Small Aggregates, Big Manipulation: Vote Buying Enforcement and Collective Monitoring*

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Abstract

Vote buying is widespread in developing democracies despite the secret ballot. What explains its resilience? I argue that brokers condition future payments on published electoral results to enforce these transactions and that this is effective at inducing voters' compliance only when the results of small voting groups are available. Using monitors' and citizens' reports of electoral manipulation and survey data from Colombia, I find a robust negative correlation between the size of the average polling station and various measures of vote buying. Evidence from a variety of identification strategies suggests that this relationship can be attributed to aggregate monitoring sustaining these transactions and not to the brokers' increased ability to identify compliers or other characteristics of places where polling stations are small.

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When the secret ballot was first introduced in Australia in 1856, it was supposed to counteract the rampant exchange of material benefits for votes that was characteristic of elections. More than 150 years later, elections all over the world use the secret ballot, and yet, these transactions are still widespread.[1] If individual vote choices are secret, how do parties prevent bribed voters from taking the rewards and voting for other candidates? Vote brokers could use their local knowledge to avoid targeting potential cheaters (Stokes 2005) or to select those who support the party but would not vote in the absence of inducements (Nichter 2008; Gans-Morse, Mazzuca and Nichter 2013). An alternative hypothesis is that vote buying can be enforced by monitoring electoral results of small groups (Chandra 2007; Kitschelt and Wilkinson 2007; Smith and Bueno de Mesquita 2012; Gingerich and Medina 2013), which is consistent with the observation that larger electorates and population centers experience less vote buying (e.g. Stokes 2005; Gingerich and Medina 2013; Stokes et al. 2013).[2] This however, raises some questions. Do small electorates and population centers have more vote buying because their electoral results often include the vote totals of small groups? Or is it that brokers who operate in those areas have more local knowledge and are better able to identify compliers? How important, if at all, are higher aggregation levels of published electoral results in deterring manipulation? Does monitoring more disaggregated results sustain vote buying even when the votes totals of those who receive the payments are not observed? Although there have been important advances in our understanding of how

[1]The literature provides examples of the fraction of people who report having received party operatives' rewards to influence their vote choice: 12% in Argentina in 2001 (Brusco, Nazareno and Stokes 2004, p.69), 15% in Mexico in 2000 (Cornelius 2004, p.50), 26% in Lebanon in 2009 (Corstange 2012), 12% in Nigeria in 2007 (Bratton 2008), and 25% in Kenya in 2007 (Kramon 2011, p.1).

[2]I define vote buying as the distribution of excludable material benefits to individuals in exchange for votes that occurs before the election.

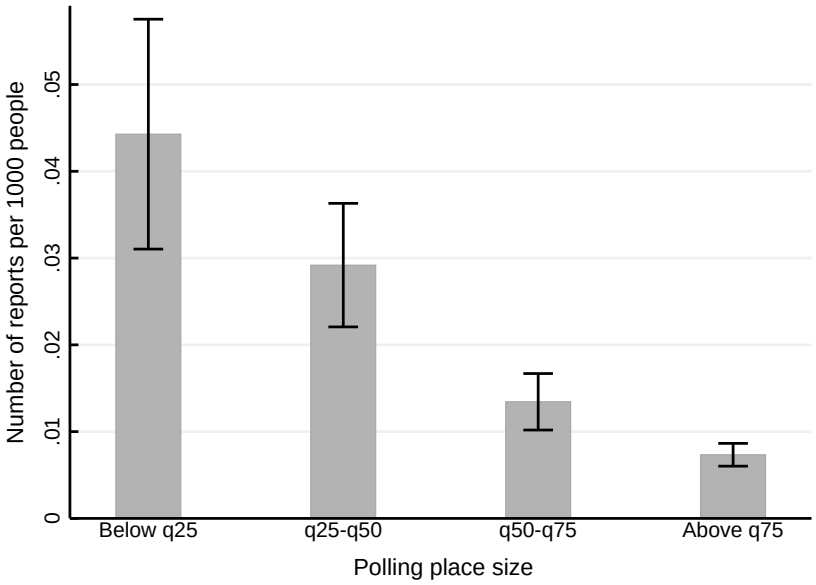
clientistic transactions are enforced, we still do not have answers to these basic questions.

This paper addresses these issues by examining the relationship between levels of aggregation of published electoral results and vote buying. Unlike previous studies that noted how election aggregates could influence clientelism (Chandra 2007; Kitschelt and Wilkinson 2007; Schaffer 2007; Smith and Bueno de Mesquita 2012), this paper highlights a mechanism that links aggregation of published results and manipulation when the results of bribed voters are not observed. This feature of vote buying separates it from other forms of clientelism in which rewards are given to groups whose voting behavior is known. Infrastructure spending that is conditioned on voting behavior, for example, is facilitated by higher disaggregation of results simply because it makes it possible for the party to observe how the targeted group voted. With vote buying on the other hand, the group of bribed voters is smaller than any group for which voting results are available. The proposed mechanism predicts that even with this uncertainty, having higher disaggregation helps to sustain vote buying. The paper also presents the first systematic empirical assessment of how aggregation of electoral results affects vote buying using qualitative evidence, surveys, and original data of citizens' and election monitors' reports of electoral crimes from Colombia.

In Colombia, as in many countries, the most disaggregated election results are those of the polling stations. Why would a broker prefer to have the bribed voters vote in a small polling station if she still cannot tell how they voted? The mechanism highlighted here is simple: only when results of small groups are available do voters feel that their vote can be important in reaching any number of votes that the broker considers acceptable to deliver future rewards. If voters perceive that their individual vote choice is not tied to whether they will receive the payments in the future—as happens when they vote with a large group—they will not have incentives to comply. Conversations with brokers, party officials, election monitors, and voters in Colombia provide evidence that is consistent with this mechanism. The paper also tests the mechanism's main observable implication: we should observe more

vote buying incidents in places where fewer voters vote at each polling station.

Figure 1: Vote Buying Reports by Polling Place Size



A first look at the reported vote buying instances by Colombian citizens from 2002 to 2011 reveals a pattern that is consistent with this intuition.[3] In Figure 1, the bar graph divides the Colombian municipalities into quartiles according to the registered number of voters per polling station. For each group of municipalities the average number of vote buying reports per capita is calculated. We see that there is a clear negative relationship between vote buying and polling place size.

While the pattern is consistent with the hypothesized mechanism, there are several empirical challenges that need to be addressed to assess whether collective monitoring is indeed driving this relationship. The first is a measurement problem. Vote buying transactions are not perfectly observed, and even if they were, those who observe them might have

[3]These are reports filed in regional offices of the Office of the Attorney General of Colombia (*Fiscalía General de la Nación*).

reasons not to report them. It may well be the case that in places where polling stations are small, citizens are less likely to report electoral crimes.[4] In the analysis that follows, I use election monitors' vote buying reports to assess whether misreporting is generating the pattern in Figure 1. The findings suggest that this is not the case. There is a strong negative relationship between the average size of the polling station and monitors' reports of vote buying as well.[5]

A separate challenge is to account for other non-measurement-related factors that offer alternative explanations for the pattern in Figure 1. As mentioned earlier, brokers might be better able to identify compliers in isolated rural areas (Stokes 2005; Stokes et al. 2013), which tend to have smaller polling stations. It can also be argued that in these same places there is a higher concentration of voters who are more likely to cooperate with the brokers. These voters tend to be poor and less informed, care little about politics, might be more altruistic and think they are helping the broker by following her instructions, or trust the broker when he or she promises future rewards.

The Colombian data offer a complete set of controls that allows us to directly rule out some alternative explanations for the observed pattern. Moreover, the data cover four elections per municipality, which permits the use of panel data techniques to directly account for unobserved time-invariant factors. I further reexamine the main hypothesis using a separate dataset with survey information from the Latin American Public Opinion Project (LAPOP 2013). These data have information on a larger set of voters' characteristics that can be included as controls. Since it is still possible that unobserved characteristics of brokers or other

[4]For more on how misreporting affects inferences on the determinants of vote buying see Corstange (2012) and Gonzalez-Ocantos et al. (2012).

[5]A second strategy that models the misreporting process and that does not assume that monitors' misreporting is less affected by factors associated to polling place size gives similar substantive results (see supplemental material).

precinct-level factors could explain the findings, I employ a Fuzzy Regression Discontinuity (RD) design that uses rules that determine maximum sizes of polling stations as a source of exogenous variation in polling place size.[6] The negative relationship between polling place size and vote buying measures holds with these different identification strategies. Finally, I carry out a falsification test in which I show that turnout suppression—a manipulation method that is similar to vote buying in terms of observability and application, but that does not require monitoring vote choices—does not seem to be systematically influenced by polling station size. The evidence gathered in these empirical exercises suggests that the pattern in Figure 1 can be attributed to the increased ability of brokers to sustain compliance by monitoring aggregates and not to differences in social norms, personal characteristics of those targeted, different sizes of the electorate, or a higher ability of brokers to identify compliers where polling stations are small.

The main theoretical mechanism highlighted here is not directly tied to the idiosyncracies of the Colombian democratic experience. Nonetheless, it is important to be cautious when making claims about external validity. At the very least, the proposed theoretical mechanism could be more consistently applied to democracies like Colombia in which brokers face uncertain electoral environments: developing democracies that experience rapid rising and falling of new parties, that have institutions that encourage intra-party competition, or where voters are forced to hide their political preferences because of electoral violence. Such conditions hinder the ability of brokers to easily identify good targets and, therefore, reduce the explanatory power of current theories of bribed voters' compliance that rely on brokers' local knowledge. The mechanism of collective monitoring should also apply to new democracies in which the secret ballot is used but where a strong market for votes has rapidly developed. The most recent wave of democratization in Sub-Saharan Africa with its

[6]For a discussion of the methodology, see Angrist and Lavy (1999); Angrist and Pischke (2009).

massive vote buying campaigns is an example.[7] These new democracies in which brokers do not have a history of multi-party competition guiding the selection of targets are appropriate settings for collective monitoring to be a driver of vote buying.

The Literature on Vote Buying

In addition to the work already cited, there is a growing literature that explores the determinants of vote buying. Loyalty, reciprocity, and a culture of gift giving initially appeared as explanations for bribed voters' compliance (White 1965; Scott 1972; Callahan and McCargo 1996). Recent studies, however, have noted that voters no longer see reciprocating the payments as a moral or socially-imposed obligation (Arghiros 2001; Brusco, Nazareno and Stokes 2004; Stokes 2005).[8] Other determinants of vote buying include poverty, uneducated citizens, proximity to party operatives, and the presence of electoral rules that increase intra-party competition (Hicken 2007; Bratton 2008; Calvo and Murillo 2013; Jensen and Justesen 2014). Brusco, Nazareno and Stokes (2004), Stokes (2005), Nichter (2008), Gans-Morse, Mazzuca and Nichter (2013), and Stokes et al. (2013) turn their attention away from economic, cultural and institutional factors and examine how voters' political preferences shape parties' targeting strategies. While brokers do take advantage of cultural traditions, proximity to voters, and knowledge of voters' preferences to select their targets, this paper focuses on how conditioning payments on groups' voting behavior can be an important complementary strategy to sustain these transactions. The paper offers the first systematic empirical assessment of that strategy and highlights a theory that clarifies why small groups' results

[7] Using interviews from party leaders, Bryan and Baer (2005) report that parties in Kenya and Zambia can spend close to 40 percent of their total campaign expenditures in vote buying.

[8] A modified cultural explanation is that brokers are able to recognize the voters who are more reciprocal (Finan and Schechter 2012).

facilitate these transactions even when the voting behavior of those bribed is not directly observed.

The ideas developed here are also connected to those of recent work that studies the relationship between party bosses and brokers. This literature recognizes that brokers are not perfect agents of parties and that their performance critically determines the effectiveness of clientelistic practices (Szwarcberg 2012; Stokes et al. 2013; Szwarcberg 2014).[9] In this way, vote buying transactions involve at least two separate relationships that can be affected by opportunistic behavior: one between party bosses and brokers, and another between brokers and voters. Where brokers have extensive local knowledge, the principal-agent problem between brokers and party bosses gains importance, as brokers have enough information to avoid voters' attempts to take the benefits without reciprocating them. We know much less about how clientelistic transactions take place when brokers can not easily identify potential cheaters. This paper contributes to the literature by studying a mechanism that sustains vote buying in these uncertain environments.

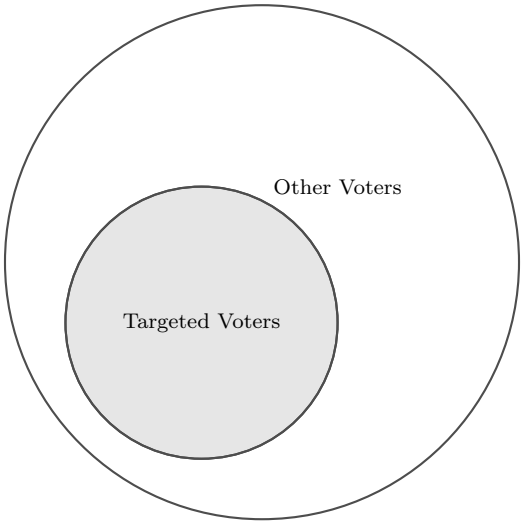
The Mechanism

In a typical vote buying transaction, the broker knows neither the targeted voters' individual votes nor the group's vote totals. To see this, consider a hypothetical polling station for which results are available represented by Figure 2. Even if the broker manages to direct all targeted voters to the same polling station, they are not the only ones voting there. Therefore, only if the broker's candidate obtains fewer votes than the number of voters she bribed does the broker know that some of them cheated. In most cases, though, there will be enough

[9] In recent working papers, Larreguy (2013) and Larreguy, Marshall and Querubín (2014) study how the parties' ability to monitor brokers' performance is linked to electoral and policy outcomes.

unbribed supporters of her candidate that the broker cannot distinguish whether targeted voters complied. This situation further reduces the bribed voters' incentive to comply, as now they can free ride on the supporters' votes in the hope they will not be caught.

Figure 2: Polling Station and Targeted Voters



Brokers can overcome these challenges by setting a minimum threshold of votes that ensures the continuation of payments. This however, will be effective only if they have access to vote totals of *small* groups. The logic behind this is simple. Targeted voters who vote in a large polling station would not perceive that their vote is important to reach any threshold set by the broker. Since their choices are not likely to determine whether the termination of future bribes will occur, the bribed voters would have a greater incentive to vote according to their true preferences. In contrast, when the bribed voters are voting in smaller groups, bribed voters will have a significant chance of avoiding the discontinuation of future benefits by following the broker's instructions. Knowing that compliance is possible where results are highly disaggregated, brokers would concentrate their vote buying efforts in those places.

Note that higher disaggregation does not deter vote buying because it allows the brokers to see the vote totals of targeted voters as others have suggested (Kitschelt and

Wilkinson 2007; Smith and Bueno de Mesquita 2012). While that alternative mechanism accounts for the enforcement of other forms of clientelism in which payments are not excludable and that benefit larger groups, it can not explain transactions in which even with highly disaggregated results, the voting behavior of bribed voters is still obscured by that of the non-bribed voters. It is also important to highlight that the proposed mechanism predicts a negative effect of higher aggregation of electoral results on vote buying irrespective of the overall size of the electorate or the size of the population. Even in large electorates, it is still possible to sustain vote buying transactions as long as results of small groups of voters are published. Previous work has shown that a larger electorate imposes greater logistical challenges to brokers and that larger electorates do have less vote buying (Stokes et al. 2013; Gingerich and Medina 2013), but the separate relationship between aggregation of published results and manipulation has not been examined.

The next question is how relevant is the proposed mechanism for explaining real life vote buying transactions. Interviews with brokers and voters show that collective monitoring is indeed used and that voters are aware of it. José, a campaign operative in Bogotá, Colombia, describes a collective monitoring mechanism that closely resembles the one described above and that applies to the case depicted in Figure 2:

> With their *cédula* number [identification number needed to vote], I know in what *mesa* [polling station] they voted. If 10 have to be voting in there and I see only five votes, that means that five of them are failing me. I have precision of 80%. Things can become difficult as there are other voters who one does not know who might vote for the candidate because they have seen him in TV or because they like his ideas...[10]

José also confirmed that suspected non-compliers were excluded from future benefits. When

[10]Interviews conducted by the author in March 2012 in Bogotá, Colombia.

asked what happens to the people who, according to those rough calculations, are not voting as instructed he replied, "like some people say, those are taken out of the keychain."

Alejandra Barrios, head of the *Misión de Observación Electoral* (MOE)—a domestic non-governmental organization that monitors elections—mentioned that brokers checking results of polling stations was common, and that it was the "least sophisticated" method of enforcement relative to other ones in which brokers seek to establish how each person voted. Other party operatives corroborated that brokers monitor results of the polling stations, and added that before these results were required by law to be published on the internet, there was a black market in which brokers could obtain results shortly after the election.

Voters are also aware that brokers are monitoring aggregate results. After asking Emilio, a voter from the town of Astreas, if he thought that it was possible for party operatives to observe how each individual voted he replied, "No, I don't think that happens, but they might do some accounting. Yes, that accounting exists."

It is also worth noting that often the targets are people the brokers have not previously met. Laura Ardila, a journalist working for the news outlet *La Silla Vacia*, reported how, in her visit to the town of Soledad on the day of congressional elections in 2014, she was approached on three different occasions by brokers who offered a gift, or *colaboración*, for voting for their candidate. In these episodes, it is clear that she was not selected by the brokers because of her political preferences, perceived reciprocity, or turnout proclivities. In each of her encounters with the brokers, however, they did want to know her cédula number.[11] Laura's experience is again in line with a monitoring mechanism in which brokers determine the polling station in which the targeted voters vote using their identification number and later check the identified station's results. On the other hand, the fact that brokers target strangers is inconsistent with theories of compliance in vote buying in which the brokers'

[11]For the complete story see "Así compraron votos en la capital del fraude" (This is how they bought the votes in the capital of fraud) in, *La Silla Vacía*, March 17, 2014.

knowledge of their targets is what sustains these transactions (Stokes 2005; Stokes et al. 2013).

The previous accounts show that brokers infer voters' compliance from polling station results, that future payments are conditioned on the brokers' assessment of compliance, that some voters are aware of parties monitoring aggregate results, and that brokers do not always have specific information on voters' preferences or other characteristics when they attempt to buy their votes. The proposed theory is consistent with all of these observations. An alternative test of the theory is to look for evidence of the predicted negative relationship between aggregation of published results and vote buying. This is done in the following sections.

Institutions and Political Context

This section describes the electoral environment of Colombia. As we will see, and similar to other developing democracies, Colombia's electoral environment is such that brokers have a hard time identifying the preferred candidates or voting proclivities of individuals. The theory highlighted here is particularly well suited to these uncertain electoral environments. I also briefly describe rules that govern polling station sizes that will later be useful for our identification strategy.

Elections in Colombia

The period of analysis covers the years 2006 to 2012. There were general elections in 2006 and 2010, and regional elections in 2007 and 2011. In general election years the president is elected under plurality rule with runoff and members of congress are elected by party-lists

proportional representation with an option to run under open or closed lists.[12] In regional elections, heads of the executive branch (mayors and governors) are elected by plurality and members of legislative bodies (department assemblies and municipal councils) are also elected by party-list proportional representation.

Colombians use the Australian Ballot (*El Tarjetón*). The constitutional reform of 1991 eliminated the old system in which citizens could only vote using ballots that were printed and distributed directly by the parties. With the party-printed ballots, the vote was only nominally secret, as brokers could give the ballot to the recipient of the bribe and make sure that he or she would immediately go to the polls without having received a different ballot from any other person.

During the period of analysis, the Colombian political landscape was transformed by two processes: the rise of non-traditional parties and the involvement of armed groups in politics. Although Colombian politics were dominated by Liberals and Conservatives for most of the country's history, after the constitution of 1991 new parties gained considerable representation. By 2002, the share of seats taken by non-traditional parties in congress was 43.2%. Around the same time, during the regional elections of 2000 and 2003 and congressional elections of 2002, right-wing paramilitaries exerted direct pressure to influence the results on a scale that had not been seen before. This was the direct result of a series of pacts where leaders of the *Autodefensas Unidas de Colombia* (AUC—United Self-Defense Organization of Colombia) and national and regional politicians agreed to engage in mutual cooperation.[13]

Electoral violence, high intra-party competition encouraged by the open lists, low effective thresholds of representation, and the rapid rise and fall of new parties and political

[12]Seats are allocated by D'Hondt divisors. Before 2006, however, the seat allocation formula was simple quota and largest remainders applied to personal lists.

[13]For more details see Acemoglu, Robinson and Santos (2013).

movements, are all factors that make it harder for brokers to identify preferred candidates and turnout proclivities of individuals. This makes Colombia a useful case for the study of how parties sustain vote buying transactions in a highly uncertain electoral environment.

Rules and Size of Polling Stations

In Colombia the most disaggregated electoral results are those of the polling stations. Results of each polling station are recorded in the form *E14*, which includes the vote totals of each candidate or party list.[14] These forms are published on the website of the National Registrar's Office shortly after the elections.

The size and location of the polling stations are determined by the National Registrar's Office. The Registrar's Office defines rules establishing the maximum size of polling stations in the months before an election. The maximum size varies according to the type of precinct and its location. In 2011, for example, regular polling stations had a maximum size of 350 registered voters, but those in special voting centers like Corferias in Bogotá, the capital, had a maximum of 800 registered voters.[15] The maximum size for most polling stations in the local elections of 2007 and previous elections was 400 and for the general elections of 2010 was 500.[16] Once the maximum number of registered voters per polling station has been fixed, the voters in a precinct are assigned to each polling station alphabetically. The last polling station, *la mesa de cola*, takes all the voters that were not assigned to the other polling stations in the precinct.

While maximum sizes of hundreds of registered voters per polling station seem to be

[14] An example of this form used in the 2011 Bogotá's mayoral election is shown in the supplemental material

[15] See National Registrar's Resolution 1072 of 2011 for more details.

[16] See National Registrar's Resolutions 167 of 2010, 1883 of 2007, and 4144 of 2005 for more details.

large numbers for the proposed argument to have bite, in practice, polling stations can have very few voters. Colombia does not have compulsory voting and abstention is high. In the most recent election for congress, for example, only 43.5% of the registered voters went to the polls and in the presidential elections the abstention rate was 60%.[17] Moreover, the high abstention rate has been relatively constant over the years, as has the fraction of null votes, which could further reduce the effective size of polling stations.

Finally, the number of registered voters varies according to several factors that include: voters changing their place of residency, people turning 18, the death of registered voters, and people joining the military.[18]

Data

I use two different measures of vote buying at the municipal level. The first one comes from citizens' reports of vote buying incidents filed in regional offices of the Attorney General of Colombia. This dataset contains the number of reports from every municipality (1,122 in total) per election year for the period from 2002 to 2011. The second measure comes from election monitors' reports collected by the MOE. The data have election monitors' reports from 632 municipalities and cover the period from 2006 to 2011.

The MOE reports are chosen for their coverage and independence from regional and national governments. The MOE is the largest non-governmental domestic organization monitoring Colombian elections. Other monitoring agencies cover fewer municipalities, do not monitor regional elections, or only report incidents occurring a few days prior to and

[17] See "La abstención la gran triunfadora" (Abstention the great winner) in, *Semana*, May 25 2014.

[18] People in the military are not allowed to vote. See Law 1475 of 2011, Articles 48 and 49 for more details.

after the elections. The MOE works with smaller regional organizations that report incidents occurring months before the elections, as well as incidents that occur during and after the election. Also, the MOE is financed by several international institutions, which lends more credibility to its political independence.[19]

For the main explanatory variable, I use two measures of aggregation of results. The first one is the number of registered voters per polling place. Since the number of registered voters can be affected by vote buying, I also use the population who is 20 years old or older per polling place. This is a proxy for the average voting age population per polling station, which includes those 18 years old or older. These variables are built with data from the National Registrar's Office and from the National Statistics Office (DANE–*Departamento Administrativo Nacional de Estadística*).

The baseline econometric specification includes as controls a measure of the size of the electorate, competitiveness of the elections, a measure of poverty, an indicator of the presence of guerrillas or paramilitary forces, and a measure of the local government's fiscal autonomy. All these controls are lagged or reflect values measured in the previous election to account for the possibility of manipulation influencing these variables.[20] Given that the dependent variable is the level of manipulation, all models also include the municipality population.[21]

[19]Some of these institutions are: the United Nations, the European Union, USAID, Konrad Adenauer Stiftung, Oxfam, the Global Network of Domestic Election Monitors, and the Ford Foundation.

[20]The results that follow change little with specifications that omit potentially endogenous controls like competitiveness and size of the electorate.

[21]The size of the electorate is calculated as the average number of valid votes of all elections in a given year. The measure of competitiveness is the average of the margins of all races in a given year weighted by the number of valid votes in each type of election. A more detailed

I use a third dataset to account for personal characteristics of voters that could affect our inferences when using aggregated data. These data come from the 2010, 2011 and 2012 LAPOP surveys. The survey is based on interviews of 4,521 voting-age individuals and covers 81 municipalities over the three years.[22]

Results

To examine the relationship of interest, I use models in which the dependent variable is the count of reports of vote buying. I model this count as a random Negative Binomial variable $y_{i,t}$ with mean equal to the exponent of the linear combination of the explanatory variable of interest and controls,

$$\tilde{\mathbf{x}}_{i,t}\beta = p_{i,t}\ \alpha + \mathbf{x}_{i,t}\ \delta.$$

Therefore

$$y_{i,t} \sim NegBin\left(exp(\tilde{\mathbf{x}}_{i,t}\beta), exp(\tilde{\mathbf{x}}_{i,t}\beta)(1+\eta\ exp(\tilde{\mathbf{x}}_{i,t}\beta))\right), \tag{1}$$

where $\tilde{\mathbf{x}}_{i,t} = (p_{i,t}, \mathbf{x}_{i,t})$, $\beta = (\alpha, \delta)$, and η is the overdispersion parameter. The subindex i denotes a municipality and t an election year. The variable $p_{i,t}$ is the polling place size and the vector $\mathbf{x}_{i,t}$ contains control variables. The main hypothesis predicts that α will be

description of the construction of the controls and the data sources is in the supplemental material.

[22]Summary statistics of all the variables used in the aggregate and individual-level analysis can be found with the supplemental material.

negative.

Table 1: Vote Buying and Polling Place Size (Citizens' Reports)

Dependent variable:	Citizens' vote buying reports		
Polling place size measure:	$\ln(\frac{Registered}{Stations})$	$L.\ln(\frac{\text{Pop. age}\geq 20}{Stations})$	
	(1)	(2)	(3)
Polling place size	-1.929	-1.544	-1.140
	(0.363)	(0.232)	(0.251)
Electorate size			-0.364
			(0.029)
Municipality controls	no	no	yes
Model	NB	NB	NB
Observations	4,473	4,473	4,351
Municipalities	1,119	1,119	1,098

All models include the logged municipality population as an additional control. Electorate size is logged. Standard errors clustered at the municipality level are in parentheses.

Table 1 presents evidence that is consistent with those expectations. Each column has the coefficients on selected variables of interest in expression (1). The model in column (1) presents the polling place size coefficient when the variable is measured as the natural log of the number of registered votes per polling station. We observe that the coefficient is negative and precisely estimated. Since polling place size is logged, its coefficient can be directly interpreted as an elasticity in count models. In this way, an increase of 10% in the size of the average polling station in a municipality is associated with a 19.3% reduction in the number of reported incidents of vote buying. The model in column (2) uses an alternative measure of polling place size, which is the logged population older than 20 per polling station in the previous election. The alternative measure should prevent the results of the model from being affected by reverse causality, as vote buying could affect the number

of registered voters.[23] We see that the estimated coefficient changes little and remains statistically significant.

The model in column (3) includes the baseline set of municipality-level controls. The results show that the main relationship holds once we control for measures of economic development, presence of non-state armed actors, competitiveness of elections, and the size of the electorate. Controlling for the size of the electorate is particularly important, as the coefficient on polling place size could be capturing the fact that larger electorates (which tend to have larger polling stations) are harder to influence through manipulation (Gingerich and Medina 2013; Stokes et al. 2013). As can be seen, larger constituency sizes are in fact associated with fewer reports of vote buying, but the effect of polling place size is still negative and significant. To reduce vote buying by 10%, the model indicates that the average polling place size would need to be increased by 8.77%, or alternatively, that the size of the constituency should increase by 27.47%. This comparison illustrates that changes in the way results are published may be more important for reducing vote buying than changes in the size of the electorate.

Misreporting

It is possible that the previous results reflect the fact that in places where there are smaller polling stations, people are less likely to report electoral crimes. To account for this, I use domestic monitors' reports as an alternative dependent variable. The logic behind this strategy is that misreporting is less likely when monitors are independent outside actors, and, more importantly, that the factors affecting the true count of electoral crimes do not determine which instances of vote buying the monitors decide to report.

[23]Note that if vote buying increases voter registration, that would bias the previous results against finding support for the main hypothesis.

Table 2: Vote Buying and Polling Place Size (Monitors' Reports)

Dependent variable:	Monitors' vote buying reports					
	Original data				Multiple imputation	
	(1)	(2)	(3)	(4)	(5)	(6)
Polling place size	-1.627	-1.058	0.660	-4.553	-0.502	-1.381
	(0.495)	(0.430)	(1.464)	(1.614)	(0.178)	(0.773)
Municipality controls	no	yes	yes	yes	yes	yes
Municipality fixed effects	no	no	yes	yes	no	yes
Model	NB	NB	Poisson FE	FE	NB	Poisson FE
Observations	1,075	1,068	222	1,068	4,488	2,904
Municipalities	634	633	82	632	1,122	726

All models include the logged municipality population as an additional control. The number of municipalities and observations in (6) reflect averages across the imputed data sets. Polling place size is the logged number of people older than 20 per polling station in the previous election. Standard errors clustered at the municipality level are in parentheses for the Negative Binomial and linear models. For models (5) and (6) standard errors are adjusted to account for error introduced by the imputation.

Table 2 shows in columns (1) through (4) the estimated coefficients in models using the monitors' data. Models (1) and (2) show that the results are very similar to those obtained previously with the citizens' reports for specifications with and without municipality controls.

Models (3) and (4) include municipality fixed effects. These models account for time-invariant unobserved confounders. For example, isolated rural areas where polling stations are smaller have different traditions and social norms that can facilitate compliance in vote buying. In these places, people may value reciprocity or trust one another more, which would help alleviate the inherent commitment problems of these transactions. Given that social norms in a municipality do not change quickly over time, these and similar concerns can be addressed with estimations that account for constant municipality effects. In the model in column (3) the results are not as expected, as the polling place size has an imprecisely estimated positive coefficient. However, it is important to note that the sample used by the Poisson fixed effects model is very small.[24] Since the estimator drops all municipalities that have no variation in the levels of reports, this leaves us with only 20% of the observations from the original sample. To check whether this explains the new results, column (4) reports the coefficient of a linear fixed effects model. The results are back in line with what we have seen previously. An increase of 10% in the size of the polling place is associated with a reduction of 0.455 reports ($10 \times -4.55/100$), which is a third of a standard deviation of the dependent variable.

While using monitors' reports may reduce concerns about how misreporting affects the results, this strategy also has some drawbacks. In particular, the efforts to identify the effect of polling place size may be hampered by the non-random selection of municipalities in the sample. As stated by the head of the MOE, the two most important factors that determine whether a municipality has MOE monitors present are security conditions and

[24]For a discussion on the advantages of using a Poisson distribution over the Negative Binomial with panel fixed effects count models see Winkelmann (2008, Ch. 7).

whether there are already other non-government organizations affiliated with MOE in the municipality.[25] Larger and more economically developed municipalities tend to have more of those organizations. At the same time, these same municipalities are likely to have different levels of manipulation.[26]

A potential solution to those shortcomings is to adopt Multiple Imputation (MI) to fill the missing observations of reports where monitors were not present (Rubin 1987; King et al. 2001). For MI to return sensible results, the missing at random assumption (MAR) needs to hold. That is, the missing vote buying reports need to depend on observed values in the dataset but not on unobservables. This is a strong assumption, but it is one that it is likely to hold in this particular case. The dataset has information on the presence of armed groups as well as several economic variables which proxy for the main determinants of monitor location as stated by the head of the MOE. An advantage of using multiple imputation to fill missing monitors' reports is that the difference between citizens' and monitors' reports, where available, provides additional information that is used at the imputation stage.

The models in columns (5) and (6) in Table 2 present the results that address selection concerns using MI. We find support for the hypothesis. It is important to note that the magnitude of the polling place size coefficient has decreased relative to the estimations that only used non-imputed data. The marginal effect is still important. Model (5), which has the smallest estimated coefficient, tells us that an increase of 10% in the size of the average polling station would lead to a reduction of nearly 5% in vote buying reports.[27]

[25]Interview with MOE director Alejandra Barrios was conducted by the author in Bogotá, Colombia, March 2012.

[26]On the one hand, safer and larger municipalities have more public resources at their disposal, increasing the incentives of politicians to engage in manipulation. On the other, monitors could deter manipulation where they operate.

[27]An additional concern is that the monitors are also unlikely to accurately report manipu-

Individual Level Analysis

In this section, I explore the relationship of interest using an alternative dataset that allows us to directly take into account social attributes of voters that make them better targets of manipulation. If people who live near small polling stations are being targeted because of their characteristics (that differ from those in other geographic areas within the municipality), once we control for them the relationship between the size of the polling station and vote buying should disappear.

When using survey data, the probability of a respondent being the target of a manipulation strategy is modeled using the logistic distribution. The question in the survey used to build the dependent variable asks whether the respondent was offered a bribe in the last 4 years to support a candidate. For this reason, all election-specific controls are averages for the most recent local and national elections.

Table 3 presents the results of these models. The model in column (1) includes respondents' characteristics like age, years of education, income level, and a dummy for whether the respondent lives in a rural area within the municipality. The model in column (2) adds to the previous set cultural characteristics as well as variables that capture how informed the respondent is about politics. These include her interest in politics, involvement in community affairs, religiosity, news readership frequency, strength of general trust in her community, and whether the person is registered to vote. Model (3) adds the municipality level controls and municipality fixed effects. For all models, the polling place size coefficient is negative and significant. Moreover, in the most robust specification that includes variables

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lation attempts where polling stations are small. Similar results of an alternative estimation strategy that does not rely on election monitors being less sensitive to factors that affect citizens' willingness to report or MAR and an analysis of misreporting patterns can be found in the supplemental material.

Table 3: Vote Buying and Polling Place Size (Individual-Level Analysis)

Dependent Variable:	1 if offered bribe, 0 otherwise		
	(1)	(2)	(3)
Polling place size	-0.364	-0.376	-2.540
	(0.169)	(0.167)	(1.126)
Cultural individual controls	no	yes	yes
Municipality controls	no	no	yes
Municipality fixed effects	no	no	yes
Model	Logit	Logit	Logit
Observations	3,655	3,655	3,655
Municipalities	77	77	77

All models include the logged municipality population as an additional control. Standard errors clustered at the municipality level are in parentheses.

that are related to both vote buying and size of the polling stations like electorate size and presence of armed groups, the effect is much larger. In Cartagena—a city where reports of vote buying are frequent and that has about 300 voters per polling station—doubling the size of the average polling station would result in a predicted drop of 40 percentage points in the probability of anyone being offered a bribe (from 0.58 to 0.18).[28] Such a change is equivalent to what would happen if the electoral commission decided to publish the results of pairs of polling stations.[29]

[28]Predicted values are calculated at the mean of the independent variables for the Cartagena subsample.

[29]These results are also robust to accounting for underreporting in survey responses when modeling the misreporting process. See the supplemental information for more details.

Discontinuities in Polling Place Size Induced by Institutional Rules

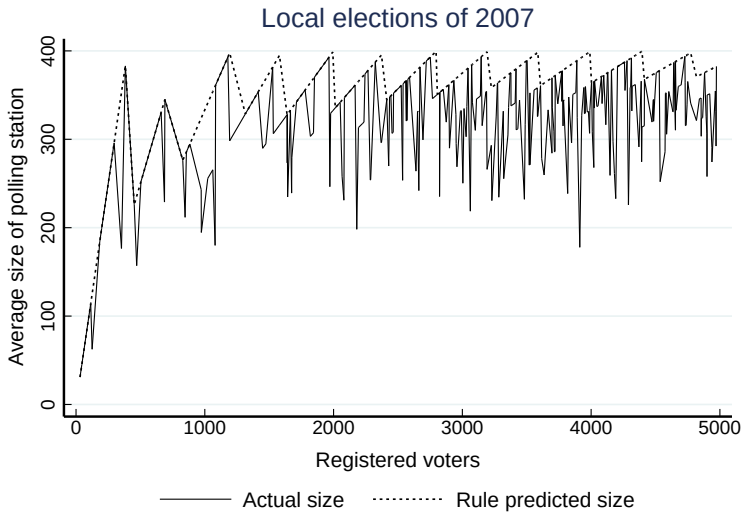
So far, I have tried to rule out alternative explanations by including municipality-level fixed effects and by controlling directly for characteristics of voters that make them more likely to be targeted. There is still, however, an important theoretical mechanism that could account for the main finding. Stokes argues that brokers who are immersed in the social networks of voters are able to recognize and target those who are less likely to cheat (Stokes 2005). If brokers are more immersed in these social networks in isolated rural areas, the relationship that we are finding might be explained by the fact that places with smaller polling stations have more connected and informed brokers. In this section, I apply an empirical strategy that allows us to be more confident that polling place size does have a direct effect on vote buying that is not capturing the better monitoring ability, knowledge of brokers, or other characteristics of areas where small polling stations are located. This approach relies on variations in the average size of the polling stations induced by institutional rules using a Fuzzy RD design (Angrist and Lavy 1999; Angrist and Pischke 2009).

The strategy implements a two-stage instrumental variables regression analysis that uses the size of the polling station predicted by the rules limiting the voters per polling station as an instrument of the actual size. The institutional rule predicts sharp reductions in the size of the average polling station of a municipality every time the number of registered voters reaches a multiple of the maximum number of voters allowed to vote. Such sharp reductions will be used as a source of exogenous variation to identify the causal effect of actual size of polling stations on vote buying.

To clarify the intuition consider a municipality with 399 registered voters in the local elections of 2007. According to the institutional rule the size of the average polling station (at this point there is only one) should be 399 voters. Similarly, if the registered voters are 400, the size of the average polling station should be 400; but if the registered voters are

above the 400 threshold, say 401, the National Registrar's delegates would have to install a new polling station where the additional voter would vote and the average size of the polling station would fall to 200.5. The institutional rule induces this discontinuous jump in average size at 400 registered voters. Other variables that might be correlated with size of the polling stations (and with the incidence of vote buying) like broker's characteristics, or factors that capture social dynamics between voters and brokers are unlikely to create abrupt and discontinuous changes in the size of the average polling station at those points.[30] In this way, the size predicted by the rule is exogenous (at least near the discontinuity points) and it becomes a good candidate to be used as an instrument of the actual polling place size in a standard instrumental variables regression.

Figure 3: Discontinuities in Polling Place Size Induced by Institutional Rules



[30]That is, municipalities with registered voters that are just below and right above multiples of 400 should be similar in terms of social dynamics or other potential unobserved confounders, but the institutional rule would make them likely to differ in their "treatment status."

The dotted line in Figure 3 shows the predicted size of the average polling station if all the registered voters in the municipality were divided equally among the stations with sizes limited by the regulation in 2007.[31] The solid lines represent the actual size of the average polling stations in the data. The figure reflects the expected discontinuities at every multiple of 400 explained by the need to include additional polling stations. However, we see that the rule does not perfectly predict the actual size all the time.[32] A reason for this is that there are municipalities where small polling stations have to be located at different points across the territory to ensure that no voter would have to travel great distances to reach a polling station.[33] Nevertheless, we see that the rule does explain some of the variation in the actual size, which is needed for the rule predicted size to be used as an instrument.

There are two key identifying assumptions for the Fuzzy RD approach. The first is that any other potential effect of registered voters on vote buying is controlled for in the first stage regression. For this, it is important to include smooth functions of the number

[31]The predicted average size of a polling station in a municipality, Ruled-based size$_{i,t}$, is calculated using the following expression,

$$\text{Ruled-based size}_{i,t} = \frac{\text{Registered}_{i,t}}{\text{int}((\text{Registered}_{i,t} - 1)/\text{Max. size}_t) + 1},$$

where Max. Size$_t$ is the maximum size imposed by the regulation. Values in the graph correspond to in-sample values of the expression above. The graph for the general election of 2010 is in the supplemental material.

[32]This feature distinguishes a sharp RD from a Fuzzy one. A fuzzy RD exploits discontinuities in the expected value of treatment, while in the sharp RD the discontinuities occur in the actual value of treatment following a deterministic rule.

[33]There are also polling stations for which the maximum may be lower, but information on the fraction of polling stations in a municipality for which those alternative rules apply is not available.

of registered voters in the model. For example, if brokers are targeting areas where more opponents are registered, that would induce a smooth positive relationship between number of registered voters and vote buying, which could violate this assumption. The second identifying assumption is that brokers are not exploiting the rule to send the targeted voters to small polling places. Calculating in advance the average size of a polling station according to the rule is a hard task that is unlikely to be done by brokers. A broker who wants to make a good prediction of the size of a polling station would be forced to have good estimates of changes in the number of registered voters. Predictions on the number of voters who die, those who turned 18, and others who have joined the military would have to be accurate to assess the new sizes of polling stations with enough precision.

Table 4 presents the results. Columns (1) through (4) include estimated coefficients for models that use citizens' reports. The model in the first column includes as controls the logged population and logged registered voters. In the second column the model has a linear, a quadratic and cubic polynomial term of registered voters, and in the third, the additional regressors are the logged number of registered voters and the municipality controls. These models show a negative and significant effect of polling place size. The fourth column presents the results of the model with the same specification as the one in (3) but that restricts the sample to municipalities with polling stations that are within 50 voters of a discontinuity point. Here, the magnitude of the negative effect increases and it is still significant. The rest of the columns present equivalent specifications but use monitors' vote buying reports as a dependent variable. The results are similar. Not surprisingly, however, the effect is not precisely estimated for the model that uses the much smaller discontinuity sample. The model that has the baseline controls gives a magnitude of the effect that is closer to the one found by the linear fixed effects model.

Table 4: Vote Buying and Polling Place Size (2SLS Estimates-Fuzzy RD)

Dep. Variable:	Citizens' reports				Monitors' reports			
	(1)	(2)	(3)	(4)	(6)	(7)	(8)	(9)
Panel A	Vote Buying equation results							
Polling place size	-0.986	-0.711	-1.466	-2.981	-0.704	-0.451	-2.185	-5.904
	(0.143)	(0.111)	(0.464)	(1.239)	(0.236)	(0.125)	(1.290)	(3.736)
Panel B	First stage equation results							
Ruled-based size	0.796	0.798	0.656	0.582	0.784	0.781	0.863	0.721
	(0.009)	(0.009)	(0.023)	(0.044)	(0.018)	(0.018)	(0.060)	(0.044)
Log(Registered)	yes	no	yes	yes	yes	no	yes	no
Cubic polynomial (Registered)	no	yes	no	no	no	yes	no	yes
Municipality controls	no	no	yes	yes	no	no	yes	no
Sample	Full	Full	Full	Discontinuity	Full	Full	Full	Discontinuity
Observations	4,351	4,351	4,351	1,072	1,068	1,068	1,068	295
Municipalities	1098	1098	1098	743	632	632	632	260

Polling place size is the logged number of registered voters per polling place. Ruled-based size is the log of the average polling station size predicted by the institutional rule.

Turnout Suppression and Polling Place Size

How does polling place size affect other forms of manipulation? If polling place size reduces vote buying, but not other alternative forms of manipulation, this would suggest that we are not simply capturing another mechanism by which larger polling places deter electoral manipulation in general. For example, we could be seeing that larger polling stations deter vote buying because they attract the attention of more representatives, delegates, or strong supporters from different parties who want to avoid manipulation at larger scales. Turnout suppression is suitable for this falsification test because it is similar to vote buying in how visible it is to outsiders and because individual voters are targeted by party operatives. Critically, it differs from vote buying in that voting choices do not need to be monitored. Therefore, whether a polling station is large or small should not directly affect the ability of the broker to prevent voters to go to the polls. This is particularly true in Colombia where brokers retain the cédulas of the targeted voters (which are required to vote) during the elections and return them some days later.

Table 5: Turnout Suppression and Polling Place Size

Data:	Citizens' reports	Monitors' reports			Survey
	(1)	(2)	(3)	(4)	(5)
Polling place size	-1.304	-1.060	-3.098	-1.157	-3.805
	(0.479)	(0.647)	(7.031)	(0.935)	(11.526)
Individual controls	-	-	-	-	yes
Municipality controls	yes	yes	yes	yes	yes
Municipality fixed effects	no	no	yes	yes	yes
Model	NB	NB	Poisson FE	FE	Logit
Observations	2,160	1,068	48	1,068	1,569
Municipalities	1,096	632	15	632	21

Polling place size is the logged number of people older than 20 per polling station in the previous election.

Table 5 shows the results of turnout suppression models. We see that while the model using citizens' reports shows a negative and significant relationship between polling place size and turnout suppression (column 1), models that account for misreporting and municipality-time-invariant confounders (columns 2, 3, and 4), as well as the one that uses individual-level data from LAPOP (column 5) do not. Polling place size does not have the same robust negative effect on reports of turnout suppression that we observed with vote buying.[34]

Concluding Remarks

A vibrant market of votes is inconsistent with a well-functioning democracy. When bribed voters do not base their vote choices on the candidates' performance or expected policies but rather on short term material inducements, the role of elections in promoting accountability is weakened. Vote buying also eliminates effective representation as the votes of the bribed individuals are not informative of their true political preferences (Stokes et al. 2013). These consequences are compounded by the fact that the poor are those whose voices are muted by these transactions (Stokes et al. 2013). Understanding the mechanisms that make vote buying possible is the first step to prevent this form of electoral manipulation.

This paper started with some basic questions that reflected important gaps in what we know about vote buying. Can vote buying be sustained through collective monitoring even when the bribed-voters' behavior is not directly observed? Here, I highlighted a mechanism under which collective monitoring sustains vote buying when the election results of small groups are available. Having access to results of small groups sustains vote buying

[34]Results of Seemingly Unrelated Equation (SUR) models confirm that the coefficients of polling place size are statistically different between turnout suppression and vote buying models. Results are reported in supplemental material.

not because it directly allows the broker to observe how the bribed voters vote, as others have suggested, but because in small groups, voters' individual actions are likely to determine whether they will be rewarded in the future. Evidence provided by conversations with brokers, election monitors, and voters is consistent with that mechanism. We also did not know how important, if at all, were higher aggregation levels of published electoral results deterring manipulation. The estimates suggest that they are, in fact, very important. Simply reporting electoral results by polling station pairs (effectively doubling the size of the group of voters that can be monitored) would reduce the predicted vote buying by at least half. Finally, it was unclear whether previous findings that related electorate size and vote buying were explained by differences in the aggregation of published results or by other characteristics of small electorates. I found that larger electorates do in fact have less vote buying, but that this association is independent of the robust negative relationship between polling place size and vote buying measures. More generally, the findings suggest that the relationship between polling place size and vote buying is not driven by differences in social norms, patters of misreporting of electoral crimes, personal characteristics of those targeted, or a higher ability of brokers to identify compliers where polling stations are small.

This evidence can inform our efforts to fight electoral manipulation. Parties continue to buy votes in places where voters do not feel morally obliged to reciprocate the payments, and even where brokers approach strangers whose preferences or turnout proclivities are not known. Increasing the levels of aggregation of electoral results might seem to be an effective policy recommendation to improve the quality of elections. One must be aware, however, of potential costs of such a measure. Detecting fraud or miscounting, for example, could be made much harder when votes from different precincts or polling stations are pooled before counting. Without an understanding of how parties choose between different manipulation strategies and how those strategies complement or substitute each other, we cannot fully assess the net benefits of electoral reforms that seek to clean up elections.

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