The Effects of Medicaid on Children's Health: A Regression Discontinuity Approach

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Questions

1. Does public health insurance targeting children of low income families increase their **utilization of health care** and, ultimately, **improve their health**?

2. Does health insurance coverage have **lagged effects** on children health?

3. Can public health insurance **"crowd out" better** private insurance options and harm children health?
   - Some higher-income families face a **trade-off**: save money but lose health care quality for their children (may imply worse children's health outcomes).
   - If health insurance quality is a **normal good** $\rightarrow$ the higher the income the higher the quality of insurance coverage the will buy.

What I do

1. Exploit Medicaid eligibility rule as **source of exogenous variation** for Medicaid eligibility:
   - Eligibility is determined by family income being below a given threshold.
   - I implement a Regression Discontinuity (RD) design.

2. Estimate the **contemporaneous and medium run causal effects** of Medicaid on poor children's health care utilization and health.

3. Test whether there are **heterogeneous effects** across different family income levels, which is possible due to heterogeneity in the eligibility thresholds across states, time and children's ages.

Results and Contribution

1. I establish causal effects of Medicaid on children's health outcomes in the medium run.

2. I find heterogeneous effects for different family income levels:
   - **"Low-income" Group**: Medicaid is more likely to have persistent **positive effects** on children's **health**.
   - **"High-income" Group**: Medicaid is more likely to have persistent **negative effects** on children's **health**.

3. I provide possible explanations for these heterogeneous effects:
   - "Utilization" channel.
   - "Quality" channel.

Related Literature

- **Medicaid and utilization of medical care and children's health**

  Currie and Gruber (QJE 1996); Currie, Decker, Lin (JHE 2008), Koch (WP 2010).

  Short run effects.

- **Medicaid and "Crowding-out" of private insurance**

  Currie and Gruber (QJE 1996); Card and Shore-Sheppard (RES 2004); Lo Sasso and Buchmueller (JHE 2004); Ham and Shore-Sheppard (JPuE 2005); Gruber and Simon (2007); Koch (WP 2010).

  Do not analyze the consequences of the "crowding out" effect in terms of children health.

Medicaid Program

- Jointly funded by the state and federal governments, and is **managed by the states**.
- **Eligibility criteria:** A child is eligible for Medicaid if the family income, as % of the Poverty Line (PL), is below a threshold T.

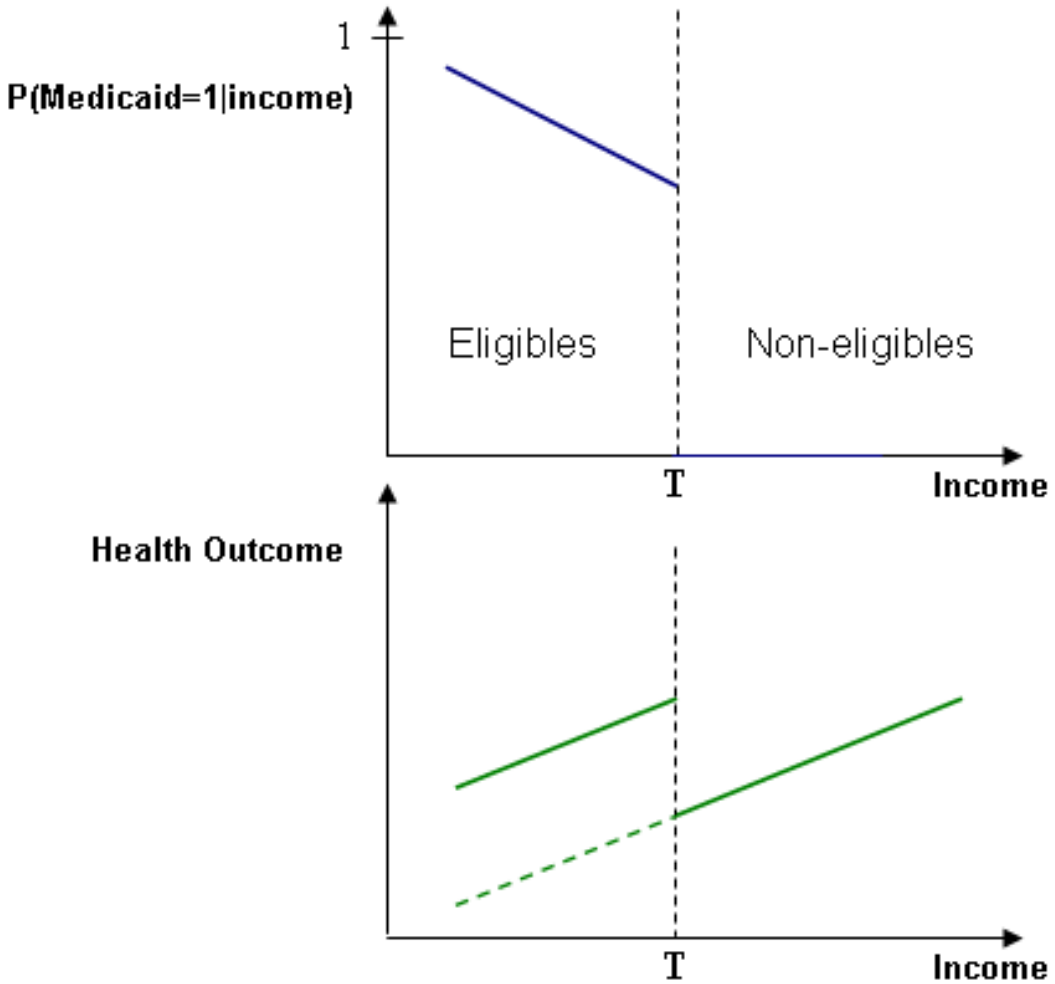
$$Eli_t = 1 \quad \text{if} \quad \frac{income_t}{PL(\text{family size}_t)} \times \leq T_t(\text{state, age}) \tag{1}$$

- Yearly **Federal Poverty Line**, family of 4 in 2007: 21,200 US$.
- **Federal Mandates:**
  - Cover all children **under 6** living in families with incomes **below 133%** of the poverty line.
  - Cover all children **under 18** with family incomes **below 100%** of poverty line.
- Ranges: [100, 400] % of PL ▸ Examples
- Medicaid Benefits: must cover mandatory services. physician and hospital services, screening, preventive, and early detection services.

Data and Sample Selection

- **Data on children:** Child Development Study (**CDS**) + Panel Study of Income Dynamics (**PSID**)
- **Data on state-specific thresholds:** National Governors' Association (1991-2007).
- **Sample selection:** Children between 5 and 18 years old (2800 observations). Years: 1997, 2002, 2007.
    - I match child outcomes with current and past Medicaid status (up to 5 years before). I impute eligibility status.
- **Outcomes:** preventive health care utilization; obesity and overweight, indicator of excellent health, indicator of missing more than 5 days of school due to illness.

Fuzzy RD design



RD implementation: parametric specifications

- Fuzzy RD design (2SLS):

$$y_{it} = \alpha + \beta M_{it} + k_{2g}(inc_{it}) + u_{it} \quad (2)$$

$$M_{it} = \pi_0 + \pi_1 Eli_{it} + k_{1g}(inc_{it}) + v_{it} \quad (3)$$

$\Rightarrow \beta$: LATE on the subpopulation of "compliers" **at the threshold** (Imbens and Angrist, 1994) .

- "Intention to treat" effect (lower bound):

$$y_{it} = \alpha + \theta Eli_{it} + f_g(inc_{it}) + u_{it} \quad (4)$$

$\Rightarrow f_g(.), k_{1g}(.), k_{2g}(.)$ are polynomials of order g, and $\theta = \pi_1 \times \beta$

Internal Validity of the RD design: Assumptions

1. There is a **"jump"** in the probability of taking Medicaid at the threshold. ▸ Graph and Regressions ▸ placebo

2. Families **do not have perfect control** of the assignment variable.
   - Family income histogram.
   - Formal test to check discontinuity of family income distribution at the threshold (McCrary, 2008).

   ▸ Histogram ▸ Graphs and Test

3. Individuals on either side of the threshold are randomly assigned to the treatment and control groups. They should be very **similar in observed and unobserved characteristics**. ▸ Regressions

Contemporaneous effects

Intention to treat (ITT): $y_{it} = \gamma + \theta Eli_{it} + f_g(inc_{it}) + u_{it}$

Outcome equation: $y_{it} = \alpha + \beta M_{it} + k_{2g}(inc_{it}) + u_{it}, \qquad t = 1997, 2002, 2007$

		Outcomes			
	Utilization	Excellent Health	Obese	Overweight	Miss school days
Intention to treat					
$Eli_t \times 1\{T < 185\}$	0.157**	-0.085	-0.051	0.035	0.031
	(0.072)	(0.075)	(0.068)	(0.055)	(0.056)
$Eli_t \times 1\{185 \leq T \leq 250\}$	-0.005	-0.157**	0.001	0.035	-0.070
	(0.060)	(0.069)	(0.057)	(0.048)	(0.044)
Outcome equation (IV-RD)					
$M_t \times 1\{T < 185\}$	0.524**	-0.574	-0.399	0.209	0.162
	(0.225)	(0.463)	(0.389)	(0.289)	(0.311)
$M_t \times 1\{185 \leq T \leq 250\}$	- 0.082	-0.816*	-0.184	0.188	-0.189
	(0.237)	(0.489)	(0.332)	(0.263)	(0.280)
N	1431	1431	1431	1431	1431

Robust standard errors (in parenthesis) are clustered at the family level. All regressions include a polynomial of order 4 of the determinants of Medicaid eligibility (log income, age, and family size), year and state dummies. In each column the sample is restricted to observations with family income levels that falls within ± 20 bandwidth.

Identification: Lagged effects cumulative effects

$$y_{it} = \alpha + \theta_\tau Eli_{i,t-\tau} + f_g(inc_{i,t-\tau}) + u_{it} \tag{5}$$

- Treatment may have dynamic effects: treatment today may affect health in the future.
- Children have multiple opportunities to be assigned to treatment.

  Making a child eligible in period t:
  - 1) **Direct effect on health**: under the assumption that she will not be eligible in any other subsequent period.
  - 2) **Indirect effect on health**: eligibility today may affect participation in the future.

$$\theta_\tau^{ITT} = \frac{\mathbf{d}y_{it}}{\mathbf{d}Eli_{i,t-\tau}} = \underbrace{\frac{\partial y_{it}}{\partial M_{i,t-\tau}} \times \frac{\partial M_{i,t-\tau}}{\partial Eli_{i,t-\tau}}}_{\text{Direct Effect}} + \underbrace{\sum_{h=1}^{\tau} \left(\frac{\partial y_{it}}{\partial M_{i,t-\tau+h}} \times \frac{\partial M_{i,t-\tau+h}}{\partial Eli_{i,t-\tau}} \right)}_{\text{Indirect Effect}} \tag{6}$$

Lagged effects: Excellent Health

$$y_{it} = \alpha + \theta_\tau Eli_{i,t-\tau} + f_g(inc_{i,t-\tau}) + u_{it}$$

Dep. Var.: Excellent Health. ITT Effects (Cumulative Effects)

	Low-income group		High-income group	
	$Eli_t \times 1\{T < 185\}$		$Eli_t \times 1\{185 \leq T \leq 250\}$	
Time Elapsed	5-11 years old	12-18 years old	5-11 years old	12-18 years old
1 year (θ_1)	-0.038	-0.092	-0.045	-0.083
	(0.083)	(0.115)	(0.089)	(0.074)
2 years (θ_2)	-0.061	-0.042	**-0.180***	0.032
	(0.079)	(0.110)	(0.065)	(0.080)
3 years (θ_3)	-0.100	0.100	-0.063	0.031
	(0.074)	(0.110)	(0.097)	(0.090)
4 years (θ_4)	0.029	**0.193****	0.029	-0.043
	(0.079)	(0.095)	(0.101)	(0.093)
5 years (θ_5)	-0.078	0.149	-0.070	-0.070
	(0.069)	(0.092)	(0.111)	(0.111)

Each entry comes from a separate linear probability model. All regressions include the determinants of Medicaid eligibility (income, age, and family size); year and state dummies. Robust standard errors (in parenthesis) are clustered at the family level.

Lagged effects: Obesity

$$y_{it} = \alpha + \theta_\tau Eli_{i,t-\tau} + f_g(inc_{i,t-\tau}) + u_{it}$$

Dep. Var.: Obesity. ITT Effects (Cumulative Effects)

	Low-income group		High-income group	
	$Eli_t \times 1\{T < 185\}$		$Eli_t \times 1\{185 \leq T \leq 250\}$	
Time Elapsed	5-11 years old	12-18 years old	5-11 years old	12-18 years old
1 year (θ_1)	0.139**	-0.119	-0.119	-0.021
	(0.067)	(0.110)	(0.110)	(0.071)
2 years (θ_2)	0.141**	0.132	0.132	0.048
	(0.064)	(0.105)	(0.105)	(0.079)
3 years (θ_3)	-0.056	0.030	0.030	0.012
	(0.064)	(0.085)	(0.085)	(0.084)
4 years (θ_4)	0.079	-0.106	0.083	-0.094
	(0.064)	(0.077)	(0.065)	(0.076)
5 years (θ_5)	0.045	0.012	0.130*	-0.027
	(0.050)	(0.079)	(0.073)	(0.086)

Each entry comes from a separate linear probability model. All regressions include the determinants of Medicaid eligibility (income, age, and family size); year and state dummies. Robust standard errors (in parenthesis) are clustered at the family level.

Heterogeneous Effects: Channels

- **"Utilization" channel: Differential effects on preventive health care utilization**.

  I find that Medicaid only increases health care utilization for the group with lower family income.

- **"Quality" channel: Medicaid may induce higher-income families to drop better private health insurance options.**

  Indirect evidence:

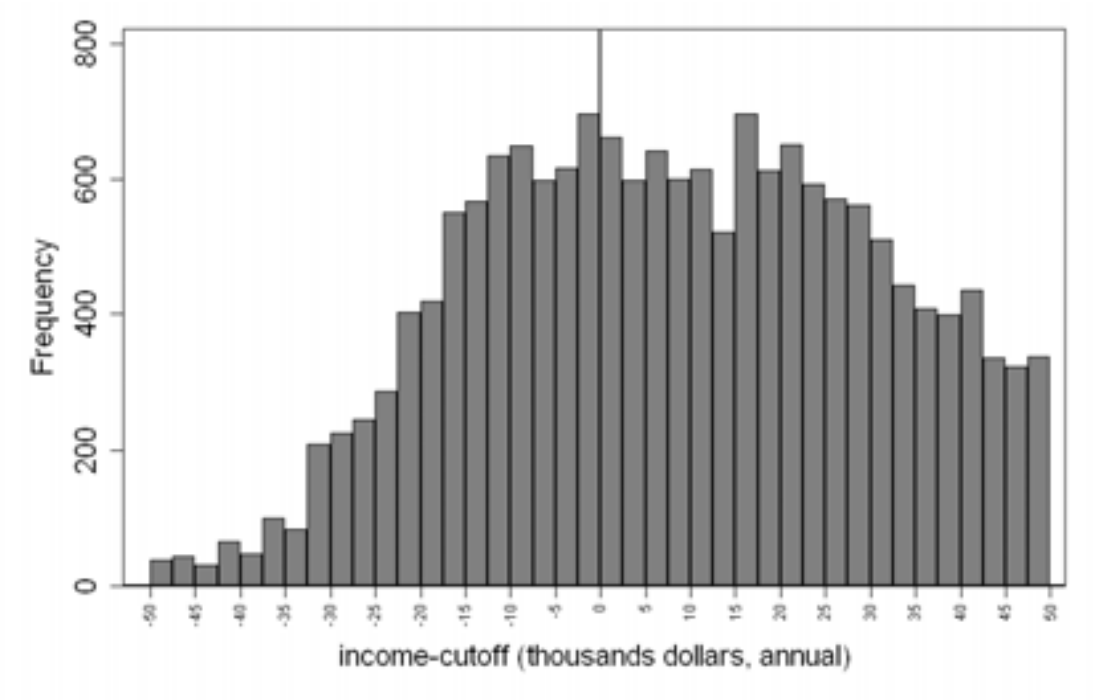
  - The higher the income, the lower the incentives to accept Medicaid (although still some families will accept it) $\rightarrow$ consistent with quality of health insurance being a normal good.
  - Medicaid provides lower quality of care than some private insurances:
    - Doctors devote less time to Medicaid patients than privately insured patients (Decker, 2007)
    - Doctors avoid Medicaid patients (Decker, 2007; Cunningham and O'Malley, 2009)
    - Doctors less likely to follow recommended practices (National Committee for Quality Assurance (NCQA))

Conclusions

- I find evidence of positive causal effects of Medicaid on health care utilization in the short-run and health outcomes in the medium-run for children in lower-income families.
- The effects are less favorable for children in relatively higher-income families .
- I provide possible explanations for these heterogeneous effects.
- These findings can provide a guide for improving the design and targeting of Medicaid.

Thank You!

A1) Imperfect control over assignment variable

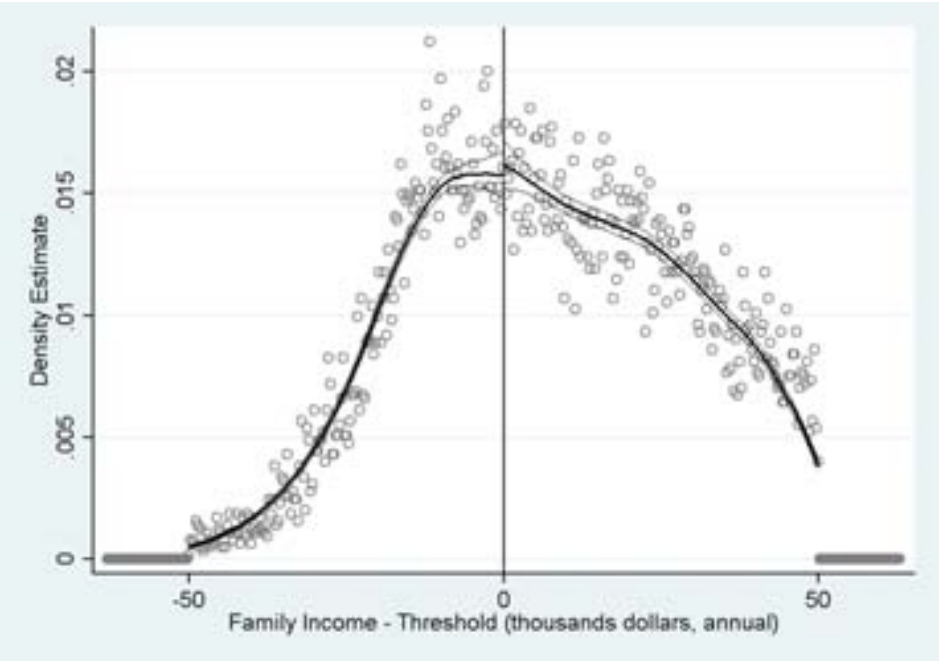


The density of family income should not be discontinuous at the threshold (McCrary 2008)

Pooling all years and all cutoffs Period 1991-2007 ▸ Return

A1) Imperfect control over assignment variable

Figure: Testing Manipulation of Assignment Variable. Years 1991-2007. All thresholds pooled.



Note: Dots are density with binsize 0.288 thousands dollars. Solid lines are predictions from local linear regressions using triangle kernel with a bandwidth 12.82 thousands dollars. Standard errors, binsize b and the bandwidth h are calculated as in McCrary (2008).

▸ Return

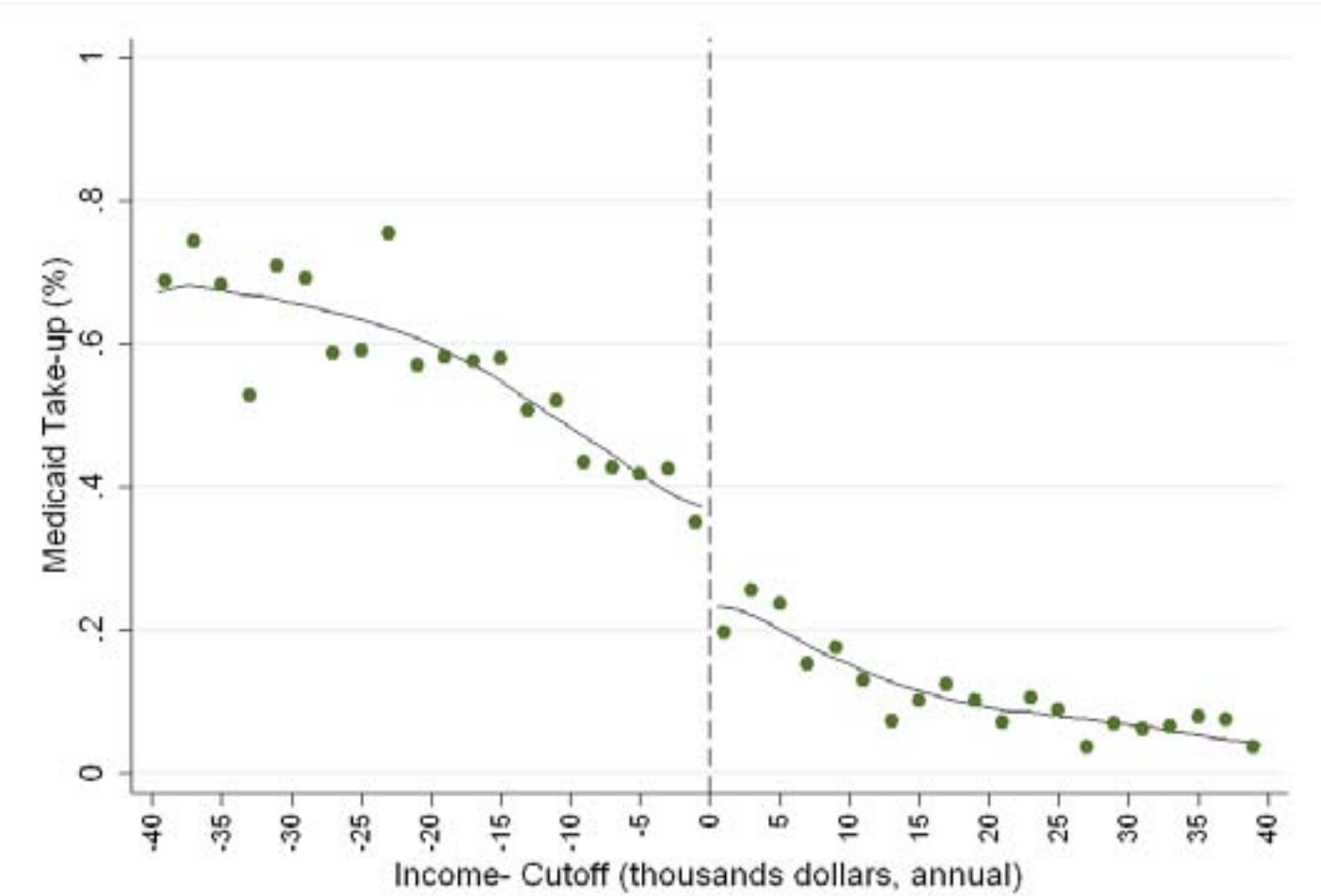
A2) Balance on individual characteristics

Estimate: $y_{it} = \pi_0 + \pi_1 Eli_{it} + k_{1g}(inc_{it}) + \omega_{it}$ $t = 1997, 2002, 2007$

	Bandwidth (thousands dollars)				
	±50	±30	±20	±15	±2
Dep. Var.					
Male	0.059	0.083**	0.068	0.069	0.071
	(0.036)	(0.038)	(0.042)	(0.045)	(0.083)
Black	0.012	0.016	0.025	0.018	0.118
	(0.031)	(0.033)	(0.036)	(0.038)	(0.087)
Metropolitan Area	0.037	0.044	0.066	0.061	0.107
	(0.037)	(0.040)	(0.042)	(0.044)	(0.086)
Rural Area	-0.035	-0.034	-0.047	-0.037	-0.062
	(0.032)	(0.035)	(0.038)	(0.039)	(0.060)
Child Birth Weight	-0.033	-0.019	-0.039	-0.047	-0.091
	(0.057)	(0.059)	(0.062)	(0.068)	(0.132)
Head Education (yrs)	0.044	0.047	0.095	0.057	0.682*
	(0.167)	(0.181)	(0.189)	(0.205)	(0.368)
Mother age at child birth	0.811*	0.481	0.436	0.523	0.218
	(0.438)	(0.493)	(0.527)	(0.555)	(1.061)
N	2818	2163	1555	1185	176

Return

A3) Medicaid Participation ($t = 1997, 2002, 2007$)



A3) Participation equation

Estimate: $M_{it} = \pi_0 + \pi_1 Eli_{it} + k_{1g}(inc_{it}) + v_{it},\ t = 1997, 2002, 2007$

Dep. Var.: Have Medicaid Coverage in period t.

	Bandwidth (thousands dollars)			
	±30	±20	±15	±2
A. Full sample				
Eli_t	0.143***	0.158***	0.163***	0.201***
	(0.036)	(0.040)	(0.042)	(0.076)
B. Heterogeneous Effects by threshold levels				
$Eli_t \times 1\{T < 185\}$	0.263***	0.276***	0.258***	0.360**
	(0.063)	(0.071)	(0.073)	(0.149)
$Eli_t \times 1\{185 \leq T \leq 250\}$	0.159***	0.222***	0.198***	0.224**
	(0.052)	(0.061)	(0.064)	(0.107)
$Eli_t \times 1\{T > 250\}$	-0.035	-0.019	-0.022	-
	(0.060)	(0.063)	(0.066)	
N	2163	1555	1185	156

Notes: All regressions include the determinants of Medicaid eligibility (income, age, and family size); year and state dummies. Polynomials are of order 4. Robust standard errors (in parenthesis) are clustered at the family level. Each sample is restricted to family income levels that falls within the bandwidth indicated.

▸ Return

Examples: State thresholds 2002

Children Below 6:

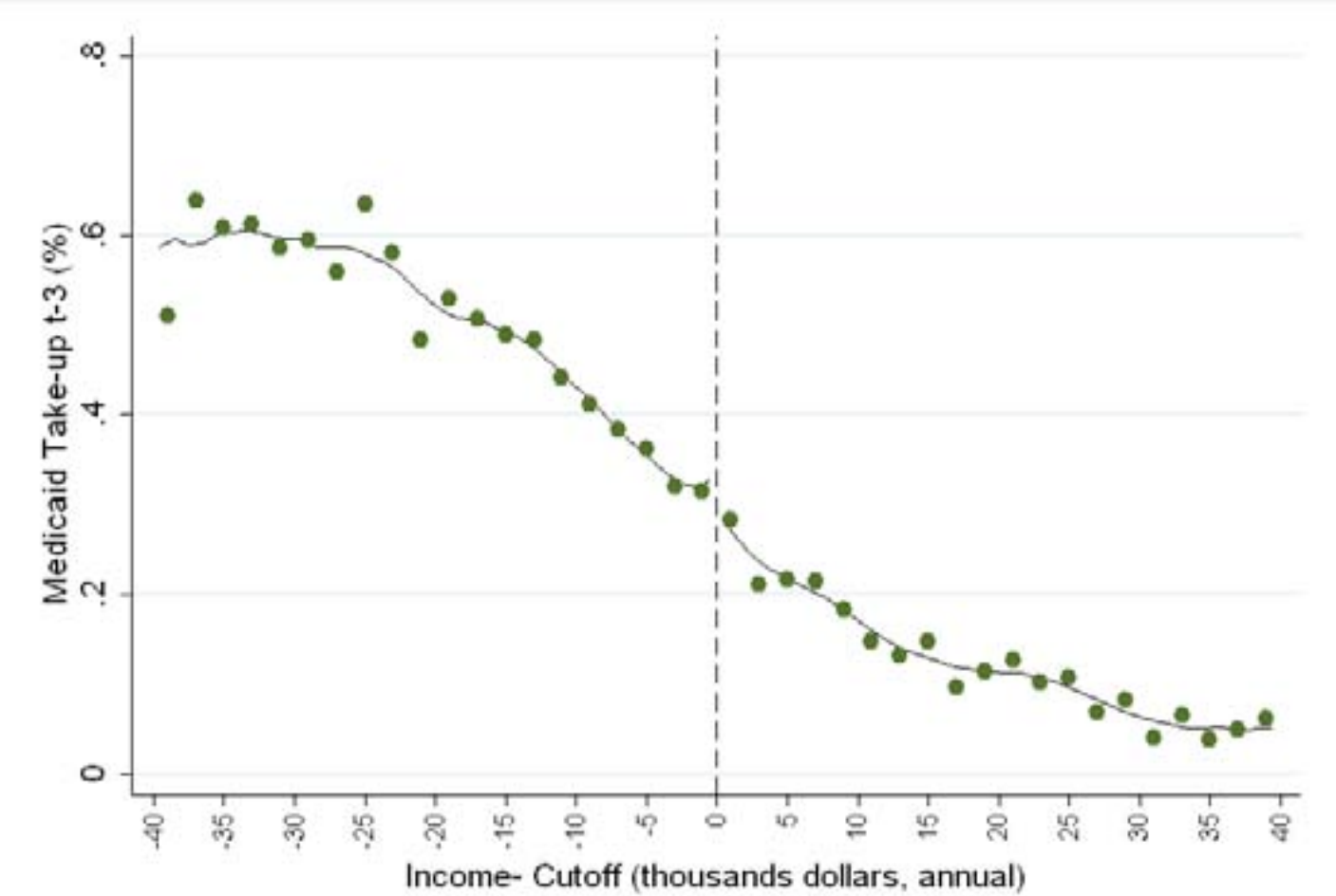
- Montana: 150% of FPL
- California: 250% of FPL
- New Jersey: 350% of FPL
- Wyoming: 133% of FPL

Children between 6 and 18

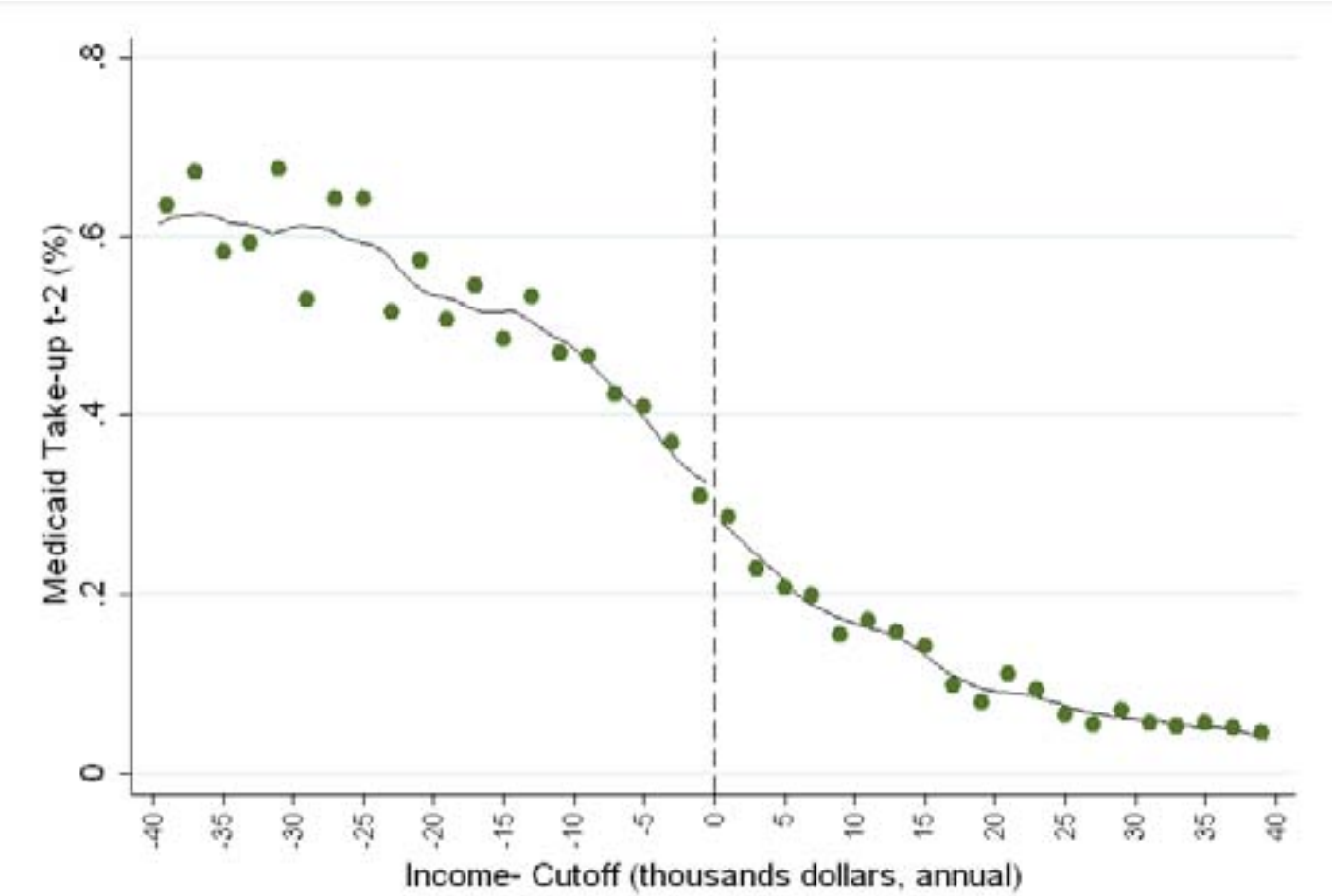
- Montana: 185% of FPL
- California: 250% of FPL
- New jersey: 350% of FPL
- Wyoming: 133% of FPL

◂ Return

Placebo test: participation in t-3



Placebo test: participation in t-2



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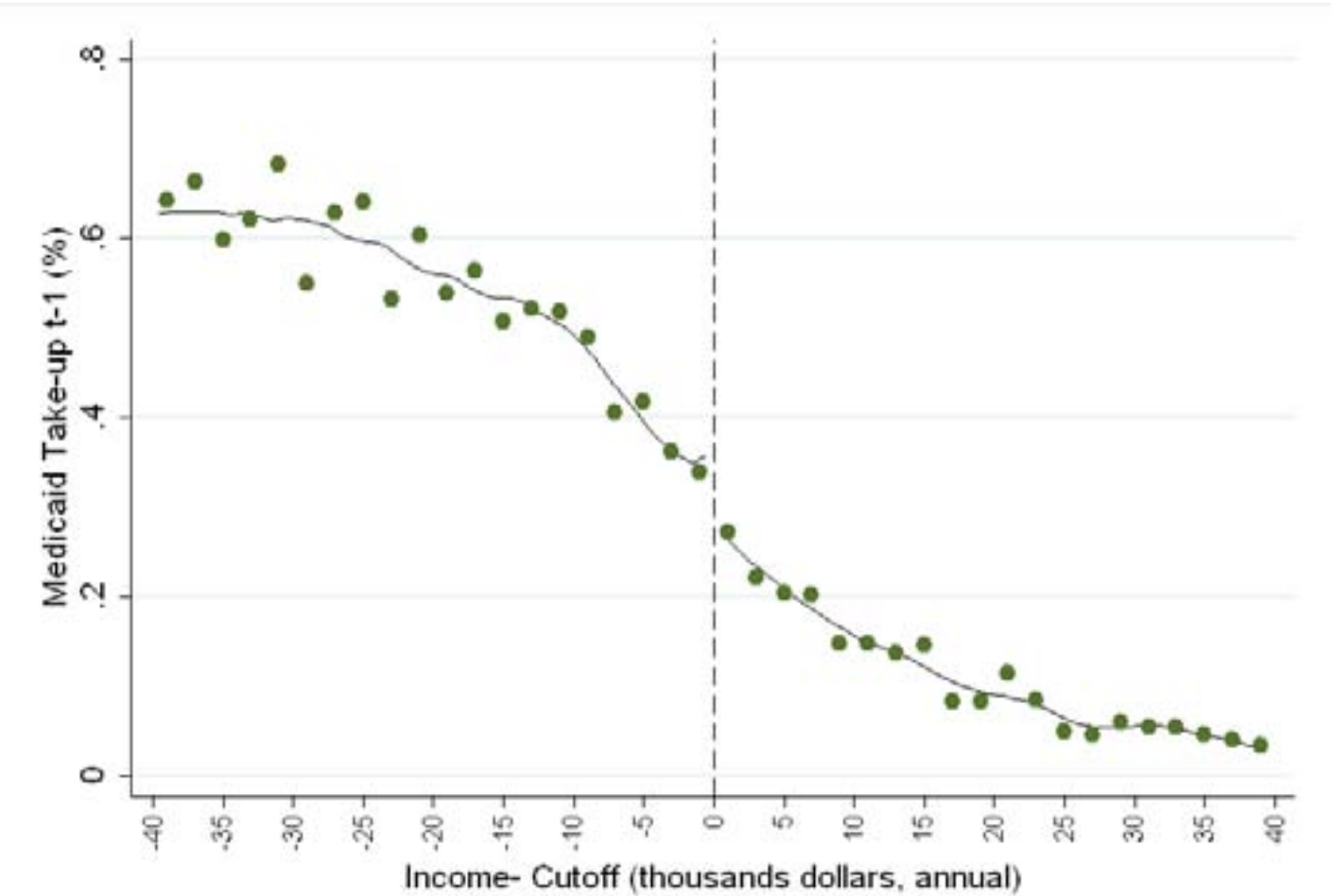
Placebo test: participation in t-1



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