CS112 Final Project: Decision Memo after Replication of Citizen Perceptions on E-Voting

Minerva Schools at KGI

Babatunde, Ayoola

Executive Summary

After replicating Voting Made Safe and Easy: The Impact of e-voting on Citizen Perceptions, a political science paper by Alvarez R. Michael, Levin Ines Pomares Julia, and Leiras Marcelo published in Political Science Research and Methods in 2013, using genetic matching instead of propensity score matching, there is still a tangible causal effect of e-voting on the perception of citizens. While the values of the individual variables used to measure the outcome has changed, the overall result still favours the conclusion that e-voting has a significantly better perception than traditional voting methods and should be adopted.

Main

I replicated Voting Made Safe and Easy: The Impact of e-voting on Citizen Perceptions, a political science paper by Alvarez R. Michael, Levin Ines Pomares Julia, and Leiras Marcelo published in Political Science Research and Methods in 2013. It was a paper covering how the citizens of Salta, Argentina feel about e-voting which was recently introduced but not widespread enough. The aim of the paper was to find if there was a causal effect of e-voting, compared to traditional voting, on the perception of the overall voting experience, ease of use and speed of voting process, and confidence in the fairness of the election process. The variables were measured as follows:

Overall assessment of voting experience

- Evaluation of voting experience: 1 if voting experience was ‘very good’; and 0 if ‘good’, ‘bad’ or ‘very bad’
- Qualification of poll workers: 1 if ‘very qualified’ or ‘somewhat qualified’; and 0 if ‘little qualified’ or ‘not at all qualified’
- Substitution of traditional voting by e-voting: 1 if ‘agree a lot’ or ‘agree’; and 0 if ‘disagree’ or ‘disagree a lot’

Ease of use and speed of voting process

- Speed of voting process: 1 if ‘very quick’ or ‘quick’; and 0 if ‘slow’ or ‘very slow’

- Ease of voting procedure: 1 if voting was ‘very easy’; and 0 if ‘easy’, ‘difficult’ or ‘very difficult’
- Preferred method for selecting candidates from different political parties: 1 if ‘electronically’, and 0 if ‘by hand’

Confidence in the fairness of the election process

- Confidence on vote being counted: 1 if ‘very sure’ or ‘sure’; and 0 if ‘unsure’ or ‘very unsure
- Confidence on ballot secrecy: 1 if ‘very confident’ or ‘confident’; and 0 if ‘not confident’ or ‘not at all confident’
- Cleanness of elections in Salta: 1 if ‘very clean’ or ‘somewhat clean’; and 0 if ‘a little clean’ or ‘not at all clean’

I do not have a lot of knowledge in political science, but the variables chosen for measurement seem adequate to detect an effect if it exists.

The mechanism of assignment to traditional or electronic voting was not done by the experimenters, it was a sort of retrospective observational study. While this was not the best way to make causal inference, they attempted to remedy the non-random assignment by matching using propensity scores (R’s *MatchIt* function) to be able to compare between individuals that are as similar as possible except for whether they used traditional or electronic voting.

Table 3 in Alvarez et. al (2013) presents the main findings of the paper and was chosen for replication. Other possible targets could have been Table 1: Initial summary statistics for Electronic and Traditional Voters, Table 2: Balance statistics for the covariates after the matching was done, Table 4: Differences in reported voting experiences between e-voters and traditional voters after a post-matching regression adjustment, and Table 5: Sensitivity analysis on results with Rosenbaum bounds tests.

For the replication, I used the code provided in the Harvard Dataverse Library. The code was essentially perfect and I only had to swap out the matching function and create a new dataframe of matched individuals. For matching, I used R's *GenMatch* function with pop.size=200, max.generations=100, and wait.generations=4. The new Table 3 is presented below:

	Before matching (N = 1,475)					After propensity score matching (N = 1,164)					After genetic matching (N = 1,858)				
	N	E-Voting (%)	Traditional Voting (%)	Diff.	p-value	N	E-Voting (%)	Traditional Voting (%)	Diff.	p-value	N	E-Voting (%)	Traditional Voting (%)	Diff.	p-value
Select Candidates electronically	1388	83.8	53.4	30.4	0.000	1101	82.7	54.1	28.6	0.000	1735	83.6	60.3	23.3	0.000
Evaluation of voting experience	1460	46.3	21.3	25.0	0.000	1151	45.6	20.9	24.7	0.000	1831	46.3	15.7	30.6	0.000
Ease of voting procedure	1469	33.6	11.5	22.1	0.000	1159	32.5	11.9	20.6	0.000	1841	34.0	7.4	26.6	0.000
Agree substitute TV by EV	1409	84.1	62.4	21.7	0.000	1114	82.4	63.3	19.1	0.000	1755	83.6	67.8	15.8	0.000
Elections in Salta are clean	1284	58.0	41.0	17.0	0.000	1022	57.6	41.5	16.0	0.000	1645	57.7	43.6	14.1	0.000
Sure vote was counted	1418	86.3	77.0	9.3	0.000	1117	85.7	77.0	8.8	0.000	1779	86.2	75.0	11.2	0.000
Qualification of poll workers	1416	85.1	76.2	8.9	0.000	1123	84.5	76.0	8.5	0.000	1778	84.46	79.9	4.6	0.002
Speed of voting process	1443	84.1	80.8	3.2	0.130	1137	83.2	80.7	2.5	0.306	1771	84.38	79.1	5.3	0.016
Confident ballot secret	1431	77.1	84.5	-7.4	0.001	1133	76.9	84.3	-7.4	0.002	1802	76.3	82.3	-6.0	0.000

Table 3

Results

	Before Matching	After propensity score matching	After genetic matching	% Change from propensity to genetic matching
Select Candidates electronically	30.4	28.6	23.3	-19%
Evaluation of voting experience	25.0	24.7	30.6	24%
Ease of voting procedure	22.1	20.6	26.6	29%
Agree substitute TV by EV	21.7	19.1	15.8	-17%
Elections in Salta are clean	17.0	16.0	14.1	-12%
Sure vote was counted	9.3	8.8	11.2	27%
Qualification of poll workers	8.9	8.5	4.6	-46%
Speed of voting process	3.2	2.5	5.3	112%
Confident ballot secret	-7.4	-7.4	-6.0	-19%

Table 4. Diff Columns of Before Matching, After propensity score matching, and After genetic matching in Table 3 above. The percentage change is also calculated as: (Prop.matching – Genmatching)/Propmatching * 100%.

This summarizes the Table 3 above showing that for some of the covariates, there is an increase or a decrease usually between -20% and +29%, although there are outliers. The main takeaway, however, is that there is still a substantial difference in the perception between Electronic and Traditional Voting members of Santa, Argentina.

Extension

This could be made better by making the assignment random and increasing the number of participants. It would be possible to do a sensitivity analysis but the paper already did that and found that it is a very robust result.

After internal validity has been shown above, a possible question to ask is whether the result has external validity and can be applicable in other cities and countries. This is a question that is a key one when doing causal inference and can be answered by induction. We need to build a case that this results hold elsewhere by performing this experiment in other places that are culturally similar (small scale matching) and find the same result.

Note: Code for the replication can be found at https://github.com/ayoola-babatunde/other/tree/master

References

Alvarez, R. Michael; Levin, Ines; Pomares, Julia; Leiras, Marcelo (2013). Voting Made Safe and Easy: The Impact of e-voting on Citizen Perceptions. *Political Science Research and Methods*. Vol 1, No. 1, 117–137 June 2013.

Alvarez, R. Michael; Levin, Ines; Pomares, Julia; Leiras, Marcelo (2015) Replication data for: Voting Made Safe and Easy: The Impact of e-voting on Citizen Perceptions. Harvard Dataverse, V1. Retrieved from https://doi.org/10.7910/DVN/24896