Graduate Public Economics

Labor Supply Responses to Taxes and Transfers

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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., single parent who needs child care, 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 τ 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 $l^u(w, y)$

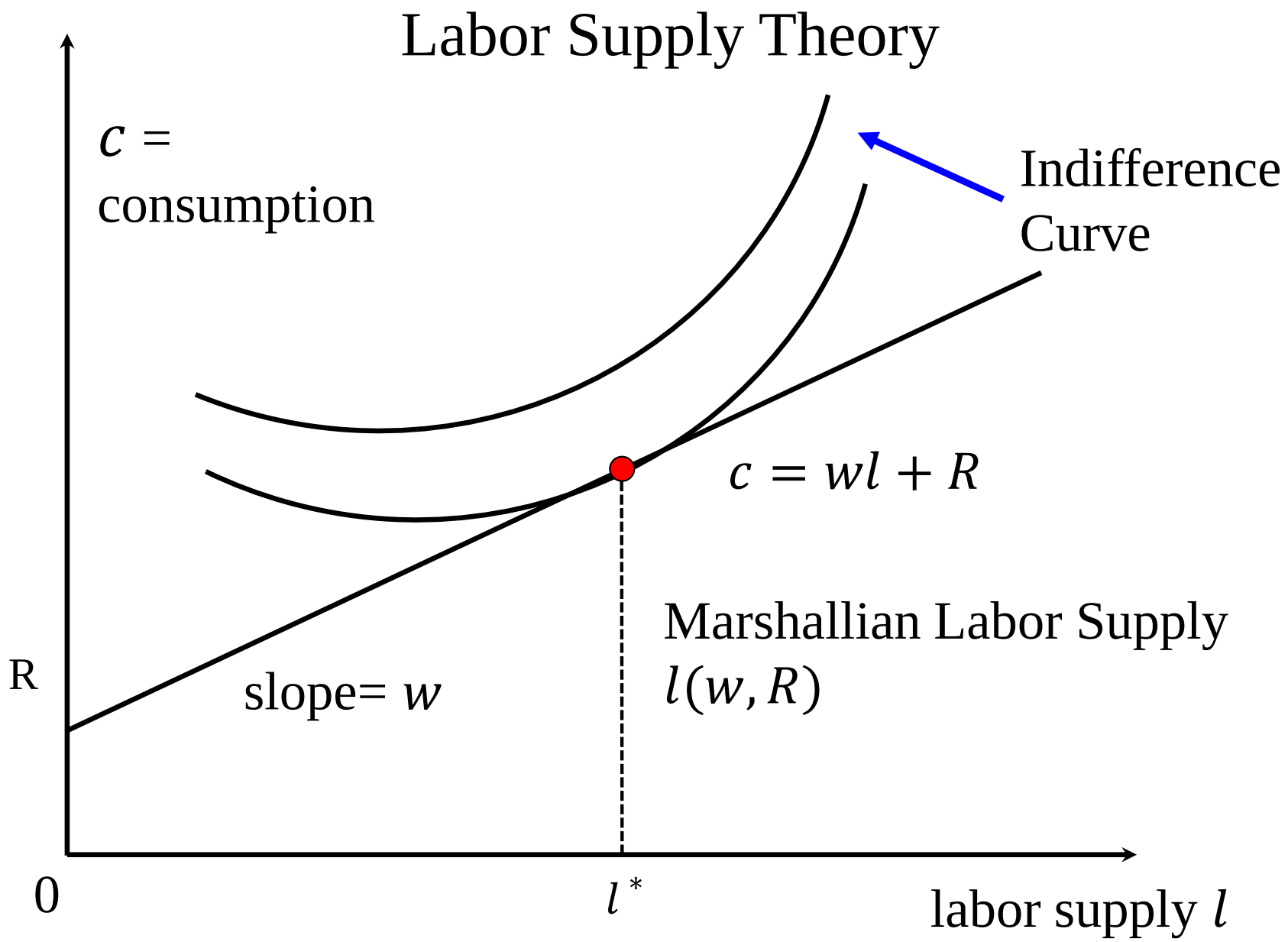
Uncompensated elasticity of labor supply: $\varepsilon^u = (w/l)\partial l^u/\partial w$ [% change in hours when net wage $w \uparrow$ by 1%]

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

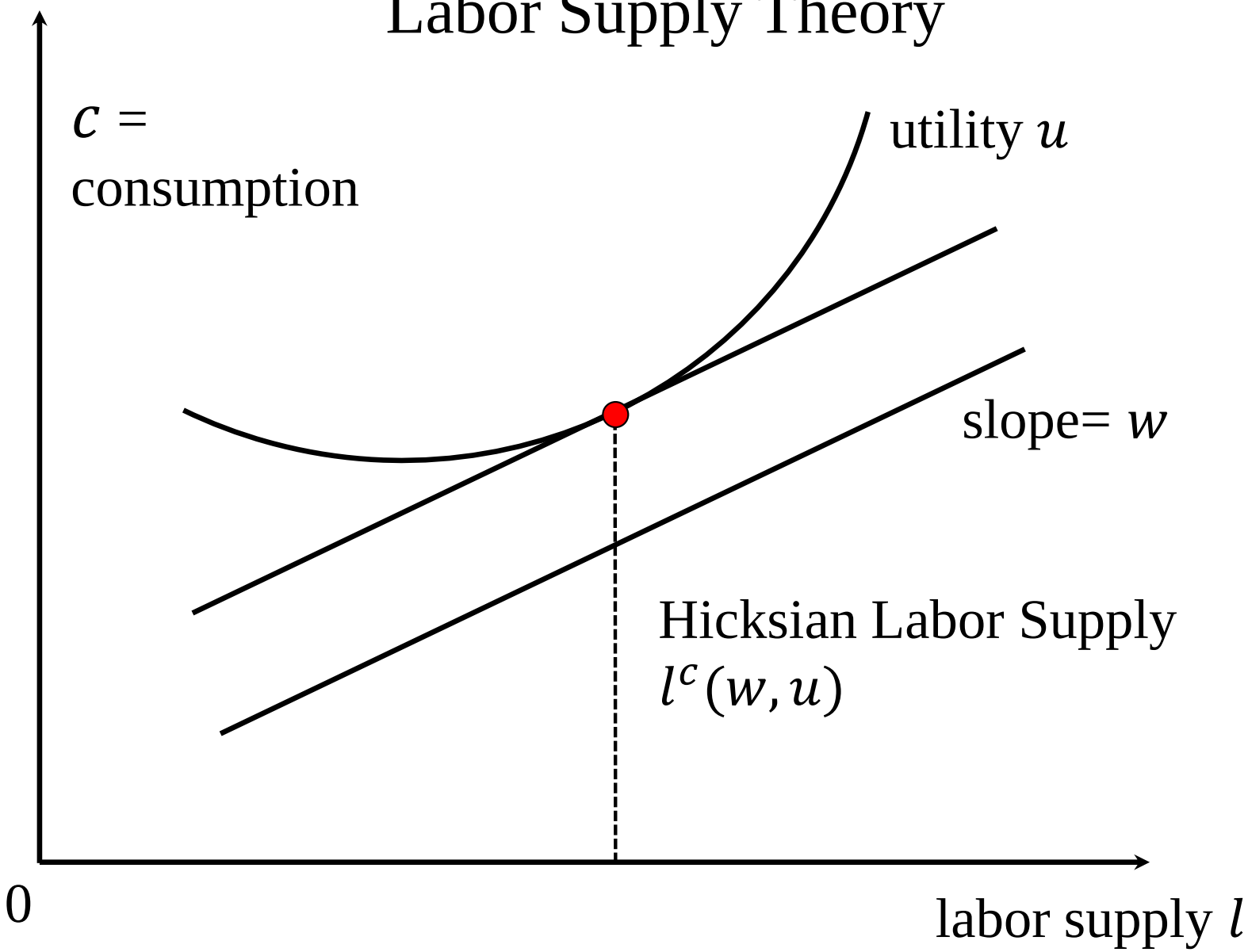
Compensated (Hicksian) labor supply function $l^c(w, u)$ which minimizes cost $c - wl$ st to constraint $u(c, l) \geq u$.

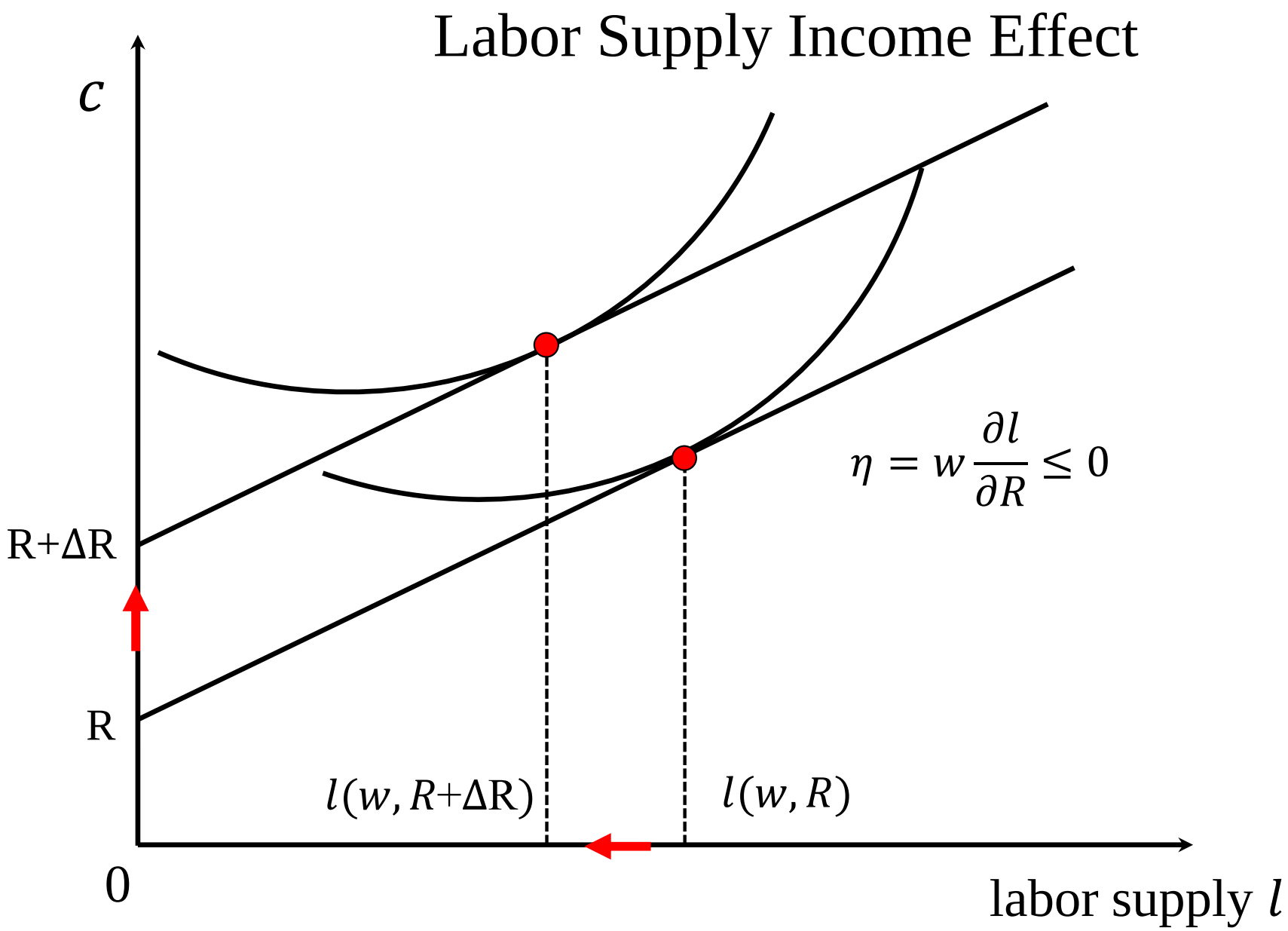
Compensated elasticity of labor supply: $\varepsilon^c = (w/l)\partial l^c/\partial w > 0$

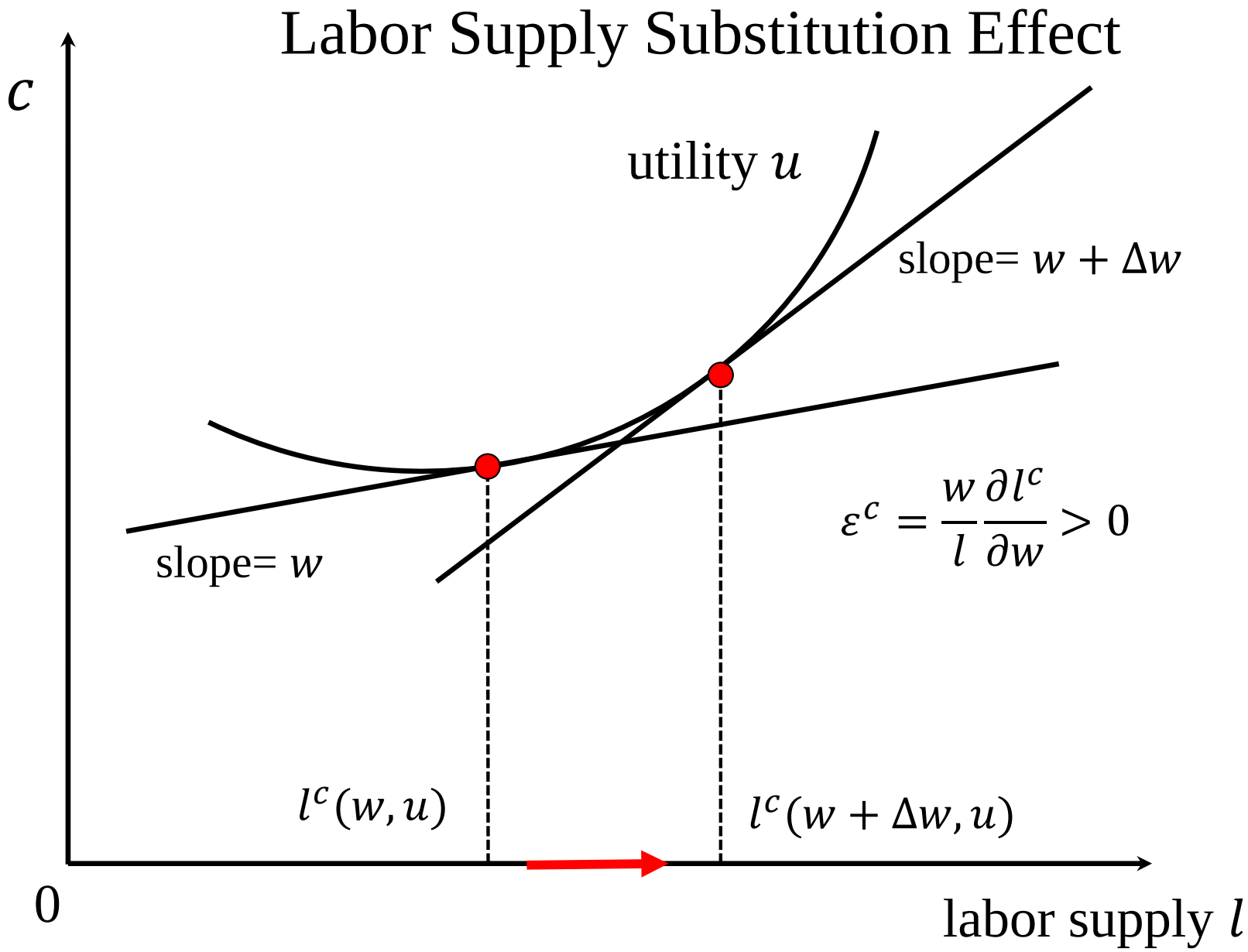
Slutsky equation: $\partial l/\partial w = \partial l^c/\partial w + l\partial l/\partial y \Rightarrow \varepsilon^u = \varepsilon^c + \eta$

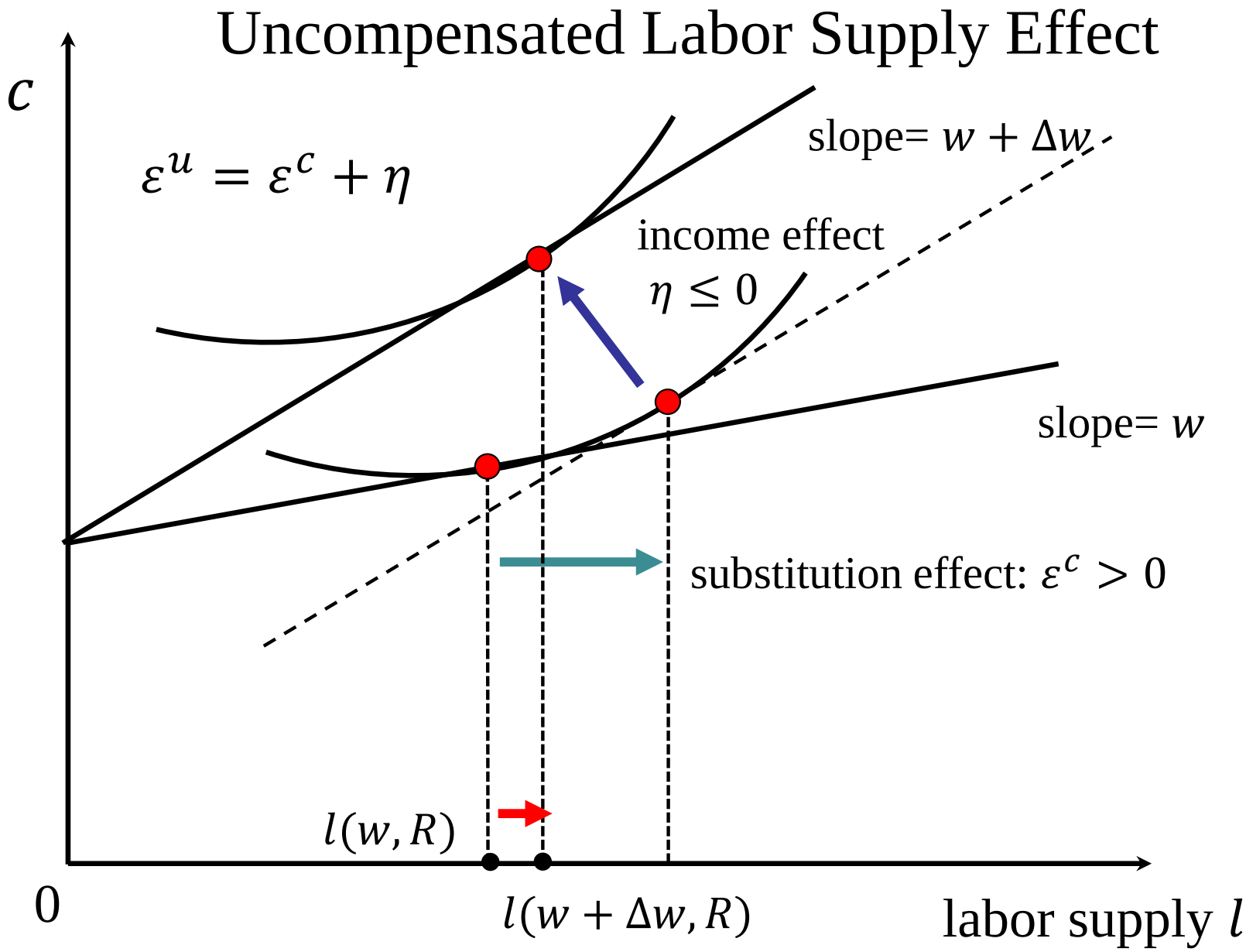

Labor Supply Theory
c =
consumption
Indifference
Curve
$c = wl + R$
Marshallian Labor Supply
$l(w, R)$
R
slope= w
0
l^*
labor supply l

Labor Supply Theory




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

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

BASIC CROSS SECTION RESULTS

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

a) Small effects $\varepsilon^u = 0$, $\eta = -0.1$, $\varepsilon^c = 0.1$ in general

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 ϵ_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. In US, top professionals work a lot.

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 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 τ (50%-80%) [based on family earnings]

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

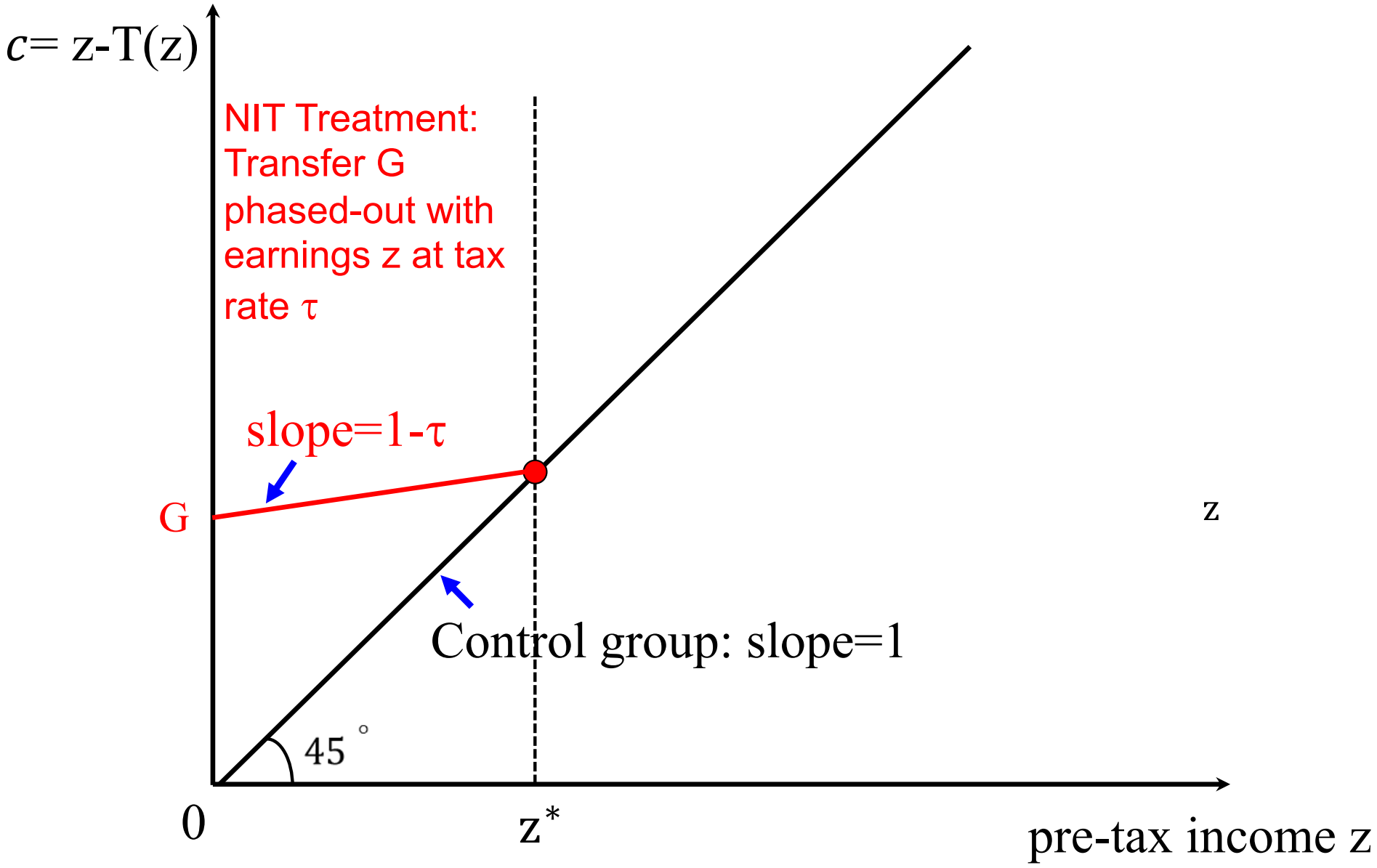
6) Several groups, with randomization within each; approx. N = 75 households in each group

Table 1
Parameters of the 11 Negative Income Tax Programs

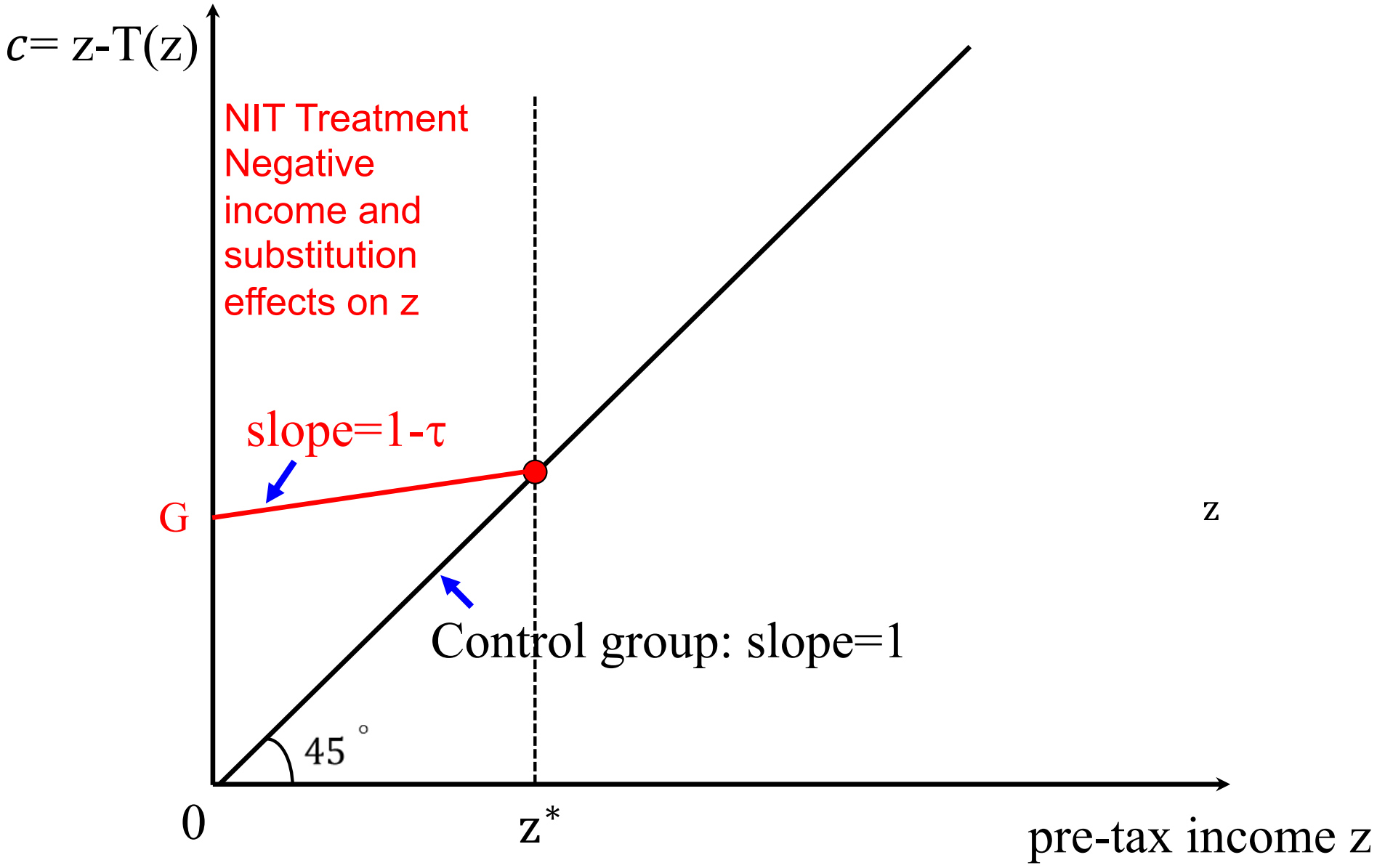
Program Number	G ($)	τ	Declining Tax Rate	Break-even Income ($)
1	3,800	.5	No	7,600
2	3,800	.7	No	5,429
3	3,800	.7	Yes	7,367
4	3,800	.8	Yes	5,802
5	4,800	.5	No	9,600
6	4,800	.7	No	6,857
7	4,800	.7	Yes	12,000
8	4,800	.8	Yes	8,000
9	5,600	.5	No	11,200
10	5,600	.7	No	8,000
11	5,600	.8	Yes	10,360

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

Negative Income Tax Experiment



Negative Income Tax Experiment



NIT Experiments: Ashenfelter and Plant JHR' 90

1) Present non-parametric evidence of labor supply effects

2) Compare actual benefit payments to treated household vs. hypothetical benefit payments to control households

3) Difference in benefit payments reflects aggregates hours and participation responses

4) This is the relevant parameter for expenditure calculations and for welfare analysis

5) Shortcoming: approach does not decompose estimates into income and substitution effects and intensive vs. extensive margin

$\Rightarrow$ Hard to identify the key elasticity relevant for policy purposes and predict labor supply effect of other programs

Table 3
Experimental Payment minus Predicted Control Payment for 3-Year Dual-headed Experimental Families, Attrition Families Excluded (Standard Errors in Parentheses)

G ($)	τ	Declining Tax Rate	Preexperimental Payment ($)	Payments for Year of Experiment ($)			Postexperimental Payment ($)
				1	2	3	
3,800	.5	No	193.78	248.46	368.95*	389.24*	138.56
			(143.45)	(149.58)	(170.75)	(182.99)	(188.20)
3,800	.7	No	124.96	185.18	317.28	218.37	−47.85
			(223.77)	(237.91)	(252.99)	(325.57)	(314.66)
3,800	.7	Yes	−33.37	68.94	158.44	324.84	29.28
			(178.05)	(176.07)	(213.59)	(230.50)	(222.42)
3,800	.8	Yes	75.40	336.06	221.54	160.83	91.52
			(229.44)	(237.18)	(245.92)	(264.53)	(261.84)
4,800	.5	No	52.02	85.17	294.55	337.23	70.22
			(192.31)	(184.85)	(201.73)	(221.73)	(219.58)
4,800	.7	No	220.76	288.33	496.85*	543.25*	178.32
			(160.04)	(169.04)	(197.88)	(204.50)	(194.03)
4,800	.7	Yes	136.99	281.98*	423.30*	348.03*	23.96
			(127.36)	(137.19)	(157.51)	(162.38)	(140.58)
4,800	.8	Yes	−16.87	305.09	417.90	317.39	121.47
			(175.54)	(209.24)	(234.32)	(274.11)	(239.59)
5,600	.5	No	−163.12	200.75	664.41*	717.15*	124.93
			(252.05)	(258.13)	(283.28)	(280.65)	(287.04)
5,600	.7	No	−59.97	23.34	386.12	744.94*	267.69
			(164.95)	(156.41)	(200.59)	(263.80)	(259.45)
5,600	.8	Yes	−27.64	−51.03	117.85	273.44	121.53
			(121.47)	(126.67)	(138.52)	(157.96)	(169.26)

NOTE.—Terms are explained in text.
* Denotes mean is more than twice its standard error.

Source: Ashenfelter and Plant (1990), p. 405

Table 4
Experimental Payment minus Predicted Control Payment for 5-Year Dual-headed Experimental Families, Attrition Families Excluded (Standard Errors in Parentheses)

G ($)	τ	Declining Tax Rate	Preexperimental Payment ($)	Payment for Year of Experiment ($)					Postexperimenta Payment ($)
				1	2	3	4	5	
3,800	.5	No	102.24	345.68	526.02	110.30	390.07	169.82	229.70
			(185.55)	(221.42)	(241.53)	(265.28)	(307.01)	(286.76)	(309.06)
3,800	.7	No	81.16	23.30	−99.33	98.20	−16.42	−122.01	−406.46
			(309.85)	(316.06)	(330.14)	(383.52)	(388.07)	(352.95)	(314.40)
3,800	.7	Yes	6.99	490.00	176.14	23.22	324.70	−59.79	−598.09*
			(234.01)	(288.13)	(272.87)	(300.28)	(386.93)	(331.68)	(102.72)
3,800	.8	Yes	−130.30	349.73	189.80	329.94	1207.82*	1108.49*	307.38
			(271.23)	(286.56)	(280.63)	(365.58)	(463.10)	(487.83)	(453.29)
4,800	.5	No	−23.66	30.15	160.40	399.28	419.73	434.30	251.09
			(183.73)	(208.90)	(199.26)	(236.33)	(247.25)	(254.52)	(242.45)
4,800	.7	No	−129.98	25.71	−4.47	569.10	493.42	219.74	−38.46
			(185.46)	(208.14)	(211.44)	(314.73)	(357.32)	(340.60)	(228.01)
4,800	.7	Yes	75.66	224.96	387.66	340.71	−130.10	34.61	189.49
			(234.21)	(280.43)	(367.56)	(404.05)	(308.90)	(445.67)	(491.52)
4,800	.8	Yes	467.89	325.17	599.43*	398.62	537.21	506.95	346.28
			(252.40)	(276.31)	(274.39)	(280.50)	(365.56)	(351.98)	(337.43)
5,600	.5	No	−224.97	560.51	723.08*	782.53*	592.40	313.82	−53.07
			(286.39)	(298.21)	(306.90)	(327.39)	(366.88)	(387.31)	(325.66)
5,600	.7	No	−158.74	500.18	1194.68*	890.38*	825.39	435.01	588.91
			(239.17)	(311.24)	(416.25)	(391.61)	(467.76)	(609.49)	(510.52)
5,600	.8	Yes	−6.48	193.54	617.29*	906.13*	888.72	877.71	75.21
			(175.15)	(199.51)	(255.89)	(315.98)	(337.38)	(398.38)	(216.12)

NOTE.—Terms are explained in text.
* Denotes mean is more than twice its standard error.

Source: Ashenfelter and Plant (1990), p. 407

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 (and quick reversal after treatment ends)

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)

From true experiment to "natural experiments": Income effects on lottery winners

True experiments are costly to implement and hence rare

Real economic world provides variation that can be exploited to estimate behavioral responses $\Rightarrow$ **Natural Experiments**

Natural experiments can 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

Significant but small income effects: $\eta = w\partial l/\partial y \simeq -.1$

Identification threat: differential response-rate among groups

Recent studies in Sweden (Cesarini et al. '17) and US (Golosov et al. '24)

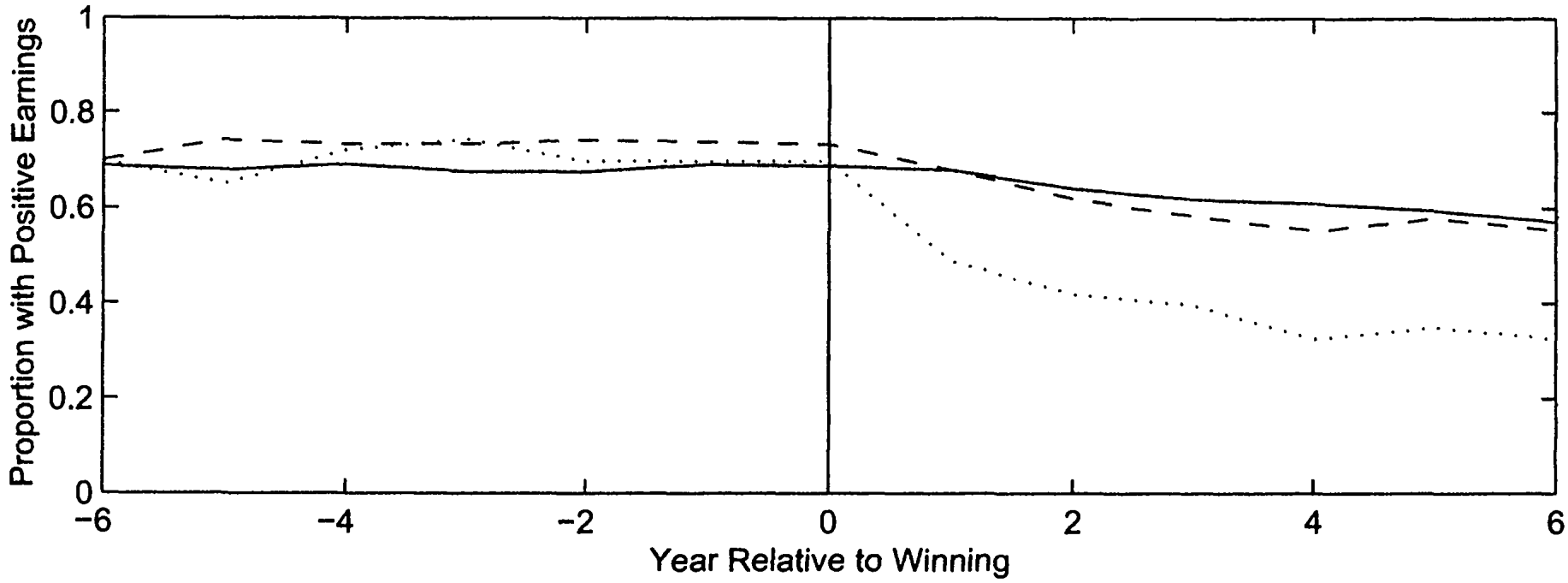


FIGURE 2. PROPORTION WITH POSITIVE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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

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

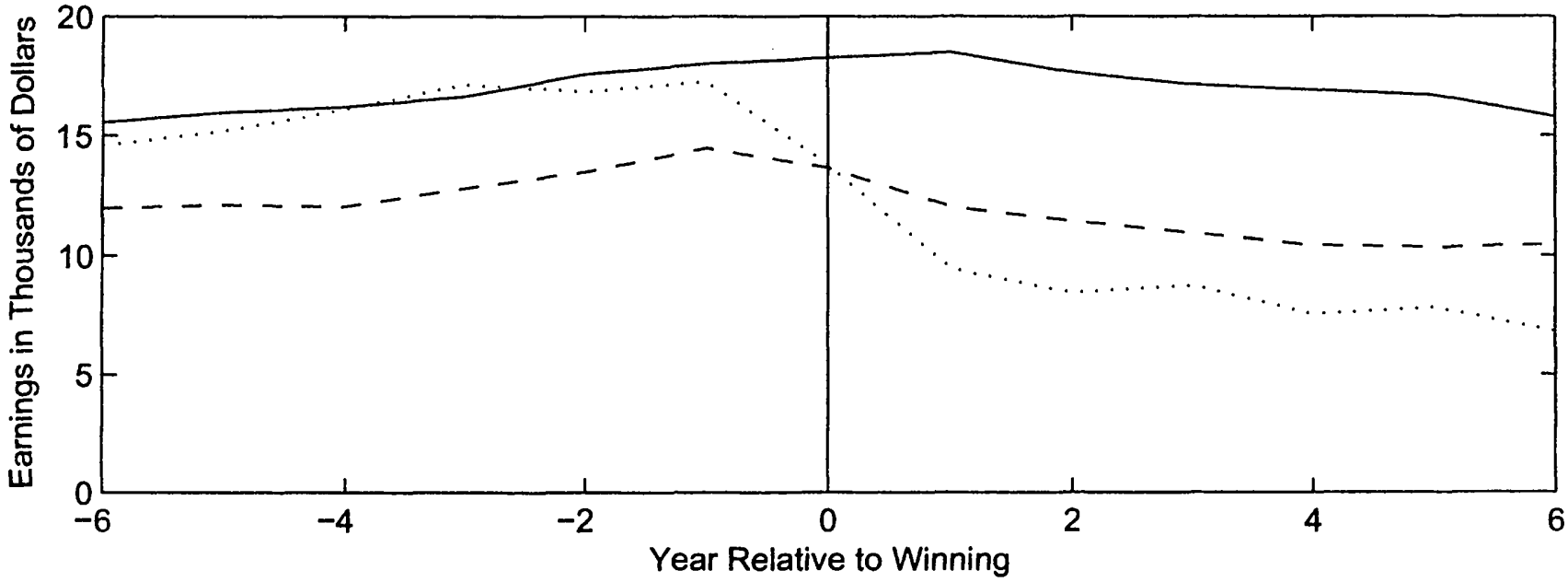


FIGURE 1. AVERAGE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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 (skip)

Cesarini et al. (2017) 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: $\eta = w\partial l/\partial y \simeq -0.1$

3) Effects on spouse but not as large as on winner $\Rightarrow$

a) Either lottery players have higher income effects than spouse

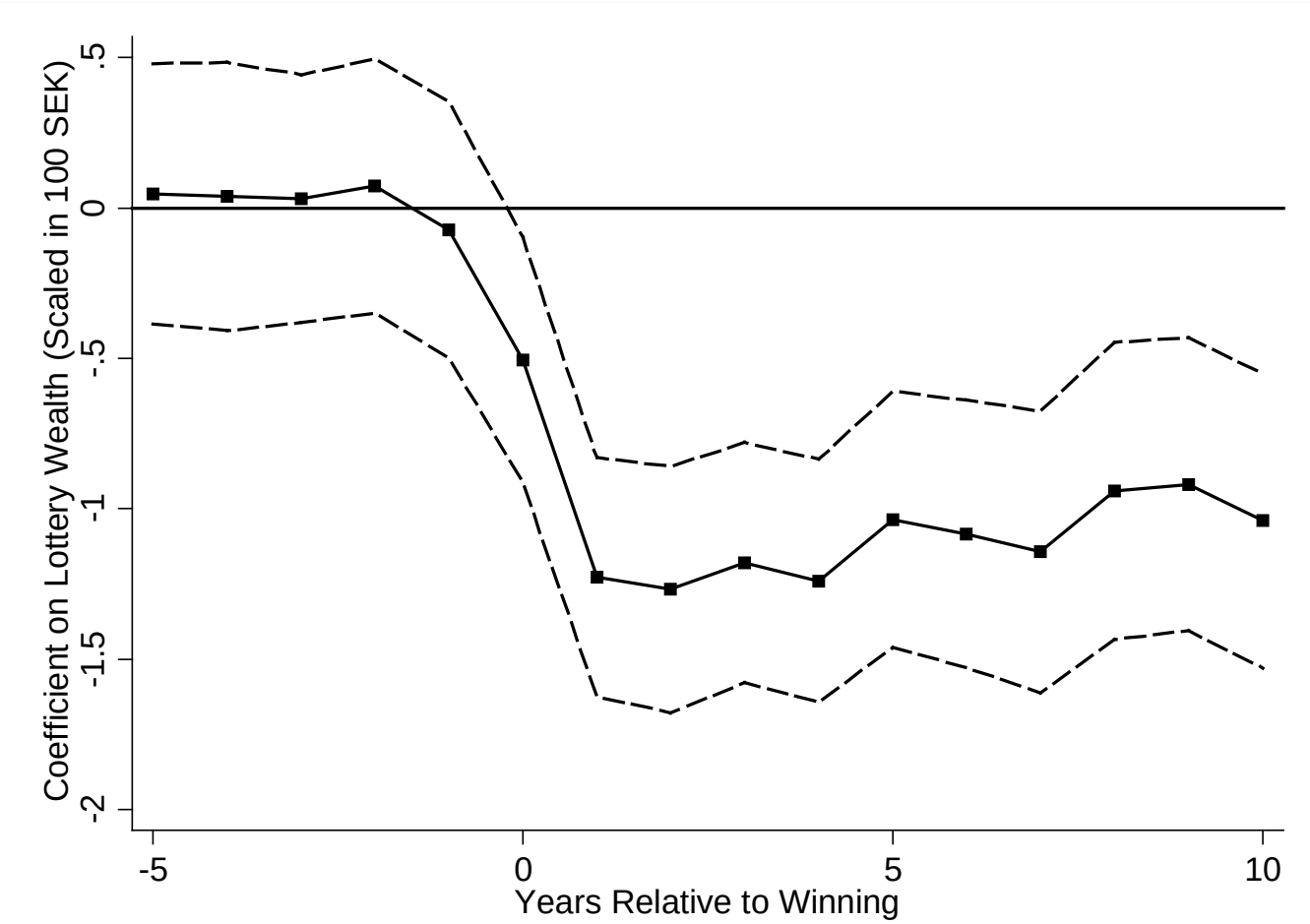
b) or Rejects the **unitary** model of household labor supply:
$\max u(c_1, c_2, l_1, l_2)$ st $c_1 + c_2 \leq w_1 l_1 + w_2 l_2 + R \Rightarrow$ only household R matters

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	

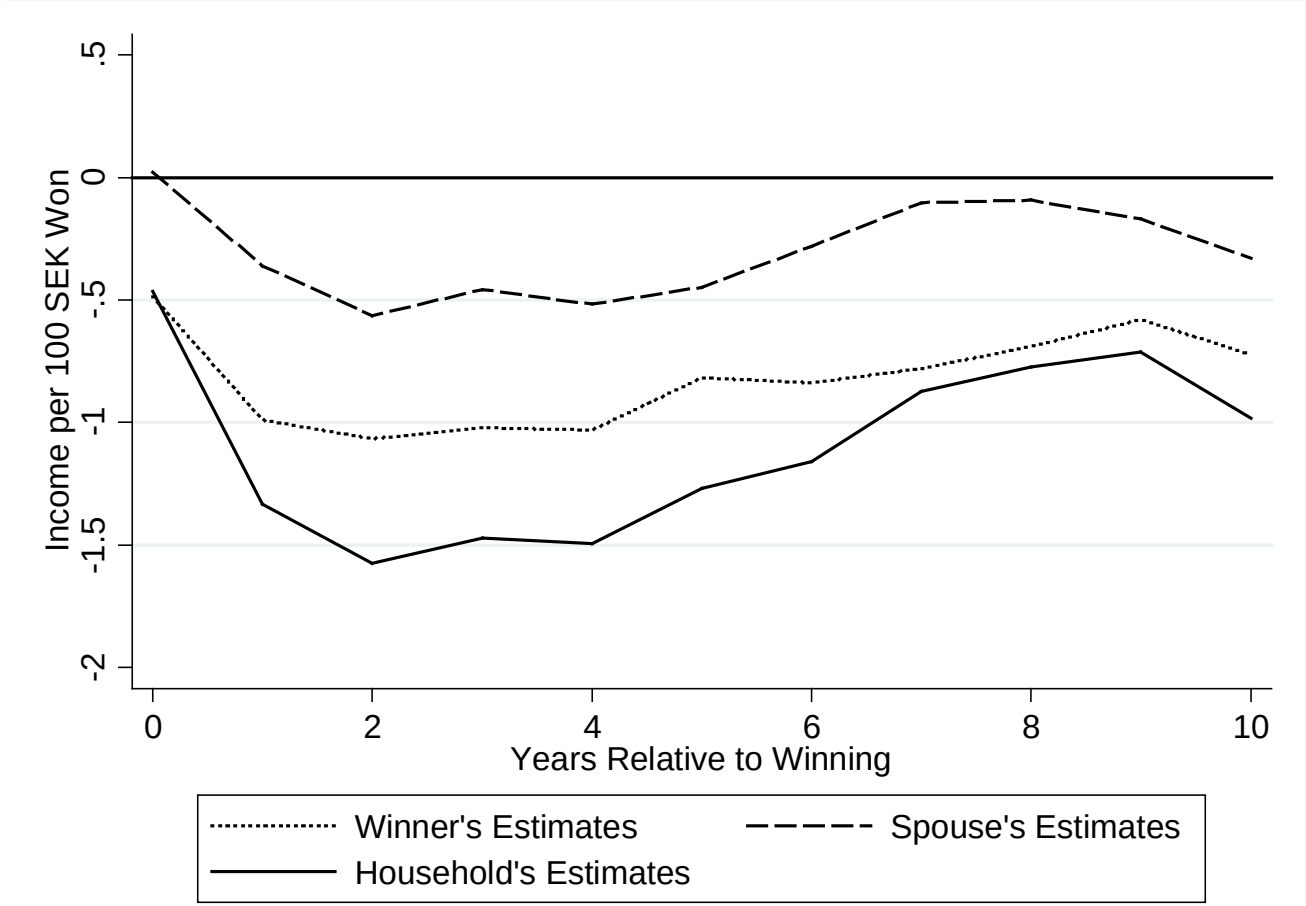
Notes: This table reports the distribution of lottery prizes for the pooled sample and the four lottery subsamples.

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.

Labor Supply Substitution Effects: Tax Free Second Jobs in Germany

In 2003, Germany made secondary jobs (paying less than 400 Euros/month) tax free: amounts to a 20-60% subsidy on second job earnings (depending on family marginal tax rate) $\Rightarrow$ almost pure substitution labor supply effect

Tazhitdinova AEJ'22 uses social security monthly earnings data

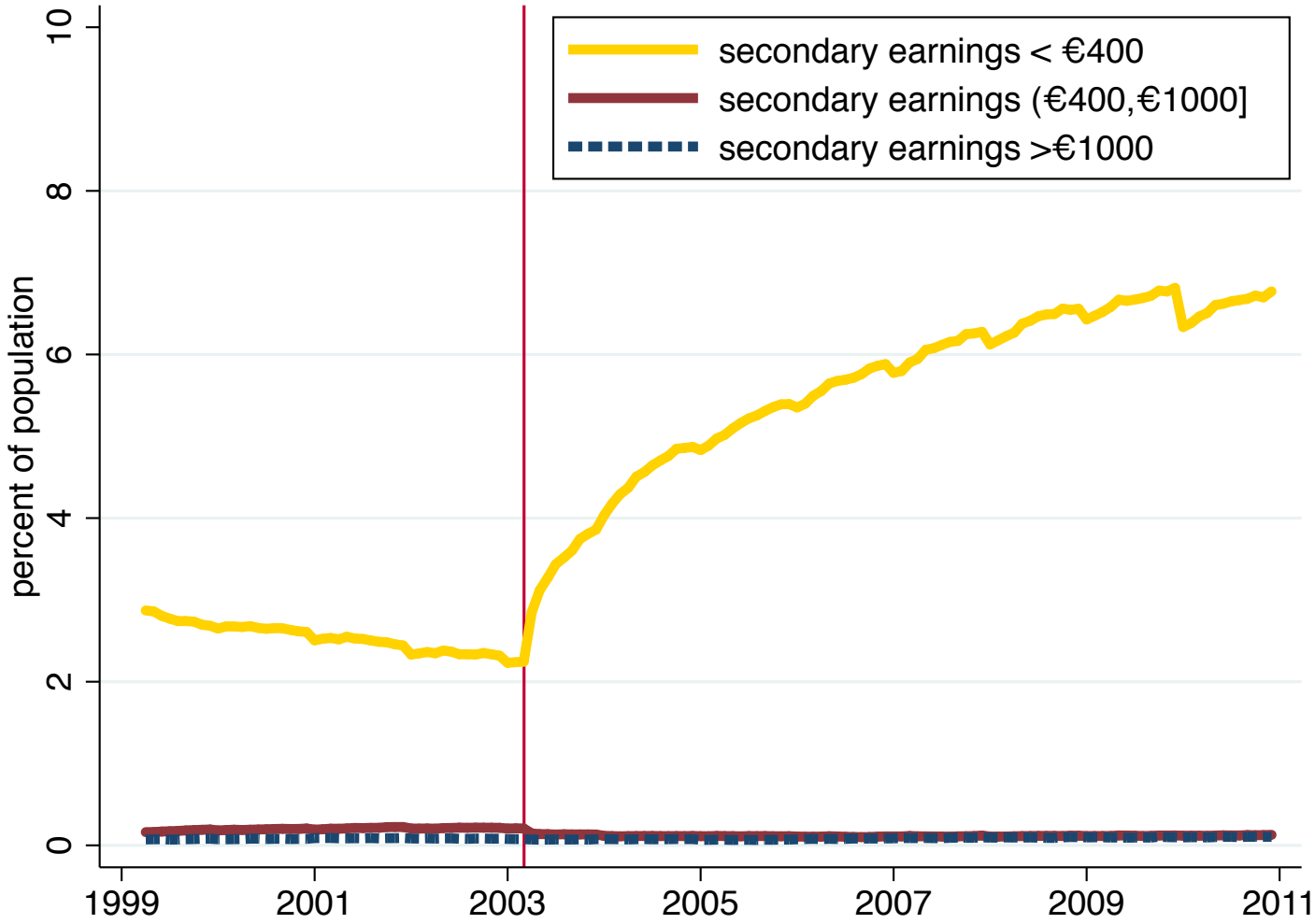
Fraction of population holding second jobs increased sharply (from 2.5% to 6-7%) with bigger response overtime

Finds no offsetting effect on primary earnings $\Rightarrow$ People did work more

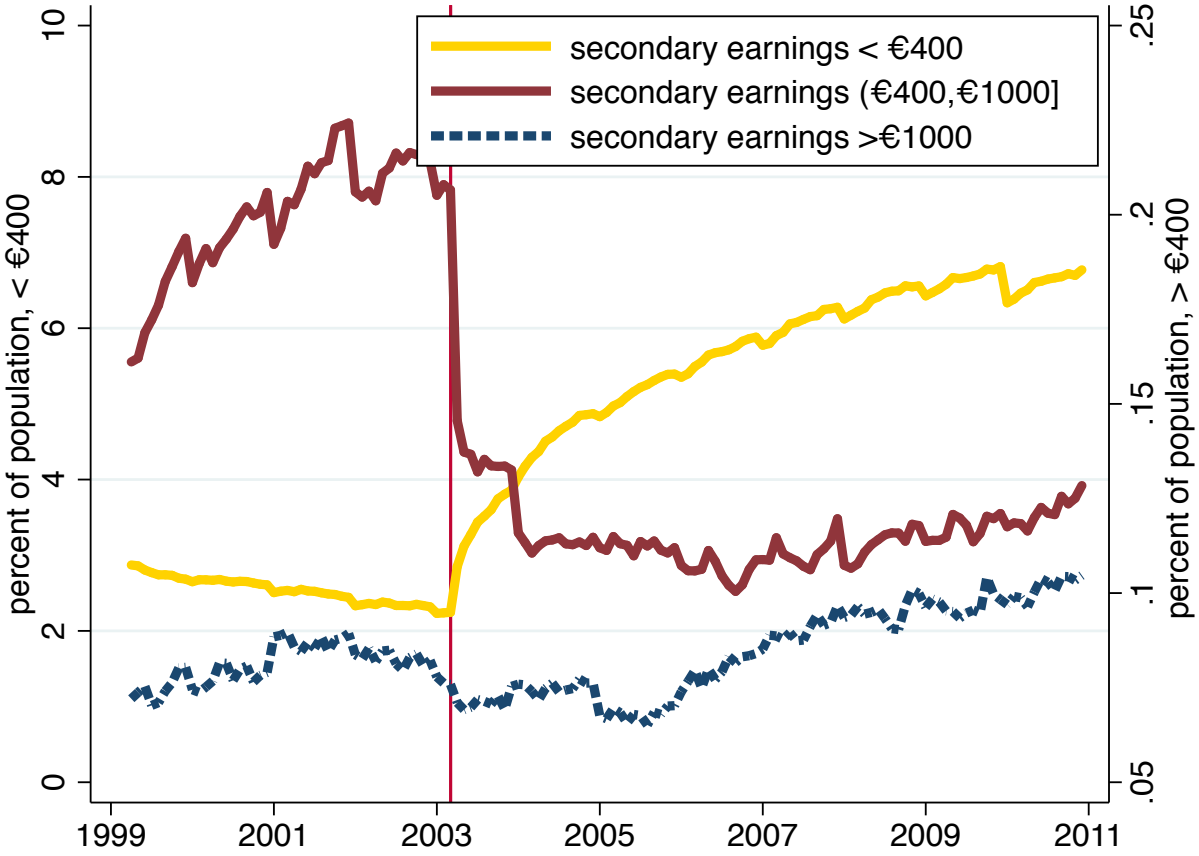
Looks like a big labor supply response but likely happened because employers willing to create lots of mini-jobs to accommodate supply

Figure 4: Secondary Job Holding Rates by Secondary Earnings Level
Source: Tazhitdinova (2019)

(a) same axis



(b) different axis



Notes: This figure shows the share of individuals with secondary jobs paying less than €400 per month, paying between €400 and €1000, or more than €1000 per month. The vertical red line identifies the 2003 tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

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 for low income families with kids; SSI (supplemental security income) for elderly/disabled

3) See Gruber undergrad textbook for details on institutions

1996 US Welfare Reform

1) Reform modified AFDC (Aid for Families with Dependent Children) cash welfare program to provide more incentives to work (renamed TANF Temporary Aid for Needy Families)

a) Requiring recipients to go to job training or work

b) Duration limits (2-year spell max, 5-year lifetime)

c) Reducing phase-out rate of benefits

2) Fed govt provided incentives for states to experiment with reforms in 1992-1995 (state waivers). Kleven '21 shows earlier effects in waiver states. Some did randomize experiments.

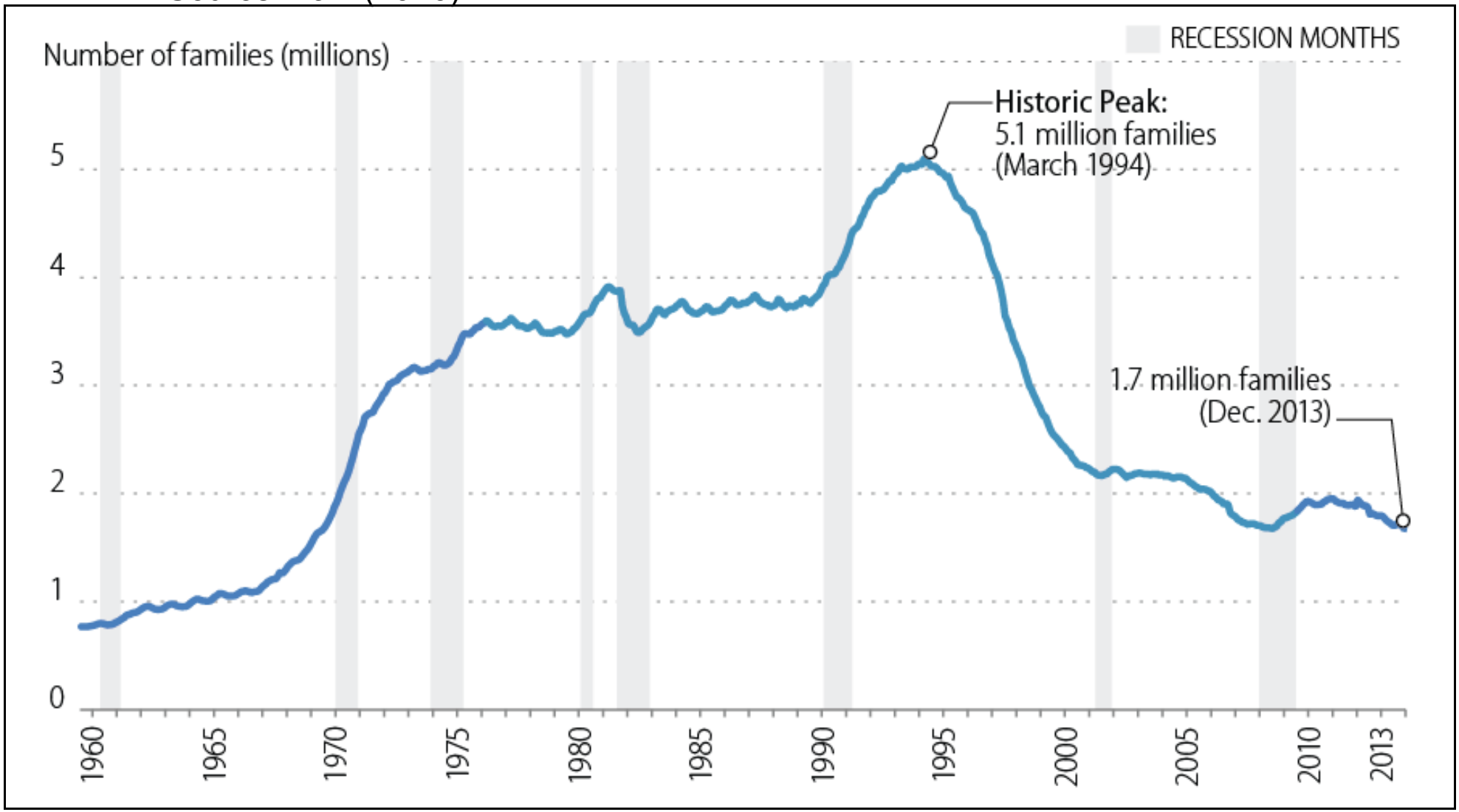
4) EITC also expanded during this period: general shift from welfare to "workfare"

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).

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 (if you start working by month 12)

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): Elasticity $e_0 = (.42/.28)/((1-.167)/(1-.743)) = 1.50/3.24 = .46$ which is large but not enormous

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

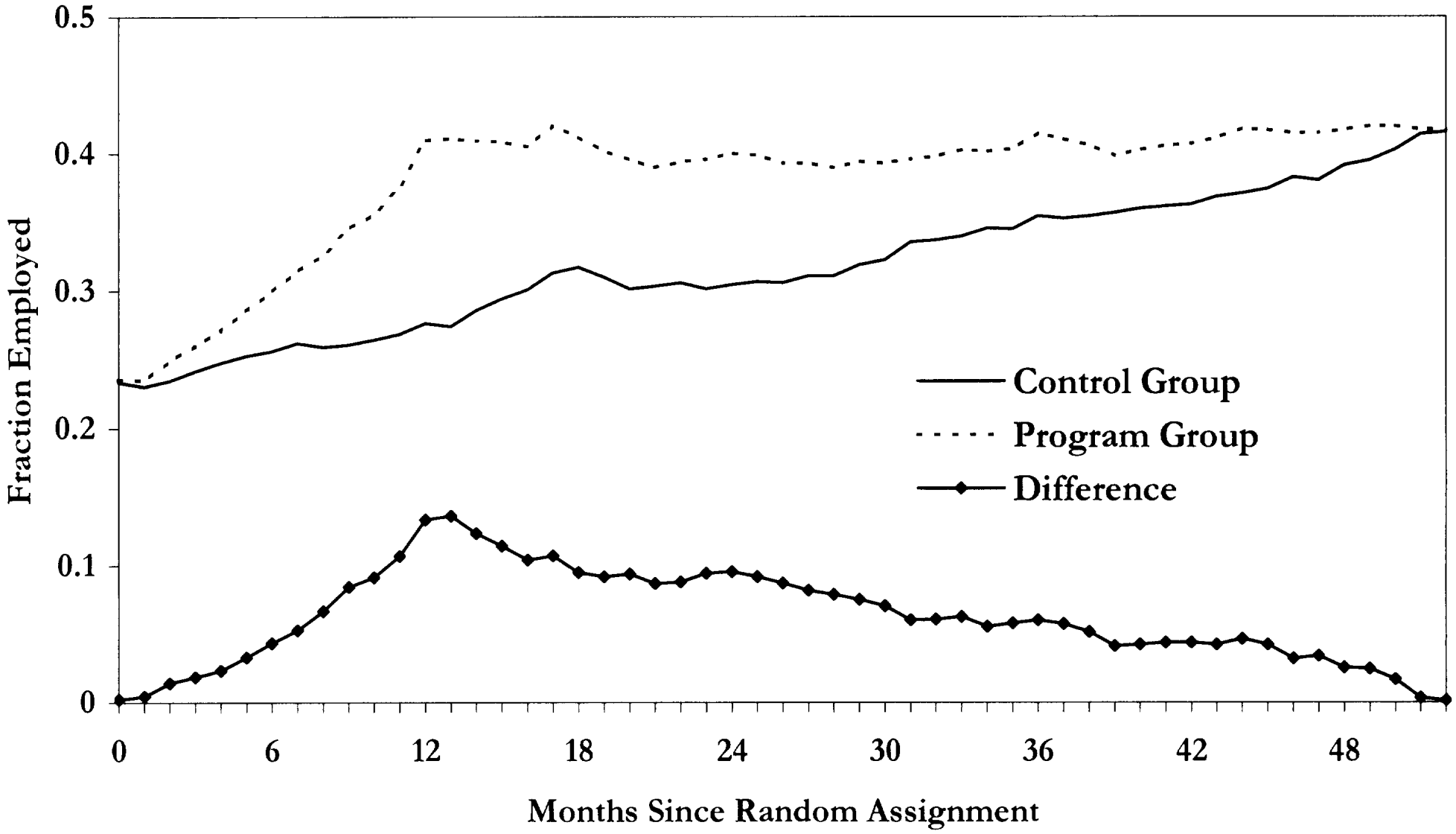


FIGURE 3.—Monthly employment rates.

Source: Card and Hyslop, 2005, p. 1734

Earned Income Tax Credit (EITC) program

Kleven JpubE'24 provides EITC 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 [$75bn in 2019, 30m families recipients]

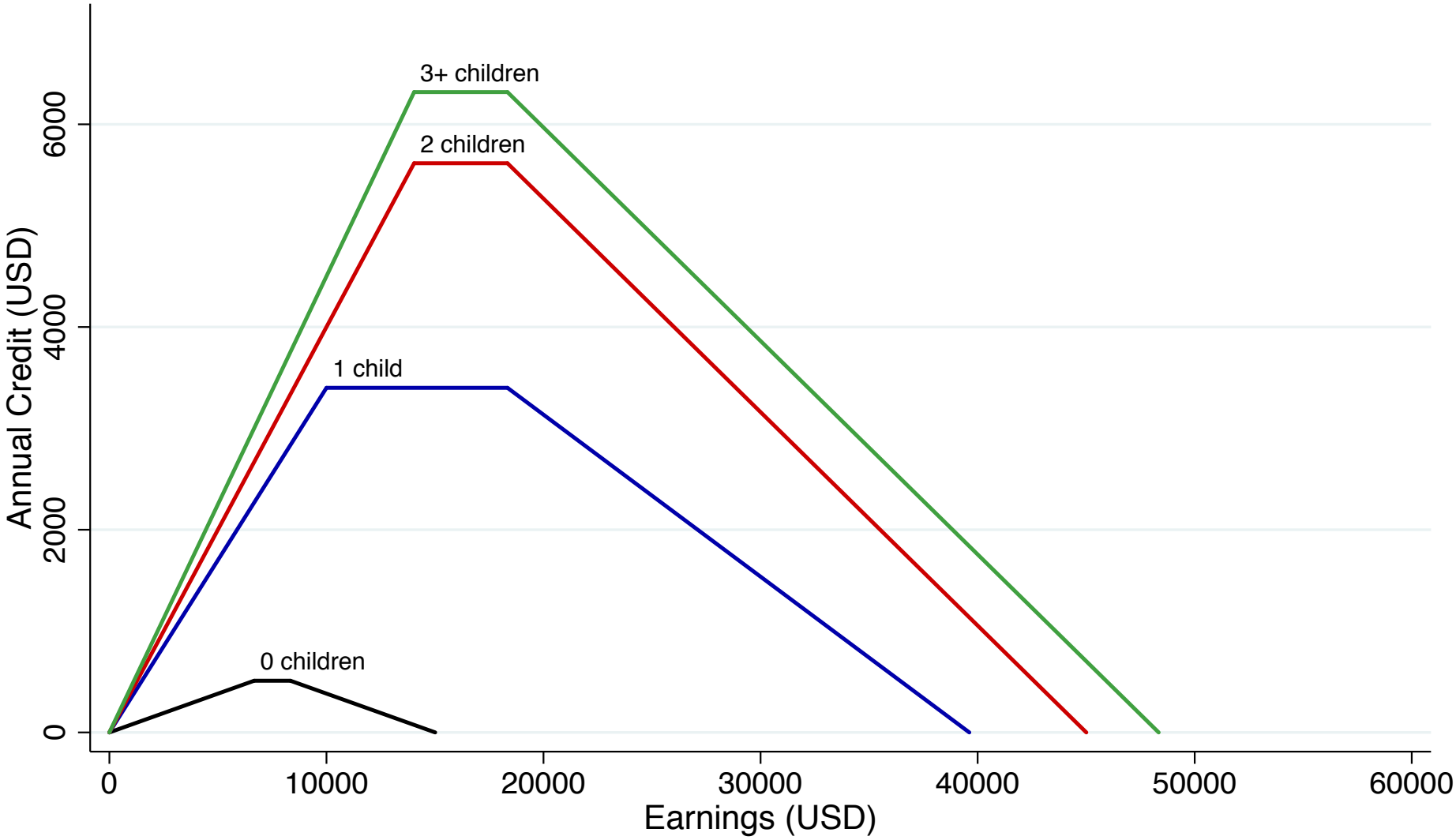
2) Eligibility: families with kids and low earnings.

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

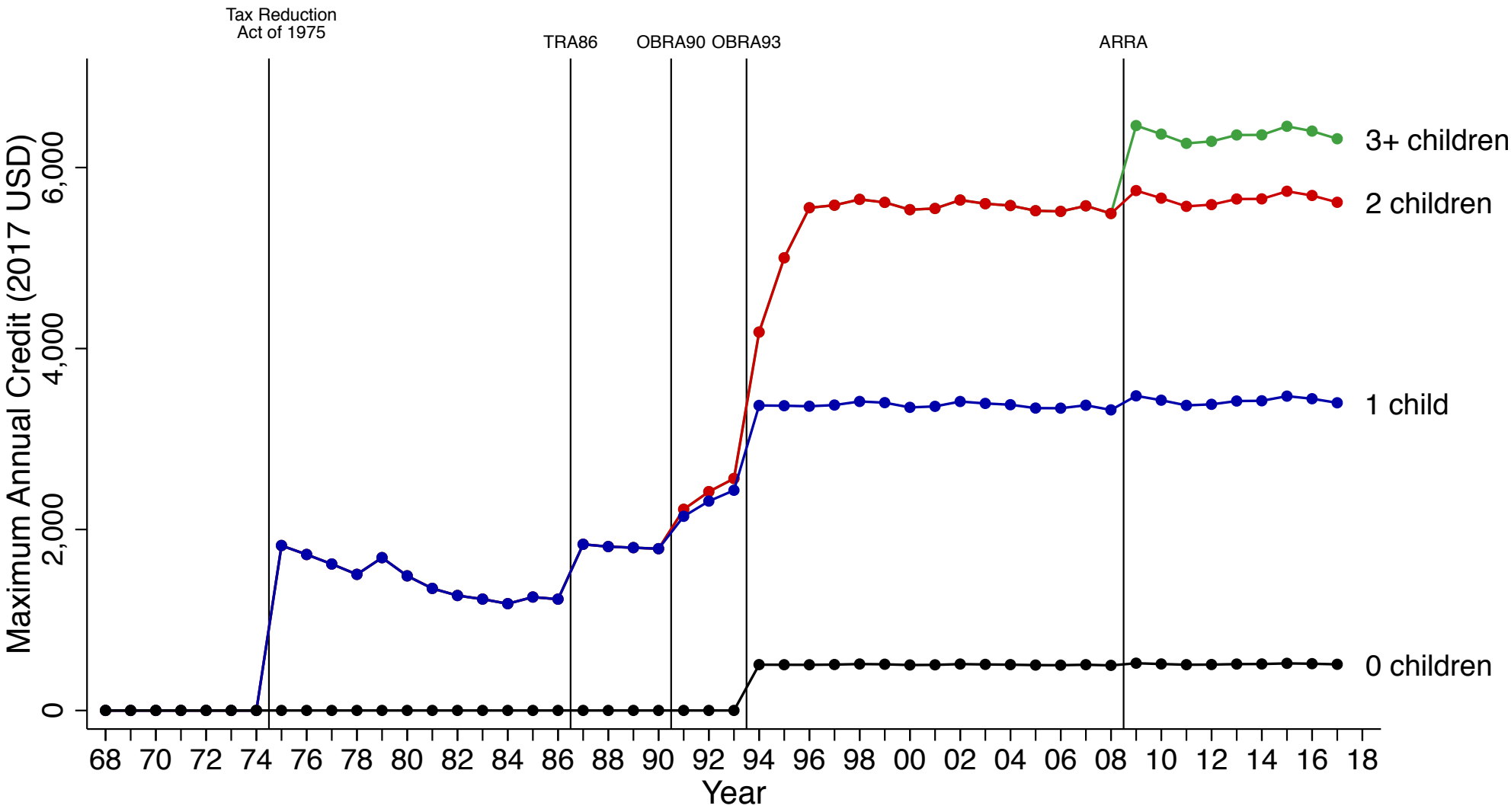
4) EITC has flat pyramid structure with phase-in (negative MTR), plateau, (0 MTR), and phase-out (positive MTR)

5) States have added EITC components to their income taxes [in general a percentage of the Fed EITC, great source of natural experiments, understudied, Kleven '19 finds nothing]

EITC Schedule in 2017



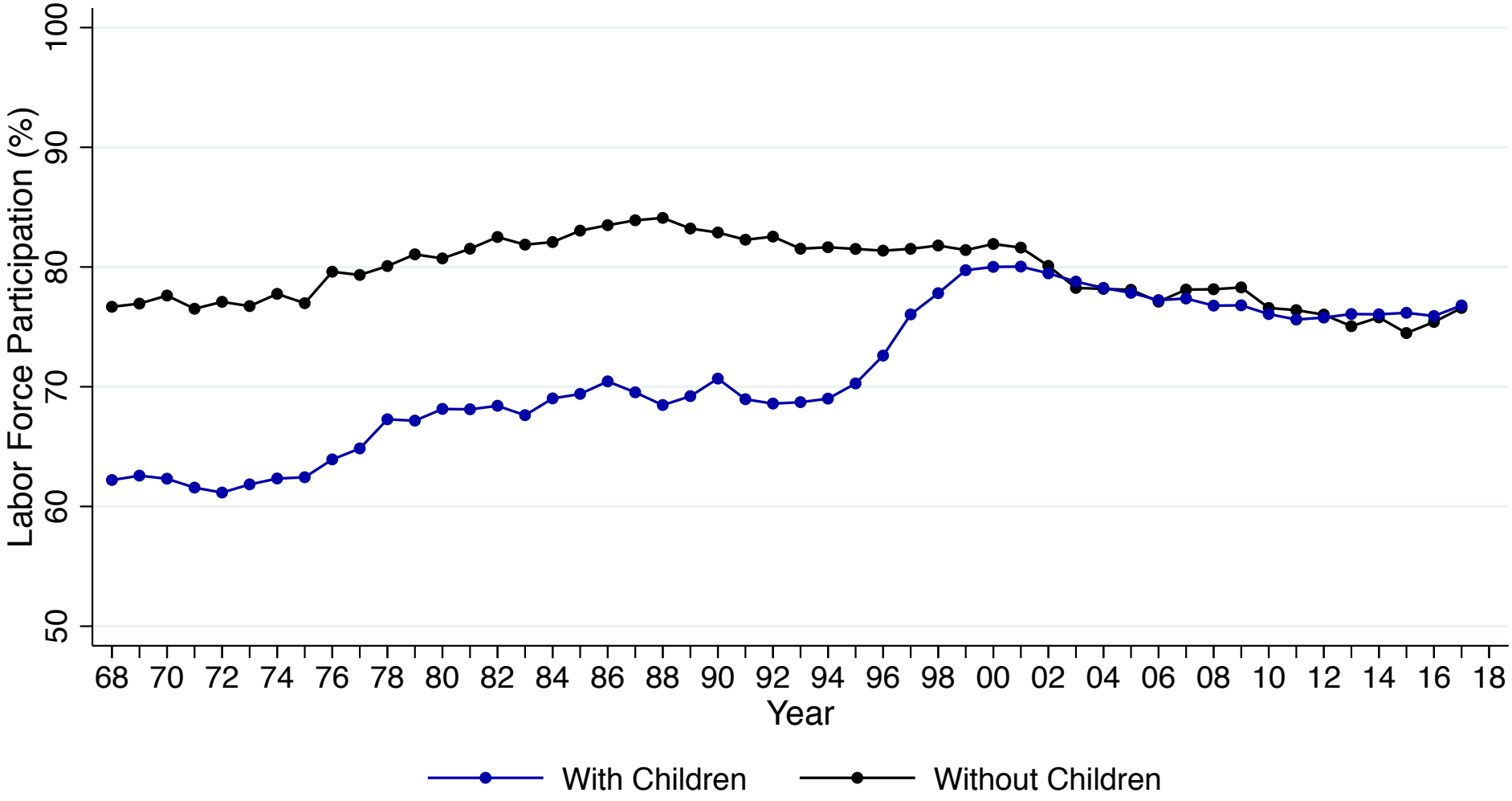
EITC Maximum Credit Over Time



Source: Kleven (2018)

Labor Force Participation of Single Women

With and Without Children

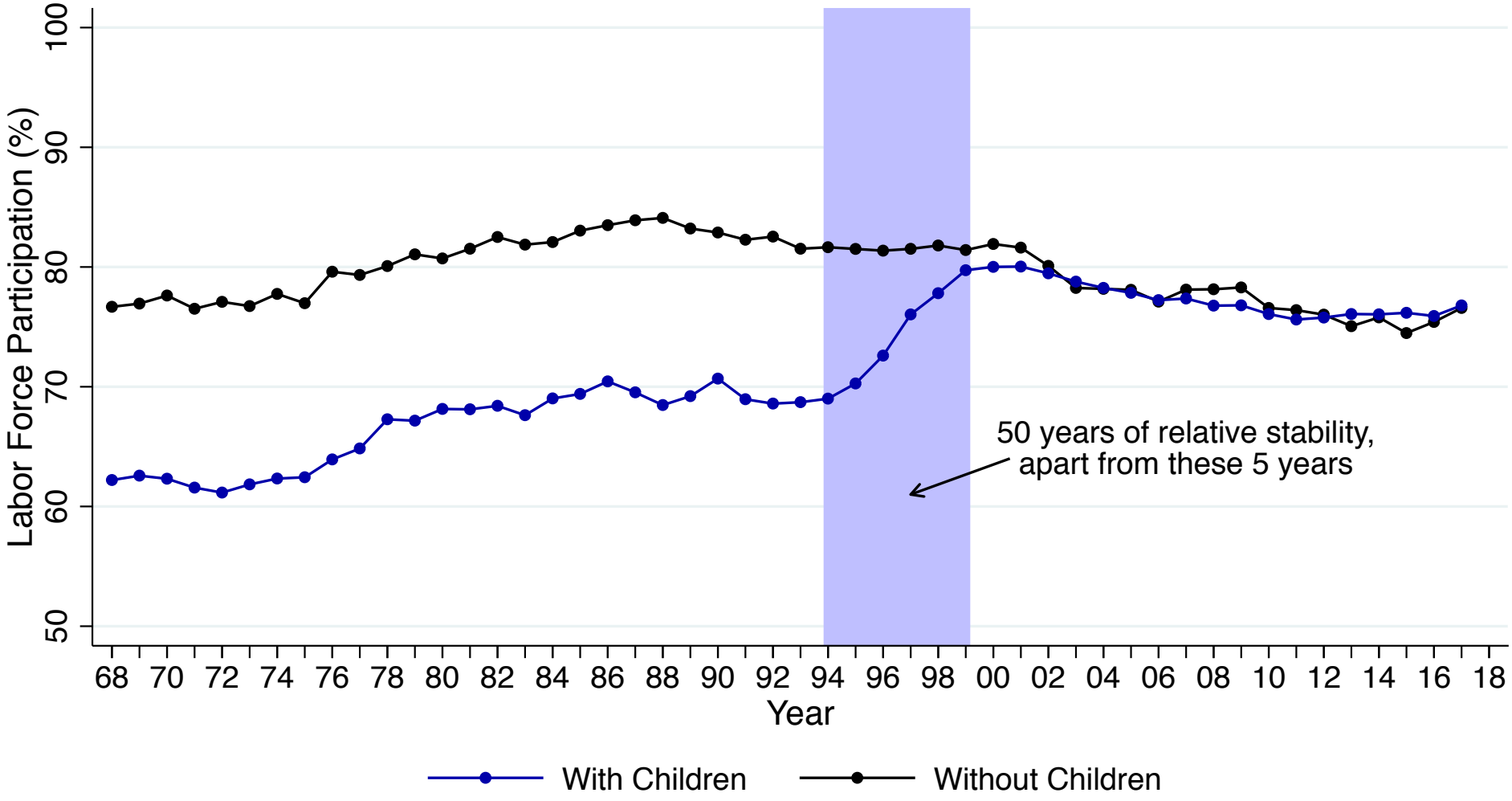


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

With and Without Children

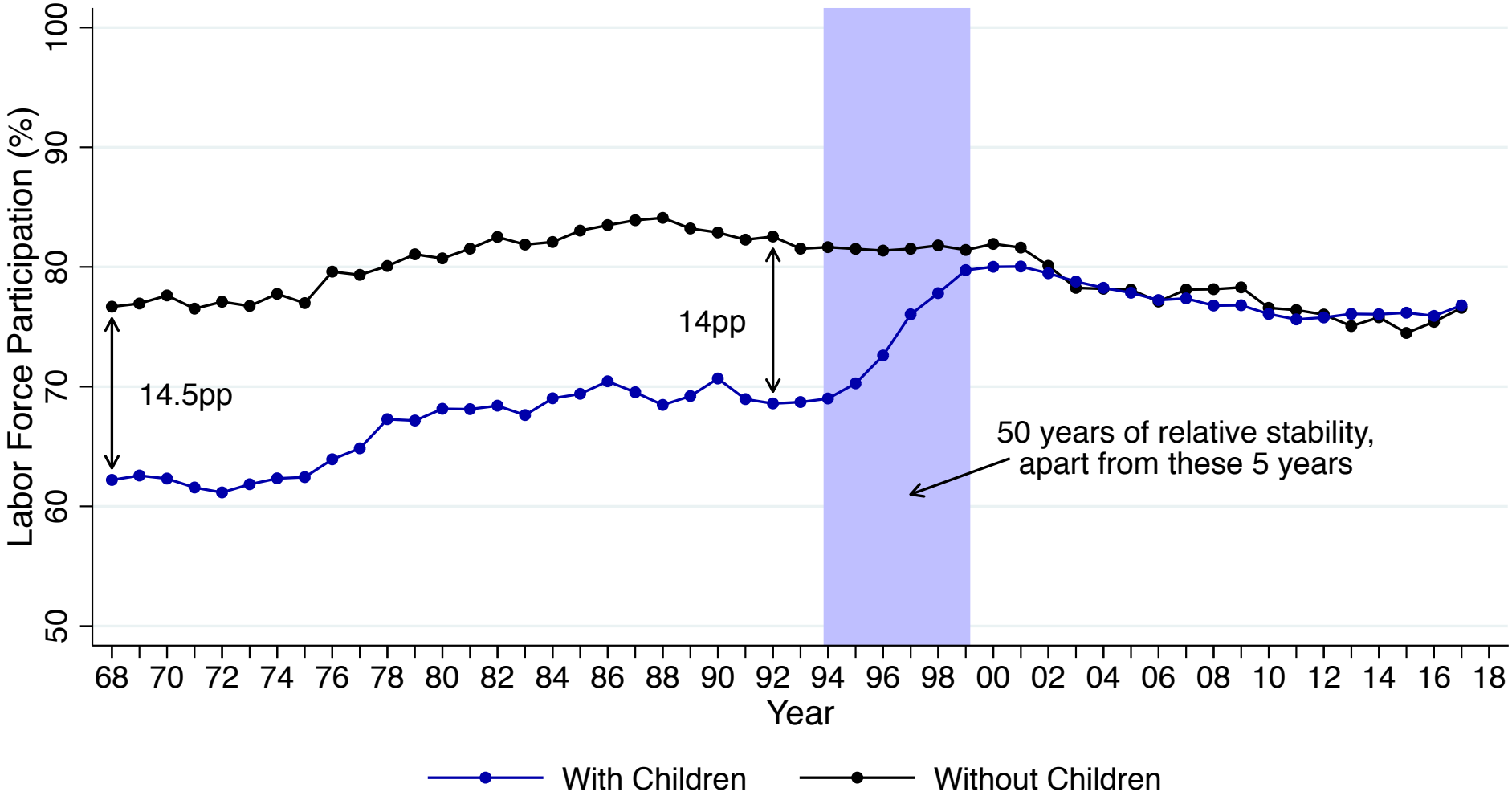


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

With and Without Children

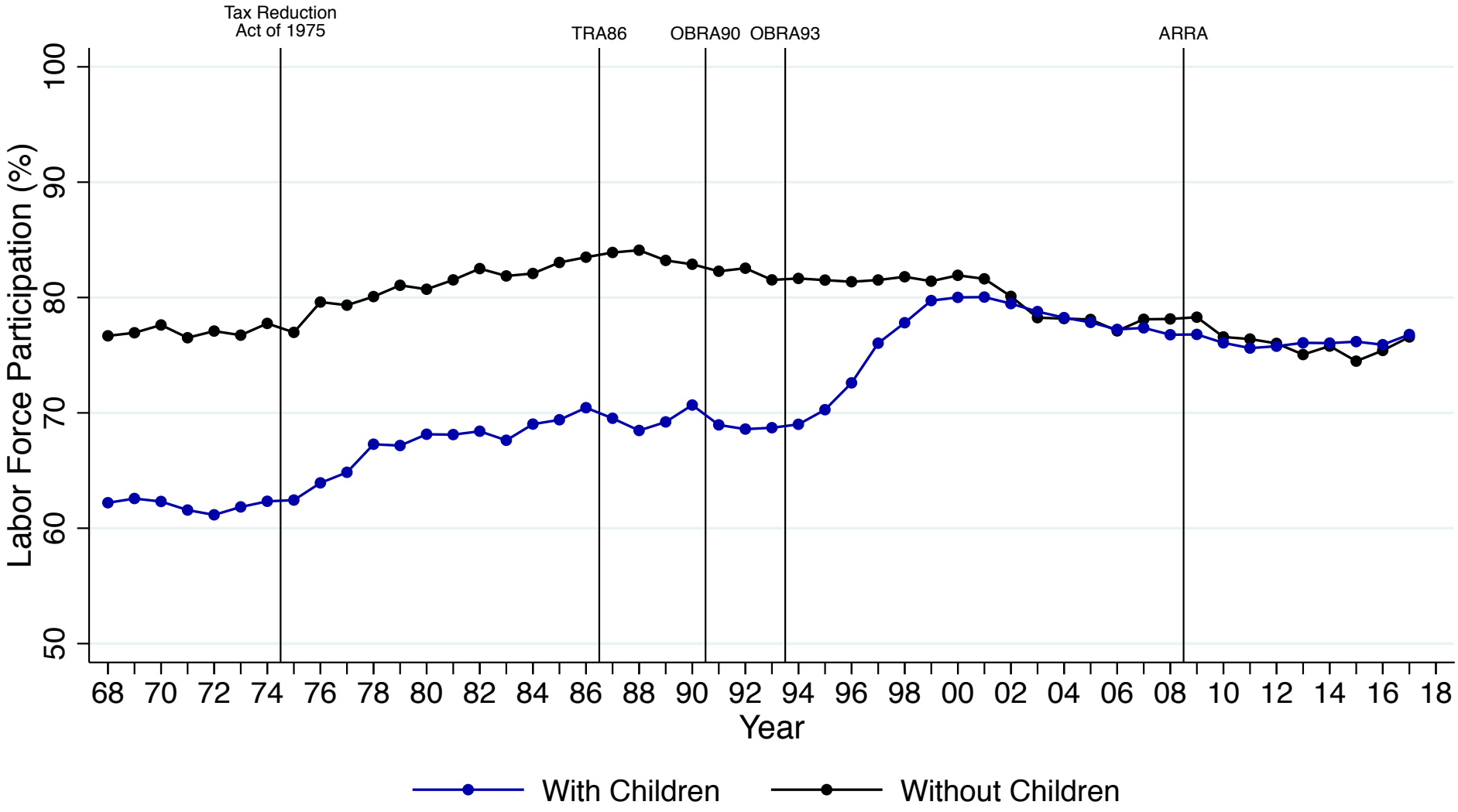


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

With and Without Children

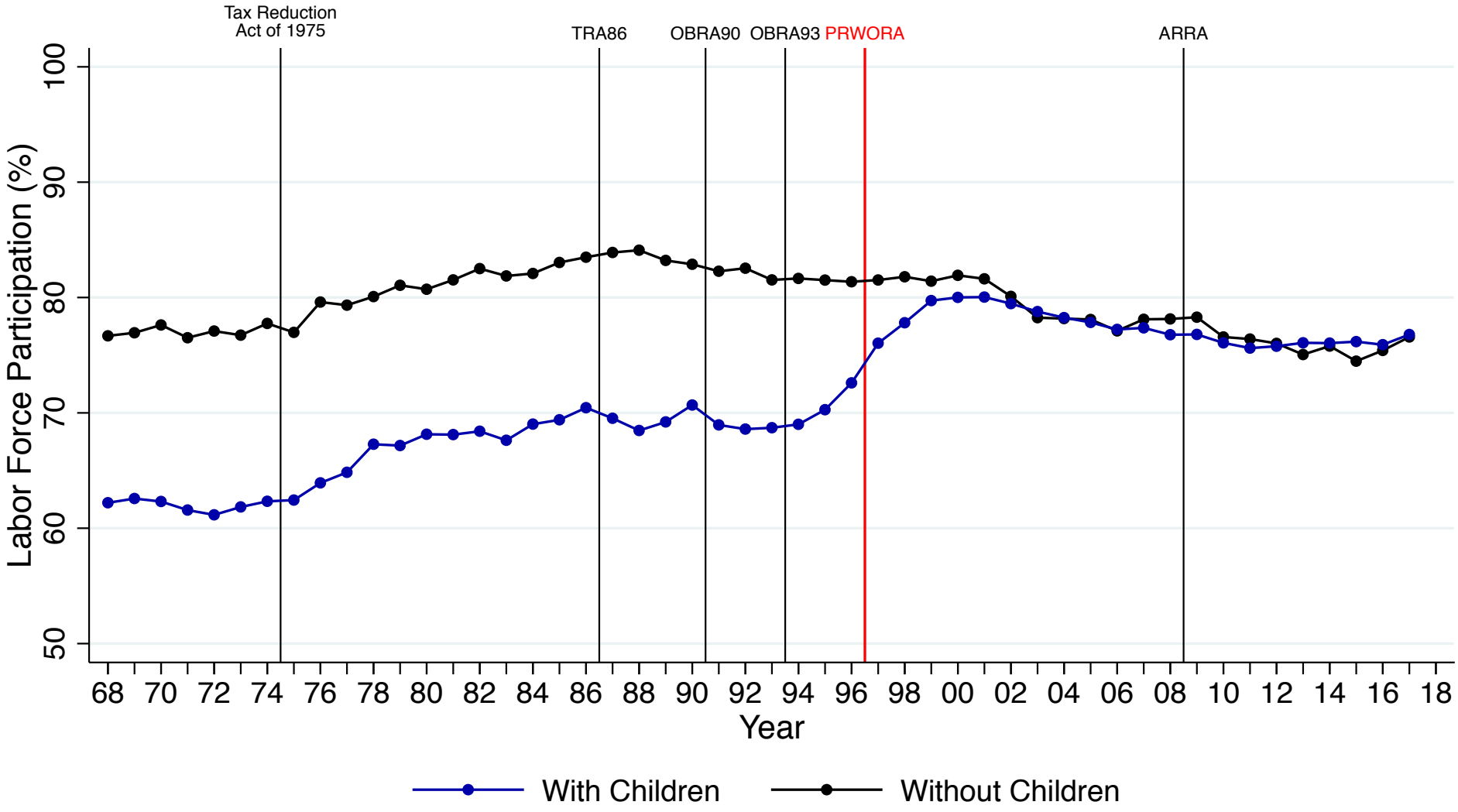


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

With and Without Children

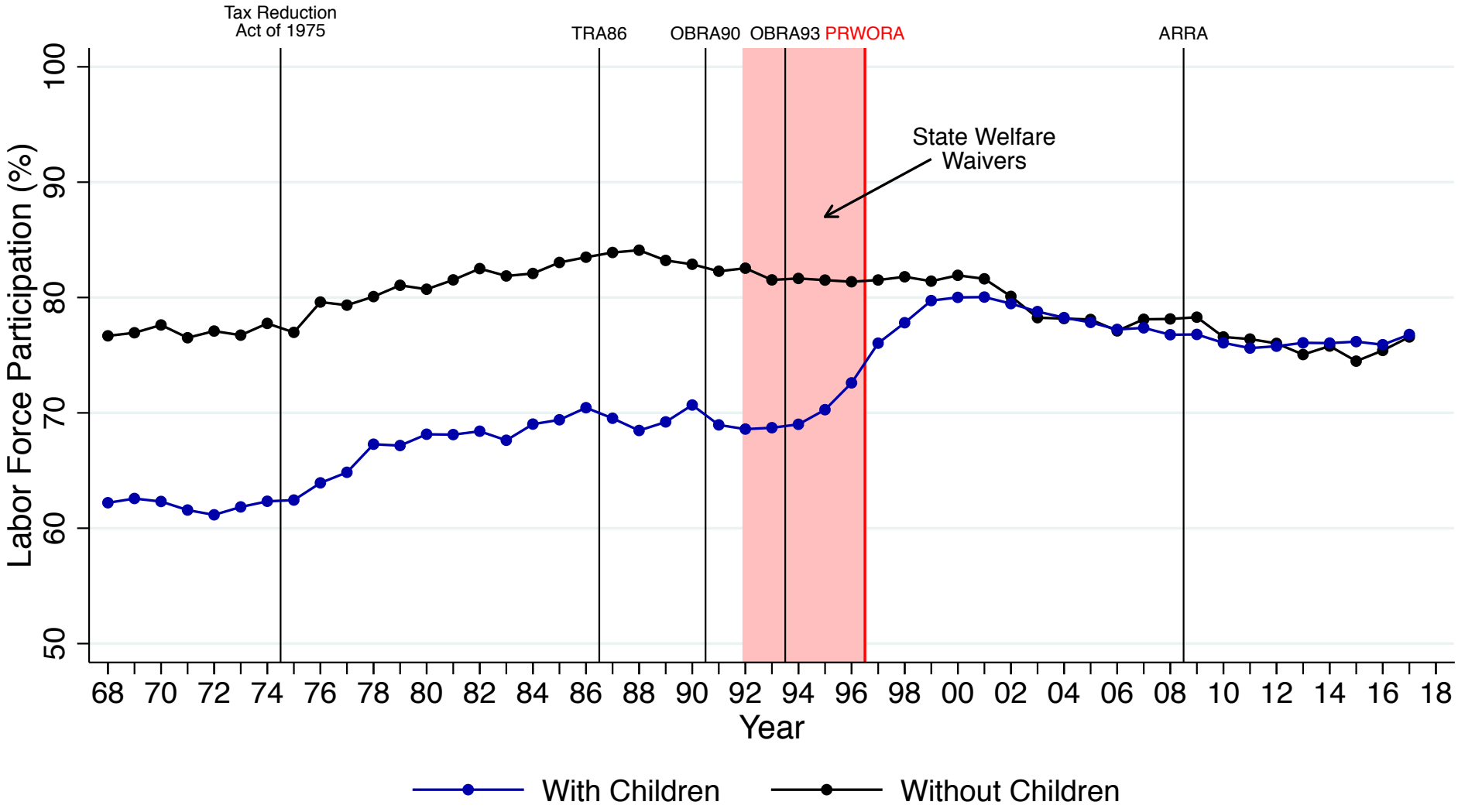


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

With and Without Children

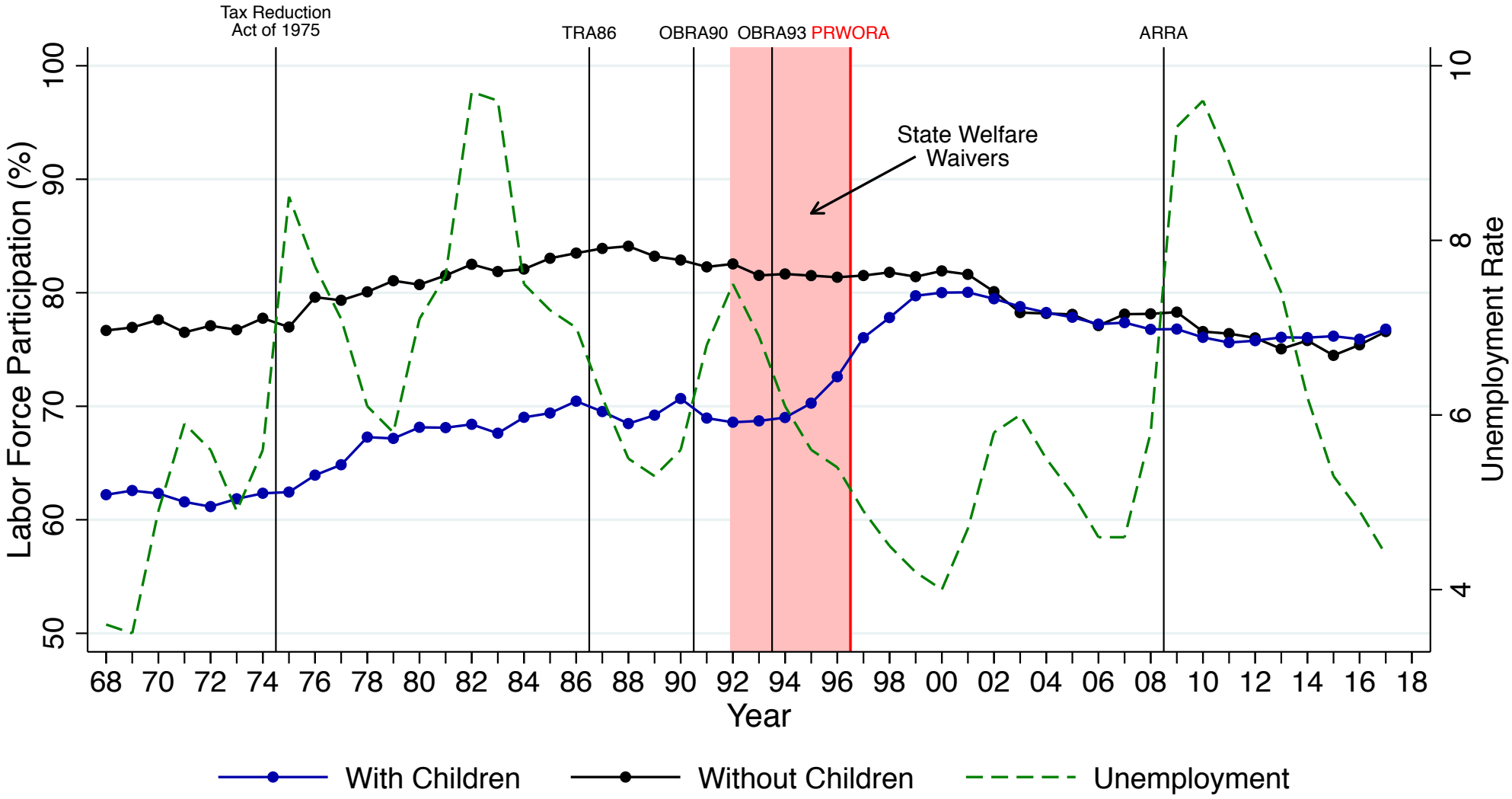


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

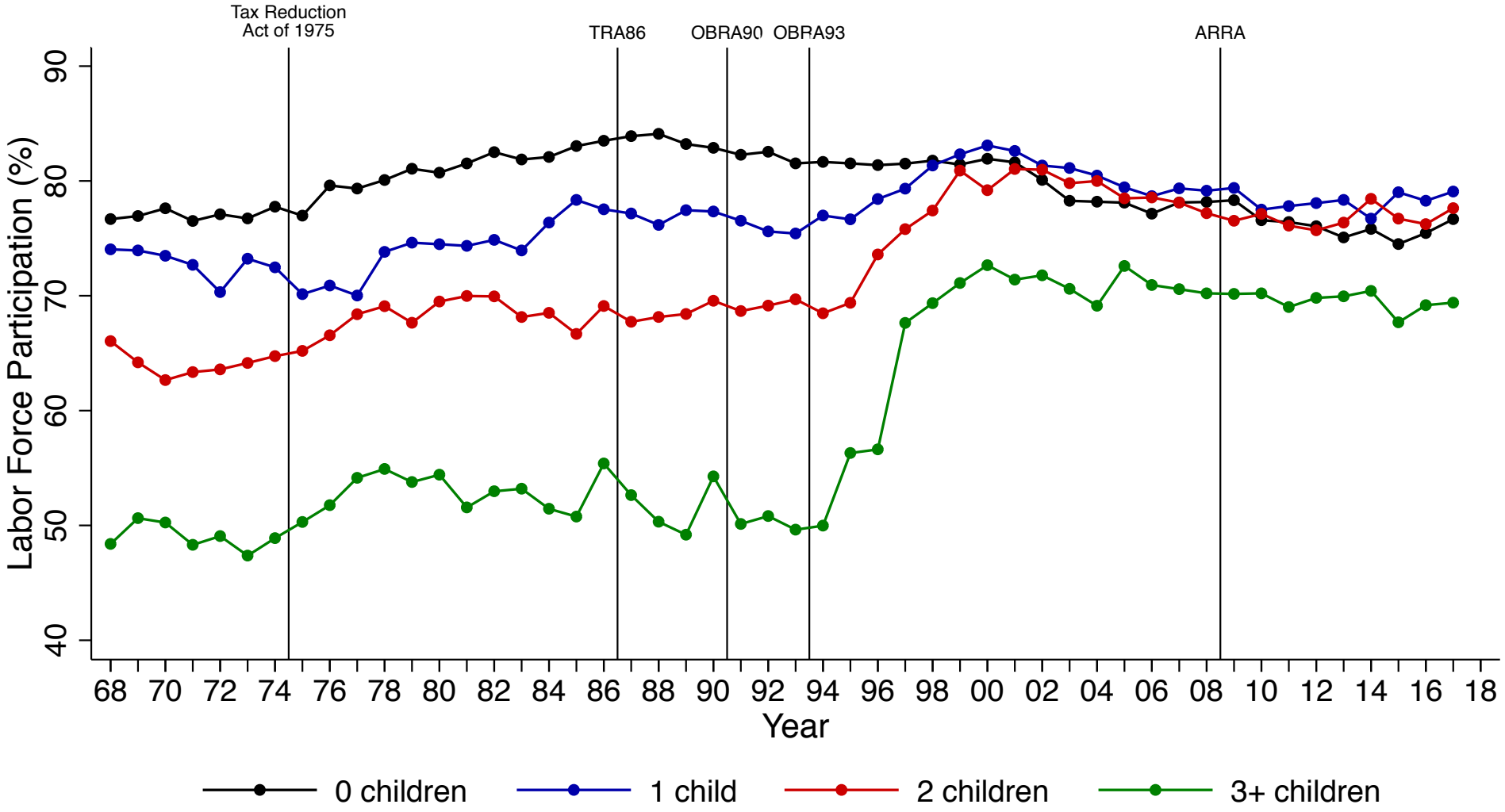
With and Without Children



Source: Kleven (2018)

Labor Force Participation of Single Women

By Number of Children

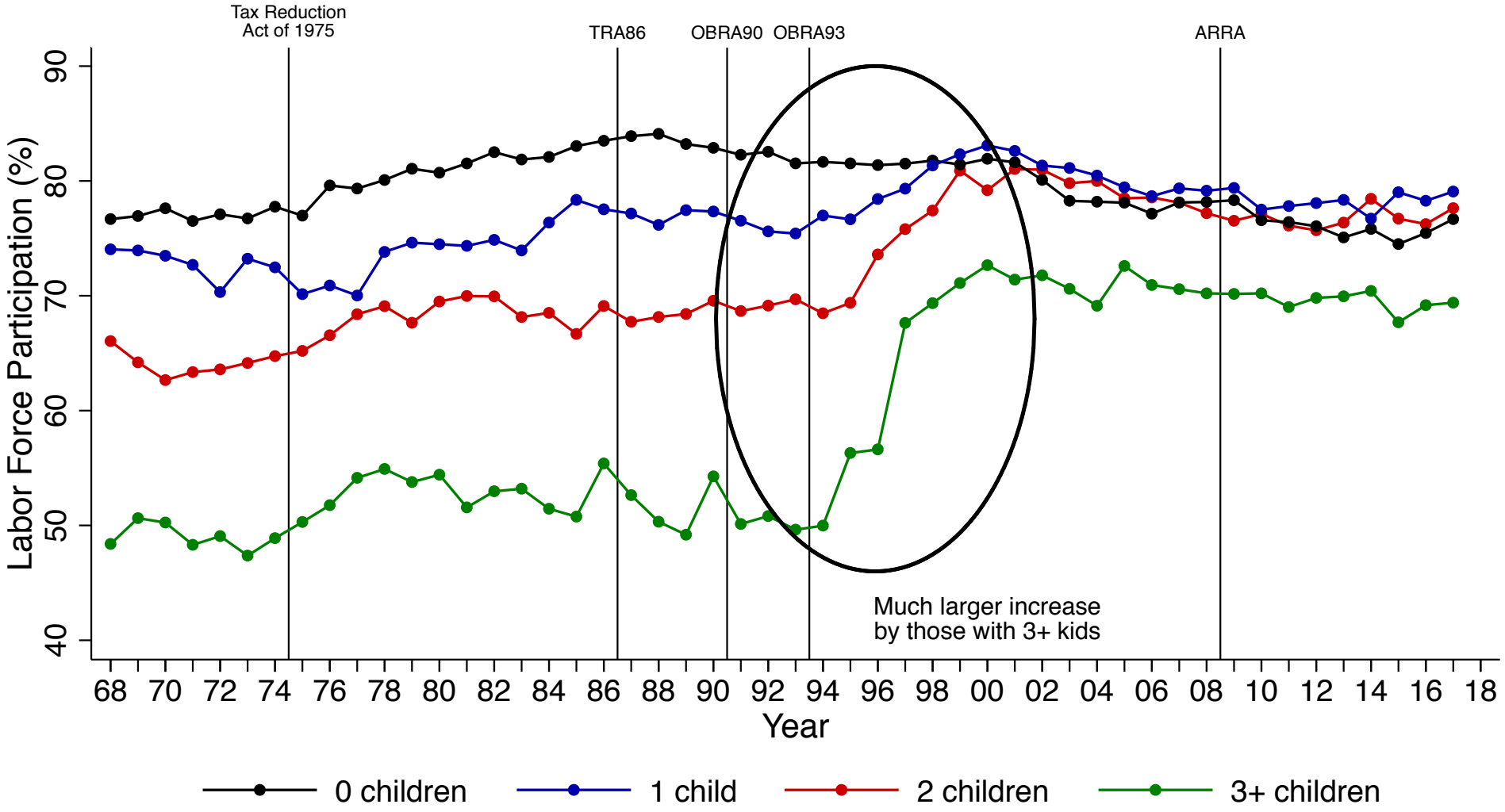


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

By Number of Children

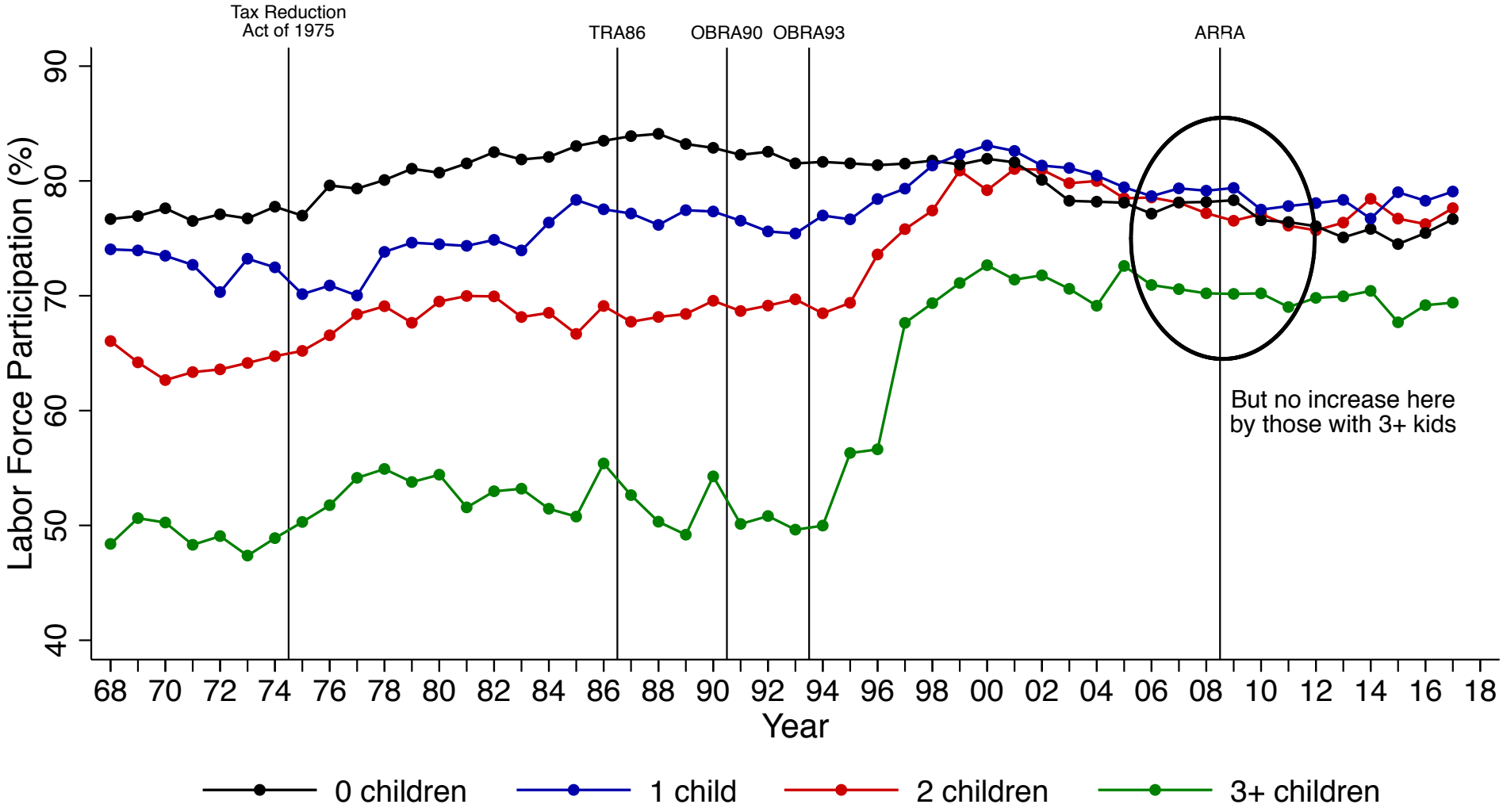


Source: Kleven (2018)

Annual Employment | Low Education

Labor Force Participation of Single Women

By Number of Children



Source: Kleven (2018)

Annual Employment | Low Education

Kleven '24: no labor supply responses to state EITCs

30 states have implemented EITC supplements

Kleven '24 uses a synthetic control approach

For each state with an EITC supplement (treatment state), a synthetic control state is created from those without (matching on pre-reform outcomes)

Difference-in-Differences comparing states with and without EITC reforms, conditional on having children:

$$P_{st} = \sum_j \alpha_j \cdot Event_{j=t} + Treat_s + \sum_j \gamma_j \cdot Event_{j=t} \cdot Treat_s + \varepsilon_{st}$$

Fairly large first stage (4 points of average tax rate) yet no effect on employment

$\Rightarrow$ State EITC reforms deliver a pretty compelling zero effect

Difference-in-Differences:

Treated vs Control States (With Kids)

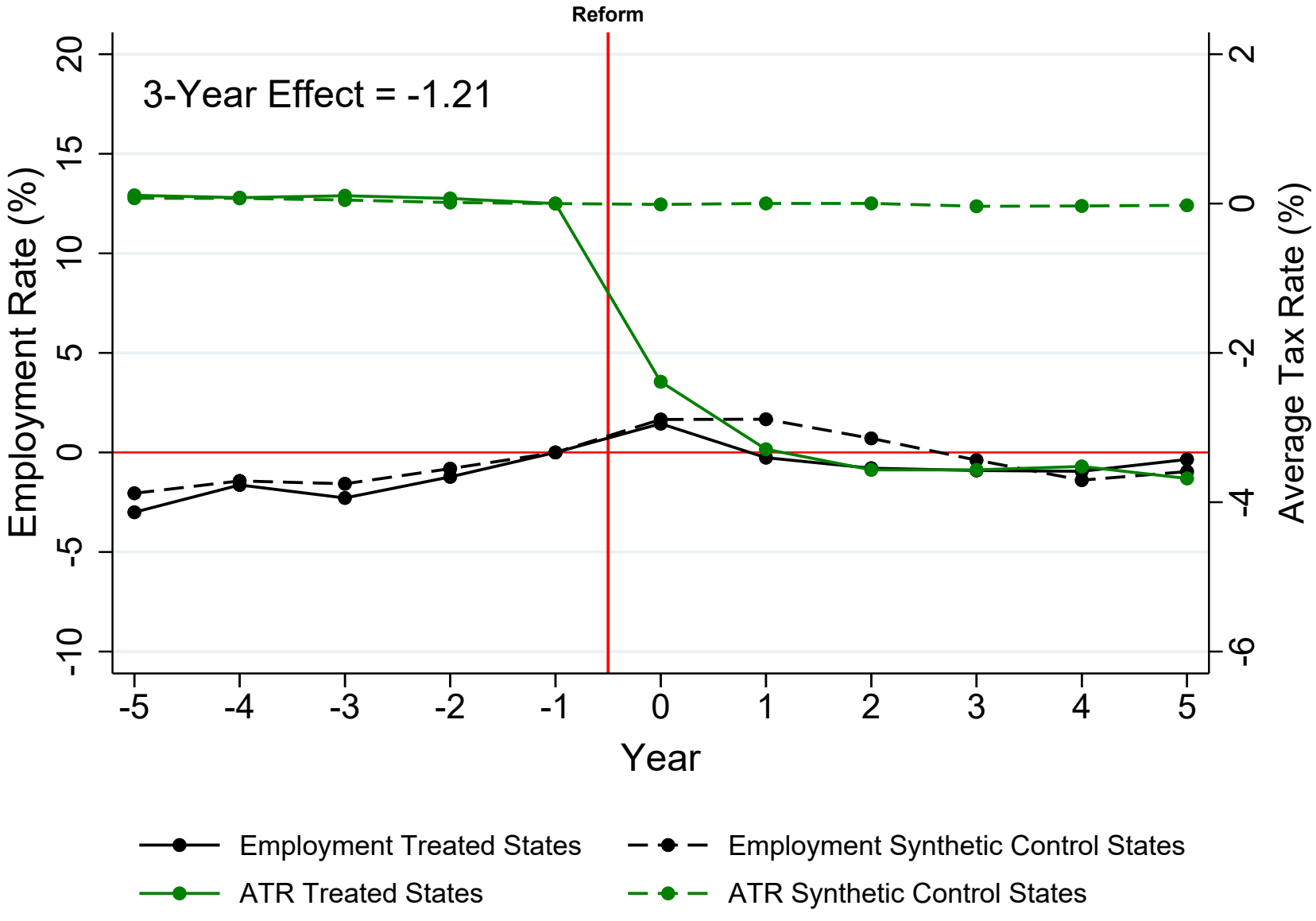
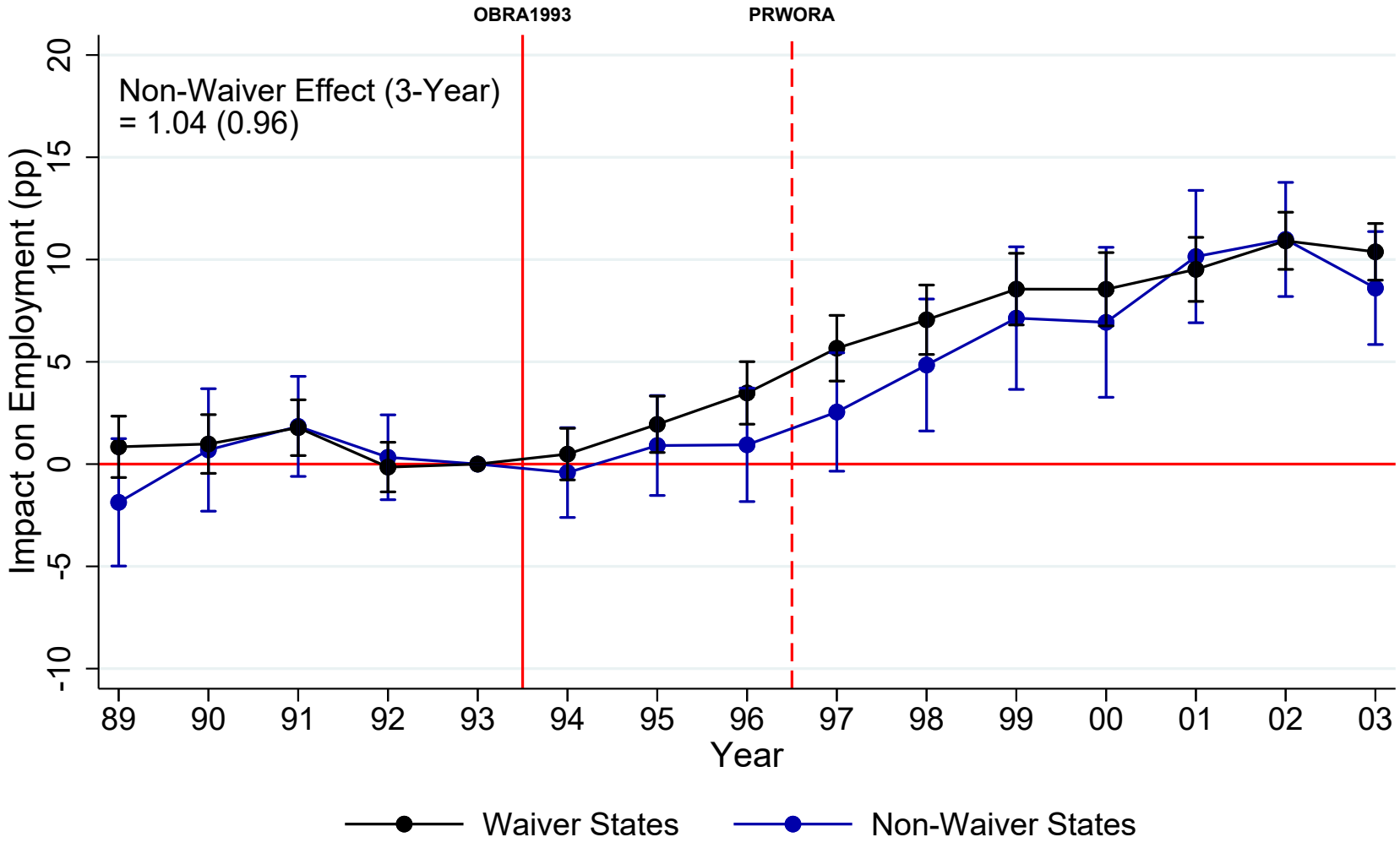


FIGURE 16: HOW MUCH CAN BE EXPLAINED BY WELFARE WAIVERS?
ALL SINGLE WOMEN, WEEKLY EMPLOYMENT



Notes: This figure shows DiD event studies of the 1993 reform for waiver states (black series) and non-waiver states (blue series). Specifically, the series show estimates of the DiD coefficient γ_t from specification (2), implemented separately on states that ever approved statewide waiver legislation and those that did not. Both series include controls for demographics and unemployment. From Table A.3 in the appendix, there were 13 states without any statewide waiver legislation: Alabama, Alaska, District of Columbia, Kansas, Kentucky, Louisiana, Nevada, New Mexico, New York, Oklahoma, Pennsylvania, Rhode Island, and Wyoming. The extensive margin outcome is weekly employment. The sample includes single women aged 20-50 using the March and monthly CPS files combined. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

Welfare Reform and EITC Expansion: Labor supply

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

Unlikely that the EITC can explain it because other Fed EITC and all State EITC changes haven't generated much effects

Seems to have happened first in "waiver states" that started experimenting with welfare reform a few years earlier

Looney (2024) shows larger effects on single moms labor supply in states where AFDC was more generous

Sociological evidence shows that welfare reform "scared" single mothers into working Single moms in the US were suddenly expected to work

A unique combination of EITC reform, welfare reform, economic upturn, and changing social norms lead to this shift

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) Bunching is compelling and non-parametric evidence of behavioral responses to taxes

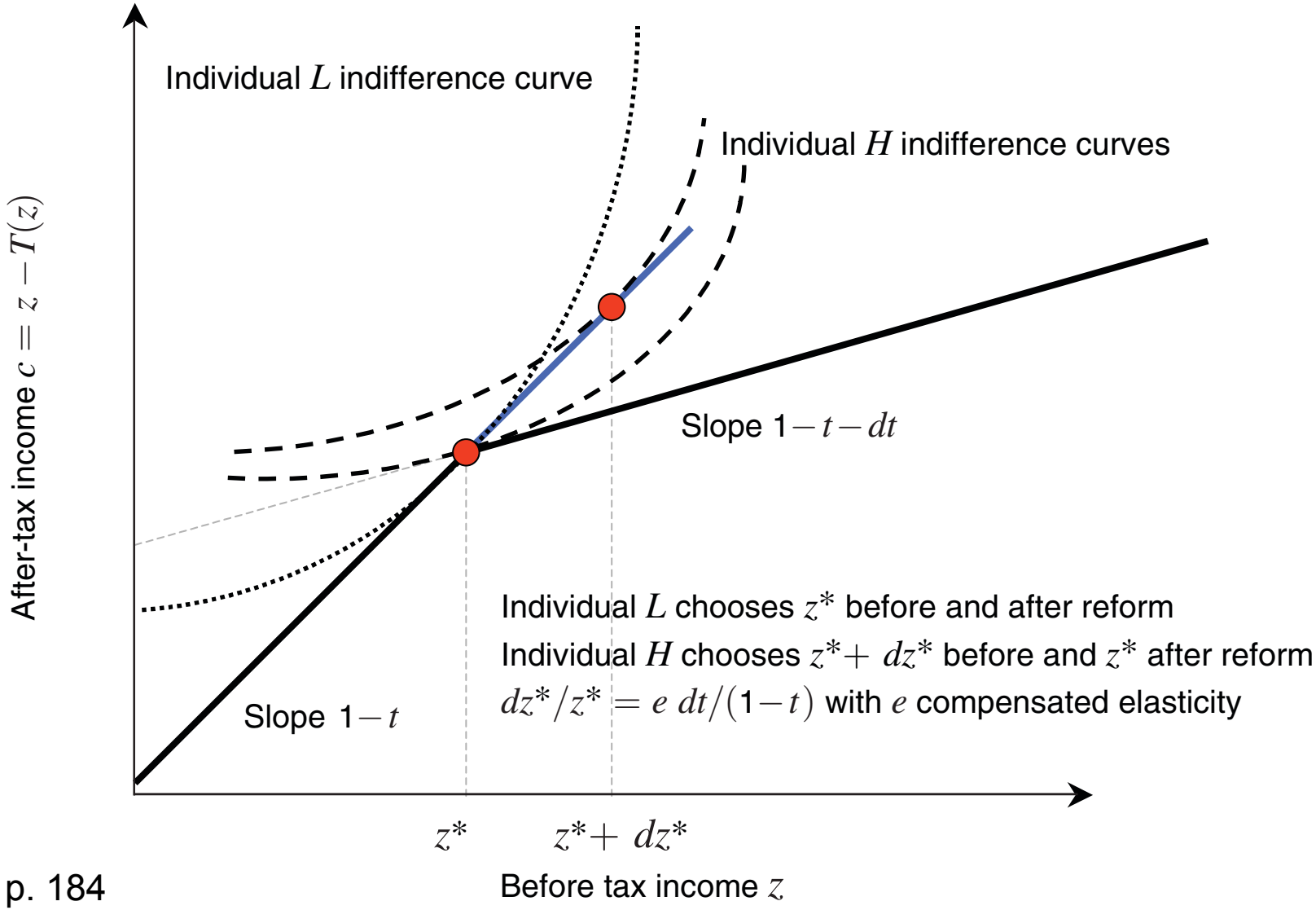
2) Saez '10 develops method of using bunching at kinks to estimate the compensated income elasticity

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

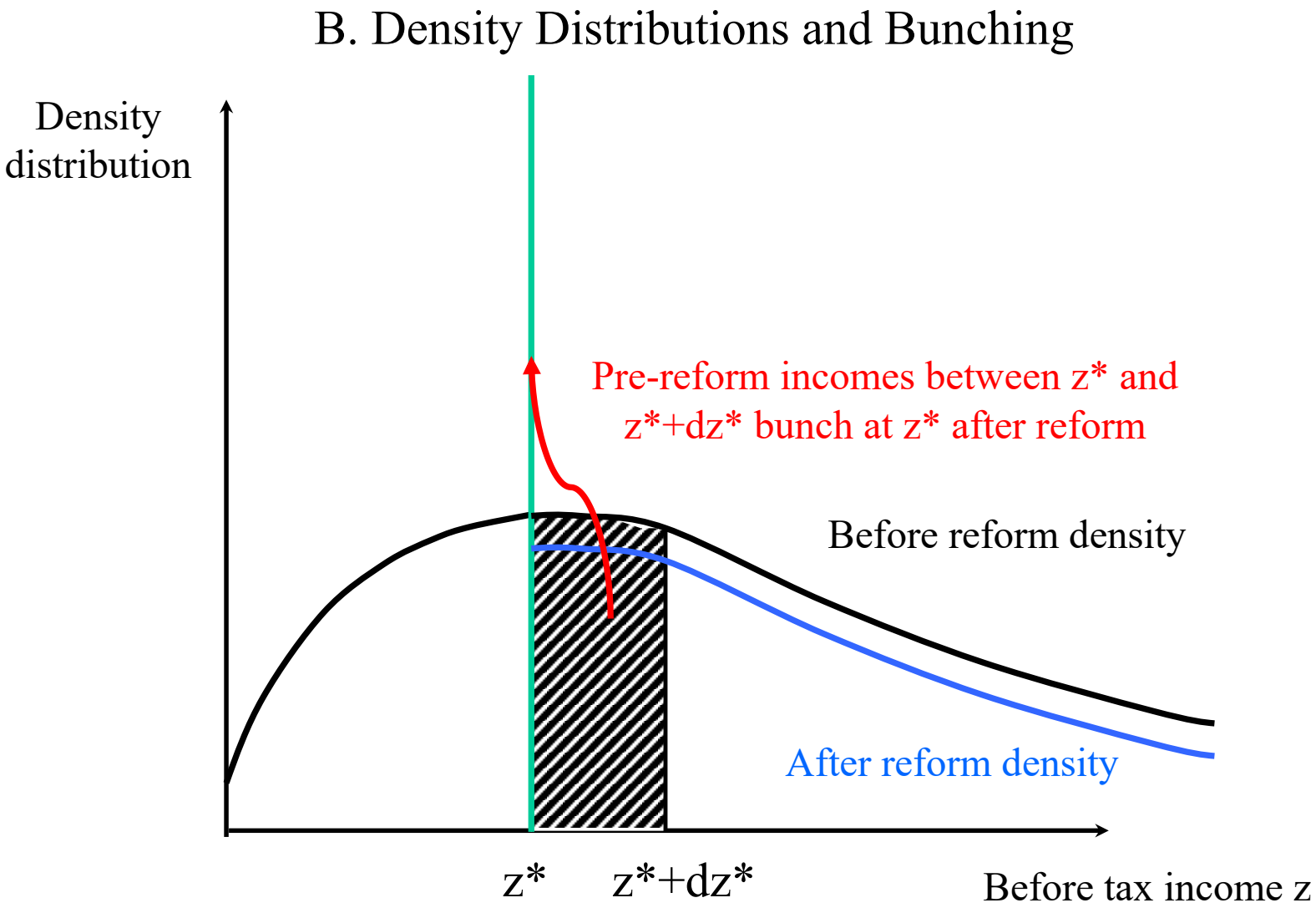
$\Rightarrow$ Amount of bunching proportional to compensated elasticity

Blomquist et al. JPE'21: 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


B. Density Distributions and Bunching
Density distribution
Pre-reform incomes between z* and z*+dz* bunch at z* after reform
Before reform density
After reform density
z*
z*+dz*
Before tax income z

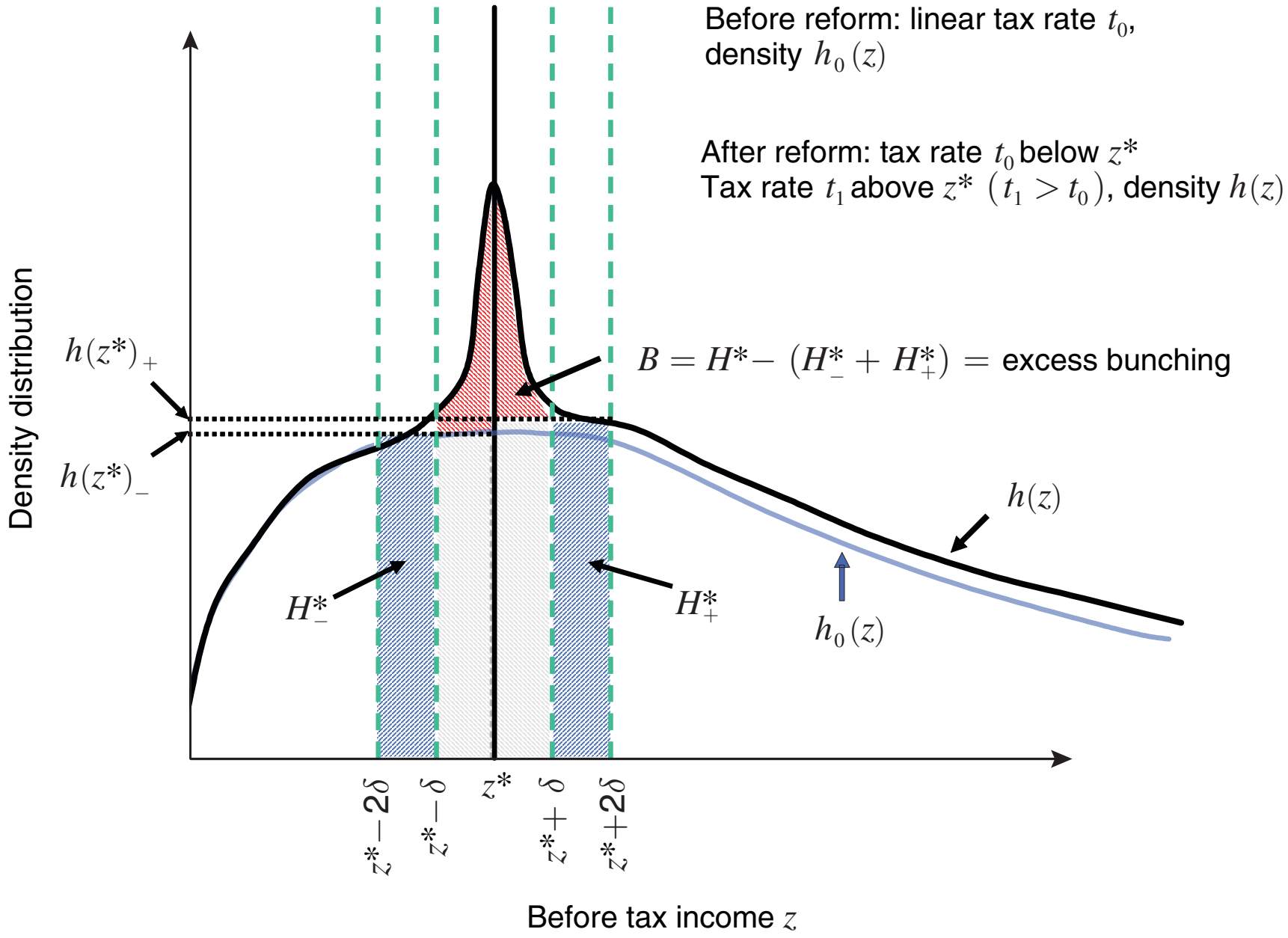


FIGURE 2. ESTIMATING EXCESS BUNCHING USING EMPIRICAL DENSITIES

Bunching at Kinks (Saez AEJ-EP'10)

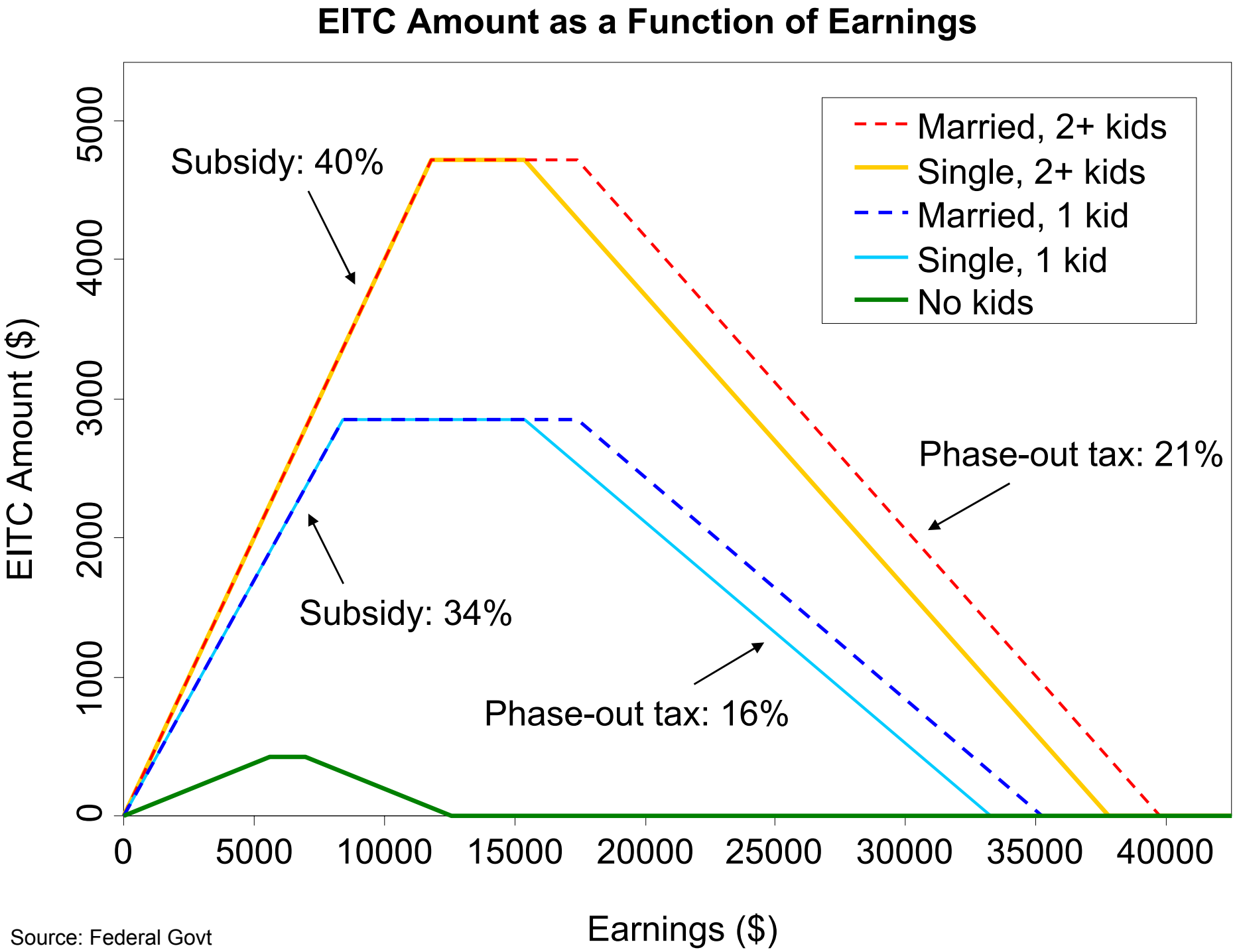
1) Uses individual tax return micro data (IRS public use files) from 1960 to 2004

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

3) Finds bunching around first kink point of the Earned Income Tax Credit (EITC), driven by self-employed

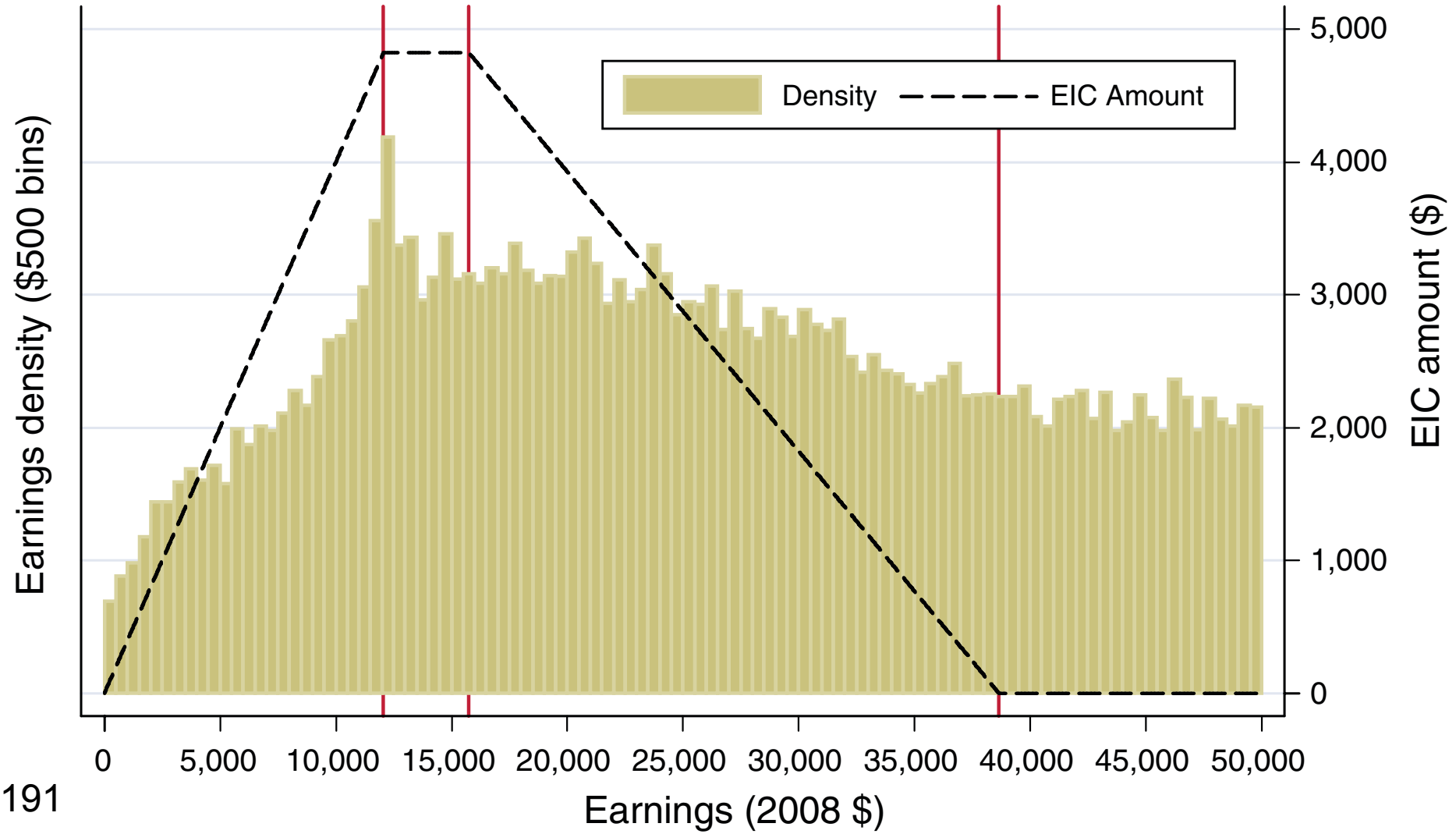
$\Rightarrow$ Explained by misreporting self-employment to maximize tax refund (not labor supply)

4) No bunching observed around all other kink points

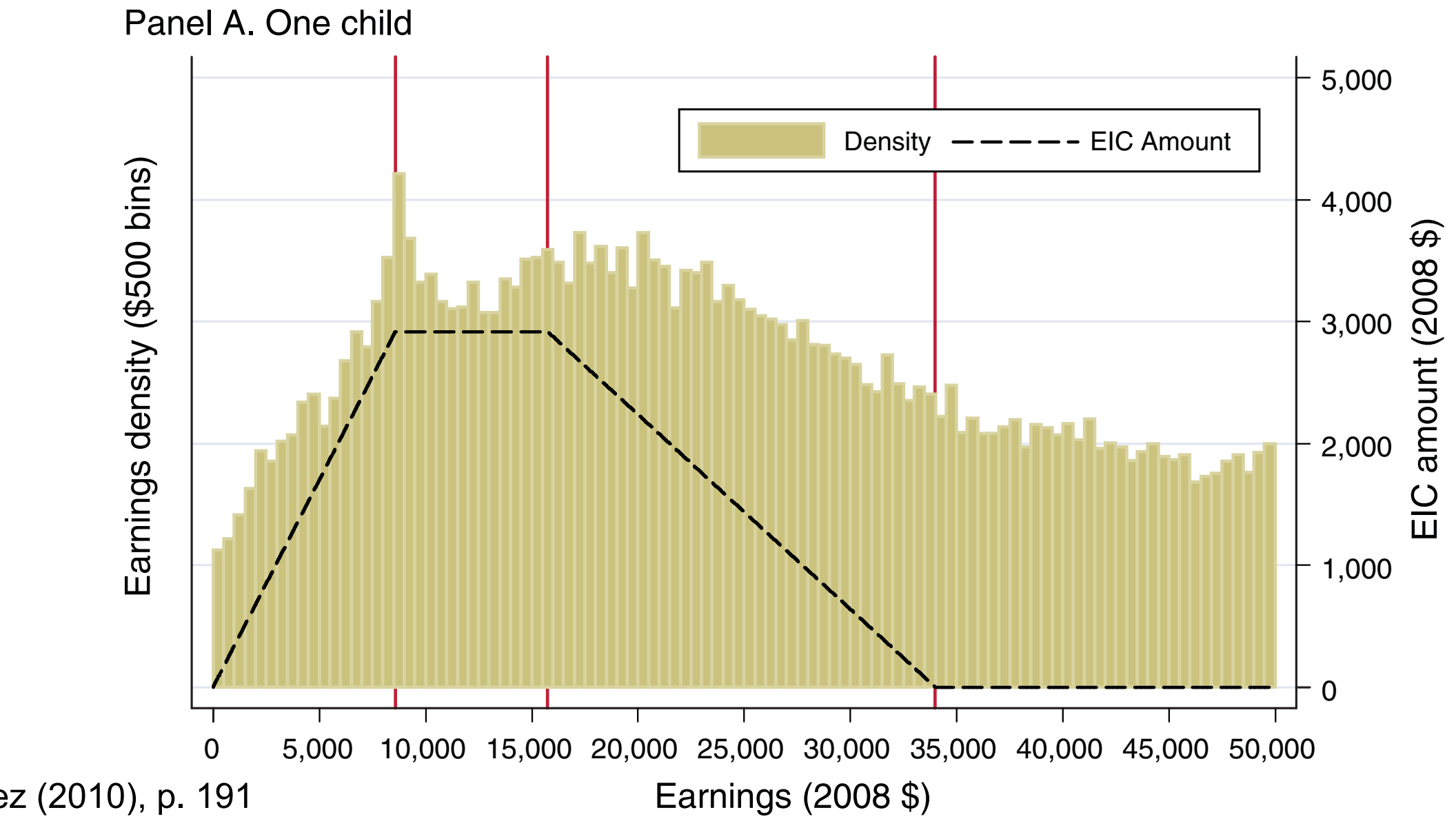


Source: Federal Govt

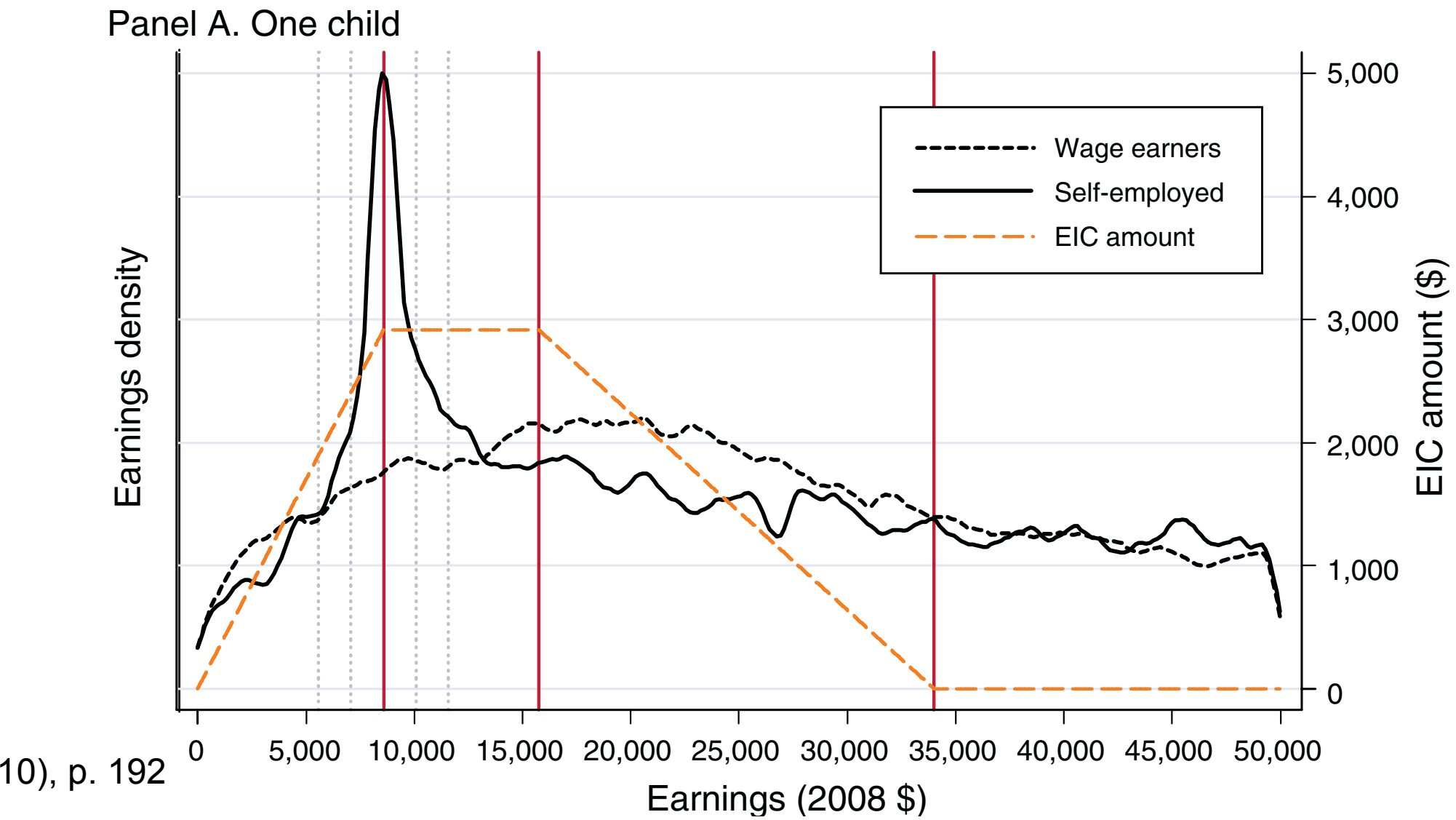
B. Two children or more



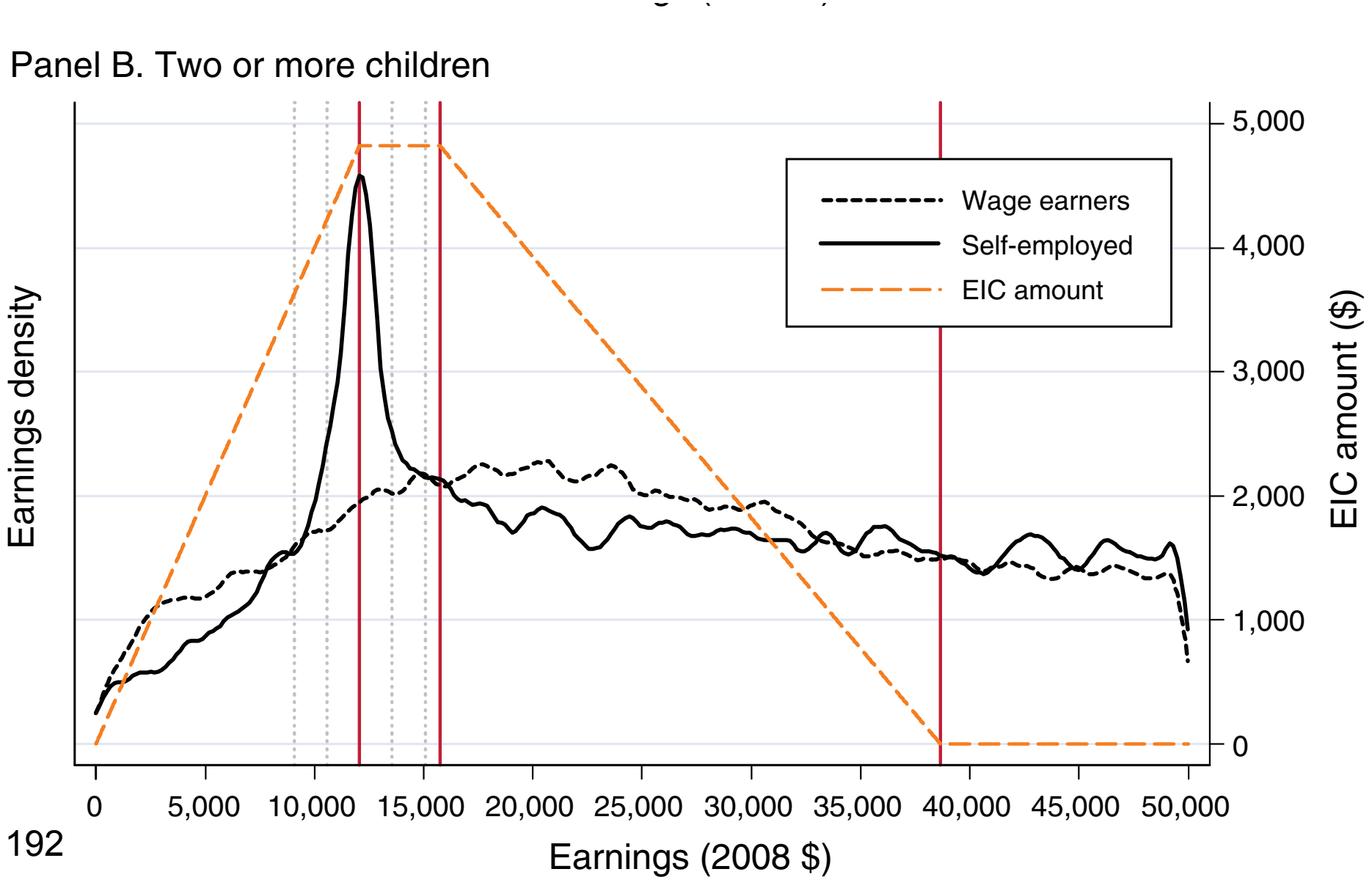
10), p. 191


Panel A. One child
Density
EIC Amount
Earnings density ($500 bins)
EIC amount (2008 $)
0
1,000
2,000
3,000
4,000
5,000
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
Earnings (2008 $)

ez (2010), p. 191


Panel A. One child
Earnings density
EIC amount ($)
Wage earners
Self-employed
EIC amount
0
1,000
2,000
3,000
4,000
5,000
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
Earnings (2008 $)

10), p. 192


Panel B. Two or more children
Earnings density
EIC amount ($)
Wage earners
Self-employed
EIC amount
0
1,000
2,000
3,000
4,000
5,000
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
Earnings (2008 $)

10), 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

Evidence of response along extensive margin but 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 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 (Liebman-Zeckhauser '04, Rees-Jones and Taubinsky '20)

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**

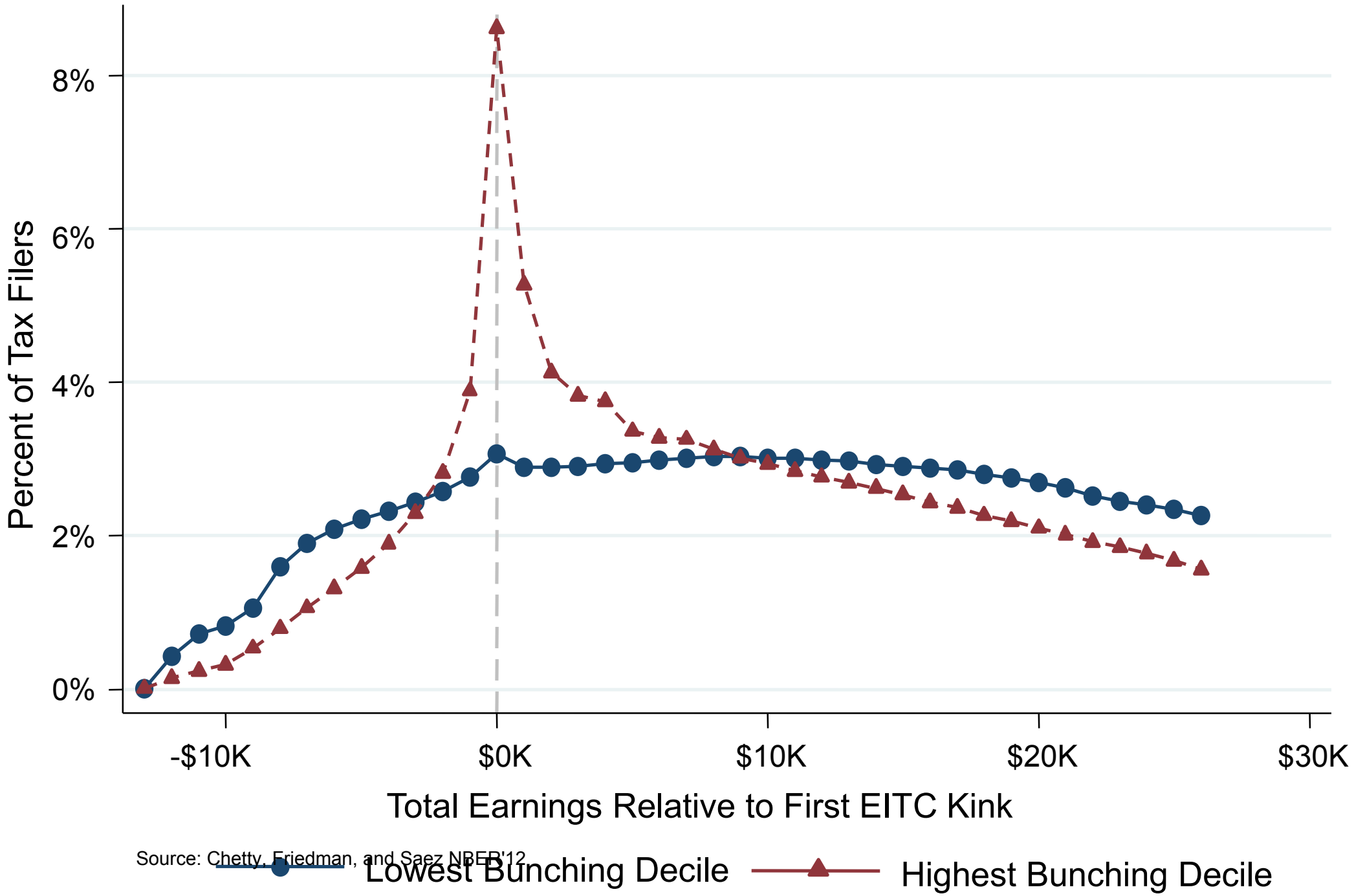
$\Rightarrow$ Information on EITC varies across areas and grows overtime

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

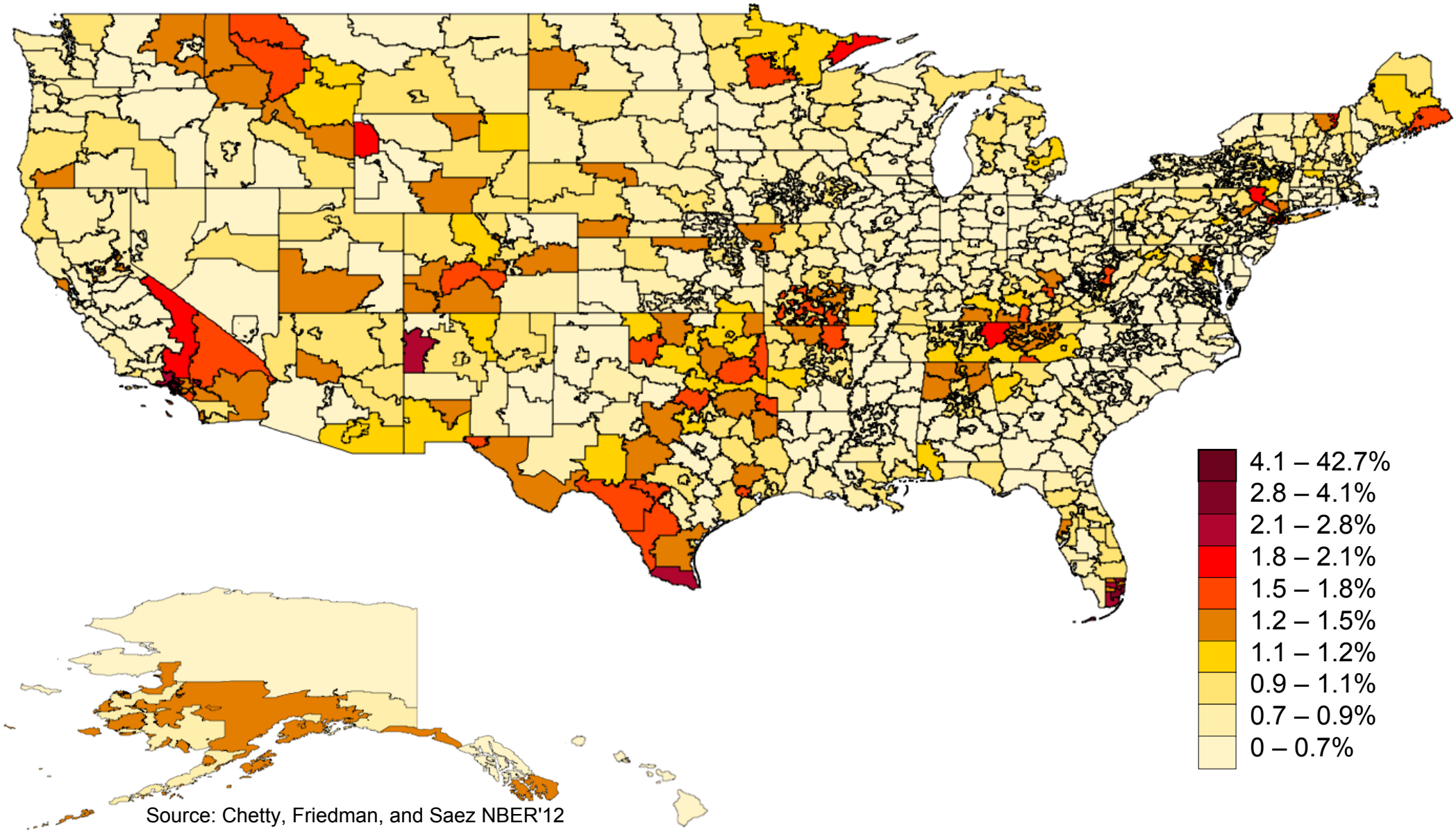
3) Omitted variable test: use birth of first child to test causal effect of EITC on wage earnings

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

Earnings Distributions in Lowest and Highest Bunching Deciles

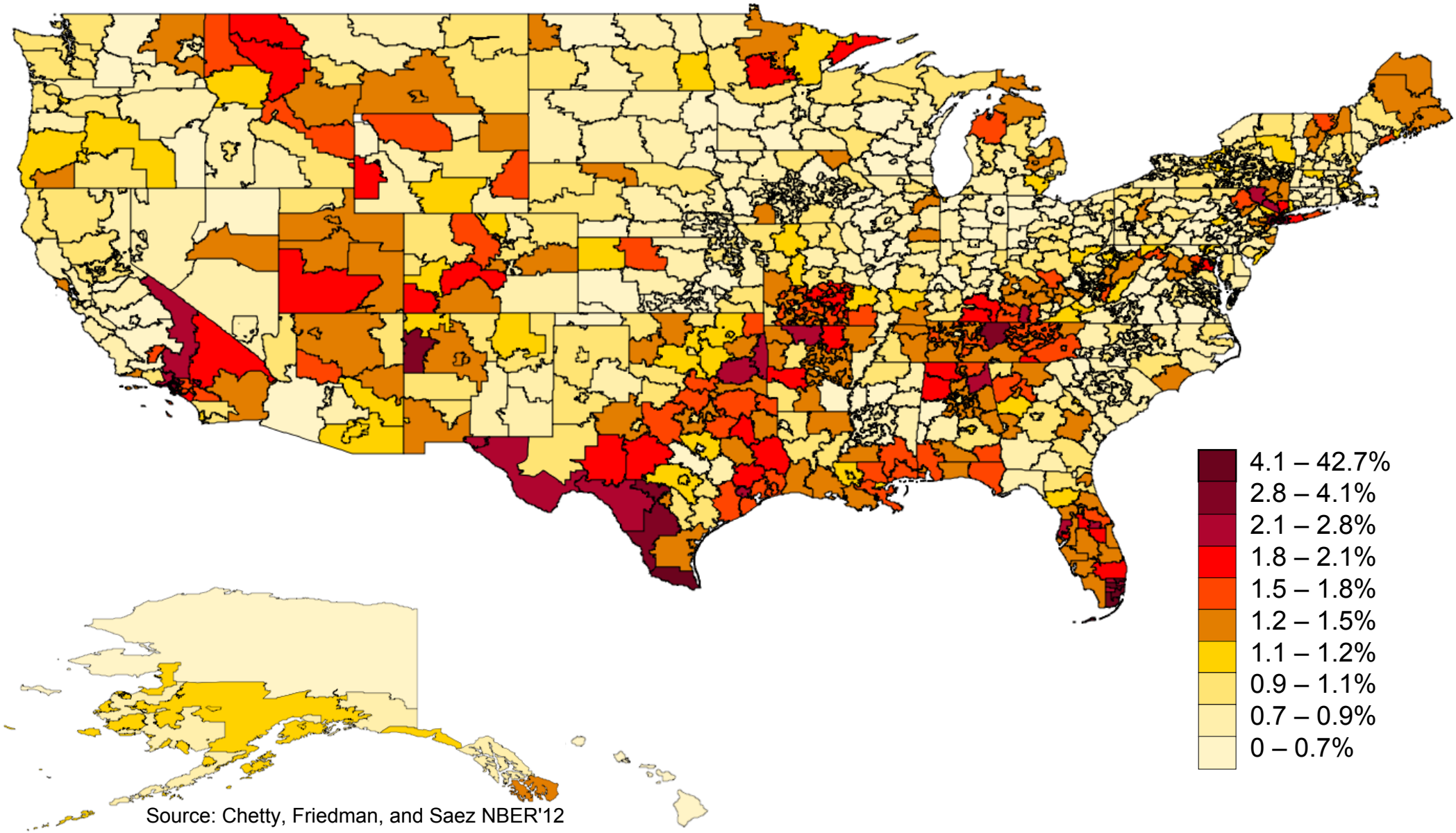


Fraction of Tax Filers Who Report SE Income that Maximizes EITC Refund in 1996



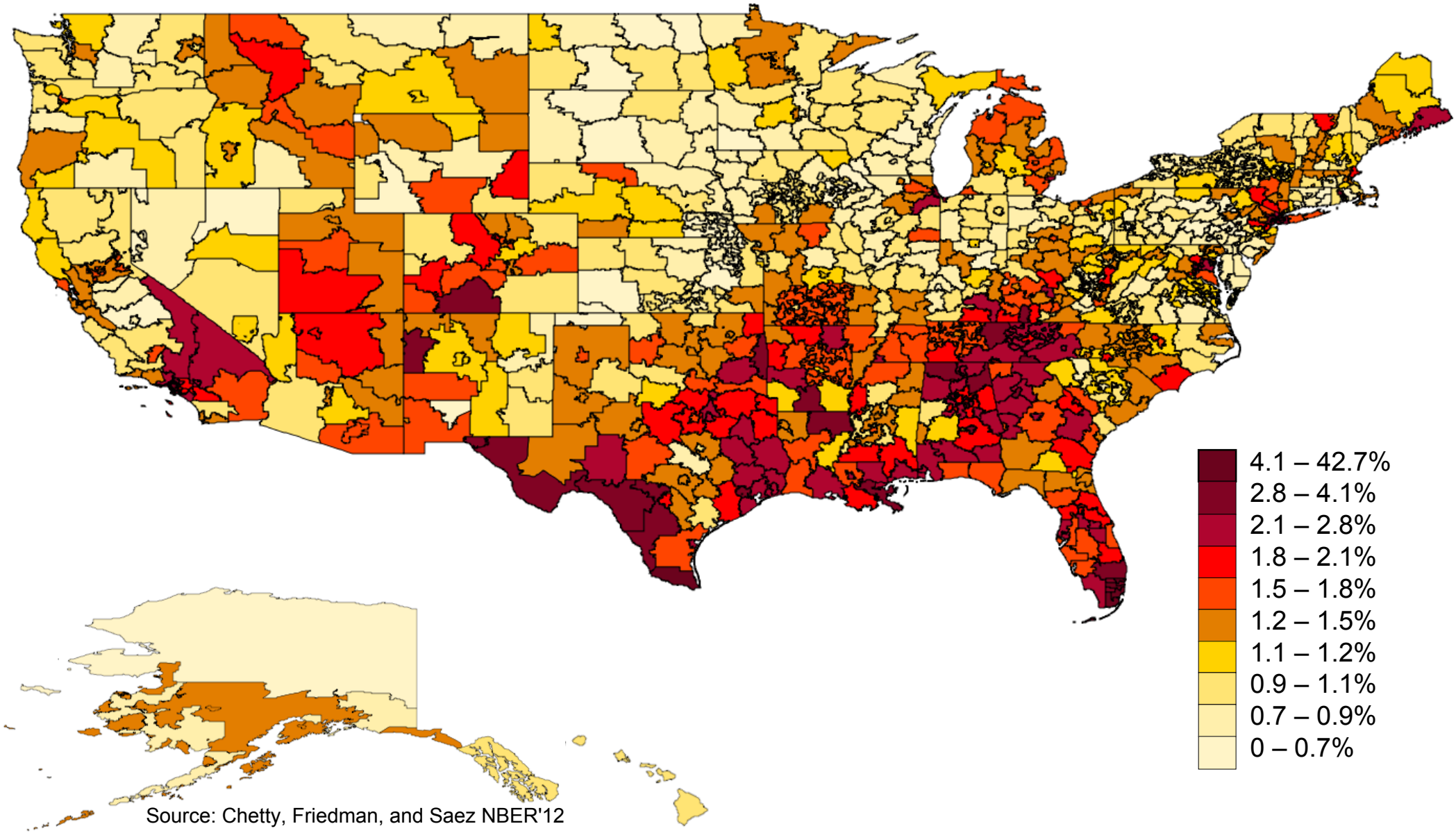
Source: Chetty, Friedman, and Saez NBER'12

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



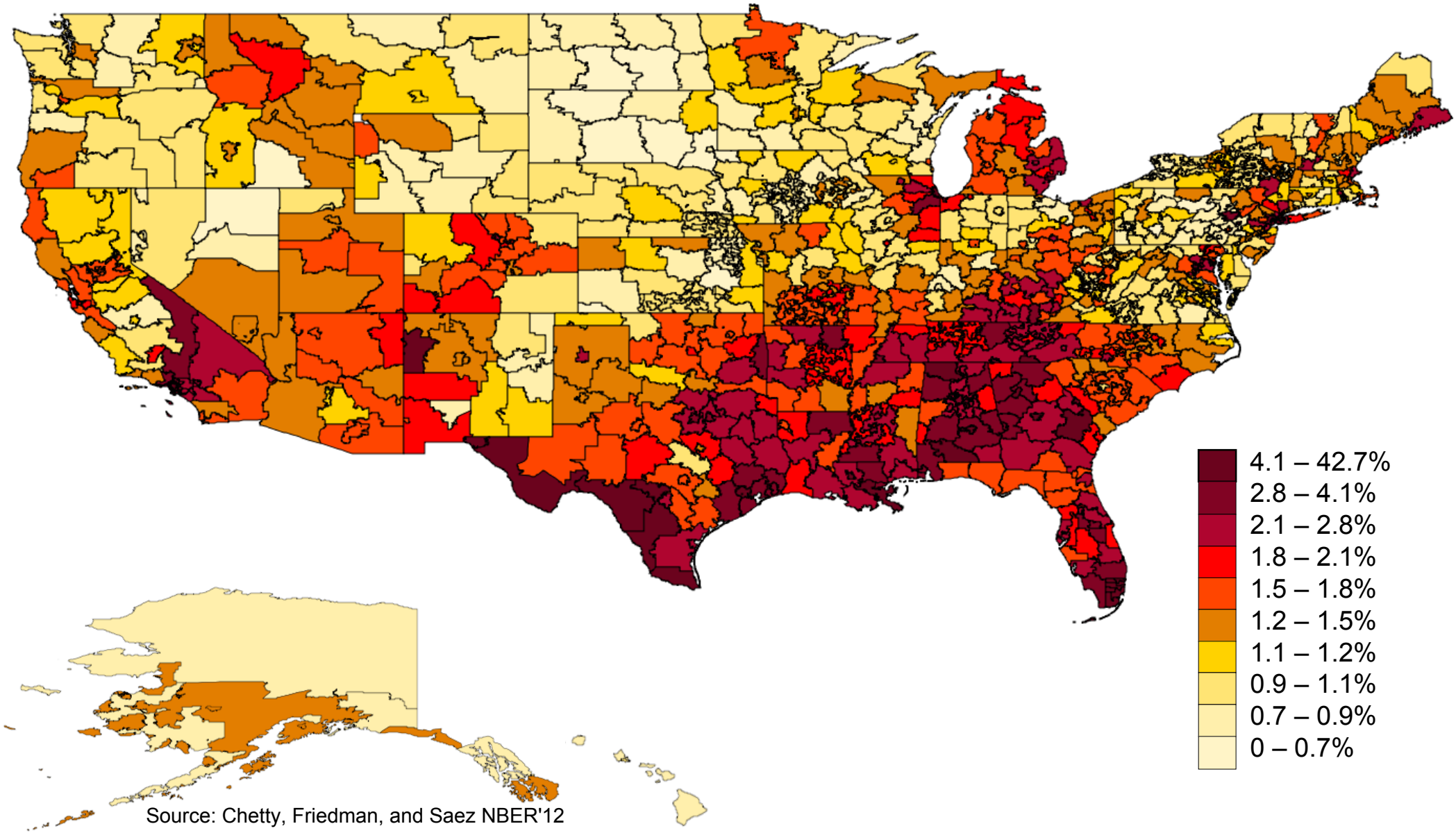
Source: Chetty, Friedman, and Saez NBER'12

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



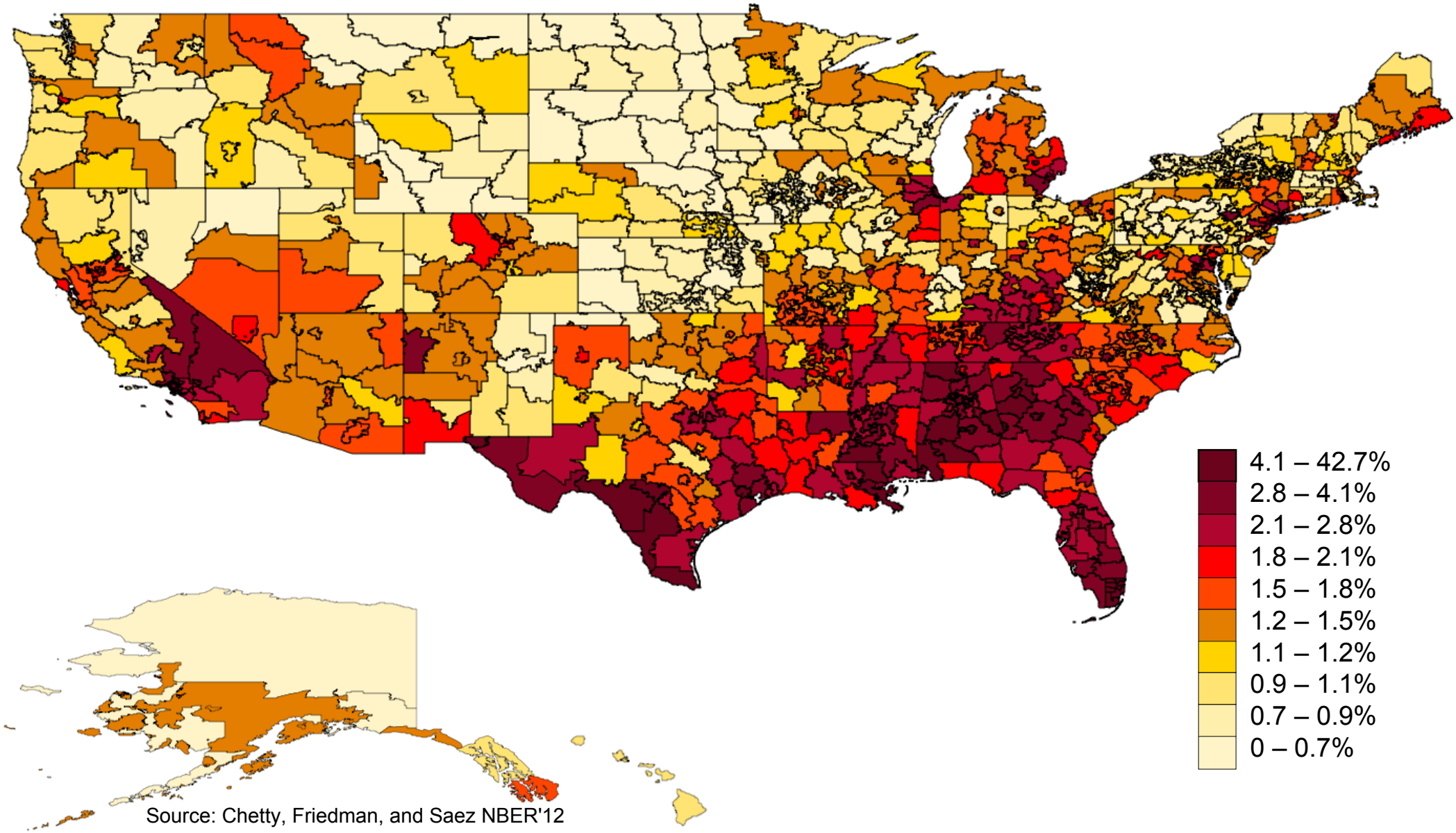
Source: Chetty, Friedman, and Saez NBER'12

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



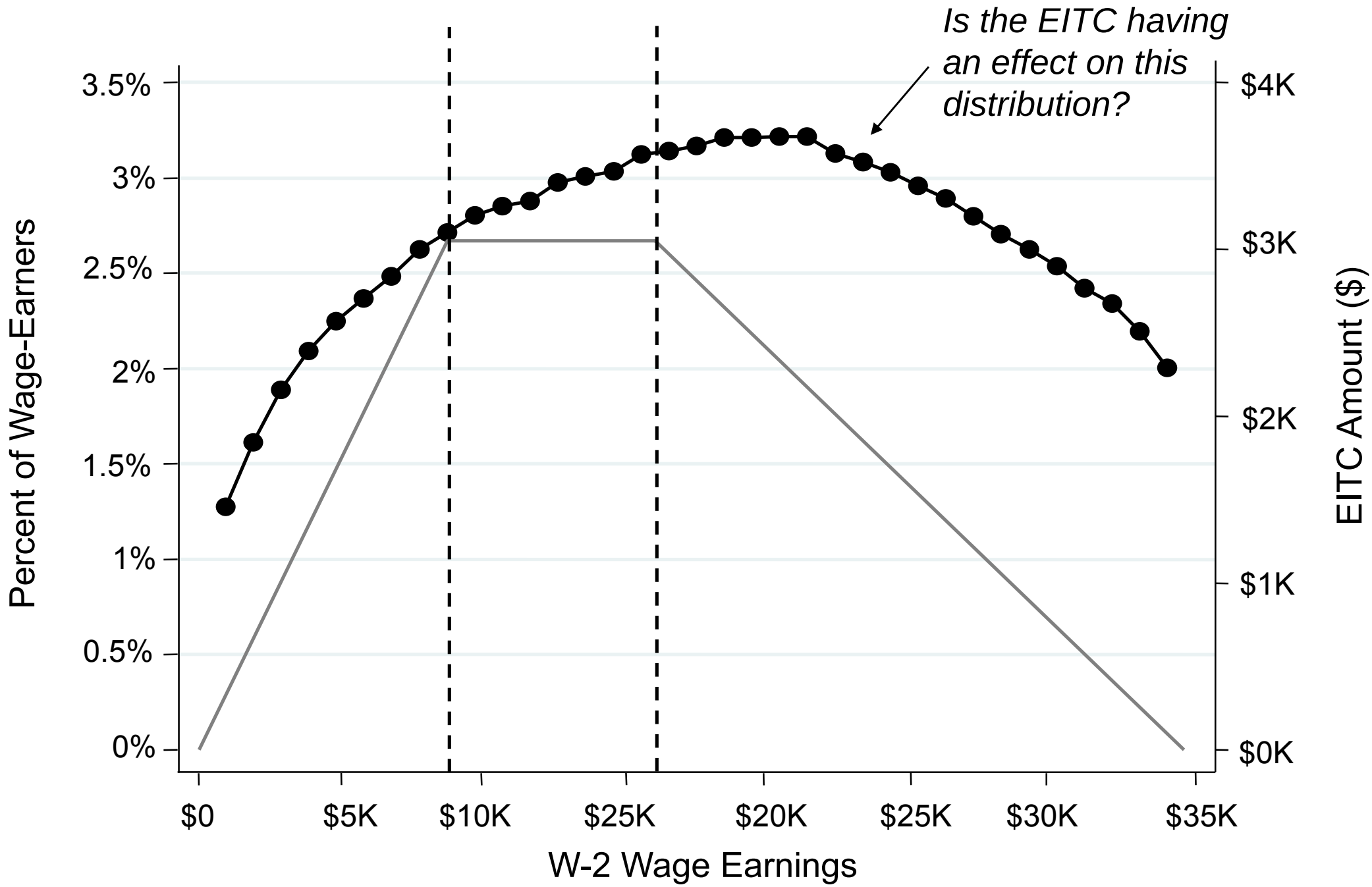
Source: Chetty, Friedman, and Saez NBER'12

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

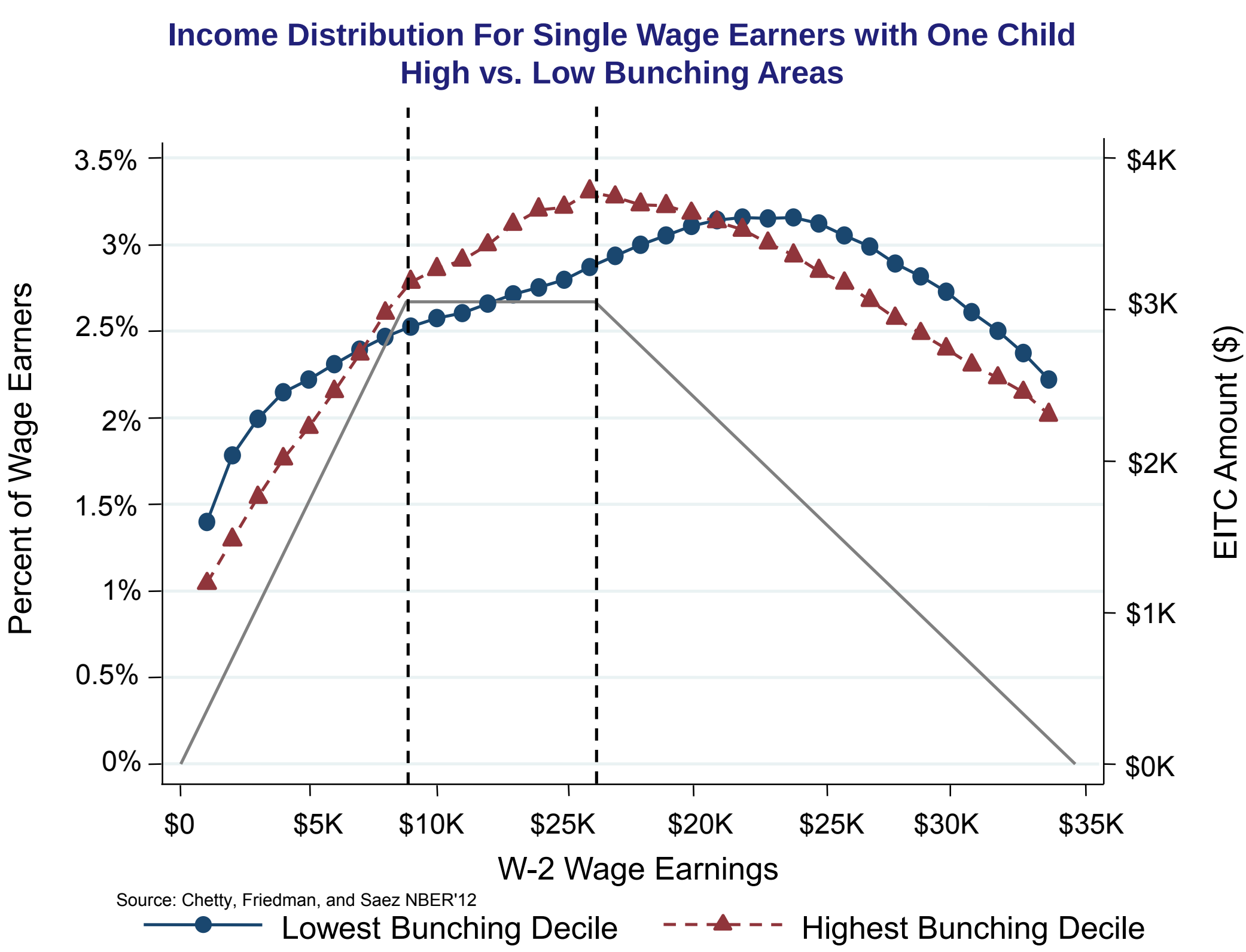


Source: Chetty, Friedman, and Saez NBER'12

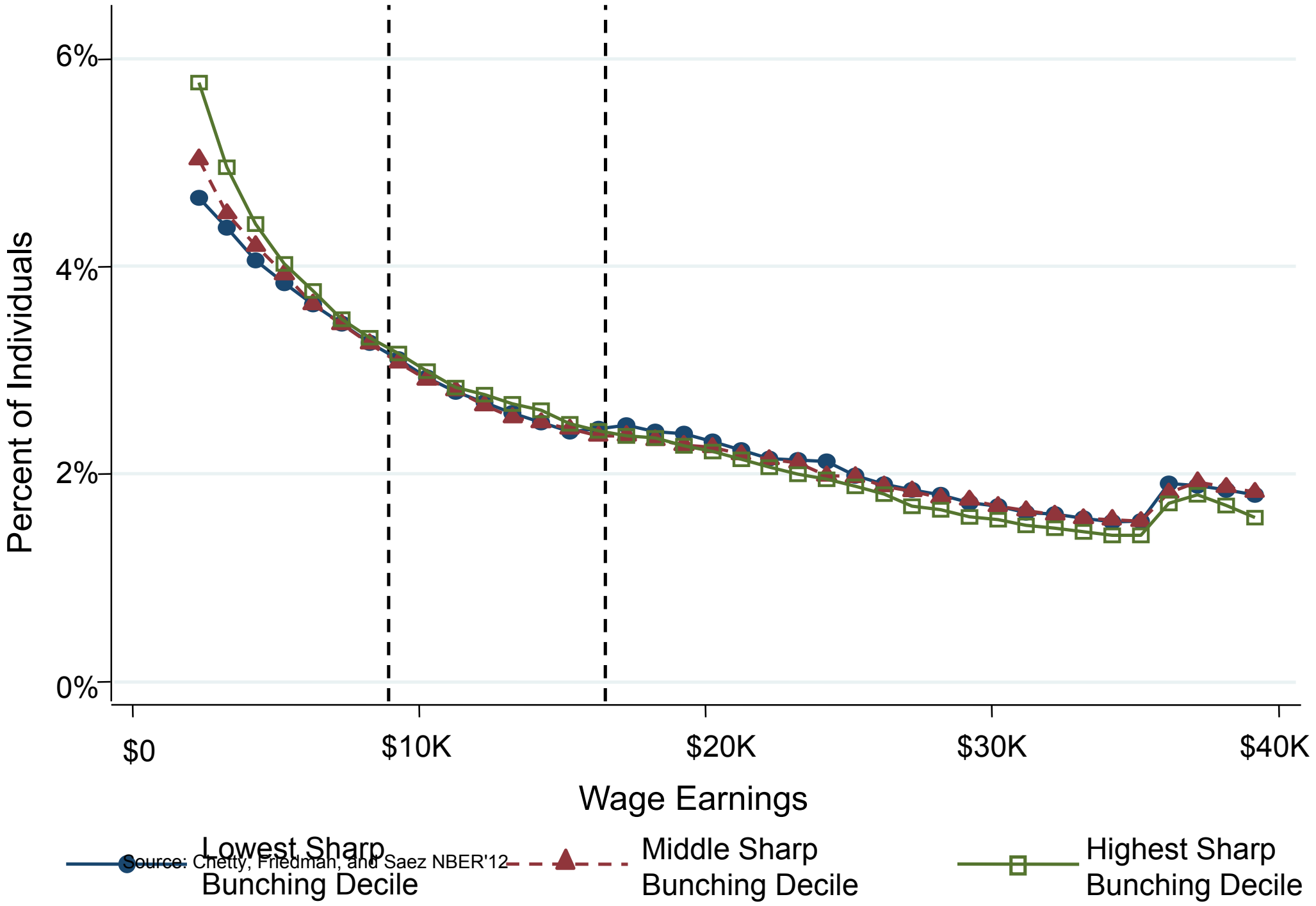
Income Distribution For Single Wage Earners with One Child



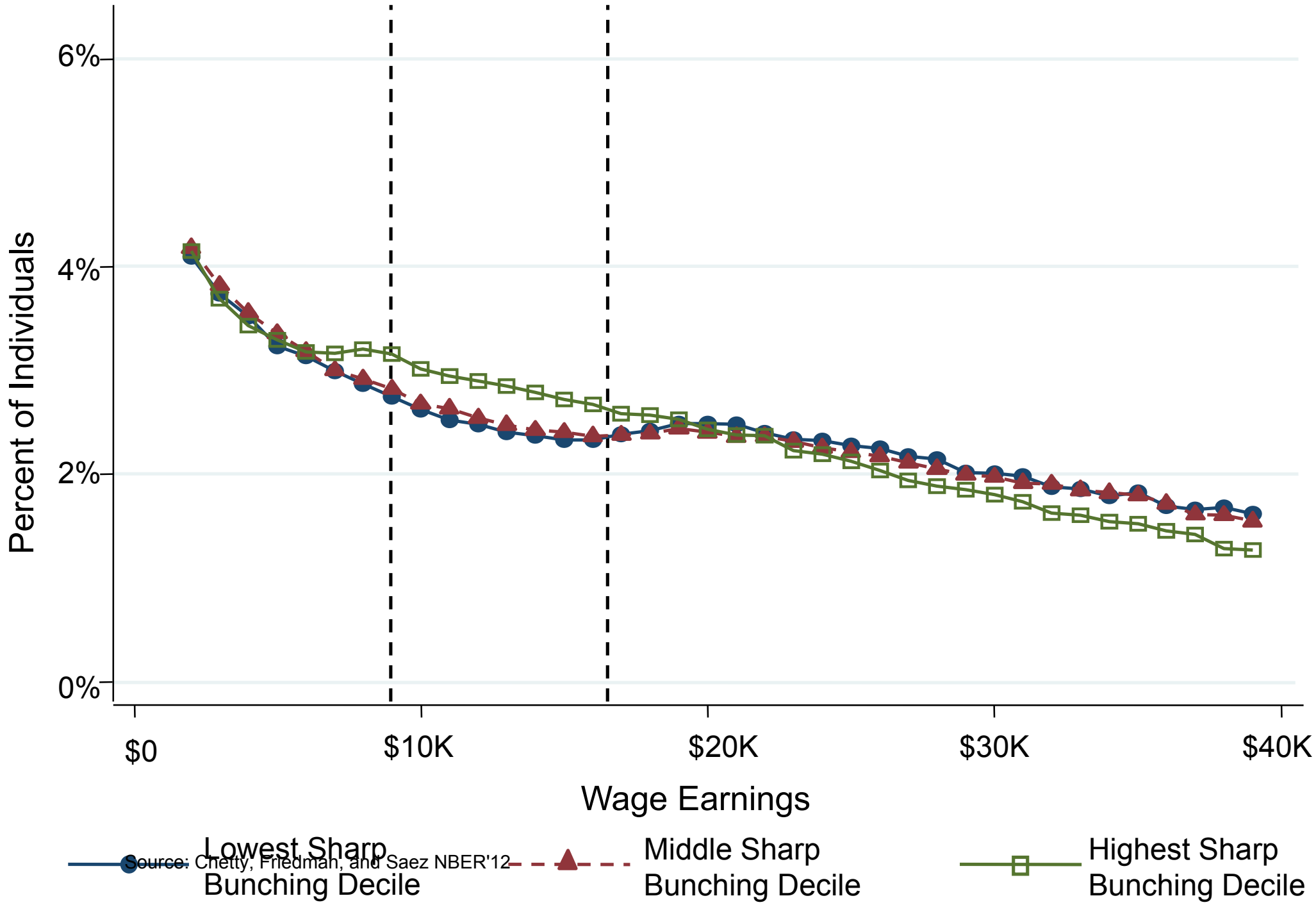
Source: Chetty, Friedman, and Saez NBER'12


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



Bunching at Notches: Kleven and Waseem QJE'13

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

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

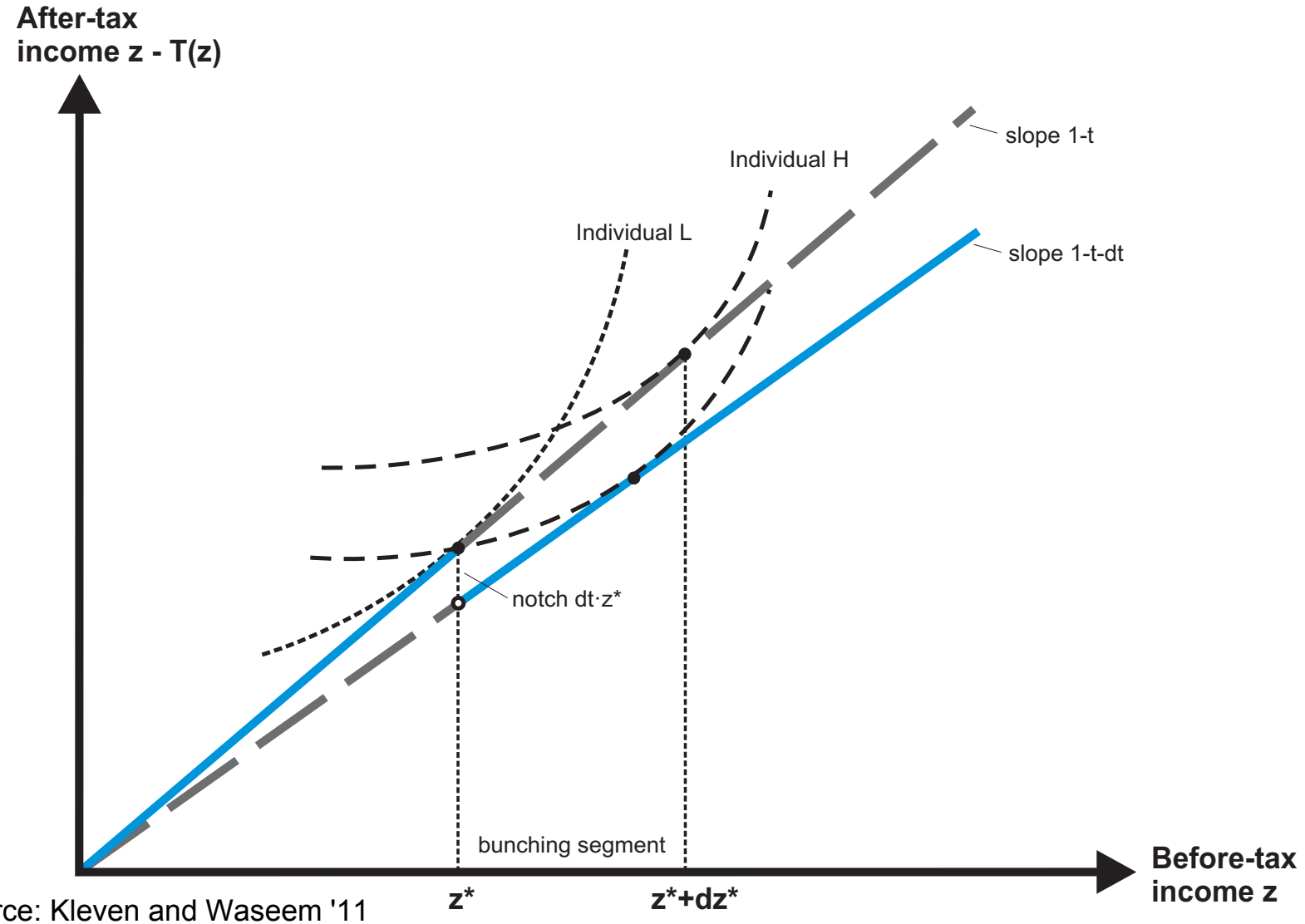
Kleven and Waseem QJE'13 pioneered tax notch analysis using income tax in Pakistan where **average** tax rate jumps

$\Rightarrow$ Bunching below the notch and gap in density just above the notch

Large fraction of taxpayers are in the dominated region, likely due to lack of information

FIGURE 1
Effect of Notch on Taxpayer Behavior

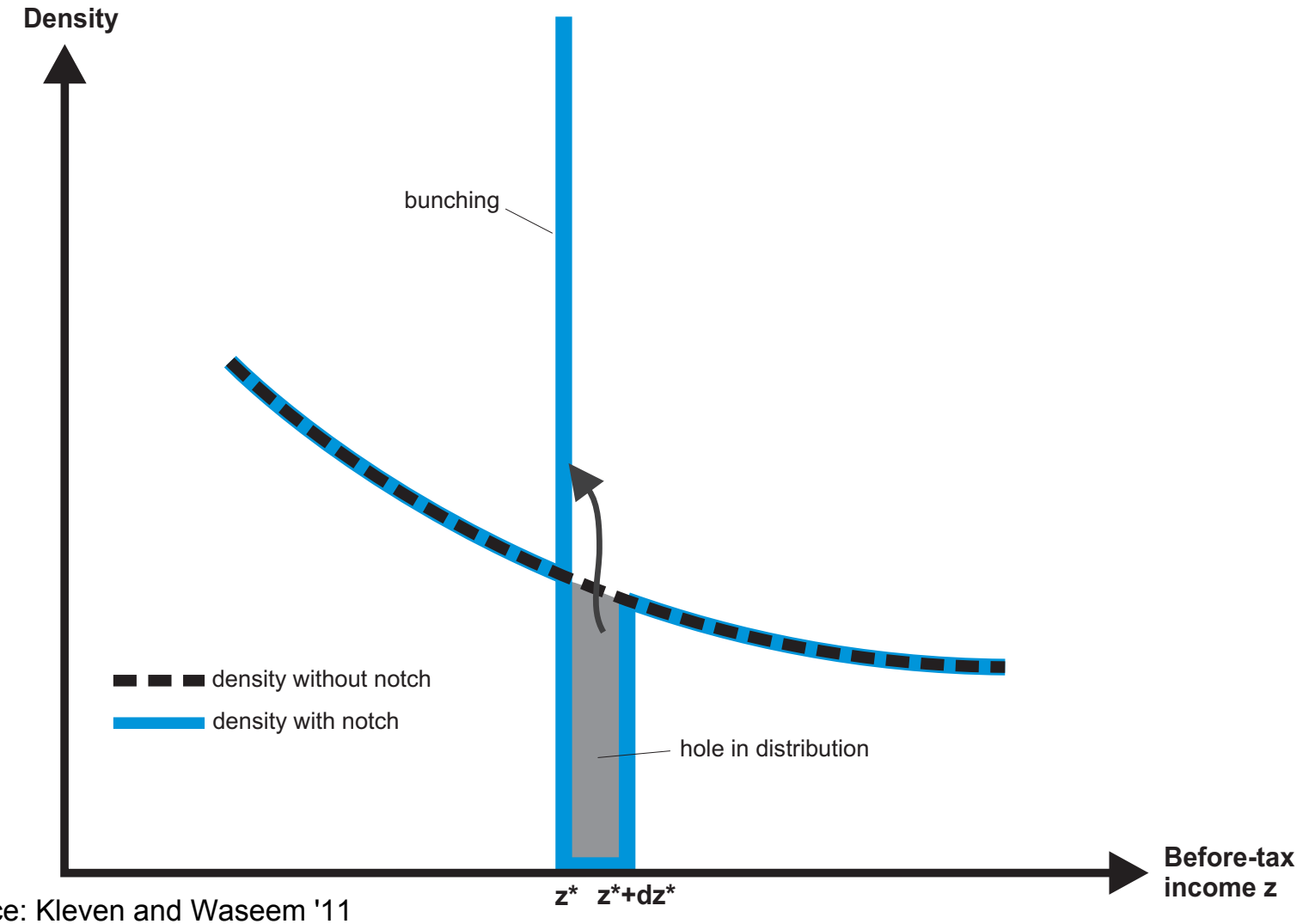
Panel A: Bunching at the Notch



Source: Kleven and Waseem '11

FIGURE 2
Effect of Notch on Density Distribution

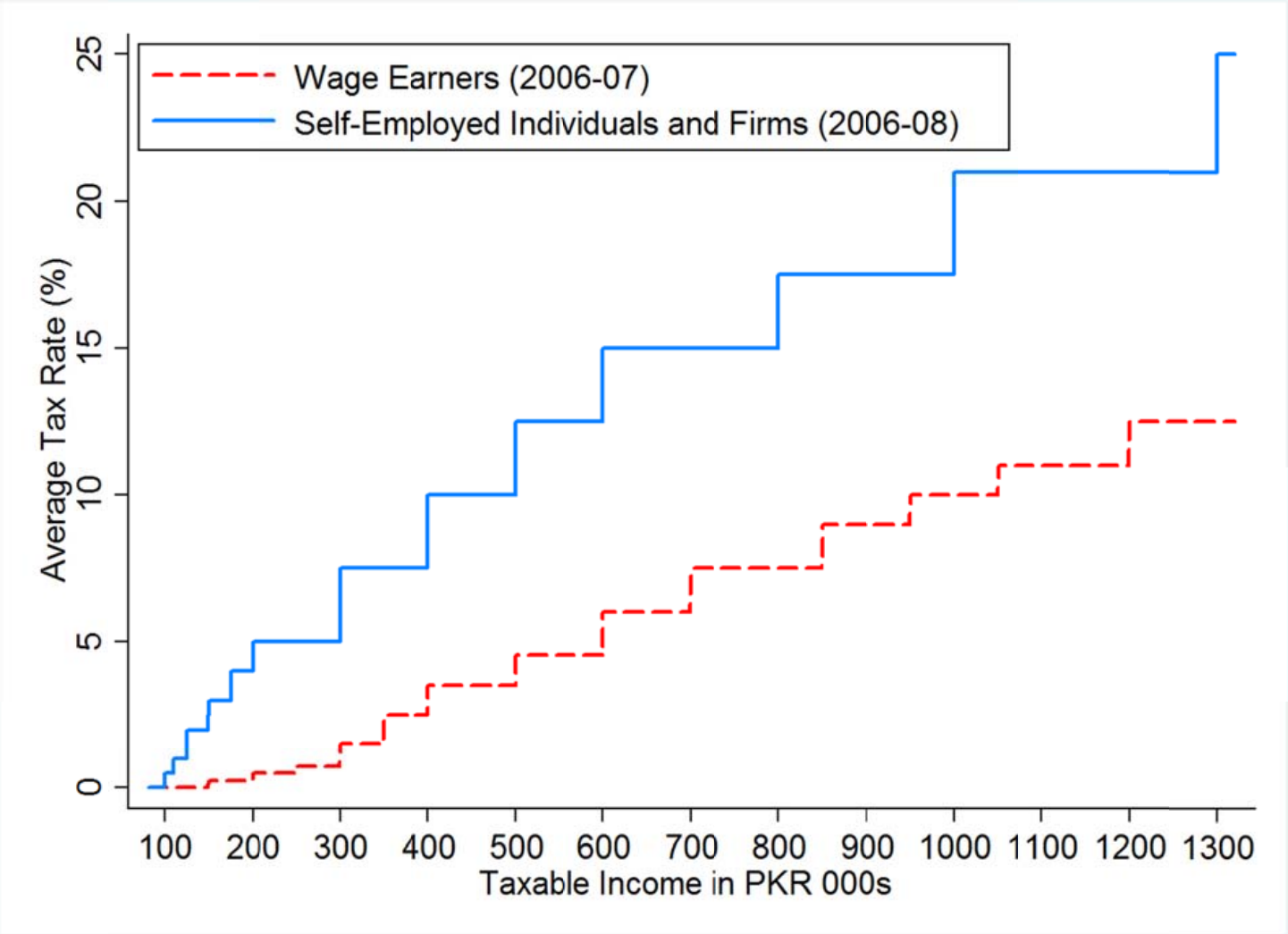
Panel A: Theoretical Density Distributions



Source: Kleven and Waseem '11

FIGURE 3

Personal Income Tax Schedules in Pakistan



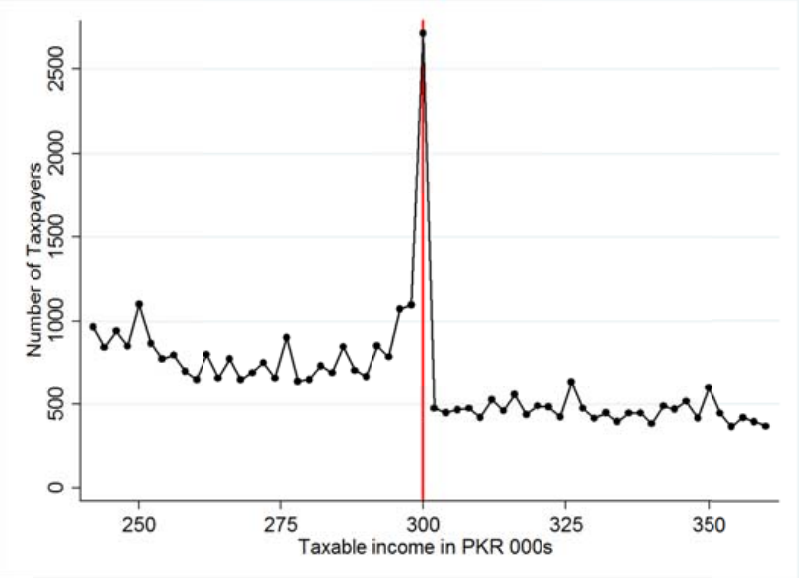
Notes: the figure shows the statutory (average) tax rate as a function of annual taxable income in the personal income tax schedules for wage earners (red dashed line) and self-employed individuals and unincorporated firms (blue solid line), respectively. Taxable income is shown in thousands of Pakistani 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 earners or self-employed based on whether income from wages or self-employment constitute the larger share of total income, and then taxes total income according to the assigned schedule. The tax schedule for self-employed individuals and firms consists of 14 brackets, while the tax schedule for wage earners consists of 21 brackets (the first 14 of which are shown in the figure). Each bracket cutoff is associated with a notch, and the cutoff itself belong to the tax-favored side of the notch.

Source: Kleven and Waseem '11

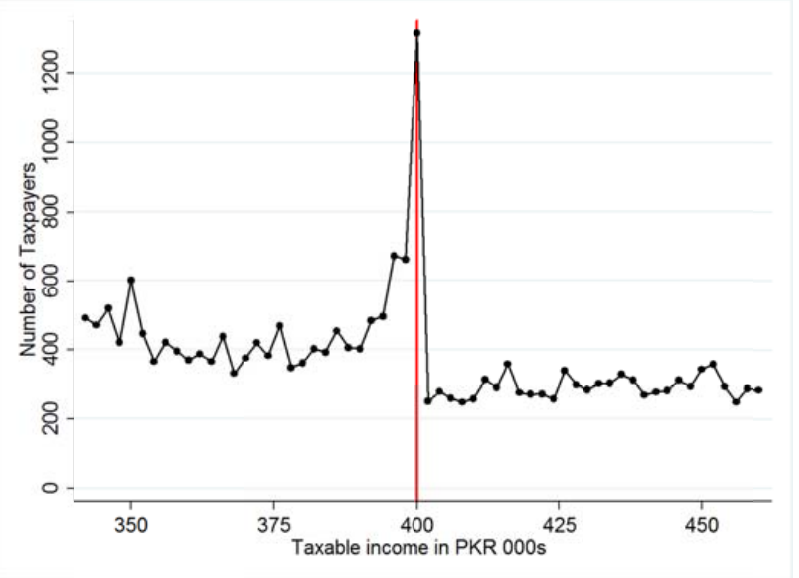
FIGURE 5

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

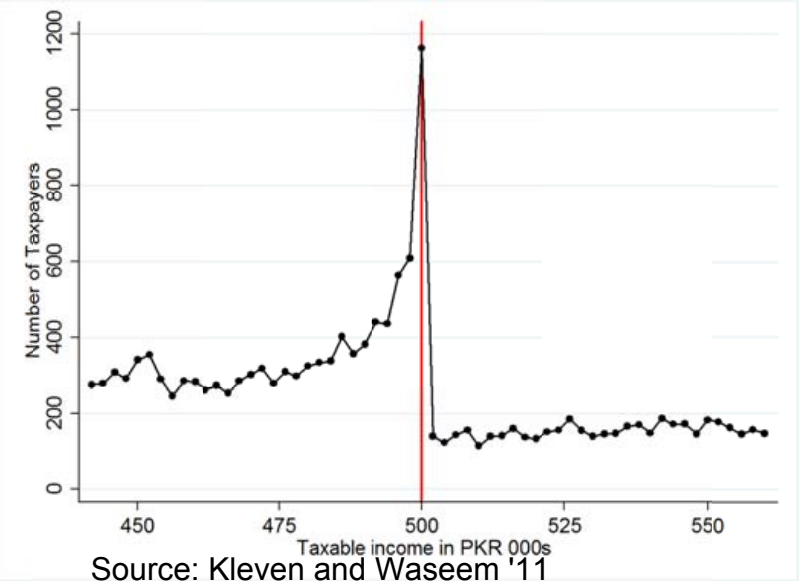
Panel A: Notch at 300k



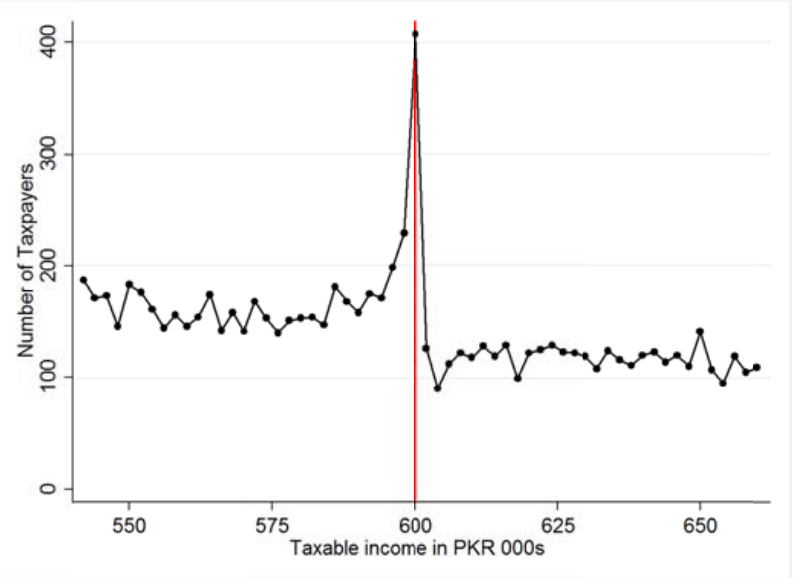
Panel B: Notch at 400k



Panel C: Notch at 500k



Panel D: Notch at 600k



Source: Kleven and Waseem '11

Bunching at notches: elasticity estimation

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

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:

(1) clear bunching when information is salient and outcome easily manipulable. Bunching arises from avoidance/evasion rather than real behavior.

(2) bunching is generally small relative to conventional elasticity estimates

Fuzzy Regression Discontinuity (skip)
Responses to Corporate Tax Notches: Bachas-Soto '18

Bachas and Soto '18 exploit the notched Costa Rica corporate tax system to estimate compellingly the effects of the corporate tax rate on reported profits

Corporate tax applies to profits = revenue minus costs

But tax rate depends on size of revenue with 3 rates: 10%, 20%, 30%

1) Firms bunch at the notches to benefit from the lower rates

2) Most importantly: clear evidence that profit rates (profits/revenue) is strongly affected by the corporate tax rate

Source: Bachas and Soto (2018)

Figure 1: Costa Rica's Corporate Tax Schedule

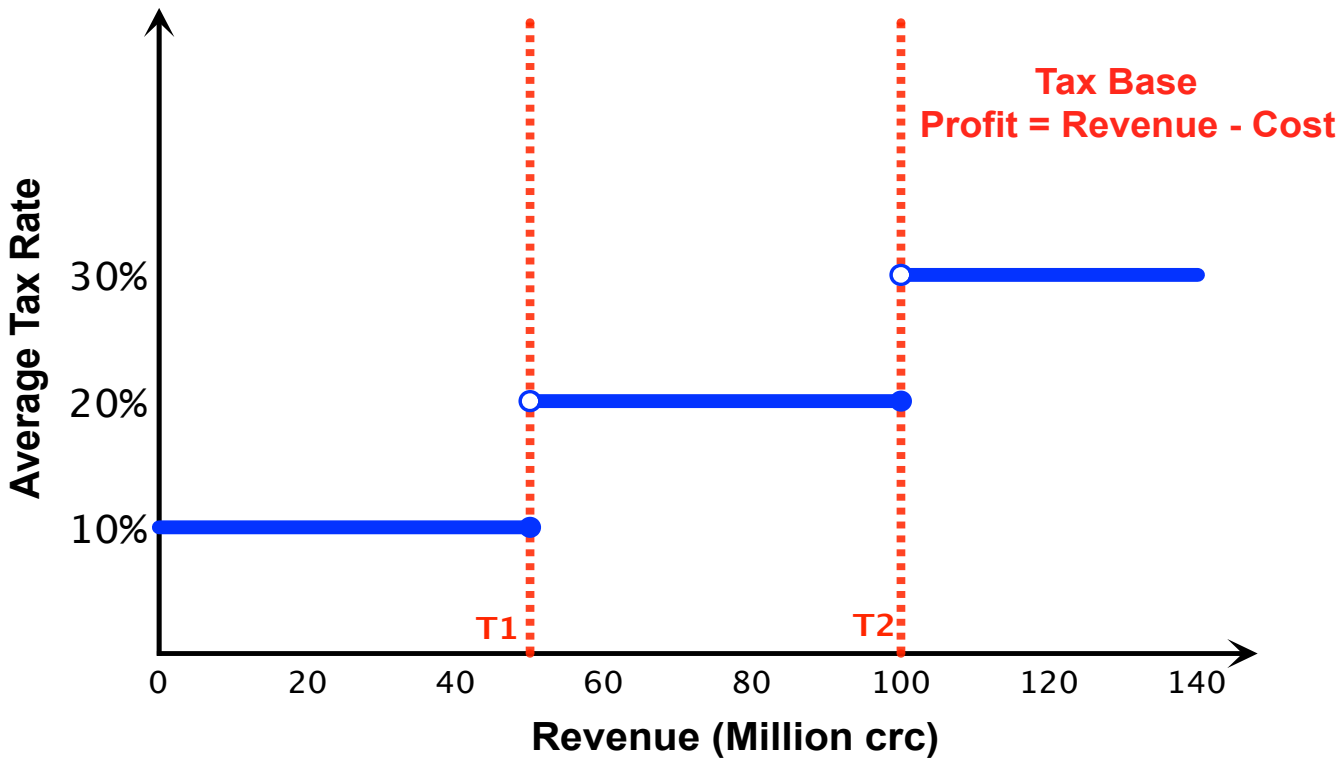
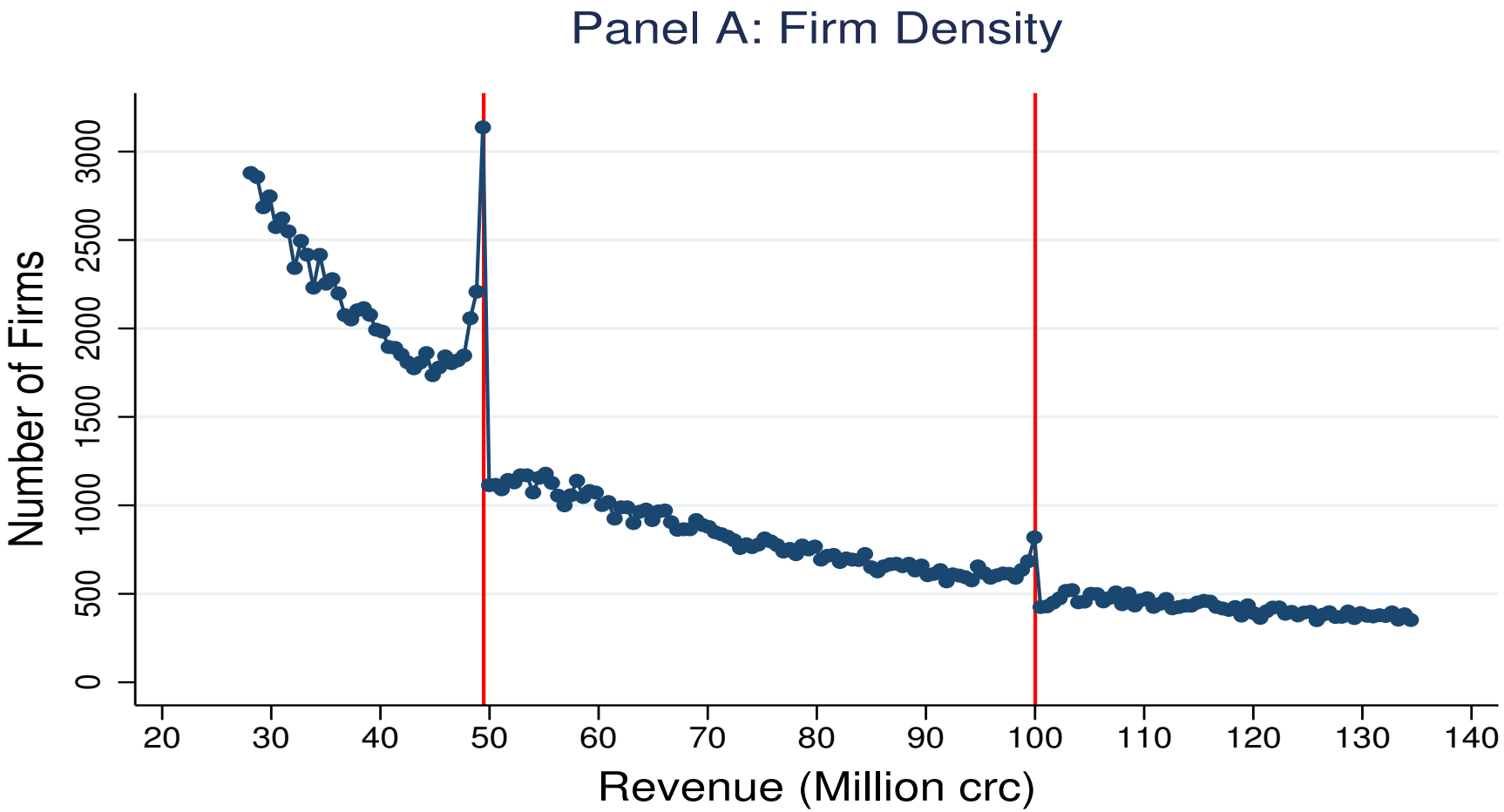
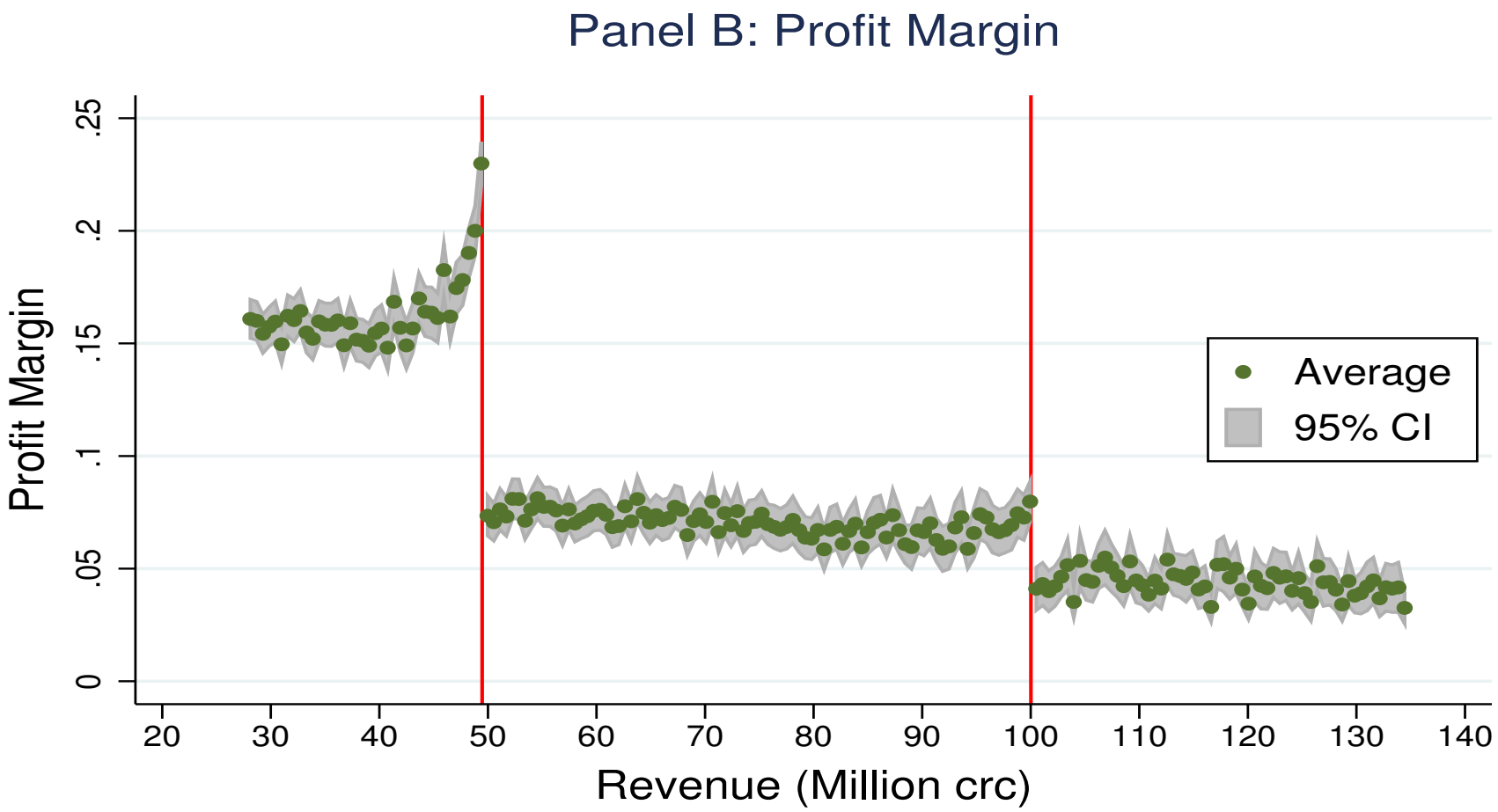


Figure 1 shows the design of the corporate income tax in Costa Rica, as discussed in section 2.1. Firms face increasing *average* tax rates on their profits (revenue minus cost) as a function of their revenue. When revenue exceeds the first threshold, the average tax rate jumps from 10% to 20% and from 20% to 30% past the second threshold. Thresholds are adjusted yearly for inflation.

Figure 3: Firm Density and Average Profit Margin





Source: Administrative data from the Ministry of Finance 2008-2014.

Figure 3 presents the key patterns of the corporate tax data, discussed in Section 3.1. The figure pulls together data from years 2008 to 2014. Panel A shows the density of firms by revenue. Panel B displays the average profit margin by revenue. Profit margin is defined as profits over revenue. The size of the revenue bins is 575,000 CRC.

Intertemporal Labor Supply: High Frequency

Frisch elasticity e^F: changing wages in a single period and keeping marginal utility of income λ constant

Compensated static elasticity e^C: changing wages in all periods but keeping utility constant

Uncompensated static elasticity e^U: changing wages in all periods with no compensation

$$\text{Theoretically: } e^F > e^C > e^U$$

Frisch elasticity is of central interest for calibration of macro business cycle models:

Real business cycle model requires huge Frisch elasticity to generate realistic employment fluctuations

Intertemporal substitution: Tax Holiday in Iceland

After 1987, Iceland transitioned from paying taxes on previous year's income to current year income. To avoid double taxation during transition, no tax charged over 1987 incomes

Average tax rate of 14.5% in 1986, 0% in 1987, 8% in 1988

Reform announced in late 1986 $\Rightarrow$ unanticipated temporary tax change

Temporary change in incentives $\Rightarrow$ ideal quasi-experiment to intertemporal substitution elasticity (work hard in 1987, take a break in 1986 or 1988)

Bianchi et al. AER'01 look at employment effects [hard to know what counterfactual is]

Sigurdsson (2025) compares high (big tax cut) vs. low earners (small tax cut) and finds larger response among high earners [but possible that high earners are more elastic to start with]

Sigurdsson (2024) finds positive effects on dropping out from school at 16 and getting a job with negative long-term impacts for men.

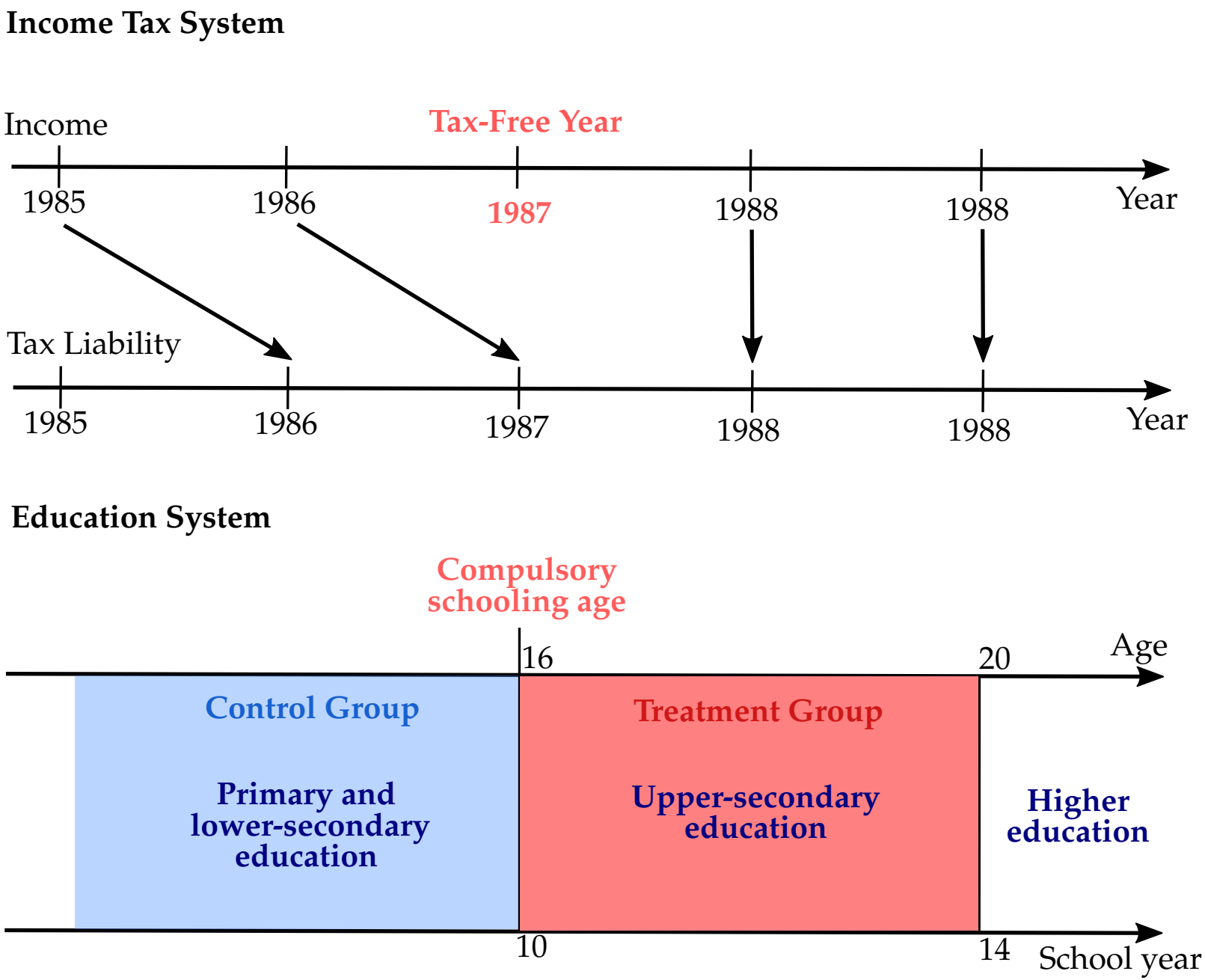
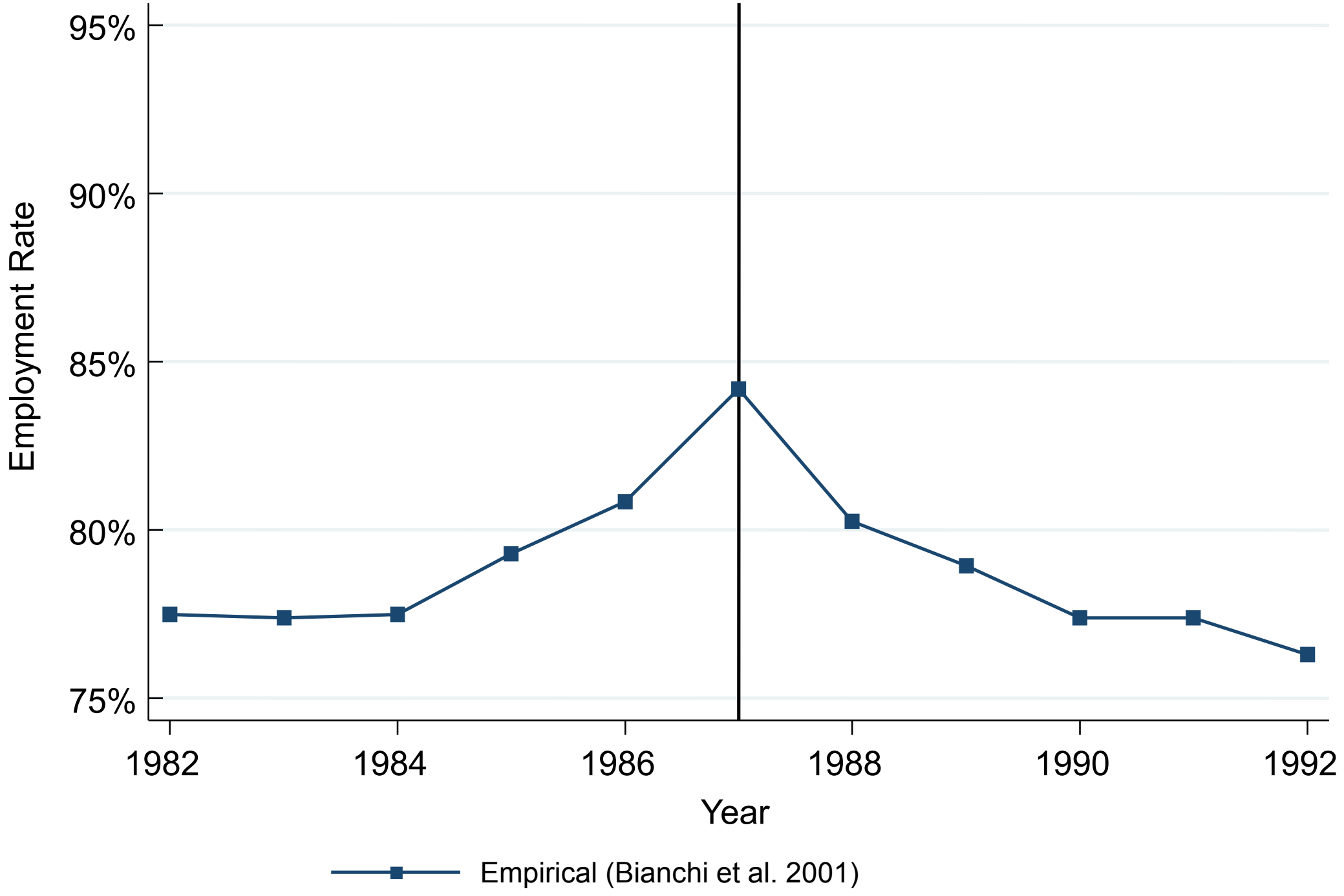
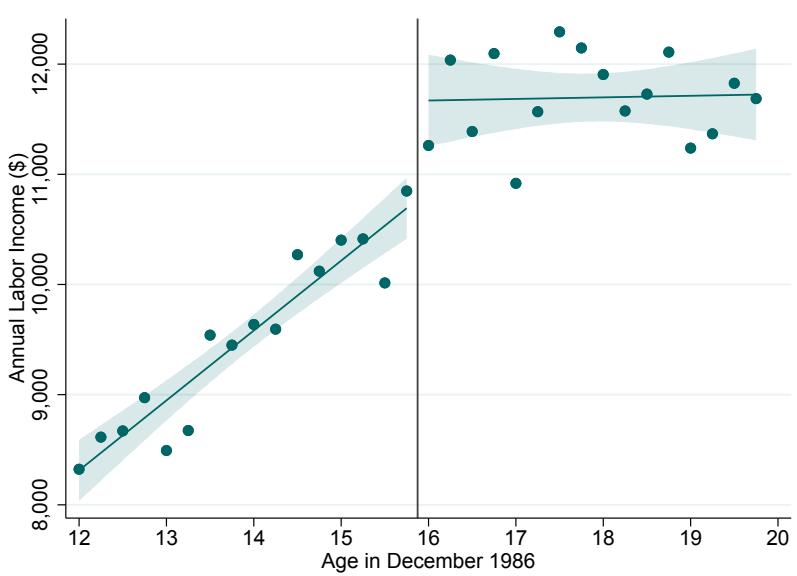


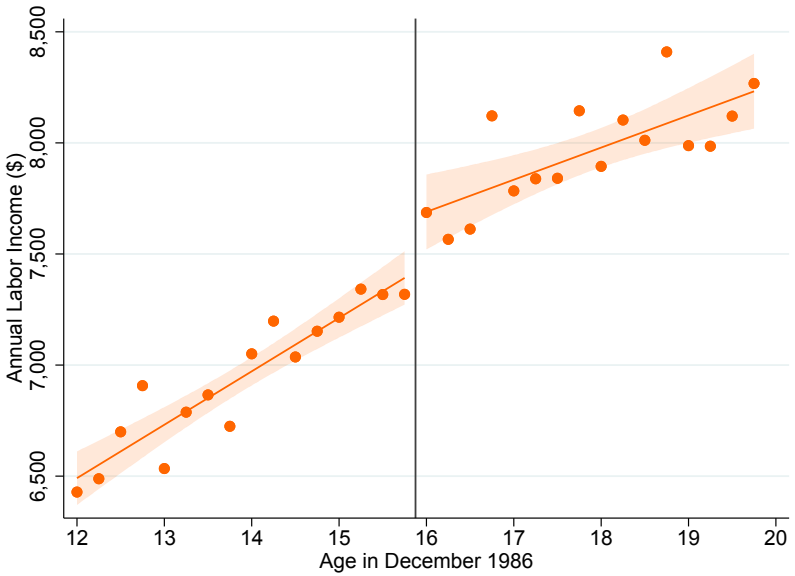
Figure 3: Research Design: Tax-free Year and Compulsory Schooling Age

Figure 1a: 1987 Tax Holiday in Iceland

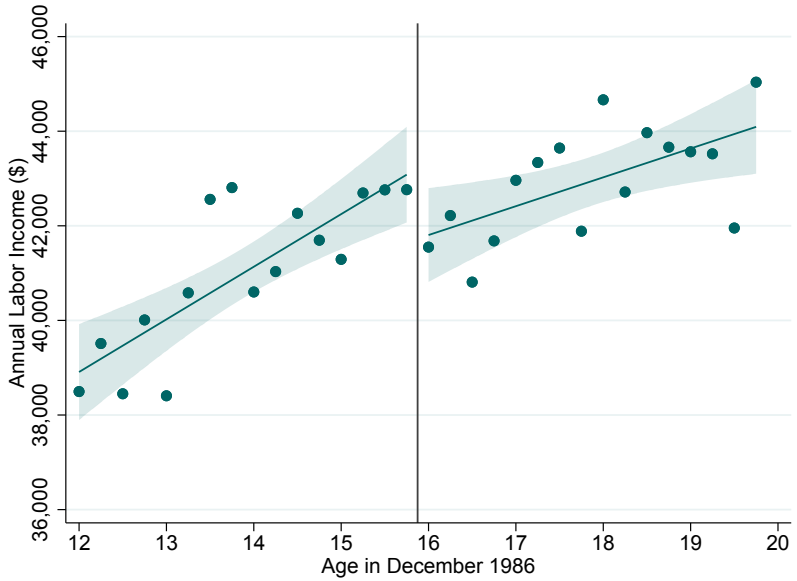




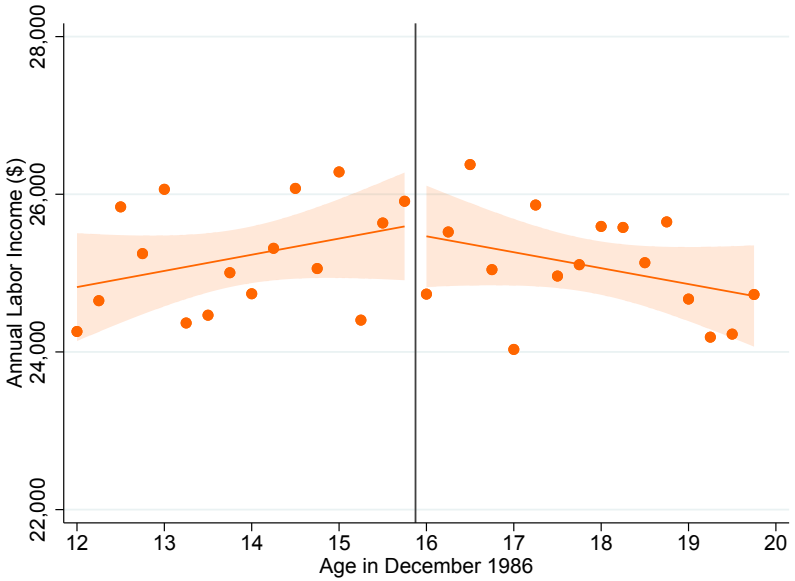
(a) Men at Upper-Secondary School Age



(b) Women at Upper-Secondary School Age



(c) Men at Prime Age



(d) Women at Prime Age

Figure 6: Labor Income at Upper-Secondary School Age and Prime Age

Notes: The figure reports the effect of the tax-free year on labor income. Panels (a) and (b) plot the average annual labor income at upper-secondary school age (16-20) around the compulsory schooling age threshold for men and women, respectively. Panels (c) and (d) plot the average annual labor income at prime age (31-40) around the compulsory schooling age threshold for men and women, respectively. The vertical line denotes the compulsory schooling age threshold. Dots are four-

Tax Holiday in Swiss Cantons

Martinez, Saez, Siegenthaler AER'21 study tax holidays in Swiss cantons also created by a transition to pay-as-you earn

Key advantage: different cantons transitioned at different times (creating staggered tax holidays across cantons)

Main findings:

(a) precise zero effect on extensive margin

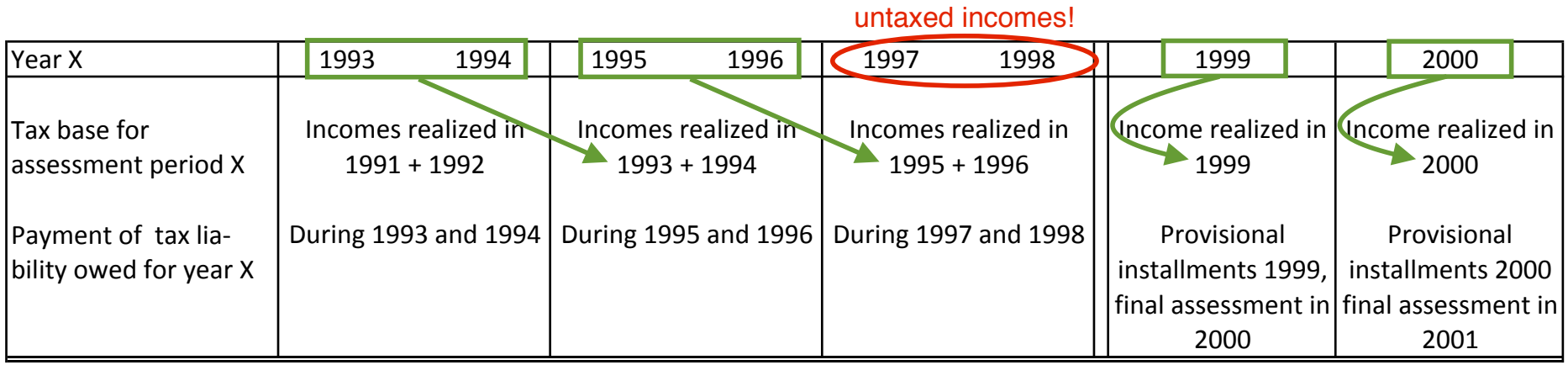
(b) some effects on intensive margin for high wage earners and self-employed (possibly avoidance rather than real)

Why smaller effects in Switzerland than Iceland? Iceland sold tax holiday as opportunity to work more (Switzerland did not)

1990s Income Tax Reform in Switzerland

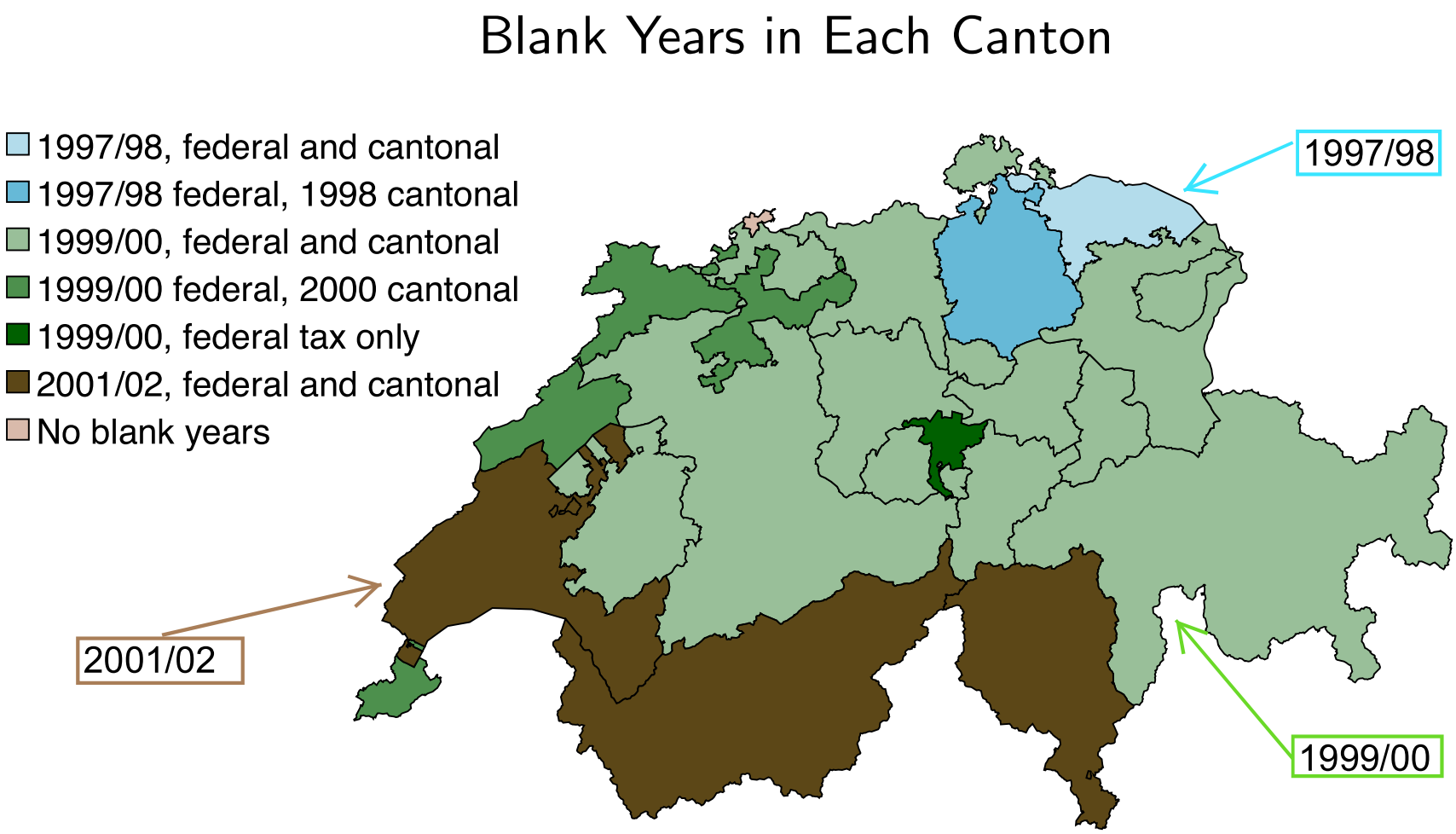
Transition from retrospective taxation to annual pay-as-you-earn

- Reasons: modernizing, simplifying and harmonizing
- Side effect: incomes earned during the two years prior to the change remained untaxed (blank years, tax holiday)

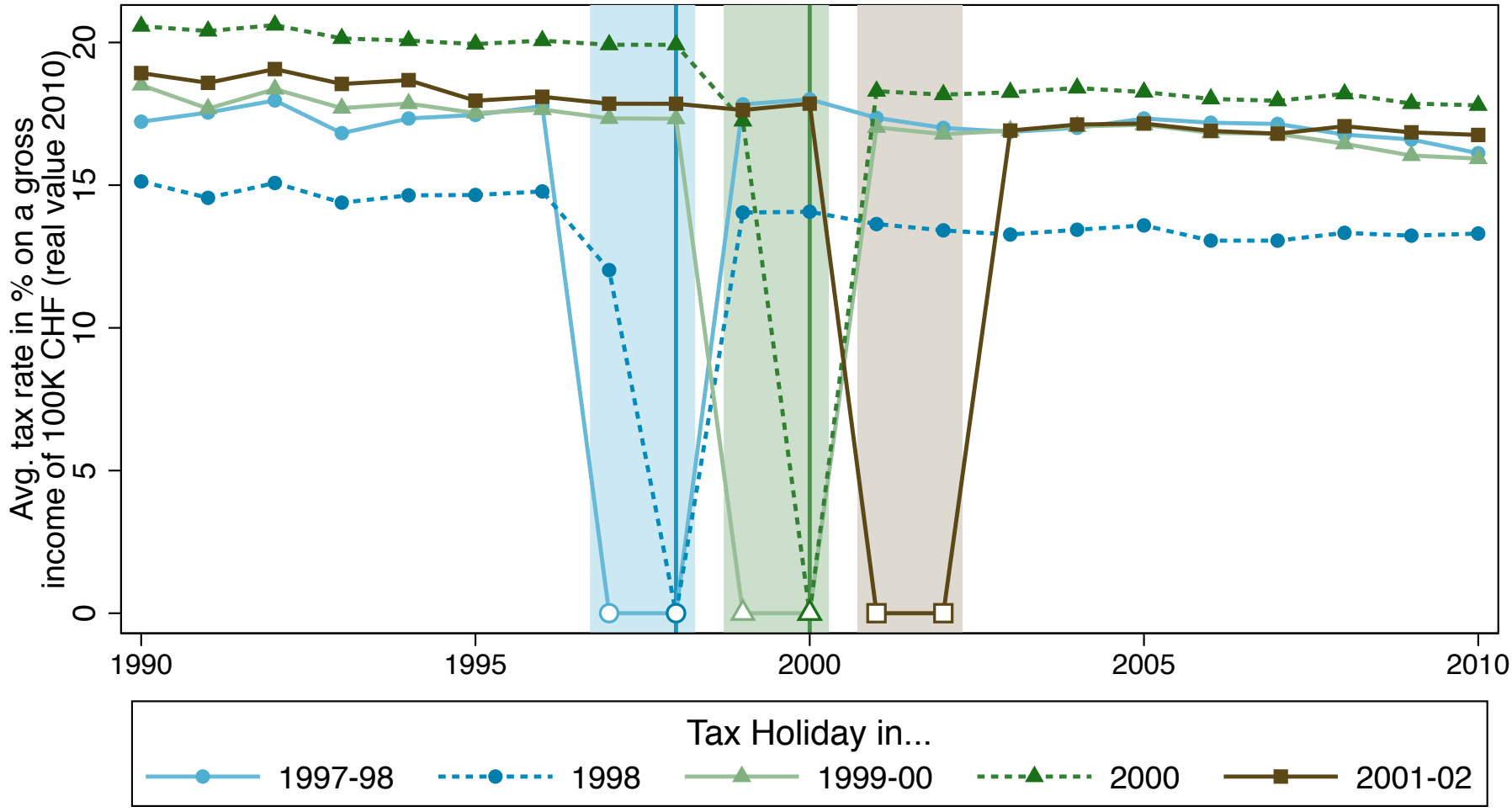


- Cantons chose different years to change: 1999, 2001, and 2003

Timing of the Reform

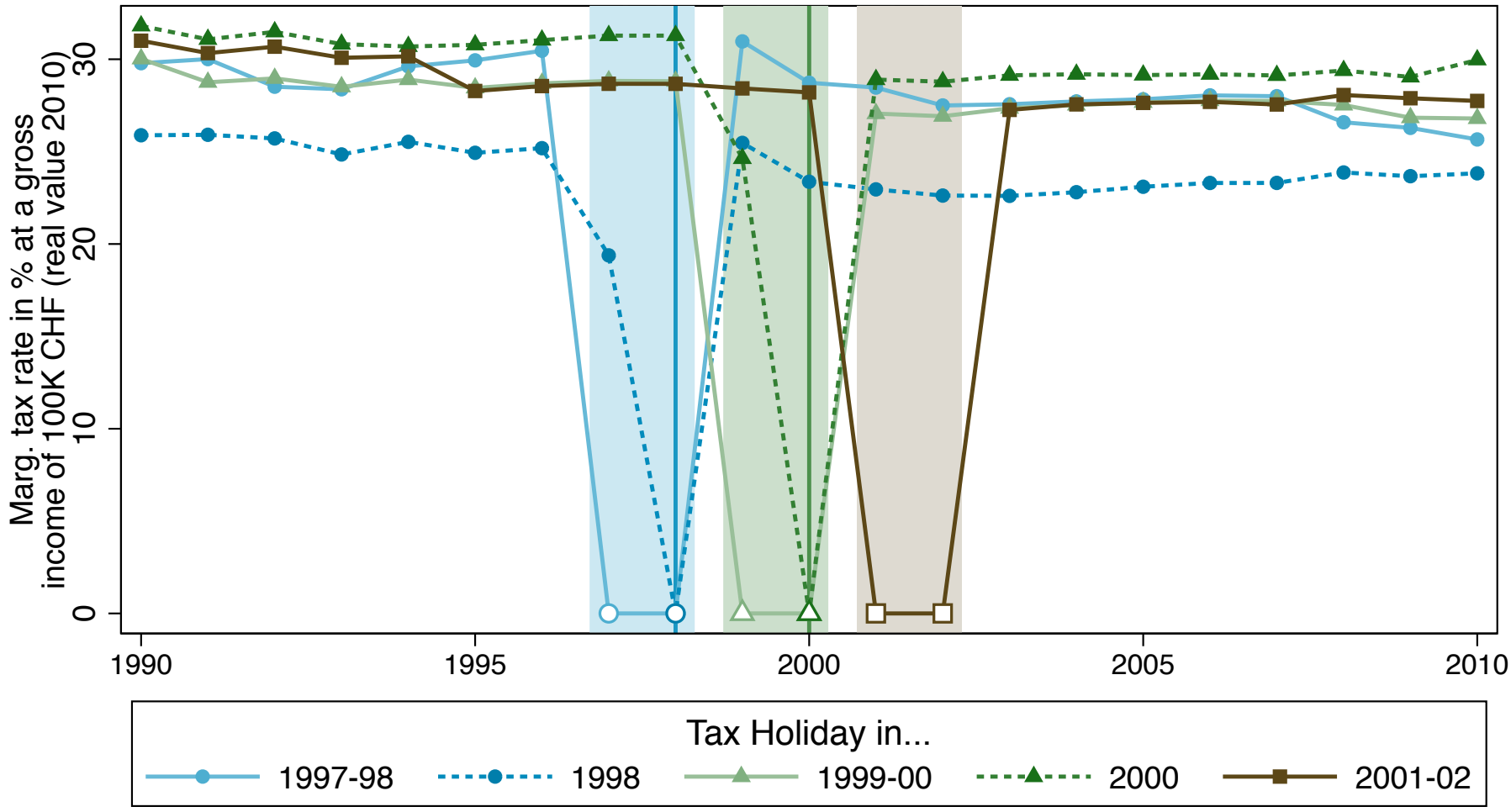


Average Income Tax Rates over Time



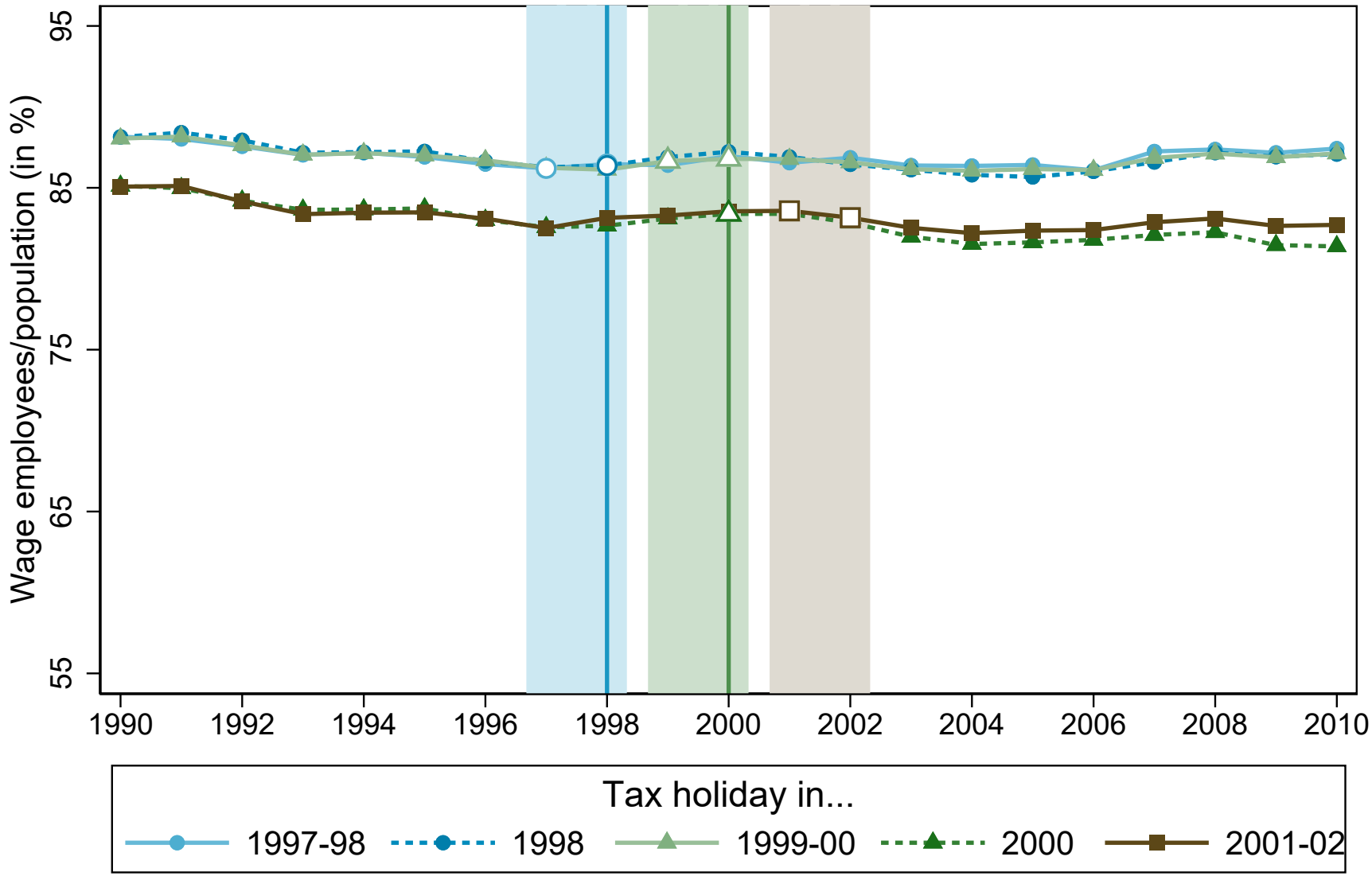
Total federal, cantonal and municipal tax, single taxpayer; weighted by municipality population.

Marginal Income Tax Rates over Time



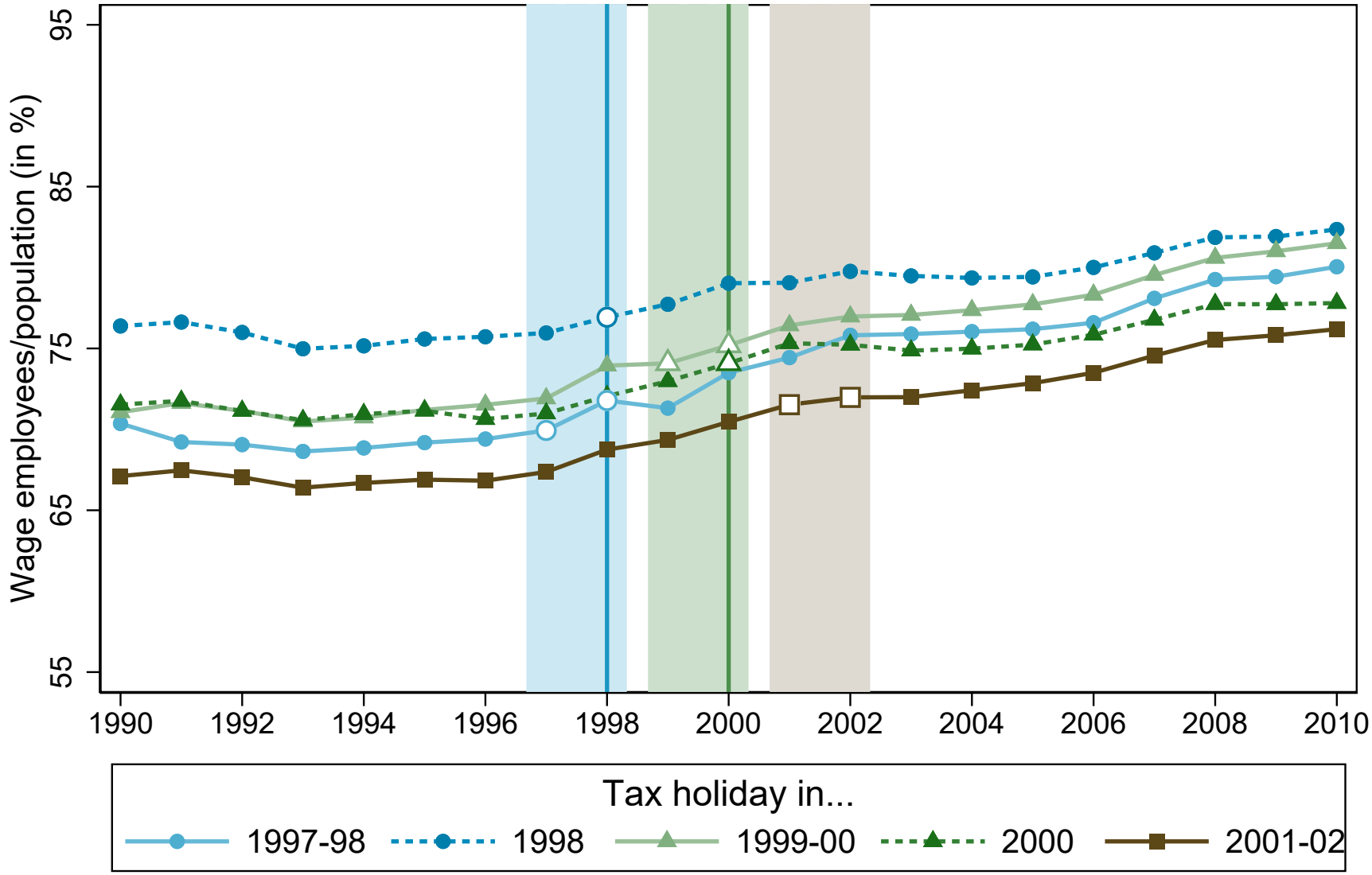
Total federal, cantonal and municipal tax, single taxpayer; weighted by municipality population.

Employment Rate: Men (age 20-60)



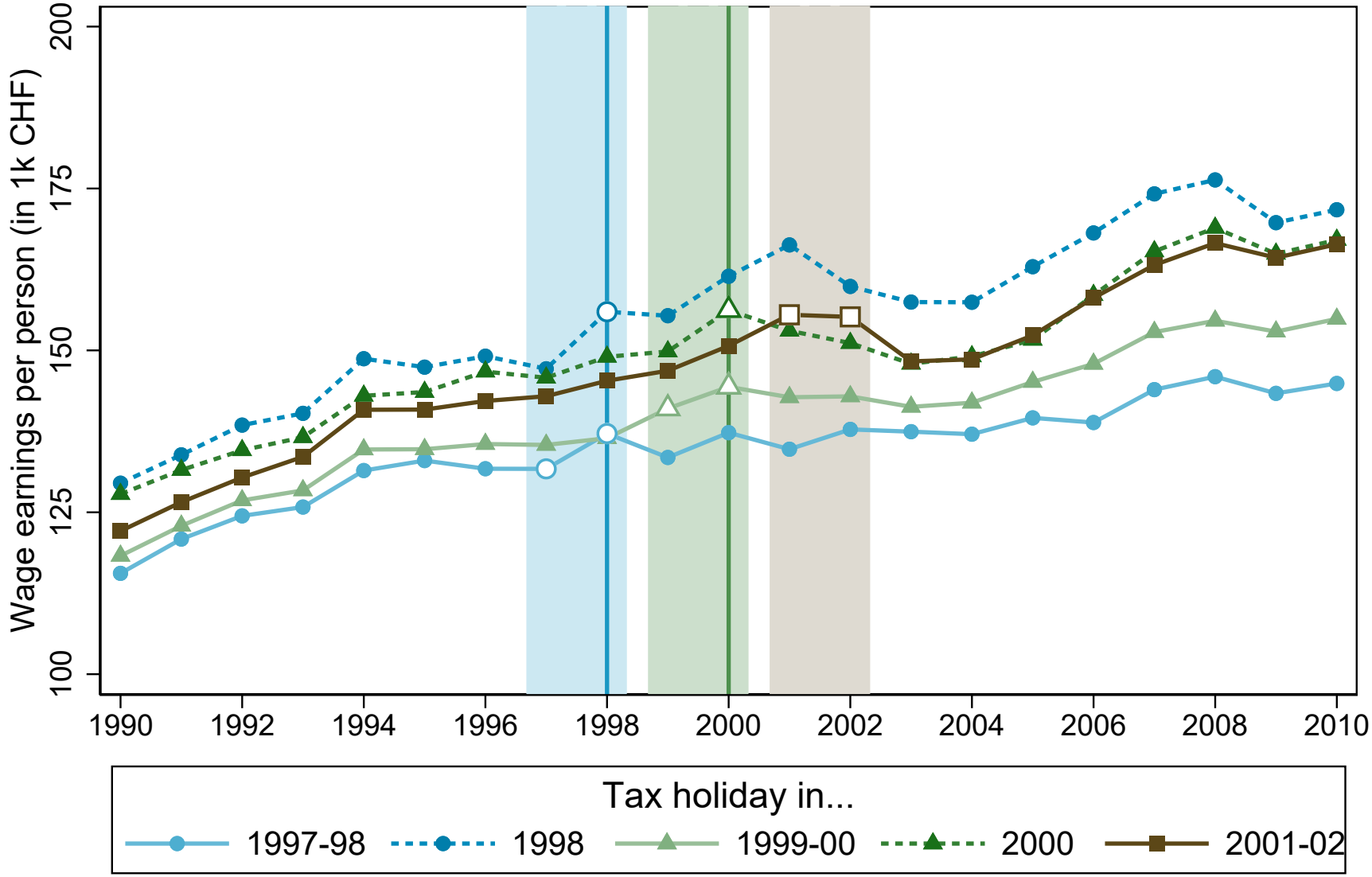
Data source: AHV-STATPOP

Employment Rate: Women (age 20-60)



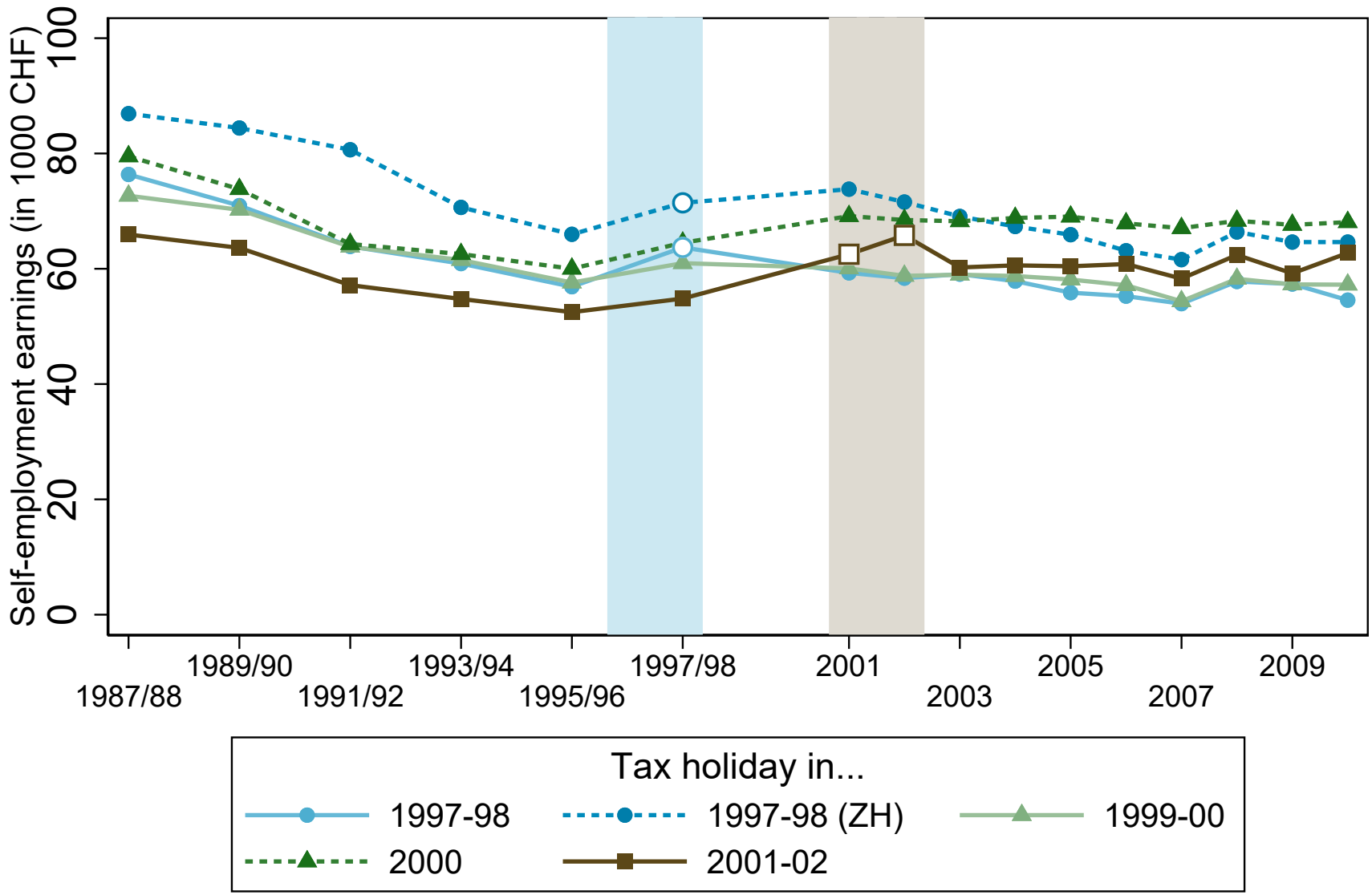
▸ unemployment rate

Average Wage Earnings: High-income Employees



High income: avg. real wage earnings in 1994-1996 $> 100k$ CHF/year

Mean Self-employment Earnings (excluding zeros)



Data source: AHV-STATPOP

SOCIAL DETERMINANTS OF LABOR SUPPLY

Concern that taxes funding social state could discourage work

Standard econ view: labor supply $l(w, R)$ coming out of $\max u(\underset{+}{c}, \underset{-}{l})$ subject to $c = wl + R$ is highly incomplete

Social determinants of labor supply:

a) Youth labor is regulated by labor laws/education

b) Old age labor regulated by retirement programs

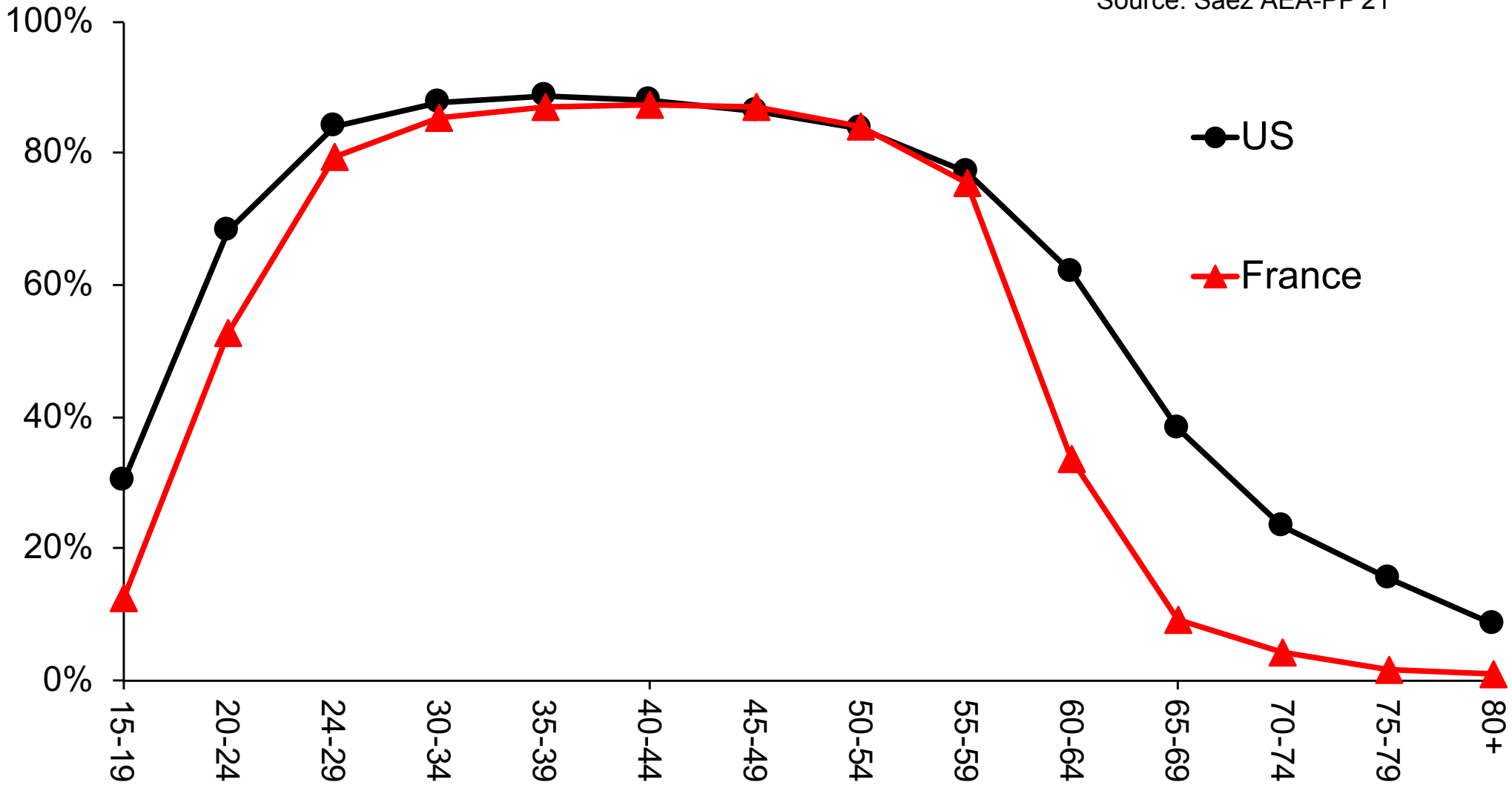
c) Female market labor driven by norms + child care policy

d) Hours of work regulated by overtime + vacation mandates

Social labor supply with disutility for youth, old, overtime labor

Employment Rates of Men by Age, 2019

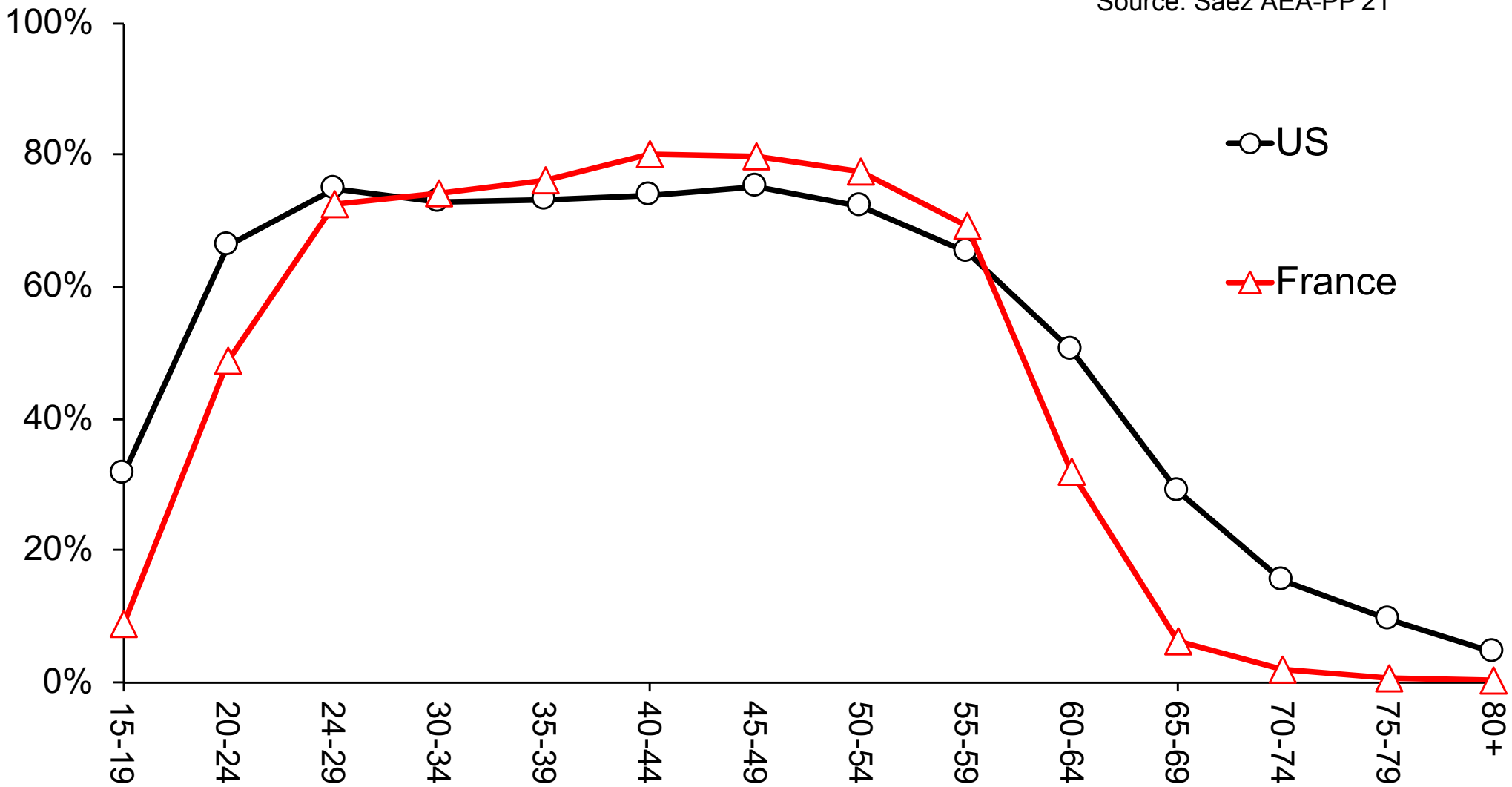
Source: Saez AEA-PP'21



Source: OECD database online. Employment to population ratios.

Employment Rates of Women by Age, 2019

Source: Saez AEA-PP'21



Source: OECD database online. Employment to population ratios.

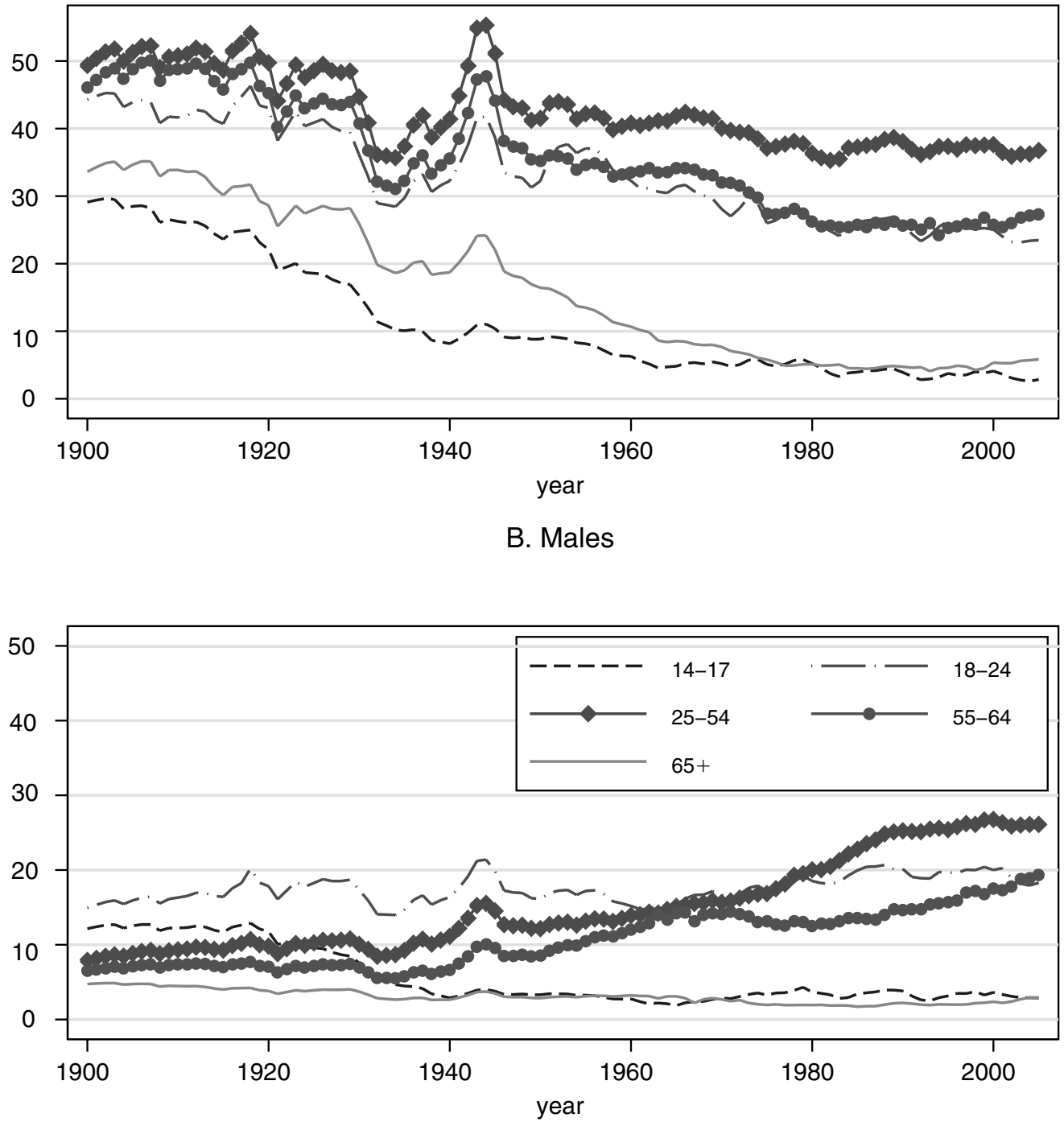
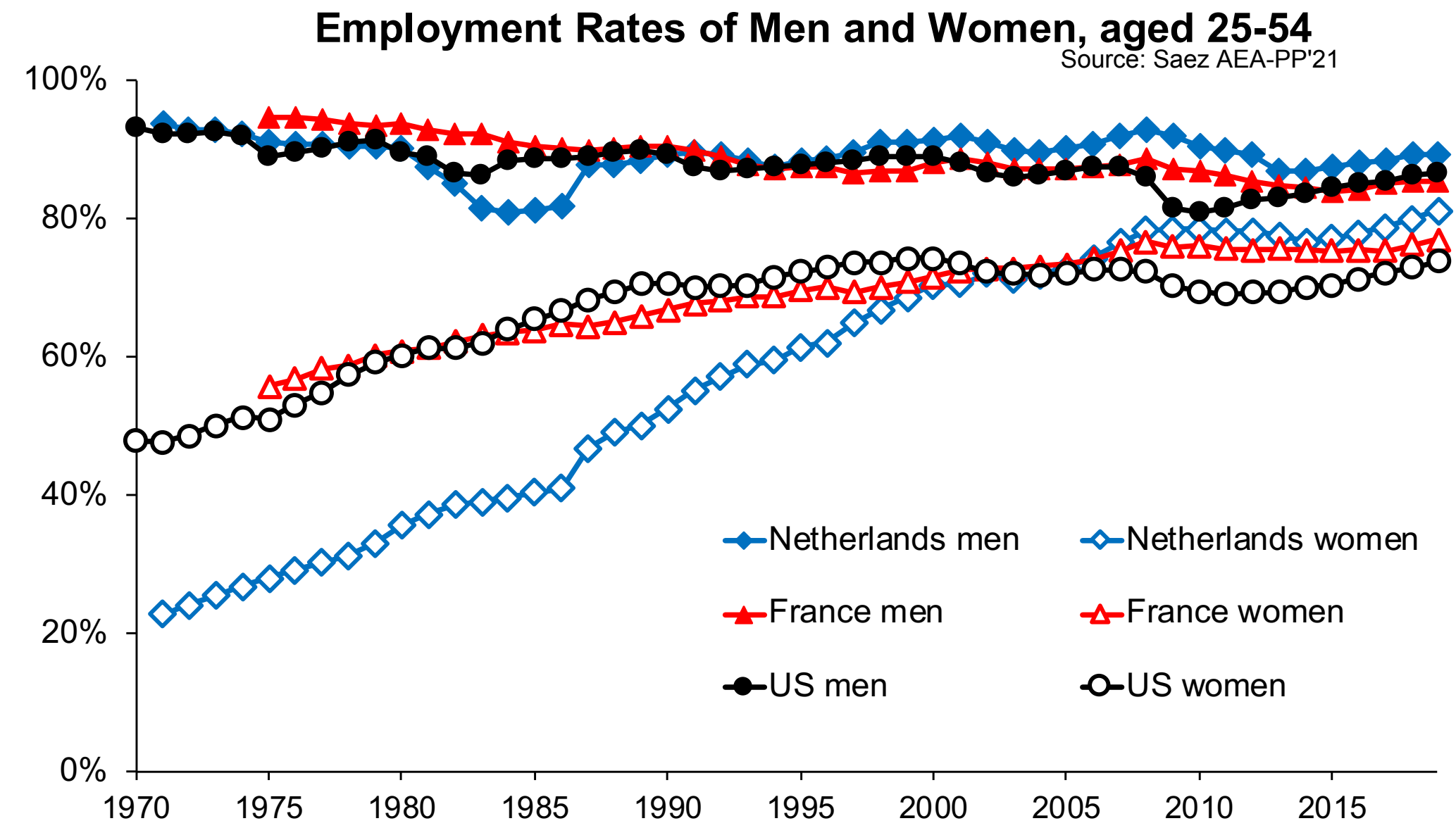


FIGURE 2. AVERAGE WEEKLY HOURS WORKED PER PERSON, BY AGE GROUP



Source: OECD database online.

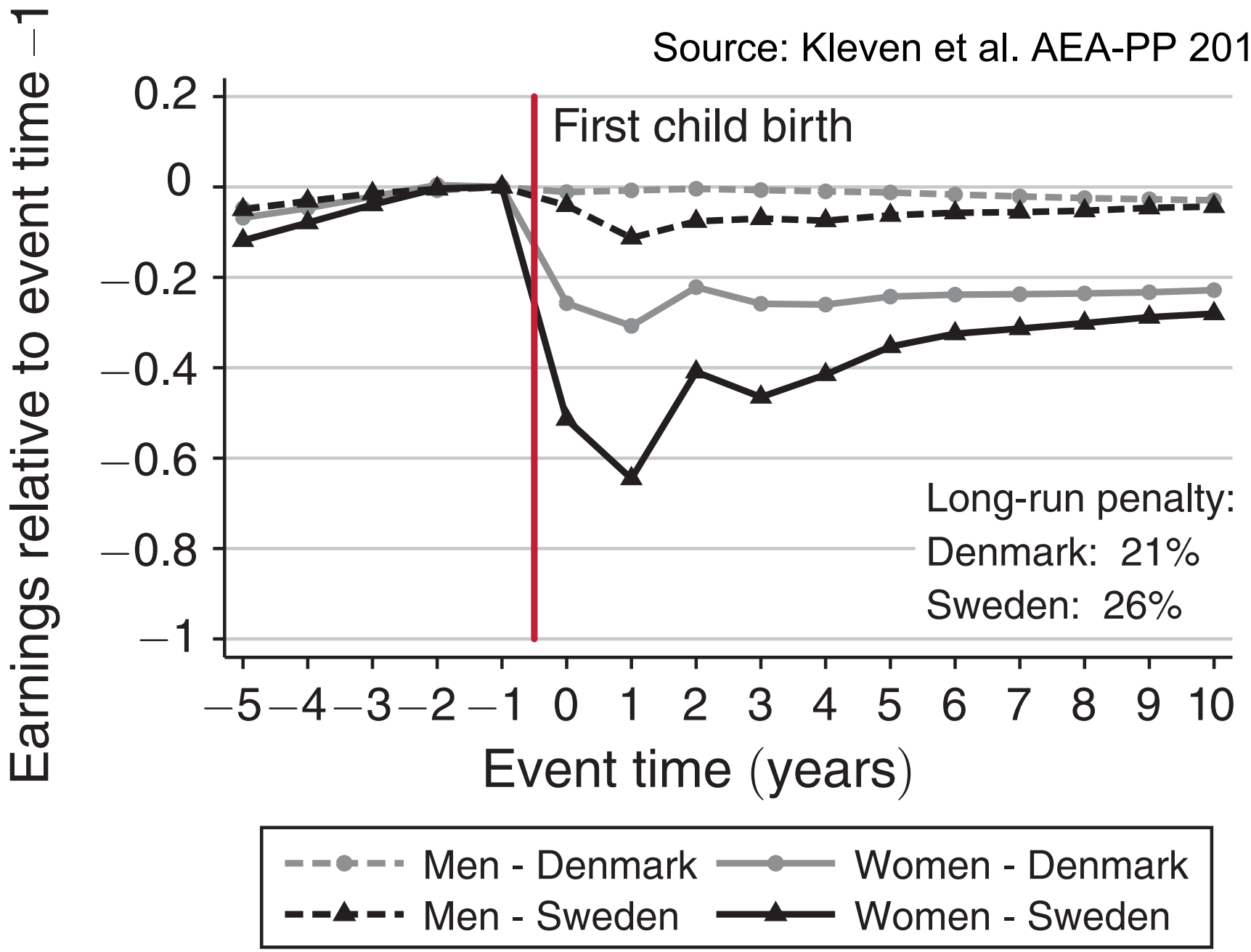


FIGURE 1. CHILD PENALTIES IN EARNINGS IN SCANDINAVIAN COUNTRIES

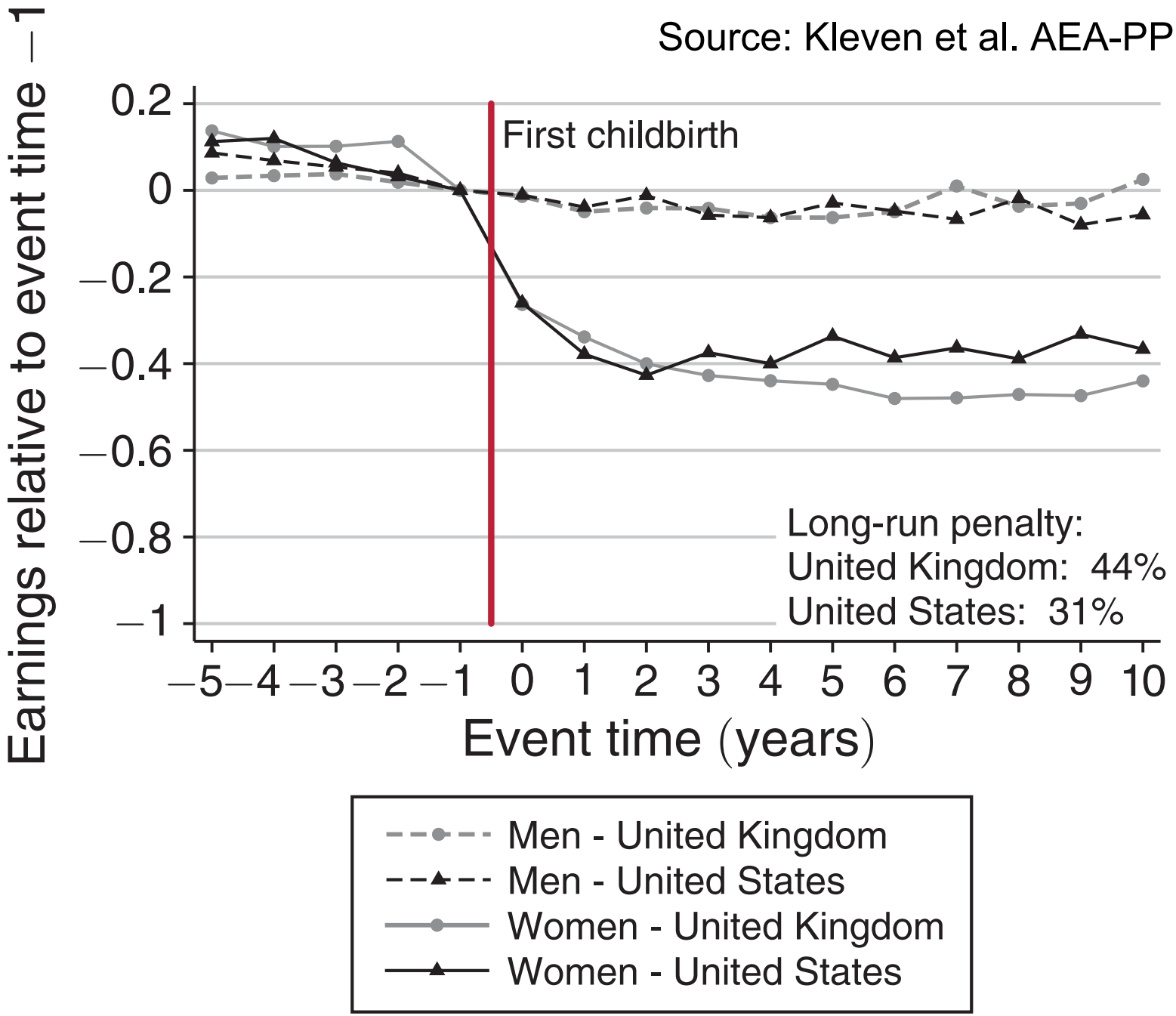


FIGURE 2. CHILD PENALTIES IN EARNINGS IN ENGLISH-SPEAKING COUNTRIES

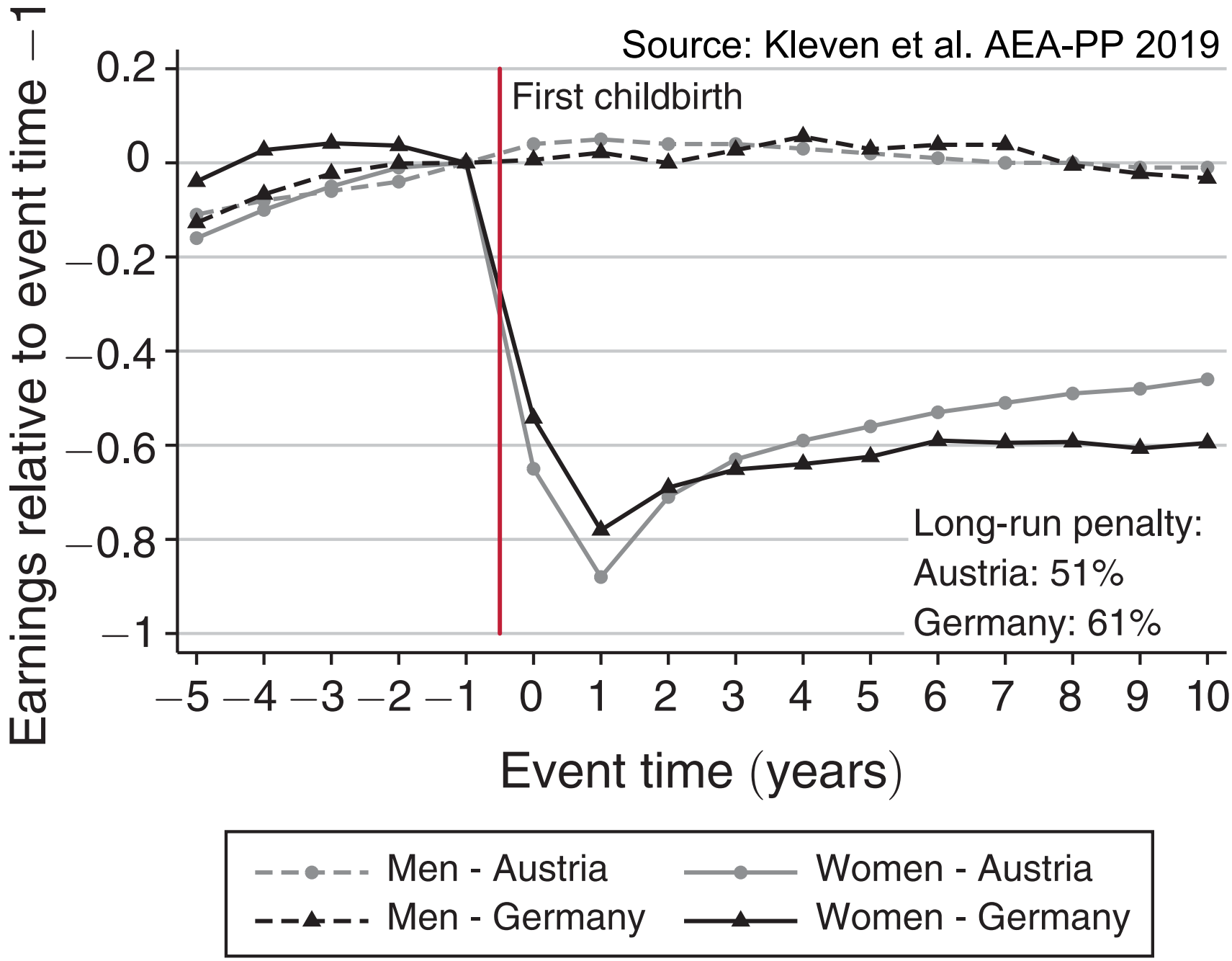
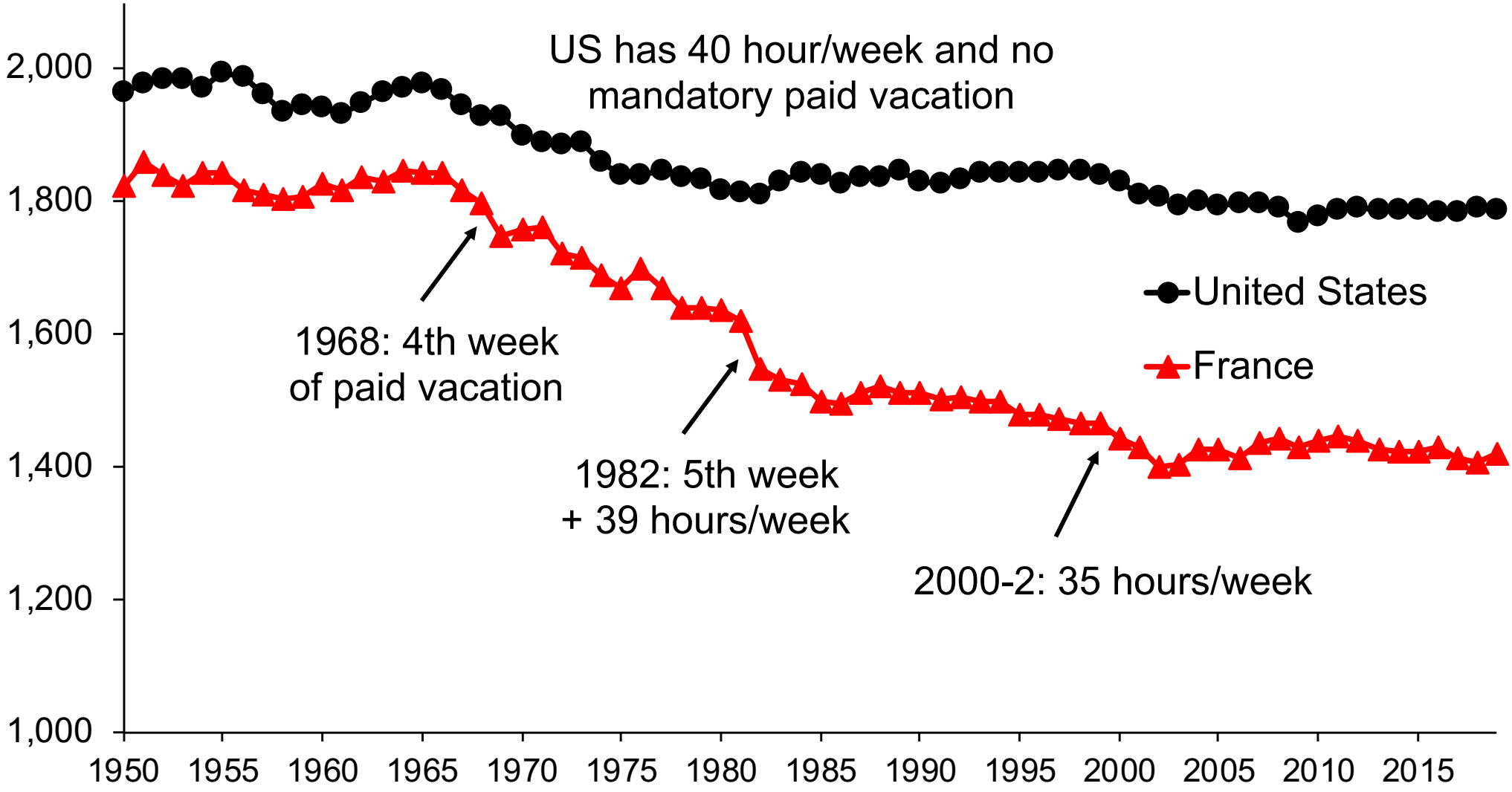


FIGURE 3. CHILD PENALTIES IN EARNINGS IN GERMAN-SPEAKING COUNTRIES

Average Annual Hours of Work of Employees

Source: Saez AEA-PP'21



Source: OECD database online. Includes all ages, genders, and part-time, full-time, overtime.

Long-term effects: Evidence from the Israeli Kibbutz

Abramitzky '18 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 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

Long-term benefits for children of support programs

Traditional economic view: equity vs. efficiency tradeoff

But support programs can also have positive efficiency long-term impacts on children later on (birth weight, health, education, earnings) as shown in series of papers by H. Hoynes

Example: Hoynes, Schanzenbach, Almond AER'16 studies effect of Food Stamp Program rollout across counties in the 1960s-1970s on health (based on age of children at rollout)

Use PSID survey data and event study based on county and year of birth in sample of people with low education parents:

$$y_{itcb} = \eta_c + \lambda_b + \gamma_t + \text{dummies for age at rollout}$$

Find large positive impact of food stamps on health (-.4 std dev. of having metabolic syndrome precursor to diabetes)

$\Rightarrow$ Social state support should also be seen as investment

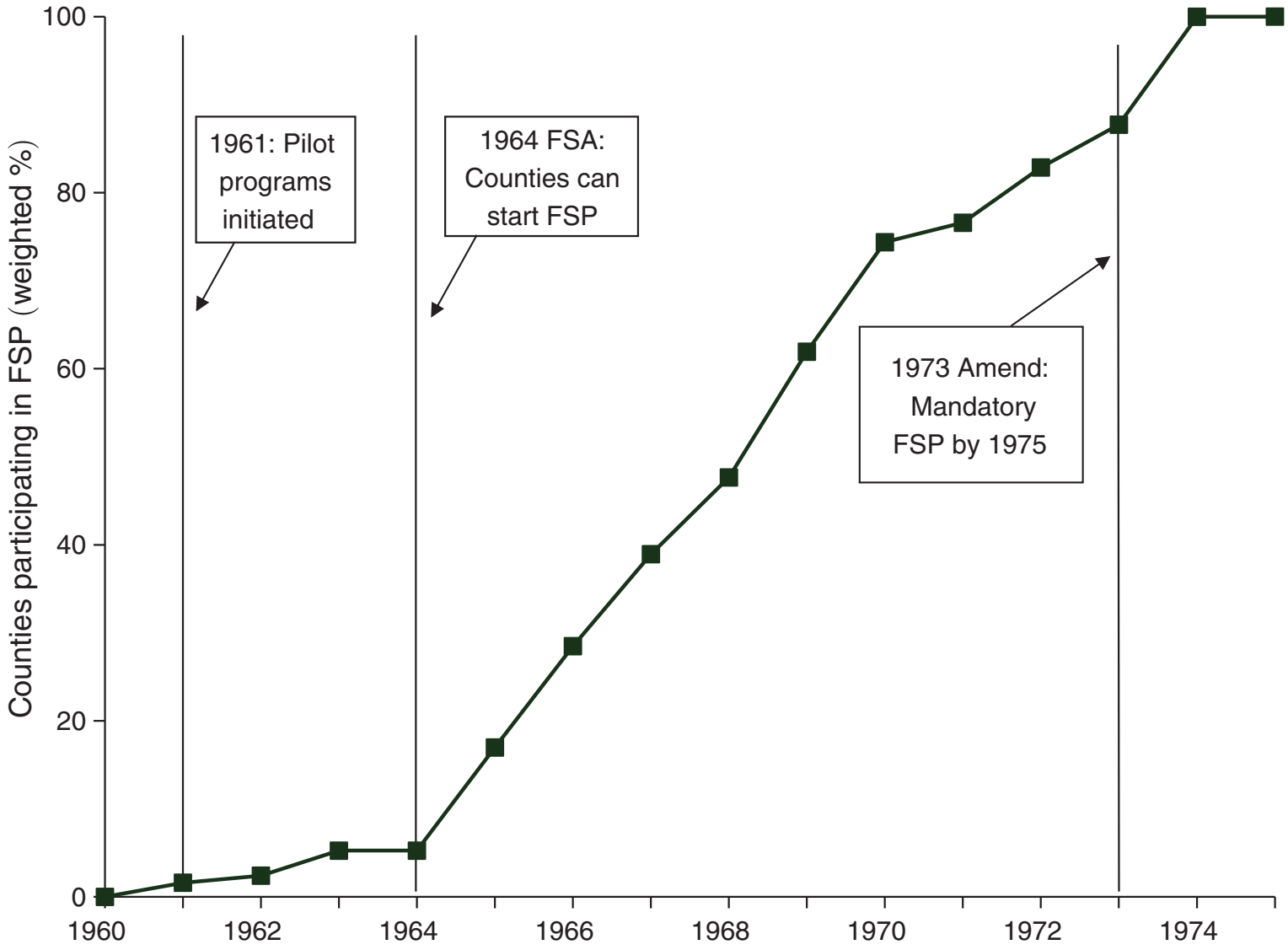


FIGURE 1. WEIGHTED PERCENT OF COUNTIES WITH FOOD STAMP PROGRAM, 1960–1975

Source: Authors' tabulations of food stamp administrative data (US Department of Agriculture, various years). Counties are weighted by their 1960 population.

Source: Hoynes, Schanzenbach, and Almond AER'16

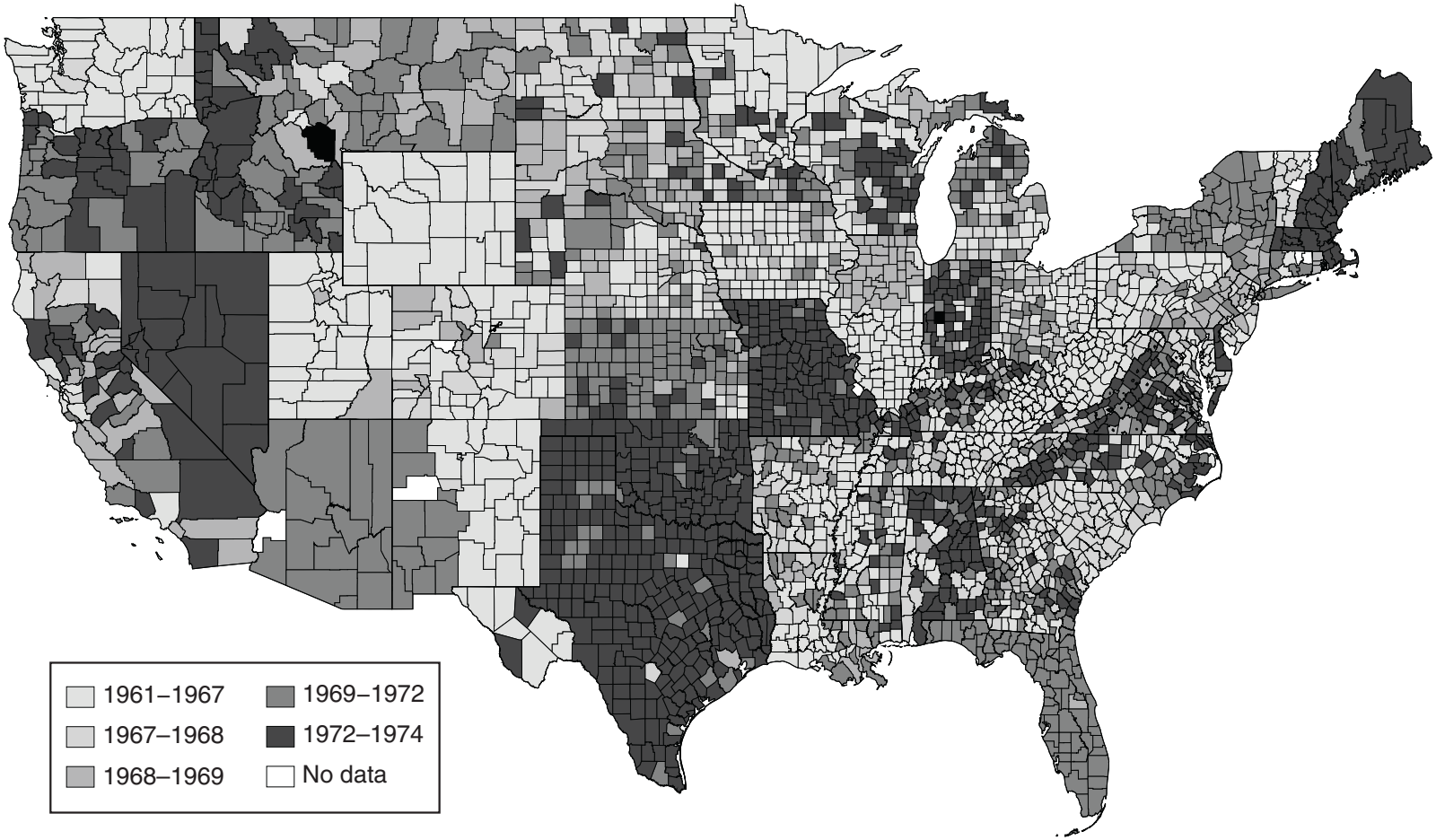


FIGURE 2. FOOD STAMP PROGRAM START DATE, BY COUNTY, 1961–1974

Notes: Authors' tabulations of food stamp administrative data (US Department of Agriculture, various years). The shading corresponds to the county FSP start date, where darker shading indicates later county implementation.

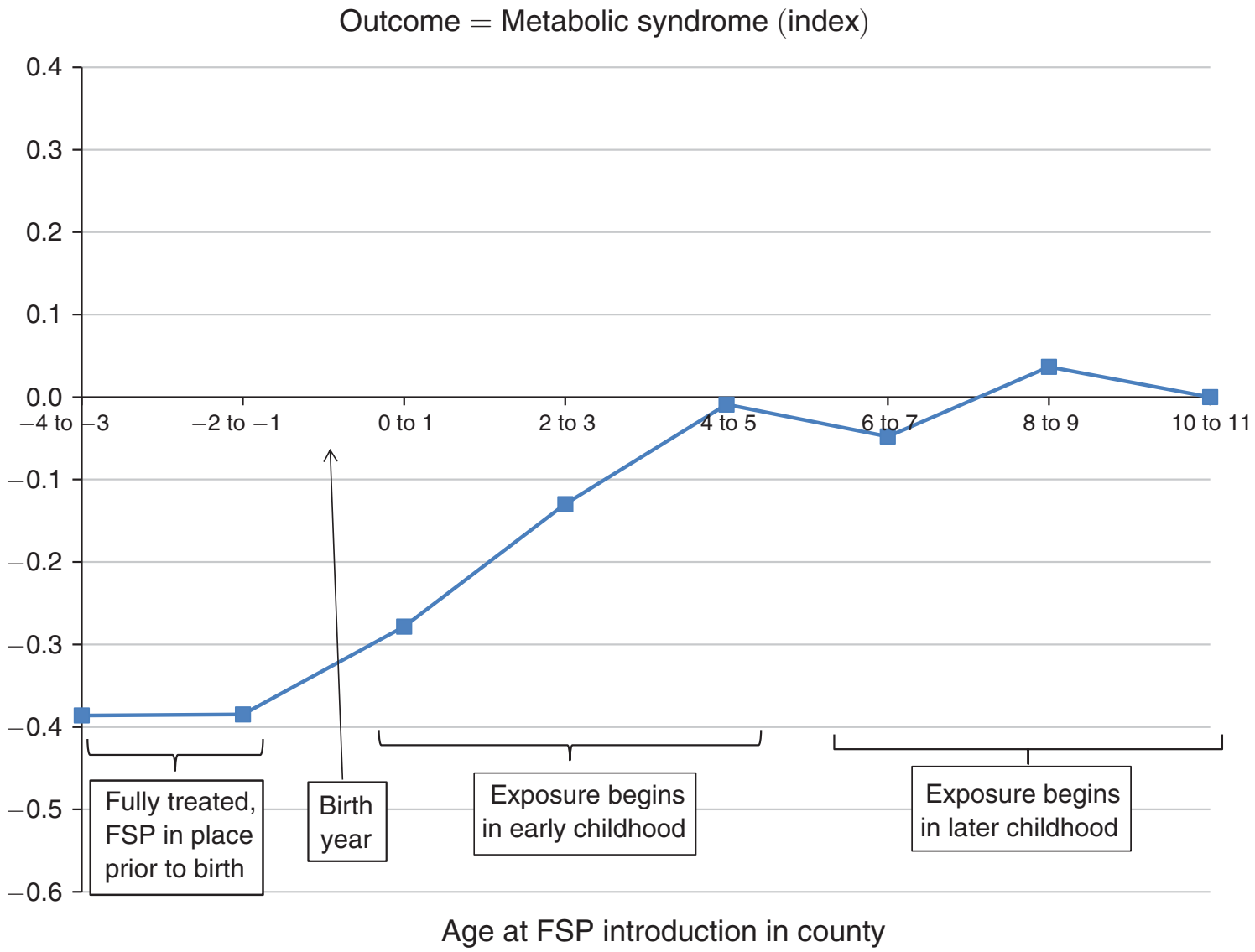


FIGURE 3. EVENT STUDY ESTIMATES OF THE IMPACT OF FSP EXPOSURE ON METABOLIC SYNDROME INDEX (*High Participation Sample*)

Notes: The figure plots coefficients from an event-study analysis. Event time is defined as age when FSP is implemented in the birth county. The models are estimated for the sample of individuals born into families where the head has less than a high school education. Age 10–11 is the omitted year so estimates are relative to that point. See the text for a description of the model.

Crime Reduction Benefits of Welfare Benefits

US has very high incarceration rate .50% of population down from .75% in 2008 peak (but still 5 times more than Europe)

Costs $50K/year per inmate $\Rightarrow$ Expensive and punitive

Deshpande and Mueller QJE'22 use welfare reform which made it harder for disabled children to keep SSI (supplemental security income for low income aged+disabled) past age 18

Finds that it increased likelihood of income related offenses (theft, drug dealing, fraud, prostitution) by 20% and incarceration by 60% over next 2 decades [Deshpande AER'16 showed positive but small effect on regular work]

Incarceration effect persists even after 1st stage effect on SSI recipiency has vanished

Extra incarceration costs almost as big as SSI benefits saved

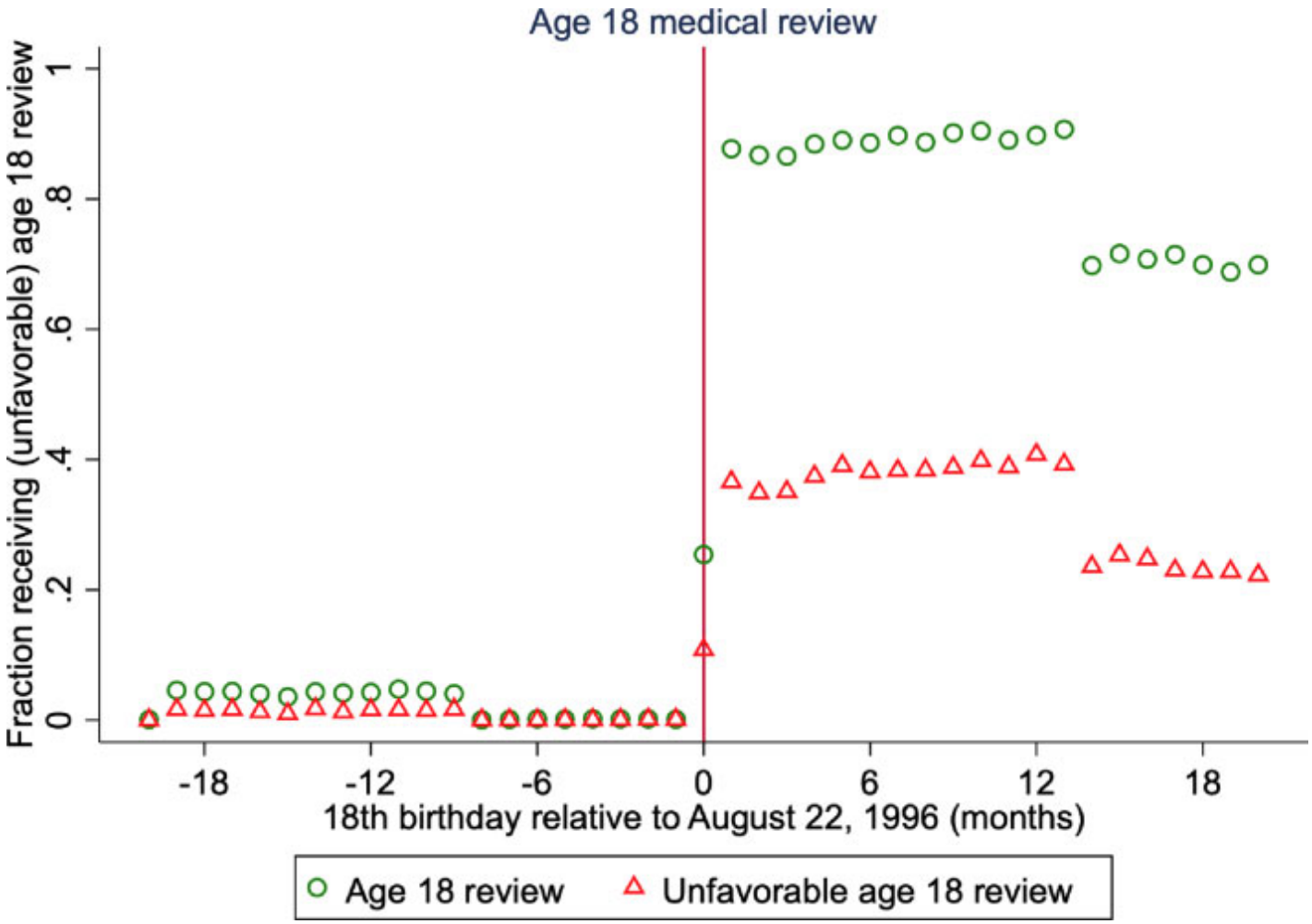


FIGURE II

First Stage: Likelihood of Age 18 Medical Review across Cutoff

Figure plots the likelihood of receiving an age 18 medical review and the likelihood of receiving an unfavorable age 18 review (i.e., being removed from SSI at age 18). The sample is SSI children with an 18th birthday within 18 months of the August 22, 1996, cutoff who reside in a county with CJARS coverage. Table I reports point estimates and standard errors.

Source: Deshpande and Mueller-Smith QJE 2023

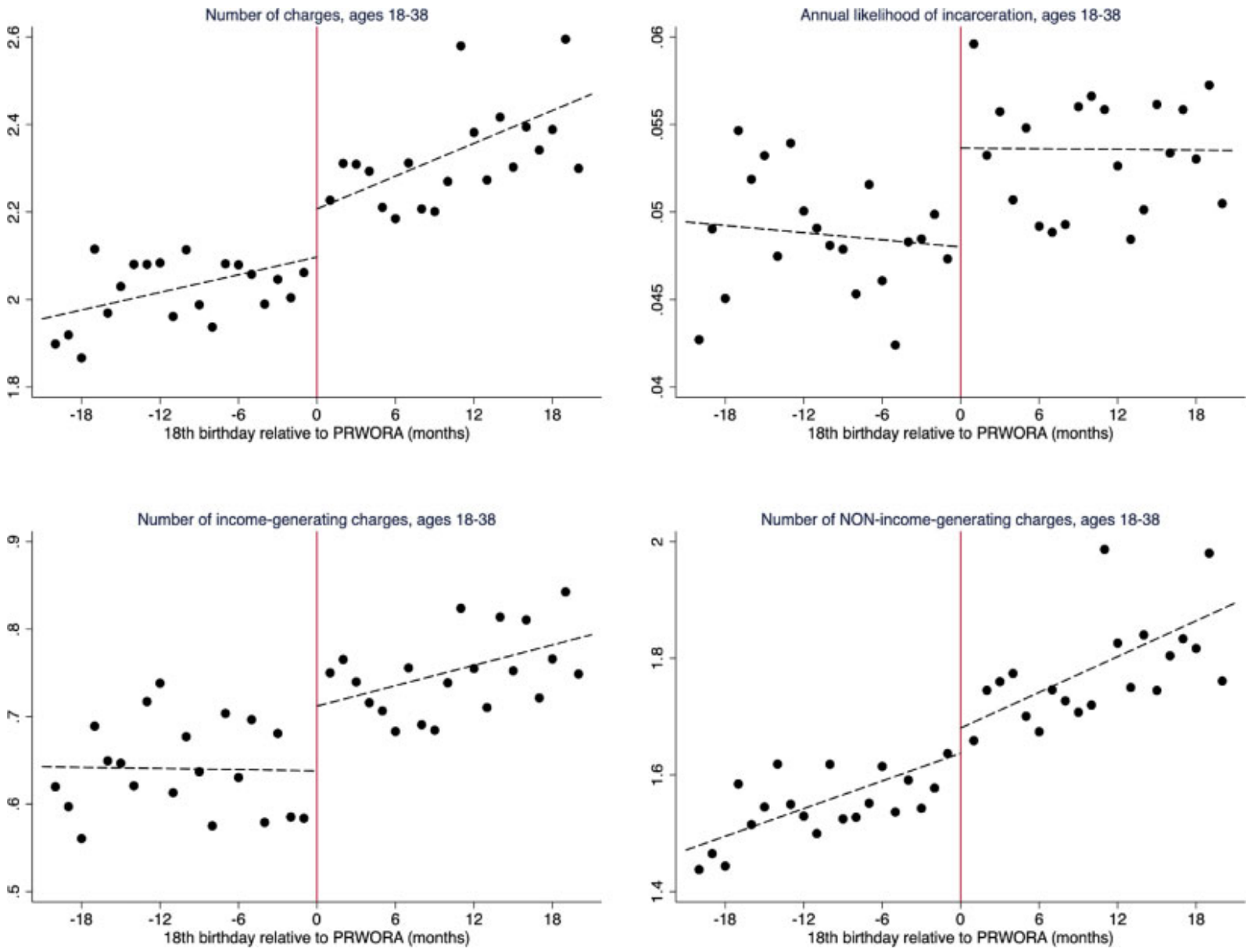


FIGURE III

Reduced Form: Criminal Justice Outcomes across Cutoff

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