# Lecture 4: Labor Supply Responses to Taxation

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# GOALS OF THIS LECTURE

1) Cover empirical studies of labor supply responses to taxation going historically from earlier to more recent papers. Contributes to our highly important "internal paper wikipedia" (IPW).

2) Understand key methodologies such as non-linear budget sets and "bunching at the kinks," which are useful for a wide range of empirical work.

3) Critically discuss papers' methodologies and results so as to practice our research skills.

# MOTIVATION

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

2) 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 and migration decisions]

3) Reported earnings for tax purposes can also vary due to (a) tax avoidance [legal tax minimization], (b) tax evasion [illegal under-reporting]

4) Different responses in short-run and long-run: long-run response most important for policy but hardest to estimate

# STATIC MODEL: SETUP

Baseline model: (a) static, (b) linearized tax system, (c) pure intensive margin choice, (d) single hours choice, (e) no frictions

Let $c$ denote consumption and $l$ hours worked, utility $u(c, l)$ increases in $c$, and decreases in $l$

Individual earns wage $w$ per hour (net of taxes) and has $y$ in non-labor income

Key example: pre-tax wage rate $w^p$ and linear tax system with tax rate $\tau$ and demogrant $G \Rightarrow c = w^p(1-\tau)l + G$

Individual solves

$$\max_{c,l} u(c, l) \quad \text{subject to} \quad c = wl + y$$

# LABOR SUPPLY BEHAVIOR

FOC: $wu_c + u_l = 0$ defines uncompensated (Marshallian) labor supply function $l^u(w, y)$

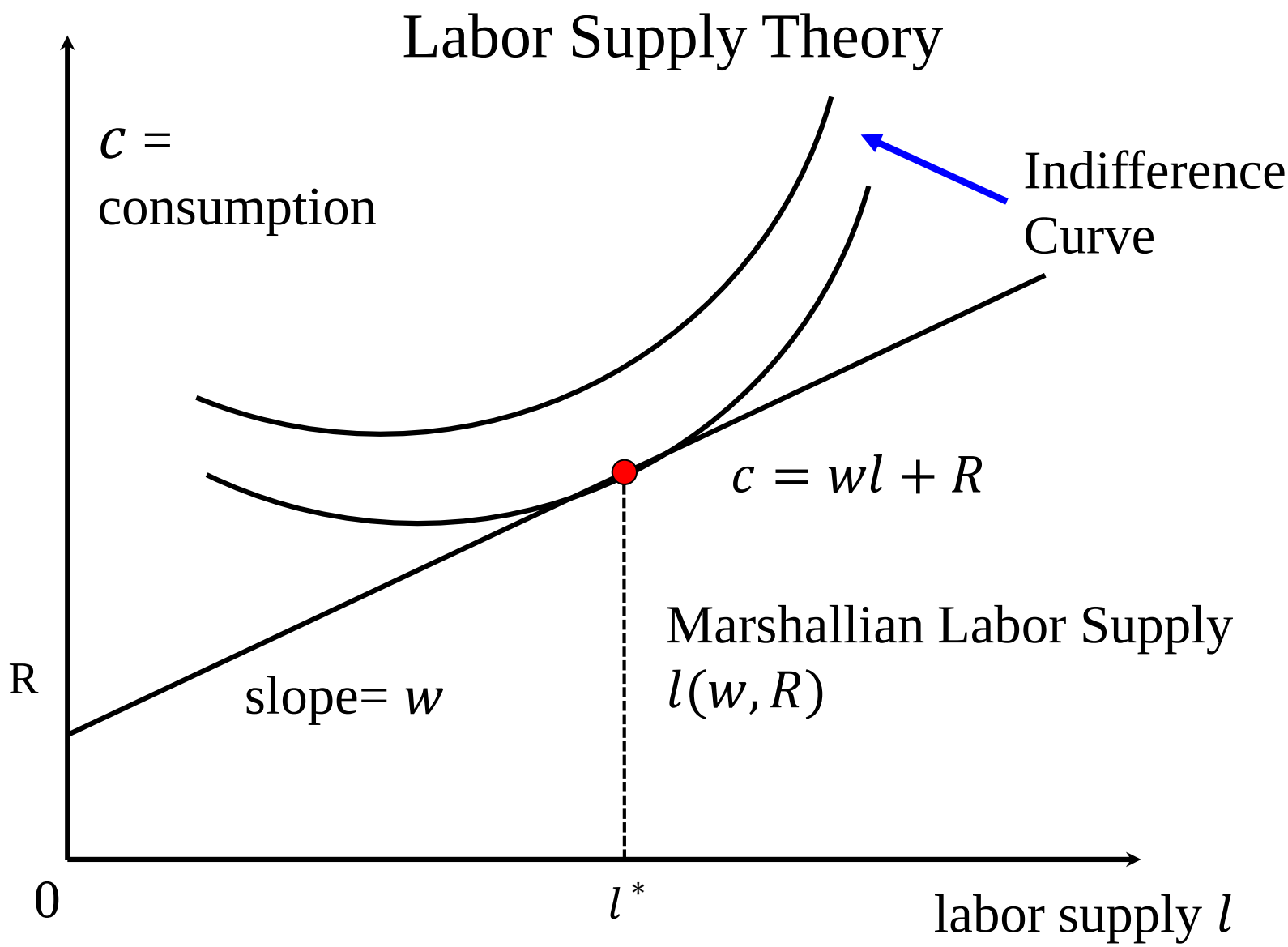
Uncompensated elasticity of labor supply: $\varepsilon^u = (w/l)\partial l^u/\partial w$ [% change in hours when net wage $w \uparrow$ by 1%]

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

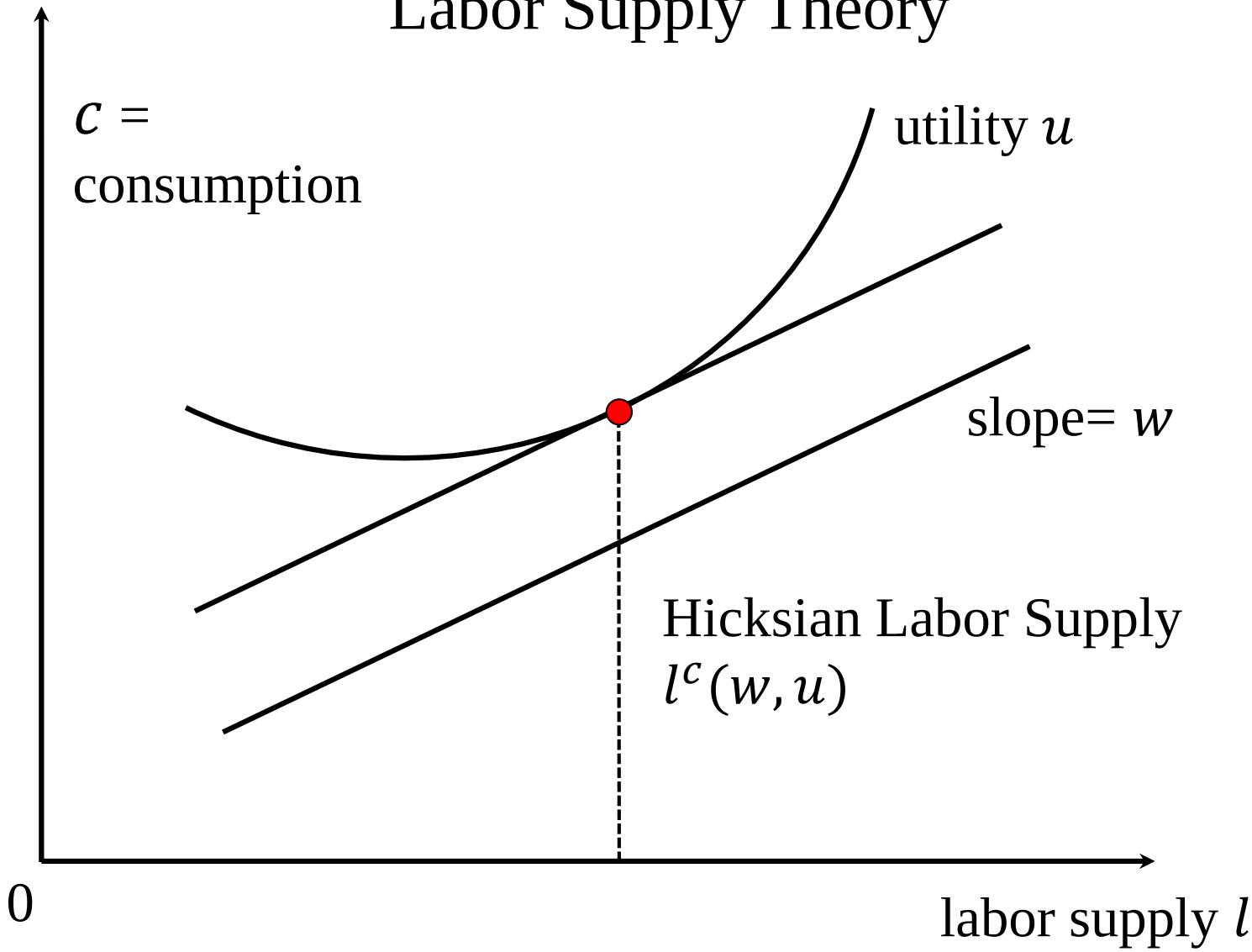
Compensated (Hicksian) labor supply function $l^c(w, u)$ which minimizes cost $wl - c$ st to constraint $u(c, l) \geq u$.

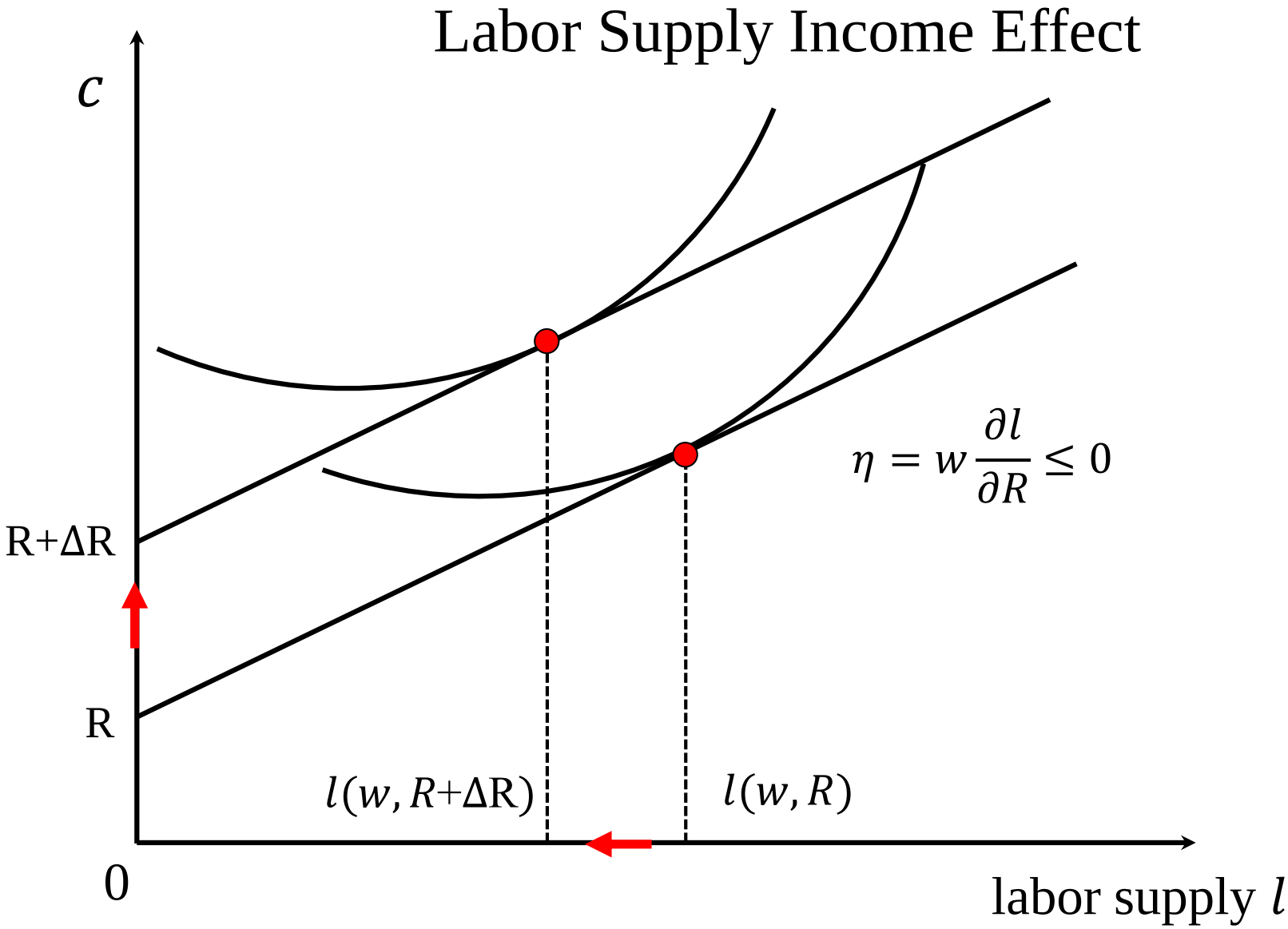
Compensated elasticity of labor supply: $\varepsilon^c = (w/l)\partial l^c/\partial w > 0$

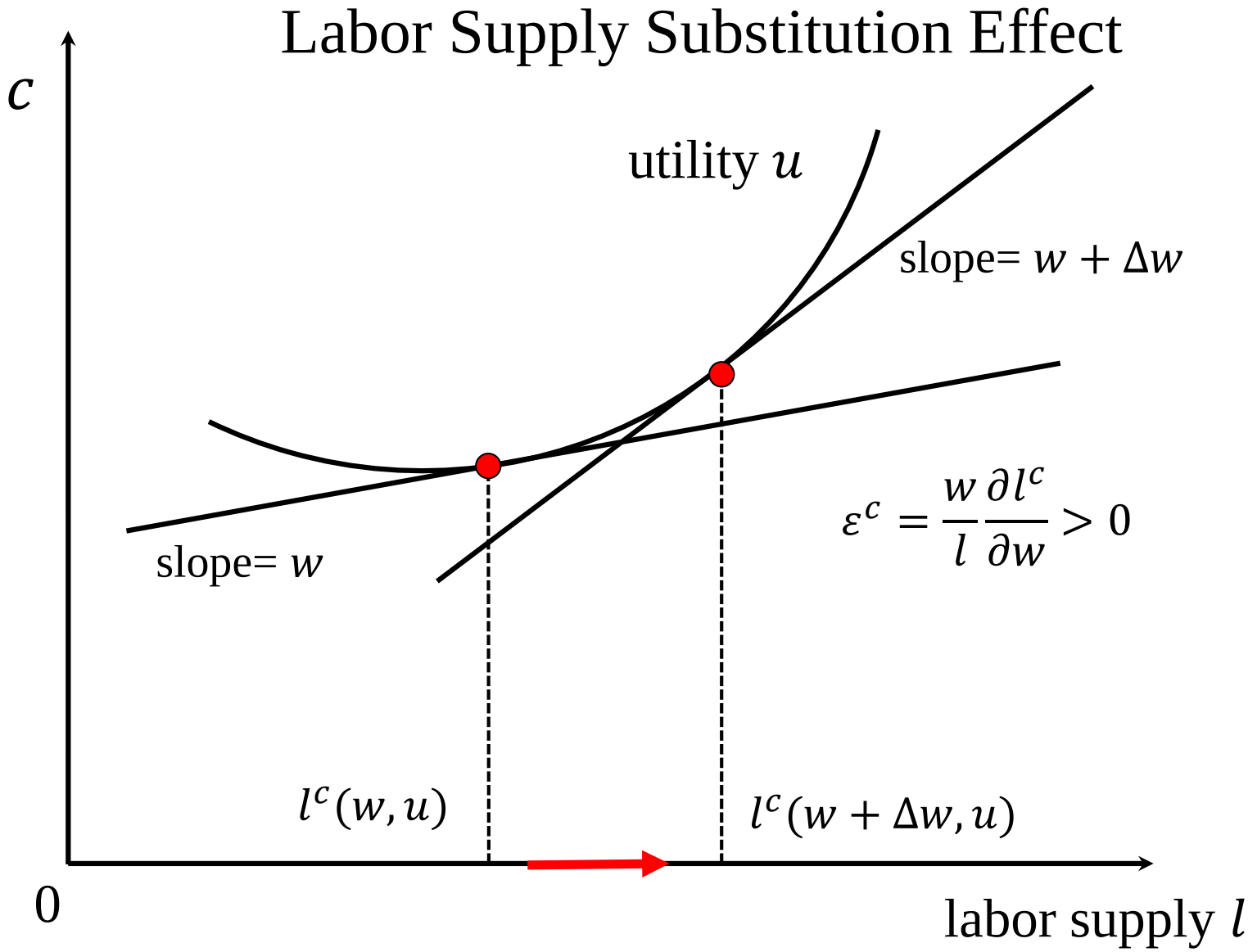
Slutsky equation: $\partial l/\partial w = \partial l^c/\partial w + l\partial l/\partial y \Rightarrow \varepsilon^u = \varepsilon^c + \eta$

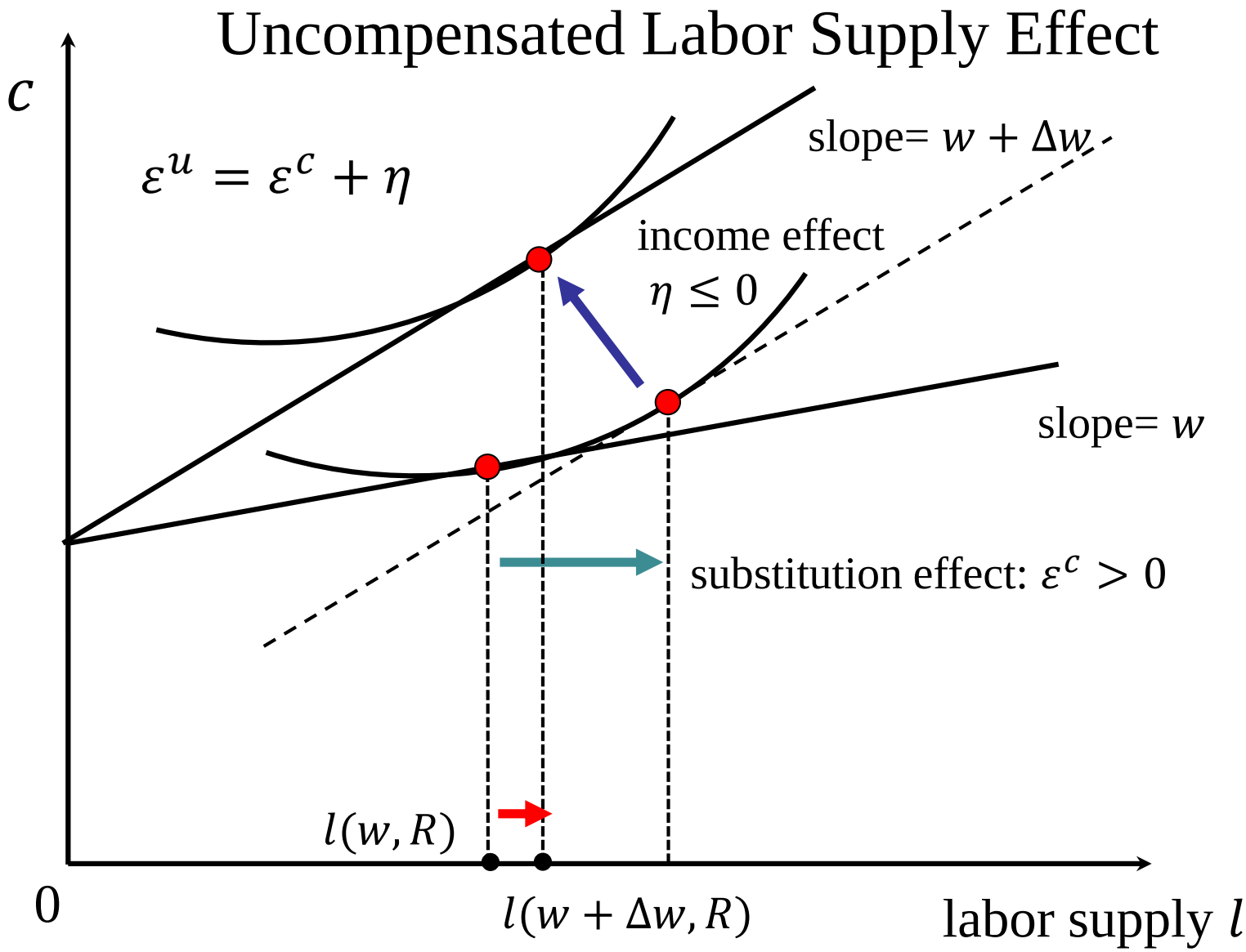

Labor Supply Theory
$c$ =
consumption
Indifference
Curve
$c = wl + R$
Marshallian Labor Supply
$l(w, R)$
R
slope= $w$
0
$l^*$
labor supply $l$

# Labor Supply Theory




Labor Supply Income Effect
$c$
R+ΔR
R
0
$l(w, R+\Delta R)$
$l(w, R)$
$\eta = w\frac{\partial l}{\partial R} \leq 0$
labor supply $l$


Labor Supply Substitution Effect
$c$
utility $u$
slope= $w + \Delta w$
slope= $w$
$\varepsilon^c = \frac{w}{l}\frac{\partial l^c}{\partial w} > 0$
$l^c(w, u)$
$l^c(w + \Delta w, u)$
0
labor supply $l$


Uncompensated Labor Supply Effect
$c$
$\varepsilon^u = \varepsilon^c + \eta$
slope= $w + \Delta w$
income effect
$\eta \leq 0$
slope= $w$
substitution effect: $\varepsilon^c > 0$
$l(w, R)$
0
$l(w + \Delta w, R)$
labor supply $l$

# 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 regression:

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

$w_i$ is the net-of-tax wage rate

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

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

$\beta$ measures uncompensated wage effects, and $\gamma$ income effects [can be converted to $\varepsilon^u$, $\eta$]

# BASIC CROSS SECTION RESULTS

1. **Male workers** [primary earners when married] (Pencavel, 1986 survey):

a) Small effects $\varepsilon^u = 0$, $\eta = -0.1$, $\varepsilon^c = 0.1$ with some variation across estimates (sometimes $\varepsilon^c < 0$).

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)

# KEY ISSUE: $w$ correlated with tastes for work

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

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 $\epsilon_i$ is positively correlated with $w_i$ leading to an upward bias in OLS

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

Controlling for $X_i$ can help but can never be sure that we have controlled for all the factors correlated with $w_i$ and tastes for work: **Omitted variable bias**

$\Rightarrow$ Tax changes provide more compelling identification

# TAX ISSUE: NON-LINEAR BUDGET SETS

Actual tax system is not linear but piece-wise linear with varying marginal tax rate $\tau$ due to (a) means-tested transfer programs, (b) progressive individual income tax

Same theory applies when considering the linearized tax system $c = wl + y$ with $w = w^p(1 - T')$ and $y$ defined as virtual income (intercept of budget with x-axis when setting $l = 0$)

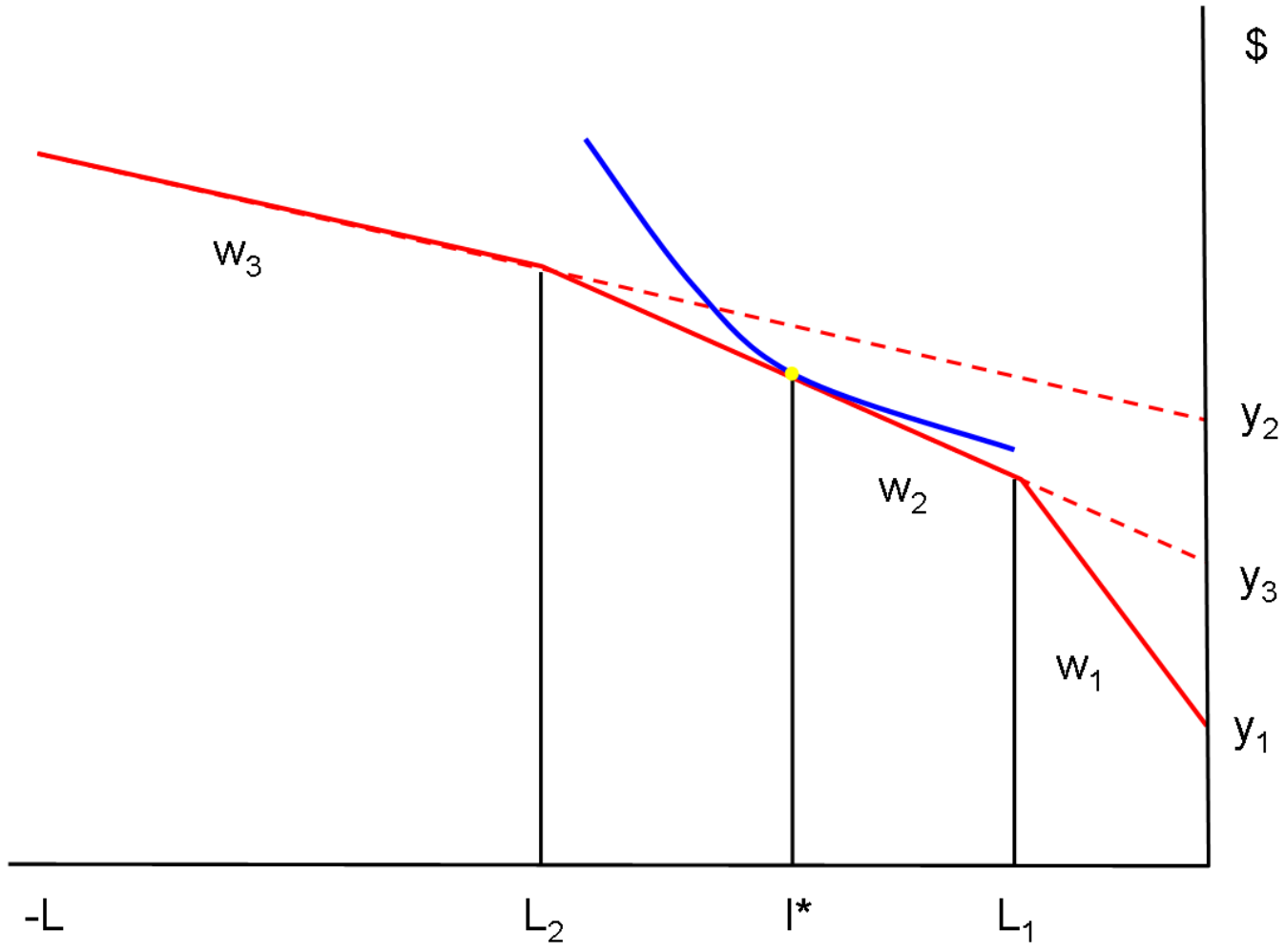
Main complications:

(a) $w$ [and $y$] become endogenous to choice of $l$

(b) FOC may not hold if individual bunches at a kink

(c) FOC may not characterize the optimum choice

# Non-Linear Budget Set Estimation: Virtual Incomes




Source: Hausman (Hbk 1985)

# TAX ISSUE: NON-LINEAR BUDGET SETS

Non-linear budget set creates two econometric problems:

1) Model mis-specification: OLS regression no longer recovers structural elasticity parameter of interest

2) Econometric bias: $\tau_i = T'(w_i l_i)$ and $y_i$ depends on income $w_i l_i$ and hence on $l_i$

Tastes for work are positively correlated with $\tau_i$ (due to progressive tax system) $\rightarrow$ downward bias in OLS regression of hours worked on net-of-tax rates

# OLD NON-LINEAR BUDGET SET METHOD

Issue addressed by non linear budget set studies pioneered by Hausman in late 1970s (Hausman, 1985 PE handbook chapter)

Method uses a structural model of labor supply to derive and estimate labor supply function fully consistent with theory

Key point: the method still uses the standard cross-sectional variation in pre-tax wages $w^p$ for identification. Taxes are seen as a problem to deal with rather than an opportunity for identification.

New literature identifying labor supply elasticities using tax changes has a totally different perspective: taxes are seen as an **opportunity** to identify labor supply

# Negative Income Tax (NIT) Experiments

1) Best way to resolve identification problems: exogenously change taxes/transfers with a **randomized experiment**

2) NIT experiment conducted in 1960s/70s in Denver, Seattle, and other cities

3) First major social experiment in U.S. designed to test proposed transfer policy reform

4) Provided lump-sum welfare grants $G$ combined with a steep phaseout rate $\tau$ (50%–80%) [based on family earnings]

5) Analysis by Rees (1974), Munnell (1986) book, Ashenfelter and Plant JOLE'90, and others

6) 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 | $G$ ($) | $\tau$ | 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

# NIT Experiments: Findings

See Ashenfelter and Plant JHR' 90 for non-parametric evidence. More parametric evidence in earlier work. Key results:

1) Significant labor supply response but small overall

2) Implied earnings elasticity for males around 0.1

3) Implied earnings elasticity for women around 0.5

4) Academic literature not careful to decompose response along intensive and extensive margin

5) Response of women is concentrated along the extensive margin (can only be seen in official govt. report)

6) Earnings of treated women who were working before the experiment did not change much

## From true experiment to "natural experiments"

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 matched to Social Security administrative data to estimate income effects

Lottery generates random assignment conditional on playing

Find significant but relatively small income effects: $\eta = w\partial l/\partial y$ between -0.05 and -0.10

Identification threat: differential response-rate among groups

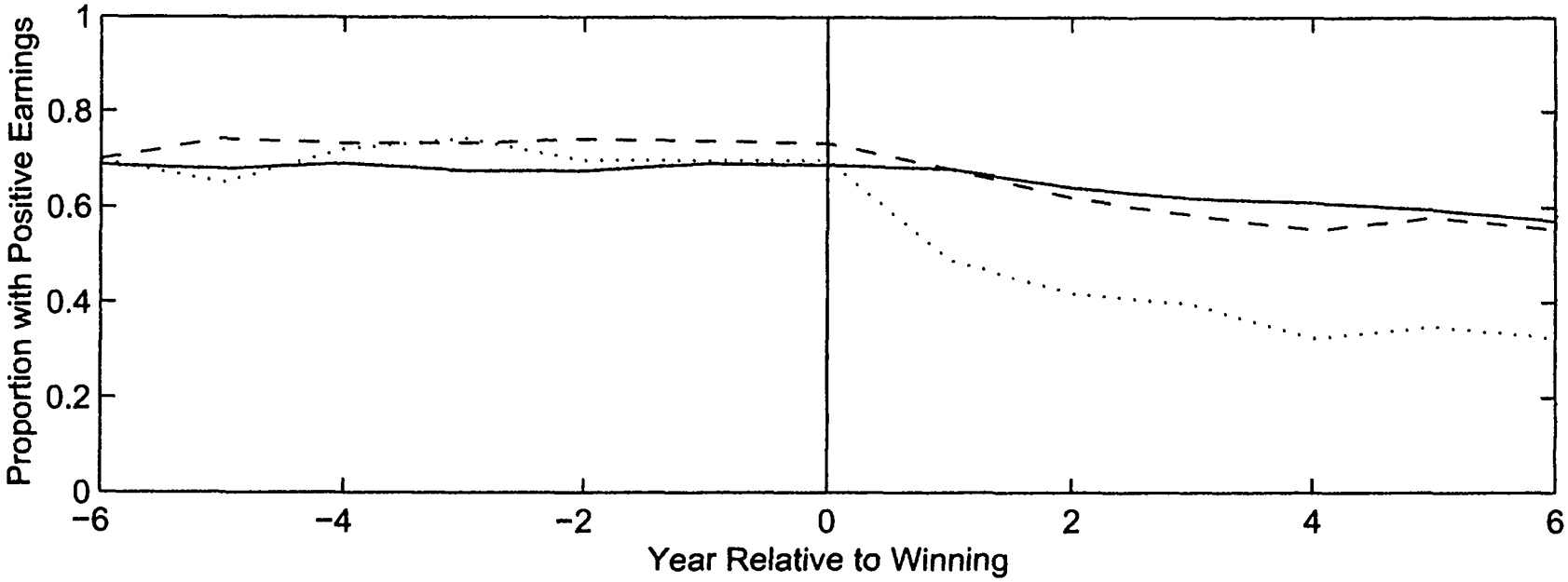



FIGURE 2. PROPORTION WITH POSITIVE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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

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

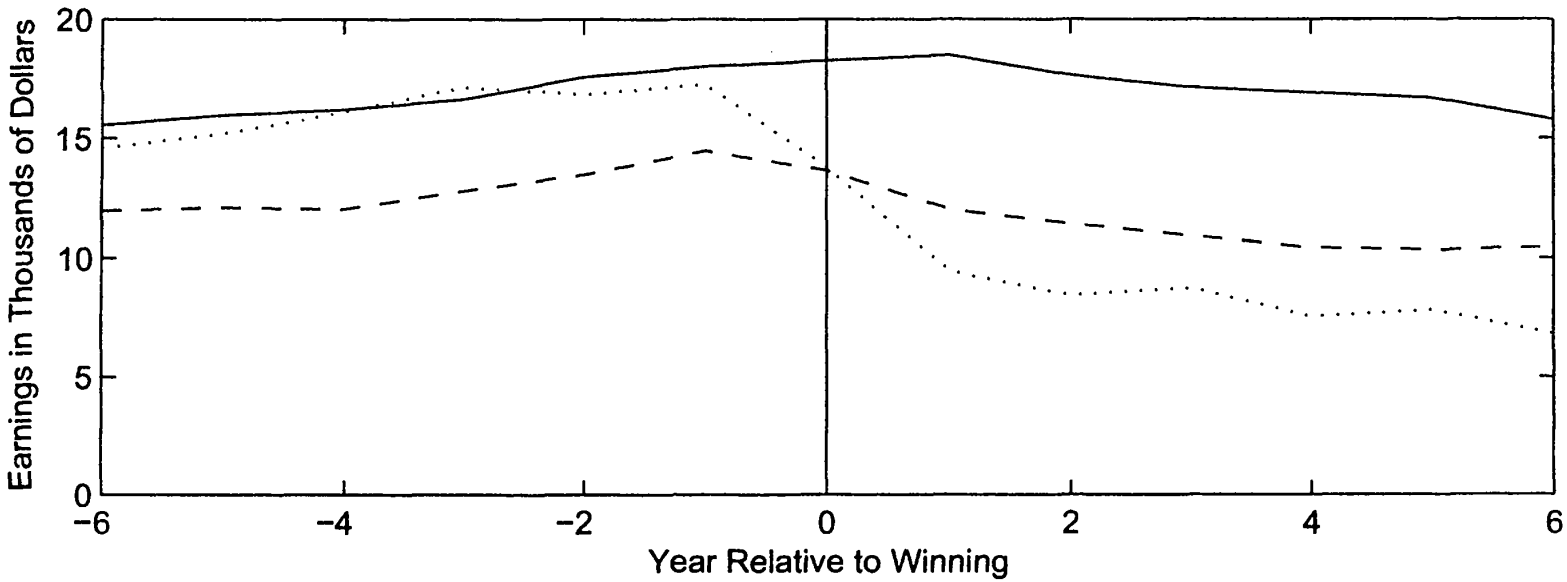



FIGURE 1. AVERAGE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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

Source: Imbens et al. (2001), p. 783

# Difference-in-Difference (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. (2015) 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 relatively small income effects: $\eta = w\partial l/\partial y$ around -0.10

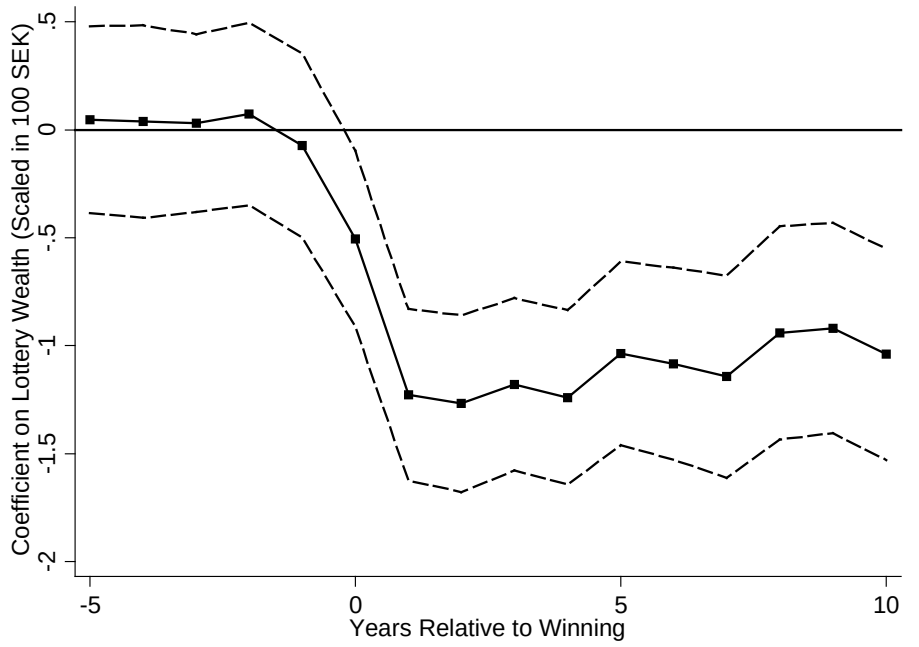
3) Effects on spouse but not as large as on winner
$\Rightarrow$ Rejects the **unitary** model of household labor supply:
$\max u(c_1, c_2, l_1, l_2)$ st $c_1 + c_2 \leq w_1 l_1 + w_2 l_2 + R$

Table 1. Distribution of Prizes

| | Pooled Sample | | Individual Lottery Samples | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | PLS | | Kombi | | Triss-Lumpsum | | Triss-Monthly | |
| | Count | Share | Count | Share | Count | Share | Count | Share | Count | Share |
| 0 to 1K SEK | 25,172 | 10.0% | 0 | 0.0% | 25,172 | 99.0% | 0 | 0.0% | 0 | 0.0% |
| 1K to 10K SEK | 204,626 | 81.3% | 204,626 | 92.0% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| 10K to 100K SEK | 16,429 | 6.5% | 15,520 | 7.0% | 0 | 0.0% | 909 | 27.8% | 0 | 0.0% |
| 100K to 500K SEK | 3,685 | 1.5% | 1,654 | 0.7% | 0 | 0.0% | 2,031 | 62.1% | 0 | 0.0% |
| 500K to 1M SEK | 355 | 0.1% | 195 | 0.1% | 0 | 0.0% | 160 | 4.9% | 0 | 0.0% |
| ≥1M SEK | 1,481 | 0.6% | 481 | 0.2% | 263 | 1.0% | 168 | 5.1% | 569 | 100.0% |
| TOTAL | 251,748 | | 222,476 | | 25,435 | | 3,268 | | 569 | |

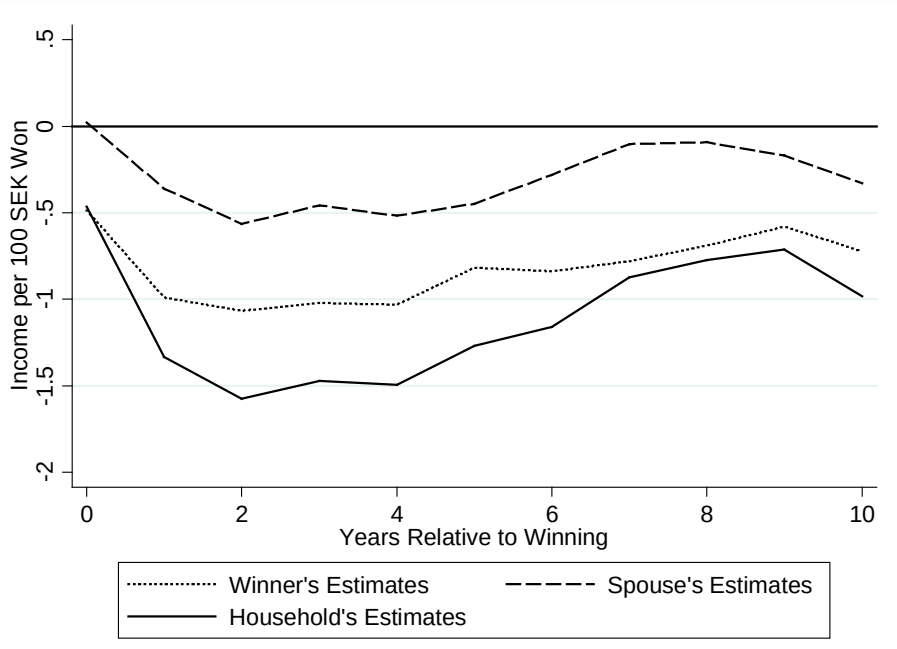
Notes: This table reports the distribution of lottery prizes for the pooled sample and the four lottery subsamples.

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.

Figure 5: Effect of Wealth on Gross Labor Earnings of Winners and Spouses




Notes: This figure reports estimates obtained from equation (2) estimated separately for winners, their spouses, and the household. The dependent variable is gross labor earnings. Each year corresponds to a separate regression.

# Married Women Elasticities: Blau and Kahn '07

1) Identify elasticities from 1980-2000 using grouping instrument

a) Define cells (year$\times$age$\times$education) and compute mean wages

b) Instrument for actual wage with mean wage in cell

2) Identify purely from group-level variation, which is less contaminated by individual endogenous choice

3) Results: (a) total hours elasticity for **married women** (including intensive + extensive margin) shrank from 0.4 in 1980 to 0.2 in early 2000s, (b) effect of husband earnings $\downarrow$ overtime

4) Interpretation: elasticities shrink as women become more attached to the labor force

## Summary of Static Labor Supply Literature (SKIP)

1) Small elasticities for prime-age males

Probably institutional restrictions, need for at least one income, etc. prevent a short-run response

2) Larger responses for workers who are less attached to labor force: Married women, low income earners, retirees

3) Responses driven primarily by extensive margin

a) Extensive margin (participation) elasticity around 0.2-0.5

b) Intensive margin (hours) elasticity smaller

## Responses to Low-Income Transfer Programs

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

2) Complicated set of transfer programs in US

a) In-kind: food stamps, Medicaid, public housing, job training, education subsidies

b) Cash: TANF, EITC, SSI

3) See Gruber undergrad textbook for details on institutions

# 1996 US Welfare Reform

1) Reform modified AFDC cash welfare program to provide more incentives to work (renamed TANF)

a) Requiring recipients to go to job training or work

b) Limiting the duration for which families able to receive welfare

c) Reducing phase-out rate of benefits

2) Fed govt provided incentives for states to experiment with reforms in 1992-1995 (state waivers). Some did randomized experiments.

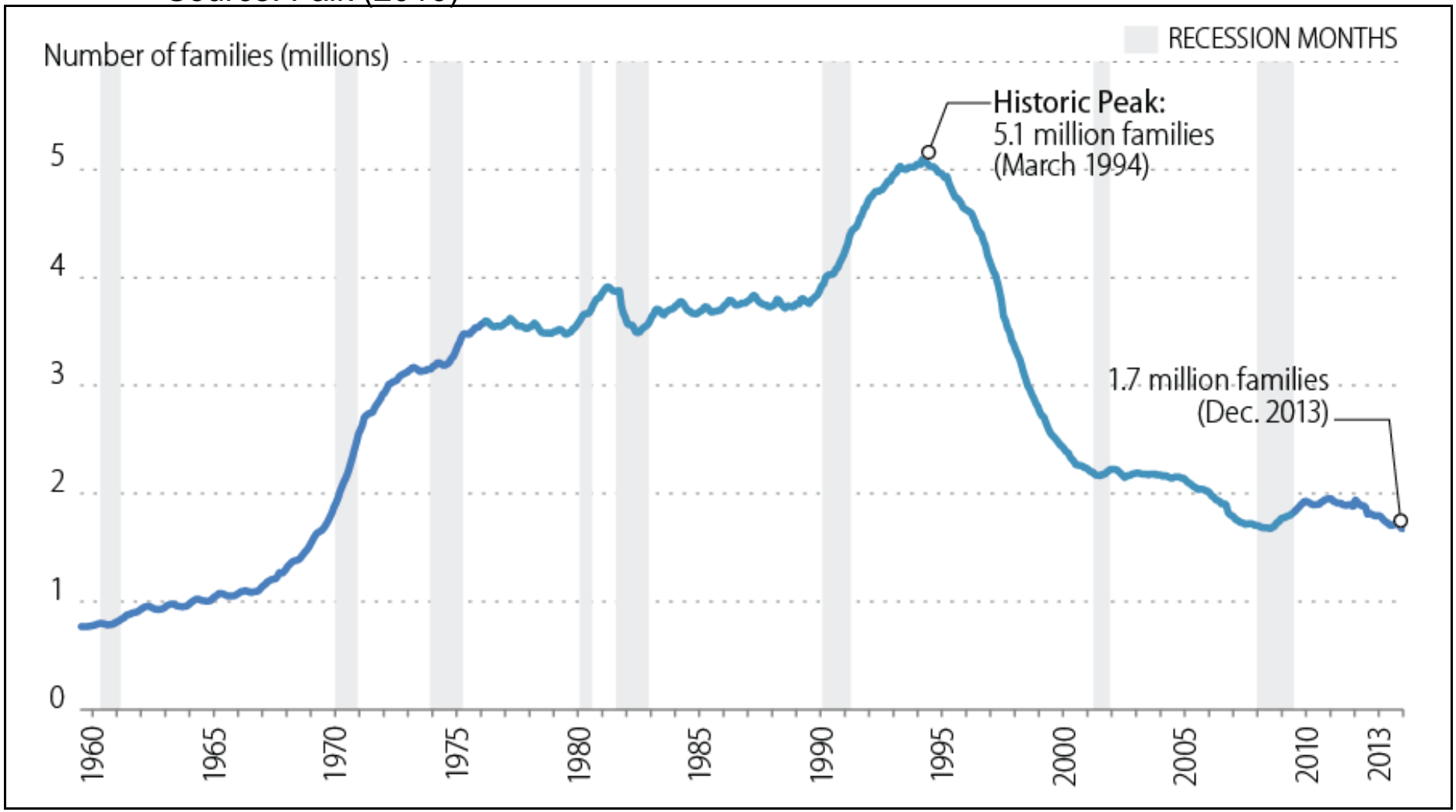
4) EITC also expanded during this period: general shift from welfare to "workfare"

Did welfare reform and EITC increase labor supply?

**Figure 1. Number of Families Receiving AFDC/TANF Cash Assistance, 1959-2013**

(Families in millions)

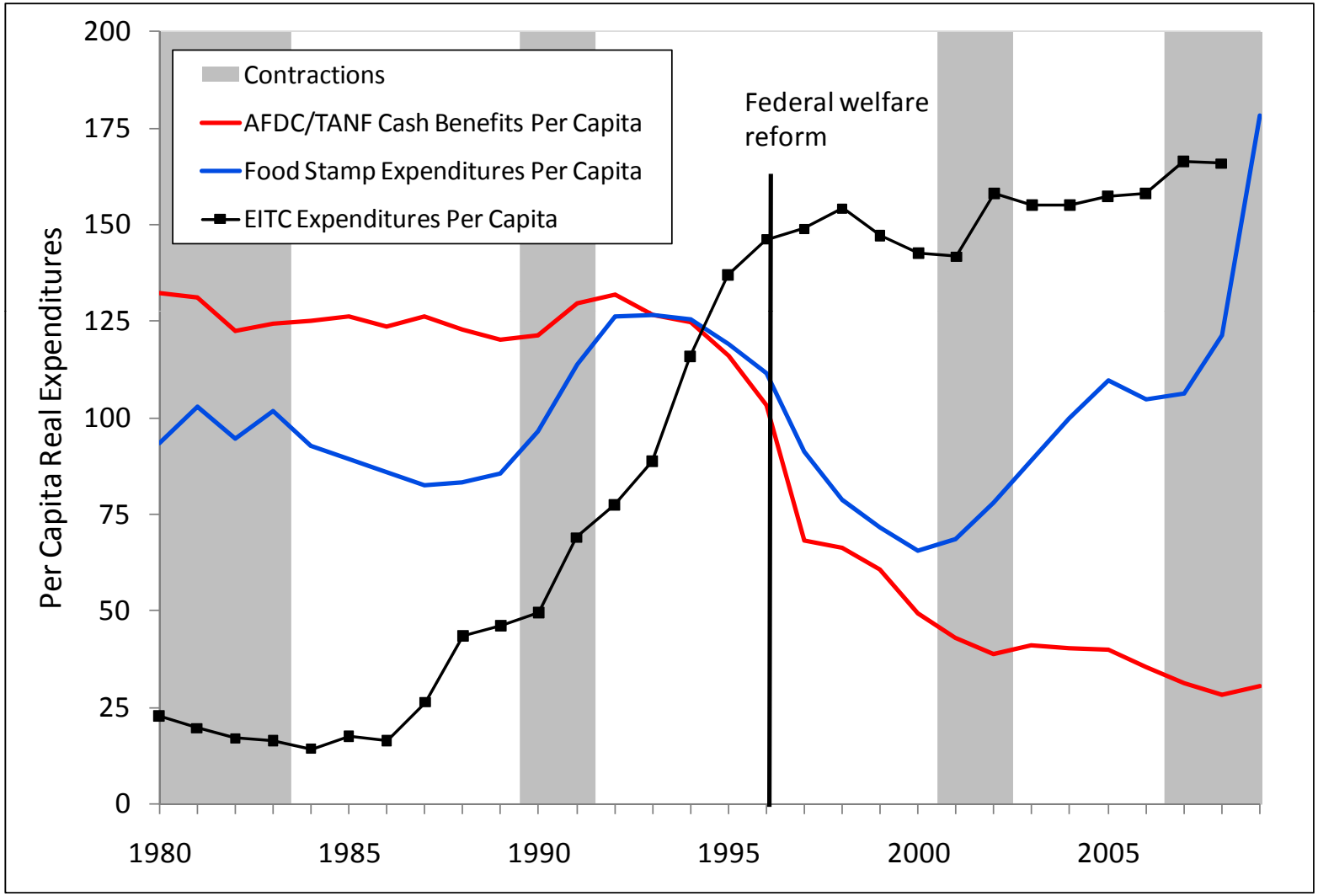
Source: Falk (2016)




**Source:** Congressional Research Service (CRS), based on data from the U.S. Department of Health and Human Services (HHS).

**Notes:** Shaded areas represent recessionary periods. Families receiving TANF cash assistance since October 1, 1999, include families receiving cash assistance from separate state programs (SSPs) with expenditures countable toward the TANF maintenance of effort requirement (MOE).

# The landscape providing assistance to poor families with children has changed substantially



## Randomized welfare experiment: SSP Welfare Demonstration in Canada

Canadian Self Sufficiency Project (SSP): randomized experiment that gave welfare recipients an earnings subsidy for 36 months in 1990s (but need to start working by month 12 to get it)

3 year temporary participation tax rate cut from average rate of 74.3% to 16.7% [get to keep 83 cents for each $ earned instead of 26 cents]

Card and Hyslop (EMA 2005) provide classic analysis. Two results:

1) Strong effect on employment rate during experiment (peaks at 14 points)

2) Effect quickly vanishes when the subsidy stops after 36 months (entirely gone by month 52)

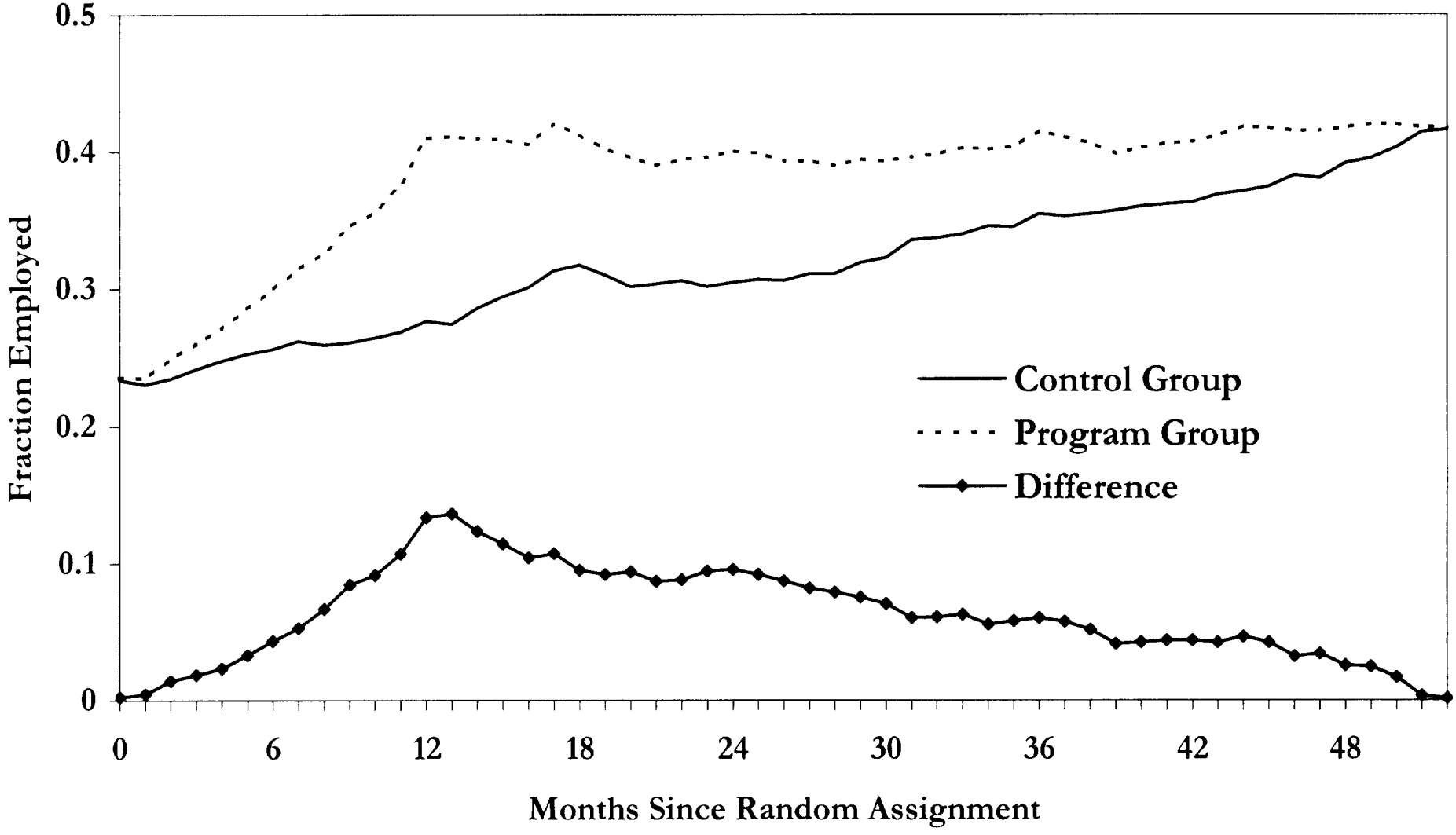



FIGURE 3.—Monthly employment rates.

Source: Card and Hyslop, 2005, p. 1734

# Earned Income Tax Credit (EITC) program

See Kleven (2018) provides comprehensive ex-post re-analysis using women aged 20-50 and CPS data

1) EITC started small in the 1970s but was expanded in 1986-88, 1994-96, 2008-09: today, largest means-tested cash transfer program [$70bn in 2016, 30m families recipients]

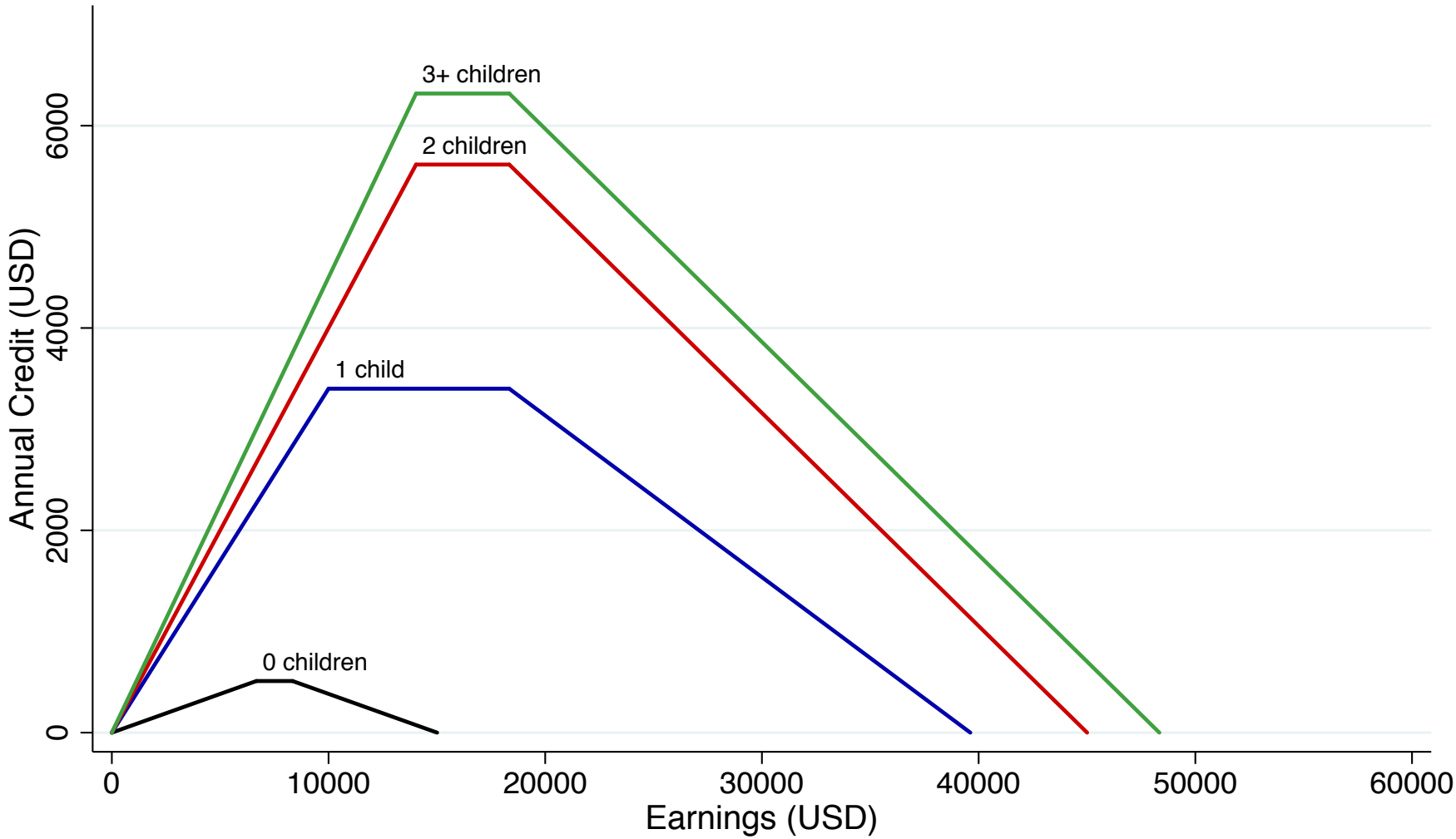
2) Eligibility: families with kids and low earnings.

3) Refundable Tax credit: administered as annual tax refund received in Feb-April, year $t+1$ (for earnings in year $t$)

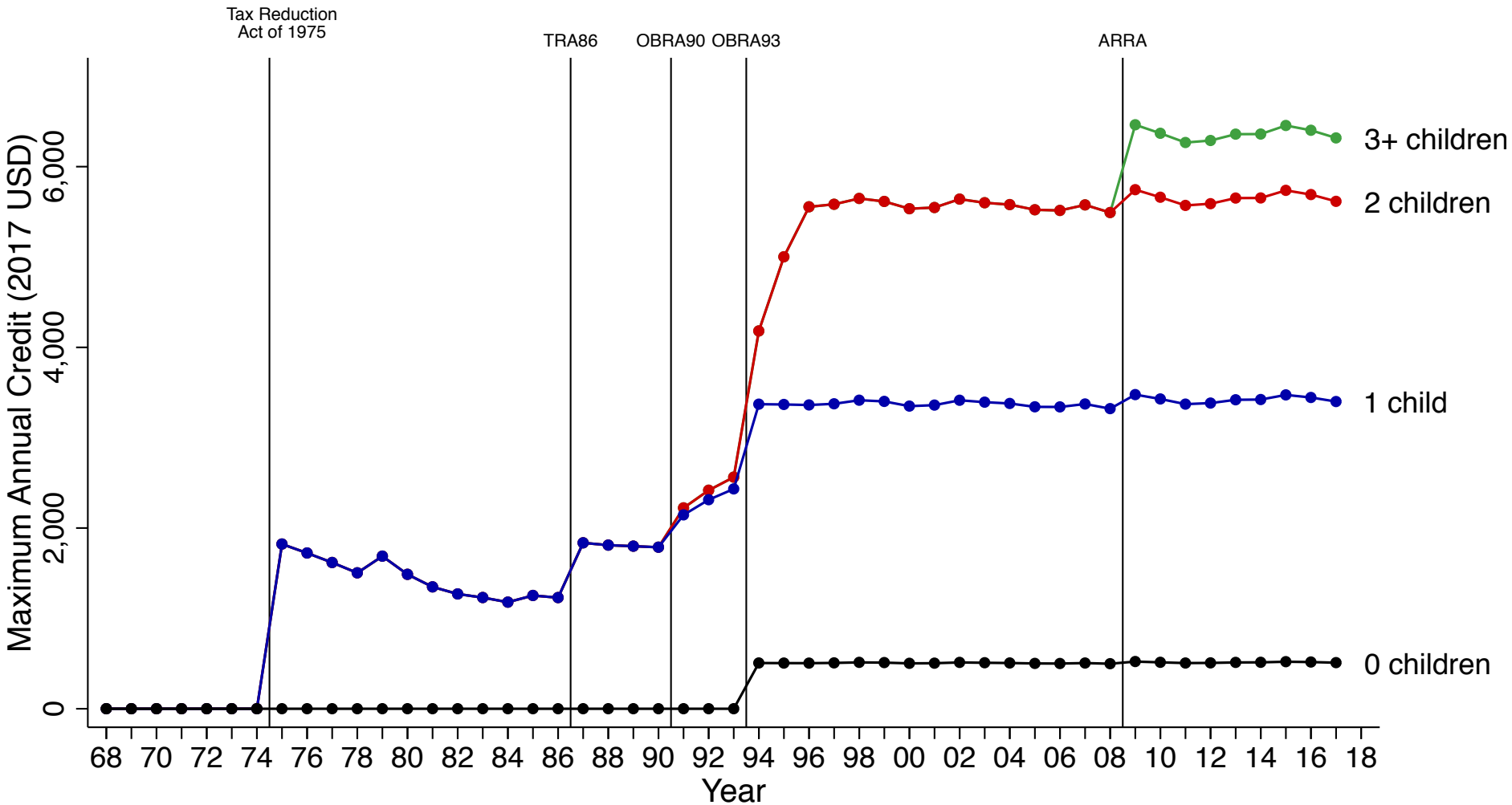
4) EITC has flat pyramid structure with phase-in (negative MTR), plateau, (0 MTR), and phase-out (positive MTR)

5) States have added EITC components to their income taxes [in general a percentage of the Fed EITC, great source of natural experiments, understudied bc CPS too small]

# EITC Schedule in 2017



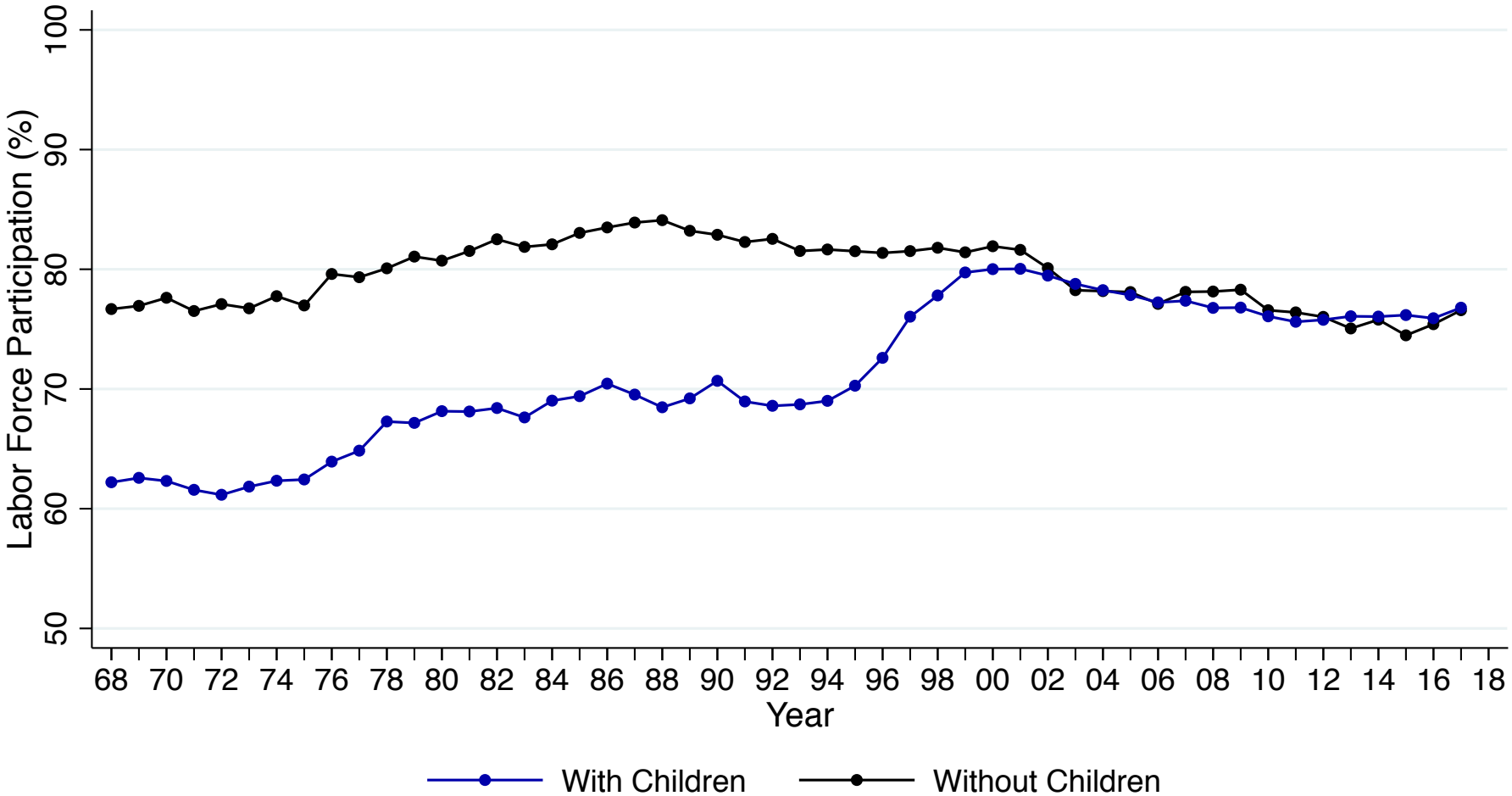
# EITC Maximum Credit Over Time




Source: Kleven (2018)

# Labor Force Participation of Single Women

## With and Without Children




Source: Kleven (2018)

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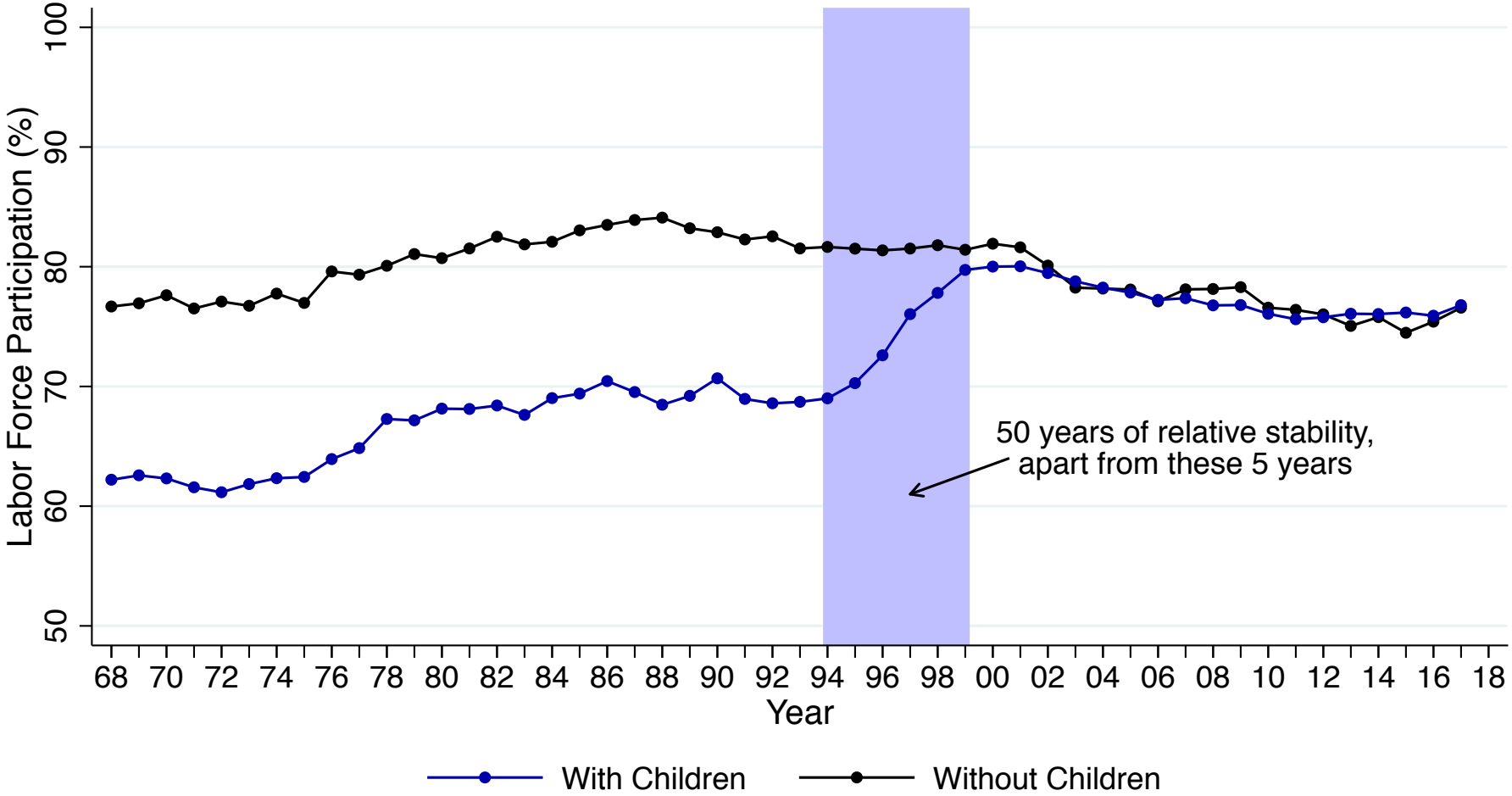


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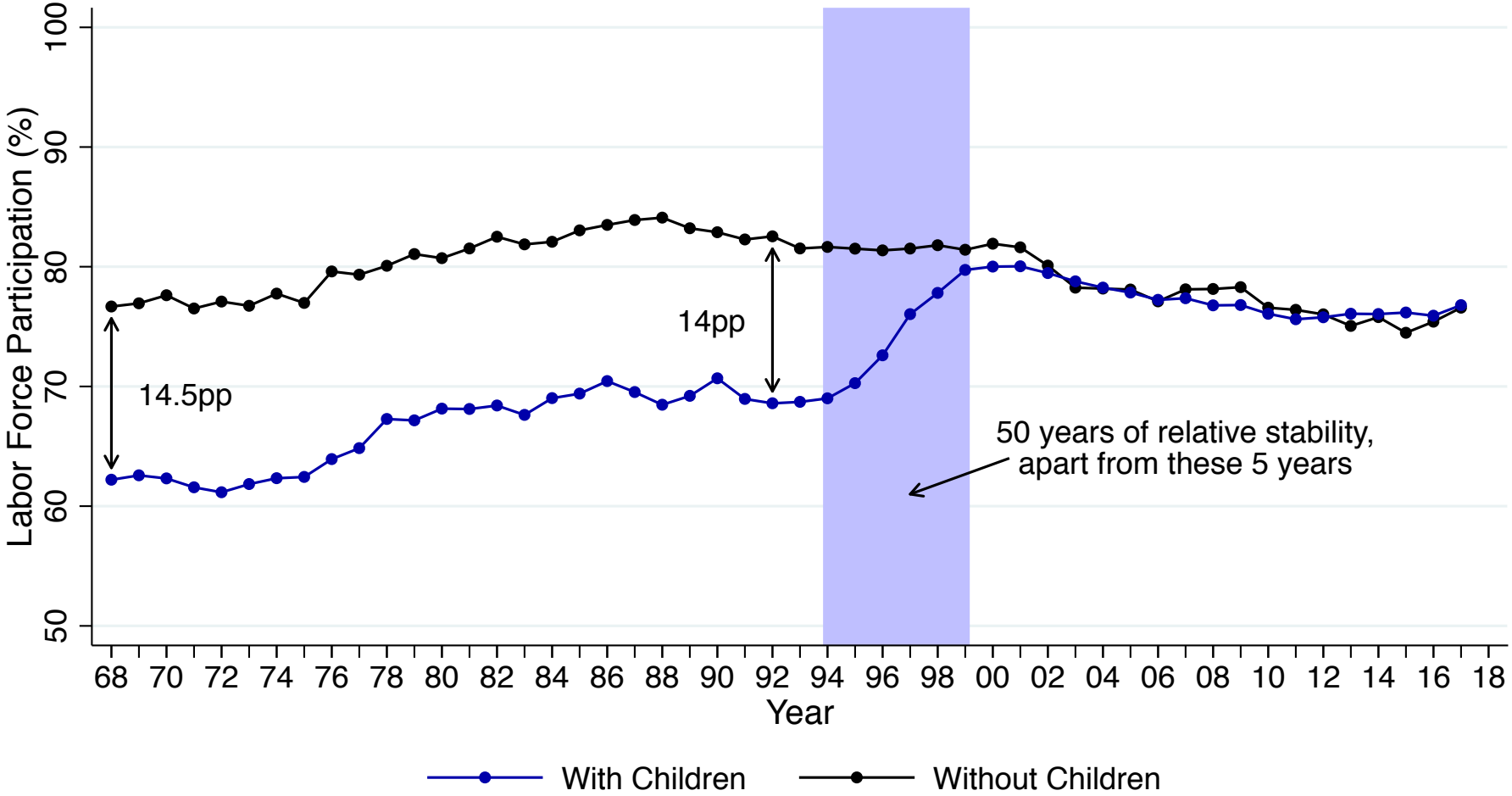


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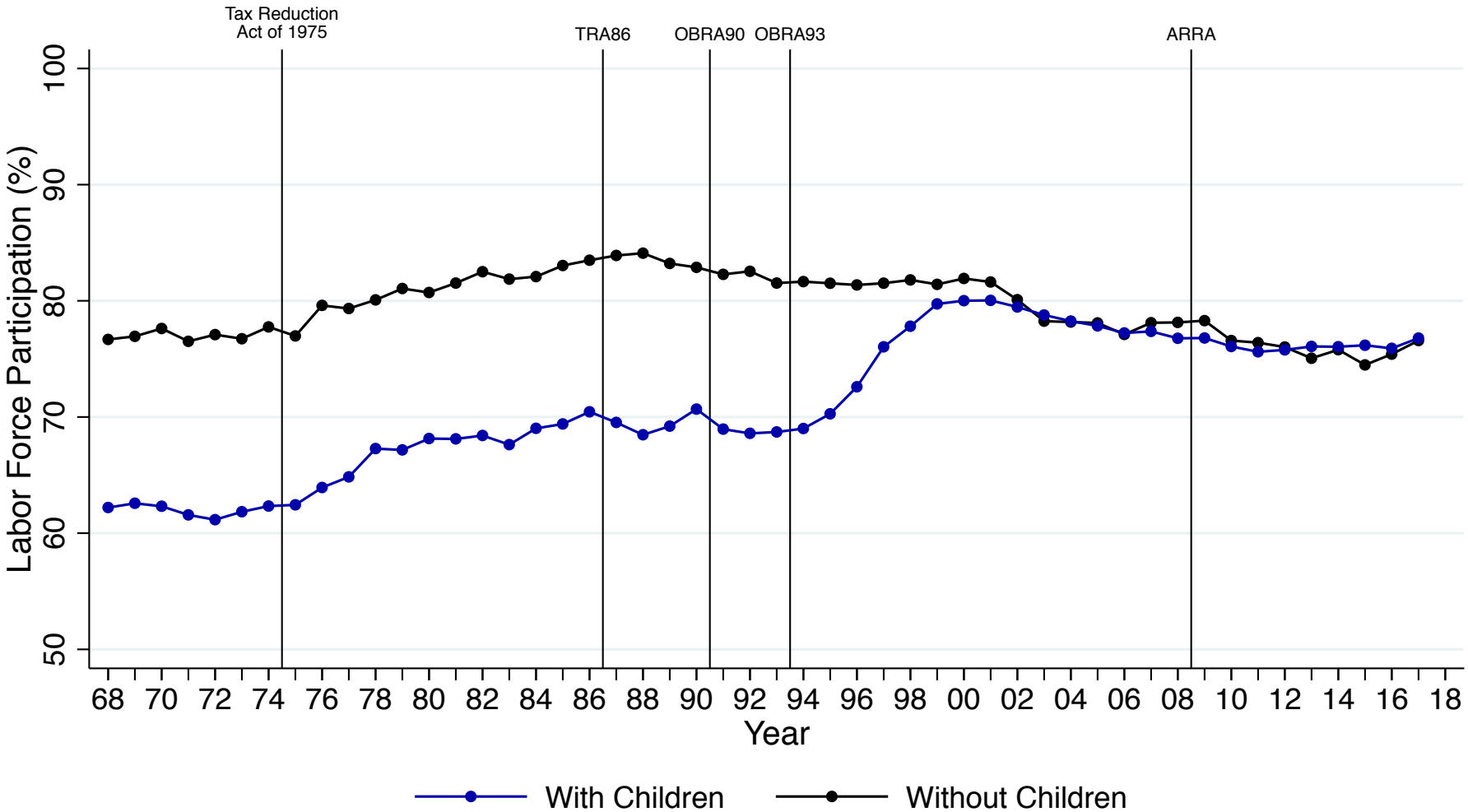


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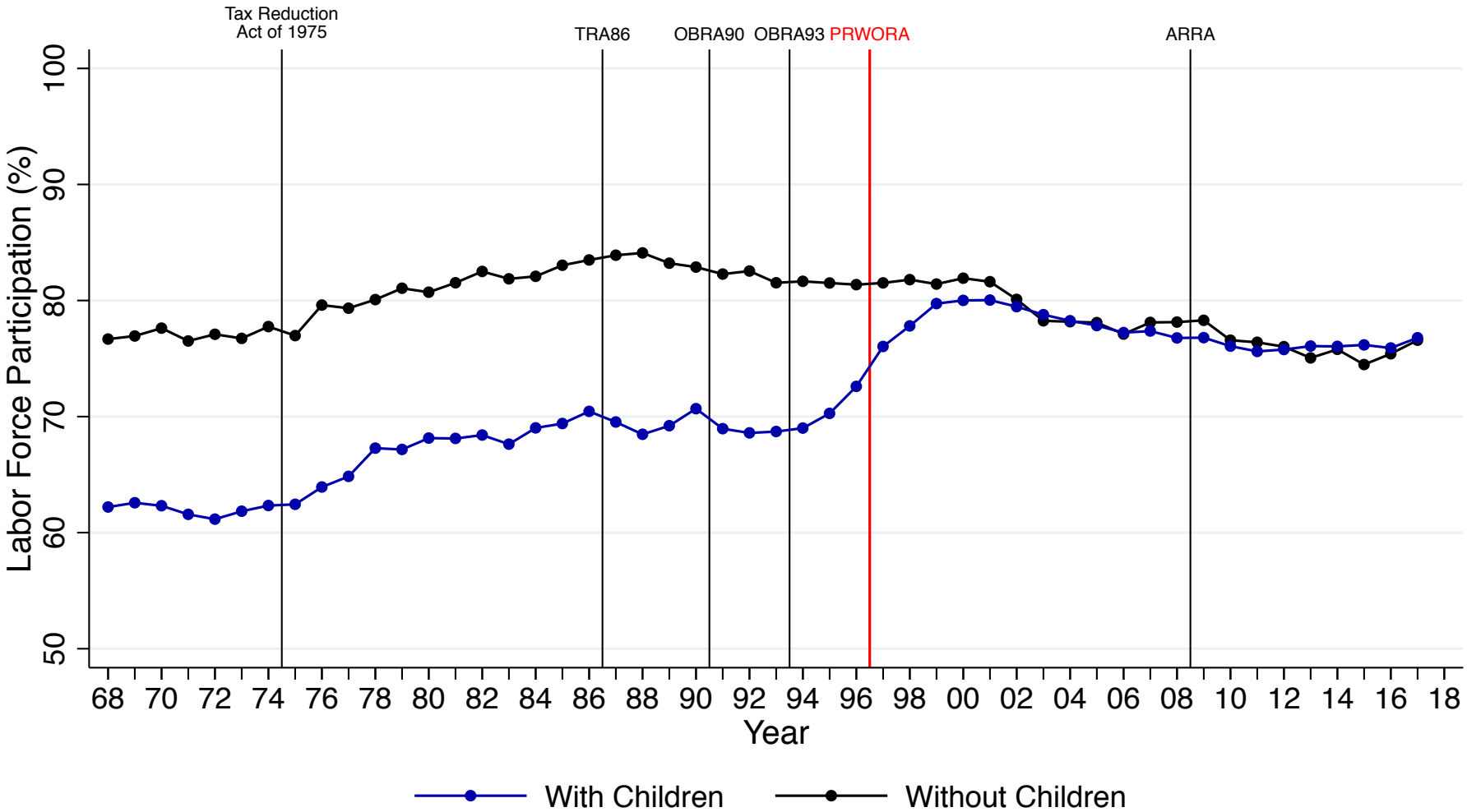


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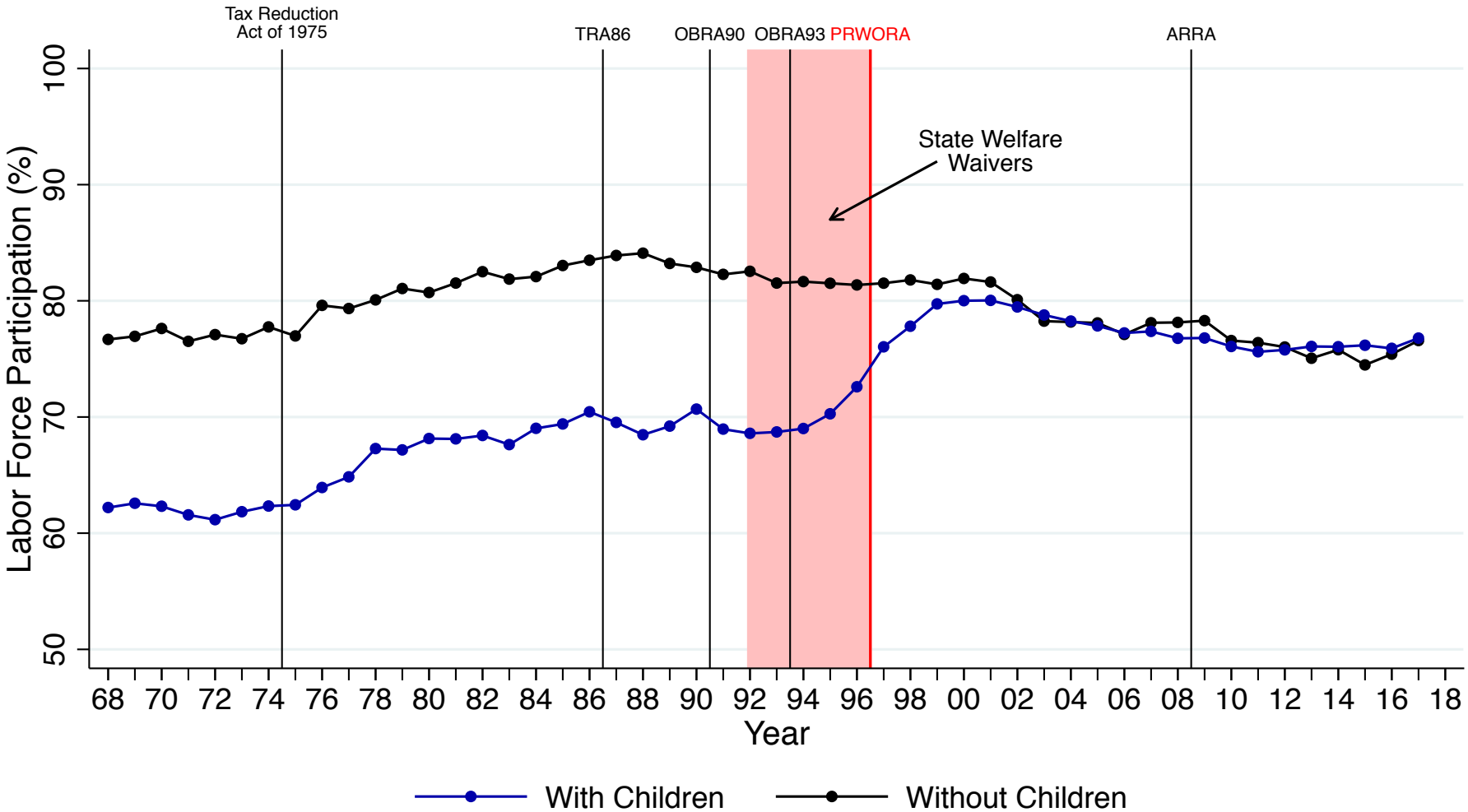


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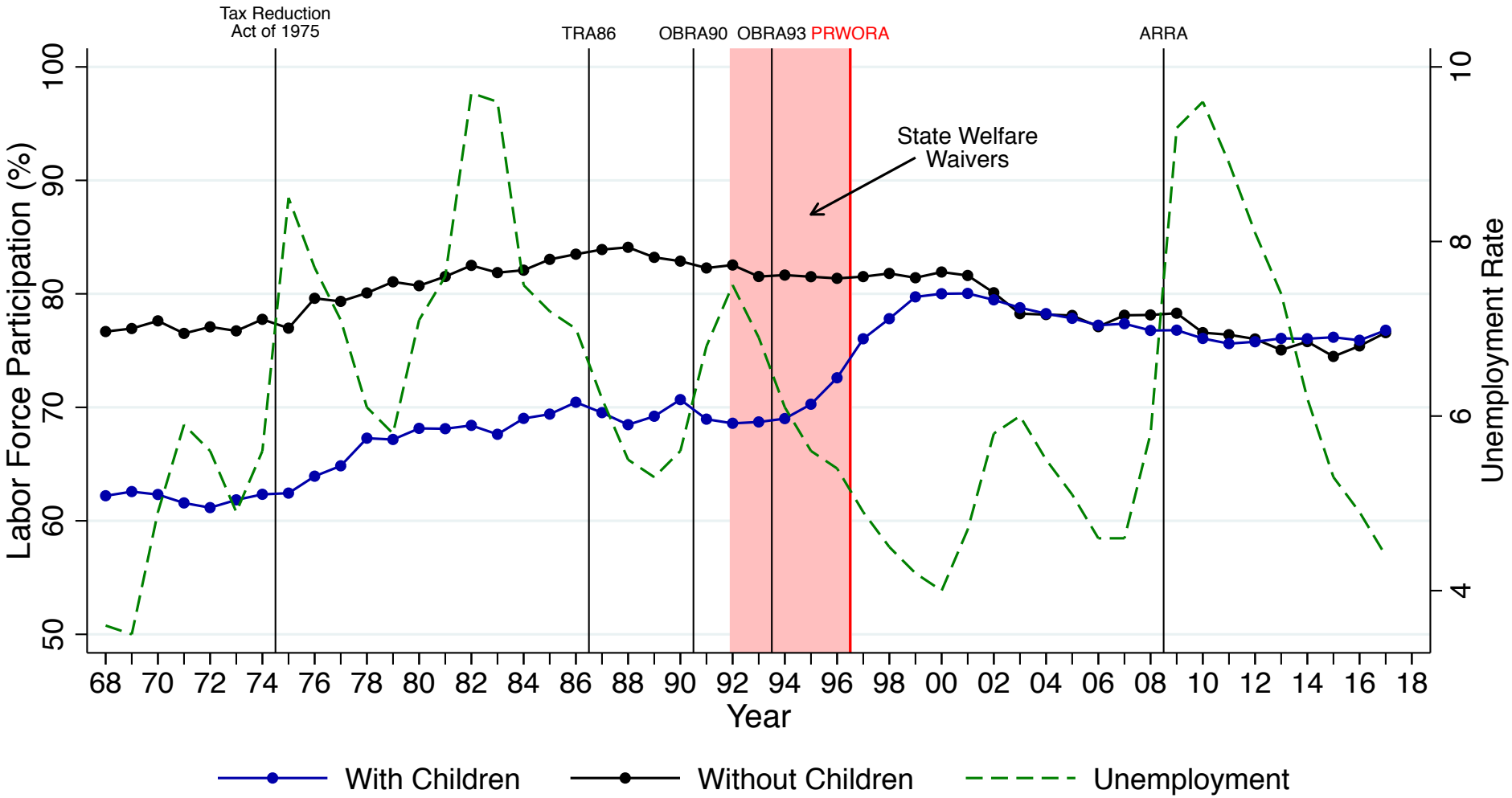
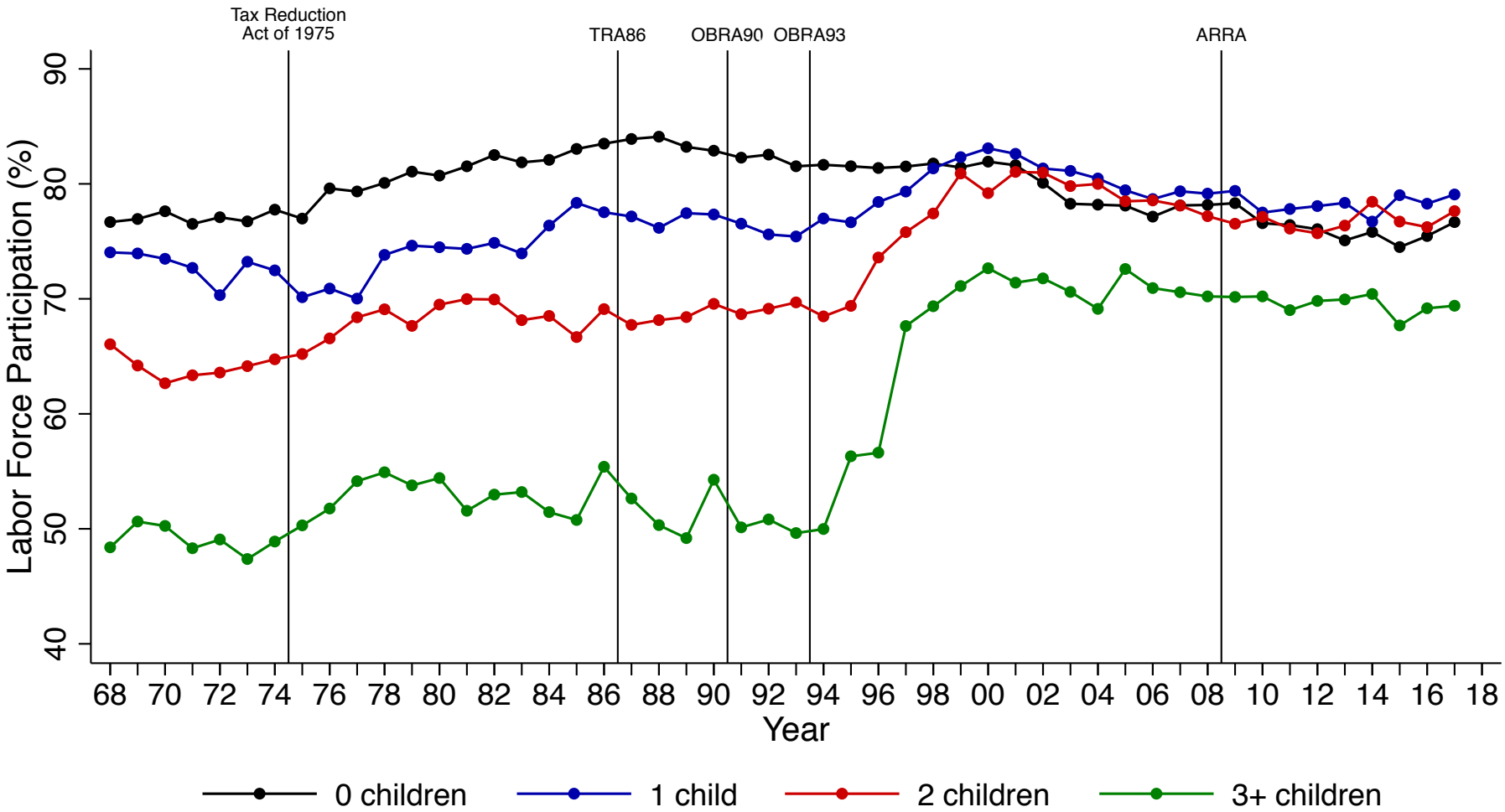



Source: Kleven (2018)

# Labor Force Participation of Single Women

## By Number of Children




Source: Kleven (2018)

Annual Employment | Low Education

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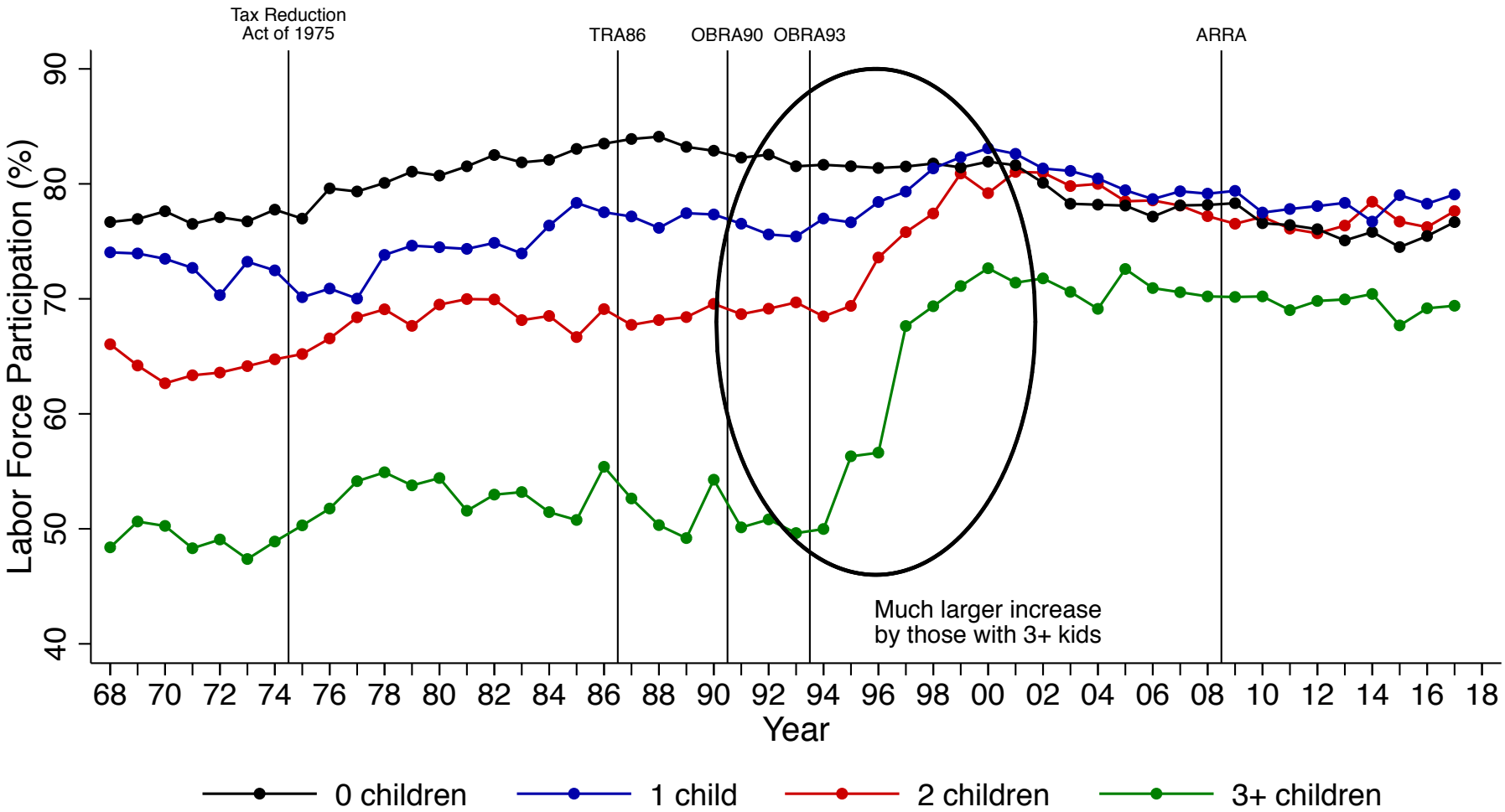


Source: Kleven (2018)

Annual Employment Low Education

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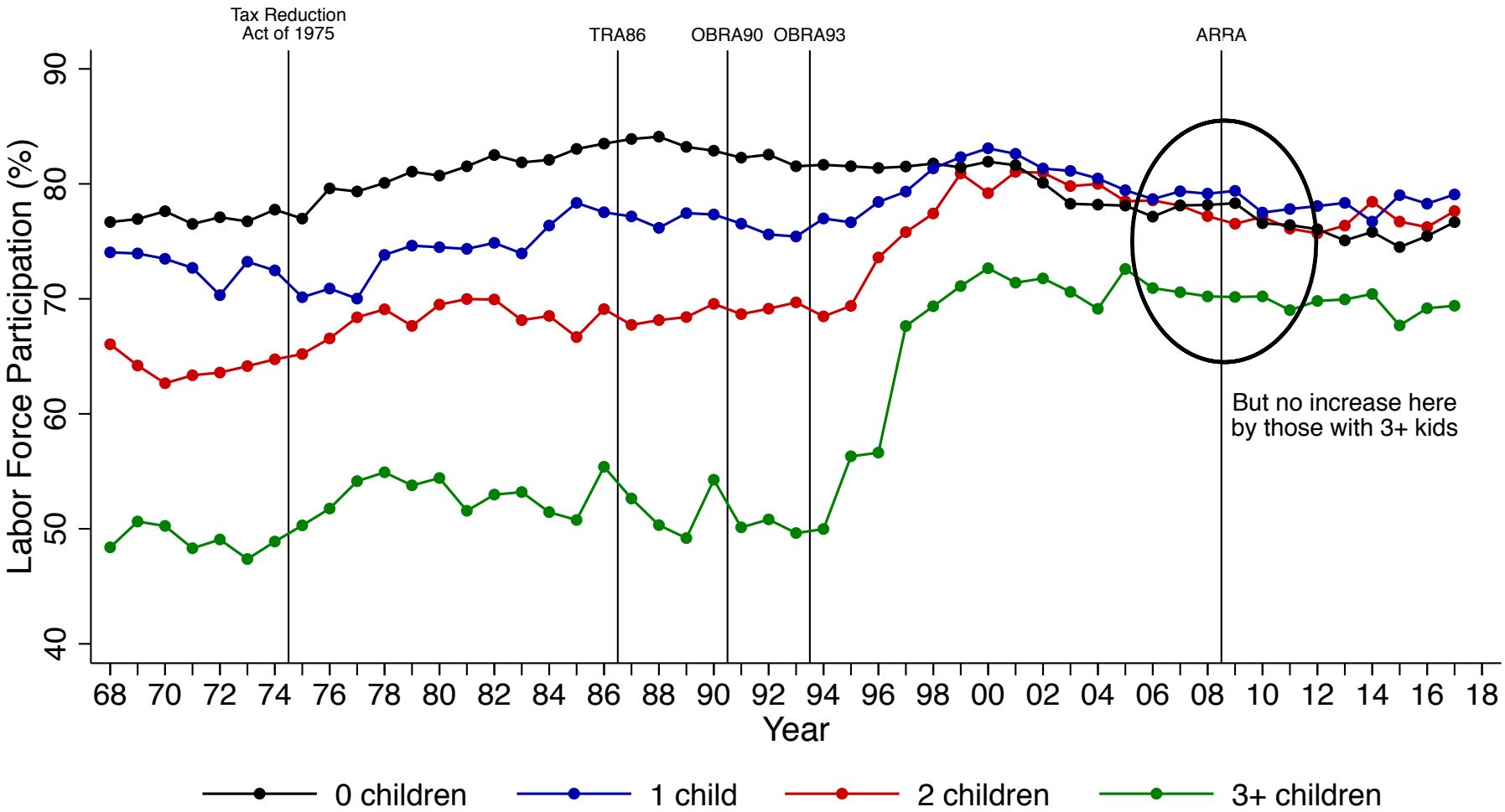



Source: Kleven (2018)

Annual Employment Low Education

## Welfare Reform and EITC Expansion: Labor supply

Incredible increase in labor force participation of single mothers during the 1990s when welfare reform and EITC expansion happened

Unlikely that the EITC can explain it 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

Kleven (2018): Maybe a unique combination of EITC reform, welfare reform, economic upturn, and changing social norms lead to this shift

# Theoretical Behavioral Responses to the EITC

**Extensive margin:** positive effect on Labor Force Participation as EITC makes work more attractive

**Intensive margin:** earnings conditional on working, mixed effects

1) Phase in: (a) Substitution effect: work more due to wage subsidy, (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

Should expect bunching at the EITC kink points

# Bunching at Kinks (Saez AEJ-EP'10)

Key prediction of standard labor supply model: individuals should bunch at (convex) kink points of the budget set

1) The only non-parametric source of identification for intensive elasticity in a single cross-section of earnings is amount of bunching at kinks creating by tax/transfer system

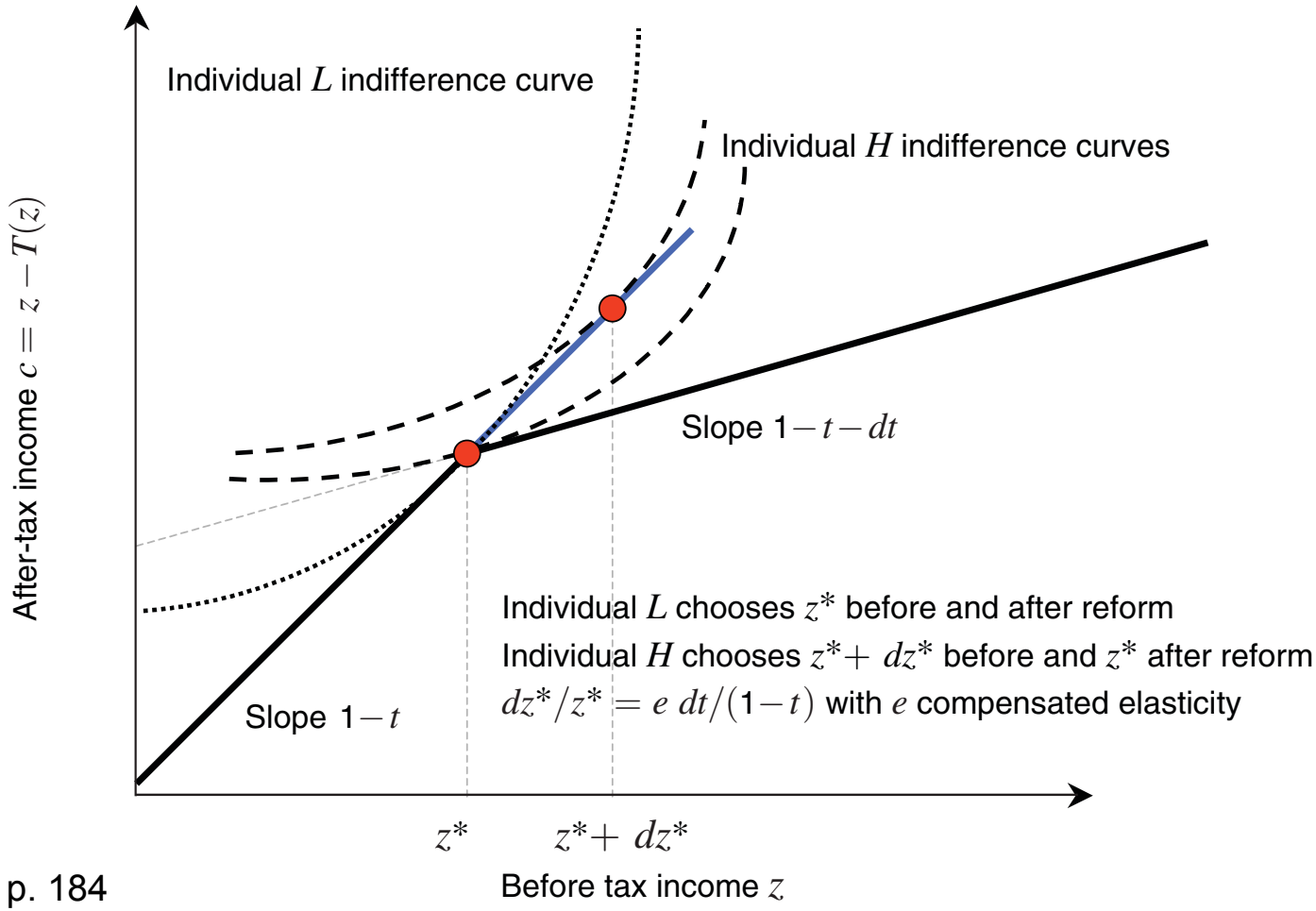
2) Saez '10 develops method of using bunching at kinks to estimate the compensated income elasticity

Formula for elasticity: $\varepsilon^c = \frac{dz/z^*}{dt/(1-t)}$ = excess mass at kink / change in NTR

$\Rightarrow$ Amount of bunching proportional to compensated elasticity

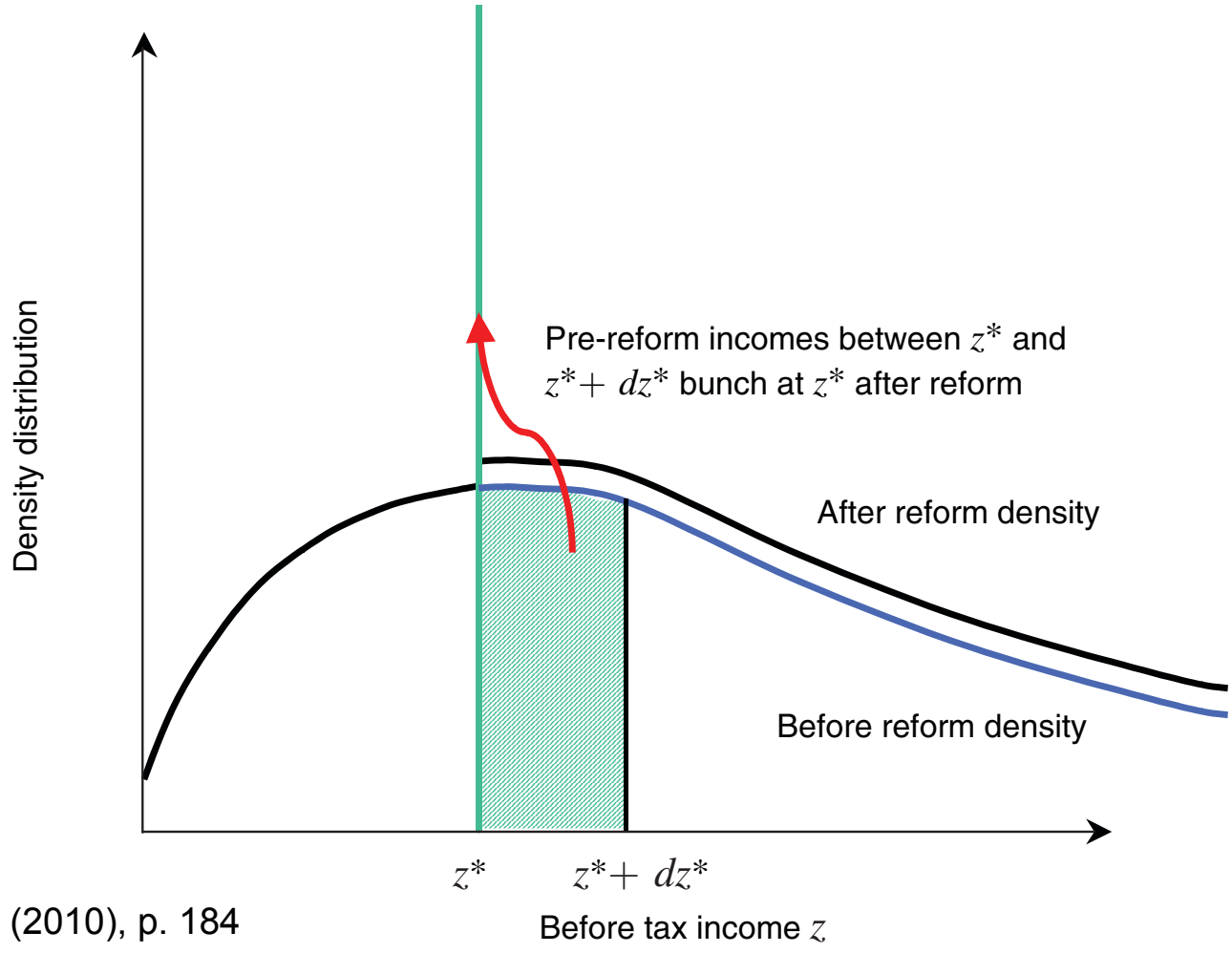
Blomquist-Newey 2017: Bunching method requires making assumptions on counterfactual density (but testable using tax changes see Londono-Avila '18 below)

Panel A. Indifference curves and bunching




Source: Saez (2010), p. 184

Panel B. Density distributions and bunching




Source: Saez (2010), p. 184

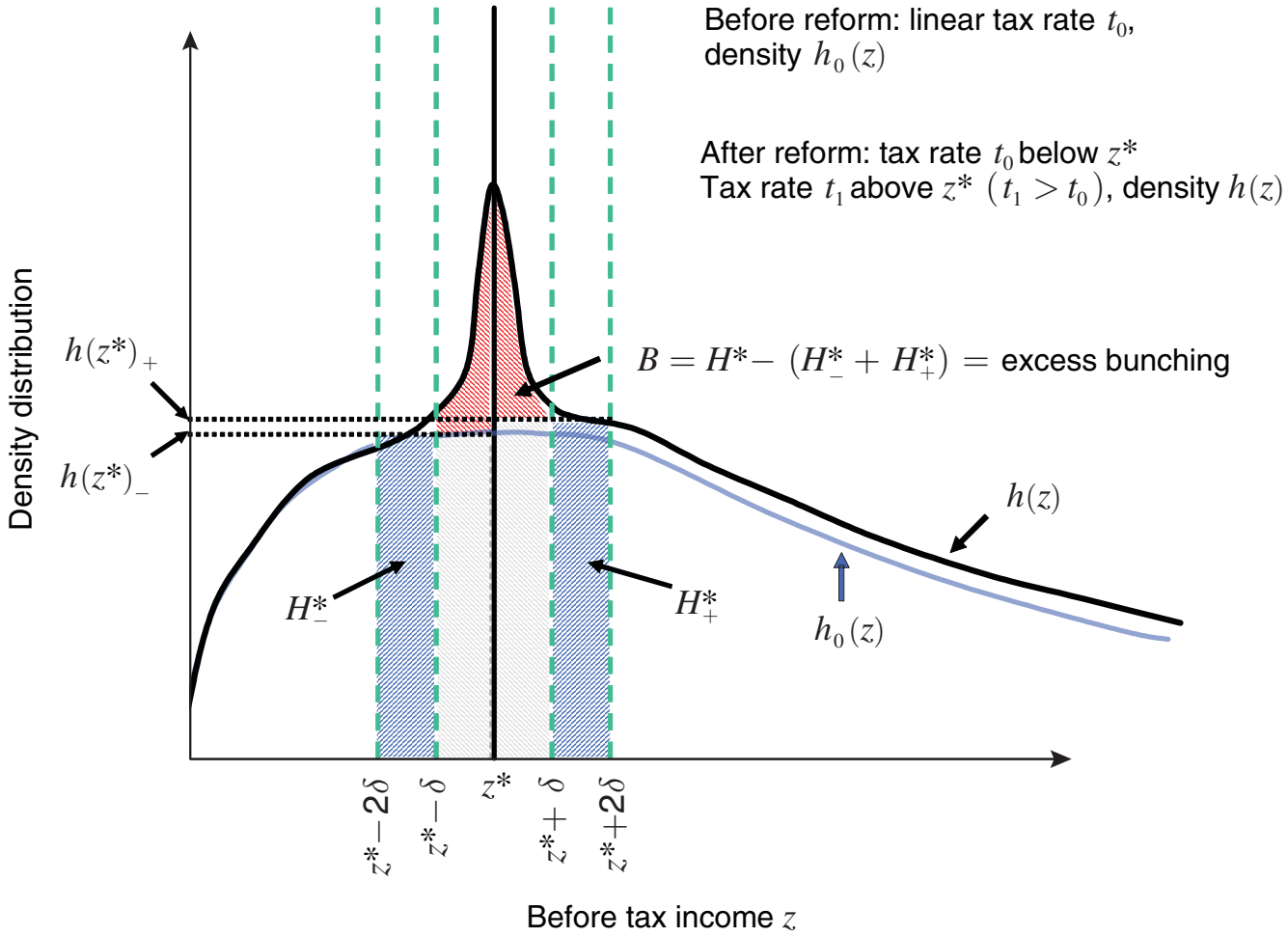



FIGURE 2. ESTIMATING EXCESS BUNCHING USING EMPIRICAL DENSITIES

# Bunching at Kinks (Saez AEJ-EP'10)

1) Uses individual tax return micro data (IRS public use files) from 1960 to 2004

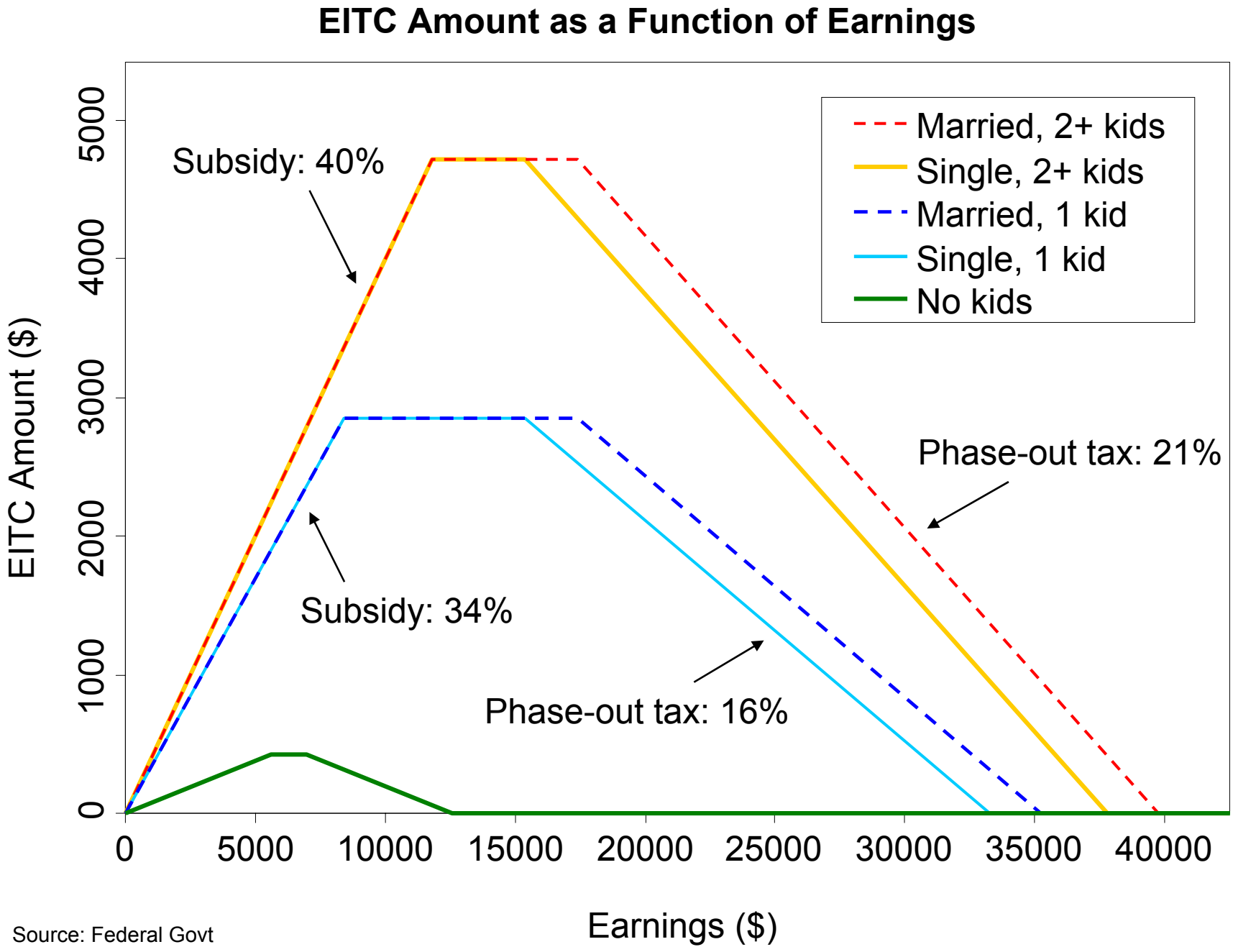
2) Advantage of dataset over survey data: very little measurement error

3) Finds bunching around:

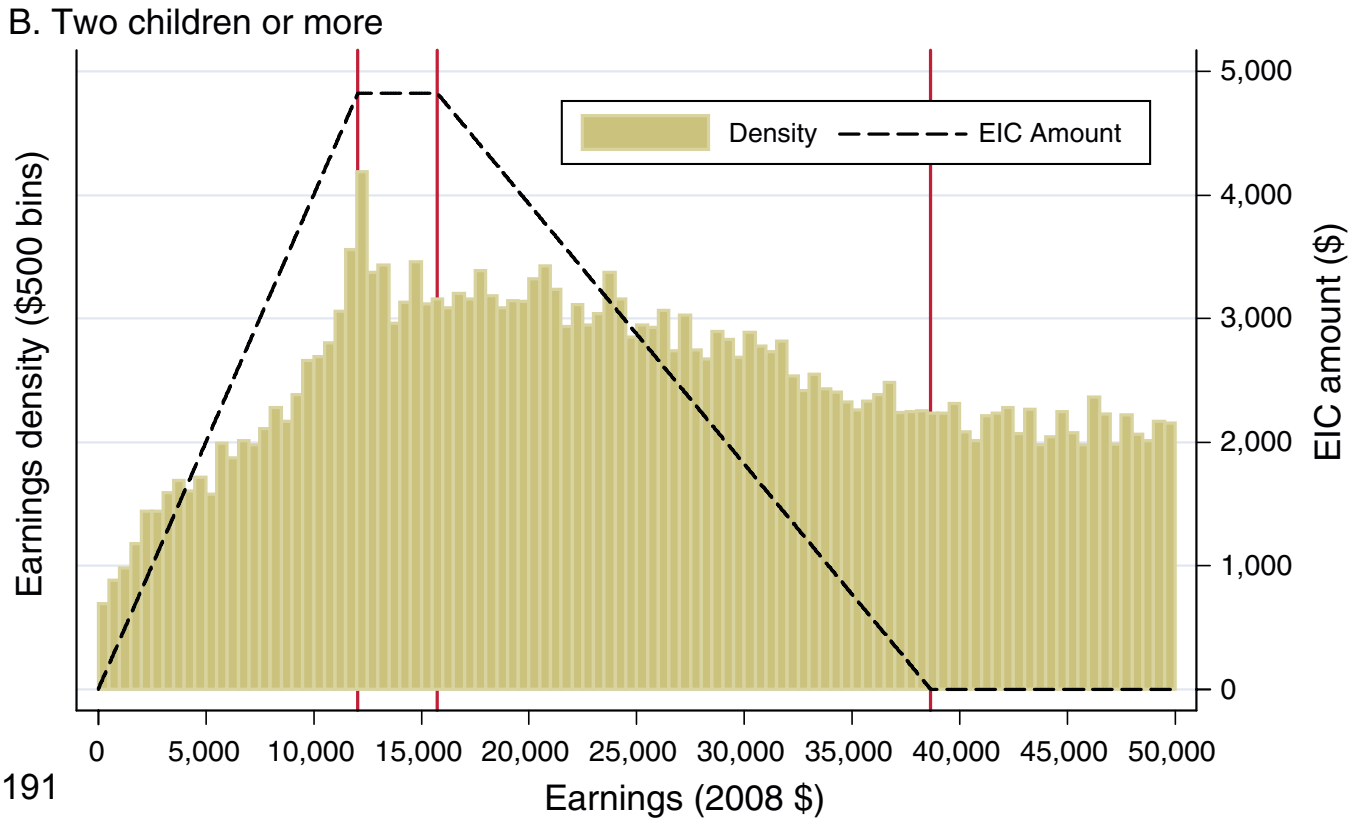
a) First kink point of the Earned Income Tax Credit (EITC), especially for self-employed

b) At threshold of the first tax bracket where tax liability starts, especially in the 1960s when this point was very stable

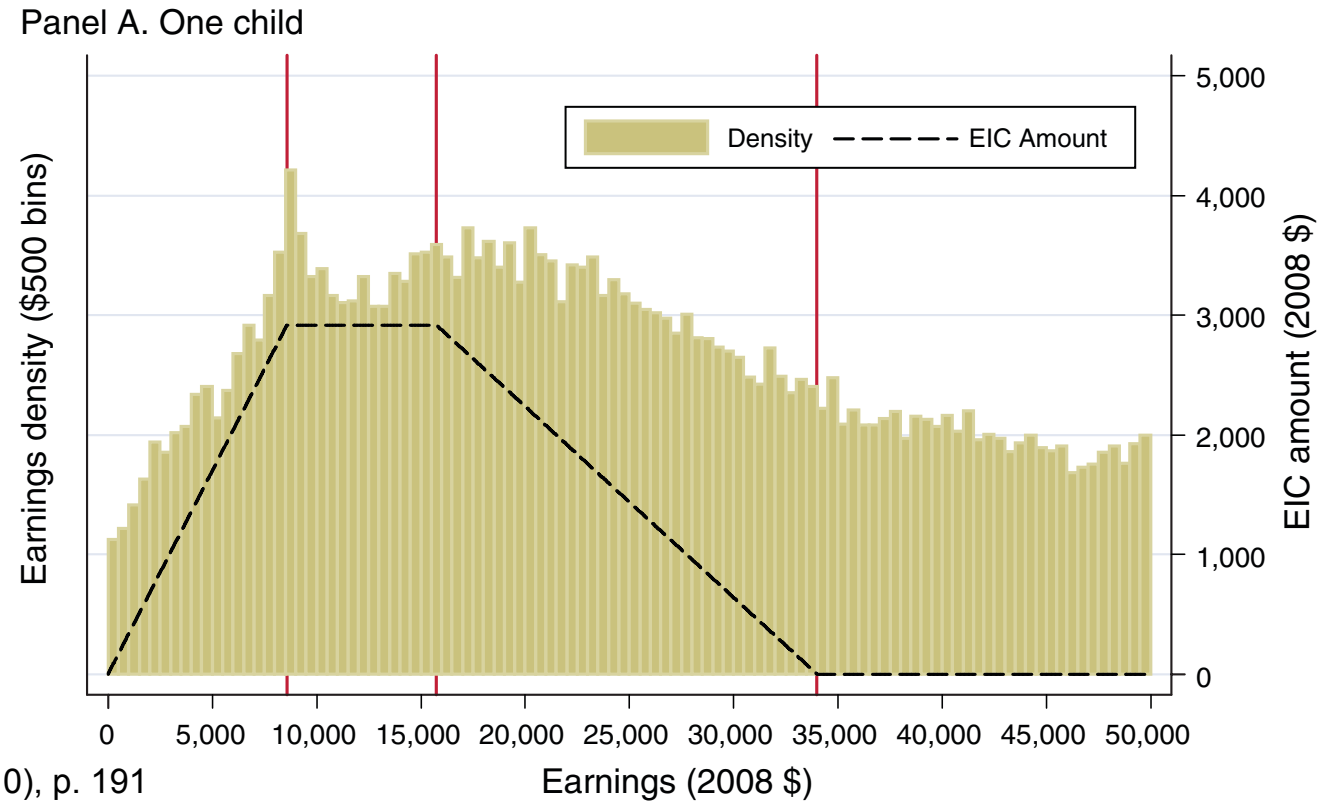
4) However, no bunching observed around all other kink points



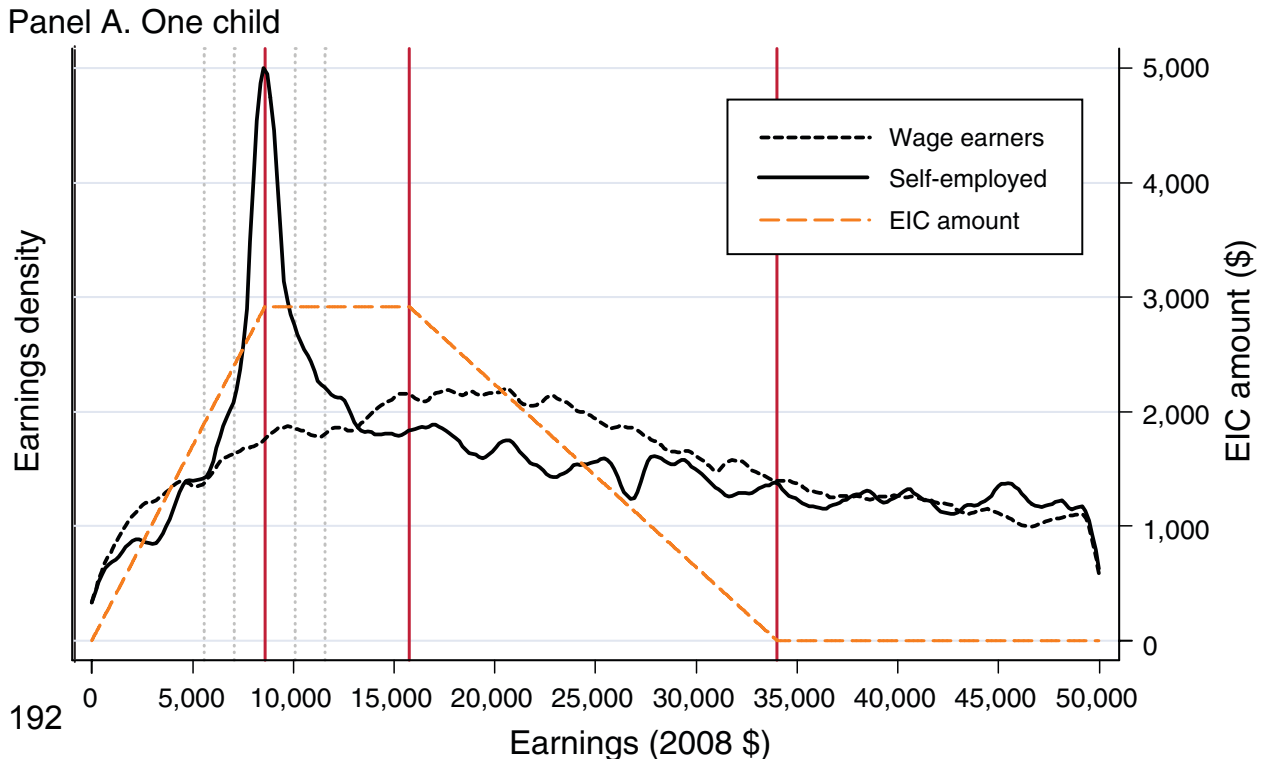

Source: Federal Govt



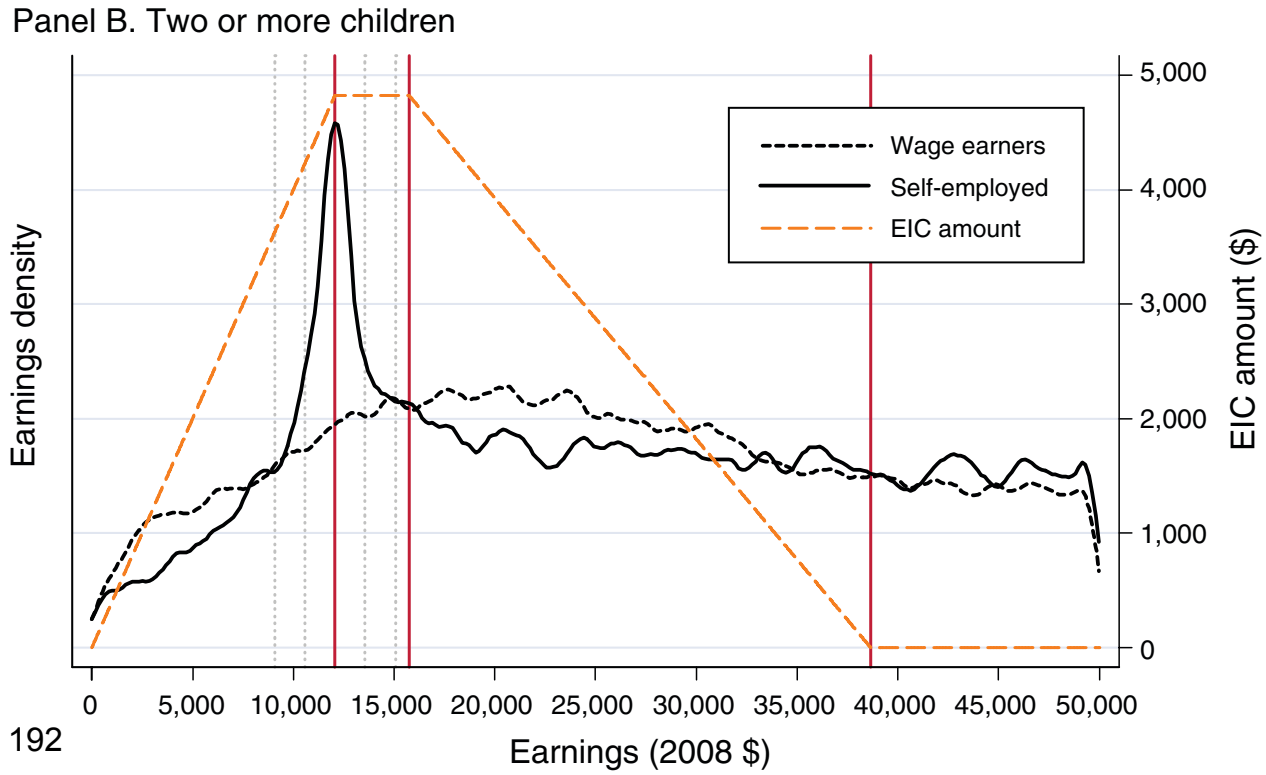

Source: Saez (2010), p. 191




Source: Saez (2010), p. 191




Source: Saez (2010), p. 192




Source: Saez (2010), p. 192

## Why not more bunching at kinks?

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, and Pistaferri QJE'11)

4) Information and salience

# EITC Behavioral Studies

Strong evidence of response along extensive margin, little evidence of response along intensive margin (except for self-employed) $\Rightarrow$ 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 $\uparrow$ or $\downarrow$ with earnings

Such confusion might be good for the government as the EITC induces work along participation margin without discouraging work along intensive margin (Liebman-Zeckhauser '04, Rees-Jones and Taubinsky '16)

## Chetty, Friedman, Saez AER'13 EITC heterogeneity

Use US population wide tax return data since 1996 (through IRS special contract)

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

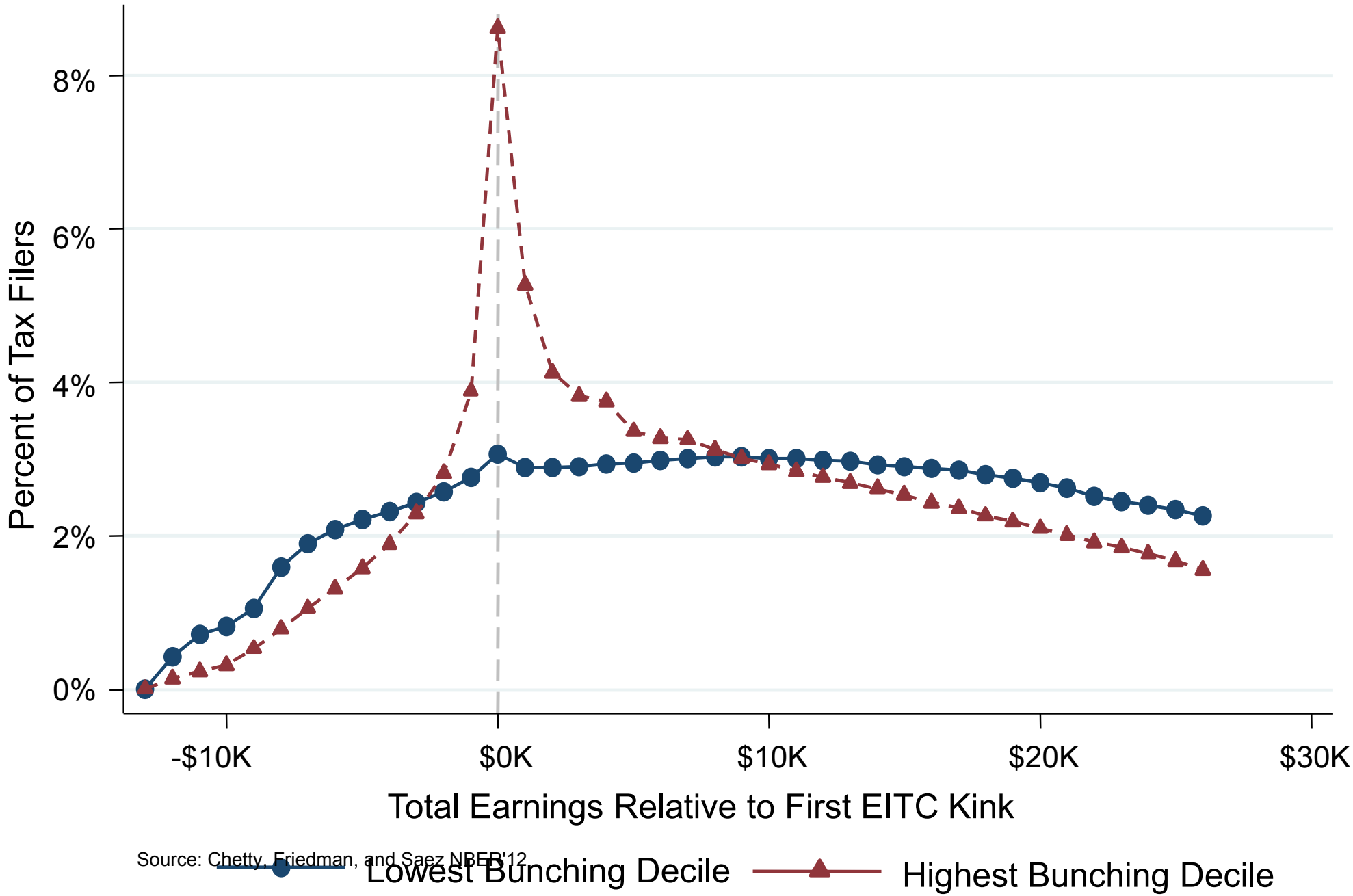
$\Rightarrow$ Information on EITC varies across areas and grows overtime

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

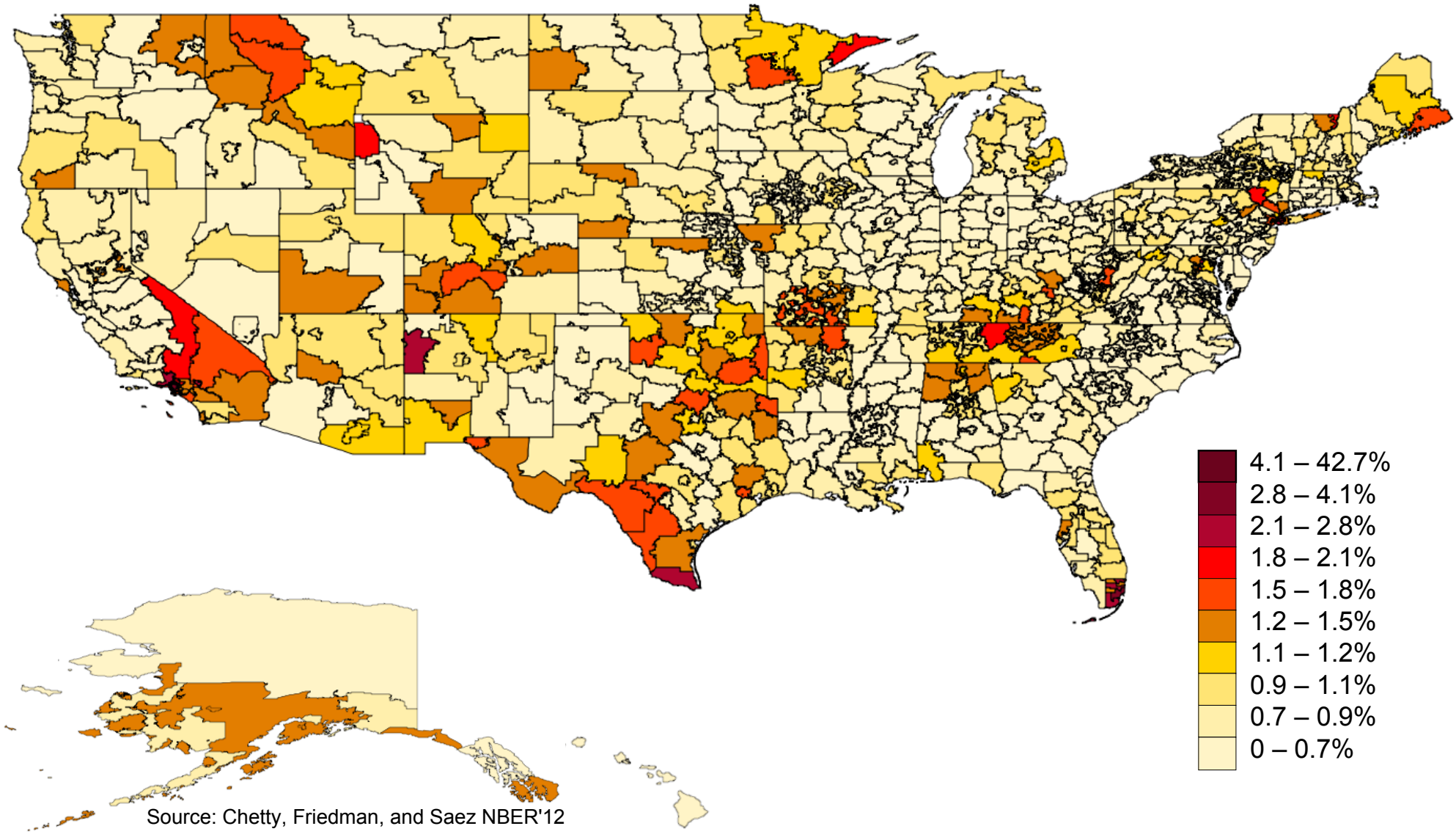
3) Omitted variable test: use birth of first child to test causal eff'EITC on wage earnings

$\Rightarrow$ Evidence of wage earnings response to EITC along intensive margin

# Earnings Distributions in Lowest and Highest Bunching Deciles

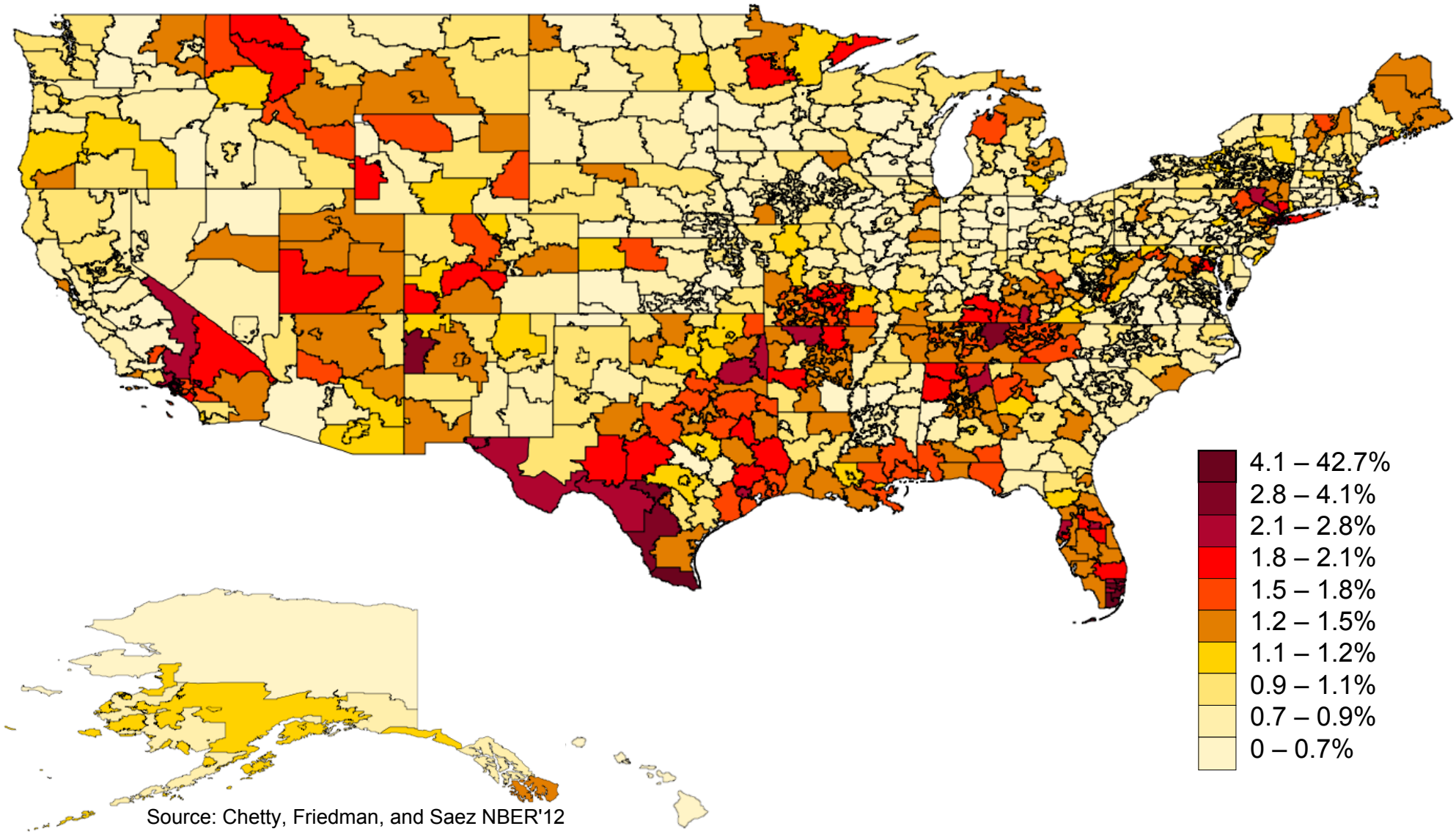


# Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 1996



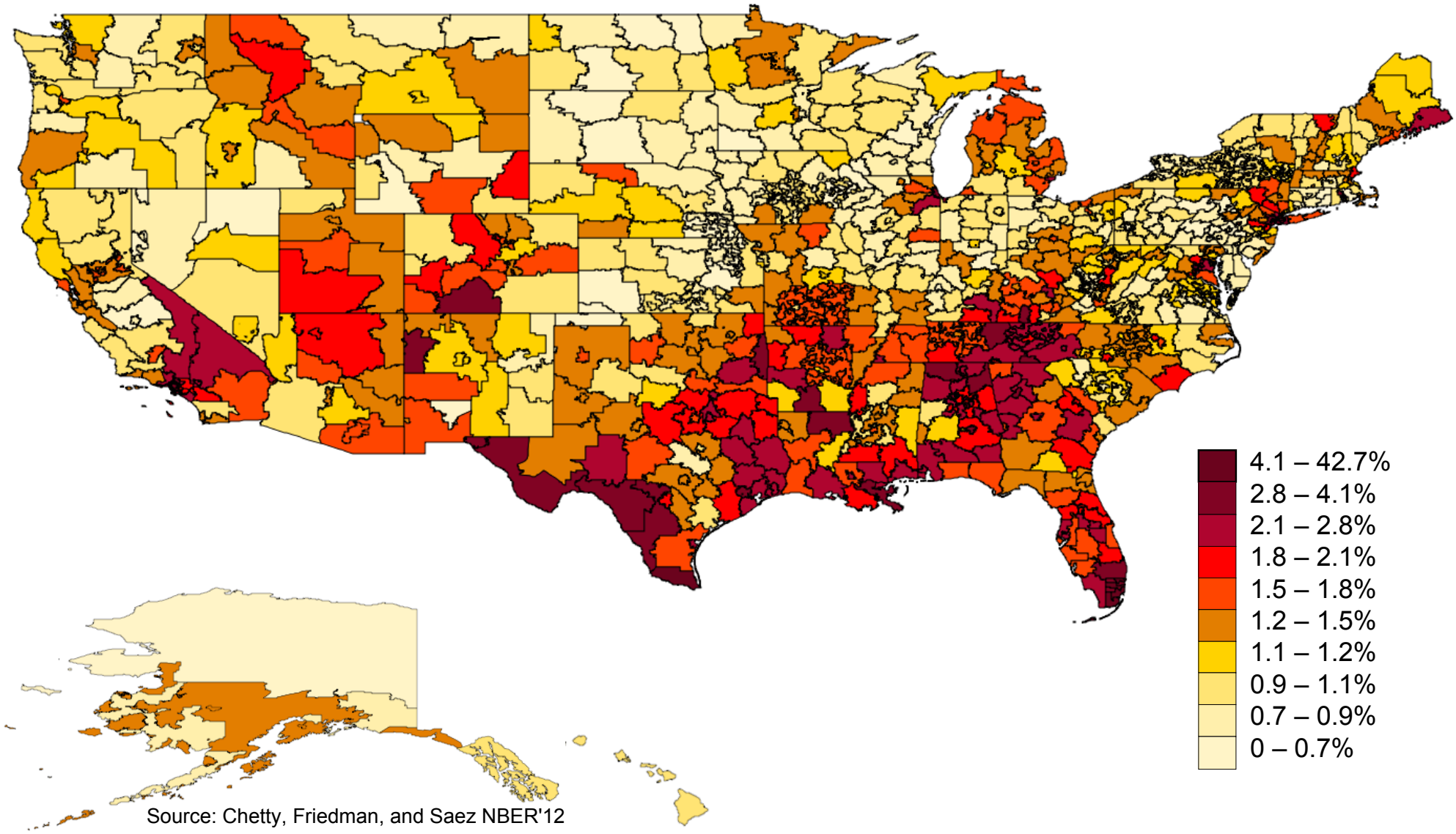

Source: Chetty, Friedman, and Saez NBER'12

# Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 1999



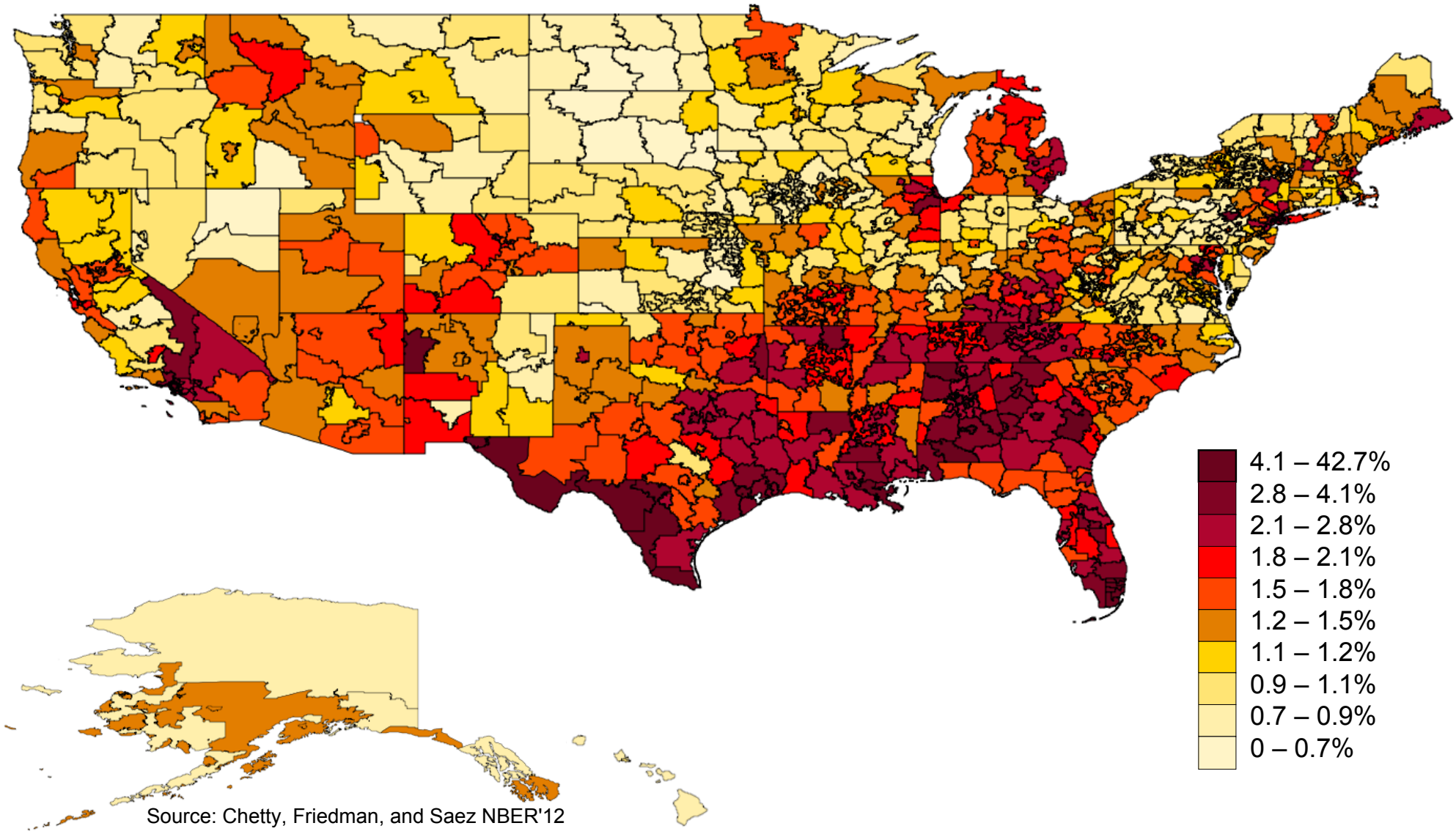

Source: Chetty, Friedman, and Saez NBER'12

# Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 2002



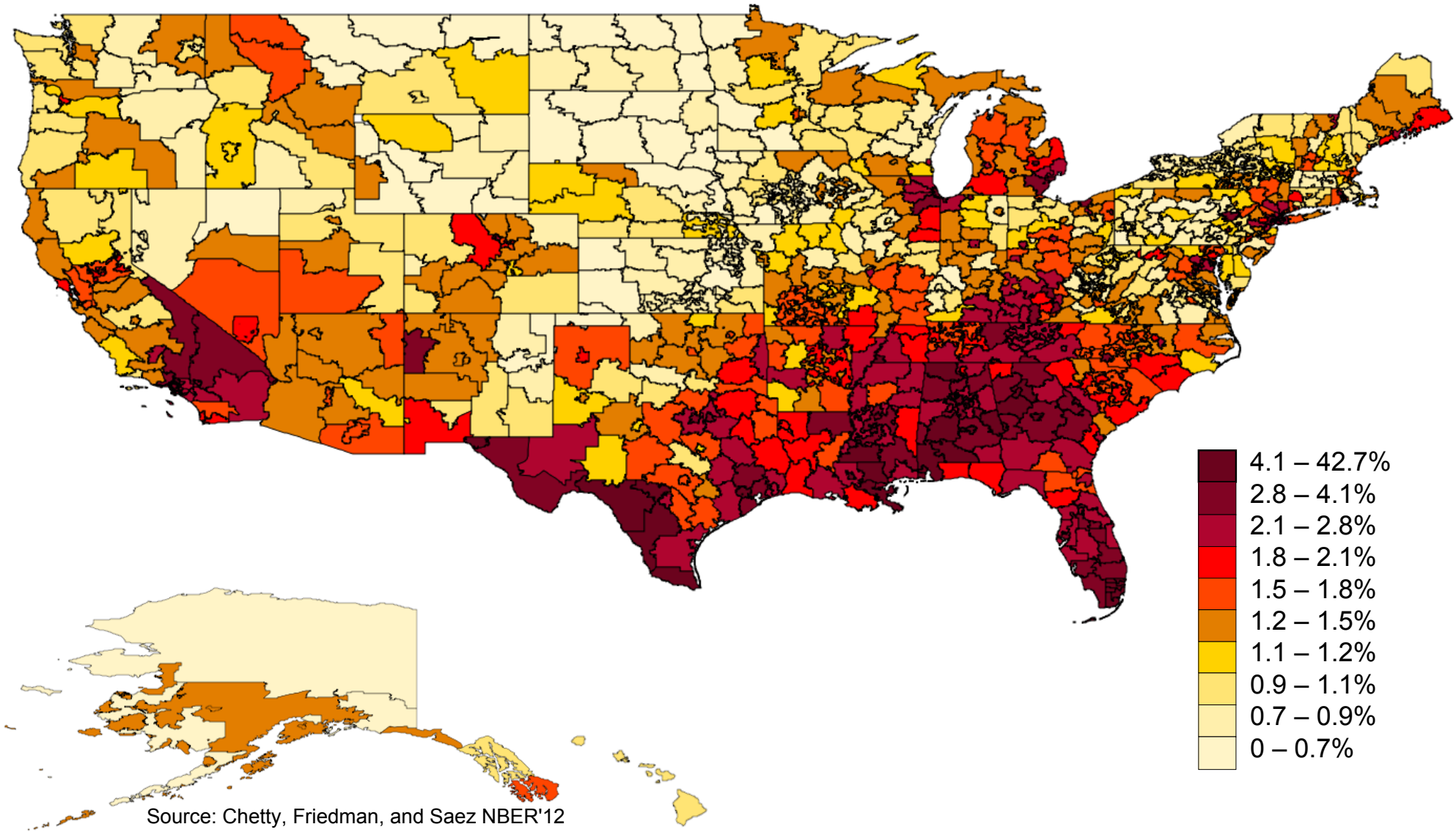

Source: Chetty, Friedman, and Saez NBER'12

# Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 2005



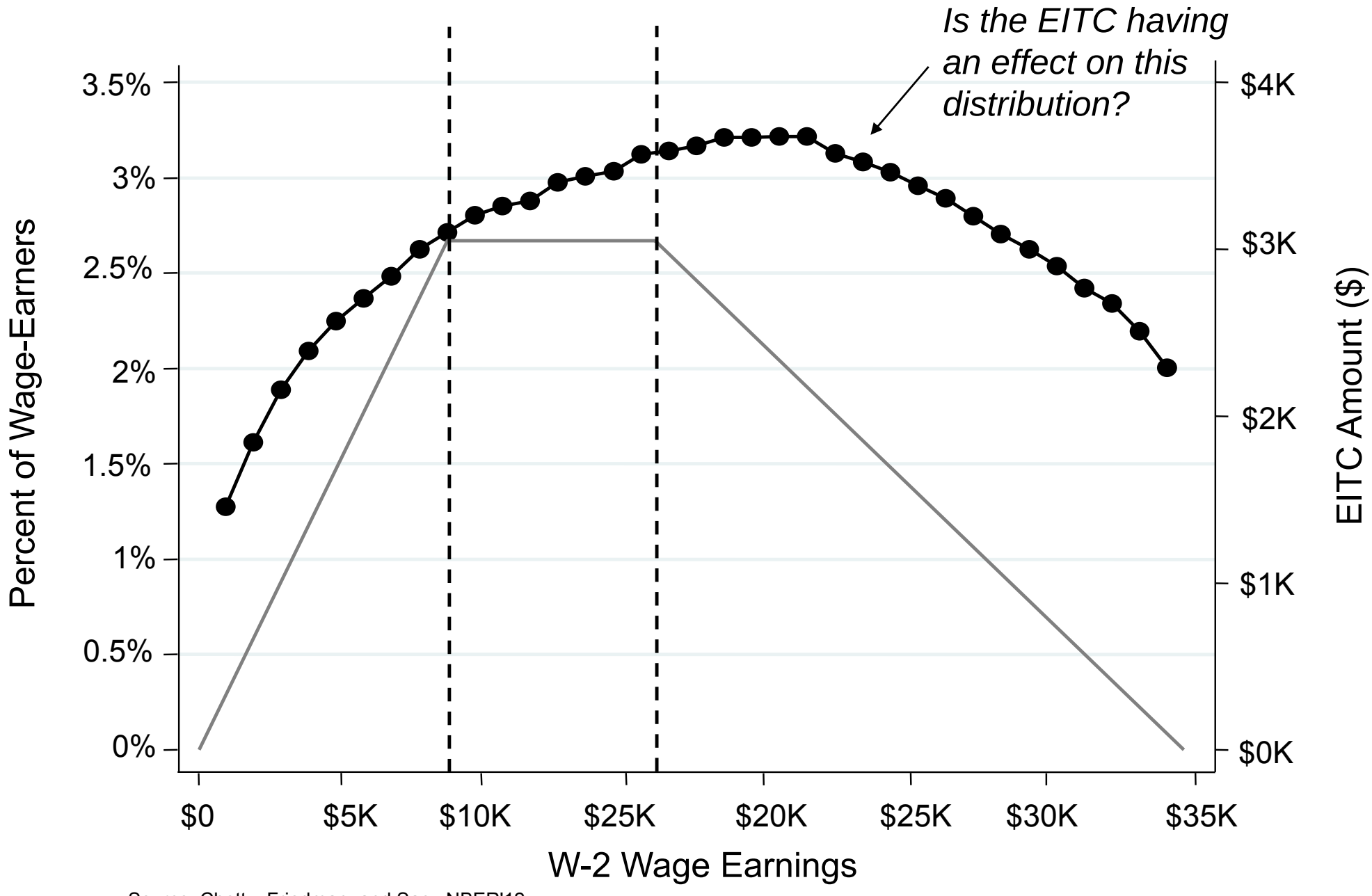

Source: Chetty, Friedman, and Saez NBER'12

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

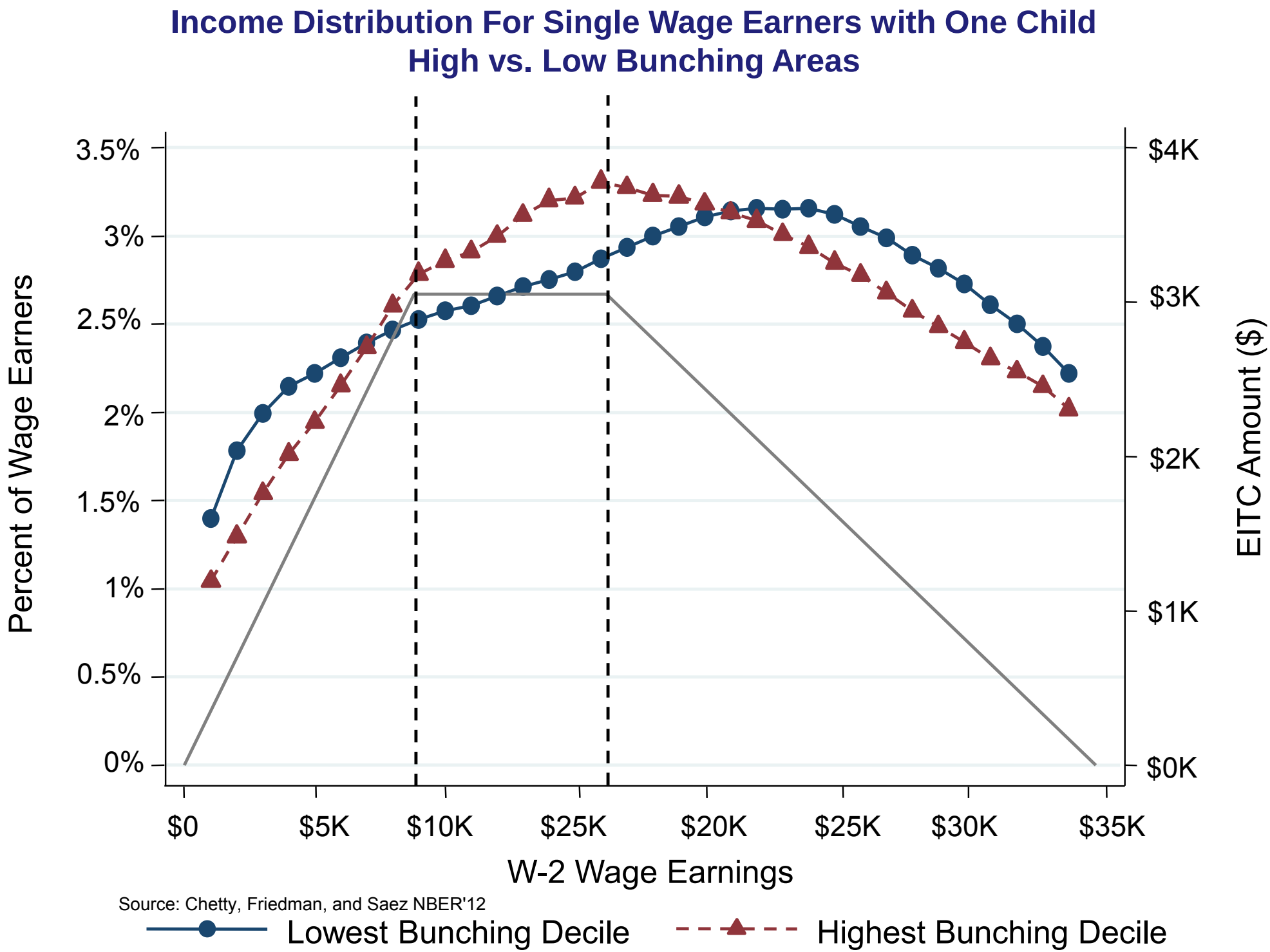



Source: Chetty, Friedman, and Saez NBER'12

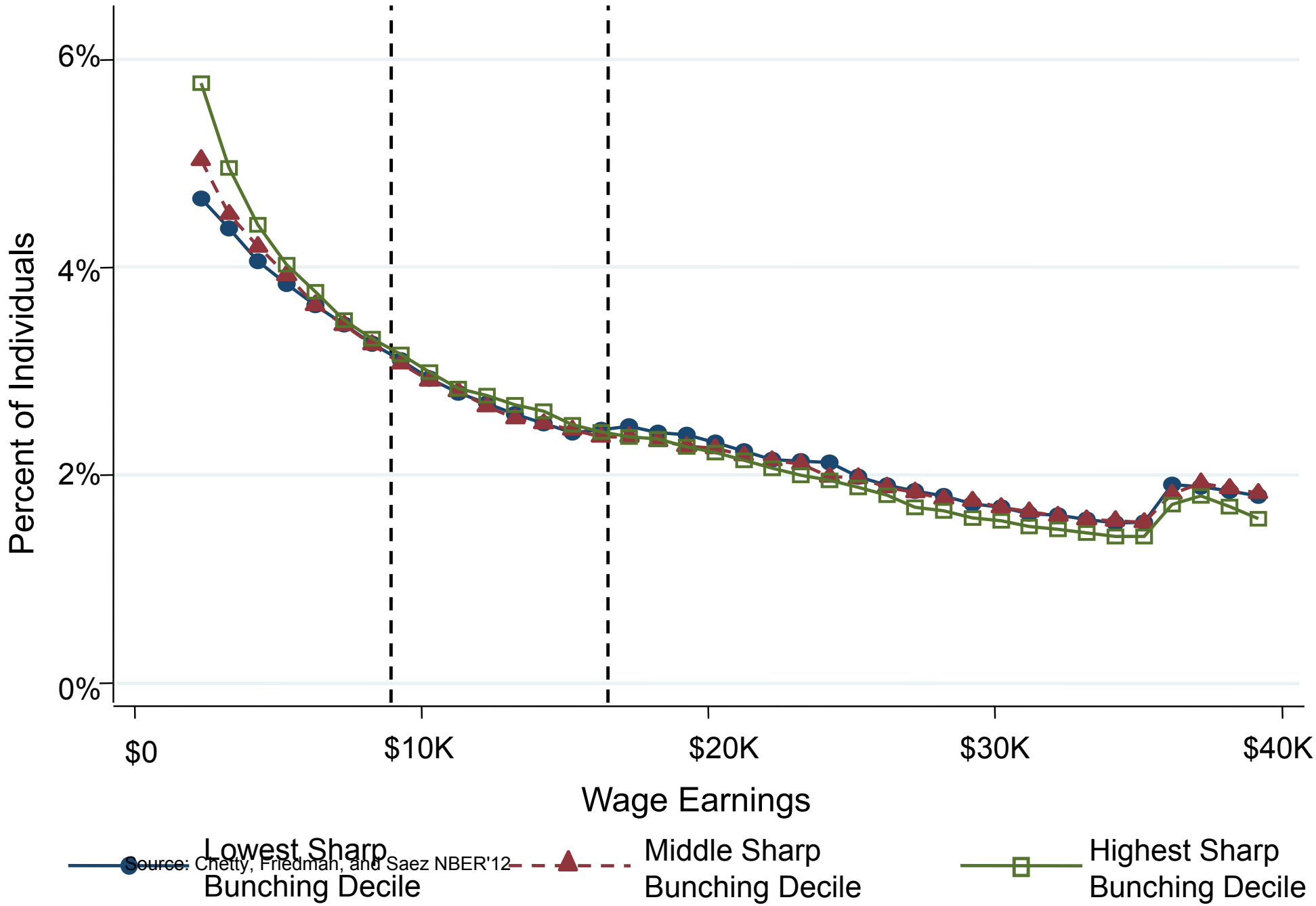
# Income Distribution For Single Wage Earners with One Child



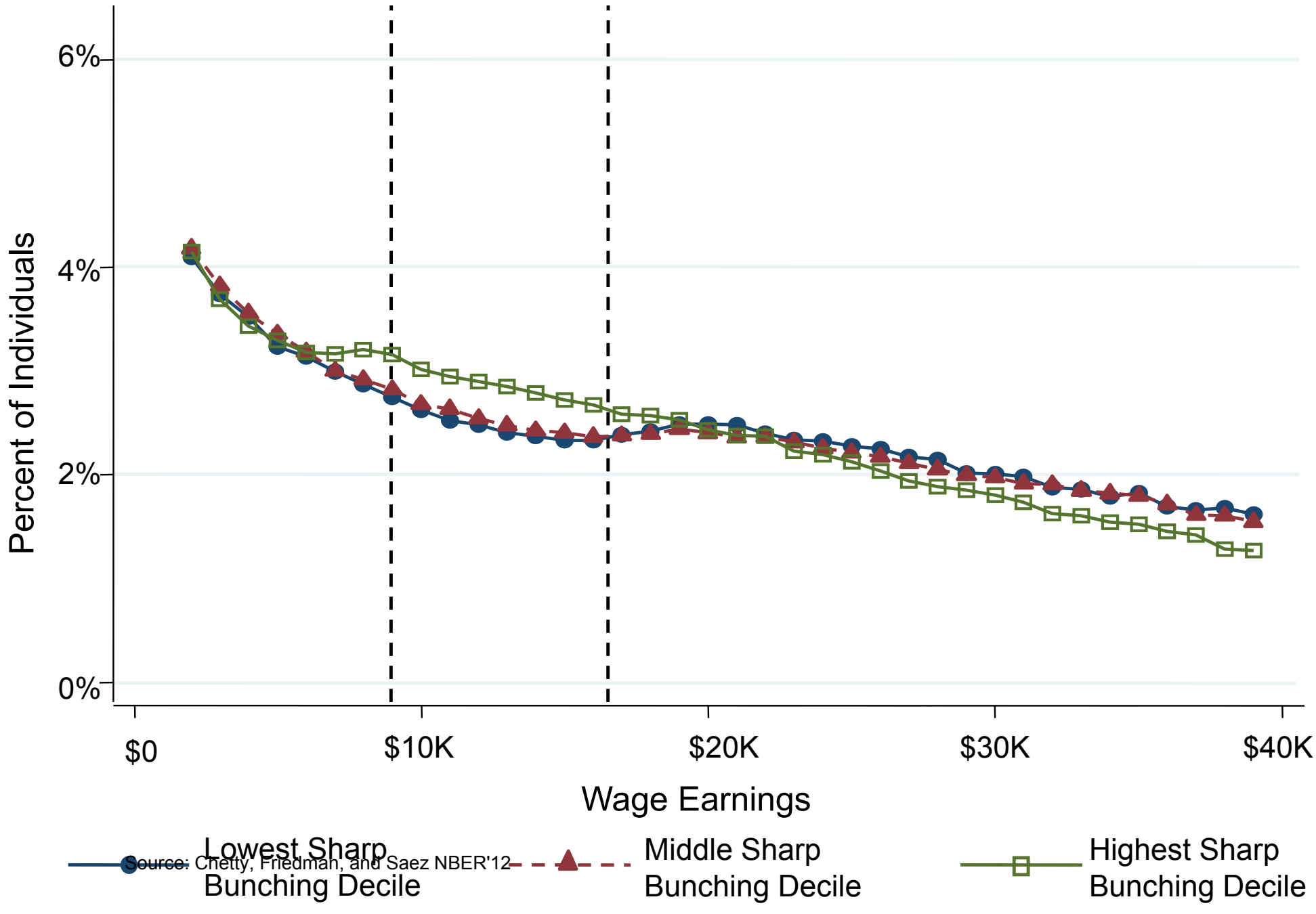

Source: Chetty, Friedman, and Saez NBER'12


Income Distribution For Single Wage Earners with One Child
High vs. Low Bunching Areas
Percent of Wage Earners
3.5%
3%
2.5%
2%
1.5%
1%
0.5%
0%
EITC Amount ($)
$4K
$3K
$2K
$1K
$0K
$0
$5K
$10K
$25K
$20K
$25K
$30K
$35K
W-2 Wage Earnings
Source: Chetty, Friedman, and Saez NBER'12
Lowest Bunching Decile
Highest Bunching Decile

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



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



# IMPLICATIONS OF ROLE OF INFORMATION

**Empirical work:**

Information should be a key explanatory variable in estimation of behavioral responses to govt programs

When doing empirical project, always ask the question: did people affected understand incentives?

Cannot identify structural parameters of preferences without modeling information and salience

**Normative analysis:**

Information is a powerful and inexpensive policy tool to affect behavior

Should be incorporated into optimal policy design problems

# Value of Administrative data

Key advantages of admin data (in most advanced countries such as Scandinavia):

1) Size (often full population available)

2) Longitudinal structure (can follow individual across years)

3) Ability to match wide variety of data (tax records, earnings records, family records, health records, education records)

US is lagging behind in terms of admin data access [hard to match across agencies]

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

# Bunching at Notches

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

Such discontinuities should create bunching (and gaps) in the resulting distributions

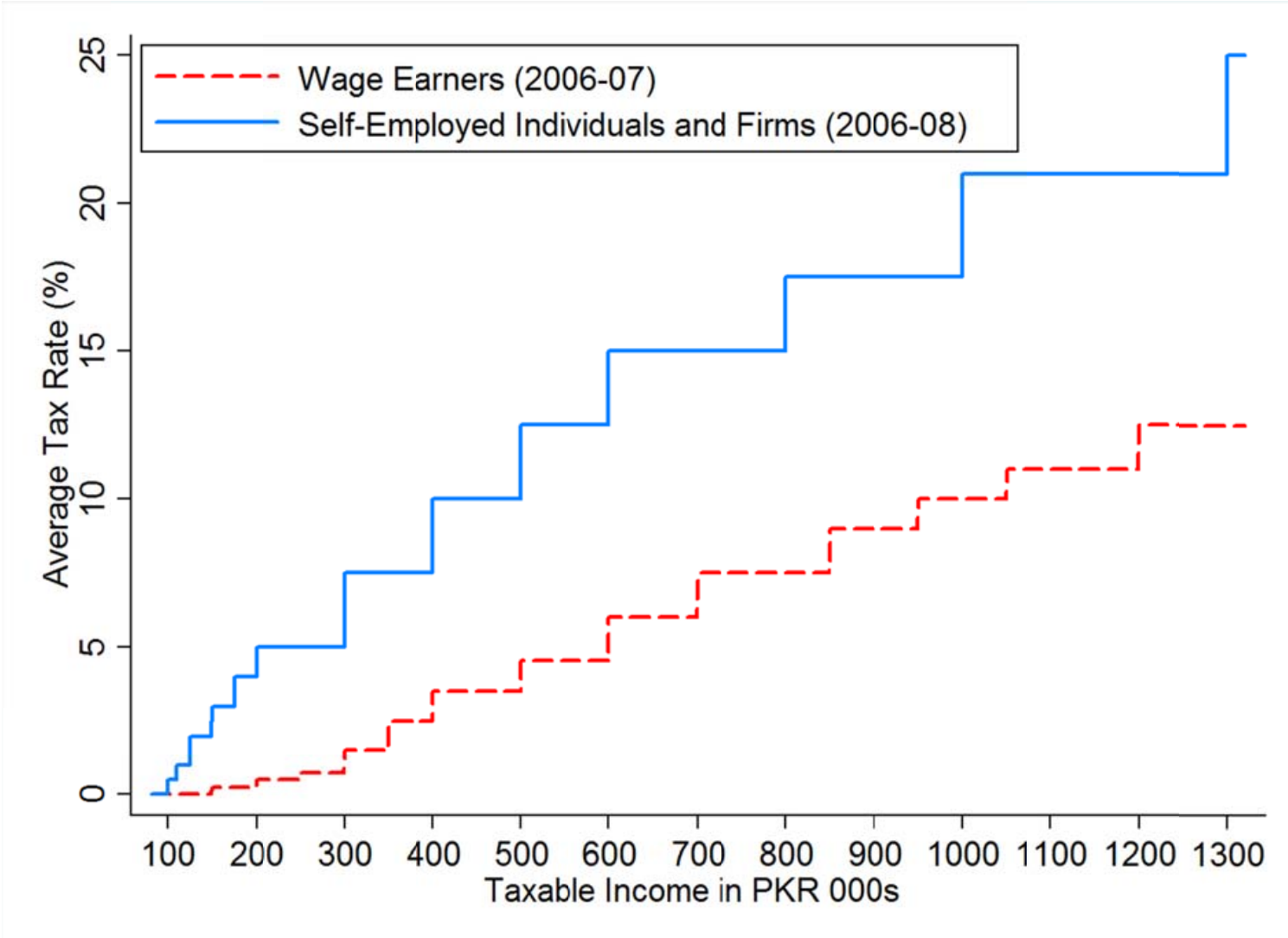
Example: Pakistani income tax creates notches because **average** tax rate jumps $\Rightarrow$ Bunching below the notch and gap in density just above the notch

**Empirically:** Kleven and Waseem QJE'13 find evidence of bunching (primarily among self-employed) but size of the response is quantitatively small

Large fraction of taxpayers are unresponsive to notch likely due to lack of information

**FIGURE 3**

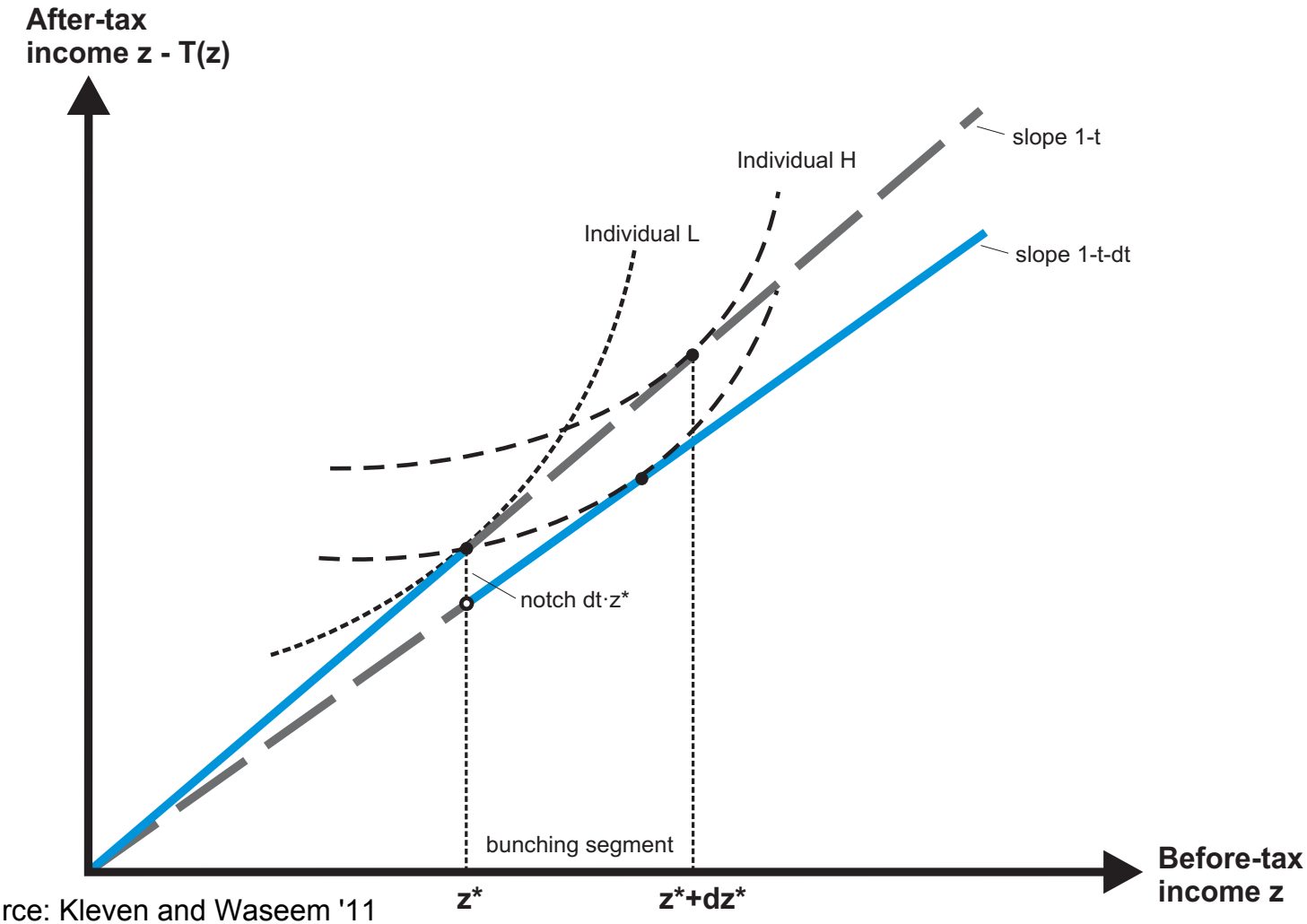
Personal Income Tax Schedules in Pakistan




Notes: the figure shows the statutory (average) tax rate as a function of annual taxable income in the personal income tax schedules for wage earners (red dashed line) and self-employed individuals and unincorporated firms (blue solid line), respectively. Taxable income is shown in thousands of Pakistani Rupees (PKR), and the PKR-USD exchange rate is around 85 as of April 2011. The schedule for the self-employed applies to the full period of this study (2006-08), while the schedule for wage earners applies only to 2006-07 and was changed by a tax reform in 2008. The tax system classifies individuals as either wage

# FIGURE 1
Effect of Notch on Taxpayer Behavior

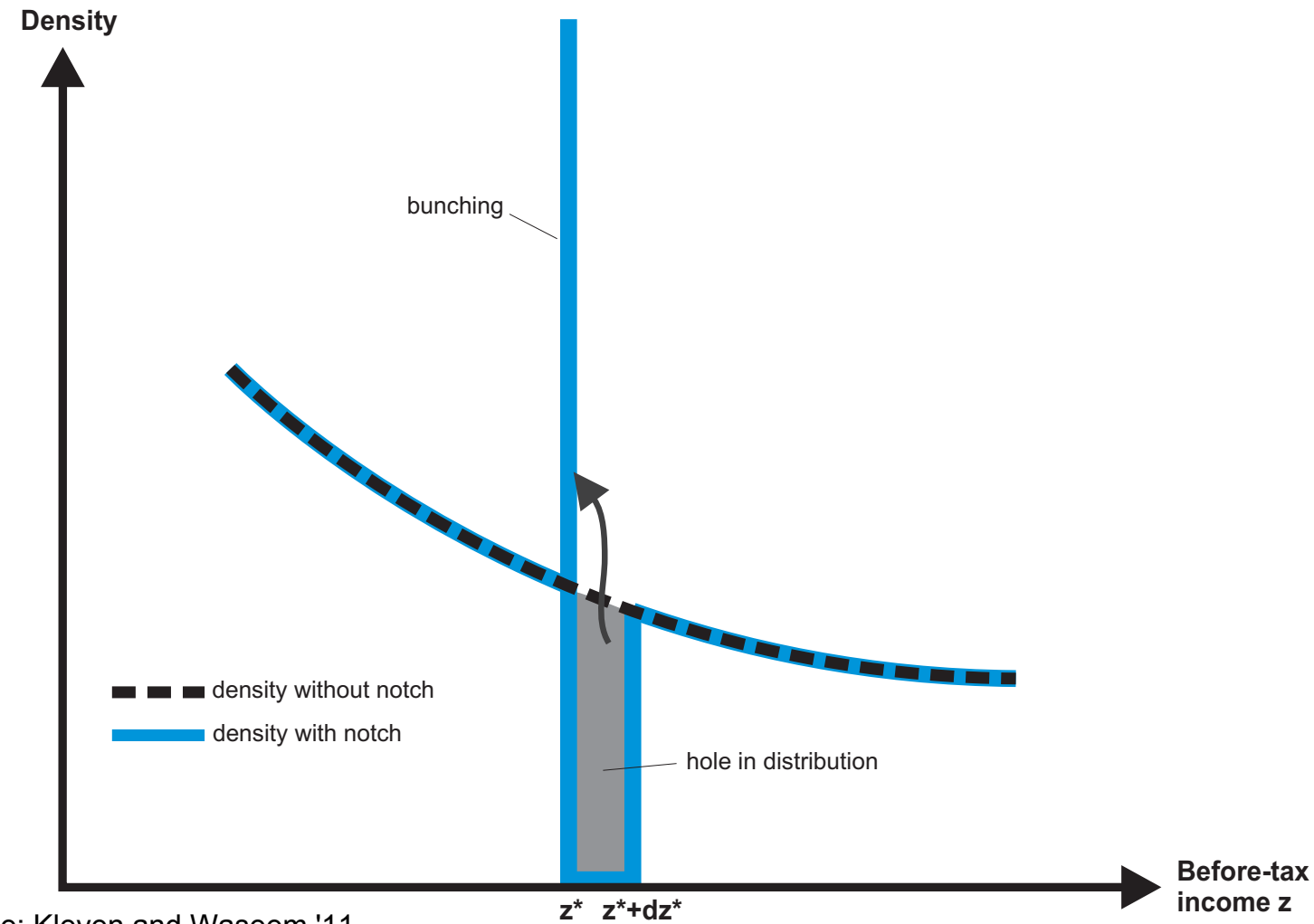
## Panel A: Bunching at the Notch




Source: Kleven and Waseem '11

# FIGURE 2
Effect of Notch on Density Distribution

## Panel A: Theoretical Density Distributions

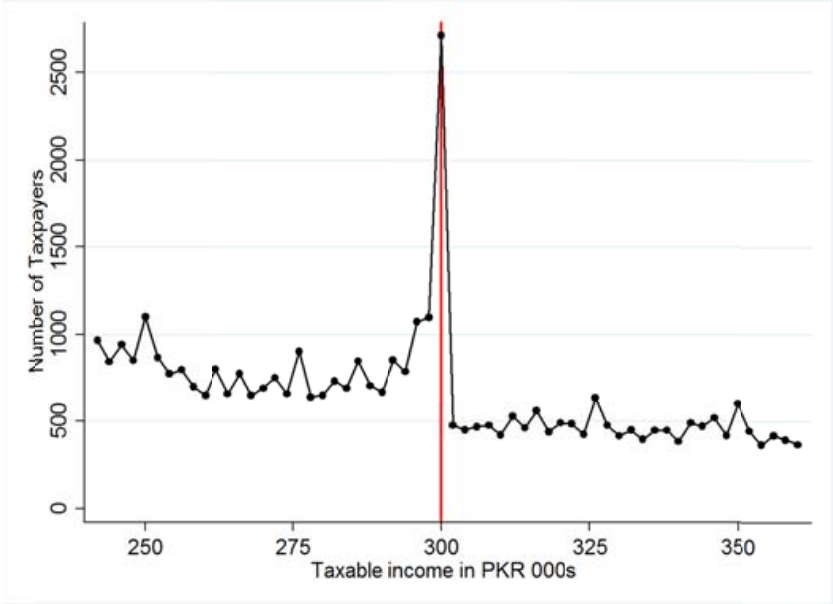



Source: Kleven and Waseem '11

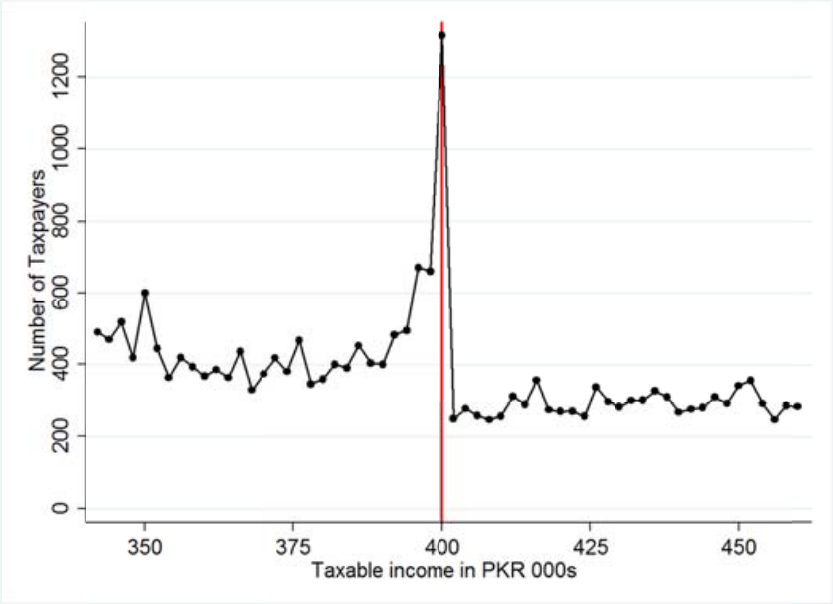
**FIGURE 5**

Density Distribution around Middle Notches:
Self-Employed Individuals and Firms (Sophisticated Fillers)

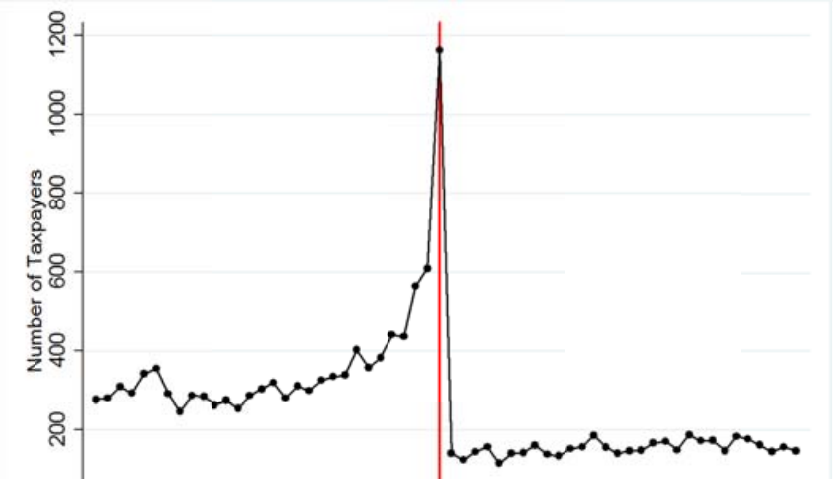
**Panel A: Notch at 300k**



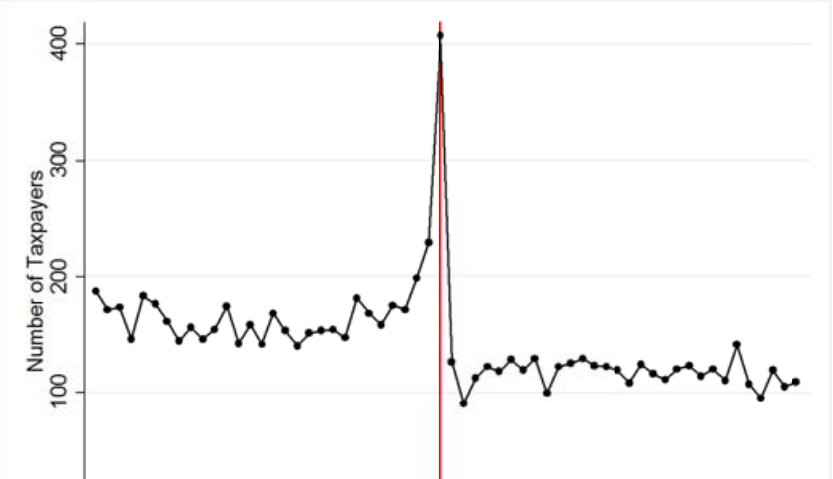

**Panel B: Notch at 400k**




**Panel C: Notch at 500k**




**Panel D: Notch at 600k**



## Kleven and Waseem QJE'13 notch analysis

With optimization frictions (lack of information, costs of adjustment), a fraction of individuals fail to respond to notch

Kleven-Waseem use empirical density in the theoretical gap area to measure the fraction of unresponsive individuals

This allows them to back up the frictionless elasticity (i.e. the elasticity among responsive individuals)

The frictionless elasticity is much higher than the reduced form elasticity but remains still relatively modest

## Blomquist-Newey critique and "solutions"

With a single cross-section, need to make assumptions about the counterfactual distribution (which is unknown).

How can we address this problem?

With a cross-section?

What additional data could we use?

Recently Londono-Velez and Avila (2018) use notch analysis to study wealth tax in Columbia

They show clean prior-year counterfactual overcoming the Blomquist-Newey '17 critique

Figure 1: The Personal Wealth Tax Schedule in Colombia

(a) Wealth Tax Liability as a Function of Reported Net Wealth (FY 2010)

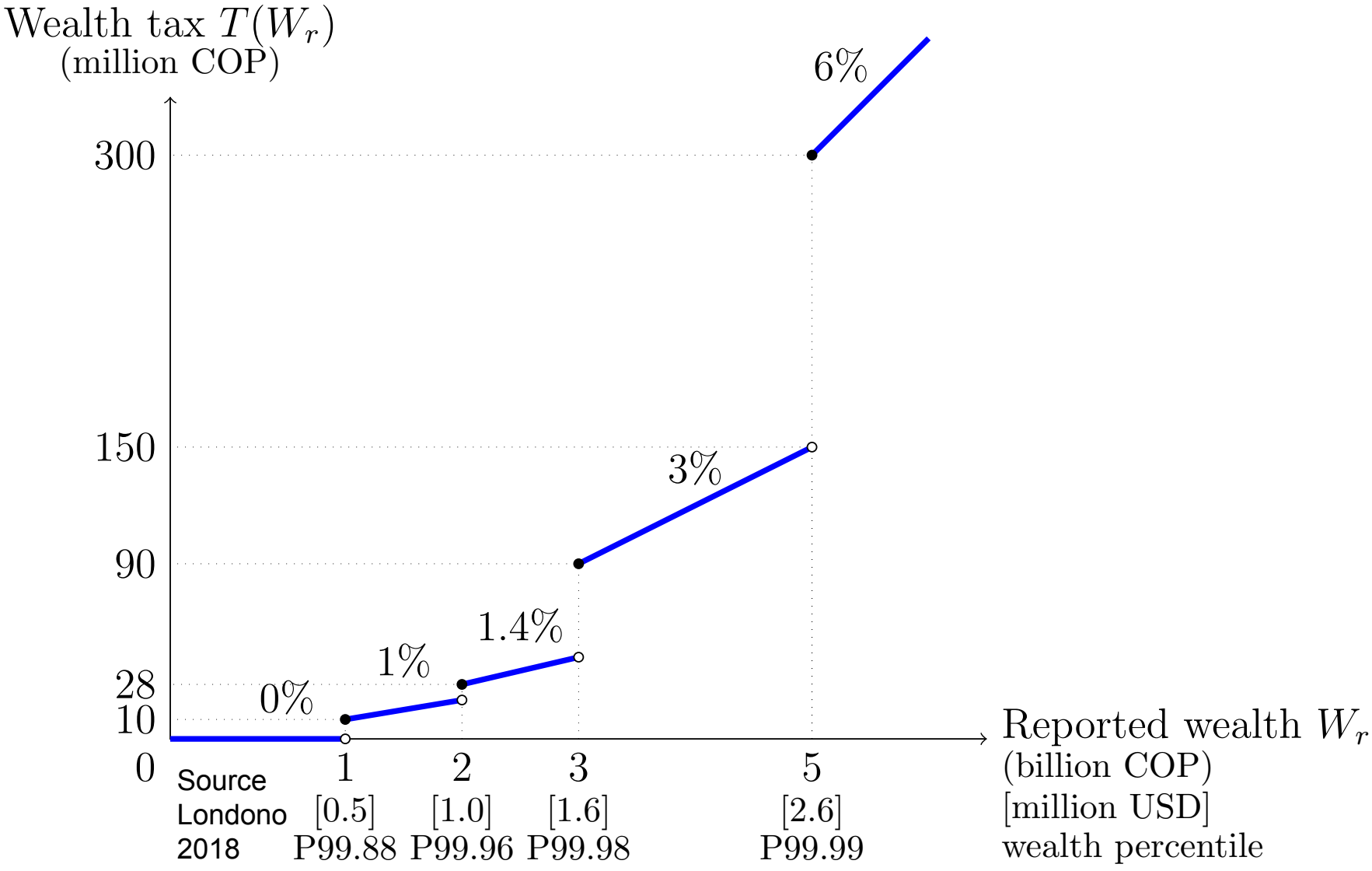
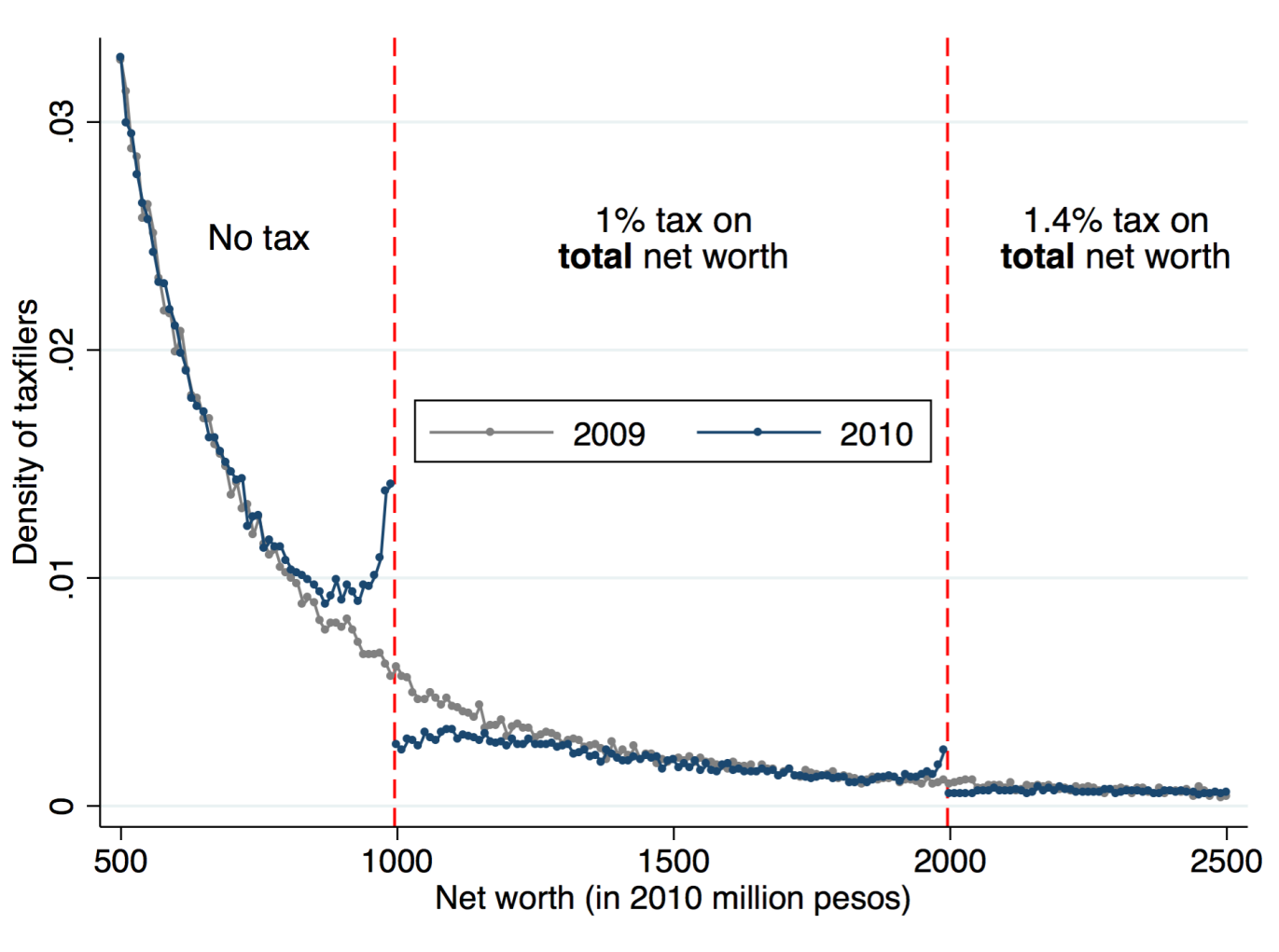


Figure 2: Distribution of Reported Net Worth in 2009 (Before Reform) and 2010 (After Reform)




*Notes:* This figure overlays the distribution of tax filers by reported net wealth before and after a reform introduced two wealth tax notches at 1 and 2 billion pesos (red vertical lines), as depicted in Figure 1. These notches imply that wealth tax liability jumps discontinuously, as illustrated in Figure 1. The figure shows that the distribution of individuals is smooth in the absence of wealth tax notches (2009). The two notches result in the immediate emergence of excess mass below the notch points, and corresponding missing mass just above them (2010). This

# 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 (Tazhidinova '15 on UK)
- Corporate tax (Devereux-Liu-Loretz '14, 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, 2017)

General findings:

# Macro Long-Run Evidence

1) Macroeconomists also estimate elasticities by examining long-term trends/cross-country comparisons

2) Identification more questionable but estimates perhaps more relevant to long-run policy questions of interest

3) Use aggregate hours data and aggregate measures of taxes (average tax rates)

4) Highly influential in calibration of macroeconomic models

## Trend-based Estimates and Macro Evidence

**Long-Run:** US real wage rates multiplied by about 5 from 1900 to present due to economic growth

Aged 25-54 male hours have fallen 25% and then stabilized (Ramey and Francis AEJ-macro '09)

$\Rightarrow$ Uncompensated hours of work elasticity is small ($< .1$)

However, taxes are rebated as transfers so can still have labor supply effects if large compensated elasticity/income effects

Alternative plausible story: utility depends on relative consumption $\Rightarrow$ Earnings \$10,000 is low today but would have been very good in 1900 (reference point labor supply theory)

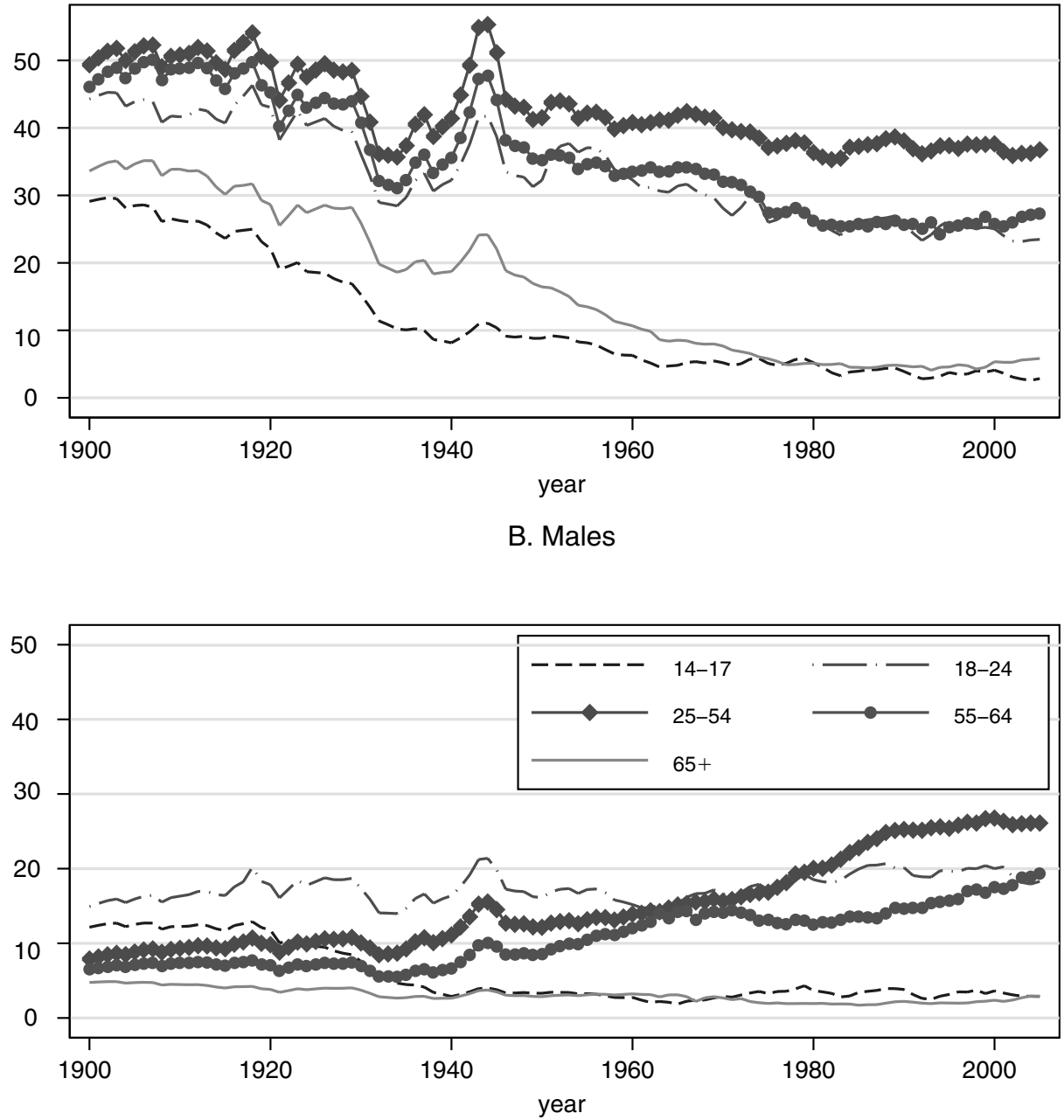



FIGURE 2. AVERAGE WEEKLY HOURS WORKED PER PERSON, BY AGE GROUP

# Long-run cross-country panel: Prescott 2004

Uses data on hours worked by country in 1970 and 1995 for 7 OECD countries [total hours/people age 15-64]

Technique to identify elasticity: calibration of GE model

Rough intuition: posit a labor supply model, e.g.

$$u(c, l) = c - \frac{l^{1+1/\varepsilon}}{1 + 1/\varepsilon}$$

Finds that elasticity of $\varepsilon = 1.2$ best matches time series and cross-sectional patterns

Note that this is analogous to a regression without controls for other variables

Results verified in subsequent calibrations by Ohanina-Raffo-Rogerson JME'08 and others using more data

Table 2

## Actual and Predicted Labor Supply

In Selected Countries in 1993–96 and 1970–74

| Period | Country | Labor Supply* | | Differences (Predicted Less Actual) | Prediction Factors | |
|---|---|---|---|---|---|---|
| | | Actual | Predicted | | Tax Rate $\tau$ | Consumption/ Output ($c/y$) |
| 1993–96 | Germany | 19.3 | 19.5 | .2 | .59 | .74 |
| | France | 17.5 | 19.5 | 2.0 | .59 | .74 |
| | Italy | 16.5 | 18.8 | 2.3 | .64 | .69 |
| | Canada | 22.9 | 21.3 | –1.6 | .52 | .77 |
| | United Kingdom | 22.8 | 22.8 | 0 | .44 | .83 |
| | Japan | 27.0 | 29.0 | 2.0 | .37 | .68 |
| | United States | 25.9 | 24.6 | –1.3 | .40 | .81 |
| 1970–74 | Germany | 24.6 | 24.6 | 0 | .52 | .66 |
| | France | 24.4 | 25.4 | 1.0 | .49 | .66 |
| | Italy | 19.2 | 28.3 | 9.1 | .41 | .66 |
| | Canada | 22.2 | 25.6 | 3.4 | .44 | .72 |
| | United Kingdom | 25.9 | 24.0 | –1.9 | .45 | .77 |
| | Japan | 29.8 | 35.8 | 6.0 | .25 | .60 |
| | United States | 23.5 | 26.4 | 2.9 | .40 | .74 |

*Labor supply is measured in hours worked per person aged 15–64 per week.
Sources: See Appendix.

Source: Prescott (2004)

## Reconciling Micro and Macro Estimates

Recent interest in reconciling micro and macro elasticity estimates (see Chetty-Guren-Manoli-Weber '13)

Three potential explanations

a) Statistical Bias: culture differs in countries with higher tax rates [Alesina, Glaeser, Sacerdote 2005, Steinhauer 2018 for Swiss communities by language]

b) Macro-elasticity captures long-term response which could be larger than short-term response (frictions, etc. Chetty '12).

c) Other programs: retirement, education affect labor supply at beginning and end of working life (Blundell-Bozio-Laroque '11) and child care affecting mothers (Kleven JEP'14)

## Blundell-Bozio-Laroque '13

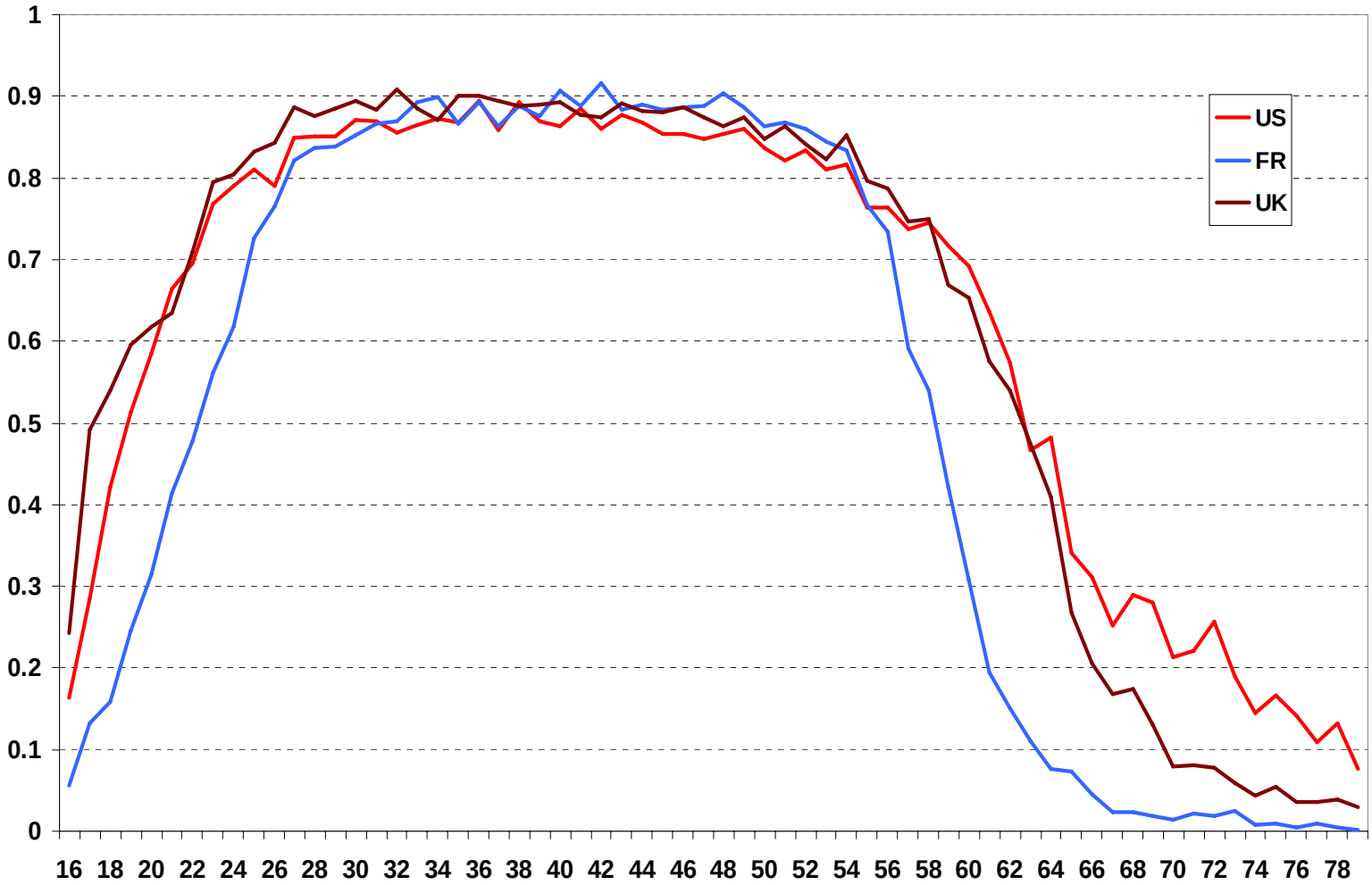
Strong evidence that variation in aggregate hours of work across countries happens among the young and the old: (a) schooling-work margin (b) presence of young children (for women), (c) early retirement

Serious cross-country time series analysis would require to put together a better tax wedge by age groups which includes all those additional govt programs [welfare, retirement, child care]

This has been done quite successfully in the case of retirement by series of books by Gruber and Wise, *Retirement around the world*

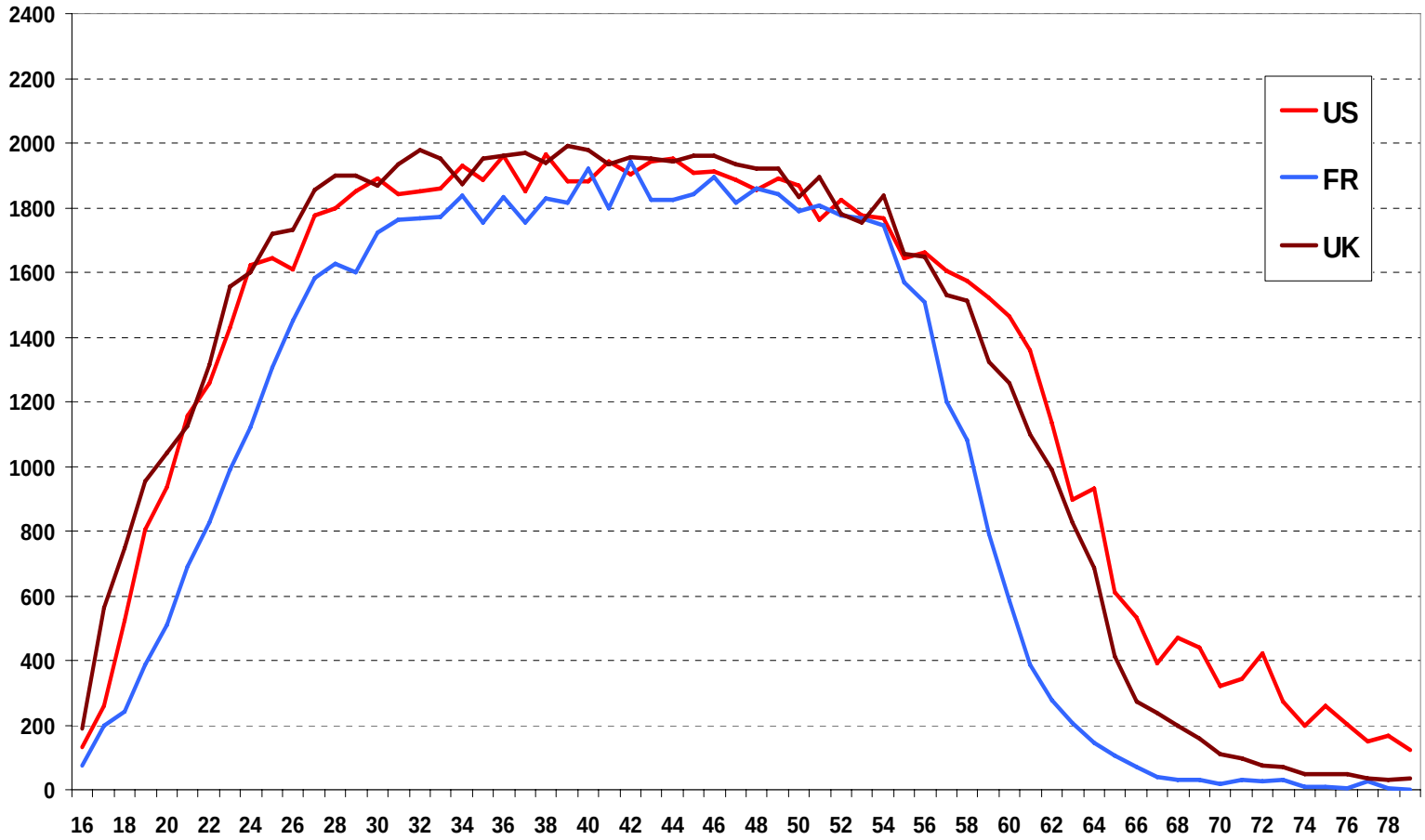
$\Rightarrow$ Need to develop a more comprehensive international / time series database of tax wedges by age and family types

# Male employment by age – US, FR and UK 2005



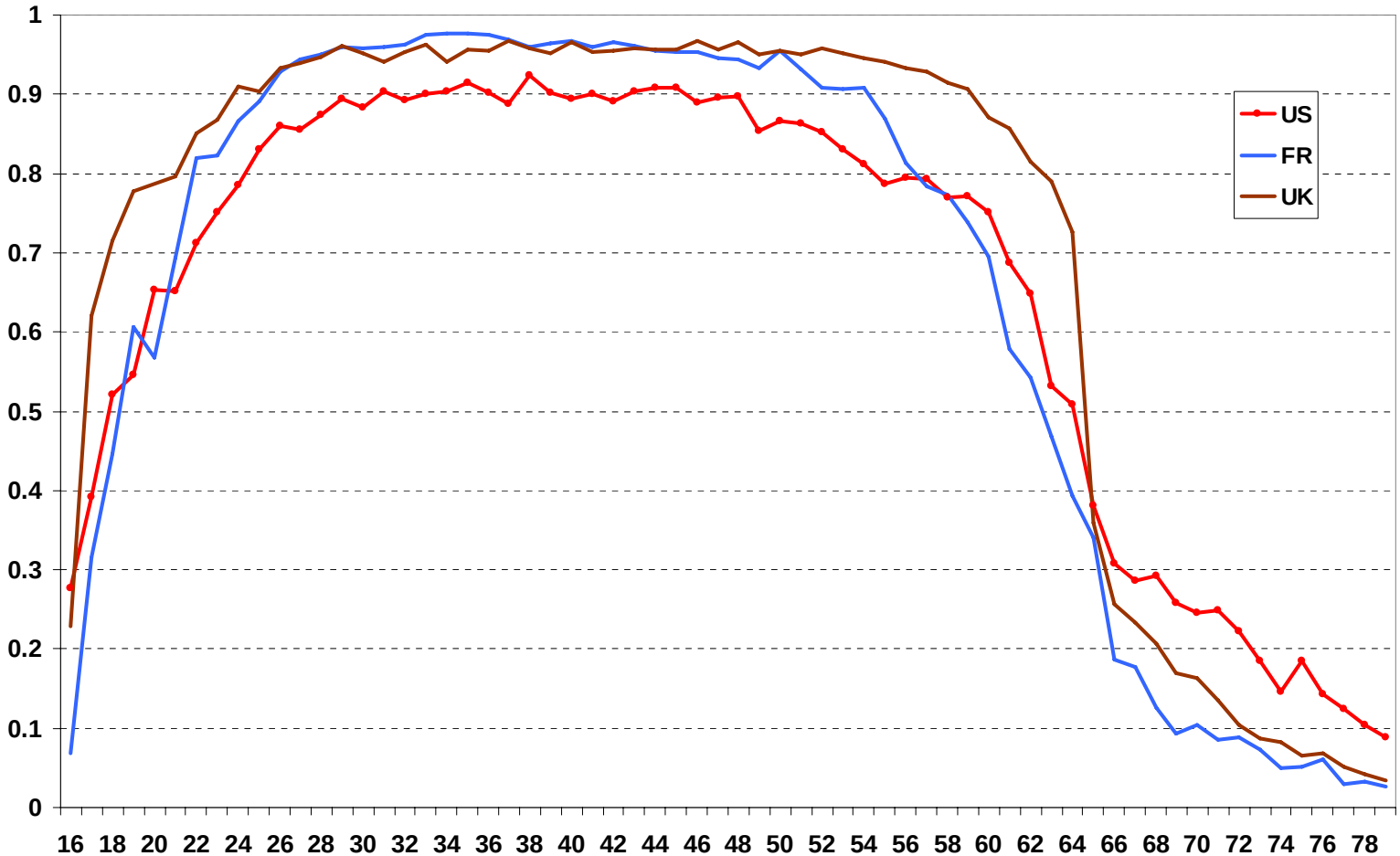

Source Blundell (2009), Mirrlees Review

# Male Hours by age – US, FR and UK 2005



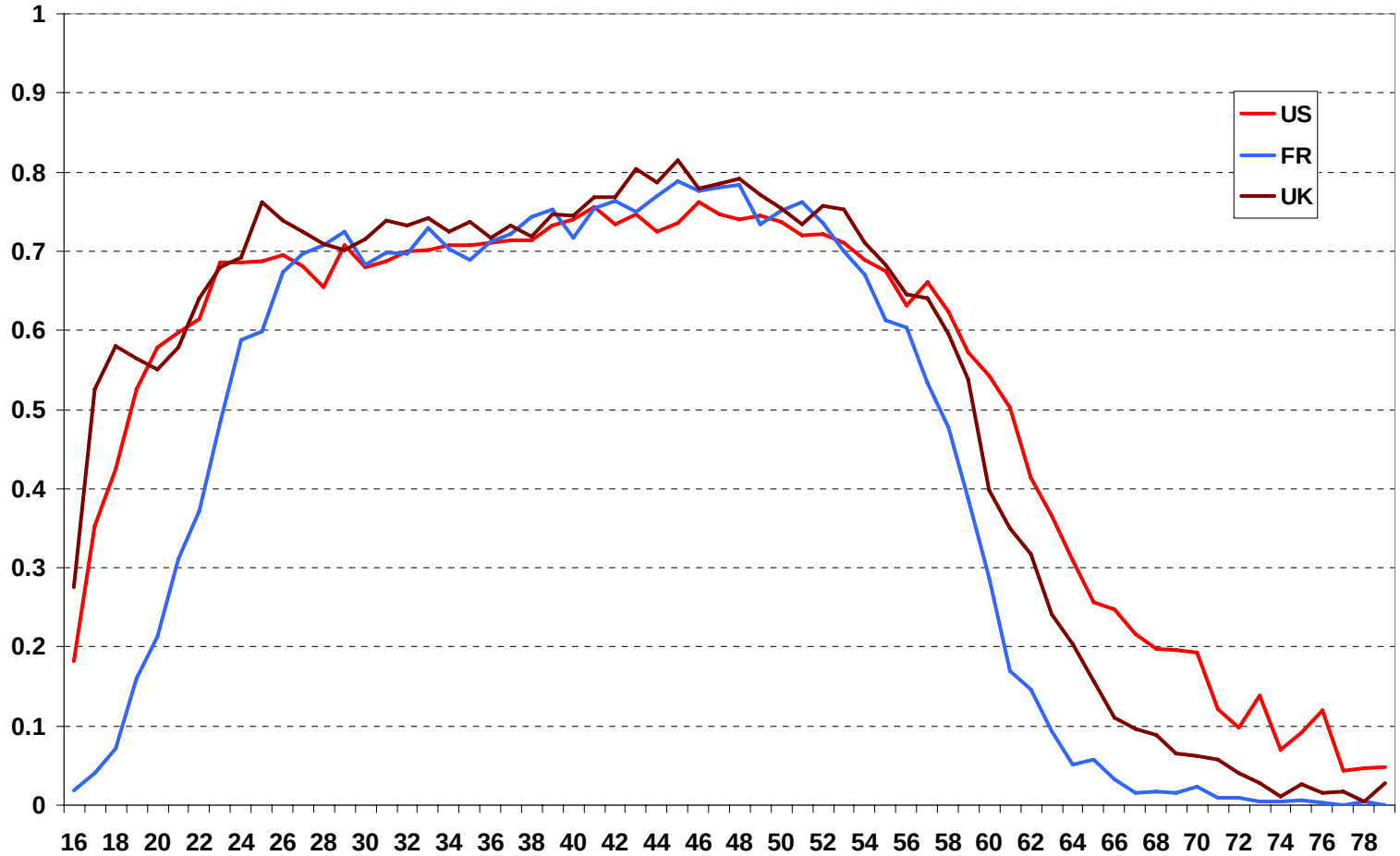

Source Blundell (2009), Mirrlees Review

# Male employment by age – US, FR and UK 1975



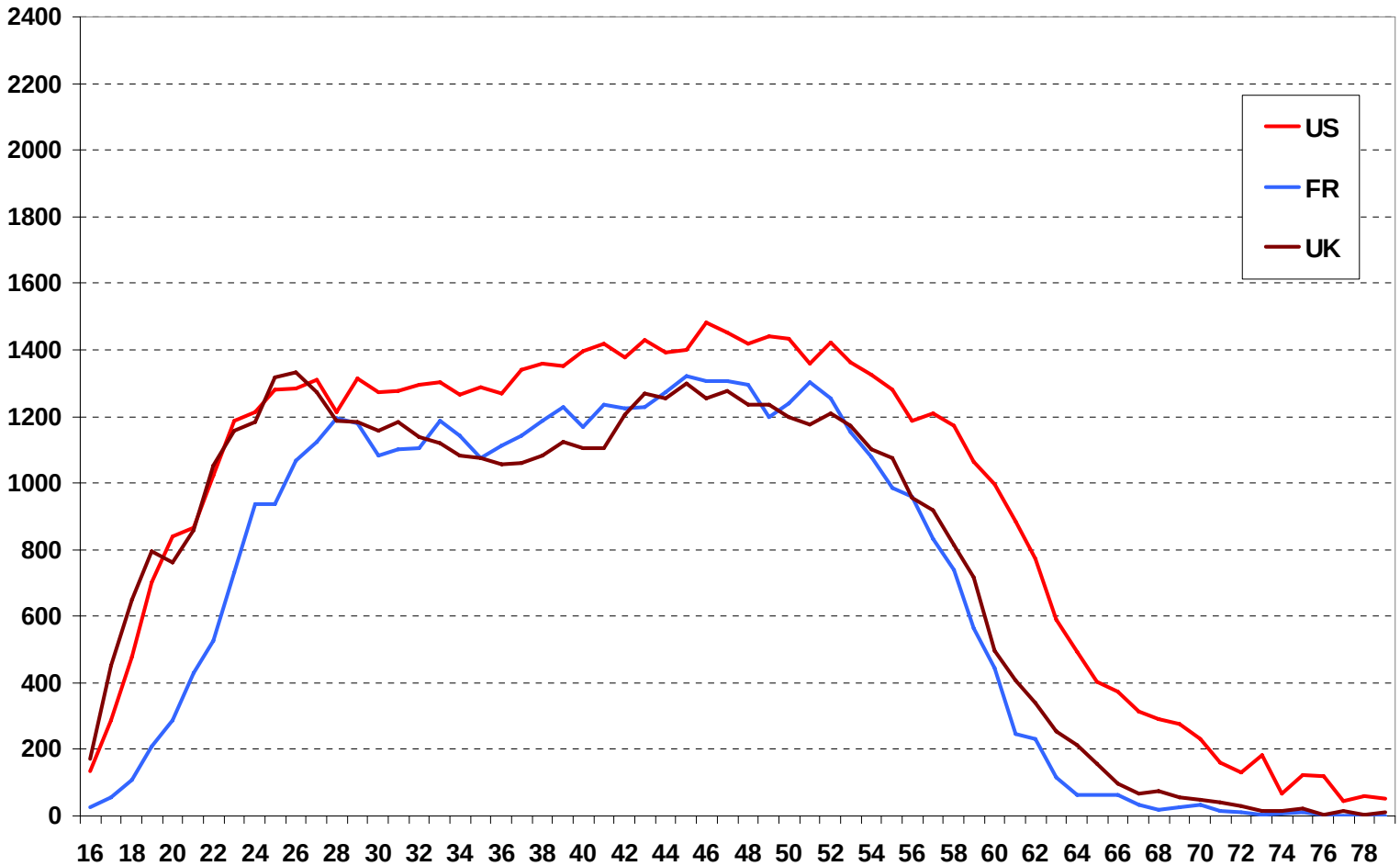

Source Blundell (2009), Mirrlees Review

# Female Employment by age – US, FR and UK 2005



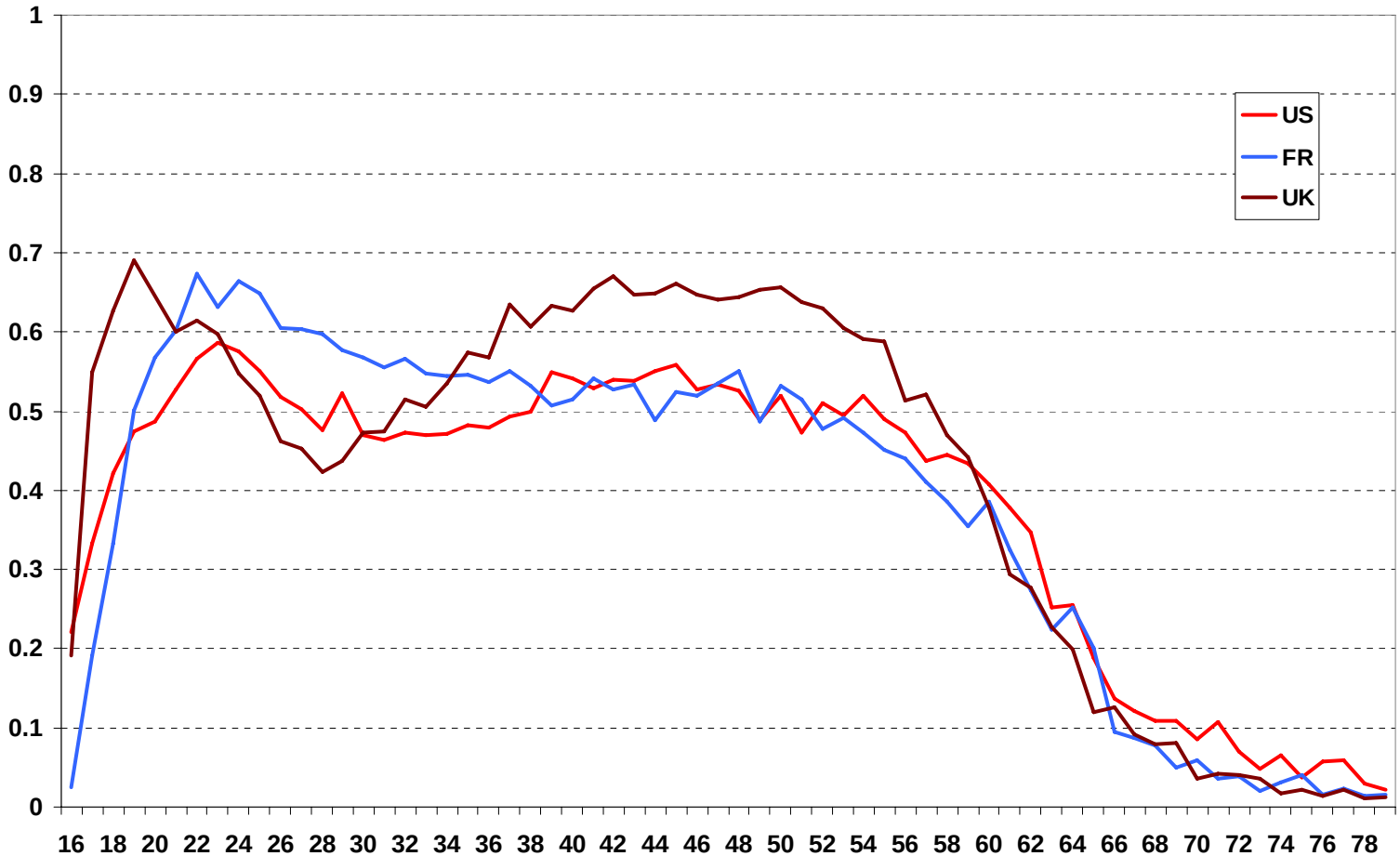

Source Blundell (2009), Mirrlees Review

# Female Hours by age – US, FR and UK 2005




Source Blundell (2009), Mirrlees Review

# Female Employment by age – US, FR and UK 1975




Source Blundell (2009), Mirrlees Review

## Long-term effects: Evidence from the Israeli Kibbutz

Abramitzky '15 book based on series of academic papers

Kibbutz are egalitarian and socialist communities in Israel, thrived for almost a century within a more capitalist society

1) Social sanctions on shirkers effective in small communities with limited privacy

2) Deal with brain drain exit using communal property as a bond

3) Deal with adverse selection in entry with screening and trial period

4) Perfect sharing in Kibbutz has negative effects on high school students performance but effect is small in magnitude (concentrated among kids with low education parents)

## Long-term effects: Evidence from the Israeli Kibbutz

Abramitzky-Lavy ECMA'14 show that high school students study harder once their kibbutz shifts away from equal sharing

Uses a DD strategy: pre-post reform and comparing reform Kibbutz to non-reform Kibbutz. Finds that

1) Students are 3% points more likely to graduate

2) Students are 6% points more likely to achieve a matriculation certificate that meets university entrance requirements

3) Students get an average of 3.6 more points in their exams

Effect is driven by students whose parents have low schooling; larger for males; stronger in kibbutz that reformed to greater degree

# Culture of Welfare across Generations

Conservative concern that welfare promotes a culture of dependency: kids growing up in welfare supported families are more likely to use welfare

Correlation in welfare use across generations is obviously not necessarily causal

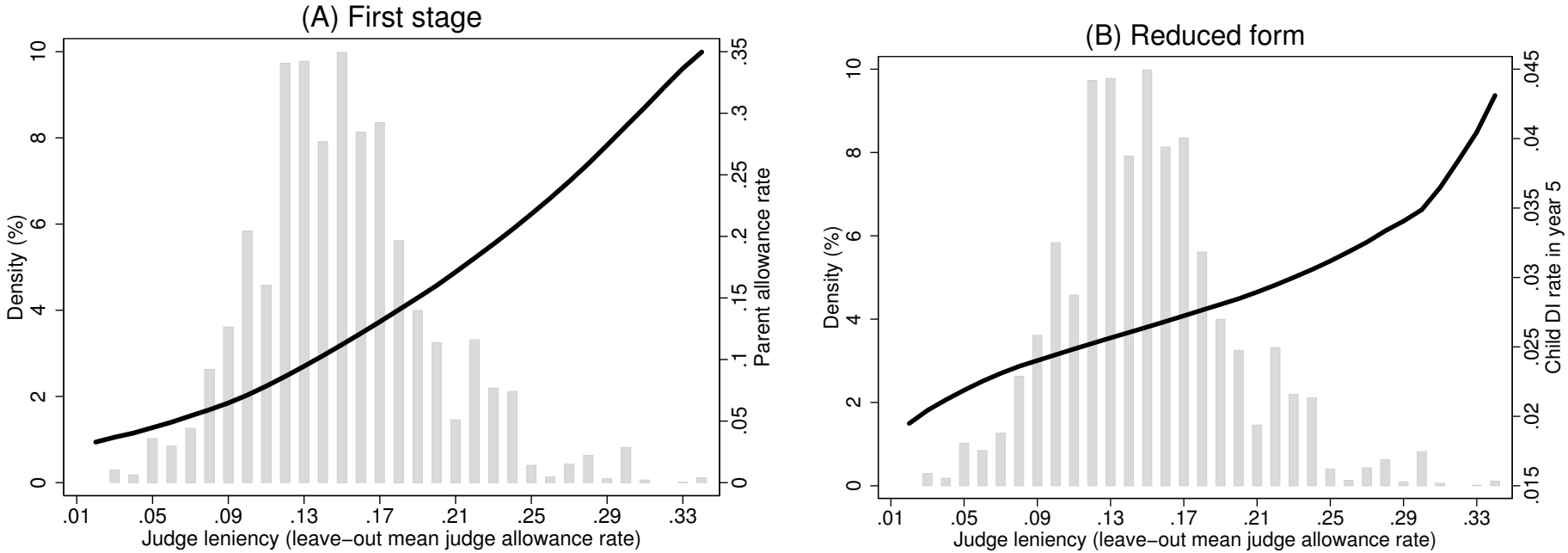
Dahl, Kostol, Mogstad QJE'2014 analyze causal effect of parental use of Disability Insurance (DI) on children use (as adults) of DI in Norway

Identification uses random assignment of judges to denied DI applicants who appeal [some judges are severe, some lenient]

Find evidence of causality: parents on DI increases odds of kids on DI over next 5 years by 6 percentage points

Mechanism seems to be learning about DI availability rather than reduced stigma from using DI [because no effect on other welfare programs use]

**Figure 3: Effect of Judge Leniency on Parents (First Stage) and Children (Reduced Form).**




*Notes:* Baseline sample, consisting of parents who appeal an initially denied DI claim during the period 1989-2005 (see Section 3 for further details). There are 14,893 individual observations and 79 different judges. Panel (A): Solid line is a local linear regression of parental DI allowance on judge leniency. Panel (B): Solid line is a local linear regression of child DI receipt on their parent's judge leniency measure. All regressions include fully interacted year and department dummies. The histogram of judge leniency is shown in the background of both figures (top and bottom 0.5% excluded from the graph).

Source: Dahl, Kostol, Mogstad (2013)

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