## Non-Linear Budget Set Estimation: Virtual Incomes



Source: Hausman (Hbk 1985)

## Panel A. Indifference curves and bunching



## B. Density Distributions and Bunching



## EITC Amount as a Function of Earnings



Panel A. One child



Panel B. Two or more children


Panel A. Married tax filers


Panel B. Single tax filers


Figure 3-A.-Earnings Distribution, 1980-81


Earnings in \$1000 intervals relative to the exempt amount

Age 67-69 $\quad$ Age 71-72

Figure 3-B.-Earnings Distribution, 1980-81


Earnings in \$1000 intervals relative to the exempt amount
$\square$ Age 71-72 $\square$ Age 73-75


Note: In 1983 the earnings test was eliminated for 70-71 year olds (71-72 year olds in the following March CPS) but was not changed for 62-69 year olds. See Figure 2 note.

## Cost of Bunching at Bracket Cutoff Points in Tax Schedule



Source: Chetty et al. (2009)

## Marginal Tax Rates in Denmark in 1995



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


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


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


## Married Women



Taxable Income Relative to Top Bracket Cutoff (1000s DKr)

Single Men


Married Female Professionals with Above Median Experience


Military


## Married Women, 1994



Married Women, 1995


Married Women, 1996


## Married Women, 1997



## Married Women, 1998



## Married Women, 1999



Taxable Income (1000s DKR)

## Married Women, 2000



Married Women, 2001


Married Women at the Middle Tax: 10\% Tax Kink


Married Women at the Middle Tax: 10\% Tax Kink


Married Women at the Middle Tax: 6\% Tax Kink


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


Distribution of Individuals' Deductions in 1995


Teachers Wage Earnings: 1995


Teachers Wage Earnings: 1998


Teachers Wage Earnings: 2001


Wage Earnings: Teachers with Deductions > DKr 20,000


## Self Employed: Top Kink



## Self-Employed: Middle Kink



## All Female Wage Earners



## All Male Wage Earners



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 |

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

|  |  |  |  | Payments for Year of <br> Experiment$(\$)$ |  |  |  |  |
| :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |

Note.-Terms are explained in text.

* Denotes mean is more than twice its standard error.

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

| $G(\$)$ | $\tau$ | Declining Tax Rate | Preexperimental Payment (\$) | Payment for Year of Experiment (\$) |  |  |  |  | Postexperimenta Payment (\$) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 1 | 2 | 3 | 4 | 5 |  |
| 3,800 | . 5 | No | 102.24 | $3+5.68$ | 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 | $\underline{23.22}$ | 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) |
| +,800 | . 5 | No | $-23.66$ | 30.15 | 160.40 | 399.28 | 419.73 | +34.30 | 251.09 |
|  |  |  | (183.73) | (208.90) | (199.26) | (236.33) | (247.25) | (254.52) | (242.45) |
| +,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 | $3+0.71$ | -130.10 | 34.61 | 189.49 |
|  |  |  | (23+.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) | (+16.25) | (391.61) | (467.76) | (609.49) | (510.52) |
| 5,600 | . 8 | Yes | $-6.48$ | $193.5+$ | $617.29^{*}$ | 906.13* | $888.72$ | $877.71$ | $75.21$ |
|  |  |  | $(175.15)$ | (199.51) | (255.89) | (315.98) | (337.38) | (398.38) | (216.12) |

Noti.- Terms are explained in text.

* Denotes mean is more than twice its standard error.


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.
marginal
tax rate


Figure II

Taxable Income (1985\$)
124000

59700
24700

Table IIa
Marginal Tax Rate

| Group | Before <br> TRA86 | After <br> TRA86 | Change | Relative <br> Change |
| :--- | :---: | :---: | :---: | :---: |
| High | .521 |  |  |  |
|  | $(.002)$ | $(.001)$ | -.139 |  |
| $75^{\text {th }}$ |  |  | $(.002)$ |  |
| Percentile | .365 | .324 | -.041 | $\mathbf{- . 0 9 8}$ |
|  | $(.001)$ | $(.001)$ | $(.001)$ | $\mathbf{( . 0 0 2 )}$ |
| $90^{\text {th }}$ |  | .330 | $(.001)$ | -.07 |
| Percentile | $(.001)$ |  | $(.001)$ | $\mathbf{- . 0 6 9}$ |
|  |  |  |  | $\mathbf{( . 0 0 2 )}$ |

The marginal tax rate is calculated using family wage and salary, self-employment, interest, dividend, farm and social-security income. I assume all couples file jointly, and that all itemize their deductions. Itemized deductions and capital gains are imputed using Statistics of Income data. These figures include the secondary earner deduction, as well as social security taxes. Standard errors are in parentheses. Before TRA86 is tax years 1983-1985; After TRA86 is tax years 1989-1991.

Source: Eissa 1995

Table III
Differences-in-Differences Estimates
CPS Married Women Before and After TRA86
A: Labor Force Participation

| Group | Before TRA86 | After TRA86 | Change | Difference-inDifference |
| :---: | :---: | :---: | :---: | :---: |
| High | $\begin{gathered} 0.464(.018) \\ {[756]} \end{gathered}$ | $\begin{gathered} 0.554 \text { (.018) } \\ {[718]} \end{gathered}$ | $\begin{gathered} 0.090(.025) \\ \{19.5 \%\} \end{gathered}$ |  |
| $75^{\text {th }}$ <br> Percentile | $\begin{gathered} 0.687(.010) \\ {[3799]} \end{gathered}$ | $\begin{gathered} 0.740(.010) \\ {[3613]} \end{gathered}$ | $\begin{gathered} 0.053(.010) \\ \{7.2 \%\} \end{gathered}$ | $\begin{gathered} 0.037(.028) \\ \{12.3 \%\} \end{gathered}$ |
| $90^{\text {th }}$ <br> Percentile | $\begin{gathered} 0.611(.010) \\ {[3765]} \end{gathered}$ | $\begin{gathered} 0.656 \text { (.010) } \\ {[3584]} \end{gathered}$ | $\begin{gathered} 0.045(.010) \\ \{6.5 \%\} \end{gathered}$ | $\begin{gathered} 0.045(.028) \\ \{13 \%\} \end{gathered}$ |

Source: Eissa 1995

| Group | Before <br> TRA86 | After TRA86 | Change | Difference-inDifference |
| :---: | :---: | :---: | :---: | :---: |
| High | $\begin{gathered} 1283.0(46.3) \\ {[351]} \end{gathered}$ | $\begin{gathered} 1446.3(41.1) \\ {[398]} \end{gathered}$ | $\begin{gathered} 163.3(61.5) \\ \{12.7 \%\} \end{gathered}$ |  |
| $75^{\mathrm{dh}}$ <br> Percentile | $\begin{gathered} 1504.1(14.3) \\ {[2610]} \end{gathered}$ | $\begin{gathered} 1558.9(13.9) \\ {[2676]} \end{gathered}$ | $\begin{gathered} 54.8(20.0) \\ \{3.6 \%\} \end{gathered}$ | $\begin{gathered} 108.6(65.1) \\ \{9.4 \%\} \end{gathered}$ |
| $90^{\mathrm{th}}$ <br> Percentile | $\begin{gathered} 1434.1(16.4) \\ {[2303]} \end{gathered}$ | $\begin{gathered} 1530.1(15.9) \\ {[2348]} \end{gathered}$ | $\begin{gathered} 96.0(22.8) \\ \{6.8 \%\} \end{gathered}$ | $\begin{gathered} 67.3(64.8) \\ \{6.2 \%\} \end{gathered}$ |

Each cell contains the mean for that group, along with standard errors in (), number of observations in [], and \% increase in \{\}. Means are unweighted.

Source: Eissa 1995

## Figure 10

Fraction of Married Women with Positive Annual Earnings by Income Group in March CPS


Notes: Groups are based on other household income (husband's earnings plus asset income) as described in Eissa (1995). Group $1<=75^{\text {th }}$ percentile. Group 75 is $>75^{\text {th }}$ percentile and $<=80^{\text {th }}$ percentile. Group 80 is $>80^{\text {th }}$ and $<=90^{\text {th }}$. Group 90 is $>90^{\text {th }}$ and $<=95^{\text {th }}$. Group 95 is $>95^{\text {th }}$ and $<=99^{\text {th }}$. Group 99 is $>99^{\text {th }}$.

Source: Liebman and Saez (2006)


Source: Meyer and Sullivan (2004), p. 1391
Fig. 1. Average monthly AFDC/TANF caseloads (1963-2000) (in millions).

## EITC Amount as a Function of Earnings



## LABOR SUPPLY RESPONSE TO THE EITC



Figure IV
1986 and 1988 Earned Income Tax Credit

TABLE II
Labor Force Participation Rates of Unmarried Women

|  | Pre-TRA86 <br> (1) | Post-TRA86 <br> (2) | Difference <br> (3) | Difference-indifferences <br> (4) |
| :---: | :---: | :---: | :---: | :---: |
| A. Treatment group: |  |  |  |  |
| With children | 0.729 (0.004) | 0.753 (0.004) | 0.024 (0.006) |  |
| [20,810] |  |  |  |  |
| Control group: |  |  |  |  |
| Without children | 0.952 (0.001) | 0.952 (0.001) | 0.000 (0.002) | 0.024 (0.006) |
| [46,287] |  |  |  |  |
| B. Treatment group: |  |  |  |  |
| Less than high school, with children | 0.479 (0.010) | 0.497 (0.010) | 0.018 (0.014) |  |
| [5396] |  |  |  |  |
| Control group 1: |  |  |  |  |
| Less than high school, without children [3958] | 0.784 (0.010) | 0.761 (0.009) | -0.023 (0.013) | 0.041 (0.019) |
| Control group 2: |  |  |  |  |
| Beyond high school, with children [5712] | 0.911 (0.005) | 0.920 (0.005) | 0.009 (0.007) | 0.009 (0.015) |
| C. Treatment group: |  |  |  |  |
| High school, with children | 0.764 (0.006) | 0.787 (0.006) | 0.023 (0.008) |  |
| [9702] |  |  |  |  |
| Control group 1: |  |  |  |  |
| High school, without children | 0.945 (0.002) | 0.943 (0.003) | -0.002 (0.004) | 0.025 (0.009) |
| [16,527] |  |  |  |  |
| Control group 2: |  |  |  |  |
| Beyond high school, with children [5712] | 0.911 (0.005) | 0.920 (0.005) | 0.009 (0.007) | 0.014 (0.011) |

[^0] hours are positive, zero otherwise. Standard errors are in parentheses. Sample sizes are in square brackets. Means are weighted with CPS March supplement weights.

Source: Eissa and Liebman (1996), p. 617

All Unmarried Females

_- without children --- with children

## Unmarried Males With Less Than High School Education


——without children --- with children
Figure II
Labor Force Participation Rates 1981 to 1992, Unmarried Females Ages 16-44 Source: Eissa and Liebman (1996), p. 624

Figure 1. EITC Schedule, 1992 and 1996 by number of children


Source: Rothstein 2005

Employment Rates for Single Women with and without Children


Source: Meyer and Rosenbaum 2001

Figure 4
Labor Force Participation Rates for Women by Marital Status and Children (Ages 20-65)



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

$\rightarrow$ Mean regression: less educated single women

- $-25 \%$ quantile regression: all single women
- $-25 \%$ quantile regression: less educated single women
$-x-15 \%$ quantile regression: all single women
$\rightarrow-15 \%$ quantile regression: less educated single women

Fig. 3. Relative total consumption: single mothers vs. single women without children, 1984-2000.


Fig. 4. Relative total consumption: single mothers vs. married mothers, 1984-2000.

## Single With Two or More Children

## Explaining EIC: 4 steps

## 4.Take-home

 Message
## The EIC (Earned Income Credit) is a tax refund that gives families as much as $\$ 4,500$ per year.

We want to explain how the EIC works to help you decide how much to work and earn this year. In 2006, you made $\$ 10,000 \_$you are getting an EIC of $\$ 4,000$ in your refund.

- Your earnings this year (in 2007) will determine the size of your EIC refund next year
- The EIC has 3 ranges: 1) Increasing, 2) Peak, 3) Decreasing

1. Fill in


## 2. Explain

 and dot graph
## 3. Table

Year 2 Earnings Distributions: 1 Dep., Clients of Complying Tax Preparers


Year 2 Earnings Distributions: 2+ Deps., Complying Tax Preparers


Self-Employed Clients of Complying Tax Professionals: 1 Dependent


Self-Employed Clients of Complying Tax Professionals: 2+ Dependents



TABLE IV
Elasticities: Grouping Instruments: Cohort and Education

|  |  |  |  | Group Means: |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Wage |  | Other Income | Hours | Wage | Income |
| No Children | 0.140 |  | 0.000 | 32 | 2.97 | 88.63 |
|  | $(0.075)$ | $(0.088)$ | $(0.041)$ |  |  |  |
| Youngest Child 0-2 | 0.205 | 0.301 | -0.185 | 20 | 3.36 | 129.69 |
|  | $(0.128)$ | $(0.144)$ | $(0.104)$ |  |  |  |
| Youngest Child 3-4 | 0.371 | 0.439 | -0.173 | 18 | 3.10 | 143.64 |
|  | $(0.150)$ | $(0.159)$ | $(0.139)$ |  |  |  |
| Youngest Child 5-10 | 0.132 | 0.173 | -0.102 | 21 | 2.86 | 151.13 |
|  | $(0.117)$ | $(0.127)$ | $(0.109)$ |  |  |  |
| Youngest Child 11 + | 0.130 | 0.160 | -0.063 | 25 | 2.83 | 147.31 |
|  | $(0.107)$ | $(0.117)$ | $(0.084)$ |  |  |  |

Note: Asymptotic standard errors in parentheses.
Source: Blundell et al. (1998), p. 846


Figure I
Hours-Wage Relationships

## TABLE II <br> OLS Log Hours Worked Equations

| Sample | TRIP |  | TLC1 |  | TLC2 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Log hourly wage | -.411 | -.186 | -.501 | -.618 | -.355 |
|  | $(.169)$ | $(.129)$ | $(.063)$ | $(.051)$ | $(.051)$ |
| High temperature | .000 | -.000 | .001 | .002 | -.021 |
|  | $(.002)$ | $(.002)$ | $(.002)$ | $(.002)$ | $(.007)$ |
| Shift during week | -.057 | -.047 | -.004 | .030 | - |
|  | $(.019)$ | $(.033)$ | $(.035)$ | $(.042)$ |  |
| Rain | .002 | .015 | - | - | -.150 |
|  | $(.035)$ | $(.035)$ |  |  | $(.062)$ |
| Night shift dummy | .048 | -.049 | -.127 | -.294 | -.253 |
|  | $(.053)$ | $(.049)$ | $(.034)$ | $(.047)$ | $(.038)$ |
| Day shift dummy | - | - | .000 | .053 | - |
|  |  |  | $(.028)$ | $(.045)$ |  |
| Fixed effects | No | Yes | No | Yes | No |
| Adjusted $R^{2}$ | .243 | .484 | .175 | .318 | .146 |
| Sample size | 70 | 65 | 1044 | 794 | 712 |
| Number of drivers | 13 | 8 | 484 | 234 | 712 |

[^1] variables are described in Appendix 1.

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 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | n/ |
|  |  | Actual | Predicted |  | Tax Rate $\boldsymbol{\tau}$ | 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: Davis and Henrekson 2005


Source: Davis and Henrekson 2005

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




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



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




Female Employment by age - US, FR and UK 2005


Female Employment by age - US, FR and UK 1975


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




Figure 1a: 1987 Tax Holiday in Iceland

——— Empirical (Bianchi et al. 2001)


Figure 3.-Monthly employment rates.
Source: Card and Hyslop, 2005, p. 1734



Ramey and Francis AEJ'09 C. Females
Figure 2. Average Weekly Hours Worked per Person, by Age Group

## 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



## Earnings Distributions in Lowest and Highest Bunching Deciles



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
$\ldots$ Lowest Bunching Decile $--\_-$Highest Bunching Decile

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



Highest Sharp Bunching Decile

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



Highest Sharp
Bunching Decile Bunching Decile
Bunching Decile

Simulated EITC Credit Amount for Wage Earners Around First Child Birth



Highest Sharp Bunching Decile Bunching Decile

Number of EITC Qualifying Children Claimed Around Birth of $1^{\text {st }}$ Child


Figure I. Number of Families Receiving AFDC/TANF Cash Assistance, 1959-20 I3
Source: Falk (2016) (Families in millions)


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 I, 1999, include families receiving cash assistance from separate state programs (SSPs) with expenditures countable toward the TANF maintenance of effort requirement (MOE).

## Annual Employment Rates for Women

By Marital Status and Presence of Children, 1980-2009


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

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


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)

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

## FIGURE 1

## Effect of Notch on Taxpayer Behavior

## Panel A: Bunching at the Notch



FIGURE 2

## Effect of Notch on Density Distribution

Panel A: Theoretical Density Distributions


## 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 selfemployed 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 Yene cutofl tsedfbelong to the tax-favored side of the notch.

## FIGURE 5

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

Panel A: Notch at 300k


Panel C: Notch at 500k


Source: Kleven and Waseem '11

Panel B: Notch at 400k


Panel D: Notch at 600k


Figure 2. Maximum credit over time, constant 2013 dollars, by number of children


Source: Nichols and Rothstein (2015)






|  | 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\% |
| $\geq 1 \mathrm{M} \mathrm{SEK}$ | 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.

Cesarini, Lindqvist, Notowidigdo, Östling NBER WP 2015

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.

Cesarini, Lindqvist, Notowidigdo, Östling NBER WP 2015
(b) Evolution of Statutory Annual Wealth Tax Rates by Bracket Cutoff Tax rate $\tau$


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

Figure 1: The Personal Wealth Tax Schedule in Colombia
(a) Wealth Tax Liability as a Function of Reported Net Wealth (FY 2010)


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

Panel A: Firm Density


## Panel B: 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.

## EITC Schedule in 2017



## EITC Maximum Credit Over Time



Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children

———With Children
$\longrightarrow$ Without Children
Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children

———With Children
Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children

———With Children
Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children

$\longrightarrow$ With Children $\longrightarrow$ Without Children
Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children

$\longrightarrow$ With Children $\longrightarrow$ Without Children
Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children


Source: Kleven (2018)

## Labor Force Participation of Single Women

With and Without Children

———With Children ———Without Children ----- Unemployment
Source: Kleven (2018)

## Labor Force Participation of Single Women

 By Number of Children
$\longrightarrow 0$ children $\longrightarrow-1$ child $\longrightarrow 2$ children $\longrightarrow 3+$ children
Source: Kleven (2018)

## Labor Force Participation of Single Women

 By Number of Children
$\longrightarrow 0$ children $\longrightarrow-1$ child $\longrightarrow 2$ children $\longrightarrow 3+$ children
Source: Kleven (2018)

## Labor Force Participation of Single Women

 By Number of Children
$\longrightarrow 0$ children $\longrightarrow-1$ child $\longrightarrow 2$ children $\longrightarrow 3+$ children
Source: Kleven (2018)


Figure 2. Estimating Excess Bunching Using Empirical Densities

## 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)

| Year X | 19931994 | 19951996 | 19971998 | 1999 | 2000 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Tax base for assessment period X | Incomes realized in $1991+1992$ | Incomes realized in $1993+1994$ | Incomes realized in $1995+1996$ | Income realized in 1999 | Income realized in 2000 |
| Payment of tax liability owed for year X | During 1993 and 1994 | During 1995 and 1996 | During 1997 and 1998 | Provisional installments 1999, final assessment in 2000 | Provisional installments 2000 final assessment in 2001 |

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


## Timing of the Reform

## Blank Years in Each Canton



## 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)



## Employment Rate: Women (age 20-60)




## Average Wage Earnings: High-income Employees




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

## Mean Self-employment Earnings (excluding zeros)



## Empirical first stage

## Marginal Tax Rates <br> single workers without children



Note: Computed using own tax calculator (similar to the TAXSIM in the U.S.).

## Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500. Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19\%, 39\%, 27\% and 36\%.

## Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500. Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19\%, 39\%, 27\% and 36\%.

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## Earnings growth w.r.t. 2013



Note: average growth of (real) annual earnings w.r.t. 2013 within equally spaced bins of AR\$ 500. Sample: private sector wage earners. Growth winsorized at p99. Inflation: 19\%, 39\%, 27\% and 36\%.

## Evolution of RD estimates, 2011-2017



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

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.

Employment Rates of Men by Age, 2019


Source: OECD database online. Employment to population ratios.

## Employment Rates of Women by Age, 2019



Source: OECD database online. Employment to population ratios.

## Employment Rates of Men and Women, aged 25-54



Source: OECD database online.

## Employment Rates of Men and Women, aged 25-54



Source: OECD database online.

US female labor force participation, age 16-64


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

## Average Annual Hours of Work of Employees



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

Starting from a Means-Tested Program


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 $\gamma_{t}$ 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.

## Difference-in-Differences: Treated vs Control States (With Kids)



$\because$ ATR Treated States $\quad-*-$ ATR Synthetic Control States


Figure 1. Child Penalties in Earnings in Scandinavian Countries


Figure 2. Child Penalties in Earnings in EnglishSpeaking Countries


Event time (years)
--- Men - Austria $\quad$ Women - Austria

Figure 3. Child Penalties in Earnings in GermanSpeaking Countries


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.

Outcome $=$ Metabolic syndrome (index)


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.


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

## Negative Income Tax Experiment

$$
c=\mathrm{z}-\mathrm{T}(\mathrm{z}) \uparrow \begin{aligned}
& \text { NIT Treatment: } \\
& \text { Transfer G } \\
& \text { phased-out with } \\
& \text { earnings } \mathrm{z} \text { at tax } \\
& \text { rate } \tau
\end{aligned}
$$

## Negative Income Tax Experiment




[^0]:    Data are from the March CPS, 1985-1987 and 1989-1991. Pre-TRA86 years are 1984-1986. Post-TRA86 years are 1988-1990. Labor force participation equals one if annual

[^1]:    Dependent variable is the log of hours worked. Standard errors are in parentheses and are corrected for the nonfixed effects estimates in coulmns 1 and 3 to account for the panel structure of the data. Explanatory

