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

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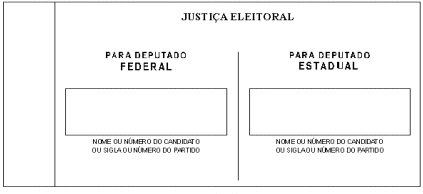
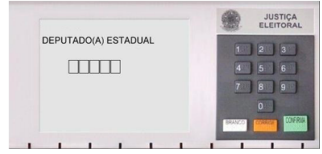
Changing the Electorate: Fujiwara (2015)

- 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.



Paper ballot



Initial screen of the voting technology

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:

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

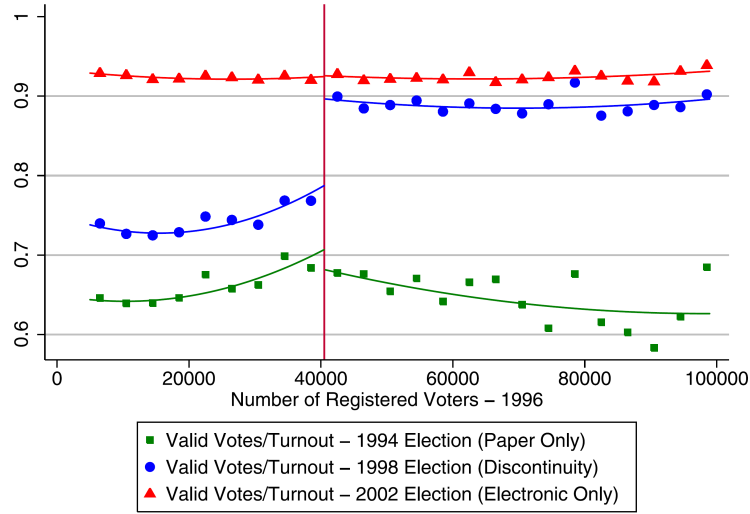
- Consider two municipalities, j and k.

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

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

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	123.13	174.83	20,000	0.908	6.096	14.017
(1991 *reais*)	[73.10]	(8.102)	{558}	(16.292)	(22.097)	(32.863)
Gini Index	0.559	0.575	15,596	0.005	0.002	−0.005
(Income)	[0.058]	(0.007)	{377}	(0.010)	(0.013)	(0.017)
Latitude	−16.53	−16.40	16,547	0.174	0.361	−0.674
(Degrees)	[8.23]	(1.078)	{412}	(1.69)	(2.070)	(2.998)
Longitude	46.36	45.18	14,531	0.419	0.550	2.685
(Degrees)	[6.319]	(0.850)	{345}	(1.421)	(1.636)	(2.466)
Illiteracy Rate	0.360	0.274	16,068	−0.012	−0.076	−0.041
	[0.183]	(0.020)	{389}	(0.020)	(0.046)	(0.065)
Share w/o 4 Years	0.607	0.483	15,415	0.0006	−0.026	−0.041
of Schooling	[0.179]	(0.020)	{372}	(0.035)	(0.041)	(0.065)
Share w/o 8 Years	0.876	0.788	20,000	−0.009	−0.017	−0.030
of Schooling	[0.077]	(0.008)	{558}	(0.015)	(0.020)	(0.032)
Population—1991	24.80	58.35	20,000	0.653	1.066	0.962
(Thousands)	[153.69]	(0.583)	{558}	(1.456)	(1.716)	(1.880)
Population—2000	28.73	69.79	17,668	1.619	2.639	7.059
(Thousands)	[170.91]	(1.257)	{454}	(3.043)	(3.937)	(5.011)
Share of Urban	0.507	0.237	20,000	0.004	−0.015	−0.069
Population	[0.258]	(0.021)	{558}	(0.034)	(0.048)	(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 fully 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:		θ^{98}	θ^{02}	Linear Combinations $(\theta^{98}-\theta^{02})/2$	Linear Combinations $(\theta^{98}+\theta^{02})/2$
Sample (Terms):		1994–1998 (Paper–Disc.)	1998–2002 (Disc.–Electr.)		
	Sample Avg.	(1)	(2)	(3)	(4)
Panel A: Electoral Outcomes					
Valid Votes/Turnout	0.829	0.092	−0.111	0.102	−0.009
	[0.112]	(0.033)	(0.010)	(0.017)	(0.018)
		{0.102}	{0.002}	{0.008}	{0.630}
Seat-Weighted Policy Position	4.623	−0.112	0.299	−0.206	0.094
	[0.601]	(0.641)	(0.167)	(0.350)	(0.302)
		{0.842}	{0.154}	{0.574}	{0.800}
Panel B: Fiscal Outcomes (Health Care Spending)					
log(Total Spending)	—	−0.004	−0.257	0.127	−0.131
		(0.093)	(0.156)	(0.097)	(0.082)
		{0.946}	{0.274}	{0.254}	{0.228}
Share of Spending in Health Care	0.099	0.039	−0.029	0.034	0.005
	[0.037]	(0.017)	(0.013)	(0.008)	(0.013)
		{0.104}	{0.044}	{0.000}	{0.678}
log(Health Spending p.c.)	—	0.428	−0.677	0.552	−0.125
		(0.264)	(0.262)	(0.096)	(0.242)
		{0.200}	{0.034}	{0.000}	{0.628}
Panel C: Birth Outcomes (Mothers Without Primary Schooling)					
Share With 7+ Visits	0.362	0.122	−0.023	0.069	0.047
	[0.123]	(0.065)	(0.033)	(0.040)	(0.039)
		{0.154}	{0.558}	{0.182}	{0.320}
Share With Low-Weight Births (×100)	7.721	−0.370	0.528	−0.529	0.201
	[1.110]	(0.304)	(0.269)	(0.246)	(0.236)
		{0.266}	{0.104}	{0.044}	{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.