Free or Fair Elections? The Introduction to Electronic Voting in Brazil*

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April 2020

Abstract: This paper studies the phased-in introduction of electronic voting in Brazil to disentangle the effects of free and fair elections on politicians' responsiveness to voters' demands. The new technology improved voters' access, particularly of less educated ones, to legislative elections and undercut voter fraud that had previously been shown to take place with paper ballots after voting (i.e., adding votes to tabulation sheets after voting has ended). At the same time, the new technology increased the relative appeal of voter fraud via ballot stuffing (i.e., when voters illegally vote more than once). I find that municipalities using electronic rather than paper ballots experienced larger increases in the number of registered voters suggesting an increase of ballot stuffing. I also find that enfranchisement biased toward low-income voters does not necessarily lead to an increase in public spending. Results suggests that fairness of elections is a complementary condition to guarantee electoral accountability.

Keywords: Electronic voting; Enfranchisement; Electoral Fraud; Social Spending
JEL Codes: H41, H51, H75, D72

*I thank the chief-editor, Marcela Eslava, and two anonymous referees for their insightful comments and suggestions. I am also grateful to José Antonio Cheibub, Rebecca Thornton, Dan Bernhardt, Daniel McMillen, and Jake Bowers for their detailed feedback and support. This paper benefited from comments by participants at the 2015 Global Studies Association Conference; the 10th Economic Graduate Student Conference; The 34th Polmeth annual meeting; The 113th APSA annual meeting and the UIUC graduate seminars. Finally, I thank Kelly Senters, Anderson Frey, Mauricio Bugarin and Diloá Athias for their generous comments and numerous revision suggestions. All errors are my own.

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1 Introduction

In a democratic system, free and fair elections are the mechanisms guaranteeing that politicians will be responsive to citizens and less likely to pursue policies for their own self-interest (Acemoglu et al. 2013). Therefore, democracy, per se, is not sufficient to guarantee that governments will consider the preferences of its citizens (Callen and Long 2015). Meltzer and Richard (1981) explain this fact focusing on enfranchisement, i.e. free elections, showing that politicians will only consider the preferences of voters who participate in elections. An alternative explanation for politicians ignoring their citizens' preferences is the presence of electoral fraud, i.e. unfair elections, as politicians are not hold accountable in this situation and can divert resources for their own benefit (Debnath et al. 2017).

I examine electoral accountability in Brazil, where electronic voting affected both access to and fairness of elections. On one hand, electronic voting enfranchised voters, especially less skilled ones, in legislative elections (Fujiwara 2015), which led elected members of congress to increase expenditure in municipalities using electronic voting by proposing amendments to the annual national budget favoring these places (Schneider et al. forthcoming). This result should be expected because low-income voters demand more public expenditure as they benefit from it but pay a smaller share of the tax revenue used to finance it (Meltzer and Richard 1981). On the other hand, the new voting system eliminated the possibility of fraud after voting (Hidalgo 2012) and, therefore, increased the relative attractiveness of fraud before voting (Hidalgo and Nichter 2016). Empirical evidence suggests that elimination of fraud is a complement to enfranchisement to provide accountability: Places where electronic voting enfranchised poor voters, but that also had suggestive evidence of electoral fraud, experienced relatively lower or no change in public expenditure in areas such as health and employment in local administrations.

I take advantage of the phased-in introduction of electronic voting in Brazil to disentangle the effects of enfranchisement and electoral fraud on public spending. The advantage of examining the Brazilian case is that four States used electronic voting across their territories

in 1998 and, as congressional candidates are elected in this country to represent their States, which are large multi-member districts, there would be no possibility of fraud after voting for congressional candidates belonging to these four States. Therefore, fraud before voting via ballot stuffing, i.e., when voters illegally vote more than once, would be relatively more attractive in these districts. This fact allows me to construct a geographical regression discontinuity in which the distance to the boundaries of these four States is the running variable while change in registered voters is the dependent variable. As the most common way of ballot stuffing is when voters illegally obtain more than one voter ID card and cast more than one ballot, then municipalities belonging to the States using electronic voting across their territories should have their number of registered voters relatively inflated.

The Brazilian case offers an opportunity to disentangle the effects of free and fair elections because electronic voting homogeneously enfranchised less educated voters and generated variations in registration of voters, which as discussed below, can be related to electoral fraud. Using the geographical regression discontinuity proposed, I find an enfranchisement of voters similar to the one reported by the literature using a different sample exploring a population regression discontinuity (Hidalgo 2012, Fujiwara 2015) suggesting that electronic voting homogeneously caused enfranchisement in Brazil. However, increase in voters' registration was not homogeneous across electronic voting usage. Evidence consistent with the presence of ballot stuffing is only observed in the sample analyzing the geographical regression discontinuity. I find that municipalities belonging to the four States using electronic voting across their territories had relatively inflated numbers of registered voters. Nonetheless, the same is not observed in the sample using the population regression discontinuity previously explored in the literature. In addition, I find heterogeneous effects of electronic voting on the number of registered voters within the geographical regression discontinuity sample. This allows me to keep enfranchisement of less educated voters' constant, while changing the level of inflated electorate. Exploring this heterogeneity, I find that members of congress are more responsive to less educated voters' enfranchisement in places where

there was no increase in voters' registration.

The most natural explanation for the increase in voters' registration is that citizens positively responded to the new technology by registering more to vote. If this is the case, then the results showing that there was relatively smaller social spending in places using electronic voting and that had higher levels of voters' registration could be conciliated with a broader literature showing that enfranchisement do not necessarily leads to redistributive politics for reasons such as malapportionment (Ardanaz and Scartascini, 2013) and lack of pro-poor candidates (Machado, 2012).[1] However, in the specific case of electronic voting in Brazil, empirical results suggest that Meltzer and Richard (1981) model's prediction is valid as poor voters' enfranchisement increased taxation, intergovernmental transfers and public expenditure (Fujiwara, 2015; Schneider et al., 2019, forthcoming). Moreover, although I cannot establish that positive changes in voters' registration is an evidence of electoral fraud, I show evidence that is consistent with this interpretation. First, I report anecdotal evidence of ballot stuffing in districts impeded to use fraud after voting (i.e., the ones using the new technology across their territories). Second, I show empirical evidence that electronic voting only caused increase in voters' registration in these districts. Third, I find empirical evidence that municipalities that were more likely to be involved in electoral fraud in pre-electronic voting elections were also more likely to have inflated electorate in the 1998 elections. Finally, I show that places with smaller number of voters per seat in congress, which are relatively more attractive for ballot stuffing as voters have larger weight in the political process, are also more likely to show larger increases in their electorate.

This work communicates with the literature investigating the consequences of enfranchisement on fiscal policies and electoral outcomes. Husted and Kenny (1997) argue that eliminating voting requirements in the United States such as literacy tests and poll taxes increased voting participation, especially among the poor, and government spending increased in response. Similar results are found in other contexts as a consequence of nationwide en-

[1] Another possibility that can explain why policymakers disregard voters' preferences is the subordination of local politicians to central government's interests (Kresch and Schneider, 2020).

franchisement (Aidt and Jensen, 2009; Acemoglu and Robinson, 2000).[2] Gingerich (2013) shows that the introduction to Australian ballot in Brazil in the 1960s decreased *de facto* participation among poor voters benefiting left wing parties. The author argues that the poor and illiterates were dominated by clientelism and would cast a vote under the influence of local notables representing the right wing parties. Since the Australian ballot did not allow those voters to take a printed ballot and slip it into the urn, they would have to actually write the name of their candidates, which they could mostly not do in a successful way. Thus, the *disenfranchisement* of the poor and uneducated disproportionately benefited left wing parties. The present work, on the other hand, investigates an electoral policy that *de facto* enfranchised poor voters in Brazil and their consequences for electoral outcomes and fiscal policies.

The second strand of the literature that this paper relates to is the one analyzing electronic voting systems, which have been adopted by many democracies since the 1990s (Katz et al. 2011), and have others on the verge of using them (Alvarez and Hall 2010). Although the adoption of the new technology is expected to improve elections, it is not clear whether electronic voting can improve political accountability and if they fail to do so, then politicians can be less responsive to voters' demands (Lehoucq 2003). Therefore, if electronic voting attempts to enhance political accountability, it should eliminate the possibility of electoral fraud and be politically neutral. Nonetheless, many authors show that voting technologies can hold important consequences for electoral outcomes, such as favoring political parties (Katz et al. 2011, Schneider and Senters 2018, Garner and Spolaore 2005, Stewart III 2011, Card and Moretti 2007, Shue and Luttmer 2009, Ansolabehere and Stewart III 2005).[3] Moreover, as Birch et al. (2014) indicate, electronic systems include potential systemic glitches and lack of transparency in the recording, counting, and tabulation of votes.[4] Thus, the

[2]For more examples on the positive effect of enfranchisement on public spending see Mueller and Stratmann (2003); Lindert (2004); and Bugarin and Portugal (2015).

[3]Notice that the impact of electronic voting on electoral outcomes could actually be considered a "correction" of the preexisting bias as the new technology may enfranchise voters as in the Brazilian case.

[4]One example of how electronic voting can reduce fraud is discussed by Callen and Long (2015) analysis of voting technology in Afghanistan.

usage of electronic voting can be problematic for achieving electoral fairness.

The homogeneous enfranchisement of lower income voters caused by electronic voting in Brazil is expected to increase taxes and redistribution. This prediction is derived from Meltzer and Richard (1981) seminal work showing that, when the income of the median (decisive) voter becomes smaller than the average income, there is an increase in taxes and redistribution. Three papers show empirical evidence corroborating this result. Fujiwara (2015) shows that Brazilian States with larger share of voters using electronic voting experienced larger public spending on health care and improvements in health outcomes, such as prenatal care. Schneider et al. (forthcoming) show that Brazilian municipalities using electronic voting were disproportionately favored by amendments to the annual public budget resulting in larger expenditure in their territories. Finally, Schneider et al. (2019) find that municipalities using electronic voting had an increase in tax revenue and public spending in the areas of education, public employment and health.

I add to these works by also considering that electronic voting, by eliminating the possibility of fraud after voting, increased the attractiveness of alternative electoral malfeasance (Hidalgo and Nichter, 2016). Therefore, I take into account the possibility that enfranchisement of low-income voters can be mitigated by electoral fraud affording politicians to ignore the low-income voters' higher demand for public provision. This prediction is consistent with Acemoglu and Robinson (2008) theoretical model showing that voters' preferences can be ignored in a democracy when elites have relatively more *de facto* political power through lobbying and bribery. Fergusson et al. (2020) show empirical evidence corroborating this prediction in Colombia where political elites used violence to retaliate against electoral victories of previously excluded left-wing parties.

2 Electronic voting and free and fair elections in Brazil

2.1 Introduction to electronic voting in Brazil

Electronic voting technology was introduced in Brazil to eliminate fraud after voting (Hidalgo 2012). In 1996, all municipalities with more than 200,000 eligible voters used the new technology. In 1998, the use of the technology expanded to include all municipalities with more than 40,500 eligible voters. In addition, four States used electronic voting for all their municipalities regardless of the number of eligible voters (Rio de Janeiro, Amapá, Alagoas and Roraima). In the 2000 election and for every subsequent election, every Brazilian voter voted electronically.

The new system also enfranchised voters and increased participation in legislative elections. Before electronic voting, many Brazilians experienced difficulties casting valid votes due to low literacy skills; votes were invalidated when candidates' names (or numbers) were not clearly written. Prior to the introduction of the electronic voting, knowing how to read and write as well as understanding the complicated ballot instructions were crucial for a voter to cast her vote correctly and validly. With the introduction of the new system, voters had only to indicate the number of their preferred candidate (or party in the legislative elections). Following their entry of said candidate's (or party's) number, a photo of the candidate or party would appear on the screen for confirmation. The ratio of the number of valid votes to turnout for federal representatives increased from 54 percent in 1994, when all municipalities used paper ballots, to 90 percent in 2002, when all municipalities used voting machines. Fujiwara (2015) shows empirical evidence that the introduction to voting machines in Brazil, by no longer requiring voters to write the names of legislative candidates in the ballot, amplified the ratio of valid votes to turnout for representatives, especially benefiting illiterate voters.

Nonetheless, the introduction of voting technology in Brazil also increased the attractiveness of electoral fraud before voting (Hidalgo and Nichter (2016)). As previously mentioned,

while electronic voting eliminated the possibility of fraud after voting, such as adding votes to tabulation sheets after actual voting takes place, it generated incentives for alternative methods of electoral malfeasance, such as ballot stuffing. In what follows, I explain the Brazilian electoral context, which motivated the introduction of electronic voting to eliminate fraud after voting.

2.2 Electronic voting and the possibility of electoral fraud in Brazil

The 1994 legislative elections in the State of Rio de Janeiro were manipulated and consequently annulled. The 1994 federal elections in Brazil had the State of Rio de Janeiro re-running its proportional elections due to allegations of widespread fraud during the vote count (Folha 1994). For instance, there was fraud in 80% of the ballot boxes belonging to the 25th electoral zone of this State. Fraud was detected when ballot boxes were illegally unsealed. There was also evidence of fraud when the total counting of votes for a candidate coming from a specific ballot box were larger than the total number of ballots containing votes for the candidate inside of it.[5] Finally, electoral fraud was also identified when voters illegally cast more than one ballot.[6]

The electoral fraud in the State of Rio de Janeiro motivated the introduction of electronic voting in Brazil to avoid similar problems in the future. In 1994, the Electoral Judge of Rio de Janeiro and current Supreme Court justice, Luiz Fux, said that the only solution to avoid electoral fraud in Brazil would be the introduction of electronic voting (Brasil 1994a). In 1998, Brazil used the new voting system for the first time in a federal election and Rio de Janeiro was one of the four States selected to use it across their territories because of its past involvement with electoral fraud (Folha 1998a).

Although electronic voting eliminated the possibility of fraud after voting, it did not rule

[5]One case illustrates this type of fraud: Marcia Cibilis Viana, one of the candidates running for Brazilian congress in the 1994 election to represent the state of Rio de Janeiro, had 21 votes counted coming from one specific ballot box. However, once there was a recount of the votes inside this ballot box, it was found only one ballot cast for her (Brasil 1994b).

[6]For instance, one ballot box contained 45 votes, with the same handwriting, for the congressional candidate Paulo de Almeida (Folha 1994).

out the possibility of fraud before voting. With the introduction of electronic voting the possibility of manipulating ballot boxes was eliminated, therefore, the relative attractiveness of ballot stuffing (i.e., having voters voting more than once) increased for those who were willing to manipulate electoral outcomes. One way to have the same voter illegally voting more than once is to give him or her more than one voter identification card. Although voters need to be registered and have their voter ID cards verified prior to voting, they were not required to show a photo ID. Therefore, voters could vote more than once if they had a voter ID card that did not belong to themselves. Voters could obtain more than one voter ID card by using fake social security cards to register to vote and, that way, obtaining extra voter ID cards.[7]

There were also two indirect sources from which voters could obtain extra voter ID cards: First, from voters who passed away and did not have their ID cards cancelled. Second, from voters who moved to another municipality and did not have their ID cards cancelled. The surplus number of voter ID cards coming from these two sources, if not cancelled, could be illegally sold. In 1998, authorities believed that the most likely electoral fraud taking place in Brazil was voting in the place of a voter that had already passed away (Folha 1998d). In what follows, I report evidence of extra voter ID cards being sold in the first year of electronic voting usage in federal elections in Brazil.

In 1998, police officers found and arrested in Roraima - one of the States using electronic voting across their territories - a voter that had 622 voter ID cards in his belongings (Estado 1998a). He was reported to police after attempting to sell these cards for 50 thousand Brazilian Reais (close to $42,000 in 1998 U.S. dollars) to one of the candidates in Roraima.[8]

In 1998, the State of Alagoas - also one of the States using electronic voting across their territories - had 10 thousand voter ID cards stolen from the 1st electoral zone of its

[7]The most extreme case of this illegal action was found in 2017 in the State of Goiás where the same voter had 52 voter ID cards. Link, accessed in October 17, 2018: samevoterID.

[8]In the same State of Roraima, police identified, in the day of the 1998 federal election, dozens of voters that had their Voters' ID cards duplicated, one voter was arrested with 12 fake IDs in his belongings. Police was also investigating allegations of 10 thousand fake voters' ID cards circulating in the State (Estado 1998b).

State capital, Maceió (at the time, one person was arrested with 498 of these cards in his belongings). To avoid fraud, therefore, electoral justice determined that Alagoas would be the only State in the 1998 federal elections to require voters to take a photo ID card with them to avoid voters being able to vote more than once (voter ID cards contain no photos). However, this requirement was not enough to eliminate fraud: Two days prior to the election, police officers in the State of Alagoas had apprehended 340 fake worker ID cards, one of the options of photo ID that voters had to identify themselves in the election day (Folha 1998e).

Finally, another evidence of this type of electoral fraud comes from suspiciously high increase in the number of voters in each State. In 1998, the State of Tocantins recounted its number of voters and cancelled 45 thousand voter ID cards belonging to voters that had more than one voter ID card in their names, and that did not show up to explain why this happened. The State of Tocantins, therefore, had a decrease of 6.7% in its number of registered voters between 1996 and 1998. Nonetheless, State electoral authorities are not required to do such a recount of voters and the excess number of voters could potentially be used to manipulate elections. In fact, many States had their number of registered voters inflated between 1996 and 1998, this was especially the case of Roraima and Amapá, two States that had electronic voting across their territories in 1998, and that increased their electorate by respectively, 21.43% and 22.67%, the two largest increase in electorate over the period (Folha 1998b).[9]

3 Data Description and Methodology

I collect electoral and socioeconomic data to analyze whether places using electronic voting had a suspicious increase in their electorate size. I focus on the federal elections of 1994, 1998 and 2002, which elected State and Federal Representatives, as well as Senators, Governors and President. I examine the possibility of electoral fraud by studying the increase in the

[9]Roraima was also the most extreme case of having more voters than population eligible to vote in 1998. There were 13% more voters than population eligible to vote at the time. (Folha 1998c).

number of eligible voters at the municipality level. I collect this information, as well as other relevant electoral variables, from the TSE (Superior Electoral Court). The socioeconomic data I use for my analysis were collected from Ipeadata (Institute of Applied Economic Research).[10]

I then construct a geographical regression discontinuity, where distance to the boundaries of States using the voting technology across their territories is the forcing variable.[11] For this analysis, I restrict the sample to municipalities surrounding the geographical boundaries of the four States that used electronic voting in all their territories. Formally, I construct the following regression:

$$EC_{mt} = \alpha + \gamma D_m + \beta(r_m - c) + \epsilon_{mt}, \quad s.t. : (c-h) \geq r_m \leq (c+h), \tag{1}$$

where EC_{mt} is the number of registered voters' percentage change at municipality m from election $t-1$ to election t, c represents the cutoff (boundaries of States using electronic voting), r_m indicates the distance in kilometers to the cutoff, D_m is a dummy indicating that the boundaries of States using electronic voting were crossed, and h represents the selected bandwidth (in kilometers).γ is the main independent variable, which captures the electronic voting effect. β measures closeness to the cutoff. Finally, ϵ_{mt} contains the error term for each observation.[12]

My hypothesis is that States using electronic voting across their territories will have an inflated number of voters suggesting an attempt of fraud before voting. States that had electronic voting across their territories are a good treatment in this case because, in Brazil, each State act as a multi member district. Therefore, congressional candidates belonging to these districts who were willing to commit electoral fraud did not have an option of manipulating ballot boxes (i.e., fraud after voting). States that had part of their territories

[10]The English version of the Superior Electoral Court can be accessed in the following link: TSE. The English version of the Ipea data can be accessed in the following link: IPEA.

[11]For a detailed description of geographical regression discontinuity, see Keele and Titiunik (2015).

[12]I also allow for a change in slope after the cutoff have been surpassed (i.e., $D_m * (r_m - c)$) when using the `rdrobust` package.

using electronic voting and the remaining using paper ballot, could concentrate their efforts on "fraud after voting" in municipalities using paper ballot.

Therefore, the population regression discontinuity, previously used by Fujiwara (2015) and Schneider et al. (forthcoming), is not ideal. Their studies eliminate the four States using electronic voting across their territories from the sample used in their empirical models. That way, their analysis contain districts (States) that elect their representatives in congress using both electronic and paper ballots. Thus, if fraud after voting is easier or "cheaper" than fraud before voting, which is likely to be the case as the new technology was enacted to eliminate the frequent usage of the former, then politicians would be less attracted to use fraud before voting in municipalities using electronic voting when they have the possibility of fraud after voting within municipalities lying inside their electoral districts and that used paper ballots. Thus, this paper uses the population regression discontinuity only to provide robustness for the main results.

4 Results

4.1 Inflated electorate

The main assumption required to validate my estimations from equation (1) is that municipalities close to the geographical boundaries of the States using electronic voting across their territories have similar characteristics. The choice of the four States using electronic voting across their territories was not random. Amapá and Roraima (two remote states covered by the Amazon forest) were selected to test electoral authorities' ability to use the voting machines in isolated areas, while Rio de Janeiro and Alagoas were selected because of their history of electoral fraud (Folha 1998a). Including the States of Rio de Janeiro and Alagoas in the econometric analysis can, therefore, overestimate coefficients given their past involvement with electoral fraud.

This concern, however, is mitigated analyzing Figure 1, which shows two maps of Brazil.

The first one, on the left-hand side, shows all municipalities using electronic voting in 1998 (represented in black). The second one, on the right-hand side, shows all municipalities belonging to the top 10% largest increase in the number of registered voters between 1996-1998 (also represented in black). As one can notice, Roraima and Amapá (circled in red indicating usage of electronic voting across their territories) are the two states that had the most suspicious increase in their number of registered voters. Rio de Janeiro does not show to have experienced suspicious increase in its number of registered voters, which can be explained by three facts: First, Rio de Janeiro was being watched by electoral authorities. The 1994 scandal involving fraud after voting, which took place in its territory, motivated the adoption of electronic voting in 1998 (Brasil 1994a, Folha 1998a). Second, there were no electoral scandals reported in the main Brazilian media outlets related to fake IDs involving Rio de Janeiro in 1998. Third, due to malapportionment, Rio de Janeiro have a large number of voters per seat which mitigates incentives for fraud (this will be further discussed below).

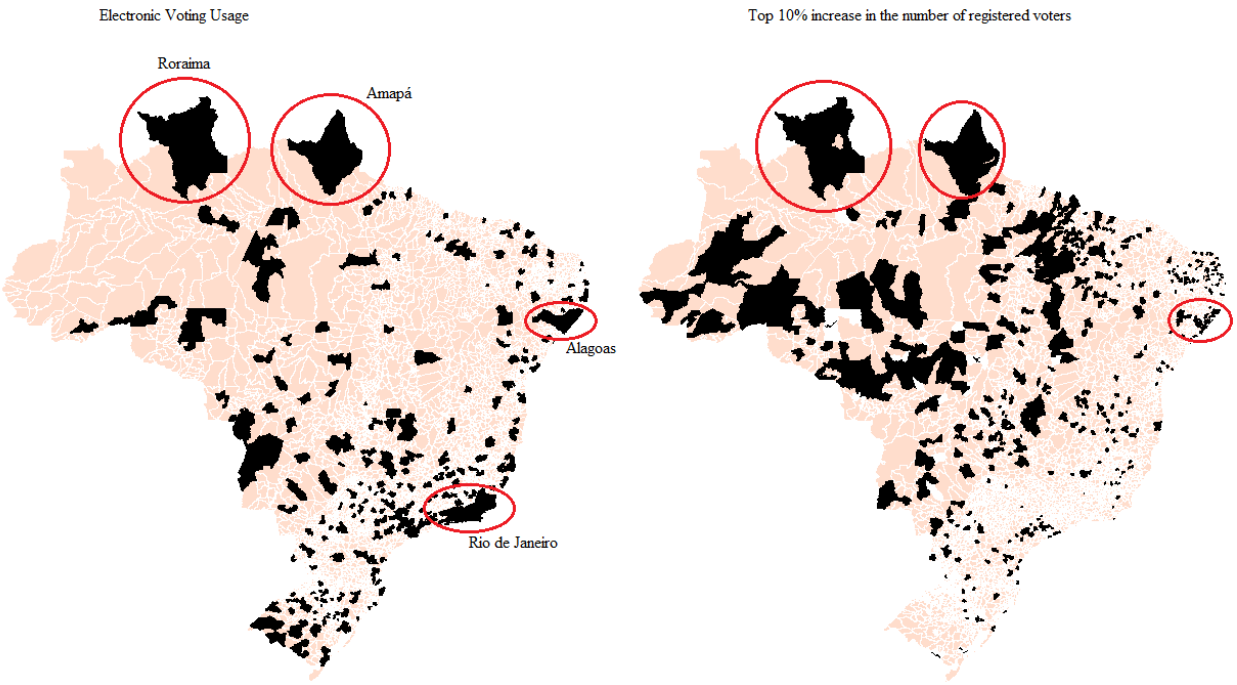

Figure 1: The left-hand side figure shows, in black, all Brazilian municipalities that had electronic voting in 1998. The four States using electronic voting across their territories are circled in red. The right-hand side figure shows, in black, all Brazilian municipalities belonging to the top 10% largest increase in the number of registered voters between 1996-1998.

Next, I provide further evidence that States using electronic voting across their territories have similar characteristics and are, therefore, comparable. I estimate equation (1) showing placebo changes in registered voters. I find that in 1994 (when all municipalities used paper ballots) as well as in 2002 (when all municipalities voted electronically), the percentage change in the number of registered voters is continuous around the cutoff. The only discontinuity close to the cutoff is observed in 1998, when only the treated group used electronic voting. Figure 2 presents the results. As it indicates, electronic voting caused the number of registered voters between 1996-1998 to increase by 5.2 percent, while in the remaining years, the change in registered voters is continuous around the cutoff.

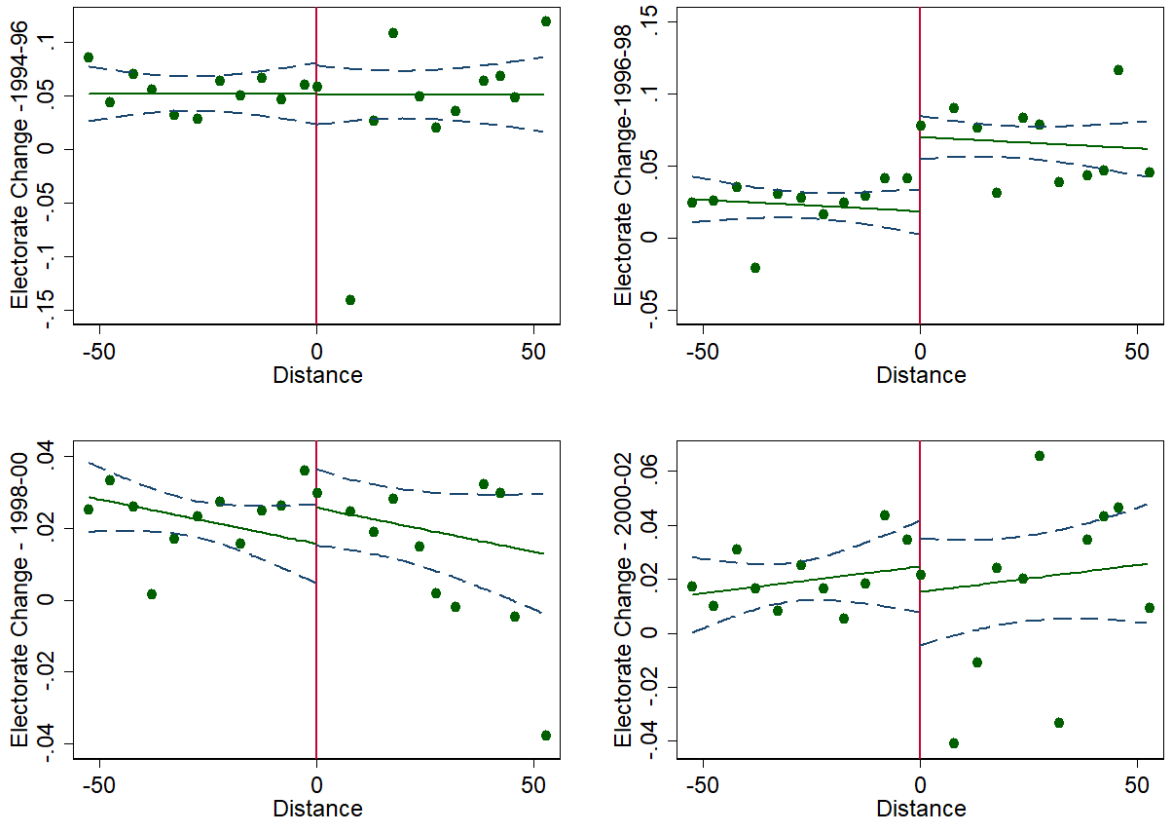

Figure 2: Shows four time-varying functions using a 52.529 kilometers' bandwidth selected by the robust bias-corrected confidence intervals proposed by Calonico et al. (2014) and a vertical red line representing the cutoff point. The solid line is fitted separately on each side of the threshold, and the dashed line represents the 95% confidence interval. The scatter plots show 5 kilometers' bins averages. The first, third and fourth graphs show, respectively, placebo estimations using the change in the number of registered voters between 1994-1996, 1998-2000 and 2000-2002. The second graph shows the change in the number of registered voters between 1996-1998 and captures the "true" electronic voting effect.

I then extend the analysis checking the validity of the comparability assumption to socioeconomic characteristics. I test whether rural population; change in population; human development index; GDP per capita; and illiteracy rate are all continuous across the four State boundaries. In Table 1, column 1, I find that the socioeconomic variables analyzed are continuous around the State boundaries, validating the comparability assumption. In Table 1, column 2, I show that the socio-economic variables analyzed are also continuous around the threshold used for the population RDD, which is consistent with Fujiwara (2015)

Table 1: RDD measuring the effect of electronic voting usage on socio-economic variables

VARIABLES	(1) Geographical RDD	(2) Population RDD
Illiteracy rate (in percent)	2.925	-3.655
	(2.906)	(3.308)
Human Development Index (in decimal)	-0.004	0.021
	(0.017)	(0.022)
GDP per capita (in 2000 Brazilian Reais)	6.967	28.374
	(16.022)	(32.81)
$\frac{Population_t - Population_{t-1}}{Population_{t-1}}$	0.025	6.663
	(3.539)	(5.168)
$\frac{Rural\ Population_t}{Total\ Population_t}$	0.013	-0.048
	(0.043)	(0.055)
N	342	156

Note: Robust standard errors clustered at the municipality level are reported in parenthesis. Each row reports the effect of electronic voting usage on each dependent variable (labeled in the first column). The socioeconomic variables were collected at the 2000 Brazilian Census. Columns one and two represents, respectively, a geographical and population RDD with a 52.529 kilometers' and 7,064 eligible voters' optimal bandwidth. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

findings.[13] Nonetheless, as I show below, the change in the number of registered voters is only observed in the geographical RDD.

In Table 2, column 1, I use the geographical RDD and find that electronic voting increased the number of registered voters (as showed in Figure 2), votes cast, and valid votes to turnout ratio for federal representatives. The increase in votes cast (i.e., valid votes) and valid votes to turnout ratio should be expected because electronic voting made it easier for voters to cast a ballot. However, the observed positive change in registered voters was not expected *a priori*. Next, I analyze the impact of electronic voting on the same dependent variables, but using the number of eligible voters as the running variable (i.e., population RDD) and I then compare those results to the ones obtained using the geographical RDD.

[13] As previously mentioned, 22 Brazilian States not using electronic voting across their territories had the new technology adopted in their municipalities with more than 40,500 eligible voters. I take advantage of this cutoff point and construct a population RDD, which excludes the four States using electronic voting across their territories and considers the same independent variables as the ones used in the geographical RDD.

Table 2: RDD measuring the effect of electronic voting usage on electoral outcomes

VARIABLES	(1) Geographical RDD	(2) Population RDD
$\frac{Registered\,Voters_t - Registered\,Voters_{t-1}}{Registered\,Voters_{t-1}}$	0.052***	0.028
	(0.014)	(0.019)
$\frac{Valid\,Votes\,Federal\,Representatives_t}{Number\,of\,People\,Voting_t}$	0.239***	0.202***
	(0.012)	(0.027)
$\frac{Votes\,Cast_t - Votes\,Cast_{t-1}}{Votes\,Cast_{t-1}}$	0.282***	0.259***
	(0.061)	(0.089)
$\frac{Registered\,Voters_t}{Number\,of\,People\,Voting_t}$	-0.018	0.005
	(0.015)	(0.024)
N	342	156

Note: Robust standard errors clustered at the municipality level are reported in parenthesis. Each row reports the effect of electronic voting usage on each dependent variable (labeled in the first column). Columns one and two represents, respectively, a geographical and population RDD with a 52.529 kilometers' and 7,064 eligible voters' optimal bandwidth. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

The results presented in Table 2, column 2, suggest that electronic voting usage, *per se*, is not causing an increase in registered voters. This finding mitigates concerns with alternative explanations for the results reported here. For instance, this result weakens the possibility that the change in voters observed in Table 2, column 1, is a consequence of more visits by electoral officials in municipalities using the new technology to assure that it is ready to use, which would incentivize local authorities to do their job more effectively at registering voters. Furthermore, the change in votes cast and valid votes to turnout ratio show similar increase to the one reported in column 1, confirming that electronic voting facilitated voting.[14]

The results presented in subsection 4.1 suggests that electronic voting increased the number of registered voters. Nonetheless, this result works exclusively for the investigation analysing the States that had the new technology adopted *across* their territories. I propose two ways of explaining this finding that are both related to cost effectiveness of fraud.

[14]The result on valid votes to turnout ratio presented in Table 2, column 2, is similar to the one previously reported using the population RDD where number of eligible voters is the running variable (Fujiwara 2015; Hidalgo 2012)

First, as fraud after voting was common in Brazil, which motivated the adoption of electronic voting, then it may be that fraud after voting is superior to fraud before voting. If this is the case, politicians in States that had both types of voting system (i.e., paper and electronic) and who were willing to commit a fraud, would choose fraud after voting and concentrate their efforts in municipalities using the old paper ballot system. One way to test this hypothesis is by examining valid votes to turnout ratio because, as Hidalgo (2012) mentions, suspiciously high number of valid votes in Brazil served as evidence of fraud and triggered recounts of votes by electoral authorities. However, the problem is that electronic voting *caused* an increase in valid votes to turnout ratio by facilitating casting a ballot, which prevents me from using the new technology as exogenous shock to study valid votes as proxy for fraud.[15]

Second, politicians who were willing to commit fraud before voting should have a larger incentive to do so in districts where voters have larger weight, i.e., number of voters per seat in congress is relatively small. As Brazil have high levels of malapportionment (Snyder and Samuels 2001), there are States (districts) that have a much lower electorate to seats in congress ratio. In the geographical RDD sample analyzed, three out of the four States (Alagoas, Amapá and Roraima) using electronic voting across their territories are among the top four States with lower electorate to seats ratio within the eleven States considered in the geographical RDD.[16] Therefore, the increase in registered voters observed exclusively in the geographical RDD could be explained by the fact that most of the States having the new technology across their territories were also districts where voters have larger weight making fraud before voting relatively more attractive.[17]

In what follows, I test whether the increase in registered voters' findings are robust to

[15]If fraud after voting is more cost effective and politicians who were willing to commit this fraud concentrated their efforts in municipalities using paper ballot, then the impact of electronic voting on valid votes reported in the literature is underestimated.

[16]Amapá and Roraima are the top 2 States in Brazil with lower electorate to seats ratio. Thus, voters in these States have a much larger weight.

[17]Helf and Hahn (1992) and Ziblatt (2009), for instance, discuss the connection between malapportionment and fraud.

Table 3: Testing whether the effects of electronic voting on the number of registered voters are robust to alternative model specifications

VARIABLES	(1) RD-Robust	(2) RD-Robust	(3) RD-Robust	(4) Half-Bandwidth	(5) Double bandwidth
Electronic Voting Usage	0.044***	0.050***	0.046***	0.050***	0.048***
	(0.011)	(0.009)	(0.011)	(0.017)	(0.010)
N	432	588	692	185	584

Note: Robust standard errors are reported in parenthesis. The depend variable (i.e. change in registered voters between 1996-1998) is the same across all specifications and is measured in decimals. Column 1 shows results using the `rdrobust` package choosing a uniform kernel. Column 2 shows results using the `rdrobust` package choosing a triangular kernel. Column 3 shows results using the `rdrobust` package choosing a triangular kernel and a second order polynomial to fit the running variable. Column 4 shows results using half the bandwidth size chosen by the `rdrobust` package. Column 5 shows results doubling the bandwidth size obtained using the `rdrobust` package. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

alternative model specifications and if population migration within Brazil can explain the results. I also test whether places that had larger valid votes to turnout ratio prior to electronic voting (as a proxy for fraud in the baseline), had also larger increase in registered voters. Finally, I test if malapportionment can explain the results by checking whether districts/States that have below-median electorate to seats ratio had larger increase in registered voters.

4.2 Robustness Checks and Alternative Hypothesis

I start this subsection checking whether the results showing an increase in the number of registered voters caused by the introduction of electronic voting are robust to different model specifications. Table 3 reports my findings and show a consistent and positive impact of electronic voting - across different model specifications - on the number of registered voters (varying between 4.3% and 5%). I implement bias-corrected nonparametric regression discontinuity estimation with robust confidence intervals using the optimal bandwidth as proposed by Calonico et al. (2014) and find results that are similar to the ones in Table 2. Columns 1, 2 and 3 show, respectively, similar estimations to the baseline when using uniform kernel; triangular kernel; and triangular kernel with running variable varying quadratically. Results are also not sensitive to choosing different bandwidths (columns 4 and 5).

I then analyze an alternative explanation for the results presented here that considers

Table 4: Testing the effects of electronic voting on the net inflow of registered voters

VARIABLES	(1) Net inflow of voters (inflow minus outflow of voters)
Electronic Voting Usage	0.004* (0.002)
N	342

Note: Robust standard errors clustered at the municipality level are reported in parenthesis. The depend variable (i.e. inflow minus outflow of voters over registered voters) is measured in decimals. This estimation uses the 52.529 kilometers' optimal bandwidth. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

whether there was a disproportionately larger number of voters migrating to States having electronic voting across their territories. Using electoral data, at the municipality level, on the inflow of voters (i.e., voters that moved to a place and re-registered there) and outflow of voters (i.e., voters that moved from a place and canceled their voting registration there), I construct a variable that adds the outflow of voters between 1997 and 1998 and then subtract it from the inflow of voters for the same period. Finally, the outcome is divided by the total number of registered voters. I find that municipalities belonging to the four States using electronic voting across their territories had a net inflow of voters (i.e., had more voters moving in than out between 1997 and 1998). However, this increase is not large enough to explain the main results. As Table 4 shows, there was an increase of 0.4% in the number of registered voters explained by the net inflow of voters. Not only the coefficient is less precisely estimated than the ones in Table 3 but the magnitude of it is too small to be driving the results.

Next, I analyze whether prior evidence of electoral fraud can explain the observed increase in the electorate. If the increase in the number of registered voters is an evidence of electoral fraud, then places where fraud was more likely to happen prior to the introduction of electronic voting should be driving the results. Politicians that were used to manipulate electoral outcomes via fraud after voting should be more willing to use fraud before voting once electronic voting eliminated the former type of fraud. In several states, abnormally

high percentage of valid votes to turnout ratio for congressional elections served as *prima facie* evidence of fraud and consequently triggered recounts (Araujo, 1998). This would be the case because, prior to electronic voting, casting a ballot was a difficult task requiring voters to know how to read and write. This was especially difficult in a developing country such as Brazil where about one third of the electorate was illiterate (Hidalgo, 2012).

Using this information, I divide the geographical RDD sample into tenths according to the share of valid votes to turnout ratio in the 1994 legislative elections (when all voters cast their votes on paper ballot). If larger share of valid votes to turnout ratio shows evidence of fraud, then the increase in the number of registered voters should be larger in municipalities belonging to the top deciles. Table 5 shows evidence that this is the case: The previous results reported in this paper showing an increase in the number of registered voters are driven by the 10th decile.

The results presented thus far suggest that there was an increase in the number of registered voters in States using electronic voting across their territories. This result, however, is driven by municipalities that presented larger evidence of prior electoral fraud. That is, places that had high share of valid votes to turnout ratio when votes were cast in paper ballots, which would trigger recounts of votes (Araujo, 1998). An alternative way of explaining the positive relationship between the share of valid votes to turnout ratio and increase in registered voters would be that places where share of valid votes is high are more developed and have more educated citizens. Therefore, these citizens would be more willing to register to vote once electronic voting was introduced because it hampered fraud after voting strengthening the Brazilian democracy.

In Table 6, I show evidence against this hypothesis. Among the four States using electronic voting across their territories, Rio de Janeiro is the one with the smallest share of illiterates. This State is also the one with the smallest share of illiterates in Brazil. However, Rio de Janeiro is the State with the smallest share of municipalities within its territory belonging to the top decile share of valid votes to turnout ratio. Therefore, higher level of

Table 5: Testing whether the effects of electronic voting on the number of registered voters are heterogeneous across different levels of prior indication of electoral fraud

VARIABLES	(1) Electronic voting usage (dividing the distribution into tenths)
1st	0.03
	(0.04)
	[12;21]
2nd	0.02
	(0.02)
	[18;14]
3rd	0.01
	(0.04)
	[23;10]
4th	0.05
	(0.04)
	[13;19]
5th	0.01
	(0.04)
	[21;11]
6th	0.01
	(0.02)
	[18;15]
7th	0.02
	(0.05)
	[14;18]
8th	0.03
	(0.02)
	[16;17]
9th	0.02
	(0.05)
	[15;17]
10th	0.08***
	(0.02)
	[18;14]

Note: Robust standard errors are reported in parenthesis. The depend variable (i.e. change in registered voters between 1996-1998) is the same across all specifications and is measured in decimals. All estimations use the 52.529 kilometers' optimal bandwidth and the number of observations to the left and right-hand side of the cutoff are presented in the brackets. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

education does not explain the high share of valid votes to turnout ratio reinforcing the hypothesis that fraud after voting is likely to be the cause of high levels of valid votes (Hidalgo, 2012; and Araujo, 1998).

An interesting feature revealed by Table 6 is that, among the States that used electronic voting across their territories, Amapá and Roraima have the largest percentage of municipalities within their district belonging to the top decile share of valid votes to turnout ratio. At the same time, these two states are the top two States in the country in terms of small number of voters per seat in congress. As aforementioned, Brazil has high levels of malapportionment (Snyder and Samuels, 2001) and, therefore, the influence of each voter vary within States/districts and are especially strong in Amapá and Roraima (the two top ranked States in voters' influence as Table 6 shows). Thus, one may hypothesize that politicians who were willing to buy voters, would focus on places where voters have larger influence or weight.

Table 6: Descriptive statistics: share of illiterates; valid votes; and malapportionment

VARIABLES	(1) Alagoas	(2) Amapá	(3) Rio de Janeiro	(4) Roraima
Share belonging to 10th decile	5.6%	37.5%	3.7%	57.14%
Share illiterates (Rank among 11)	1st	7th	11th	6th
Share illiterates (National rank)	1st	16th	27th	14th
Voters to seat ratio	460,075	87,579	637,276	62,379
Voters' influence (Rank among 11)	4th	2nd	9th	1th
Voters' influence (National rank)	7th	2nd	22nd	1th

Note: The first row analyzes the share of municipalities in each state belonging to the 10th decile of the distribution of valid votes to turnout ratio in the 1994 legislative elections. The state rank of share of illiterates and voters per seat in congress is calculated using the 1991 decennial census and the 1998 legislative elections respectively. Voters' influence increase when the voters per seat ratio decreases. This table reports the rank of each State both within the 11 States considered in the geographical RDD analysis and the 27 Brazilian States.

To test whether places where voters have larger influence or weight are places where politicians concentrated their effort on ballot stuffing, I split the geographical RDD sample within States that have below- and above-median number of voters per seat in congress. The below-median sample, therefore, contains States where voters have a relatively larger weight. Table 7 presents the results and, as column 3 shows, the positive change in registered voters between 1996 and 1998 was driven by States/districts where voters have a relatively larger influence or weight. This corroborates the hypothesis that politicians who were willing to commit fraud through ballot stuffing would concentrated their efforts in places where voters had a relatively larger weight.

Table 7: Testing whether malapportionment explain change in voters' registration

VARIABLES	(1) Entire Sample	(2) Above-Median	(3) Below-Median
Share belonging to Electronic Voting - 1998	0.050***	-0.004	0.070***
	(0.009)	(0.014)	(0.015)
	[380;208]	[72;62]	[158;120]
N	588	134	312

Note: Robust standard errors are reported in parenthesis. The depend variable (i.e. change in registered voters between 1996-1998) is the same across all specifications and is measured in decimals. Column 1 shows results using the entire sample and columns 2 and 3 use, respectively, the above- and below-median number of voters per seat in congress. The number of observations to the left and right-hand side of the cutoff are presented in the brackets. The treatment and *control* groups in column 2 is composed by municipalities belonging to Rio de Janeiro and *Minas Gerais and São Paulo* respectively. The treatment and *control* groups in column 3 is composed by municipalities belonging to Alagoas, Amapá and Roraima and *Bahia, Pará, Pernambuco and Sergipe* respectively. All regressions use the `rdrobust` package with triangular kernel. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

The estimations in Tables 2, 3 and 7 indicate that States using electronic voting across their territories had an average increase in their number of registered voters within 4.3 to 5.2%. Does this increase can be solely explained by electoral fraud? If so, is this magnitude reasonable? The average electorate size was 15,577 voters in 1996 considering the municipalities belonging to the geographical regression discontinuity analysis reported in Table 2. Therefore, if ballot stuffing is driving the results, an average of 810 voters per municipality were illegally registered to vote. This amount is not far from the number of fake IDs found in the reportage of fraud described in section 2.2 of this paper. For instance, a voter in Roraima had 622 voter ID cards in his belongings (Estado, 1998a). Although one cannot conclude that ballot stuffing is driving the results, the magnitude of the findings can be conciliated with the evidence of fraud reported by the main media outlets in the 1998 Brazilian federal election's coverage. In the next section, I explore the consequences of fraud on public spending.

5 Public Finance and Fraud

Next, I follow Schneider et al. (2019) and analyze the impact of electronic voting on public finance. More specifically, I examine whether municipalities using EV spent more on public employment, health and education. Using a population RDD, Schneider et al. (forthcoming) showed that Brazilian legislators sent a larger amount of discretionary intergovernmental transfers to municipalities using EV. Complementing this work, Schneider et al. (2019) shows that municipalities using EV spent more money on public employment and also had a larger public expenditure in the areas of health and education. In what follows, I test if these findings hold in the geographical RDD analysis presented here. Also, I examine whether the aforementioned increase in registered voters caused by EV, which may indicate ballot stuffing, is related to the EV impact on public expenditure.

Table 8 reports the results. In the first column of panel A, I analyze public spending in the legislature following the 1998 elections taking the entire sample into account. There was an increase of 23% in health spending. This result is similar to the one estimated in Schneider et al. (2019) paper (i.e., 25% in health spending). Nonetheless, the fact that there was no increase in public employment and education spending suggest that the results in the aforementioned work does not hold in the geographical RDD analysis.

One way to explain this result is that the increase in registered voters observed in the geographical RDD analysis may mitigate increase in public spending. I examine this hypothesis by segregating the sample between the above- and below-median level of malapportionment. As showed before, the increase in registered voters was driven by States with relatively high levels of voters' influence or small number of voters per seat in congress. As my proxy for electoral fraud is an increase in the number of registered voters, then municipalities with above-median number of voters per seat should have relatively fewer electoral fraud and, therefore, larger response to enfranchisement of low-income voters. The second column of Panel A of Table 8 shows that municipalities with above-median voters per seats had an increase of 28% and 34% in public employment and health spending respectively. The below-

median voters per seat sample (i.e., column 3) had a smaller increase in health spending and no change in public employment expenditure.

Therefore, Table 8 results suggest that places that had relatively larger increase in registered voters had also a smaller increase in public spending. One way of interpreting this result is that, if inflated electorate indicate ballot stuffing, then places with larger increase in registered voters can have their politicians being less responsive to poorer voters' enfranchisement (i.e., offer a lower expansion of public spending). This would happen because ballot stuffing can allow politicians to increase their chances of reelection without relying exclusively on voters' support. An alternative hypothesis to this interpretation is that places using electronic voting across their territories, and with above-median number of voters per seat in congress, are relatively larger and more developed and, therefore, have larger public spending. If this was the case, then after the 2002 elections the positive and significant results observed in the panel A of Table 8 would persist. However, the following analysis mitigates concern with this alternative hypothesis.

In Table 8 - Panel B, I show that municipalities in States with above-median seats per voter did not experience the same increase in public spending over the 4-years congressional term following the 2002 elections when all municipalities used electronic voting. This falsification test mitigates concerns that the results are being driven by an omitted variable related to usage of electronic voting, especially in the sample containing larger number of voters per seat in congress.[18]

[18]I do not analyze the 4-years congressional term following the 1994 elections because there is no information on public finance during this period for the municipalities in the sample belonging to the State of Roraima. This State is especially relevant because it is one of the States that had EV across its territory, it also had the smallest number of voters per seat in congress (i.e., largest voters' influence) and it experienced the largest increase in registered voters.

Table 8: Testing whether malapportionment explain the impact of EV on public finance

VARIABLES	(1) Entire Sample	(2) Above-Median	(3) Below-Median
Panel A			
Public Employment - 1998	0.039	0.286**	-0.084
	(0.073)	(0.120)	(0.090)
	[257;189]	[100;70]	[127;118]
Health - 1998	0.230***	0.337**	0.197**
	(0.083)	(0.149)	(0.089)
	[322;202]	[133;77]	[184;122]
Education - 1998	0.059	0.006	0.099
	(0.096)	(0.168)	(0.108)
	[270;193]	[88;67]	[157;121]
Panel B			
Public Employment - 2002	0.017	0.227	-0.076
	(0.065)	(0.181)	(0.083)
	[323;200]	[117;72]	[138;118]
Health - 2002	0.067	0.072	0.050
	(0.068)	(0.131)	(0.087)
	[357;202]	[115;71]	[134;118]
Education - 2002	0.017	0.079	0.001
	(0.063)	(0.151)	(0.071)
	[374;207]	[107;70]	[162;120]

Note: Robust standard errors are reported in parenthesis. Each row analyze a different dependent variable (i.e. logarithm of total expenditure per capita in public employment, health and education within the 4-years legislature term after the 1998 and 2002 elections in panels A and B respectively). Column 1 shows results using the entire sample and columns 2 and 3 use, respectively, the above- and below-median number of voters per seat in congress. The number of observations to the left and right-hand side of the cutoff are presented in the brackets. The treatment and *control* groups in column 2 is composed by municipalities belonging to Rio de Janeiro and *Minas Gerais and São Paulo* respectively. The treatment and *control* groups in column 3 is composed by municipalities belonging to Alagoas, Amapá and Roraima and *Bahia, Pará, Pernambuco and Sergipe* respectively. All regressions use the `rdrobust` package with triangular kernel. The 1%, 5% and 10% level of significance are represented by ***, ** and * respectively.

6 Discussion, policy implications and concluding remarks

This paper presented empirical evidence that electronic voting increased the number of registered voters in electoral districts that used the new technology across their territories. The most natural way of interpreting this result is that the new technology encouraged voters that were not participating in the Brazilian elections to register to vote. Although this is plausible and one cannot rule out this explanation, this paper findings indicate that, at least part of this increase in registration may indicate usage of fraud before voting (i.e. ballot stuffing or having voters illegally voting more than once). In what follows I first explain why electronic voting may incentivize ballot stuffing and I then present the main findings corroborating this possibility.

Electronic voting eliminated the means that had been available to politicians to manipulate the outcome of elections conducted with paper ballots. That is, electronic voting, by eliminating manual vote counting, made it unfeasible to take some of the previously used fraudulent steps to increase their votes by, for example, inflating the number of votes to tabulation sheets. Therefore, politicians who were willing to conduct electoral fraud and belonging to districts that rely exclusively on electronic voting, would have to use alternative frauds such as having voters illegally voting more than once, which would inflate the number of registered voters. There are two possibilities allowing voters to cast more than one vote with the new technology: First, voters can use fake social security cards to get extra voter ID cards. Second, voters can get access to the surplus of voter ID cards belonging to people who either died or moved to a different electoral district and did not have their cards cancelled. These sort of frauds take place in Brazil and they are a concern for electoral authorities which are currently obliging voters to register their fingerprints in response to these frauds. In the 2020 elections, 80% of Brazilian municipalities will require voters to have their fingerprints matched prior to being allowed to vote and in 2022 this will be extended to all Brazilian

voters.[19]

There are three main findings in this work that suggest presence of ballot stuffing in response to electronic voting. First, electoral districts that had voters using both paper ballots and electronic voting did not have a significant increase in voters' registration in response to electronic voting. On the other hand, electoral districts where all voters used electronic voting and, therefore, fraud after voting was not possible, experienced a larger increase in voters' registration. Second, municipalities that were more likely to be involved in fraud prior to the new technology experienced larger increase in voters' registration. Finally, the results are driven by the electoral districts where voters have larger influence (i.e., smaller number of voters per seat in congress) and therefore, where ballot stuffing is relatively more rewarding. The magnitude of the findings suggest that, if the increase in registered voters solely reflected fraud before voting, then close to 800 voters on average per municipality using electronic voting were illegally registered to vote. This finding can be conciliated with anecdotal evidence of ballot stuffing in Brazil presented in section 2.2.

One problem of ballot stuffing is that it allows politicians to be less responsive to voters' demand (Debnath et al., 2017). In this paper, I find evidence consistent with this hypothesis. Electronic voting enfranchised low income voters (Fujiwara, 2015), however, this was not enough to guarantee a response of policy makers to the demands of these newly enfranchised voters. Places that had suggestive evidence of electoral fraud, experienced weaker response to poor voters' enfranchisement on public spending. However, places where enfranchisement of the poor took place, and there was no evidence of electoral fraud, had larger expenditure in public health and employment.

Many political practitioners fear that democracy may be endangered if only richer and better educated voters participate in election biasing public policies toward their preferences. Meltzer and Richard (1981)'s seminal model shows that enfranchisement of poorer voters, by decreasing the income of the median voter, increase public spending because public goods

[19]Link, accessed in December 18, 2019: fingerprints.

are disproportionately paid by richer citizens. Cascio and Washington (2013) show empirical evidence that confirm this prediction by analyzing the enfranchisement of black voters in the U.S., and Fujiwara (2015) and Schneider et al. (2019) show that enfranchisement of poorer voters increases public health spending. Meltzer and Richard (1981)'s theoretical finding, however, is not always corroborated by empirical analysis. Hodler et al. (2015) finds that enfranchisement of less educated voters actually decreased government welfare spending and business taxation in Switzerland. The mechanism explaining this result is that less educated voters are more impressionable by political campaigns, which are financed by interest groups that demand lower taxation. Hoffman et al. (2017) show that, in Austria, making voting compulsory increased turnout but not government spending. They explain this result by showing that newly enfranchised voters had low-interest in politics. Finally, Ardanaz and Scartascini (2013) and Machado (2012) show, respectively, that malapportionment and lack of pro-poor candidates can also explain why politicians may ignore voters preferences.

When enfranchisement of poorer voters does not cause government to increase spending, democracy may lose its ability to represent most of its citizens' preferences. The results presented in this paper suggest that policies targeting enfranchisement of voters should be complemented with policies that guarantee fairness of elections. If the main goal of enfranchisement is that public policies reflect the preferences of all citizens such that policymakers shape their policies in accordance to the taste of the newly enfranchised, then guaranteeing fairness of elections is central to achieve this goal.

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