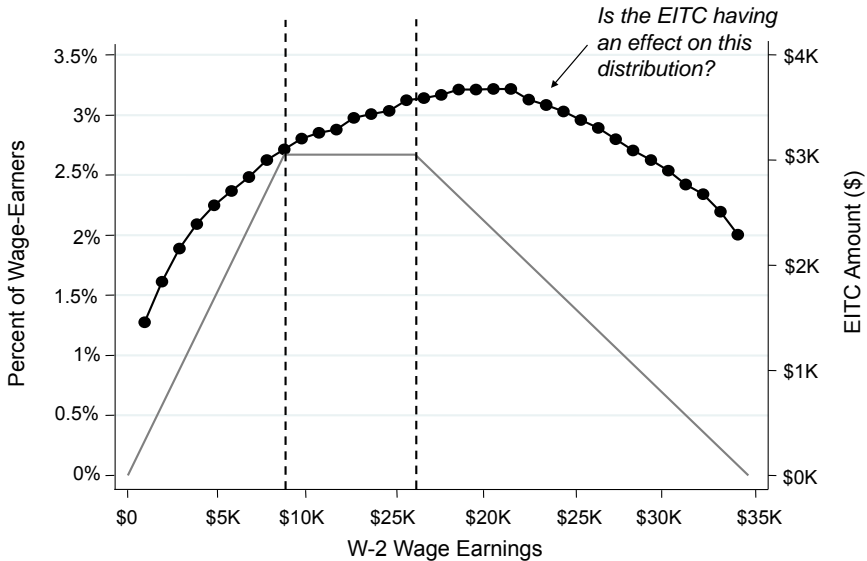


Highest Bunching Decile

Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 2008

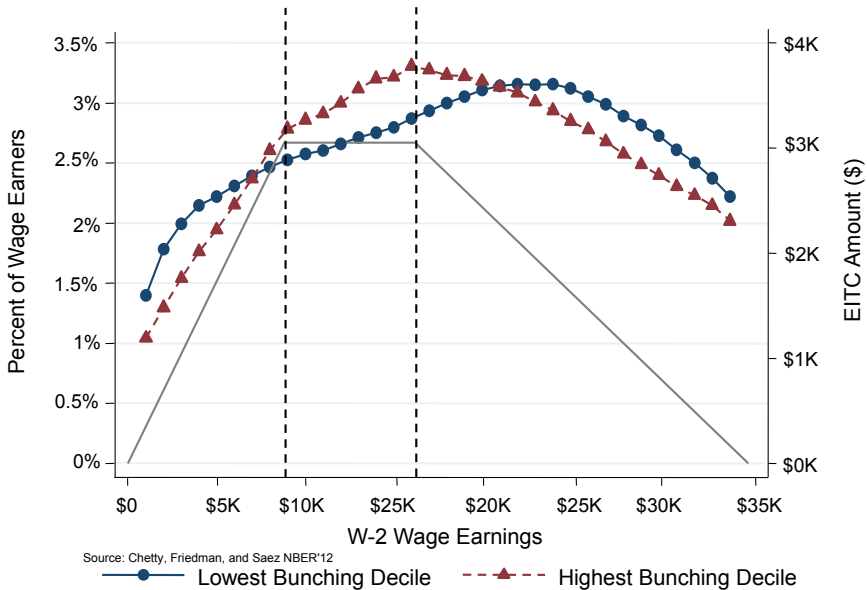


Income Distribution For Single Wage Earners with One Child

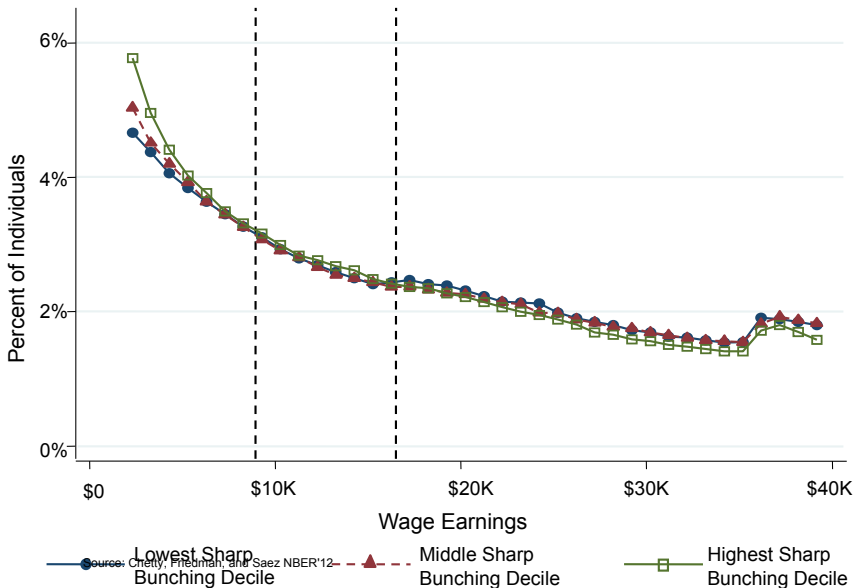


Source: Chetty, Friedman, and Saez NBER'12

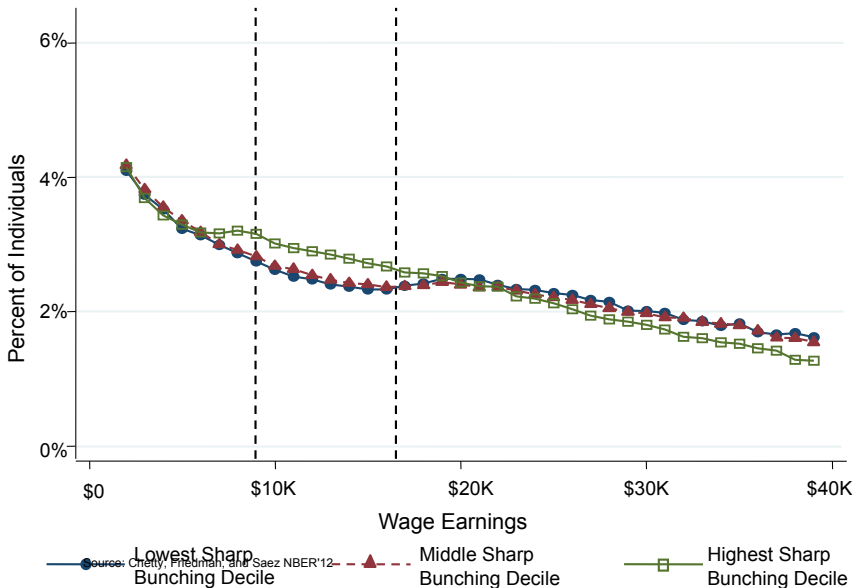
Income Distribution For Single Wage Earners with One Child High vs. Low Bunching Areas



Earnings Distribution in the Year Before First Child Birth for Wage Earners



Earnings Distribution in the Year of First Child Birth for Wage Earners



Many Recent Bunching Studies

Bunching method applied to many settings with nonlinear budgets with convex kink points or notches (Kleven '16 survey):

- Individual tax (Bastani-Selin '14 Sweden, Mortenson-Whitten '16 US)
- Payroll tax (Tazhitdinova '15 on UK)
- Corporate tax (Devereux-Liu-Loretz '14 on UK, Bachas-Soto '17)
- Wealth tax (Seim '17, Jakobsen et al. '17, Londono-Velez and Avila '18)
- Health spending (Einav-Finkelstein-Schrimpf '13 on Medicare Part D)
- Retirement savings (401(k) matches)
- Retirement age (Brown '13 on California Teachers)
- Housing transactions (Best and Kleven '17 on UK)

General findings:

- Clear bunching when info is salient and outcome easily manipulable.
Bunching comes often from avoidance/evasion rather than real behavior
- Bunching almost always small relative to conventional elasticity estimates

Social Determinants of Labor Supply

Strong evidence that labor supply $l(w, R)$ is not purely an individual decision based on standard invariant utility $u(c, l)$

Social norms play large role. So, women's market labor supply responses to taxes and transfers likely affected by social norms

US female labor force participation during World War II: 50% increase from '40 to '45 (2/3 reversed afterwards)

Child penalties in female earnings vary a lot across countries (Kleven et al. AEA PP'19) and are not due solely to monetary incentives but also to norms about working moms

US female labor force participation, age 16-64

Source: Saez AEA-PP'21



Source: Historical Statistics of the United States (Current Population Reports).

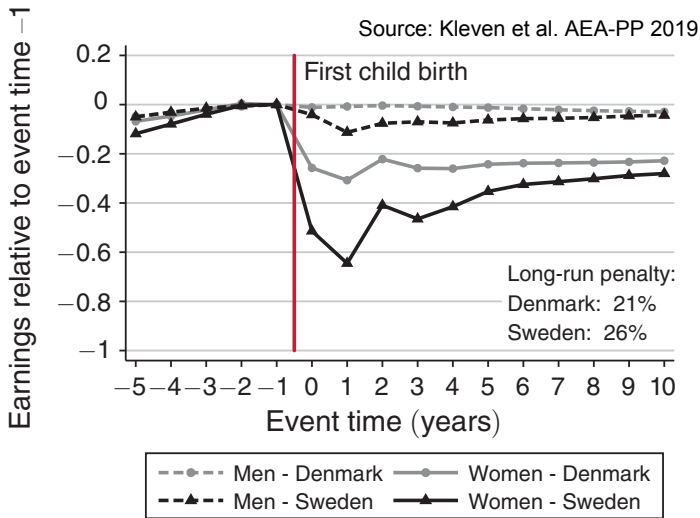


FIGURE 1. CHILD PENALTIES IN EARNINGS IN SCANDINAVIAN COUNTRIES

Source: Kleven et al. AEA-PP 2019

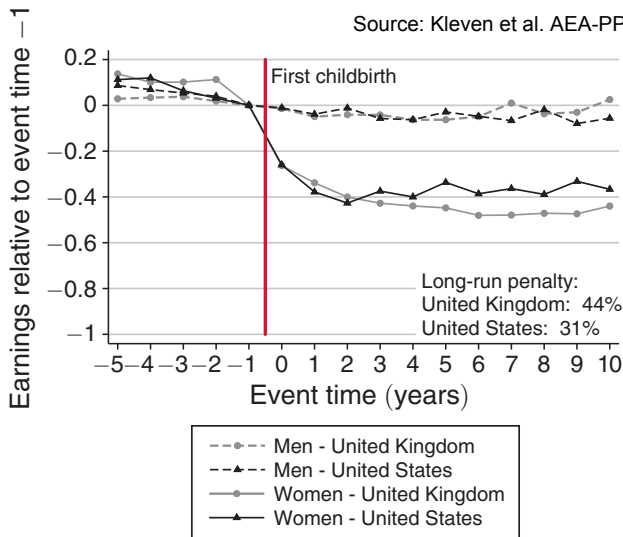


FIGURE 2. CHILD PENALTIES IN EARNINGS IN ENGLISH-SPEAKING COUNTRIES

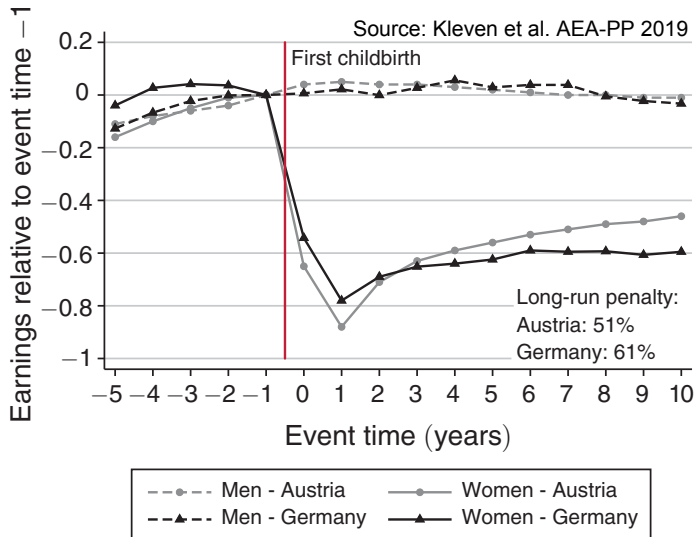


FIGURE 3. CHILD PENALTIES IN EARNINGS IN GERMAN-SPEAKING COUNTRIES

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