ECON 3510: Poverty and Economic Development
Lecture 8: Voting III (Fujiwara, 2015)

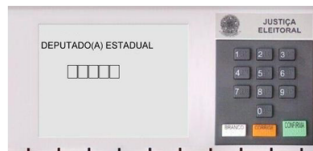Instructor: Weizheng Lai

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Changing the Electorate: Fujiwara (2015)

- ▶ Fujiwara (2015) studies the introduction of electronic voting (EV) in Brazilian elections.

- ▶ By simplifying voting procedures and reducing errors that lead to invalid ballots, EV effectively enfranchises less-educated voters and may influence policy outcomes.

Initial screen of the voting technology

Paper ballot

Voting for (fictional) candidate number 92111 (name: Monteiro Lobato, party: PLT)

Background

- EV was *partially* introduced in the 1998 elections.

- EV was only introduced in municipalities with more than 40,500 registered voters in 1996.

$$EV_i = \mathbb{1}\{v_{i,1996} - 40,500 > 0\}.$$

- After 2002, all municipalities adopted EV.

How Does EV Affect Valid Votes?

► Note that where a municipality had EV in 1998 is solely determined by the number of registered voters in 1996 ($v_{i,1996}$).
  - If $v_{i,1996} = 40,499$, no EV, $EV_i = 0$.
  - If $v_{i,1996} = 40,501$, EV, $EV_i = 1$!

  EV_i changes discontinuously around $v_{i,1996} = 40,500$.

► Fujiwara (2015) implements a regression discontinuity design:

$$Y_{i,1998} = \alpha + \beta EV_i + \gamma(v_{i,1996} - 40,500) + \delta \left[EV_i \times (v_{i,1996} - 40,500) \right] + \varepsilon_i.$$

$Y_{i,1998}$ is municipality i's share of valid votes in total votes in 1998.

How Does EV Affect Valid Votes?

▶ A closer look:

$$\text{If } v_{i,1996} \leq 40,500, \quad EV_i = 0, \qquad Y_{i,1998} = \alpha + \gamma(v_{i,1996} - 40,500) + \varepsilon_i,$$
$$\text{If } v_{i,1996} > 40,500, \quad EV_i = 1, \qquad Y_{i,1998} = \alpha + \beta + (\gamma + \delta) \times (v_{i,1996} - 40,500) + \varepsilon_i.$$

▶ Consider two municipalities, j and k.

$$v_{j,1996} \text{ is just below } 40,500, \quad EV_j = 0, \quad Y_{j,1998} \approx \alpha + \varepsilon_j,$$
$$v_{k,1996} \text{ is just above } 40,500, \quad EV_k = 1, \quad Y_{k,1998} \approx \alpha + \beta + \varepsilon_k.$$

$$\beta + (\varepsilon_j - \varepsilon_k) = Y_{j,1998} - Y_{k,1998}.$$

If j and k are similar in other aspects. i.e., $\varepsilon_j \approx \varepsilon_k$, β captures the change in the share of valid votes caused by EV.

EV Increases Valid Votes
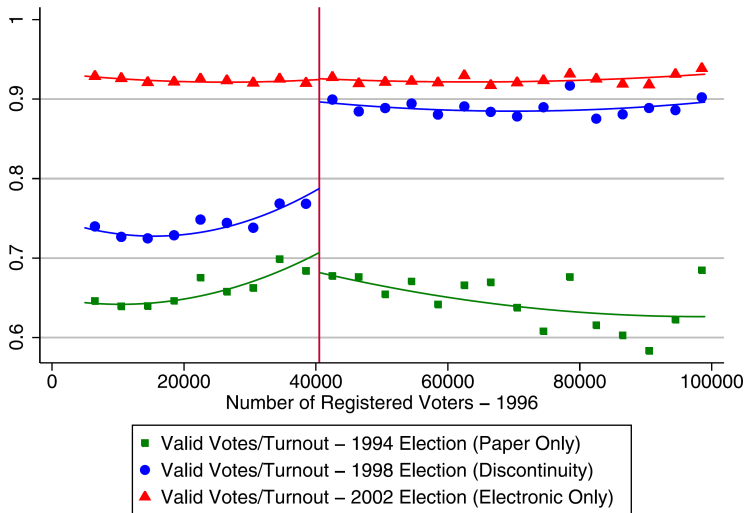
EV Increases Valid Votes

► Column (1)–(3): The author only uses data of municipalities that satisfy $40,500 - h \leq v_{i,1996} \leq 40,500 + h$. h is called "bandwidth." Why does he do this?

TABLE II
TREATMENT EFFECTS OF ELECTRONIC VOTING[a]

	Full Sample Mean	Pre-Treat. Mean	IKBW {Obs.}	(1)	(2)	(3)
Panel A: Baseline Results						
Valid Votes/Turnout	0.755	0.780	11,873	0.118	0.121	0.124
(1998 Election)	[0.087]	(0.013)	{265}	(0.015)	(0.016)	(0.025)
Turnout/Reg. Voters	0.765	0.785	12,438	−0.005	0.013	0.007
(1998 Election)	[0.091]	(0.011)	{283}	(0.019)	(0.021)	(0.033)
Reg. Voters/Population	0.748	0.737	15,956	−0.004	0.010	0.032
(1998 Election)	[0.141]	(0.010)	{388}	(0.027)	(0.034)	(0.044)
Panel B: Placebo Tests (Election Years Without Discontinuous Assignment)						
Valid Votes/Turnout	0.653	0.697	17,111	−0.013	−0.008	0.006
(1994 Election)	[0.099]	(0.011)	{433}	(0.019)	(0.023)	(0.032)
Valid Votes/Turnout	0.928	0.921	17,204	0.005	0.008	0.009
(2002 Election)	[0.026]	(0.002)	{437}	(0.005)	(0.006)	(0.010)
Panel C: Do Left-Wing Parties Benefit Disproportionately From Electronic Voting?						
Vote-Weighted Party	5.397	5.162	20,000	−0.222	−0.250	−0.108
Ideology (1998 Elec.)	[0.692]	(0.094)	{558}	(0.100)	(0.081)	(0.170)
Bandwidth				IKBW	10,000	5000
Specification				Linear	Linear	Linear
N		5281		—	229	116

Validity of Research Design

► Key assumption: at the cutoff, the *only* thing that changes discontinuously is the introduction of EV.

TABLE I
SUMMARY STATISTICS AND COVARIATE SMOOTHNESS (1991 CENSUS)[a]

	Full Sample Mean [Std. Dev.]	Pre-Treat. Mean	IKBW {Obs.}	(1)	(2)	(3)
Monthly Income (1991 *reais*)	123.13 [73.10]	174.83 (8.102)	20,000 {558}	0.908 (16.292)	6.096 (22.097)	14.017 (32.863)
Gini Index (Income)	0.559 [0.058]	0.575 (0.007)	15,596 {377}	0.005 (0.010)	0.002 (0.013)	−0.005 (0.017)
Latitude (Degrees)	−16.53 [8.23]	−16.40 (1.078)	16,547 {412}	0.174 (1.69)	0.361 (2.070)	−0.674 (2.998)
Longitude (Degrees)	46.36 [6.319]	45.18 (0.850)	14,531 {345}	0.419 (1.421)	0.550 (1.636)	2.685 (2.466)
Illiteracy Rate	0.360 [0.183]	0.274 (0.020)	16,068 {389}	−0.012 (0.020)	−0.076 (0.046)	−0.041 (0.065)
Share w/o 4 Years of Schooling	0.607 [0.179]	0.483 (0.020)	15,415 {372}	0.0006 (0.035)	−0.026 (0.041)	−0.041 (0.065)
Share w/o 8 Years of Schooling	0.876 [0.077]	0.788 (0.008)	20,000 {558}	−0.009 (0.015)	−0.017 (0.020)	−0.030 (0.032)
Population—1991 (Thousands)	24.80 [153.69]	58.35 (0.583)	20,000 {558}	0.653 (1.456)	1.066 (1.716)	0.962 (1.880)
Population—2000 (Thousands)	28.73 [170.91]	69.79 (1.257)	17,668 {454}	1.619 (3.043)	2.639 (3.937)	7.059 (5.011)
Share of Urban Population	0.507 [0.258]	0.237 (0.021)	20,000 {558}	0.004 (0.034)	−0.015 (0.048)	−0.069 (0.073)
Bandwidth	—	—	—	IKBW	10,000	5000
Observations	5281	—	—	—	229	116

Heterogeneous Effects on Valid Votes by Illiteracy Rates

- EV should be most useful to less educated voters.

TABLE III

TREATMENT EFFECTS OF ELECTRONIC VOTING, BY ILLITERACY RATE[a]

	Pre-Treat. Mean	IKBW {Obs.}	(1)	(2)	(3)	(4)
Panel A: Municipalities With Above-Median Illiteracy						
Valid Votes/Turnout	0.759	11,873	0.147	0.150	0.152	0.176
	(0.017)		(0.019)	(0.015)	(0.020)	(0.031)
N	—	—	116	279	103	49
Panel B: Municipalities With Below-Median Illiteracy						
Valid Votes/Turnout	0.799	11,873	0.092	0.113	0.096	0.089
	(0.018)		(0.020)	(0.016)	(0.022)	(0.032)
N	—	—	149	279	126	67
Test of Equality in TEs (*p*-Value)	—	—	0.049	0.090	0.056	0.054
Bandwidth	—	—	IKBW	20,000	10,000	5000

Impacts of EV on Policies

- EV effectively incorporates more less educated voters into the electorate. By the MVT, policies should shift toward the preferences of these newly incorporated voters.

- Less educated, poor households rely more on the public healthcare system. The author looks at public health spending and infant health outcomes.

- Only state-level data are available. The author comes up with a clever design that leverages the timing of EV.

$$y_{i,1998} - y_{i,1994} = \alpha_{1998} + \theta_{1998}S_i + \beta_{1998}X_i + \varepsilon_{i,1998},$$
$$y_{i,2002} - y_{i,1998} = \alpha_{2002} + \theta_{2002}S_i + \beta_{2002}X_i + \varepsilon_{i,2002}.$$

  S_i is state i's share of voters eligible for EV in 1998.

- $\theta_{1998} > 0$: From 1994 to 1998, EV was partially introduced. High S_i states adjusted policies in favor of less educated voters.

- $\theta_{2002} < 0$: From 1998 to 2002, EV was full introduced. Low S_i states also adjusted policies in favor of less educated voters.

Impacts of EV on Policies: Results

TABLE IV

MAIN OUTCOMES AND THE SIGN-SWITCH PATTERN[a]

Parameter: Sample (Terms):	Sample Avg.	θ^{98} 1994–1998 (Paper–Disc.) (1)	θ^{02} 1998–2002 (Disc.–Electr.) (2)	Linear Combinations	
				$(\theta^{98} - \theta^{02})/2$ (3)	$(\theta^{98} + \theta^{02})/2$ (4)
Panel A: Electoral Outcomes					
Valid Votes/Turnout	0.829 [0.112]	0.092 (0.033) {0.102}	−0.111 (0.010) {0.002}	0.102 (0.017) {0.008}	−0.009 (0.018) {0.630}
Seat-Weighted Policy Position	4.623 [0.601]	−0.112 (0.641) {0.842}	0.299 (0.167) {0.154}	−0.206 (0.350) {0.574}	0.094 (0.302) {0.800}
Panel B: Fiscal Outcomes (Health Care Spending)					
log(Total Spending)	—	−0.004 (0.093) {0.946}	−0.257 (0.156) {0.274}	0.127 (0.097) {0.254}	−0.131 (0.082) {0.228}
Share of Spending in Health Care	0.099 [0.037]	0.039 (0.017) {0.104}	−0.029 (0.013) {0.044}	0.034 (0.008) {0.000}	0.005 (0.013) {0.678}
log(Health Spending p.c.)	—	0.428 (0.264) {0.200}	−0.677 (0.262) {0.034}	0.552 (0.096) {0.000}	−0.125 (0.242) {0.628}
Panel C: Birth Outcomes (Mothers Without Primary Schooling)					
Share With 7+ Visits	0.362 [0.123]	0.122 (0.065) {0.154}	−0.023 (0.033) {0.558}	0.069 (0.040) {0.182}	0.047 (0.039) {0.320}
Share With Low-Weight Births (×100)	7.721 [1.110]	−0.370 (0.304) {0.266}	0.528 (0.269) {0.104}	−0.529 (0.246) {0.044}	0.201 (0.236) {0.450}
N (State-Terms)	—	54	54	—	—
N (States/First-Diffs)	—	27	27	—	—

References I

Fujiwara, Thomas (2015). "Voting technology, political responsiveness, and infant health: Evidence from Brazil". *Econometrica* 83.2, pp. 423–464.