230B: 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 $\tau$ and demogrant $G \Rightarrow c = w^p(1 - \tau)l + G$

Individual solves

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

\[ c = w l + R \]

Marshallian Labor Supply
\[ l(w, R) \]

Indifference Curve

\[ c = \text{consumption} \]

slope = \( w \)

0  labor supply \( l \)
Labor Supply Theory

\[ c = \text{consumption} \]

utility \( u \)

slope = \( w \)

Hicksian Labor Supply

\( l^c(w, u) \)
Labor Supply Income Effect

\[ \eta = w \frac{\partial l}{\partial R} \leq 0 \]
Labor Supply Substitution Effect

utility \( u \)

slope = \( w \)

slope = \( w + \Delta w \)

\( \varepsilon^c = \frac{w}{l} \frac{\partial l^c}{\partial w} > 0 \)

\( l^c(w, u) \)

\( l^c(w + \Delta w, u) \)
Uncompensated Labor Supply Effect

\[ \varepsilon^u = \varepsilon^c + \eta \]

- **Income effect:** \( \eta \leq 0 \)
- **Substitution effect:** \( \varepsilon^c > 0 \)
BASIC CROSS SECTION ESTIMATION

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

Simple OLS regression:

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

\( w_i \) is the net-of-tax wage rate

\( y_i \) measures non-labor income [including spousal earnings for couples]

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

\( \beta \) measures uncompensated wage effects, and \( \gamma \) income effects [can be converted to \( \epsilon^u, \eta \)]
BASIC CROSS SECTION RESULTS

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

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

2. **Female workers** [secondary earners when married] (Killingsworth and Heckman, 1986):

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

   Female labor supply elasticities have declined overtime as women become more attached to labor market (Blau-Kahn JOLE’07)
KEY ISSUE: $w$ correlated with tastes for work

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

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

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

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

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

$\Rightarrow$ Tax changes provide more compelling identification
Negative Income Tax (NIT) Experiments

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

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

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

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


6) Several groups, with randomization within each; approx. $N = 75$ households in each group
<table>
<thead>
<tr>
<th>Program Number</th>
<th>$G$ ($)</th>
<th>$\tau$</th>
<th>Declining Tax Rate</th>
<th>Break-even Income ($)</th>
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<tr>
<td>1</td>
<td>3,800</td>
<td>.5</td>
<td>No</td>
<td>7,600</td>
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<td>11</td>
<td>5,600</td>
<td>.8</td>
<td>Yes</td>
<td>10,360</td>
</tr>
</tbody>
</table>

Source: Ashenfelter and Plant (1990), p. 403
Disposable income $c = z - T(z)$

Starting from a Means-Tested Program

Pre-tax earnings $z$

Disposable income

$G$

$45^\circ$

$w^*$

0

Pre-tax earnings $z$
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)

6) Earnings of treated women who were working before the experiment did not change much
From true experiment to “natural experiments”: income effects on lottery winners

True experiments are costly to implement and hence rare

Real economic world provides variation that can be exploited to estimate behavioral responses ⇒ 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

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

Identification threat: differential response-rate among groups
FIGURE 2. PROPORTION WITH POSITIVE EARNINGS FOR NONWINNERS, WINNERS, AND BIG WINNERS

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

On average the individuals in our basic sample won yearly prizes of $26,000 (averaged over the $55,000 for winners and zero for nonwinners). Typically they won 10 years prior to completing our survey in 1996, implying they are on average halfway through their 20 years of lottery payments when they responded in 1996. We asked all individuals how many tickets they bought in a typical week in the year they won the lottery. As expected, the number of tickets bought is considerably higher for winners than for nonwinners. On average, the individuals in our basic sample are 50 years old at the time of winning, which, for the average person was in 1986; 35 percent of the sample was over 55 and 15 percent was over 65 years old at the time of winning; 63 percent of the sample was male. The average number of years of schooling, calculated as years of high school plus years of college plus 8, is equal to 13.7; 64 percent claimed at least one year of college.

We observe, for each individual in the basic sample, Social Security earnings for six years preceding the time of winning the lottery, for the year they won (year zero), and for six years following winning. Average earnings, in terms of 1986 dollars, rise over the pre-winning period from $13,930 to $16,330, and then decline back to $13,290 over the post-winning period. For those with positive Social Security earnings, average earnings rise over the entire 13-year period from $20,180 to $24,300. Participation rates, as measured by positive Social Security earnings, gradually decline over the 13 years, starting at around 70 percent before going down to 56 percent. Figures 1 and 2 present graphs for average earnings and the proportion of individuals with positive earnings for the three groups, nonwinners, winners, and big winners. One can see a modest decline in earnings and proportion of individuals with positive earnings for the full winner sample compared to the nonwinners after winning the lottery, and a sharp and much larger decline for big winners at the time of winning. A simple difference-in-differences type estimate of the marginal propensity to earn out of unearned income (mpe) can be based on the ratio of the difference in the average change in earnings before and after winning the lottery for two groups and the difference in the average prize for the same two groups. For the winners, the difference in average earnings over the six post-lottery years and the six pre-lottery years is -$1,877 and for the nonwinners the average change is $448. Given a difference in average prize of $55,000 for the winner/nonwinner comparison, the estimated mpe is $(-1,877 - 448)/55,000 = -0.042$ (SE 0.016). For the big-winners/small-winners comparison, this estimate is -0.059 (SE 0.018). In Section IV we report estimates for this quantity using more sophisticated analyses.

On average the value of all cars was $18,200. For housing the average value was $166,300, with an average mortgage of $44,200. We aggregated the responses to financial wealth into two categories. The first concerns retirement

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**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
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: \( \eta = \frac{w \partial l}{\partial y} \simeq -0.1 \)

3) Effects on spouse but not as large as on winner ⇒
   a) Either lottery players have higher income effects than spouse
   b) or Rejects the unitary model of household labor supply:
      \[ \max u(c_1, c_2, l_1, l_2) \text{ st } c_1 + c_2 \leq w_1l_1 + w_2l_2 + R \Rightarrow \text{only household } R \text{ matters} \]
<table>
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<th></th>
<th>Pooled Sample</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Share</td>
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<tr>
<td>0 to 1K SEK</td>
<td>25,172</td>
<td>10.0%</td>
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<tr>
<td>1K to 10K SEK</td>
<td>204,626</td>
<td>81.3%</td>
</tr>
<tr>
<td>10K to 100K SEK</td>
<td>16,429</td>
<td>6.5%</td>
</tr>
<tr>
<td>100K to 500K SEK</td>
<td>3,685</td>
<td>1.5%</td>
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<tr>
<td>500K to 1M SEK</td>
<td>355</td>
<td>0.1%</td>
</tr>
<tr>
<td>≥1M SEK</td>
<td>1,481</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

TOTAL          | 251,748| 222,476| 25,435| 3,268  | 569   | 100.0% |

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

Cesarini, Lindqvist, Notowidigdo, Östling NBER WP 2015
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
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) ⇒ almost pure substitution labor supply effect

Tazhitdinova '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 ⇒ 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

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.

Electronic copy available at: https://ssrn.com/abstract=3047332

Source: Tazhitdinova (2019)
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Married Women Elasticities: Blau and Kahn ’07

1) Identify elasticities from 1980-00 using grouping instrument
   a) Define cells (year \times age \times education) and compute mean wages
   b) Instrument for actual wage with mean wage in cell

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

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

4) Interpretation: elasticities shrink as women become more attached to the labor force
Summary of Static Labor Supply Literature (SKIP)

1) Small elasticities for prime-age males

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

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

3) Responses driven primarily by extensive margin

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

b) Intensive margin (hours) elasticity smaller
Responses to Low-Income Transfer Programs

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

2) Complicated set of transfer programs in US

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

b) Cash: TANF, EITC, SSI

3) See Gruber undergrad textbook for details on institutions
1996 US Welfare Reform

1) Reform modified AFDC cash welfare program to provide more incentives to work (renamed TANF)
   a) Requiring recipients to go to job training or work
   b) Limiting the duration for which families able to receive welfare
   c) Reducing phase-out rate of benefits


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

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 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 (but need to start working by month 12 to get it)

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

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

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

2) Effect quickly vanishes when the subsidy stops after 36 months (entirely gone by month 52)
and control groups. Unfortunately, these data have some critical limitations relative to the administratively based Income Assistance data. Most importantly, they are only available for 52 months after random assignment. Since some program group members were still receiving subsidy payments as late as month 52, this time window is too short to assess the long-run effects of the program. Indeed, looking at Figure 1a, there is still an impact on IA participation in month 52 that does not fully dissipate until month 69. Second, because of nonresponses and refusals, labor market information is only available for 85% of the experimental sample (4,757 people).28 Third, there appear to be relatively large recall errors and seam biases in the earnings and wage data.29

Nevertheless, the labor market outcomes provide a valuable complement to the administratively based welfare participation data.

Figure 3 shows the average monthly employment rates of the program and control groups, along with the associated experimental impacts. After random assignment the employment rate of the control group shows a steady

![Graph showing monthly employment rates]

**Figure 3.**—Monthly employment rates.

Source: Card and Hyslop, 2005, p. 1734

Each of the three post-random-assignment surveys asked people about their labor market outcomes in the 18 months since the previous survey. Many people report constant earnings over the recall period, leading to a pattern of measured pay increases that are concentrated at the seams, rather than occurring more smoothly over the recall period.
**Earned Income Tax Credit (EITC) program**

Kleven (2019) provides comprehensive 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 Maximum Credit Over Time

Source: Kleven (2018)
Labor Force Participation of Single Women
With and Without Children

50 years of relative stability, apart from these 5 years

Unemployment Rate

Labor Force Participation (%)

Year

With Children

Without Children

Annual Employment

Low Education

Source: Kleven (2018)
Labor Force Participation of Single Women
With and Without Children

50 years of relative stability, apart from these 5 years

Unemployment Rate

Annual Employment
Low Education

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

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

Annual Employment
Low Education

Source: Kleven (2018)
Source: Kleven (2018)
Labor Force Participation of Single Women
By Number of Children

Much larger increase by those with 3+ kids

Source: Kleven (2018)
Labor Force Participation of Single Women
By Number of Children

Tax Reduction Act of 1975 TRA86 OBRA90 OBRA93 ARRA
But no increase here by those with 3+ kids

Source: Kleven (2018)
Kleven ’19: no labor supply responses to state EITCs

30 states have implemented EITC supplements

Kleven ’19 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

⇒ State EITC reforms deliver a pretty compelling zero effect
Difference-in-Differences: Treated vs Control States (With Kids)

3-Year Effect = -1.21
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

Sociological evidence shows that welfare reform “scared” single mothers into working (waiver states show labor supply effect sooner, Kleven ’19)

Single moms in the US were suddenly expected to work

Kleven (2019): Maybe a unique combination of EITC reform, welfare reform, economic upturn, and changing social norms lead to this shift
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.
Bunching at Kinks (Saez AEJ-EP’10)

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

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

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

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

⇒ 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)
elasticity would no longer be a pure compensated elasticity, but a mix of the compensated elasticity and the uncompensated elasticity. Four points should be noted. First, the larger the behavioral elasticity, the more bunching we should expect. Unsurprisingly, if there are no behavioral responses to marginal tax rates, there

Panel A. Indifference curves and bunching

Before tax income $z$

Individual $L$ indifference curve

Individual $H$ indifference curves

Slope $1 - t$

Slope $1 - t - dt$

Individual $L$ chooses $z^*$ before and after reform
Individual $H$ chooses $z^* + dz^*$ before and $z^*$ after reform

$dz^*/z^* = e dt/(1 - t)$ with $e$ compensated elasticity

Before tax income $z$

Source: Saez (2010), p. 184
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Panel A. Indifference curves and bunching

Before tax income $z$

Slope

$1 - t$

$z^*$

$dz^*$

IndividuaL L chooses $z^*$ before and after reform

IndividuaL H chooses $z^* + dz^*$ before and after reform

$dz^*/z^* = e dt/(1 - t)$ with $e$ compensated elasticity

Panel B. Density distributions and bunching

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 $z$

Source: Saez (2010), p. 184
Before reform: linear tax rate $t_0$, density $h_0(z)$

After reform: tax rate $t_0$ below $z^*$
Tax rate $t_1$ above $z^*$ ($t_1 > t_0$), density $h(z)$
Bunching at Kinks (Saez AEJ-EP’10)

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

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

3) Finds bunching around:

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

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

4) However, no bunching observed around all other kink points
EITC Amount as a Function of Earnings

- Subsidy: 40%
- Subsidy: 34%
- Phase-out tax: 16%
- Phase-out tax: 21%

Source: Federal Govt
Two elements are worth noting in Figure 3. First, there is a clear clustering of tax filers around the first kink point of the EITC. In both panels, the density is maximum exactly at the first kink point. The fact that the location of the first kink point differs between EITC recipients with one child, versus those with two or more children, constitutes strong evidence that the clustering is driven by behavioral responses to the EITC as predicted by the standard model. Second, however, we cannot discern any...
indexes earnings to 2008 using the IRS inflation parameters, so that the EITC kinks are perfectly aligned for all years.

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Panel A. One child

Panel B. Two children or more

Notes: The figure displays the histogram of earnings (by $500 bins) for tax filers with one dependent child (panel A) and tax filers with two or more dependent children (panel B). The histogram includes all years 1995–2004 and inflates earnings to 2008 dollars using the IRS inflation parameters (so that the EITC kinks are aligned for all years). Earnings are defined as wages and salaries plus self-employment income (net of one-half of the self-employed payroll tax). The EITC schedule is depicted in dashed line and the three kinks are depicted with vertical lines. Panel A is based on 57,692 observations (representing 116 million tax returns), and panel B on 67,038 observations (representing 115 million returns).

Similarly, we cannot discern any gap in the distribution of earnings around the concave kink point where the EITC is completely phased-out. This differential response to the first kink point, versus the other kink points, is surprising in light of the standard model predicting that any convex (concave) kink should produce bunching (gap) in the distribution of earnings.

In Figure 4, we break down the sample of earners into those with nonzero self-employment income versus those with zero self-employment income (and hence whose self-employment income is zero).

Panel A. One child

Panel B. Two or more children

Figure 4. Earnings Density and the EITC: Wage Earners versus Self-Employed

Notes: The figure displays the kernel density of earnings for wage earners (those with no self-employment earnings) and for the self-employed (those with nonzero self-employment earnings). Panel A reports the density for taxpayers with one dependent child and panel B for taxpayers with two or more dependent children. The charts include all years 1995–2004. The bandwidth is $400 in all kernel density estimations. The fraction self-employed is 16.1 percent and 20.5 percent in the population depicted on panels A and B (in the data sample, the unweighted fraction self-employed is 32 percent and 40 percent). We display in dotted vertical lines around the first kink point the three bands used for the elasticity estimation with \( \delta = $1,500. \)

Source: Saez (2010), p. 192
systematic clustering around the second kink point of the EITC. Similarly, we cannot discern any gap in the distribution of earnings around the concave kink point where the EITC is completely phased-out. This differential response to the first kink point, versus the other kink points, is surprising in light of the standard model predicting that any convex (concave) kink should produce bunching (gap) in the distribution of earnings.

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Earnings density

0

5,000 10,000 15,000 20,000 25,000 30,000 35,000 40,000 45,000 50,000

Earnings (2008 $)

Wage earners

Self-employed

EIC amount

Panel A. One child

Earnings density

0

5,000 10,000 15,000 20,000 25,000 30,000 35,000 40,000 45,000 50,000

Earnings (2008 $)

Wage earners

Self-employed

EIC amount

Panel B. Two or more children

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Source: Saez (2010), p. 192
Why not more bunching at kinks?

1) True intensive elasticity of response may be small

2) Randomness in income generation process: Saez (1999) shows that year-to-year income variation too small to erase bunching if elasticity is large

3) Frictions: Adjustment costs and institutional constraints (Chetty, Friedman, Olsen, and Pistaferri QJE’11)

4) Information and salience
EITC Behavioral Studies

Evidence of response along extensive margin but little evidence of response along intensive margin (except for self-employed) ⇒ Possibly due to lack of understanding of the program

Qualitative surveys show that:

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

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

Such confusion might be good for the government as the EITC induces work along participation margin without discouraging work along intensive margin (Liebman-Zeckhauser ’04, Rees-Jones and Taubinsky ’16)
Chetty, Friedman, Saez AER’13 EITC heterogeneity

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

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

⇒ 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

⇒ Evidence of wage earnings response along intensive margin
Earnings Distributions in Lowest and Highest Bunching Deciles

Source: Chetty, Friedman, and Saez NBER'12
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 2008

Source: Chetty, Friedman, and Saez NBER'12
Income Distribution For Single Wage Earners with One Child

Is the EITC having an effect on this distribution?

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

Source: Chetty, Friedman, and Saez NBER'12
IMPLICATIONS OF ROLE OF INFORMATION

Empirical work:

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

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

Cannot identify structural parameters of preferences without modeling information and salience

Normative analysis:

Information is a powerful and inexpensive policy tool to affect behavior

Should be incorporated into optimal policy design problems
Value of Administrative data

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

1) Size (often full population available)

2) Longitudinal structure (can follow individual across years)

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

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

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

Recipients get EITC with tax refund in a single annual refund in Feb year $t + 1$ which seems suboptimal: (a) free interest loan to govt and (b) harder to smooth consumption [surveys show that primary use of tax refund is to pay overdue bills]

Tax filers have option to use Advance EITC to get part of EITC in the paycheck by filing a W5 form with employer [reverse of tax withholding]: take up extremely low ($<2\%$)

Possible explanation: (a) Information, (b) Lack of employer cooperation, (c) Risk of owing taxes if not EITC eligible, (d) Tax filers like big refunds, (e) Inertia (default is no Advance EITC)
ADVANCE EITC

Jones AEJ-AP’10 carries a randomized experiment with large employer to encourage take-up and gets significant but very small take-up effect suggesting that (a) [Information] and (b) [Employer cooperation] cannot explain low take-up

(d) [Love of refunds] seems plausible but (1) not supplied by market absent refunds [employers could also pay part of wages as annual lumpsum], (2) A-EITC use has not increased with EITC expansions

(c) [Risk of owing taxes] and (e) [Inertia] are likely part of the explanation

Interesting research topic: Have big tax refunds fueled low income credit [tax refund loans, payday loans, etc.]? Are big refunds useful forced saving mechanisms?

Biden expanded Child Tax Credit was 50% monthly
Bunching at Notches: Kleven and Waseem ’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.

⇒ Bunching below the notch and gap in density just above the notch.

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

They show clean prior-year counterfactual overcoming the Blomquist et al. ’21 critique.
FIGURE 1
Effect of Notch on Taxpayer Behavior

Panel A: Bunching at the Notch

Panel B: Comparing the Notch to a Hypothetical Kink

Effect of Notch on Taxpayer Behavior

Source: Kleven and Waseem '11
FIGURE 2
Effect of Notch on Density Distribution

Panel A: Theoretical Density Distributions

Source: Kleven and Waseem '11
Figure 1: The Personal Wealth Tax Schedule in Colombia

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

Wealth tax $T(W_r)$ (million COP)

Reported wealth $W_r$ (billion COP)

| Percentile | Wealth Tax Rate |
|------------|----------------|-----------|
| 0%         | 0%             | 0%        |
| 1%         | 1%             | 3%        |
| 1.4%       | 3%             |
| 6%         |                 |

Notes:
- These figures depict the personal wealth tax schedule for Colombia.
- Panel (a) plots wealth tax liability by reported wealth $W_r$ in FY 2010.
- Each bracket of $W_r$ is associated with a fixed average tax rate on taxable net wealth.
- As a result, wealth tax liability $T(W_r)$ jumps discretely at the notch points.
- That year, the wealth tax brackets affected the top 0.12%, top 0.04%, top 0.02%, and top 0.01%, respectively.
- Panel (b) plots the statutory wealth tax rate FY 2000–2018.
- Wealth tax eligibility is determined using (taxable and non-taxable) net worth in all years but 2001, when it is determined using gross wealth.
- In 2015–2018, eligibility is established in 2014.
- Tax brackets are expressed in current values for all years except 2004 and 2005 (2003 pesos).
- The tax schedule refers to average tax rates for all brackets in FY 2001–2010. In FY 2014–2018, only the first bracket is an average tax rate; the rest are marginal rates.

Source: Table A.1

Source
Londono 2018
(b) Evolution of Statutory Annual Wealth Tax Rates by Bracket Cutoff

Tax rate $\tau$

Bracket cutoff:
- 1 billion pesos
- 2 billion pesos
- 3 billion pesos
- 5 billion pesos

Source: Table A.1
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

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
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 comes most often from avoidance/evasion rather than real behavior.

2. Bunching is almost always small relative to conventional elasticity estimates.
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.
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


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.
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Intertemporal Labor Supply: High Frequency

Frisch elasticity \( e^F \): changing wages in a single period and keeping marginal utility of income \( \lambda \) 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

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 elasticity to generate realistic employment fluctuations
Intertemporal substitution: Tax Holiday in Iceland

In 1987, Iceland transitioned from paying taxes on previous year’s income to current 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 ⇒ unanticipated temporary tax change

Temporary change in incentives ⇒ 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]

Siggurdsson (2019) 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]
Figure 1a: 1987 Tax Holiday in Iceland

Employment Rate

Year


Empirical (Bianchi et al. 2001)

75% 80% 85% 90% 95%
Tax Holiday in Swiss Cantons

Martinez, Saez, Siegenthaler '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)

Key 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

Blank Years in Each Canton

- 1997/98, federal and cantonal
- 1997/98 federal, 1998 cantonal
- 1999/00, federal and cantonal
- 1999/00 federal, 2000 cantonal
- 1999/00, federal tax only
- 2001/02, federal and cantonal
- No blank years
Average Income Tax Rates over Time

Total federal, cantonal and municipal tax, single taxpayer; weighted by municipality population.
Marginal Income Tax Rates over Time

- Marginal tax rate in % at a gross income of 100K CHF (real value 2010)
- Tax Holiday in...
- Total federal, cantonal and municipal tax, single taxpayer; weighted by municipality population.
Employment Rate: Men (age 20-60)

Data source: AHV-STATPOP
Average Wage Earnings: High-income Employees

High income: avg. real wage earnings in 1994-1996 > 100k CHF/year
Mean Self-employment Earnings (excluding zeros)
Income Tax Holiday for High Earners in Argentina

In late August 2013, Argentina implemented an income tax holiday for wage earners with monthly earnings below $15K in Jan-Aug 2013 (predetermined), lasted until Feb 2016

Tortarolo (2019) proposes an Regression Discontinuity (RD) design using monthly social security admin earnings data

Compares workers with earnings just below $15K (treatment) vs. workers with earnings just above $15K

Evidence shows a pretty precisely estimated zero but some small significant effect on overtime hours

⇒ High wage earners cannot respond by themselves without help from employers
Empirical first stage

Marginal Tax Rates

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%.
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Evolution of RD estimates, 2011-2017

Excess earnings growth (%)

Reform
Post-repeal

Note: with $e = 0.3$ (thought experiment), excess earnings growth would be 7.5%.
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
$\max u(c, l) \text{ s.t. } c = wl + R$ 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: OECD database online. Employment to population ratios.
Source: Saez AEA-PP'21
Employment Rates of Women by Age, 2019

Source: OECD database online. Employment to population ratios.

Source: Saez AEA-PP’21
Employment Rates of Men and Women, aged 25-54

Source: OECD database online.

Source: Saez AEA-PP’21
US female labor force participation, age 16-64


25% increase in 1943-1945 during WW2 planned economy

Source: Saez AEA-PP’21
Average Annual Hours of Work of Employees

Source: Saez AEA-PP’21

US has 40 hour/week and no mandatory paid vacation

1968: 4th week of paid vacation

1982: 5th week + 39 hours/week

2000-2: 35 hours/week

Source: OECD database online. Includes all ages, genders, and part-time, full-time, overtime.
Figure 2. Average Weekly Hours Worked per Person, by Age Group

Ramey and Francis AEJ'09

Source: Authors' estimates, based on information from Kendrick (1961, 1973), the census, and the CPS.
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
Culture of Welfare across Generations

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

Correlation in welfare use across generations is obviously not necessarily causal

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

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

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

Mechanism seems to be learning about DI availability rather than reduced stigma from using DI [because no effect on other welfare programs use]
Figure 3: Effect of Judge Leniency on Parents (First Stage) and Children (Reduced Form).

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

Source: Dahl, Kostol, Mogstad (2013)
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