

# Lecture 5: Taxes and Labor Supply

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## 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 (same as previous lecture):

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

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

Individual solves

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

## LABOR SUPPLY BEHAVIOR

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:  $\varepsilon^u = (w/l)\partial l^u/\partial w$  [% 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  $wl - c$  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:  $\partial l/\partial w = \partial l^c/\partial w + l\partial l/\partial R \Rightarrow \varepsilon^u = \varepsilon^c + \eta$

## 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.]

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

## 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

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 $\epsilon_i$

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

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  $\epsilon_i$  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 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

## Negative Income Tax (NIT) Experiments

- 1) Best way to resolve identification problems: exogenously increase the tax rate / non-labor income 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

- 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) 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”

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:  $\eta = w\partial I/\partial R$  between -0.05 and -0.10

Identification threat: differential response-rate among groups

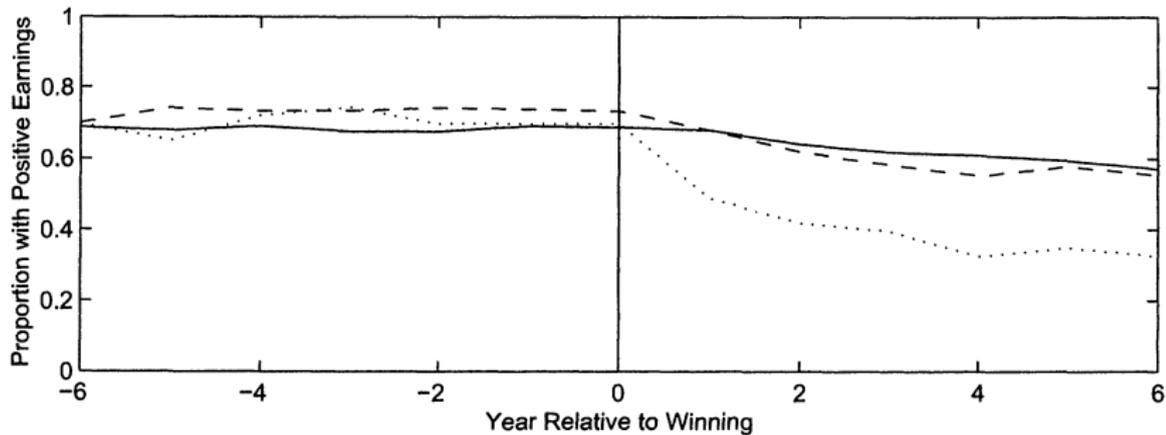


FIGURE 2. PROPORTION WITH POSITIVE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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

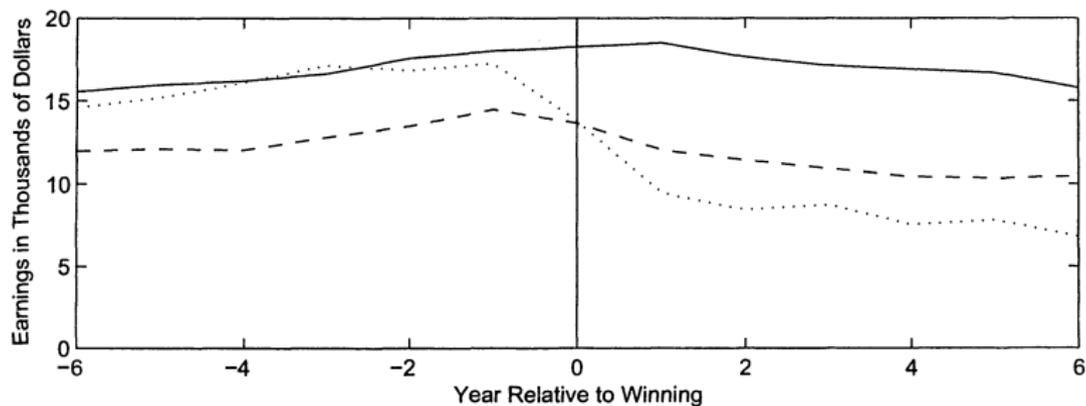


FIGURE 1. AVERAGE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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

## Responses to Low-Income Transfer Programs

- 1) Particular interest in treatment of low incomes in a progressive tax/transfer 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

## Overall Costs of Anti Poverty Programs

- 1) US government (fed+state and local) spent \$1000bn in 2016 on income-tested programs
  - a) About 5% of GDP but 15% of \$6 Trillion govt budget (fed+state+local).
  - b) About 50% is health care (Medicaid)
- 2) Only \$250 billion in cash (1.3% of GDP, or 25% of transfer spending)

## 1996 US Welfare Reform

- 1) Largest change in welfare policy
- 2) 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
- 3) Variation across states because Fed govt. gave block grants with guidelines
- 4) EITC also expanded during this period: general shift from welfare to “workfare”

## Welfare Reform: Two Empirical Questions

1) Incentives: did welfare reform actually increase labor supply?

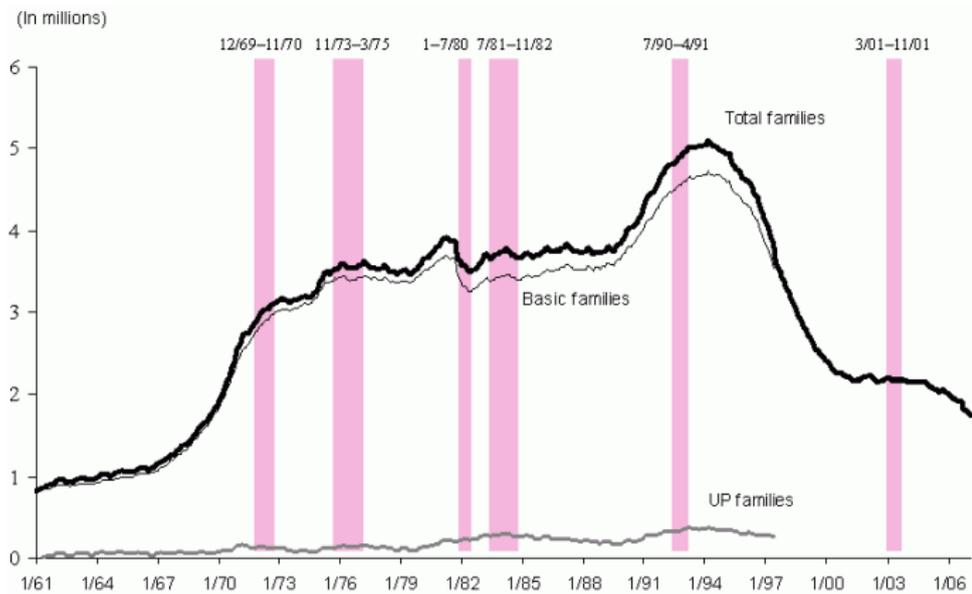
a) Test whether EITC expansions affect labor supply

b) Use state welfare randomized experiments implemented before reform to assess effects of switch from AFDC to TANF

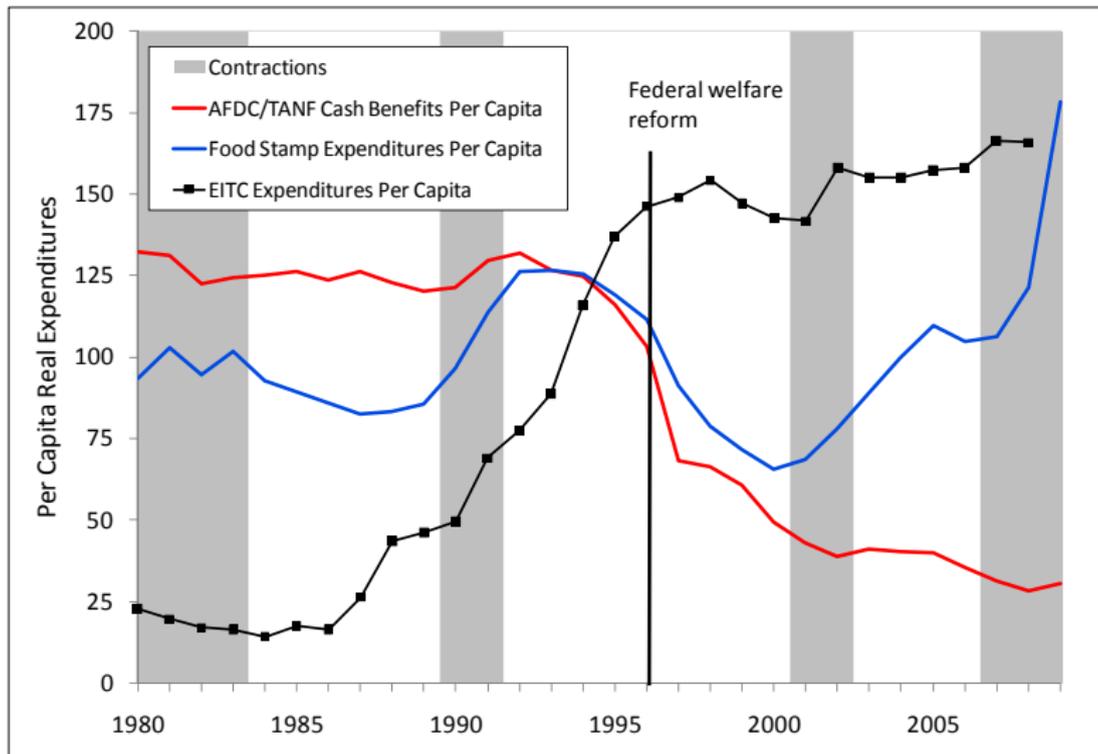
2) Benefits: did removing many people from transfer system reduce their welfare? How did consumption change?

Focus on single mothers, who were most impacted by reform

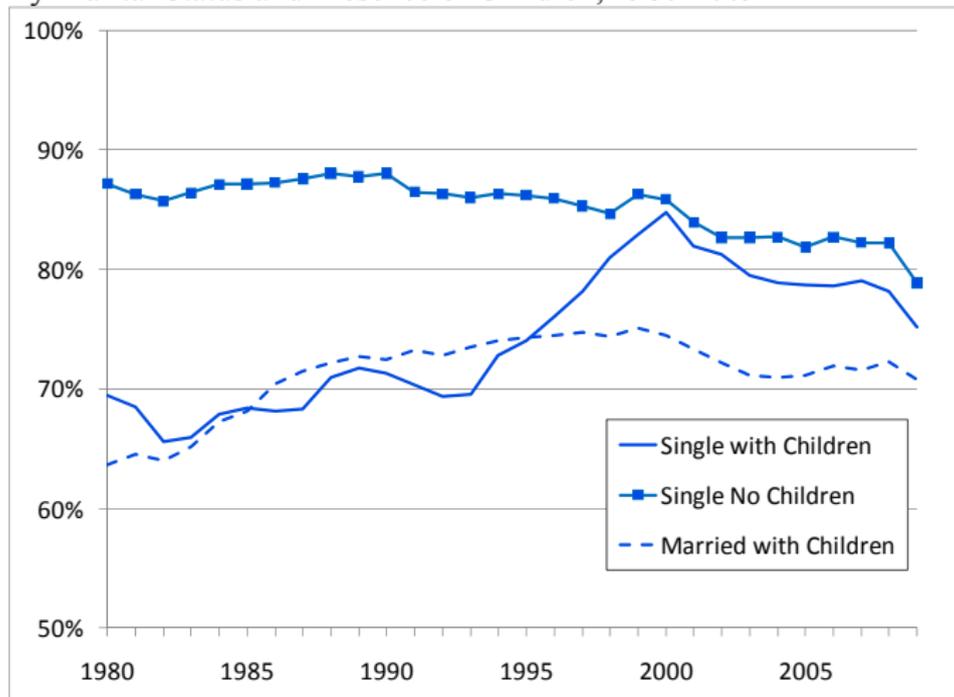
**Figure TANF 1.**  
**AFDC/TANF Families Receiving Income Assistance**



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



## Annual Employment Rates for Women By Marital Status and Presence of Children, 1980-2009



Source: Bitler and Hoynes, Brookings Papers on Economic Activity, 2011.

## Earned Income Tax Credit (EITC) program

- 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 through income tax 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)

## EITC Amount as a Function of Earnings

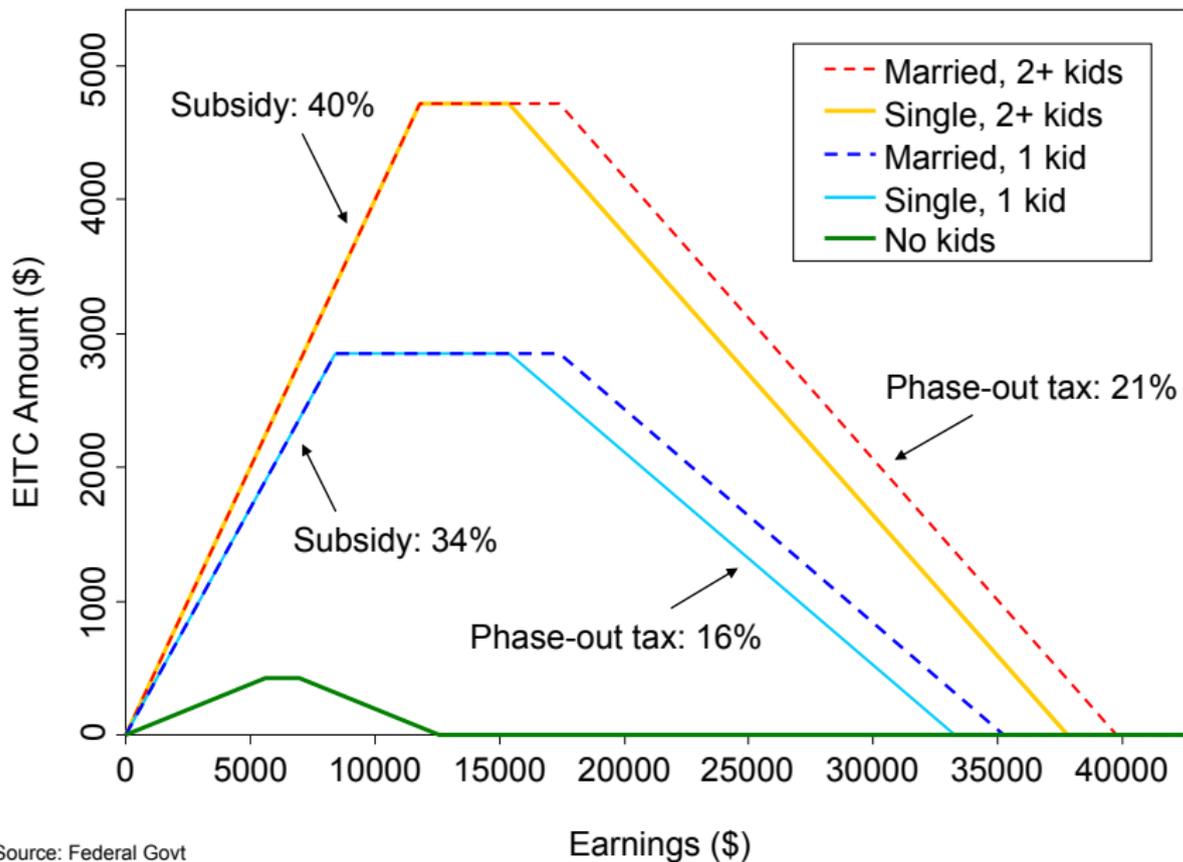
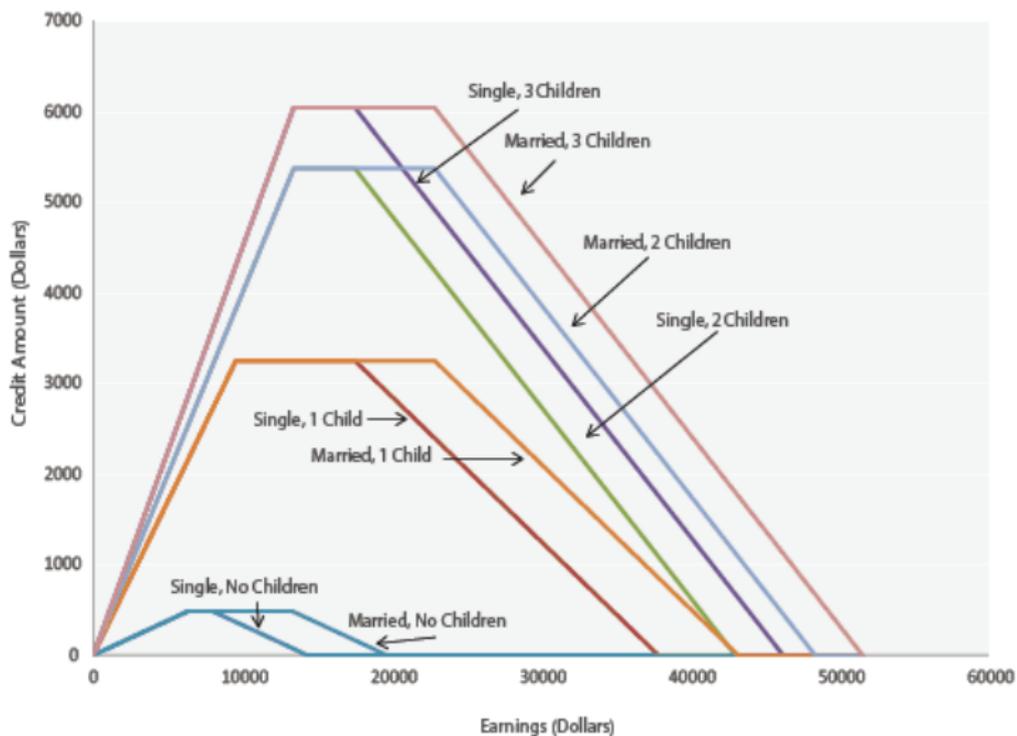


Figure 1: Earned Income Tax Credit by Number of Children and Filing Status, 2013



Source: 2013 EITC parameters taken from <http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=36>

## Theoretical Behavioral Responses to the EITC

**Extensive margin:** positive effect on Labor Force Participation.

Meyer-Rosenbaum (2001) find that 60% of LFP increase of single mothers in 1990s due to EITC expansion.

**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 Response: Bunching at Kinks

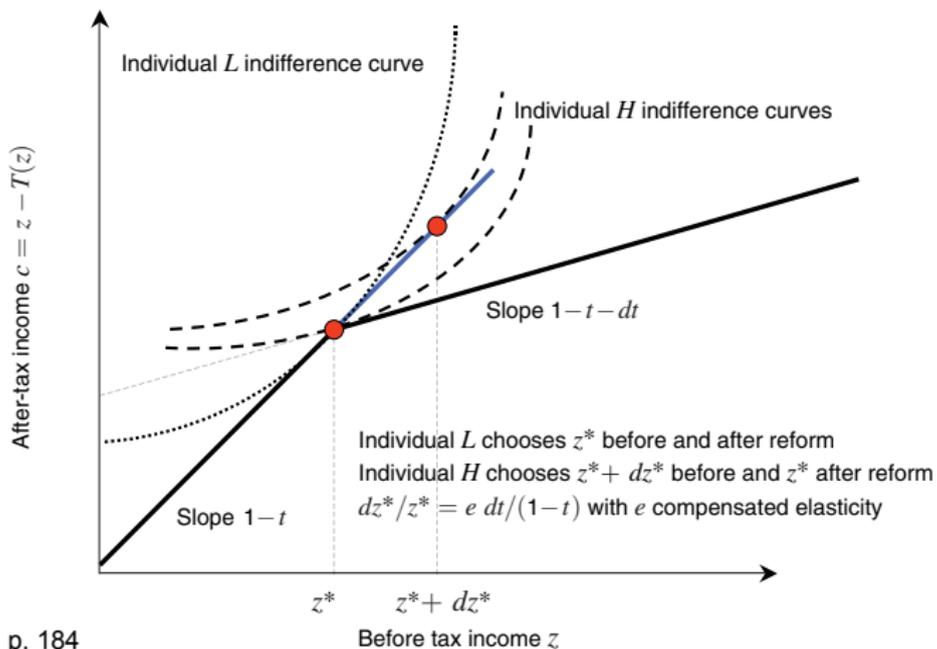
1) Basic labor supply theory predicts that we should observe bunching of individuals at the EITC kink points:

Some individuals find it worthwhile to work more when subsidy rate is 40% 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: if labor supply is inelastic, then kinks in the budget set are irrelevant and do not create bunching

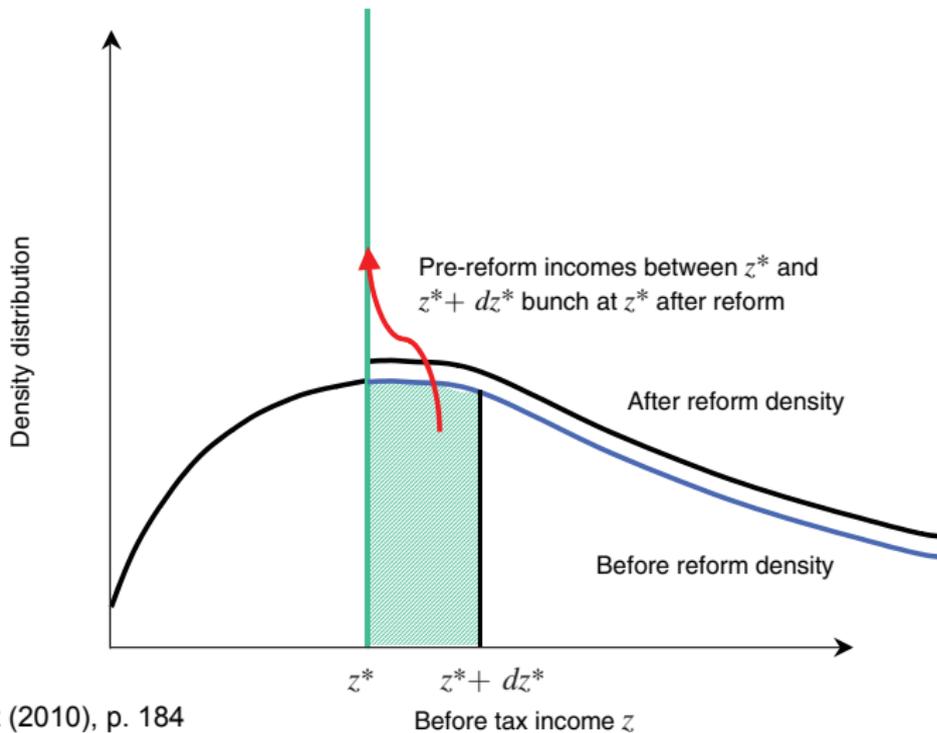
Saez AEJ'10 finds bunching around 1st kink point of EITC but only for the self-employed  $\Rightarrow$  likely due to cheating to maximize tax refund (and not labor supply)

Panel A. Indifference curves and bunching



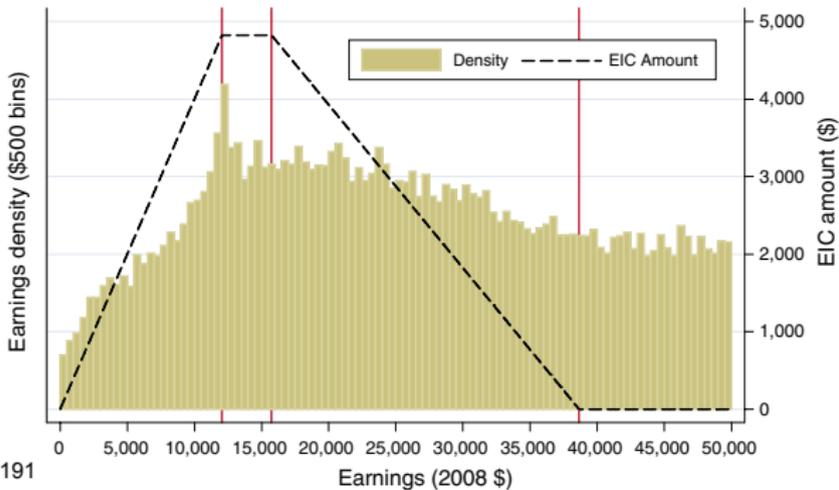
Source: Saez (2010), p. 184

Panel B. Density distributions and bunching



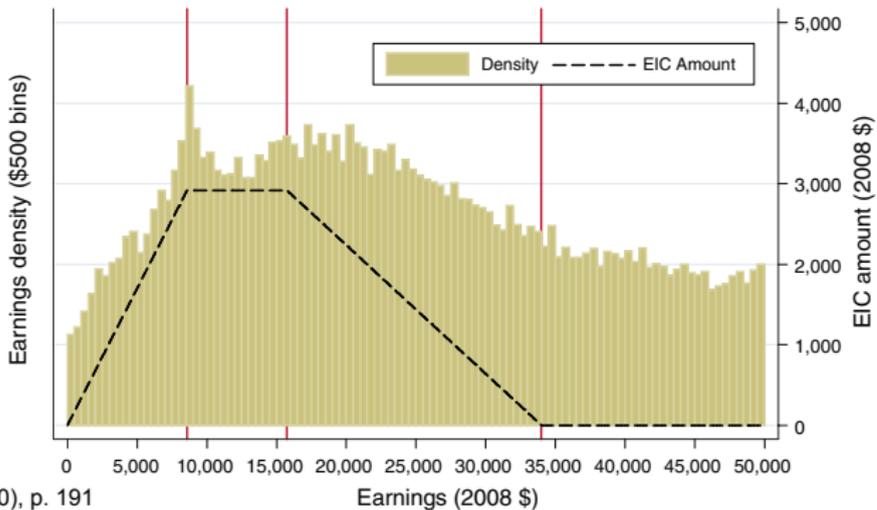
Source: Saez (2010), p. 184

B. Two children or more



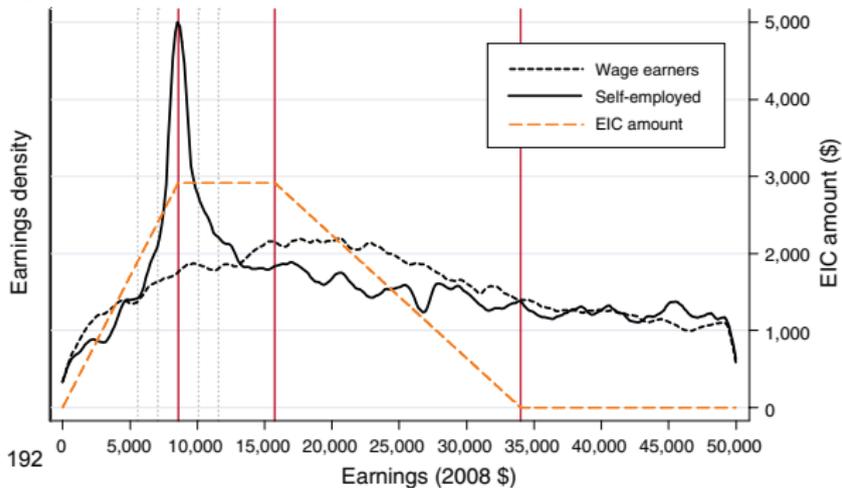
Source: Saez (2010), p. 191

Panel A. One child



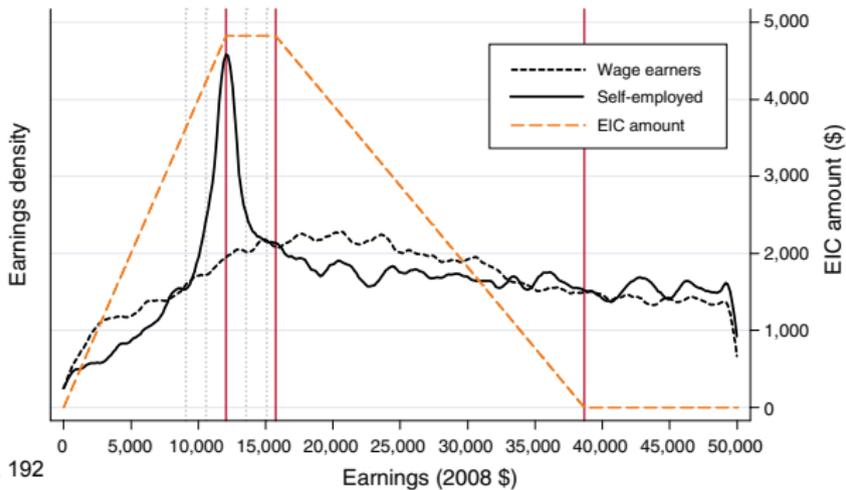
Source: Saez (2010), p. 191

Panel A. One child



Source: Saez (2010), p. 192

Panel B. Two or more children



Source: Saez (2010), p. 192

## EITC Empirical Studies

Evidence of response along extensive margin, 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

Such confusion might be good for the government as the EITC induces work along participation margin without discouraging work along intensive margin

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

Use US population wide tax return data since 1996

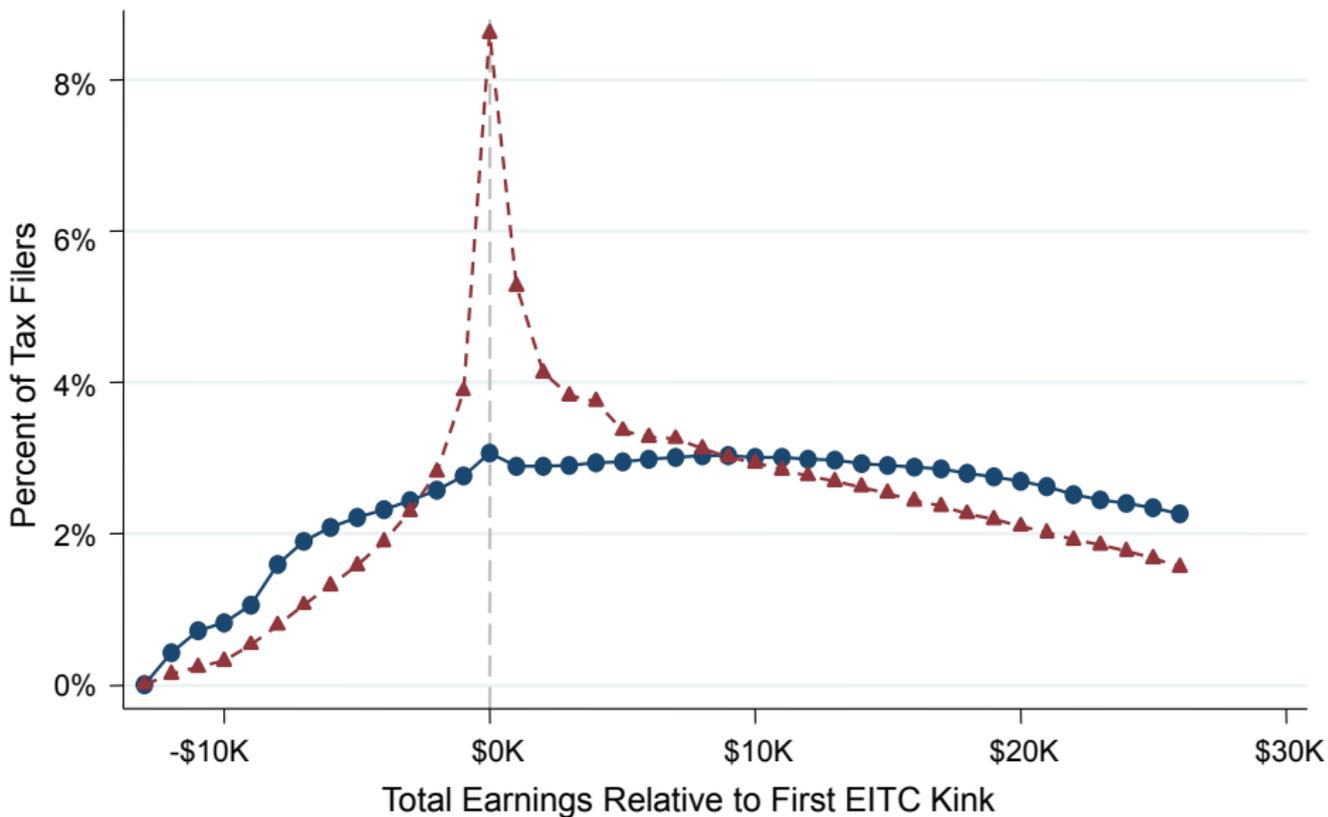
1) Substantial heterogeneity fraction of EITC recipients bunching (using self-employment) across geographical areas  $\Rightarrow$  Information about EITC varies across areas

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

$\Rightarrow$  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

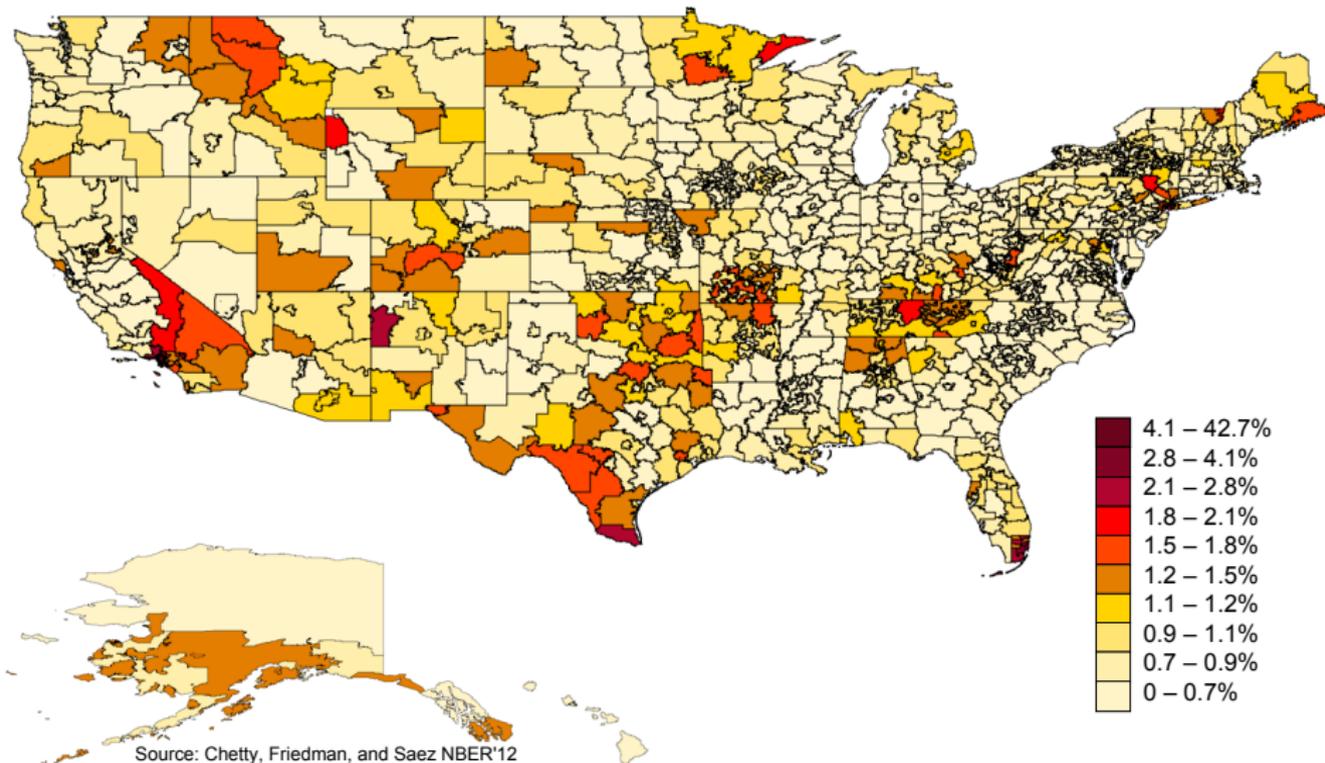
## Earnings Distributions in Lowest and Highest Bunching Deciles



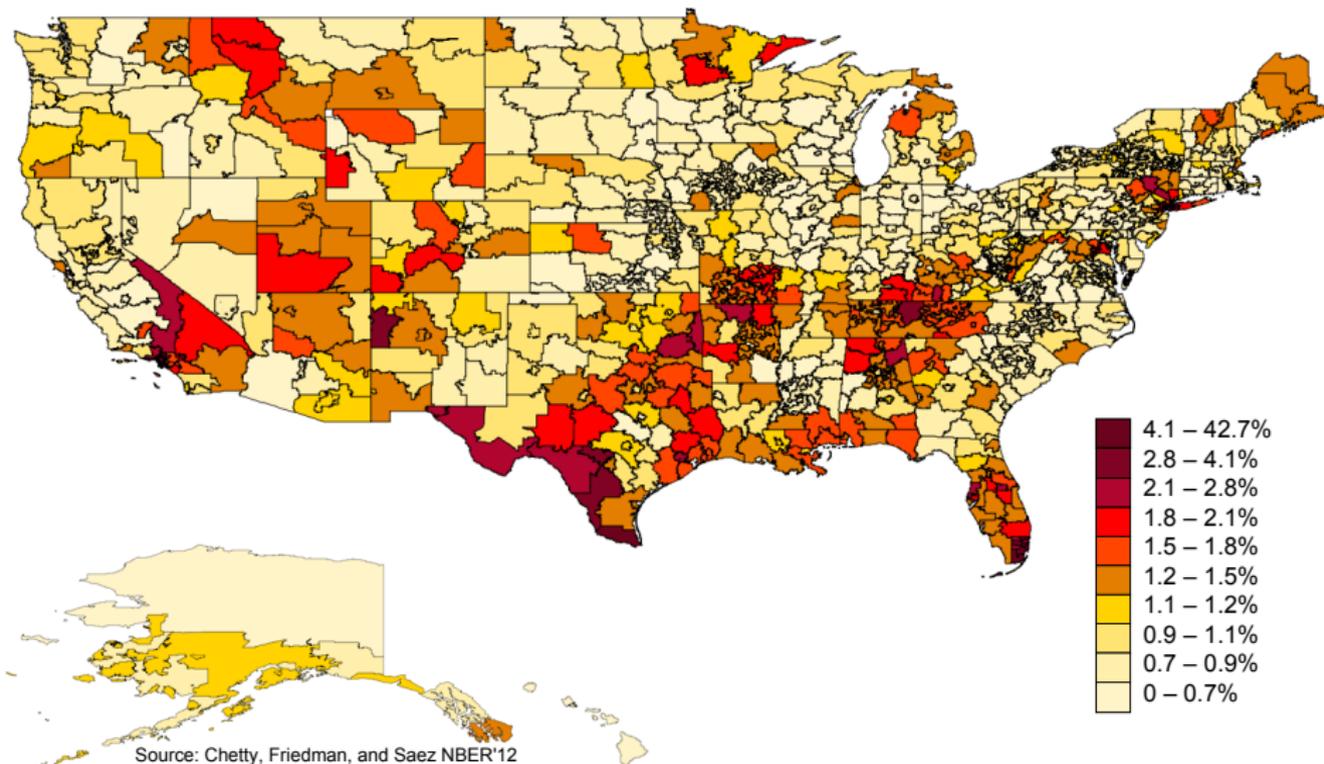
Source: Chetty, Friedman, and Saez NBER '12

—●— Lowest Bunching Decile —▲— Highest Bunching Decile

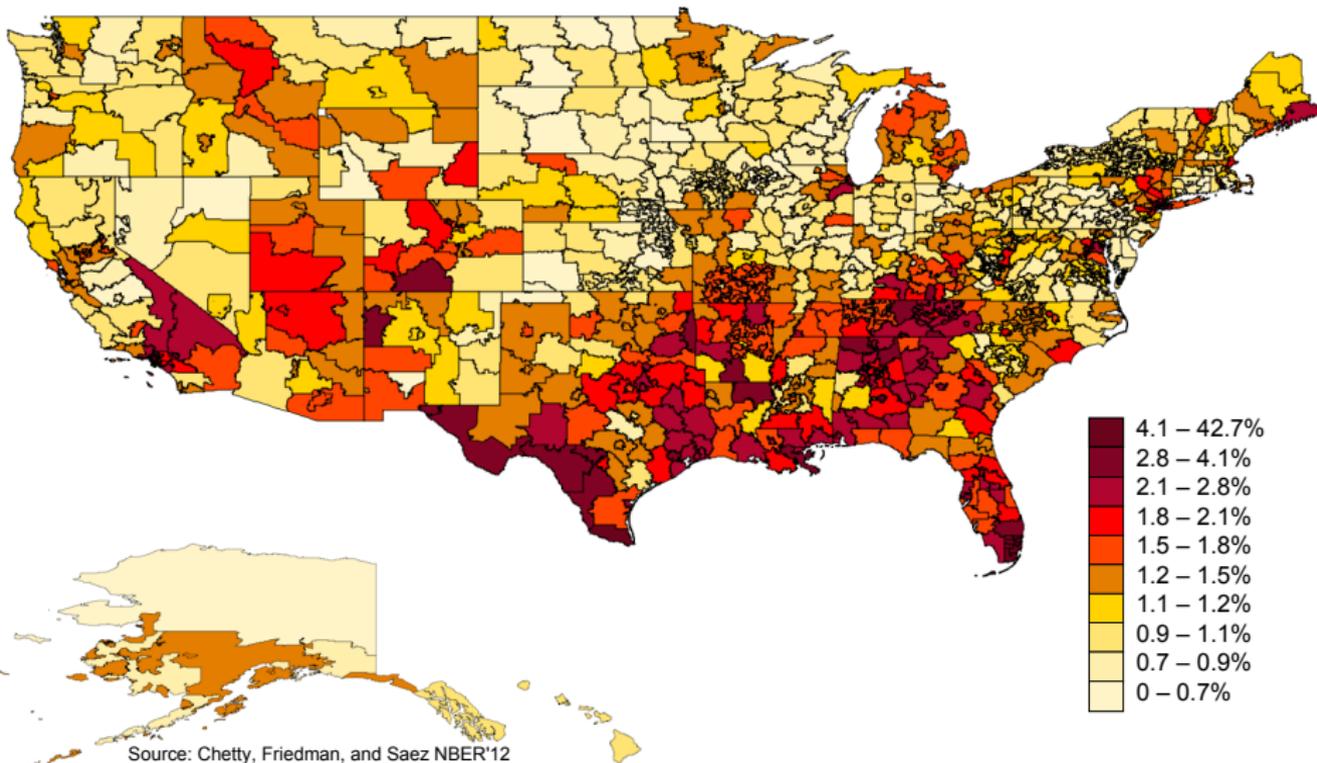
## Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 1996



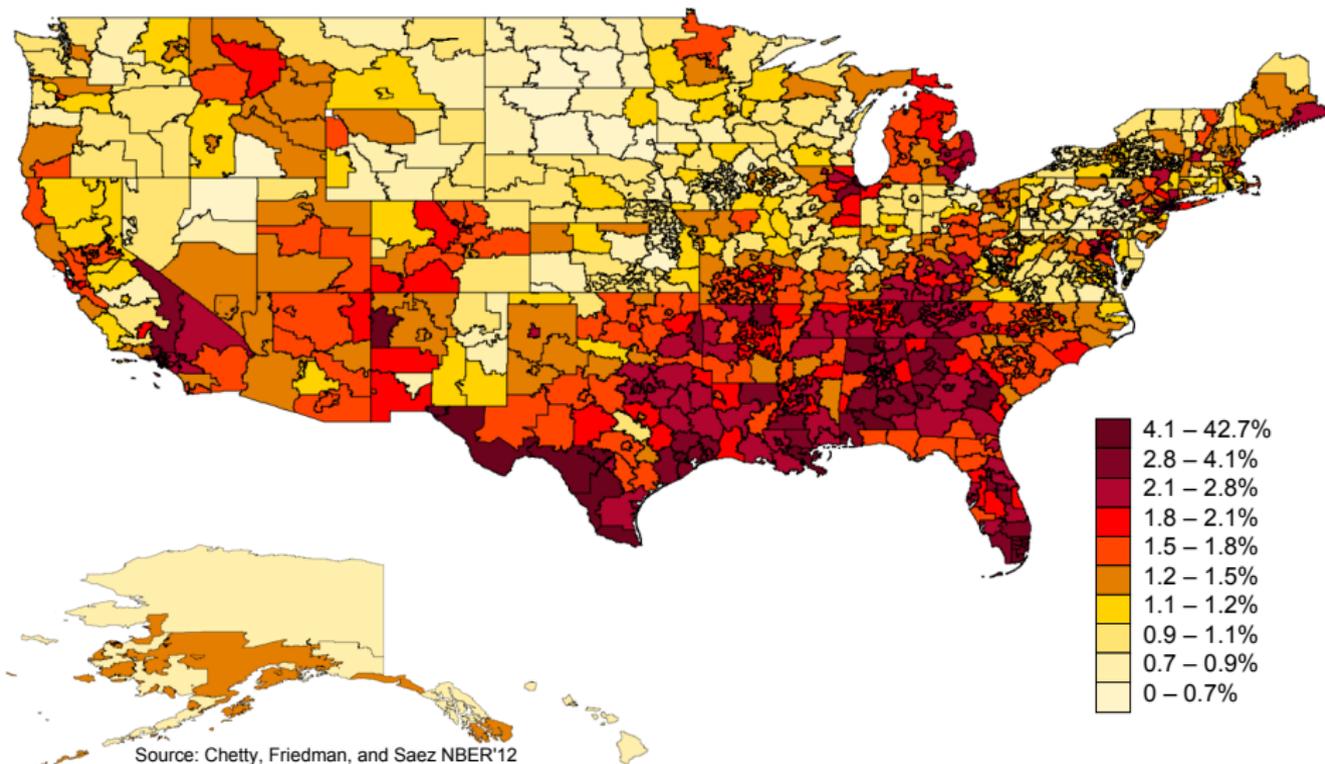
## Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 1999



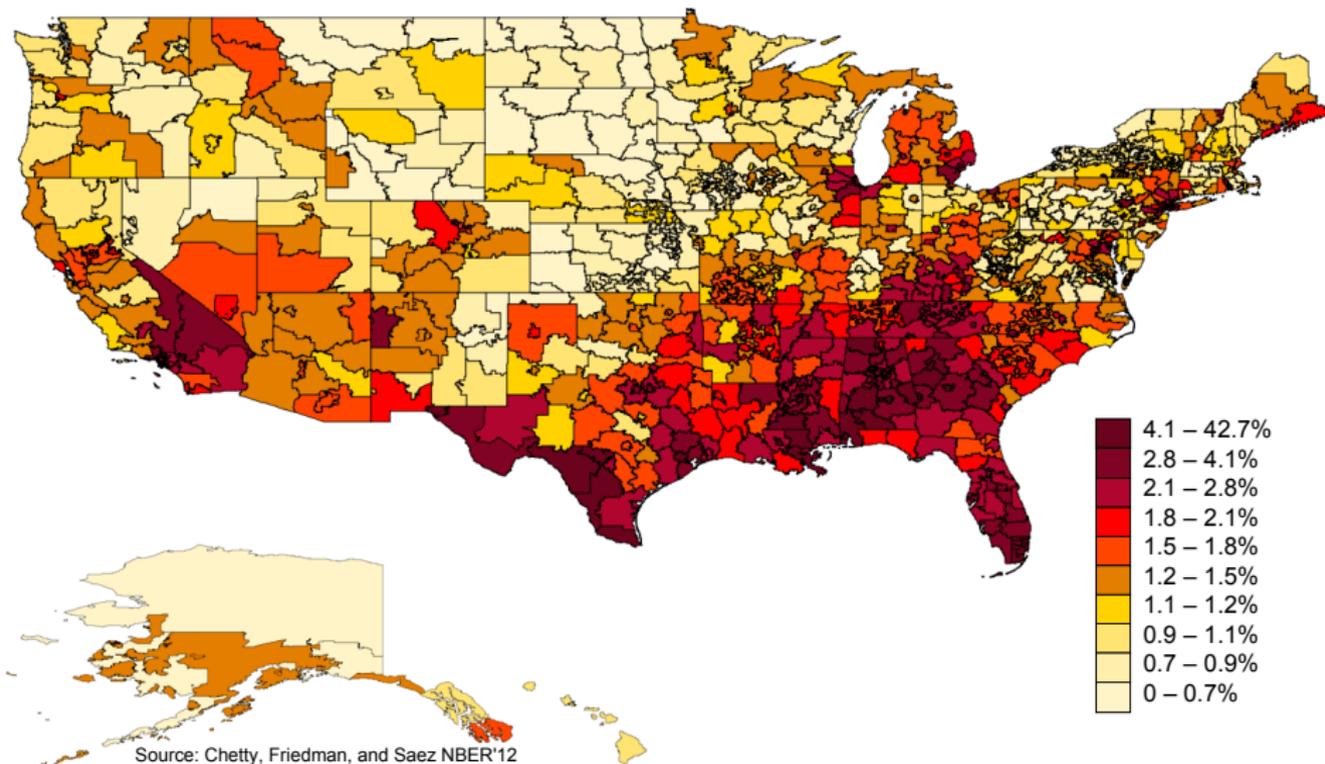
## Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 2002



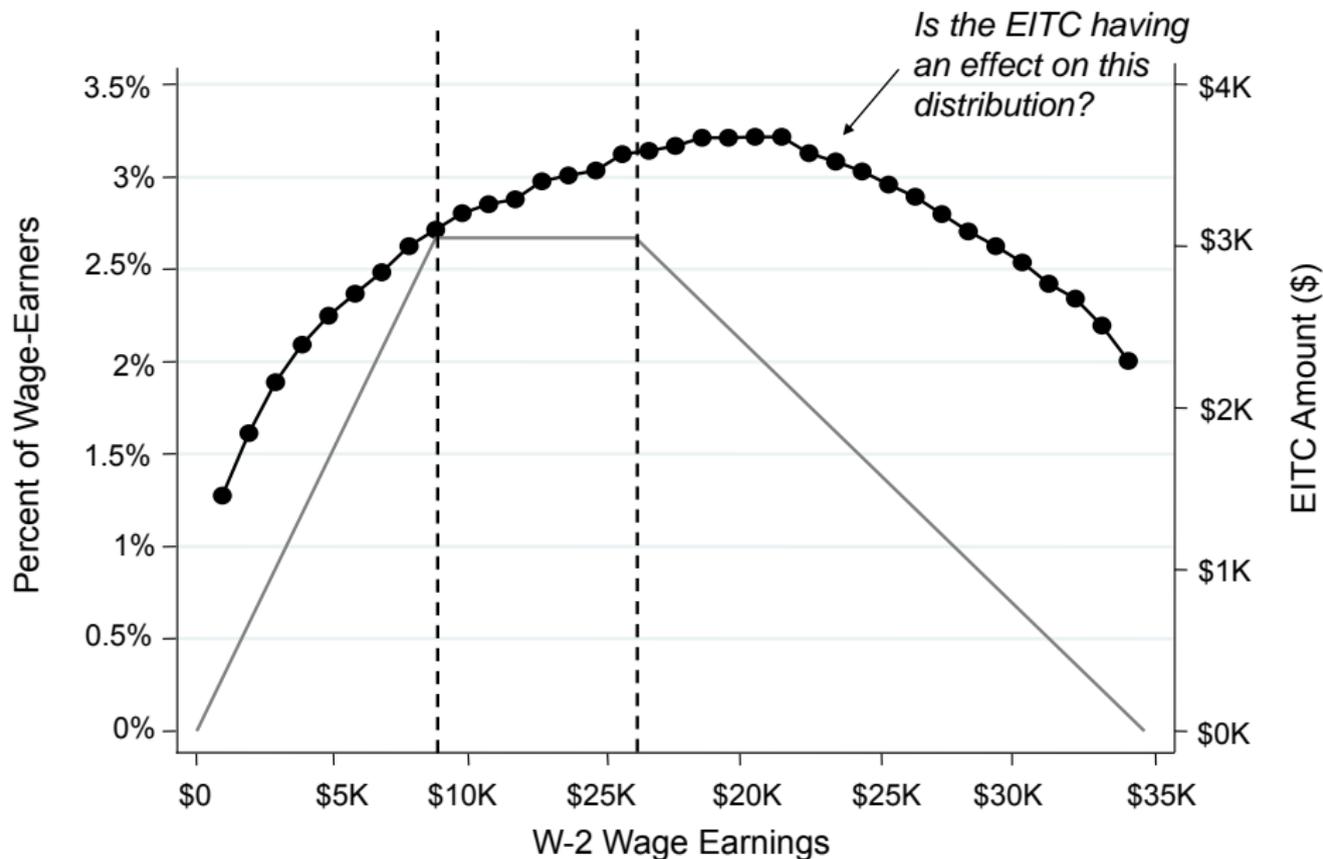
## Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 2005



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

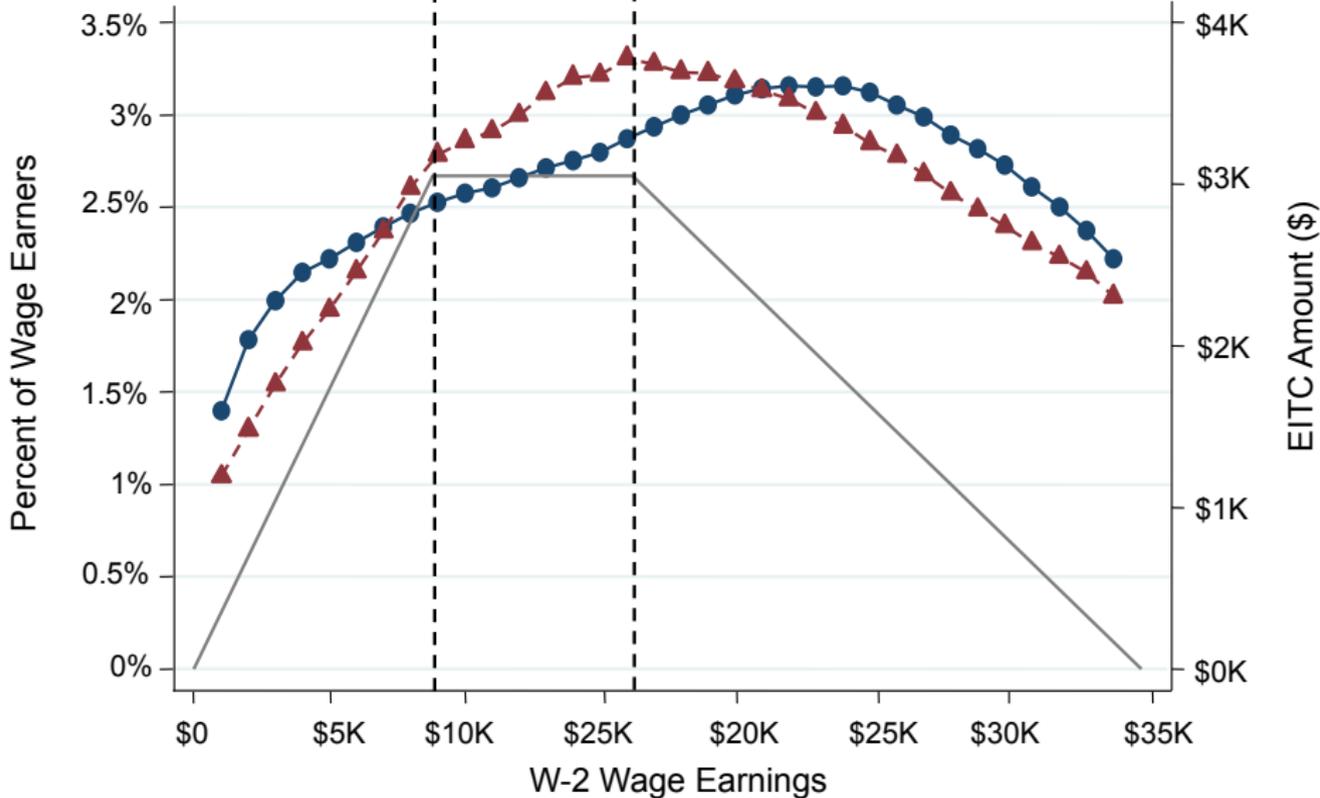


## Income Distribution For Single Wage Earners with One Child



Source: Chetty, Friedman, and Saez NBER'12

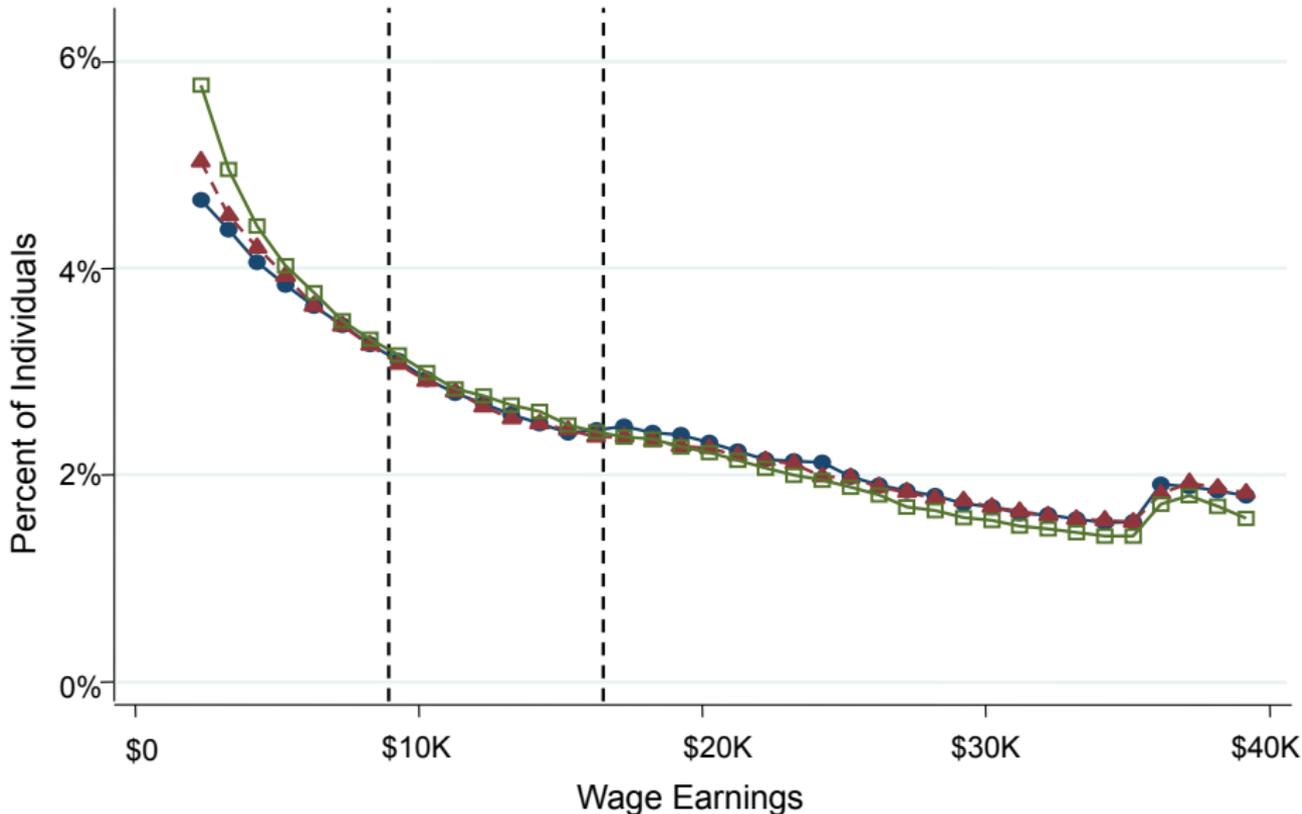
# Income Distribution For Single Wage Earners with One Child High vs. Low Bunching Areas



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

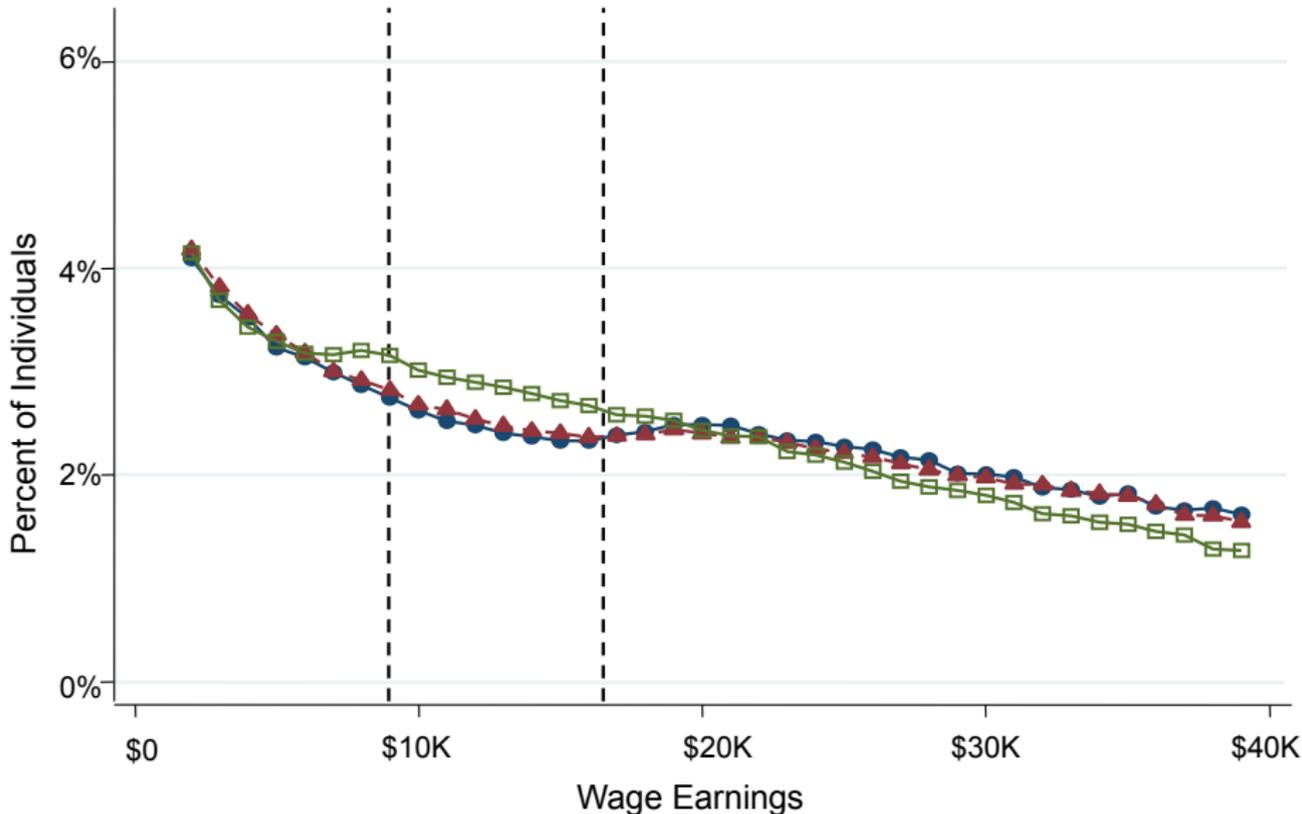


source: Chetty, Friedman, and Saez NBER'12  
Lowest Sharp Bunching Decile

Middle Sharp Bunching Decile

Highest Sharp Bunching Decile

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



Source: Chetty, Friedman, and Saez NBER'12

Lowest Sharp Bunching Decile

Middle Sharp Bunching Decile

Highest Sharp Bunching Decile

## Welfare reform and consumption: Meyer and Sullivan 2004

- 1) Examine the consumption patterns of single mothers and their families from 1984–2000 using CEX data
- 2) Question: did single mothers' consumption fall because they lost welfare benefits and were forced to work?

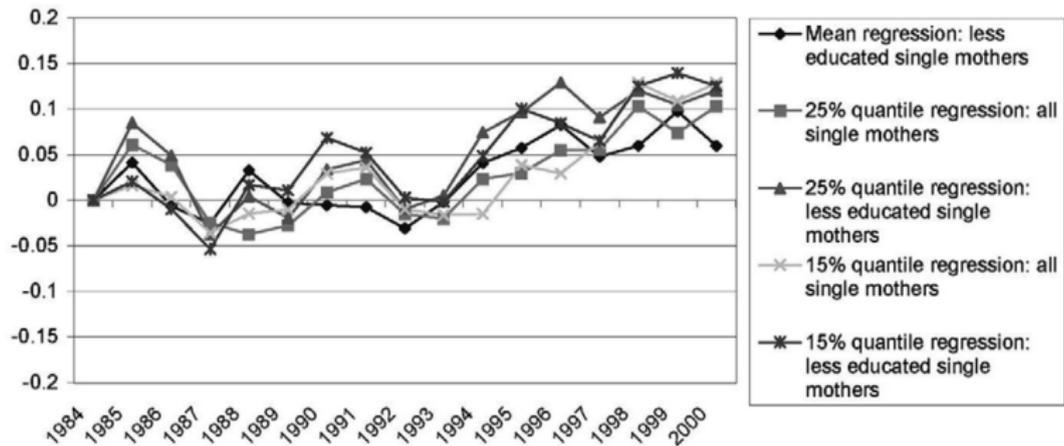


Fig. 2. Total consumption: single mothers, 1984–2000.

Source: Meyer and Sullivan (2004), p. 1407

## Meyer and Sullivan: Results

- 1) Material conditions of single mothers did not decline in 1990s, either in absolute terms or relative to single childless women
- 2) In most cases, evidence suggests that the material conditions of single mothers have improved slightly
- 3) Question: is this because economy was booming in 1990s?
- 4) Is workfare approach more problematic in recession?

Households getting SNAP (food stamps) surged from 12M in '07 to 20M in '10

But households getting TANF increased only slightly from 1.7M in '07 to 1.85M in '10

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

Abramitzky '13 book based on series of academic papers

Kibbutz are egalitarian and socialist voluntary communities in Israel, thrived for almost a century within a 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

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

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

They use a DD strategy: pre-post reform and comparing reform Kibbutz to non-reform Kibbutz. They find that

- 1) Students are 3 percentage points more likely to graduate
- 2) Students are 6 points more likely to achieve a matriculation certificate that meets university entrance requirements

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

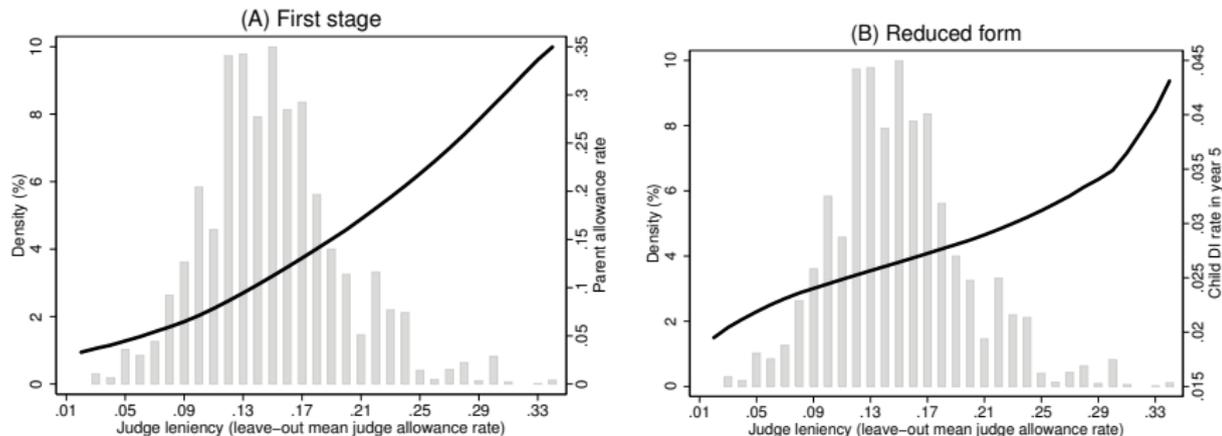
Dahl, Kostol, Mogstad QJE'14 analyze causal effect of parental use of Disability Insurance (DI) on children use (as adults) of DI in Norway

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