Adjustment Costs and Incentives to Work: Evidence from a Disability Insurance Program

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January 2018

Motivation

- A common assumption in labor supply models: individuals choose their optimal labor supply with no adjustment costs.
- It has been suggested that individuals face adjustment costs when changing their labor supply (Chetty et.al., 2009; Chetty et al., 2011; Chetty, 2012; Chetty et al., 2012b; Chetty et.al, 2013; Kleven et al., 2013).
- Adjustment costs: factors that make it harder for individuals to change their labor supply.
    - Time and financial costs of searching for a new job, negotiating hours with a current employer, understanding the policy change or emotional costs of mental stress from working.
- Very little empirical evidence on adjustment costs.

Motivation

- I estimate adjustment costs in a Disability Insurance (DI) program.
- DI programs are one of the largest social insurance programs in advanced countries (2.5% of GDP in OECD countries).
    - Provide benefits to individuals with health conditions that limit the kind or amount of work they can perform.
- Concerns about governments' high spending on DI programs.
- DI programs have been criticized for causing disincentives to work.
    - DI recipients lose all or a fraction of benefits if earnings exceed an exempt threshold.

Motivation

Anecdotal US. evidence in the Bureau of Labor Statistics report, April 24, 2013:

PERSONS WITH A DISABILITY: BARRIERS TO EMPLOYMENT, TYPES OF ASSISTANCE, AND OTHER LABOR–RELATED ISSUES — MAY 2012

"In May 2012, **half of all persons with a disability who were not working reported some type of barrier to employment**, the US. Bureau of Labor Statistics reported today. Lack of education or training, lack of transportation, the need for special features at the job, and a person's own disability were among the barriers reported. **Among persons with a disability who were employed, over half had some difficulty completing their work duties because of their disability**."

Related literature I

- Many countries recently implemented – or are considering – policies to provide incentives to work (US, UK, Norway and Switzerland).
  - Individuals eventually exit the program.
- Empirical findings on effectiveness of these policies are mixed.
  - **No effect:** Hoynes and Moffitt (1999), Benitez-Silva, Buchinsky and Rust (2011) and Butler, Deuchert, Lechner, Staubli and Thiemann (2015): in the US and Switzerland.
  - **Positive effects:** Campolieti and Riddell (2012), Kostol and Mogstad (2014) and Ruh and Staubli (2016): in Canada, Norway and Austria.
- Size of adjustment costs versus incentives to work might explain mixed findings.

Related literature II

- Adjustment costs explain differences in elasticity of earnings in micro versus macro studies (Chetty et al., 2011, Chetty 2012, Chetty et.al. 2012).
- Size of adjustment costs is important for evaluating welfare effects of policy changes (Chetty et al. 2009).
- Search costs and hours constraints affect labor supply decisions (Pencavel 1986, Altonji and Paxson 1988, Dickens and Lundberg 1993, Ham 1991, Blundell and MaCurdy 1999).
- Changes in hours are lumpy, providing evidence of adjustment costs (Altonji and Paxson 1992).
- Empirical evidence on adjustment costs is scarce, except to:
    - Gelber, Jones and Sacks (2017) estimate fixed adjustment costs.
- I extend the model of Gelber et. al (2017) by allowing for heterogeneous adjustment costs.
    - Importance for policy design.

My work I

- Exploit a policy change in a DI program in Canada, Alberta.
  - Benefits are deducted if earnings exceed an exemption threshold.
  - Marginal tax above the threshold is 50% (discontinuous change in tax rate: kink).
  - Policy change:
    - Doubled exemption threshold.
    - Increased the maximum benefits by 35%.
- Use information on bunching to estimate heterogeneous adjustment costs.
  - Bunching at a kink: informative on elasticity of earnings.
  - Speed of earnings adjustment to policy change: information on adjustment costs.
  - Find evidence for adjustment costs, large heterogeneity.

My work II

- Difference-in-Differences (DD) design to measure overall effects of the policy change
  - Analysis using only bunching captures effects on earnings around kink.
  - Overall effects on labor supply might be much larger $\Rightarrow$ Can capture this with DD.
  - Use Ontario's DI program as control group.
  - Find that policy is effective in increasing labor supply both at intensive and extensive margins.

Assured Income for the Severely Handicapped (AISH)

- Provincial DI program in Alberta, Canada.
- Eligibility criteria:
  - Medically documented disability.
  - Age: 18-64 years old adults.
  - Assets: Personal total net assets less than $100K.
- Benefits: monthly allowances, supplementary benefits (i.e. health insurance, bus pass).
- Ontario's DI program provides similar benefits.

How AISH works?

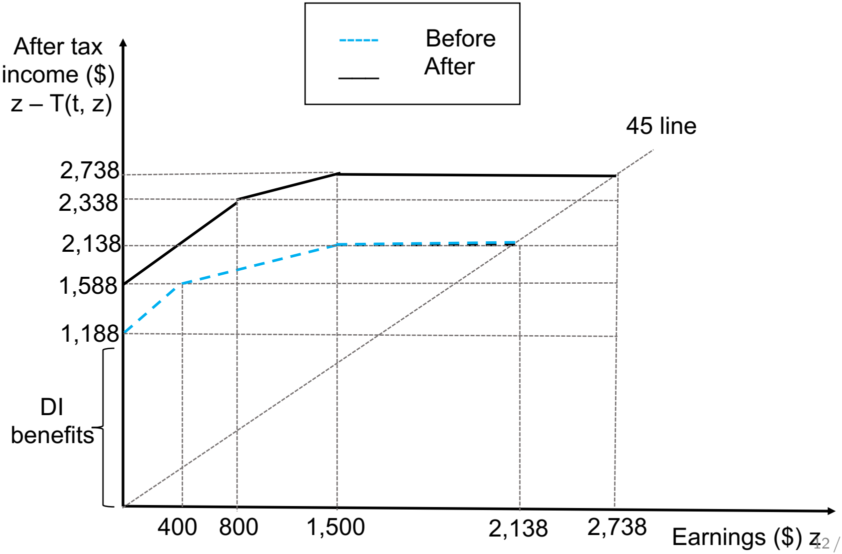
- Individuals can work and still collect a portion of their benefits.
- Earnings below an exemption threshold do not affect the benefits.
- Earnings above the exemption threshold are taxed at 50%.
- Exemption threshold is higher for those with dependents.
- Policy change in April 2012: dramatic decrease in marginal tax on earnings $\Rightarrow$ large incentives to work.

Data and study sample

- Administrative data from the Government of Alberta and Ontario.
    - Estimating adjustment costs: AISH.
    - DD analysis: AISH and Ontario's data.
- Longitudinal monthly data on earning and benefits.
- Includes individual characteristics sex, age, age DI awarded at, marital status, family size, living location and ICD-9 codes.
- Study sample: 18 years and older with non-physical disabilities (about half of the all disability types).

	AISH		ODSP	
	Before	After	Before	After
Labor market statistics				
Positive earnings (%)	48.1	48.4	9.9	9.4
Mean monthly earnings (2012$)	255	285	50	55
	(420)	(470)	(235)	(245)
Mean monthly net benefits (2012$)	1,160	1,530	1,020	1,015
	(120)	(150)	(470)	(460)
Number of new DI awards	1,215	636	8,440	9,965
Background characteristics				
Male (%)	55.3	55.4	53.4	53.9
Mean age (years)	38.5	39.8	43.0	42.9
	(12.5)	(12.8)	(12.6)	(12.9)
Mean age DI awarded at	28.8	29.1	33.2	33.1
	(11.1)	(11.4)	(11.8)	(11.9)
Has no dependent	91.3	90.8	82.1	82.2
Type of disability				
-Psychotic (%)	42.1	42.1	42.6	43.5
-Neurological (%)	50.1	51.0	36.3	36.4
-Mental (%)	7.3	6.9	21.1	20.2
Live in metropolitan area (%)	49.5	48.9	29.1	29.0
Mean number of individuals	8,940	9,890	142,970	160,775
Total number of observations	214,595	237,285	3,431,300	3,385,615

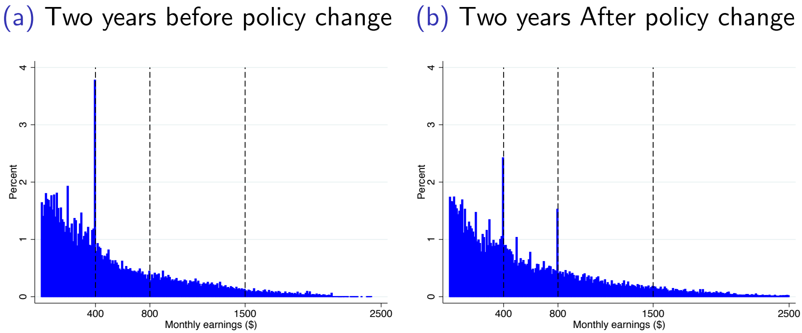
Policy change in AISH



Bunching at the kinks

- With no adjustment costs:
  - Before policy change: bunching at the kink.
  - After policy change: bunching at the kink disappears immediately, bunching at the the new kink.
- With Adjustment costs:
  - Before policy change: “attenuated” bunching at the kink.
  - After policy change: still bunching at the old kink, “attenuated” bunching at the new kink.

Density of earnings



Adjustment costs in AISH

- Strong behavioral responses to incentives to work.
    - Many individuals locate right below the threshold, where marginal tax is lower.
- Bunching at the old kink after the policy change suggests that individuals face adjustment costs when changing their labor supply.
- Conceptually, bunching should increase with elasticity of earnings and decrease with adjustment costs.

Estimating size of adjustment costs

- Extend Gelber, Jones and Sacks (2017) for estimating fixed adjustment costs.
- I allow for heterogeneous adjustment costs: vary by individuals' ability.
  - Ability: earnings if no tax would have been imposed (potential earnings).
- Use change in bunching induced by the policy change in AISH.
  - Location of a kink is shifted up whereas in Gelber et. al (2017) size of a kink is changed.
  - Intuitively: I observe more moments of bunching and can estimate more parameters.

Estimation strategy

Assume individuals face adjustment costs $\phi = \phi_1 + \phi_2\alpha$ where α is individuals ability to work.

1. Estimate bunching at each kink.
   - Fit a polynomial to the observed density of earnings.
   - Bunching: the difference between fitted polynomial and observed density.
2. Back out the earnings of marginal buncher at each kink from estimated bunching.
3. Marginal buncher condition at each observed bunching (3 equations).
   - Quasi-linear utility function:

     $$u(z) = z - T(z,\tau) - \alpha^{-1/e}\frac{z^{1+1/e}}{1+1/e}$$
   - Individuals choose their labor earnings z to maximize their utility.
4. Solve the three equations simultaneously for e, ϕ_1 and ϕ_2.

Estimation strategy

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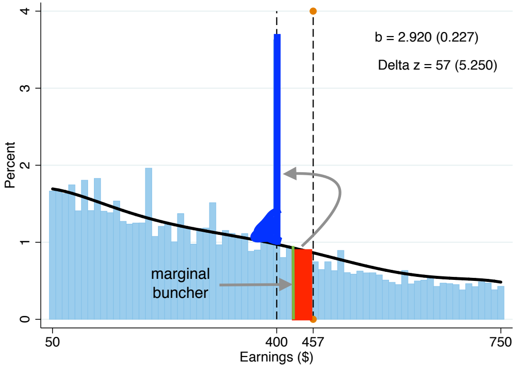
Fitted polynomial and marginal buncher at exemption threshold

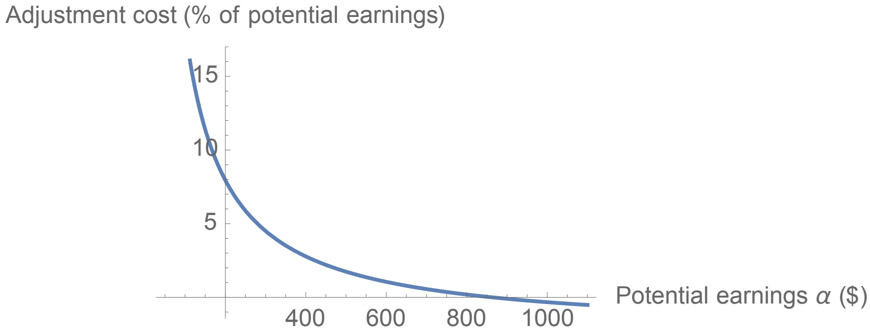
- Those with higher initial earnings gain more from bunching at a kink.
  - Marginal buncher condition: being indifferent on staying at their initial earnings or enduring adjustment costs and relocating to the kink.



Adjustment costs estimates

	Bunching at \$400 before b_1^0	Response at \$400 before Δz_1^{*0}	Bunching at \$400 after b_1^1	Bunching at\$800 after b_2	Response at \$800 after Δz_2^*	Elasticity of earnings e	Adjustment costs ϕ_1	Adjustment costs ϕ_2
Adjustment costs								
Heterogeneous	2.92***	56.90***	1.95***	1.88***	113.80***	0.19***	20.69***	-0.03***
	(0.23)	(5.25)	(0.11)	(0.39)	(10.50)	(0.02)	(1.18)	(0.00)
Fixed	2.92***	62.61***	1.95***			0.21***	11.93***	
	(0.23)	(6.03)	(0.11)			(0.02)	(0.97)	
No cost	2.92***	29.00***				0.10***		
	(0.23)	(2.27)				(0.01)		

Heterogeneous adjustment costs



Findings on adjustment costs

- Higher adjustment costs for those with lower ability.
- Adjustment costs ranges from zero to 8 percent of the potential earnings.
- Adjustment costs has large impacts on estimated elasticity of earnings.
  - Estimated elasticity accounting for adjustment costs is twice as large as the one with no adjustment costs.
- Estimates using information on bunching uses a sub-sample of individuals who bunch at a kink.
  - Bunching at a kink indicates that they are more flexible in changing their labor supply.
  - Existence of adjustment costs even for them magnifies impact of adjustment costs.
- Policy implications of heterogeneous adjustment costs.
  - Target groups for providing supports.

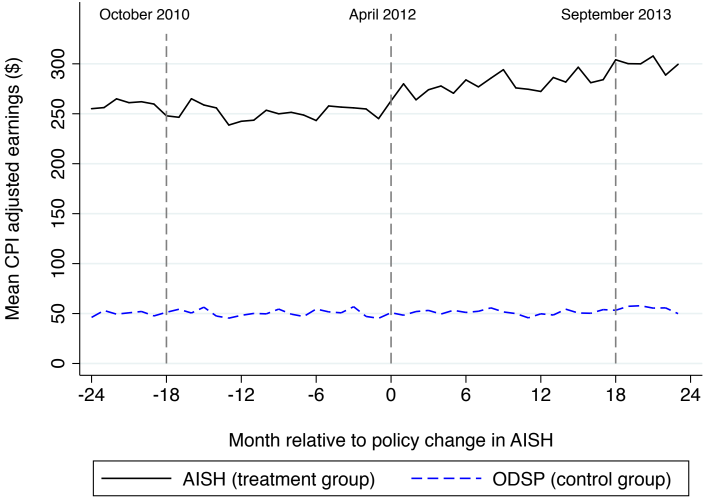
Overall effects of policy change on labor supply

- Estimates using bunching capture responses to the policy change around the kinks.
- Policy change also decreased marginal tax rates far away from the kinks.
  - Overall effects of policy change on labor supply might be much larger (Chetty et. al, 2012).
  - Policy change might also have extensive margin effects.

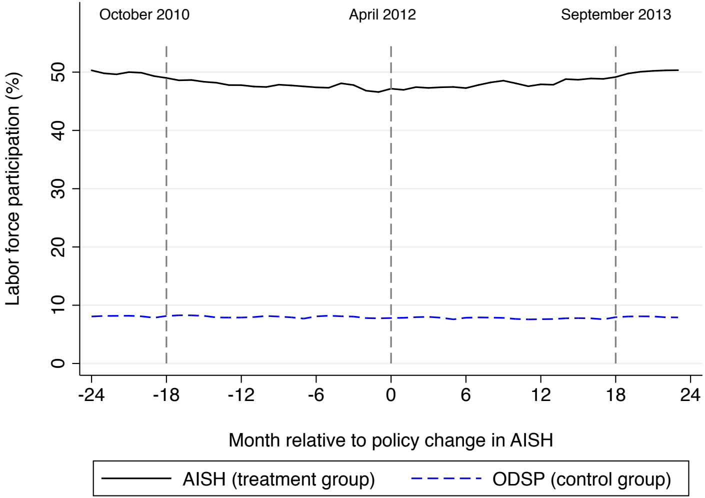
Identification strategy: DD design

- Treatment group: AISH.
- Control group: Ontario Disability Support Program (ODSP).
  - Similar DI program to AISH, but no policy change.
  - Good administrative data.
- Benefits in ODSP
  - Max monthly benefit $1,086 for those with no dependents and $1,999 for those with dependents.
  - All earnings are subject to %50 tax.

Trends in labor supply: earnings



Trends in labor supply: labor force participation



DD design

- $y_{it} = \alpha + \beta(POST_t \times AISH_{it}) + \gamma AISH_{it} + X_{it}'\delta + \lambda_t + \epsilon_{it}$
  - y_{it}: earnings and labor force participation
  - $POST_t$: post treatment dummy
  - $AISH_{it}$: treatment dummy
  - X_{it}: vector of individual characteristics such as sex, age, age DI awarded at, marital status, family size, disability type, living location.
  - λ_t: monthly time fixed effects
  - ϵ_{it}: error term

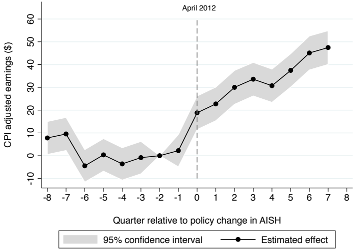
DD estimates

	Earnings ($)			Extensive margin (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
AISH × Post	29.98***	31.02***	29.87***	0.79***	0.79***	0.78***
	(1.34)	(1.34)	(1.53)	(0.15)	(0.15)	(0.17)
AISH	202.09***	197.89***	195.57***	38.22***	38.16***	37.66***
	(0.92)	(0.92)	(1.05)	(0.11)	(0.11)	(0.12)
Sample	Full	Full	Short	Full	Full	Short
Individual co-variates	No	Yes	Yes	No	Yes	Yes
Mean in AISH before policy change	252.47 (420.40)	250.18 (420.65)	250.89 (421.03)	48.12	48.12	47.60
R-Sq.	0.04	0.04	0.04	0.08	0.10	0.10
Num. of. Obs.	7,741,795	7,741,795	5,810,529	7,741,795	7,741,795	5,810,529

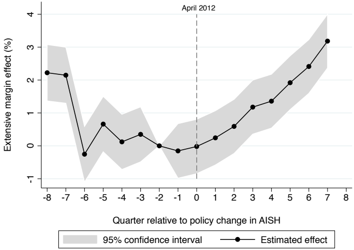
Identification assumption

- Common trend assumption
- $y_{it} = \alpha + \sum_{t=-8}^{t=7} \beta_t (q_t \times AISH_{it}) + \gamma AISH_{it} + X_{it}'\delta + \lambda_t + \epsilon_{it}$

(a) Earnings



(b) Labor force participation



Take away message

- Exploit a policy change in DI program to:
  - Estimate earnings elasticity and heterogeneous adjustment costs using bunching.
  - Estimate overall effect of the policy change on labor supply using DD design.
- Find evidence for sizeable adjustment costs.
  - Might explain mixed findings on the effects of incentives to work on labor supply in DI programs.
- Find evidence that adjustment costs are heterogeneous.
  - Implications for designing policies and targeting groups.
- Policy change is successful in increasing labor supply both at extensive and intensive margins.
- Large increase in incentives to work $\Rightarrow$ beneficial for many benefit recipients to adjust their labor supply since gain from adjusting $>$ adjustment costs.

Thanks

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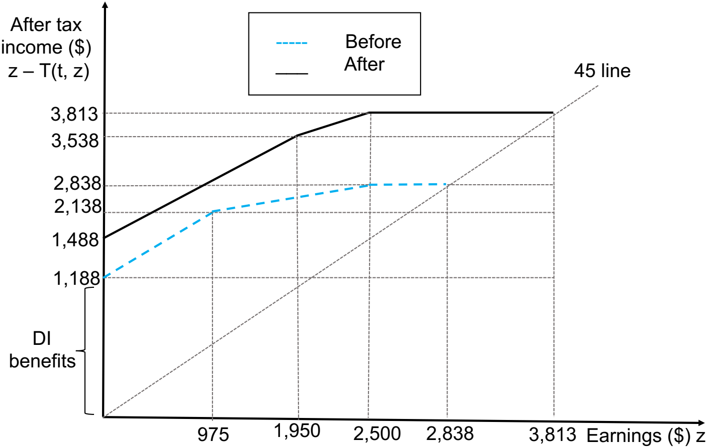
Policy change in AISH: With dependents

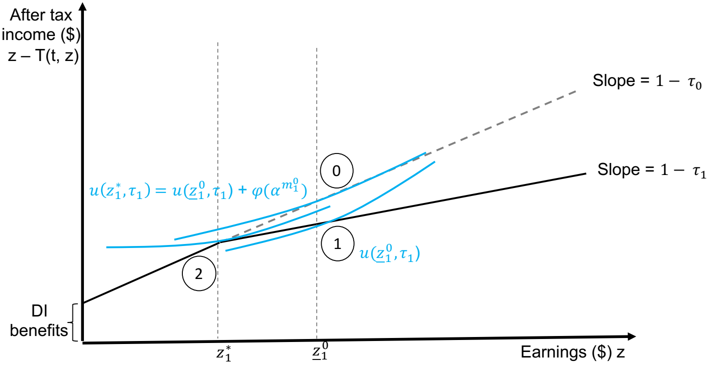


Estimating counter-factual distribution

- I divide earnings into bins with size δ.
  $p_i = \sum_{d=0}^{D} \beta_d (z_i - z^*)^d + \sum_{j=-\ell}^{u} \gamma_j \mathbb{1}\{z_i - z^* = \delta j\} + \epsilon_i$
  - D: degree of fitted polynomial
  - p_i: portion of individuals in bin z_i
  - ℓ and u: number of excluded bins around kink
  - $\widehat{h}_0(z) = \delta \sum_{d=0}^{D} \widehat{\beta}_d (z - z^*)^d$
  - $\widehat{h}_0(z^*) = \widehat{\beta}_0$
  - $\widehat{B} = \delta \sum_{j=z_\ell}^{z_u} \widehat{\gamma}_j$
  - Normalized bunching: $\widehat{b} = \frac{\widehat{B}}{\delta h_0(z^*)} = \frac{\widehat{B}}{\delta \widehat{\beta}_0}$

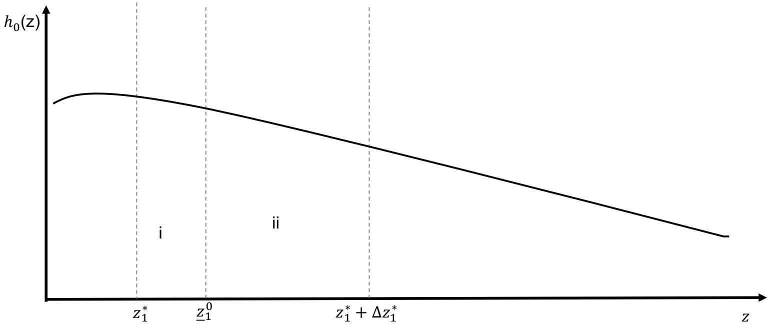
Marginal buncher at kink at z_1^*

- Marginal buncher at \$400 before policy change: $u(2) = u(1) + \phi_1 + \phi_2 \alpha$.



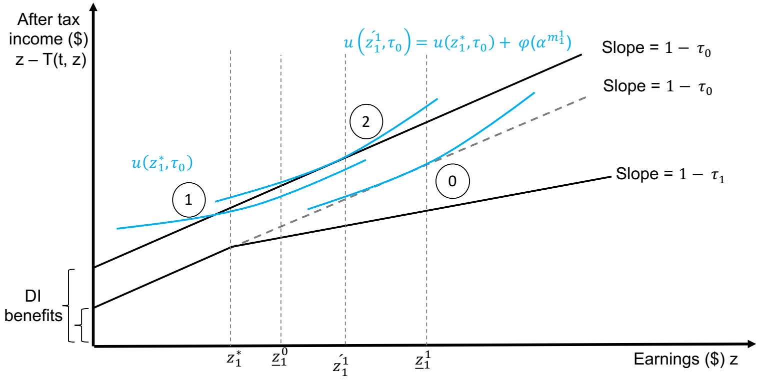
Bunching at kink z_1^*

- $B_1^0 = \int_{\underline{z}_1^0}^{z_1^* + \Delta z_1^*} h_0(\zeta)\, d\zeta \approx (z_1^* + \Delta z_1^{*0} - \underline{z}_1^0) h_0(z_1^*)$.



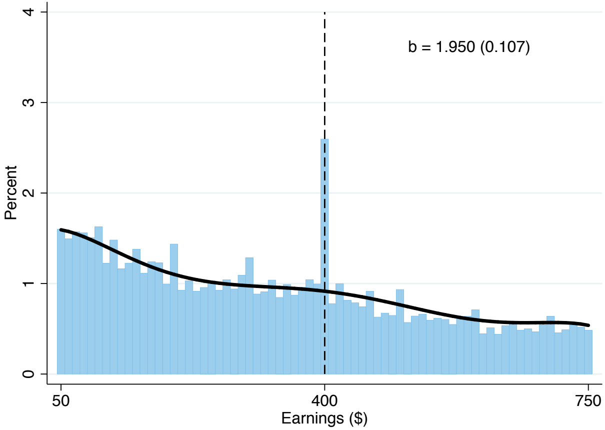
Bunching at the former kink at z_1^*

- Marginal buncher: $u(2) = u(1) + \phi(\alpha)$.



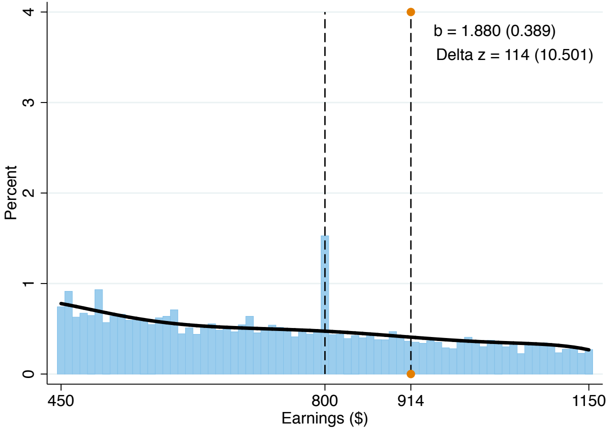
Fitted polynomial of degree 6

- At former kink at $400



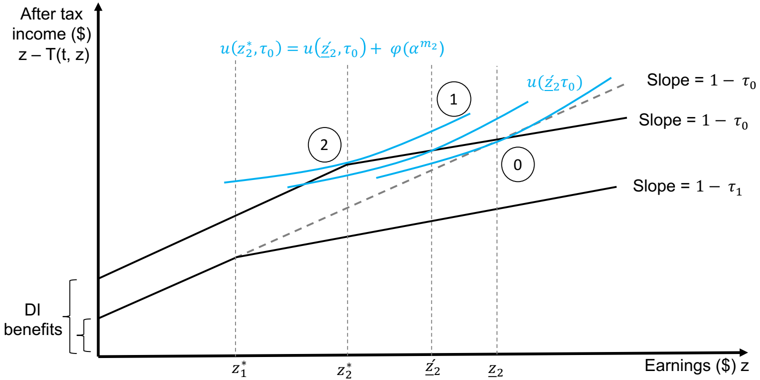
Fitted polynomial of degree 6

- At new kink at $800



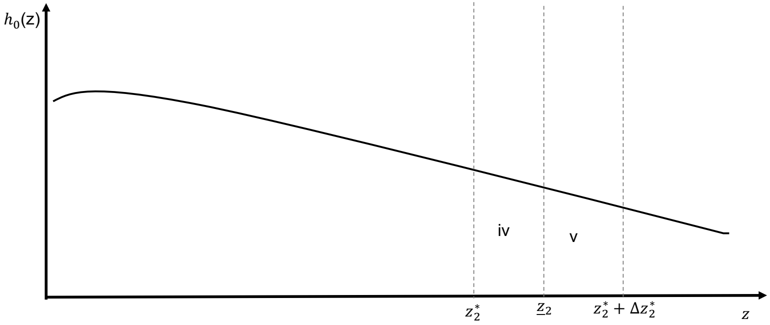
Bunching at the new kink at z_2^*

- Marginal buncher: $u(2) = u(1) + \phi(\alpha)$.



Bunching at kink at z_2^*

- $B_2 = \int_{\underline{z}_2}^{z_2^* + \Delta z_2^*} h_0(\zeta)\, d\zeta \approx (z_2^* + \Delta z_2^* - \underline{z}_2) h_0(z_2^*)$



Utility function

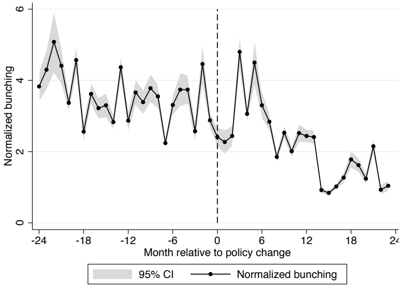
- Quasi-linear utility function:

$$u(C, z; \tau; \alpha) = C - \alpha^{-1/e} \frac{z^{1+1/e}}{1 + 1/e}$$

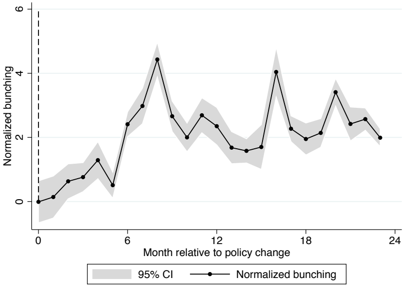
  - z: earnings
  - τ: tax on earnings
  - $T(z)$: tax liability
  - $C = z - T(z)$: consumption
  - α: ability
    - Earnings if no tax would have been imposed.
    - Has smooth distribution and only source of heterogeneity in earnings.
  - e: Elasticity of labor supply to net-of-tax rate at a kink
- Assume no income effect: I provide suggestive evidence that this is a plausible assumption.
- Optimal z to maximize utility:
  - $z = \alpha(1 - \tau)^e$ and $u(C, z; \tau; \alpha) = \alpha \frac{(1-\tau)^{1+e}}{1+e}$
  - $\tau = 0 \Rightarrow z = \alpha$.

Estimated bunching

(a) At kink at $400

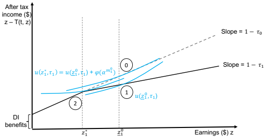


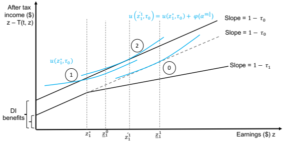
(b) At kink at $800

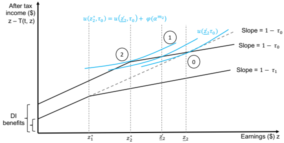


Estimating heterogeneous adjustment costs $\phi = \phi_1 + \alpha\phi_2$ and elasticity of earnings e

- Kink at \$400
  - $u(2) = u(1) + \phi_1 + \alpha\phi_2$
  - $B_1^0 = \int_{\underline{z}_1^0}^{z_1^* + \Delta z_1^*} h_0(\zeta) d(\zeta) \approx (z_1^* + \Delta z_1^{*0} - \underline{z}_1^0) h_0(z_1^*)$
- At former kink at \$400
  - $u(2) = u(1) + \phi_1 + \alpha\phi_2$
  - $B_1^1 = \int_{\underline{z}_1^0}^{\underline{z}_1^1} h_0(\zeta) d(\zeta) \simeq (\underline{z}_1^1 - \underline{z}_1^0) h_0(z_1^*)$
- Kink at \$800
  - $u(2) = u(1) + \phi_1 + \alpha\phi_2$
  - $B_2 = \int_{\underline{z}_2}^{z_2^* + \Delta z_2^*} h_0(\zeta) d\zeta \approx (z_2^* + \Delta z_2^* - \underline{z}_2) h_0(z_2^*)$



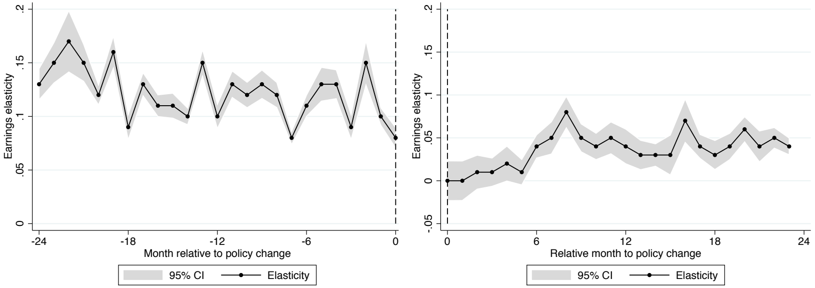




Estimated elasticity of earnings: No adjustment costs

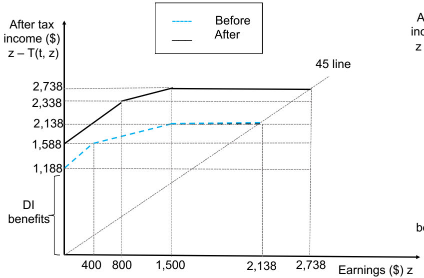
(a) At kink at $400

(b) At kink at $800

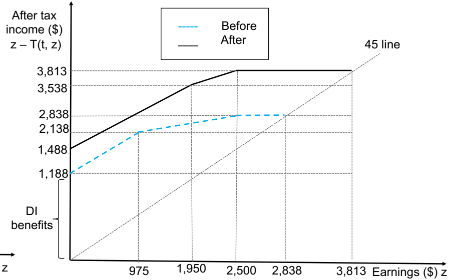


Income effects

(a) No dependents



(b) With dependents

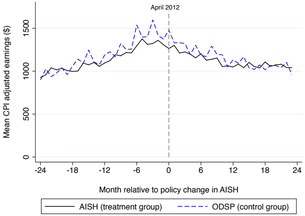


Income effects estimates

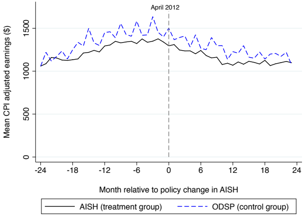
	No dependent				With dependent(s)
	(1)	(2)	(3)	(4)	(5)
AISH $\times$ Post	-1.61	4.74***	-4.99	18.97	-4.76
	(1.23)	(1.22)	(12.48)	(10.40)	(11.12)
AISH	44.66***	37.36***	-133.79***	-81.01***	2.21
	(0.81)	(0.83)	(8.23)	(7.19)	(6.67)
Sample	$0 < \textit{earnings} \leq 300$	$0 < \textit{earnings} \leq 300$	$\textit{earnings} \geq 900$	$\textit{earnings} \geq 900$	$0 < \textit{earnings} \leq 850$
	12 months	6 months	12 months	6 months	6 months
Individual co-variates	Yes	Yes	Yes	Yes	Yes
Mean in AISH before policy change	138.76	135.59	1,248.98	1,140.49	307.25
	(103.65)	(118.55)	(421.28)	(492.57)	(348.25)
R-Sq.	0.06	0.04	0.07	0.07	0.01
Num. of. Obs.	213,642	268,394	29,361	52,104	55,667

Income effects

(a) No dependents and earnings over $900 six months before the policy change

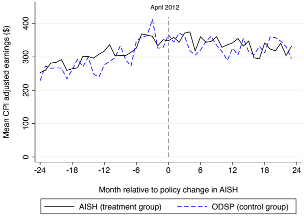


(b) No dependents and earnings over $900 one year before the policy change



Income effects

(a) With dependents and earnings in the range $(0, \$850]$ six months before the policy change



Regression Discontinuity Design (RD)

- Exploit the discontinuity at the date of policy change in AISH (cut-off date)
- Intuitively: compare labor supply outcomes right after the policy change (treatment group) to those right before the policy change (control group).

Local linear RD design

$$y_{im} = \alpha_l + f_l(c - m) + \epsilon^l_{im} \text{ if } m < c$$

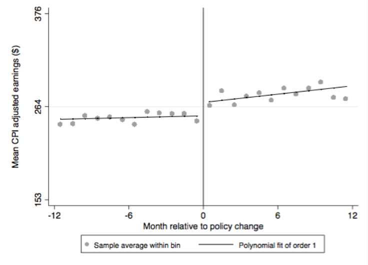
$$y_{im} = \alpha_r + f_r(m - c) + \epsilon^r_{im} \text{ if } m \geq c$$

$$\widehat{\alpha}^{RD} = \widehat{\alpha_r} - \widehat{\alpha}_l$$

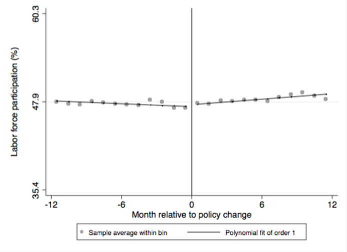
- y_{im}: earnings of individual i at month m
- c: month of policy change
- m: relative month to date of policy change
- f_l and f_r are two smooth functions
- Identification assumption: No manipulation around the date of policy change
  - Policy change announced two month in advance
  - Exclude those awarded after announcing policy change

Discontinuity in labor supply

(a) Earnings



(b) Labor force participation



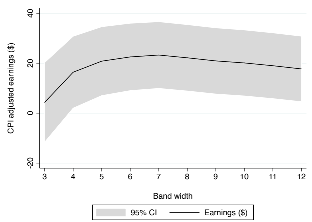
Scale of the each figure is ± 0.5 standard deviation of the corresponding variable.

RD estimates within a six months window

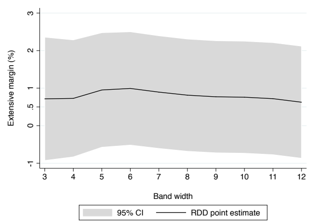
	Earnings ($)		Extensive margin (%)	
	(1)	(2)	(3)	(4)
Estimated effect	22.52***	22.54***	0.99	1.06
	(6.88)	(6.86)	(0.77)	(0.76)
Mean in AISH before policy change	252.69	252.69	47.41	47.41
	(427.04)	(427.04)		
Individual co-variates	No	Yes	No	Yes
Num. of Obs.	112,768	112,768	112,768	112,768

Robustness to selected bandwidth

(a) Earnings



(b) Labor force participation



Placebo policy changes for checking seasonality effects (six months window)

	April 2010		April 2011		April 2013	
	Earnings ($)	Extensive (%)	Earnings ($)	Extensive(%)	Earnings ($)	Extensive (%)
Robust	-8.06	-0.08	-2.84	-0.20	-0.85	0.02
Estimated effect	(6.51)	(0.78)	(6.22)	(0.75)	(6.65)	(0.72)
Mean in AISH	271.95	52.08	249.92	47.82	281.83	47.92
before policy change	(422.86)		(415.43)		(472.67)	
Num. of Obs.	99,575	99,575	107,476	107,476	118,886	118,886