

The impact of election fraud on government performance

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Abstract

Election fraud is considered pervasive throughout developing countries, raising concerns it can facilitate corruption and inhibit economic growth by preventing voters from holding elected officials accountable. This paper examines the impact of reducing election fraud on the performance of government. To measure the type of government corruption and red tape that inhibits economic growth, I focus on building permit approvals in the Philippines, since delays in granting approvals are often associated with requests for bribes. To identify effects, I exploit a switch to automated elections in 2010 that made fraud more difficult through the use of stronger ballot security measures, timely counting of ballots, and simultaneous transmission of votes to various servers. Estimates from a research design comparing changes over time in previously high-fraud and low-fraud areas indicate that automated elections significantly reduced election fraud, as measured by digit-based tests. In addition, results indicate that this led to a sharp and sustained 15 percent increase in the number of building permits approved annually, resulting in greater investment in the local economy.

Keywords: election fraud, government performance, accountability

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1 Introduction

The promise of democracy is that it allows voters to hold government accountable for their performance (Adsera, Boix, and Payne, 2003; Barro and Ferejohn, 1986). However, when election outcomes can be manipulated via fraud, government officials may no longer have an incentive to perform or respond to their constituents' needs. Worse, elected officials may engage in corrupt behavior that inhibits economic growth, such as exploiting bureaucratic red tape to exact bribes from firms. This lack of electoral accountability perhaps explains why, despite the rise of democratic institutions around the world, corruption and poor government performance remain persistent problems, especially in developing countries (Olken and Pande, 2012; Svensson, 2003). Poor government performance caused by unnecessary red tape and corruption has been shown to significantly inhibit economic development through their effect on discouraging investment (Mauro, 1995; Meon and Khalid, 2005; Fisman and Svensson, 2007; World Bank, 2013). This paper focuses on the question of whether reducing election fraud and restoring electoral accountability results in improved government performance.

Despite the intuitive appeal of linking election fraud to government performance, to my knowledge there has been no evidence demonstrating the causal pathway. This is largely because research on the impact of election fraud has been hampered by a lack of election fraud measures and settings in which there is demonstrable election fraud. Important exceptions to the absence of work on elections and its relationship with government performance include Ferraz and Finan (2008 and 2011). They exploit data on corruption constructed from publicly released expenditure audit reports to identify the effect of reported corruption on electoral outcomes, as well as the effect of reelection incentives on corruption practices of incumbent politicians. Importantly, however, these studies focus on Brazil, a country whose elections are not marred by election fraud

(Fujiwara, 2015). The purpose of this paper is to complement this small but important literature by being the first to estimate the impact of election fraud on economic growth-inhibiting behavior by government.

It does so by using data from an election reform in the Philippines. The Philippines is a developing country in East Asia whose elections have long been perceived to be fraudulent (Schaffer, 2005). Beginning in 2010, the Philippines switched from manual to automated elections. Relative to the slow and vulnerable manual election system, which on average required about six weeks to generate official results (Mugica, 2015), the automated election system was expected to reduce election fraud in several ways. Specifically, the reform was designed to reduce election fraud committed during counting and canvassing by decreasing the time needed to generate official results from six weeks to one, and also by introducing security and transparency features that make it difficult to successfully change election results after the fact.

To identify the effect of election fraud on government performance, I exploit the differential impact of the election reform across regions in the Philippines that arises because all towns were assigned to use the automated election system in 2010 regardless of their pre-existing level of fraud. As a result, if the automated election system eliminates election fraud, then areas with previously high levels of election fraud will experience a greater reduction in fraud compared to the low-fraud areas. This allows me to compare how government performance changes in the historically high-fraud areas relative to the low-fraud areas over the same period. Since my preferred specification includes region-by-year fixed effects, the specific identifying assumption is that absent the switch to the automated election system, the historically high-fraud areas would have experienced changes in government performance similar to what the low-fraud areas in the same region experienced. Importantly, I show that the empirical evidence is consistent with this

assumption, as both high- and low-election fraud areas changed similarly in the years prior and then diverged immediately after the switch.

To measure election fraud, I use the digit-based tests outlined by Beber and Scacco (2012), and validated against actual election fraud by Weidmann and Callen (2013), to examine the uniformity of the last digits of vote totals obtained by each mayoral candidate. Evidence of election fraud would be if some digits, such as zero or five, occur as the last digit more frequently than others. Government performance is measured using the number of building permits approved each year at the town level. New construction as well as repairs and improvements require permit approval from local building officials. I show descriptive evidence that government officials often ask for bribes during the permitting process, and that this is associated with longer waiting times. Thus, the performance and integrity of local governments can have a direct impact on the amount of investment activity that each town can attract.

Digit-based tests provide evidence that historically high-fraud towns indeed experienced significantly greater election fraud than other towns during the manual election period. The tests also show that election fraud in both groups was driven to undetectably low levels in the automated election period, a finding that is consistent with Crost, Felter, Mansour, and Rees (2014), who find that incumbents are no longer able to manipulate close elections in 2010 compared to 2007.

Results indicate that reducing election fraud caused the number of approved building permits to increase by 15 to 17 percent. Since red tape and the ensuing bribe requests cause delays in the processing of building permits, this large increase in the number of approved building permits provides suggestive evidence that these obstacles likely decreased. Descriptive data from selected Philippine cities surveyed by the World Bank are consistent with this interpretation, as the average waiting time to get a building permit decreased by 26 days without a corresponding drop in the

number of required procedures. In addition, one might also reasonably expect that this improvement in government performance will facilitate economic growth, since building permits proxy for greater investment flows into the local economy (Berman, Felter, Kapstein, and Troland, 2013). These estimates are robust to the inclusion of a time-varying control for population, the inclusion of region-by-year fixed effects, and the inclusion of town-specific linear time trends, which allow each town to follow a different trend over time.

These findings have important implications for policy. First, by showing that automated election technology reduced election fraud, I demonstrate that electoral accountability can be increased by preventing candidates from manipulating vote totals in their favor. Perhaps more importantly, results here demonstrate the positive effects of investing in credible elections on an outcome. To the extent that results here generalize to other contexts, the findings indicate that reducing election fraud can result in meaningful differences in the type of government performance that directly affects economic development.

The rest of this paper is organized as follows. The next section presents the institutional background of the Philippine setting. Then, Section 3 discusses the various data used in the study and describes the identification strategy. Section 4 measures and analyzes the variation in fraud induced by the switch in election systems, and the resulting impact on government performance. Concluding remarks are offered in Section 5.

2 Institutional Background

2.1 Introduction of Automated Elections and Research Design

The Philippines is a constitutional republic in Southeast Asia. It is currently divided into 18 administrative regions, containing a total of 81 provinces, and 1634 towns (Philippine Statistics

Authority, 2015). Elections for national and local positions are held every three years, except for the presidency and vice-presidency, which are held every six years. Prior to 2010, these elections used a manual election system. The use of a manual election system provided many fraudulent ways to manipulate election outcomes even after the votes have been cast. I specifically focus on the types of election fraud that occur during or after Election Day (Mala and Pangilinan, 2011). Examples of these include ballot box snatching (intercepting and destroying valid ballot boxes), ballot box stuffing (substituting fake ballots for valid ballots), vote padding or shaving (*dagdag-bawas* in the Filipino vernacular, which literally translates as “plus-minus”), and outright fabrication of election returns and canvassed results.

Several features of the manual election system made it particularly susceptible to election fraud. First, the ballots had blank spaces in which voters were to write down the names of the candidates they wished to vote for. The voters could change their choices simply by crossing out the names and replacing them with new ones. While this feature allowed voters to change their mind or correct a mistake, the downside was that it potentially allowed people other than the voters to change their vote after ballots have already been cast. Second, compared to the ballots used in the automated election system, the manual election ballots were relatively easy to duplicate (Singson, 2010a, b). This made it easy to commit ballot stuffing, a type of election fraud where fake ballots are stuffed into ballot boxes to add to or even substitute for the valid ballots that actual voters filled out on Election Day. Lastly, and perhaps most importantly, the actual counting and canvassing of ballots was done by hand. This process was time consuming and prone to error and manipulation. While it is difficult to obtain data on exactly how long the counting took prior to the reform, reports indicate it could take more than 30 days (Mugica, 2015). The longer time window provided many opportunities to commit election fraud after ballots have already been cast, for

example by changing the vote totals during the tallying process, or by intercepting and changing the election returns reported by the polling centers (Mala and Pangilinan, 2011).

The Philippines has tried to switch to automated elections since the 1990s. After several false starts and a successful piloting of various voting technologies in regional elections in the Autonomous Region of Muslim Mindanao (ARMM)¹, the Commission on Elections finally chose and deployed the automated election system in the May 2010 national and local elections. The new system addressed many of the vulnerabilities of the manual election system, from the security of ballots to the speed and accuracy of vote tallying. Figure 1 illustrates the differences between the manual and automated election ballots. First, the new ballots come with security features and are bar-coded in UV ink to the specific precincts they were issued for. This means that the new ballots cannot be easily duplicated or used in other precincts. Second, erasures were no longer allowed on the ballot. While this means that voters cannot change their mind, it also means that no one else can change their votes. Another important improvement of the automated election system over the manual election system is the deployment of precinct-level optical scanning machines to scan and transmit the votes. This greatly sped up the counting and canvassing process, since the precinct-level optical scanning machines report their vote tallies up the aggregation chain and to a transparency server immediately after counting. The transmission chain, as shown in Figure 2, has the advantage of being fast and transparent, since the vote tallies obtained after aggregation at the central server must match the tallies reported to a transparency server. The speed of the automated counting also meant that the time window in which to commit election fraud was considerably shortened. Randomized manual audits conducted after the 2010 and 2013 elections concluded that

¹ The ARMM is an autonomous region in the Philippines that was formed in 1989. In decreasing order of size, the Philippines is divided into regions, provinces, and towns. The ARMM is the only region that has its own government. Only positions for this regional government was up for grabs in 2008, making 2010 also the first local elections in the ARMM to use the automated election system.

the precinct-level optical scanning machines were 99.6 percent accurate in 2010, and 99.9 percent accurate in 2013 (Crisostomo, 2015).

2.2 Construction in the Philippines

There are significant regulations facing the construction industry in the Philippines. Ostensibly these regulations exist to ensure public safety. However, red tape and the resulting slow process to comply with these regulations also provide an opportunity for corrupt officials to request and receive bribes. Firms may be tempted to pay such bribes in the hopes of speeding up the application process. Thus, the quality of local governments affects the number of building permits that can be approved each year through their control over red tape and the likelihood of firms being asked for bribes.

New construction, as well as repairs and improvements to existing structures, require building permit approval from the Office of Local Building Officials. Obtaining building permit approval often requires ancillary permits from several different agencies as well, which greatly increases firms' exposure to corruption. Table 1 summarizes World Bank data on the number of procedures and waiting time to gain approval in selected towns in the Philippines. There is substantial variation across towns in the number of procedures and waiting time to gain approval. For instance in 2011, obtaining a building permit takes 169 days in the capital city of Manila, while in the adjacent city of Makati the waiting time is only 90 days. There is also variation over time. From 2008 to 2011, the average number of procedures increased from around 28 to 30, but the average waiting time decreased from around 132 days to 106 days.

The wide variation in waiting times is noteworthy because there is evidence that longer approval times are associated with requests for bribes in many countries around the world (Freund, Hallward-Driemeier, and Rijkers, 2015). Figure 3 plots the kernel density of how long it takes to

get a building permit approved in the Philippines, by whether or not firms are asked for bribes. It shows that while there is some overlap, the kernel density for the firms asked for bribes is shifted to the right of the firms not asked for bribes. Although this is not conclusive evidence of a causal connection, it does show that the descriptive evidence is consistent with bribery incidence being associated with longer wait times for building permit approval. Table 2 presents regression results estimating the strength of this relationship using various specifications that include controls for important factors such as firm characteristics, managerial experience, worker productivity, and interaction with government officials. The association between bribery incidence and waiting time remains meaningful and significant even after controlling for these variables. These estimates suggest that being asked for a bribe is associated with a 40 to 60 percent delay in the time that it takes to get a building permit approved. Taken together, this suggests there may be room for improvements in government performance to increase the number of approved building permits by streamlining the permitting process and reducing corruption.

Such improvements could well have important effects on prospects for economic development. Corruption in general has been found to be one of the most important determinants of investment (Asiedu and Freeman, 2009), and even just a one percent increase in bribe incidence is associated with a three percent reduction in firm growth (Fisman and Svensson, 2007). Moreover, the waiting time and complexity of application process for building permits has been identified in a survey of firms as the biggest regulatory obstacle to doing business. Research in the U.S. finds that speeding up the permitting process could spur construction spending (as cited in World Bank, 2016). Since businesses would prefer to locate in areas where such regulatory burdens are lighter, improving government performance in the building permitting process can encourage more investment and consequently greater economic growth.

3 Data and Empirical Strategy

3.1 Measuring Election Fraud from Vote Totals

I obtained elections data from the Commission on Elections in the Philippines. The data contain the final vote tallies obtained by each candidate for local office. In the Philippines, local elections for mayor, vice-mayor and town council are held every three years. The elections data are available for 2001, 2004, 2007, 2010, and 2013 elections. This yields three elections in the manual election period and two elections in the automated election period. Two of the elections, years 2004 and 2010, were presidential election years. I focus on elections for mayor, as it is the highest and most important executive office in each town. To forensically assess the level of fraud in each period using only vote totals, I employ the digit-based tests proposed by Beber and Scacco (2012), and validated by Weidmann and Callen (2013). The idea behind these tests is that absent election fraud, each digit from zero to nine should be equally likely to appear as the last digit of a vote total. However, research in psychology and statistics (Boland and Hutchinson, 2000; Dlugosz and Müller-Funk, 2009) suggest that people favor some digits over others when they attempt to manipulate vote totals. The implication of this is that analyzing the digits that appear in vote totals can provide forensic evidence of election fraud. I operationalize this idea by examining the actual distribution of last digits of vote totals for mayoral candidates in high-fraud areas and low-fraud areas, before and after automated elections. I use chi-squared tests to determine whether the observed frequencies of the last digits follow the predicted frequencies from a uniform distribution, and Mann-Whitney U tests to determine whether the observed frequencies of last digits differ between high-fraud areas and low-fraud areas.

3.2 Election Hotspots

To identify historically high-fraud areas, I obtained a list of towns that were consistently declared election hotspots from 2001 to 2007 (Eder and Barrientos, 2007). Election hotspots are towns where the Philippine National Police (PNP) expects election-related violence to occur. The PNP identifies towns as election hotspots ahead of each election if they satisfy the following criteria: 1) has a history of politically-motivated incidents, and 2) there are armed groups present in the area, such as separatist rebels or private army groups associated with influential politicians. A town is classified as an election hotspot if it meets both criteria (De Jesus, 2015).²

As shown in Figure 4, consistent election hotspots are geographically distributed all over the Philippines. This means that estimated results are unlikely to be driven by just one or two regions of the Philippines that are significantly different from the rest. Also, since consistent election hotspots are located in several regions of the Philippines, I can control for town-specific and region-by-year specific shocks.

The implicit assumption in identifying high-fraud areas using the list of consistent election hotspots is that consistent election hotspots are also the towns that experienced greater election fraud during the manual election period. The digit-based tests discussed earlier confirm that the consistent election hotspots did in fact exhibit greater election fraud compared to other towns during that time period. However, digit-based tests also suggest that towns adjacent to consistent election hotspots appear to also have experienced greater election fraud than other towns. Institutionally, this may happen because the presence of groups that carry out election fraud may be shared between local politicians³ (Centre for Humanitarian Dialogue, 2011). Since they appear

² I also investigated the possibility of identifying high-fraud and low-fraud towns empirically by examining applying the digit-based technique to historical vote totals. However, because I have data on only three elections prior to the reform, it is difficult for me to distinguish between randomness and fraud using the digit-based technique.

³ Also sourced from phone interviews with Philippine National Police.

to share characteristics of high election fraud areas and yet are not in the list of consistent election hotspots, it is ambiguous whether they should be considered part of the comparison group or the treatment group.⁴ Because of this, I compare consistent election hotspots to other towns that are not adjacent to consistent election hotspots but are located in the provinces that contain the consistent election hotspots.

3.3 Data on Approved Building Permits

Lastly, data on approved building permits come from the Philippine Statistics Authority. Each year, field personnel in each town gather data from the Office of Local Building Officials. Building permit data are based on copies of original application forms of approved building permits as well as from demolition permits. Table 3 describes the data for the hotspot (historically high-fraud) towns compared to non-hotspot (historically low-fraud) towns. On average, hotspot towns have fewer and lower-valued building permits approved each year.

3.4 Empirical Strategy

The fact that the automated election system was deployed in all towns regardless of the pre-existing level of fraud generates plausibly exogenous variation in election fraud around the 2010 elections. In particular, the towns that previously experienced relatively more election fraud will experience a relatively greater reduction in election fraud. This allows me to employ a research design that examines whether outcomes change more in towns that experience greater reductions in election fraud. As discussed in the previous section, I identify towns that experienced relatively high levels of election fraud by referring to a list of towns that were consistent election hotspots during the 2001, 2004, and 2007 national and local elections. I compare how outcomes change for this group

⁴ Appendix 1 shows the distribution of last digits of vote totals for these towns, and compares them to the distributions for the consistent election hotspots and the comparison group (non-hotspots).

of towns to the change in outcomes observed for towns that are non-adjacent but are still located in the same provinces that contain hotspots. I employ digit-based tests to verify that fraud did in fact decrease more in the towns that were consistent election hotspots relative to the comparison group. Specifically, I formally test whether there was more election fraud, as measured by zeroes occurring more often as the last digit, in the consistent election hotspots than in the other towns during the manual election years. I then test whether both groups exhibit any evidence of election fraud during the automated election years. I do this by using goodness-of-fit tests to test the observed frequencies of last digits against predicted frequencies from a uniform distribution, and by using the Mann-Whitney U test to compare observed distributions of last digits against each other.⁵

Fixed effects ordinary least squares (OLS) panel data models are estimated to determine the impact of reducing election fraud on how many building permits get approved each year. The OLS model estimated is a generalized difference-in-differences specification:

$$\ln(\text{building permit}_{it}) = \beta(\text{hotspot}_i * \text{automated elections}_t) + c_i + u_t + \varepsilon_{it}$$

Where $\ln(\text{building permit}_{it})$, the log of building permits reported at the town level is the dependent variable, $\text{hotspot}_i * \text{automated elections}_t$ is the treatment variable that takes on a value of 1 for hotspot towns in the automated election period (2010 and later), and c_i and u_t control for town and year fixed effects, respectively. This is a generalized difference-in-differences specification where the town fixed effects subsume a time-invariant indicator for being a hotspot while the year fixed effects subsume an indicator for the automated election period. In other specifications I include region-by-year fixed effects, which account for the effects of regional

⁵ The Mann-Whitney test is a nonparametric hypothesis test where the null hypothesis is that both distributions of last digits are drawn from the same distribution.

shocks and allow towns in different administrative regions to follow different trajectories over time, and town-specific linear time trends. Robust standard errors are clustered at the town level.

Since my preferred specification includes both town fixed effects and region-by-year fixed effects, the identifying assumption is that absent the switch to the automated election system, consistent election hotspots would have experienced changes in building permit approval similar to what other towns in the same administrative region of the country experienced. I test and relax this identifying assumption in the following ways. First, I graphically examine whether governance outcomes for hotspots and non-hotspots started diverging before 2010. I also formally test this by including an indicator for the year before automated elections were adopted, and by plotting estimated differences over time. If hotspots and non-hotspots were not changing similarly during the manual election period, it would suggest that the change experienced by the non-hotspots in the automated election period is not a valid counterfactual for the change the hotspots would have experienced absent the reduction in election fraud. Also, since automated elections only started in 2010, and its successful implementation was uncertain until that same year, if hotspots and non-hotspots had started diverging even before the 2010 elections, then the improvement in government performance might be due to something other than the reduction in election fraud. Lastly, I include town-specific linear time trends, which allows each town to follow a different trend over time. To the extent that the estimates are robust to these specifications, these tests provide some evidence to support the validity of this research design.

4 Results

4.1 Impact of Automated Elections on Election Fraud

I begin by forensically measuring the election fraud present in consistent election hotspots during the manual election years of 2001, 2004, and 2007, and then comparing it to the election fraud measured during the automated election years of 2010 and 2013. I do the same for the other towns. This allows me to compare how much election fraud levels in hotspots changed after the adoption of automated elections relative to the change experienced by non-hotspots during the same time period. Figure 5 summarizes the results from this exercise. It graphs the distribution of the last digits during the manual and automated election periods for hotspots and non-hotspots, and displays the results of chi-squared tests that examine whether each digit appears with equal probability. Both groups of towns appear to have experienced election fraud in the manual period, as evidenced by zeros occurring as the last digit more than ten percent of the time. However, the election fraud experienced by hotspot towns seems to have been much worse. Zeroes occur as the last digit almost 20 percent of the time in the hotspot towns, but only about 12 percent of the time in other towns. Using a Mann-Whitney test, I am able to reject the null hypothesis that the last digits of vote totals from hotspot towns are drawn from the same distribution as those from the non-hotspot towns during the manual election period. That is, although the last digits from non-hotspot towns are also not uniformly distributed in the manual election period, indicating the presence of some election fraud, the observed frequency of zeros is still much smaller than the what is observed in the hotspot towns.

Election fraud drops significantly in the automated election period in both hotspots and non-hotspots. Figure 5 shows that each digit is now equally likely to appear as the last digit of a vote total. Formally, chi-squared tests fail to reject the null hypothesis that the observed

frequencies of last digits from either hotspots or non-hotspots follow the predicted frequencies from a uniform distribution during the automated election period. In addition, a Mann-Whitney test is now unable to reject the null hypothesis that the last digits of vote totals from hotspots are drawn from the same distribution as last digits from the non-hotspots. Since hotspots previously experienced greater election fraud than non-hotspots, together these tests indicate that the automated election system reduced election fraud significantly more in the hotspot towns than in the non-hotspot towns.⁶

4.2 Impact on Government Performance

I now turn to the question of whether the large reduction in election fraud in hotspots caused government performance to improve. To do this, I compare the change in the log of total building permits approved in hotspots to the change in the log of total building permits approved in non-hotspots, before and after automated elections. To determine whether outcomes had started diverging even before treatment, in Figure 6 I graph the log of the total number of building permits approved over time in hotspots compared to other towns. There are a few things worth noting in this graph. First, both sets of towns appear to track each other in terms of changes in total building permits approved in the years before 2010. This suggests that the research design is reasonable, in that if there had been no switch to automated elections, both groups would have continued tracking each other after 2010. In fact, there is a sharp rise in building permits approved in 2010 in the hotspots relative to the other towns. It then stays at that higher level throughout the automated election period. That the effect manifests immediately during the first automated election year also gives further evidence that it is the reduction in election fraud that caused the divergence. This also

⁶ To provide evidence against the alternative explanation that hotspots may exhibit more zeros due to benign reasons such as illiteracy or lack of equipment to facilitate counting many ballots, I redo all of these analyses by splitting the hotspots and non-hotspots into below median and above median poverty incidence. As shown in Appendix 2 and Appendix 3, the election fraud results are unchanged when I split the sample in this way.

means that elected governments were able to quickly improve their performance along this dimension, which is plausible since reducing red tape and corruption takes only executive action. Third, the improvement in government performance persists in the succeeding years. This is exactly what one would expect if the improvement is due to the reduction in election fraud. That is, since election fraud was reduced throughout the automated election period, we should expect that government performance should continue at a higher level for as long as they are held accountable in elections.

In Figure 7, I graph the estimated divergence between hotspots and non-hotspots over time. The figure graphs coefficients from a dynamic difference-in-differences model that controls for town and year fixed effects as well as region-by-year fixed effects. The estimated differences are relative to the average difference in building permits three or more years before automated elections. In line with Figure 6, Figure 7 shows that there is little evidence of divergence before the switch to automated elections, and that there is a sharp and sustained increase in building permits after the election reform occurs.

Estimation results are shown in Table 4. In Column 1, where only town and year fixed effects are included, the estimated effect of reducing election fraud is an increase in the number of building permits approved by about 16.6 percent. This represents a substantial improvement in government performance, and is statistically significant at the 5 percent level. In Column 2, I add a time-varying control for town-level population and this does not change the estimate. In Column 3, my preferred specification, I add region-by-year fixed effects. The inclusion of region-by-year fixed effects means that I am comparing changes in hotspots to other towns located in the same region of the country and accounting for region-specific shocks over time. Given that similar towns are assigned to administrative regions in the Philippines, it is likely that this is the more appropriate

comparison to make. The estimate in this preferred specification is 14.9 percent, and is statistically significant at the five percent level. Column 4 adds an indicator for the year 2009, which formally tests whether the hotspots and other towns began to diverge even before the switch to automated elections. Since the estimated coefficient on this leading indicator is not statistically significant, there is little evidence of divergence before automated elections. This is also in line with the parallel pre-trends shown in Figure 6. Finally, column 5 adds town-specific linear time trends. Town-specific linear time trends allow for each town to follow a different trend. The estimate in column 4 is a 16.7 percent increase in approved building permits. For each of these specifications, robust standard errors are clustered at the town level.

Importantly, all of the estimates are significant at the 5 percent level. Taken together, these estimates provide strong evidence that reducing election fraud improved government performance along an economically important dimension, the number of building permits that are approved each year.

4.3 Potential Mechanisms

I now examine potential mechanisms through which reducing election fraud may lead to a significant improvement in government performance. Government performance might be improving because different, higher-performing people are getting elected to office, or even just because incumbents now face the threat of being removed from office if they perform poorly. In the Philippines, more than half of candidates are incumbent officials running again for the same office. These incumbents enjoy substantial electoral advantages such as name recognition and, perhaps more importantly, control over local public projects and employees. Incumbent candidates win about 80 percent of the time when they run. Incumbent candidates typically win by a margin of 30 percentage points over their challengers, reflecting the advantage that incumbents have in

elections. Institutional reforms such as term limits have so far failed to reduce this advantage (Querubin, 2012).

If incumbents were cheating during the manual election period, then eliminating election fraud may lead to fewer incumbents getting reelected. In Table 5, I investigate this hypothesis directly by estimating the effect on the probability that incumbents win re-election. Estimates from various specifications show that there is little evidence that incumbents became less likely to win re-election during as a result of the reduction in election fraud. I then examine whether incumbents may face more competition, which could induce them to perform better even though their likelihood of getting re-elected has not changed. To do so, I examine whether incumbent candidates get a smaller share of the total vote in the automated election period. Table 6 presents evidence in favor of this mechanism. Across specifications, the estimated effect is approximately a 10 percentage point reduction in the incumbent victory margin. That is, the difference between the vote share obtained by winning incumbents and the vote share obtained by their closest challenger narrowed by 10 percentage points. This represents the erosion of about a third of the average victory margin formerly experienced by winning incumbent. Since a decrease in the incumbent candidates' victory margins would imply an increase in the vote share received by challengers, this would mean that elections between challengers and incumbents become more competitive in the automated election period. Thus, reducing election fraud appears to increase electoral pressure on re-elected candidates, even though it does not appear to decrease the number of incumbents that win re-election.

5 Discussion and Conclusion

The fundamental question addressed in this paper is whether election fraud causes poor government performance, as measured by a proxy for the type of government performance widely believed to inhibit economic growth. If so, reducing election fraud should improve government performance and perhaps eventually lead to higher economic growth. The election reforms in the Philippines present a unique opportunity to determine whether reducing election fraud can have such an effect. The switch to an automated election system in 2010 dramatically reduced election fraud, thereby increasing electoral accountability. The reduction in election fraud means that winning elections now requires that candidates actually receive the most votes from actual people because candidates can no longer manipulate election results after the ballots have been cast. An analysis of vote shares reveals that the reduction in election fraud also appeared to negatively affect the victory margins enjoyed by winning incumbents, suggesting that the reform increased electoral pressure on incumbents.

Importantly, the reduction in election fraud led to an immediate and sustained 15 to 17 percent increase in the number of building permits approved. This result is robust to using various specifications, including adding region-by-year fixed effects, and town-specific linear time trends. Secondary descriptive data from World Bank surveys indicate that the average number of procedures actually increased slightly around the time of election reform so there is little evidence to suggest that building permit requirements were suddenly relaxed. Rather, it seems to be the case that improvements in government performance, whether by reducing red tape or by reducing bribe requests, are the drivers of this increase. The descriptive data are also consistent with this explanation, as the average waiting time actually decreased by 26 days. Since building permits are mandatory for any construction to take place, the removal of bottlenecks in the application process

can have strong positive effects on the local economy. Of course, it remains an open question whether other, more difficult to measure, functions of government improve as a result of the reduction in election fraud. But what is clear is that at least in this context, reducing election fraud results in a large and sustained improvement in a measure of government performance capturing investment in the local economy.

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Figure 1. Old ballots used in manual elections compared to new ballots used in the automated elections system

Partial picture of a filled-out manual election ballot used in 2007. The ballot is a piece of paper with handwritten names of candidates in the voting booth. It includes sections for SENATORS, CONGRESSMAN, MAYOR, VICE MAYOR, and MEMBERS KARGUWANG BAYAN MUNICIPAL COUNCIL. The party list is also visible, with 'BANAT' marked.

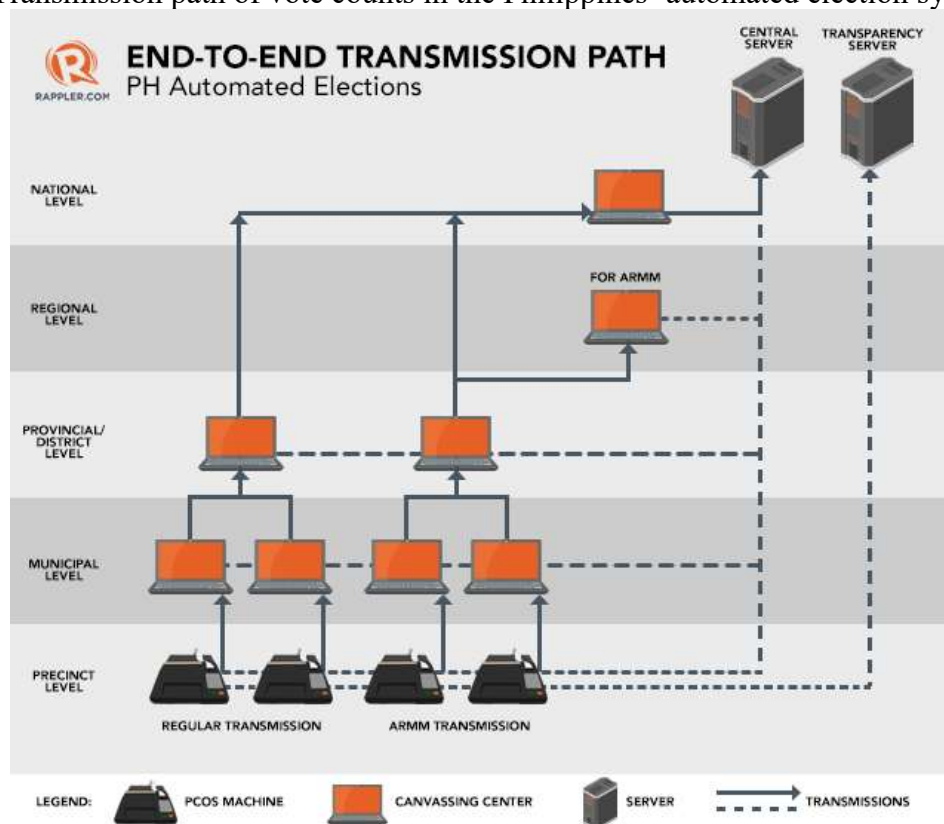
(a) Partial picture of a filled-out manual election ballot used in 2007

Partial picture of an official sample ballot released for the 2010 automated elections. The ballot is a piece of paper with a grid of candidates and their names. It includes sections for COMMISSION ON ELECTIONS, VOTER INFORMATION SHEET, and OFFICIAL SAMPLE BALLOT. The candidates are listed in a grid, and the ballot is marked with a 'V' in the top right corner.

(b) Partial picture of an official sample ballot released for the 2010 automated elections

Notes: Panel (a) shows a partially filled-out manual election ballot while panel (b) shows part of the official sample ballot for 2010. The manual election ballot is a piece of paper with blanks for voters to write names of candidates in. Voters are provided with a list of candidates in the voting booth. To use the automated elections ballot, voters must shade the appropriate circles and must use a marking pen. The new ballots also come with more security features to make it harder to duplicate.

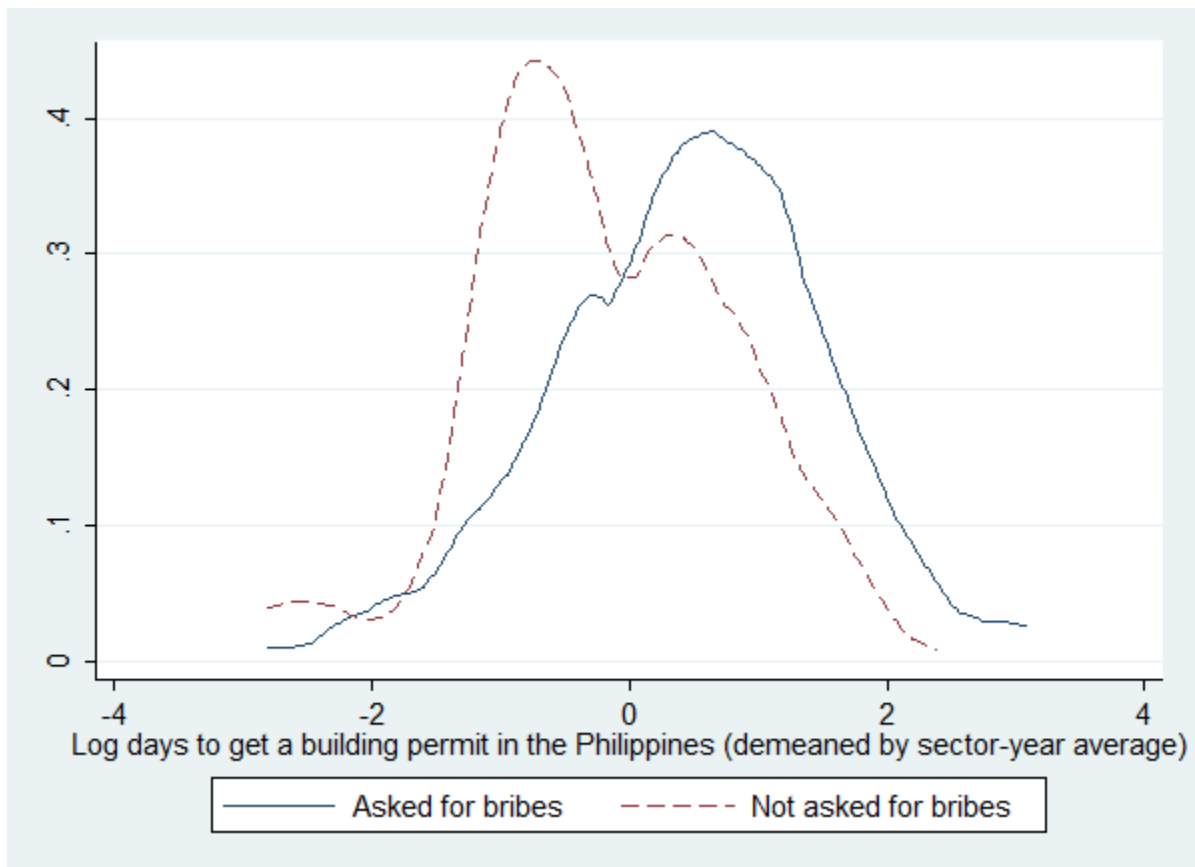
Figure 2. Transmission path of vote counts in the Philippines' automated election system



Notes: Precinct-level optical scanning machines report vote counts up the canvassing center chain. At each level of canvassing, votes are aggregated to determine winners in municipal, provincial, and national elections. Moreover, the precinct-level machines also report vote counts directly to a transparency server.

Source: Rappler.com

Figure 3. Kernel Density of the amount of time it takes to get a building permit, by whether or not a firm is asked for a bribe.



Notes: These graphs show the difference in the time it takes to obtain approval for a building permit depending on whether or not a firm is asked for bribes. The unit of observation is an individual firm. Waiting time is measured in log days, and are demeaned by the sector-year average waiting times.

Source of data: World Bank Enterprise Survey of the Philippines in 2009 and 2015.

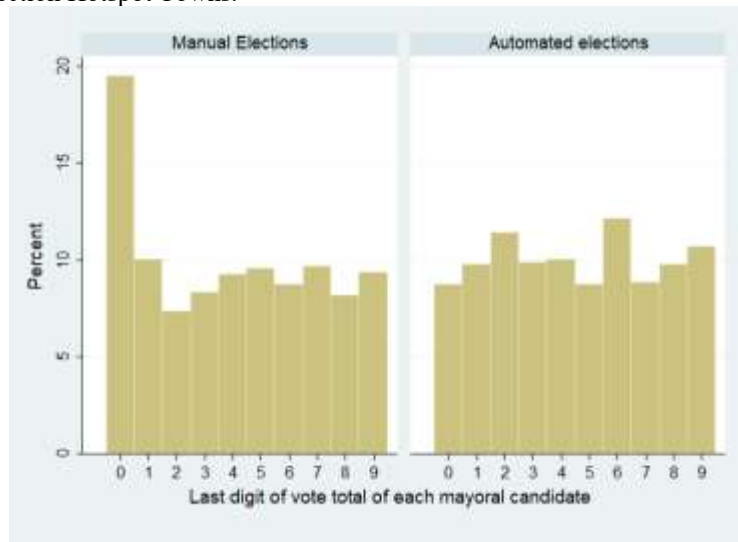
Figure 4. Map of the Philippines, with consistent election hotspots highlighted.



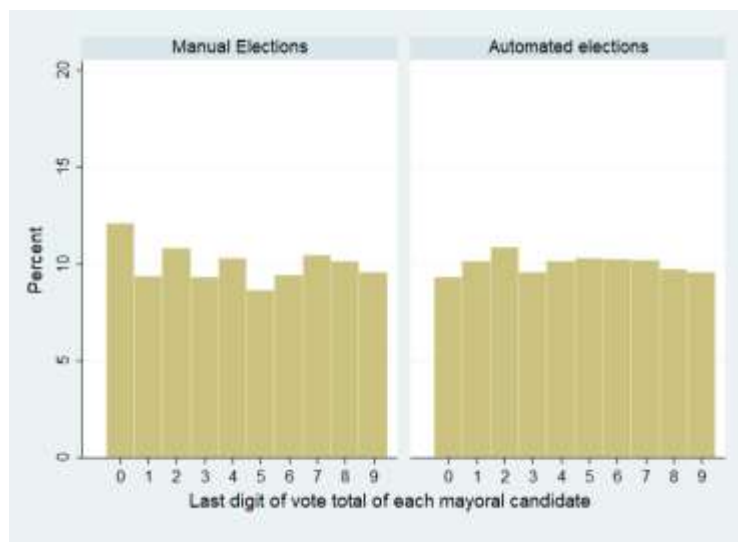
Notes: This map shows the municipality-level boundaries in the Philippines. The shaded areas represent the towns that were consistently identified as election hotspots in 2001, 2004, and 2007. The Philippine National Police identifies towns as election hotspots ahead of each election. A town is declared an election hotspot if both of the following are true: 1) history of politically motivated incidents; and 2) presence of threat groups (rebel groups or private armies affiliated with politicians).

Figure 5. Distribution of last digits of vote totals from mayoral races, manual election period vs automated election period

A. Consistent Election Hotspot Towns.

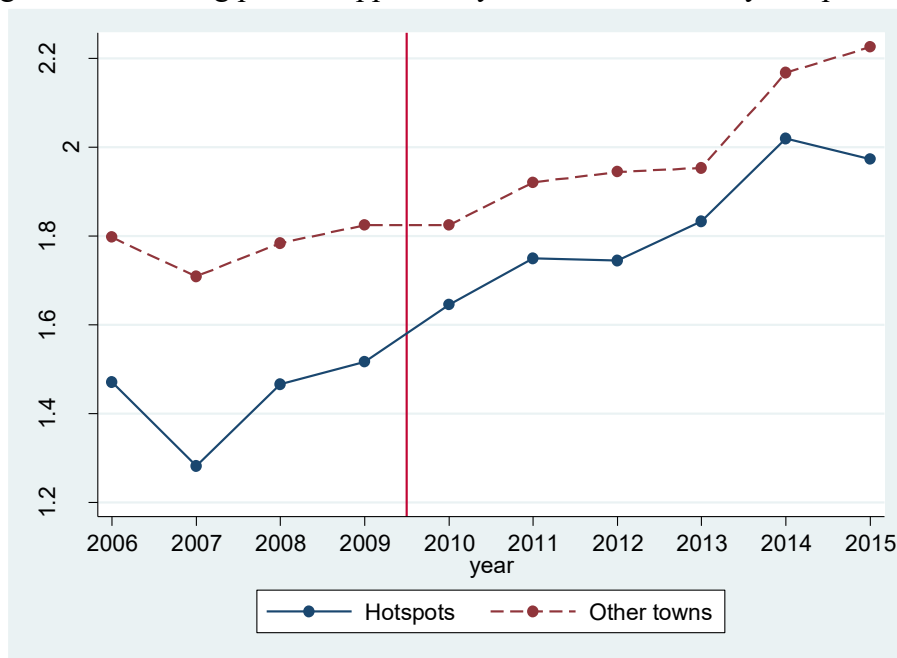


B. Other towns



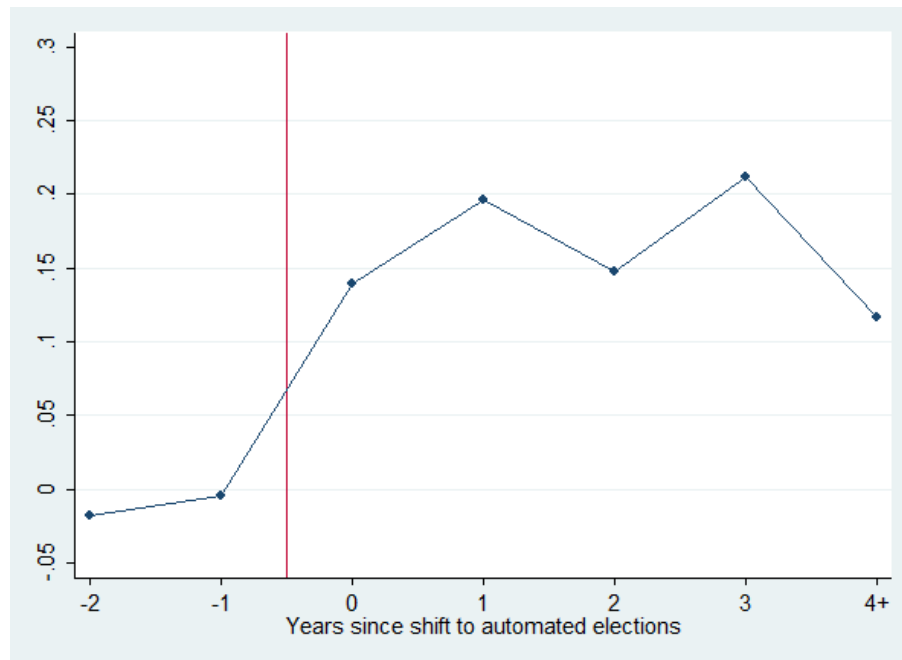
Notes: Each discrete distribution is tested against the predicted last digit frequencies from a uniform distribution. The manual election histograms show last digits of vote totals for mayoral elections in 2001, 2004, and 2007. The automated election histograms show data from the 2010 and 2013 mayoral elections. Both hotspots and non-hotspots exhibit non-uniform distributions of last digits in the pre-2010 period, however results from a Mann-Whitney test rejects the null hypothesis that the two samples are drawn from the same population. In the automated election period, both groups of towns last digit distributions that are indistinguishable from a uniform distribution.

Figure 6. Log of total building permits approved, years 2006 – 2015, by hotspot incidence.



Notes: The graph shows the time series plot of the log of total building permits approved. The blue unbroken line is for hotspot towns while the red dashed line is for the other towns. The vertical line between 2009 and 2010 represents the shift in election systems. The 2010 elections were held in May, with winning candidates taking office in June 2010.

Figure 7. Estimated divergence in building permits before and after the shift to automated elections between hotspots and other towns, relative to three or more years before.



Notes: The graph shows the estimated difference over the period 2008-2015 between building permits approved in hotspots and non-hotspots, relative to the difference in the first two years of the data. The estimates come from a regression that allows for dynamic effects, and includes indicators for town and year fixed effects as well as region-by-year fixed effects.

Table 1. Number of procedures and waiting time needed to obtain a building permit in twenty sampled cities in the Philippines in 2008 and 2011.

	2008		2011	
	Number of Procedures	Waiting time (in days)	Number of Procedures	Waiting time (in days)
Caloocan	29	135	31	109
Cebu	31	83	36	92
Davao	28	60	27	57
Lapu-Lapu	32	90	34	88
Las Piñas	25	134	27	102
Makati	25	125	26	90
Malabon	29	155	32	112
Mandaluyong	29	155	33	121
Mandaue	33	70	35	72
Manila	24	203	26	169
Marikina	25	121	28	91
Muntinlupa	30	141	31	108
Navotas	27	145	28	107
Parañaque	31	137	30	107
Pasay	27	161	31	121
Pasig	33	173	36	148
Quezon City	28	141	33	120
San Juan	31	175	33	144
Taguig	23	121	25	85
Valenzuela	25	123	28	91
Average	28.25	132.4	30.5	106.7

Notes: The unit of observation is a city (twenty cities were sampled by the World Bank). The average waiting time decreased significantly, by almost 26 days, between 2008 and 2011 ($p=0.01$). On the other hand, the number of procedures increased by 2 procedures ($p=0.04$).

Source: World Bank Doing Business Reports, 2008 and 2011.

Table 2. The relationship between being asked for a bribe and the waiting time for approval of building permit in the Philippines

Dependent variable: Log (1+ days to get building permit)

Panel A: All firms	(1)	(2)	(3)	(4)	(5)
Firm is asked for bribe	0.624*** (0.159)	0.622*** (0.160)	0.462** (0.200)	0.452** (0.195)	0.428** (0.196)
Observations	173	173	119	117	105
Panel B: Subset of firms for which data on all variables are available	(1)	(2)	(3)	(4)	(5)
Firm is asked for bribe	0.335* (0.199)	0.331 (0.223)	0.433** (0.204)	0.431** (0.206)	0.428** (0.196)
Observations	105	105	105	105	105
Sector fixed effects		x	x	x	x
Controls for firm and managerial characteristics			x	x	x
Control for worker productivity				x	x
Controls for firm visibility and interaction with government officials					x

Notes: Each column in each panel represents a separate regression. The unit of observation is an individual firm in the World Bank Enterprise Survey. Standard errors are heteroscedasticity-robust.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3. Descriptive Statistics for municipalities, by historical fraud incidence.

	All municipalities	High-fraud towns	Low-fraud towns
Log(number of building permits)	1.85 (1.97)	1.67 (1.82)	1.91 (2.01)
Log(value of building permits)	5.53 (5.00)	5.32 (4.89)	5.61 (5.03)
Observations	7070	1760	5310

Notes: Each cell contains the mean with the standard deviation in parentheses. The unit of observation is a municipality in a given year. The time period is 2006-2015.

Table 4. The effect of reducing election fraud on the total number of building permits that get approved.

Dependent variable: Log(number of building permits)	(1)	(2)	(3)	(4)	(5)
Hotspot*automated election	0.166** (0.0706)	0.166** (0.0706)	0.149** (0.0665)	0.145** (0.0737)	0.167** (0.082)
Hotspot*year before automated election				-0.0163 (0.0657)	
Observations	7070	7070	7070	7070	7070
Town and year fixed effects	x	x	x	x	x
Control for population		x	x	x	x
Region-by-year fixed effects			x	x	x
Town-specific time trends					x

Notes: Each column represents a separate regression. The unit of observation is town-year. Robust standard errors are clustered at the town level.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 5. The effect of reducing election fraud on the probability that incumbent candidates are re-elected.

Dependent variable: Incumbent win rate	(1)	(2)	(3)	(4)
Hotspot*automated election	0.00457 (0.0602)	-0.0171 (0.0622)	-0.0581 (0.0640)	0.00501 (0.0701)
Year before automated elections			-0.0971 (0.0846)	
Observations	4057	4057	4057	4057
Town fixed effects	x	x	x	x
Region-by-year fixed effects		x	x	x
Province-specific time trends				x

Notes: Each column represents a separate regression. The unit of observation is town-year. Year 2001 is held out because it is used as the reference point for determining incumbents, so the election years included are 2004, 2007, 2010, and 2013. Robust standard errors are clustered at the town level.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 6. The effect of reducing election fraud on incumbent candidates' victory margins.

Dependent variable: Incumbent victory margin	(1)	(2)	(3)	(4)
Hotspot*automated election	-0.102* (0.0513)	-0.0967* (0.0553)	-0.118** (0.0541)	-0.125 (0.437)
Year before automated elections			-0.0589 (0.0824)	
Observations	2882	2882	2882	2882
Town fixed effects	x	x	x	x
Region-by-year fixed effects		x	x	x
Town-specific time trends				x

Notes: Each column represents a separate regression. The unit of observation is candidate-year. A candidate's victory margin is calculated by taking the difference between their vote share and the vote share received by the candidate with the second-highest number of votes. Year 2001 is held out because it is used as the reference point for determining incumbents, so the election years included are 2004, 2007, 2010, and 2013. Robust standard errors are clustered at the town level.

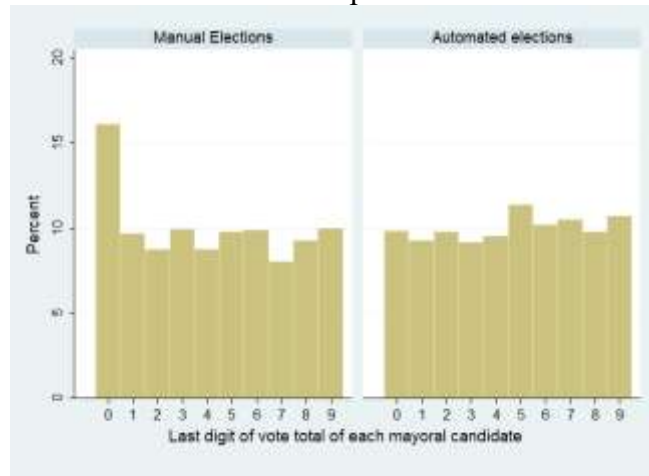
* Significant at the 10% level

** Significant at the 5% level

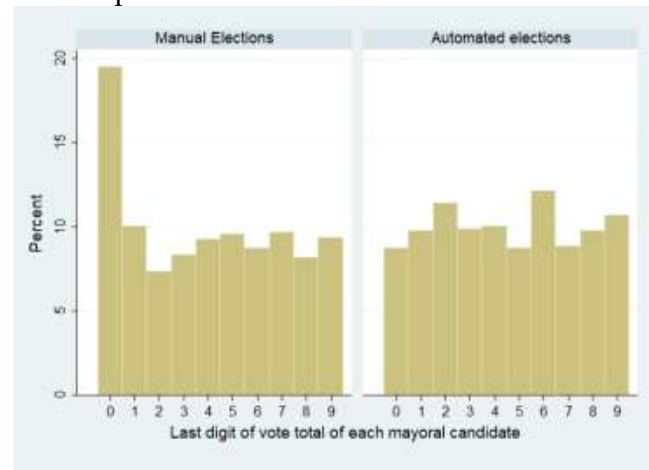
*** Significant at the 1% level

Appendix 1 Distribution of last digits of vote totals from mayoral races during the manual and automated election periods, by historical fraud incidence.

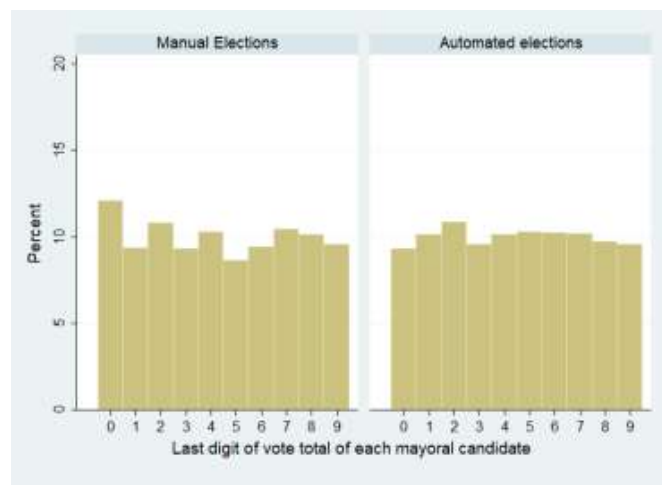
A. Towns adjacent to consistent election hotspots



B. Consistent election hotspots

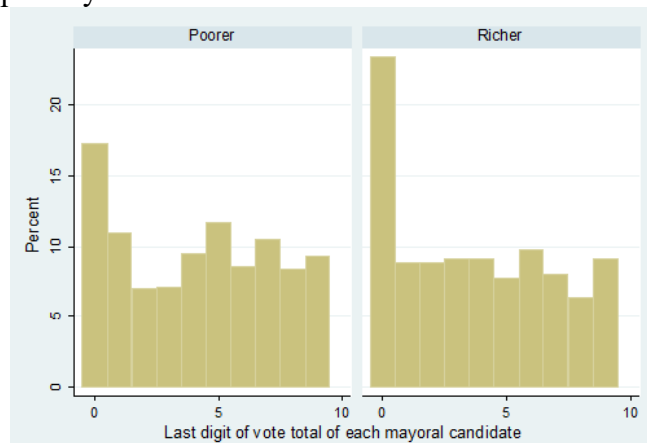


C. Other towns

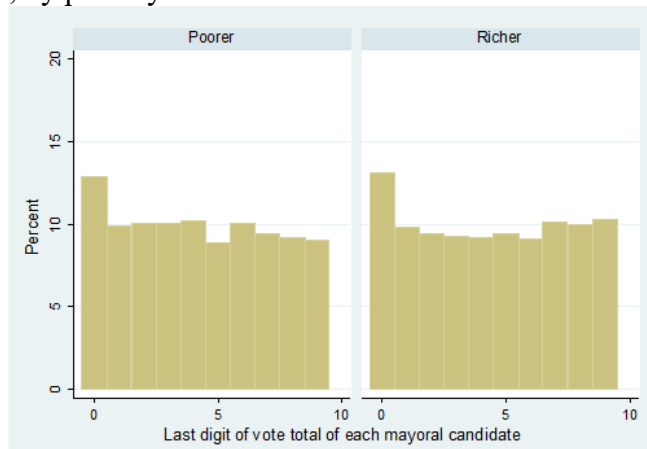


Appendix 2 Distribution of last digits of vote totals from mayoral races during the manual election period, by poverty incidence

Panel A. Hotspots, by poverty incidence



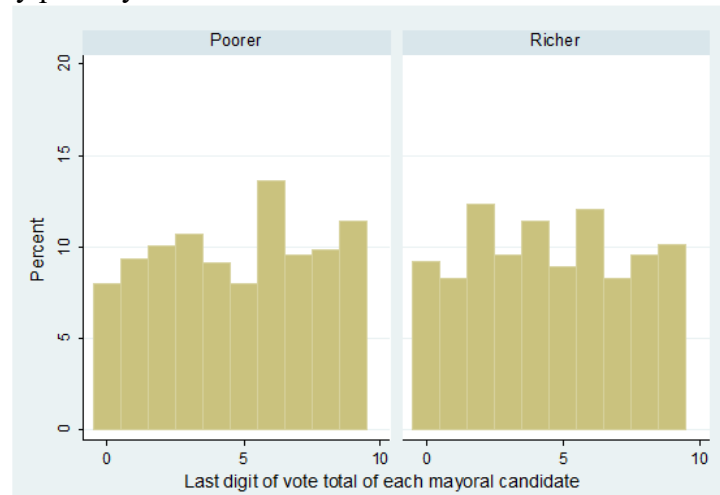
Panel B. Non-Hotspots, by poverty incidence



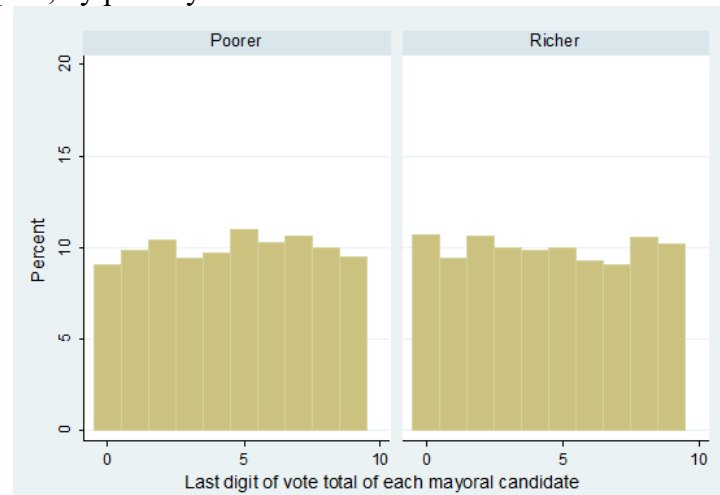
Notes: Each discrete distribution is tested against the predicted last digit frequencies from a uniform distribution. These graphs show that the excess mass at zero can be found in both poorer and richer municipalities, and the general size of the mass parallels those found when the sample is not split into poorer and richer municipalities.

Appendix 3 Distribution of last digits of vote totals from mayoral races during the automated election period, by poverty incidence.

Panel A. Hotspots, by poverty incidence



Panel B. Non-Hotspots, by poverty incidence



Notes: Each discrete distribution is tested against the predicted last digit frequencies from a uniform distribution. These graphs show that the distributions of last digits all follow a uniform distribution, even when the hotspot and non-hotspot municipalities are split into richer and poorer municipalities.