Do ghosts exist?
Clientelistic networks and corruption in public education*

Leopoldo Fergusson† Arturo Harker ‡ Carlos Molina§

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Abstract

We study the effect that political alignment between local (municipal) and regional (department) politicians plays in explaining false or "ghost" students, fabricated by local politicians and bureaucrats to obtain (and then divert) more transfers from the national government. Using a Regression Discontinuity Design, we show that the proportion of ghost students is larger in municipalities where the candidate from the governor's party is elected, suggesting that resource extraction in this highly clientelistic environment is particularly valuable to politicians whose political network is connected to higher echelons of power. Also, we find larger effects in "autonomous municipalities" that have more discretion over resource spending. Additional findings reveal that the quality and quantity of education are not higher in aligned areas, where instead there is a higher likelihood of future electoral fraud and incumbent parties have better future electoral prospects. These results are consistent with the idea that places with more valuable rents and discretionary scope for diversion of resources for the reproduction of the clientelistic network engage more in this form of corruption, in which a substantial part of the money is being diverted for political and economic gain rather than to improve the quantity or quality of the service. Finally, the higher likelihood of future electoral vote fraud and party performance is consistent with a resulting entrenchment of the clientelistic machine.

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†Universidad de los Andes, Department of Economics, Cra 1 N° 18A - 12 Bogotá, Colombia. E-mail: lfergusson@uniandes.edu.co

‡Universidad de los Andes, Escuela de Gobierno, Cra 1 N° 18A - 12. E-mail: a.harker@uniandes.edu.co

§University of Chicago, Harris School of Public Policy, 1155 E 60th St Chicago, IL 60637. E-mail: carlosmolina@uchicago.edu

1 Introduction

Public spending in education has increased substantially over the last several decades. Since the 1980s, real spending has doubled on average in Latin America and Sub-Saharan Africa, tripled in the Middle East, increased more than five times in East Asia and risen almost eight times in South Asia (Glewwe, Hanushek, Humpage, & Ravina, 2011).

The pace of improvements in learning has been less dramatic (Mbiti, 2016). Although many factors likely play a role (for example, poor-quality of education, particularly teachers, and insufficient complementary inputs in the school, family or community) one first obvious pre-requisite for spending to be effective is that it is actually invested in education. However, poor governance can lead to resource mismanagement and outright diversion from corruption in countries with weak institutions.

In this paper, we study this problem and its political determinants using within-country variation from Colombia.[1] We rely on an unusually precise measure of resource diversion in the education sector. Allegations of the fabrication by local bureaucrats and politicians of fake or so-called "ghost" students to increase (and later divert) national transfers for education in 2011, led the Ministry of Education to commission an independent and comprehensive nation-wide assessment of the number of these false students in every school in 2012. Local mayors play an important role in the fabrication of false students, and resource extraction in this highly clientelistic environment is particularly valuable to politicians whose political network is connected to higher echelons of power. We therefore study the effect that political alignment between local (municipal) and regional (department) politicians plays in explaining this phenomenon. Using a Regression Discontinuity Design, we show that the proportion of ghost students is significantly larger in municipalities where the candidate from the governor's party is narrowly elected (compared to areas where it narrowly looses). Also, we find larger effects in "autonomous municipalities" that have more discretion over resource spending. Additional findings reveal that tests scores are not higher in the areas producing more ghost students and that in aligned areas there is a higher likelihood of future electoral vote buying and parties have better future electoral prospects.

These results are consistent with the idea that places with more valuable rents and discretionary scope for diversion of resources for the reproduction of the clientelistic network

[1] Colombia is no exception to the overall trend of increasing education expenditures. In fact, from 1980 to 2012, public expenditure on education rose from 1.7 to 4.5% of GDP, according to the World Bank (see `https://data.worldbank.org`). The improvement in outcomes has been more uneven, with sustained gains in coverage but little success in increasing quality indicators.

engage more in this form of corruption. Also, the findings on tests scores indicates that at least a substantial part of the money is being diverted for political and economic gain rather than to improve the quality of the service (Fernández-Vázquez, Barberá, & Rivero, 2016). Finally, the higher likelihood of future electoral vote buying and party performance is consistent with a resulting entrenchment of the clientelistic machine.

Our paper contributes to several strands of literature. First, to the measurement and understanding of corruption in developing countries (Olken & Pande, 2012). A closely related paper is Reinikka and Svensson (2004), also emphasizing local capture of government transfers for education by political elites. However, rather than explaining variation on capture with school-level features that change their bargaining power and thus influence missing funds, we study variation in the political incentives to divert the money. An important question in the literature on corruption concerns its efficiency costs since, at least theoretically, not every form of corruption decreases efficiency (Banerjee, 1997). Some empirical evidence suggests that corruption in education can decrease quality (e.g., Ferraz, Finan, & Moreira, 2012), arguably an inefficient outcome. Also, the prevalence of ghost students, by distorting the real expenditure figures on education, could imply that authorities do not realize the extent of service under-provision, which in turn may lead to inefficient underfunding (Olken, 2007, 2009). While we cannot make an overall assessment of the net efficiency impact, these observations (coupled with the fact that we do not uncover any local increases in service quality) suggests that ghosts students have positive efficiency costs.

Second, we contribute to the literature of clientelism. The preponderance of the research focuses on the costs from emphasizing particularistic transfers over public goods, and the resulting undermining of political accountability (Bates, 1981; Kitschelt, 2000; Stokes, 2005, 2007). However, an additional key problem (that our findings reinforce) is that clientelistic networks need funds for reproduction, and obtaining those funds may fuel corruption (e.g., Maiz & Requejo, 2001; Singer, 2009).

Third, there is a broad literature on the effects of political alignment between different levels of government. Most of it, however, looks at the impact on transfers from central to local governments and on incumbency effects (Solé-Ollé & Sorribas-Navarro, 2008; Brollo & Nannicini, 2012; Solé-Ollé, Curto-Grau, & Sorribas-Navarro, 2012; Bracco, Porcelli, & Redoano, 2013; Migueis, 2013; Bracco, Lockwood, Porcelli, & Redoano, 2015) One key exception is Borrella Mas (2015), with an interesting and closely related exercise offering compelling evidence for positive effects of political alignment on local corruption. Some of the likely underlying mechanisms, as we will discuss below, are also similar. However, our

empirical strategy has several advantages. First, the corruption measure in Borrella Mas (2015) is a news-based indicator, which raises concerns on potential measurement error (for example, if journalists look harder in aligned areas or in places with features correlated with alignment). Second, the study exploits within-municipality variation in alignment that might potentially be correlated with other changes affecting corruption.

Finally, our findings also underscore the risks of incentive and fixed-rule schemes in financing public goods when there is weak oversight. In the case of education, the literature has focused mostly on teacher incentives and payment schemes.[2] One exception is Angrist, Lavy, Leder-Luis, and Shany (2017), who document enrollment manipulation to obtain an extra class using Maimonides rule, but the focus is not on the political determinants of manipulation. Our findings suggest, more generally, that when cheating is a possibility it is essential to have strong monitoring for payment schemes based on quantities and results.[3] In other words, rule-based program financing is not a safeguard when parameters can be tinkered with (Litschig, 2012).

The paper proceeds by discussing in Section 2 the relevant institutional context for public education provision in Colombia, as well as the key political actors, their incentives, and likely influence on corruption. Section 3 then presents our data sources and the empirical strategy to identify the effect of alignment on ghost students and other key outcomes. Section 4 presents the main findings and is divided into three main parts. First, we validate the assumptions of the research design. Second, we present the main results of the impact of alignment on ghosts students, including basic robustness tests and some heterogeneous treatment effects. Third, we discuss implications on other outcomes that help suggest the likely mechanisms explaining our results. The final section takes stock of the main findings and discusses their overall importance.

[2]Several studies show that teacher absenteeism responds to incentives, though not always in the desired manner for varying reasons like difficulties when scaling up interventions or complementarity between teachers and other (missing) inputs (Duflo, Dupas, & Kremer, 2011; Bold, Kimenyi, Mwabu, Ng'ang'a, & Sandefur, 2013; Behrman, Parker, Todd, & Wolpin, 2015).

[3]In this sense our findings line up with Acemoglu, Fergusson, Robinson, Romero, and Vargas (2016), who study an extreme case where linking payments to quantities is costly: the assassination of civilians by army members to disguise them as killed rebels following the introduction of rewards for number of guerrillas killed.

2 Context

In this section we discuss how public education is provided and financed in Colombia, and what is the overall political context and how it can influence (mis)allocation. This provides the essential context to help interpret our main findings, and in particular how we expect political alignment of mayors and governors to alter incentives to produce false students.

2.1 Public education in Colombia: institutional details

The key players in public education provision and finance in Colombia are the central government through the Ministry of Education, the regional governments of each the 32 departments plus the capital district of Bogotá, and local governments in each of over a 1100 municipalities. Most of the money spent in education (88%) comes from central government transfers, while regional governments contribute with 3% of the total and local government sources complete the remaining 9%.

A set of rules govern each of these sources. Regional and local governments funds spent in education come from royalties from natural resources and from regional or local taxes. In the case of tax money, the governor or mayor administers the resources, subject to the approval of her investment plan by the Departmental Assembly or Local Council, respectively. Money from royalties spent in education is approved via investment projects that are discussed and approved by a council that includes national, regional, and local government representatives. A crucial rule for these expenditures is that they must be used for investment items, prohibiting any outlay on recurrent expenditures.

The rules for central government funds are part of the *Sistema General de Participaciones*, (or SGP, the overall framework for decentralized public service provision in Colombia) and are summarized in Table 1. The Table highlights the key role that student enrollment plays in the allocation of national resources to different areas. Government funds are divided into three accounts: payroll (*nómina*), quality-enrollment (*calidad-matrícula*), quality-access (*calidad-gratuidad*).

Most of the money (90%) is in the payroll account, with the remaining 10% split equally in the two "quality" accounts. The amount the Ministry of Education pays for payroll is a function of the number of teachers in each school. The number of teachers, in turn, is a function of enrollment. Specifically, the norm (Decree 3020 of 2002) stipulates that the allocation of teachers must use as reference point a minimal pupil-teacher ratio of 32:1 in urban areas and 22:1 in rural areas.

The quality-enrollment account, instead of being managed by the Ministry directly, is transferred to the Regional Secretary of Education. There is one Secretary for each department and the capital district, with relevant exceptions that we discuss in further detail below. The criteria for the distribution of these national funds to different areas is threefold: enrollment, performance (in student dropout and grade repetition), and poverty indices. These funds can be used for items such as infrastructure, teaching materials, utilities, teacher training, student transportation, and student meals. They cannot be used for payroll, uniforms and materials for individual students, any machinery generating recurrent expenditures, or cleaning and security services.

Finally, the funds in the quality-access account are transferred directly to schools as a function of enrolled students. They can be used for items like teaching materials, infrastructure, office supplies, utilities, student travel expenses, subcontracting professional and technical services, pedagogical activities, transportation, academic and non-academic activities. Explicitly excluded items include donations, payroll, cleaning and security services, meals, and teacher training.

The regional Secretaries of Education are key actors monitoring the funds managed by schools in the jurisdiction. Crucially, they are in charge of hiring, promoting and firing teachers. The system is nominally a tenure track system based on open calls. However, when open calls fail, then provisional direct hiring is allowed. Allegations that open calls are intentionally designed to fail, so as to facilitate discretionary temporary hiring, are not rare. In fact, payroll and especially direct provisional hiring has long been linked to electoral support for local politicians, particularly mayors, in classic clientelistic patronage fashion. School principals are also crucial in establishing the parameters for funds distribution and managing the use of part of the resources. In particular, they draft the reports that are used to project enrollment, and they are legally responsible for the use of the resources allocated to the school via the quality-access account in an *Education Services Fund*. School principals are monitored by the Secretary of Education, as well as by each school's board.

2.2 The political landscape and the case of ghost students

As already hinted, the overall political landscape in which this unfolds is one marked by a highly clientelistic pattern of political exchanges. A simplified scheme of clientelistic exchanges not unusual in the Colombian context is the following. First, at the lowest level of the clientelistic pyramid, voters sell votes to local leaders or party brokers. In exchange,

they receive money and other gifts. Second, these leaders and brokers sell votes to politicians, who promise money, jobs, or other gifts in exchange. Third, to return and finance the favors, politicians involved in these patterns of exchange take advantage of their access to public resources while in office. They may do so by controlling public jobs, or by influencing decisions on public contracting (both favoring political allies and/or demanding a cut for contracts given), and finally with direct control and misuse of resources. Of course, each of these exchanges incentivize corruption. Finally, in this setting politicians at different levels of power and decision making who are connected to the network may exchange favors with one another. This means that, for a local politician, corruption is a better strategy if his connected network has access to the upper tiers of power.

The prevalence of vote buying is well known in Colombia, and Fergusson, Molina, and Riaño (2017) provide direct evidence for it as well as for the extent to which it is considered "normal". They apply "list experiments" or "item count" techniques (see, e.g., Blair and Imai (2012)) that seek to protect the respondents' anonymity, thus preventing the figures from being influenced by a desire to give a "correct" or "socially desirable" answer to the question. Using this method, they calculate that close to 20% of respondents normally make a voting decision based on the gifts or favors they receive from politicians or their brokers (the incidence appears to be slightly higher in rural than in urban areas). A second relevant finding is that the estimated incidence is the same when respondents are asked directly about this behavior, rather than indirectly with the list. This suggests that respondent are not embarrassed to admit to vote buying, consistent with the idea that this is a "normal" or "socially acceptable" behavior.

In this context, a "friendly" connection between governors and mayors strengthens incentives and opportunities to produce ghost students. From the perspective of the mayor, having a friendly governor likely implies more demand for (and supply of) siphoning opportunities. As the examples above illustrate, an aligned clientelistic governor (who might have helped the mayor during the campaign, or facilitated other discretionary funds while in office) will expect an aligned mayor to use part of the resources at its disposal in a clientelistic fashion, and contribute with the governor's personal and/or political gain. For the same reason, the governor will be more likely to collude with enrollment inflation, and turn a blind eye when this occurs in aligned relative to non-aligned municipalities.[4]

[4]This basic predictions are in line with Borrella Mas (2015), who proposes a career concerns model for local politicians in which local corruption increases with alignment, so long as alignment increases the resources for local politicians and reduces monitoring and accountability from upper-tier governments. They also coincide with the findings of Armesto (2009) in Mexico, though she emphasizes the response of particularistic spending

This discussion also underlines the importance of local discretion in public funds use. We can examine this empirically since a few municipalities can get "certified" to have their own (that is, not departmental) Education Secretary. Currently, 62 municipalities are certified (the remaining 1039 are not). While one presumption is that the effects of alignment should be weaker in certified municipalities because they are more "independent" from the departmental government, the examples above suggest discretion and autonomy in the use of local resources can be instrumental for corruption. In particular, these "autonomous" municipalities not only have more resources (which directly increases the corruption incentives (Borrella Mas, 2015)), but at least as importantly enjoy more discretion for local contracting (of teachers and other providers) and a direct control over school principals. These expectations on the effects of autonomy line with those of education experts and former functionaries who we interviewed. We discussed their view on the impact of municipal autonomy of corruption, in general, and in interaction with political alliances with the department level. A telling reaction from a former departmental Secretary of Education asked on whether he/she expected more or less ghosts in friendly autonomous municipalities of his/her department was: "You can take advantage of the certified municipality as a channel for good and bad things, but you can certainly take a lot of advantage."

3 Data and empirical strategy

We build on the 2012 audit study financed and contracted by the national government's Ministry of Education. Audit firms implementing the study were competitively selected, and Ministry functionaries sought to protect the audit from cooptation, for instance by avoiding local auditors. The audit was designed to be fully comprehensive of all schools in the country, and the goal was nearly reached: 8,167,051 out of 8,679,035 students present in the records of the Ministry's information system were audited (94.1%). Auditors physically visited every school for a detailed verification, with a face to face verification of each student. If the student was missing, they demanded complementary documentary evidence (notes on the reason for missing school, grade records, works and examinations presented by the student). This allows for a very precise measure of false students. Also, Secretaries of Education and schools only had two days to respond and clarify (*Circular 28 of 2012*) to any alleged mistake by the auditing firm, a short lapse that allowed little margin to fabricate evidence and helped guarantee that the schools either had good and reliable information to insist on their count,

rather than of corruption.

or had to admit the revision. The audit found 148,410 ghosts in total, and the government estimated this to have cost roughly US $40 million lost per month transferred. With these data we construct our main dependent variable: the share of ghost students in each school.

To measure alignment, we focus on the 2011 local elections, in which mayors of municipalities, representatives of municipal councils, department governors, and members of departmental assemblies are elected. They all start their period in January first of 2012, and the 2012 audit was based on information from the schools and Education Secretaries reported by June 30 of 2012, six months into the period of each local mayor. Mayors are selected by simple plurality rule in the municipality, as are governors in the department. Local councilors and members of the assembly are elected from open or closed lists (parties can choose which) with a proportional, single-district representation system in the municipality and department at large, respectively.

We exploit the randomness in the outcome of municipal close races for mayor, causing party alignment with elected governor. Our Regression Discontinuity Design (Lee, 2008; Lee & Lemieux, 2010b) thus compares the share of ghost students for schools in municipalities where a candidate of the same party as the elected governor narrowly won the election to that same quantity in places where it narrowly lost. We cluster standard errors at the municipality level (Abadie, Athey, Imbens, & Wooldridge, 2017). We also verify the robustness of our findings with regressions at the municipal level, with one observation per municipality instead of one per each school in each municipality. Selecting what "narrowly" means (that is, selecting the "bandwidth") involves a trade-off between efficiency and bias. We use the optimal bandwidth, bias correction, and robust standard errors proposed by Calonico, Cattaneo, and Titiunik (2014). These estimates are a refinement of the non-parametric local polynomial estimators usually employed. We verify the robustness to the choice of bandwidth and kernels used to weigh observations. Following Gelman and Imbens (2017), we limit our analysis to linear and quadratic (local) polynomials.

Figure 1 shows the main variables in the analysis and their distribution in Colombia. We use darker colors for a higher proportion of ghosts in the municipality. The red squares shows all places where a candidate of the elected governor competed and lost in a close race, using a 10% vote margin between winner and runner-up, corresponding roughly to our average optimal bandwidth (that varies by specification). The green triangles shows the places where it won. We see that there is significant variation in the proportion of ghosts in municipalities, and that competitive races involving governor-party candidates (and winners)

are well dispersed throughout the territory.[5].

Descriptive statistics for the main variables in the analysis are in Table 2, at the school level, and in Appendix Table A-1 for variables at the municipality level.

4 Results

4.1 Validation

Our approach relies on the assumption that other covariates besides our treatment variable, namely "alignment between mayor and governor" (henceforth often simply referred to as "alignment"), vary smoothly at the threshold. Thus, any discontinuous change in the proportion of ghost students is only attributable to the current partisan affiliation of the mayor. To test this, Figures 2-4 run a series of RD analyses using pre-determined baseline covariates as "placebo" outcomes of a close win of the aligned mayor. We start in Figure 2 showing a standard RD plot for a particularly important predetermined variable: political alignment in previous races. In particular, we look at whether current alignment can predict the success of aligned candidates in past (in the 1997, 2000, 2003 and 2007) elections. Reassuringly, we find no statistically significant differences at the threshold between treatment and control municipalities.[6] Figure 3 shows the (standardized) RD coefficients for the effect of selecting an aligned mayor on pre-determined school characteristics, and Figure 4 does the equivalent exercise for municipal characteristics. Again, we find no statistical significant differences in any of the covariates, with the point estimates lying close to zero (though in a some cases there is considerable imprecision which does not allow us to rule out fairly sizable effects, and so we also verify the robustness of our results to the inclusion of controls).

We also evaluate the possibility that electoral results are manipulated (for example, by aligned mayors having a differential advantage in fraudulently winning close races), which would violate our identification assumption by creating a selected sample of winners that might not be comprable to narrow losers. Testing for sorting of the observations around the threshold is a useful way of examining potential manipulation (Lee & Lemieux, 2010a). We follow McCrary (2008) to check the distribution of our forcing variable around the winning

[5]One must bear in mind that there are much fewer but larger (in area) municipalities in the sparsely populated areas of the Eastern Planes (on the east of the map) and the Amazon (towards the south and south-east).

[6]Results are similar, though somewhat noisier, for a similar analysis year by year, as well as for a dummy measuring alignment of the elected mayor with a party with national congress representation.

threshold in Figure 5 and estimate the jump in the distribution to be equal to 0.0268 (with a standard error of 0.2647). This is a very precise zero that implies no grounds to reject the null of no jump.[7]

4.2 Main results and robustness

Figure 6 shows our main results graphically. There is a sizable and significant increase in the share of ghosts in municipalities where the mayor is aligned with the governor. This result is robust to using linear or quadratic local polynomials.

In Panel A of Table 3 we look at these effects in more detail and their robustness to the types of kernels used. In every case, there is significant increase of 1.4 to 1.5 percentage points in the share of ghosts (roughly as large as the mean value of this variable and a third of its standard deviation).[8]

Moreover, in Panel B we include the different sets of controls described in Tables 2 and A-1 (we rely here on the triangular kernel estimation with linear polynomial, having verified in Panel A that these choices make little practical difference). Column 1 has all the set of student controls (student features aggregated at the schools level), Column 2 the school controls, and Column 3 the teacher controls (again, teacher features by school). In column 3 we simultaneously include all these school-level variables. Column 5 considers a different exercise, including municipal-level controls as well as party controls (namely, fixed effects for each of the main parties in the countries). The motivation for this last exercise is addressing the possible concern that our effects are driven, not so much by electing an aligned candidate, but rather one of a "big" or "major" party, which mechanically is more likely to coincide with that of the governor but could have an independent influence on share of ghosts. Finally, column 6 includes all these controls. Results are robust to all these checks, with the coefficient for alignment remaining significant at conventional levels and changing in magnitude only modestly.[9]

[7]There are less observations to the right than to the left of the winning threshold, and this reflects that, in a system with many parties as in Colombia, there are many ways for an aligned mayor to narrowly loose (many non-aligned contenders that can have a chance) and only one way to win. The essence for our strategy, of course, is the balance near the threshold.

[8]Regressions in this panel are at the school level, with errors clustered at the municipality level. Table A-2 runs the regression at the municipality level, finding qualitatively similar and typically statistically significant results.

[9]Variation in the intensive margin is important for our effects. A similar analysis using a simple dummy variable for the presence of ghosts shows no significant effects of alignment. However, the coefficient is typically positive, which is in line with the raw descriptives in Table 2: mean incidence is higher in aligned municipalities, and the median for the ghost dummy is one under alignment and zero without alignment.

Given the relatively small sample, the optimal bandwidth (around a 10% vote margin or more) in these estimates is large relative to what is normally considered a "close" election.[10] Thus, it is important to verify the robustness of the results to the bandwidth choice, as we do in Figure 7. The Figure shows, not only the estimated treatment effect and confidence bands, but the number of observations as we vary the bandwidth from 50% to 150% of the optimal bandwidth. The main message is that the coefficient is quite stable, changing only slightly and smoothly as we vary the window. Also, we only loose conventional statistical significance with bandwidths that are 60-70% as large as the optimal, and even then the changes are more in the precision of the estimates than in the size of the estimated effects.

As discussed in the context section, a key expectation both from a theoretical perspective and from experts and functionaries is that more autonomous municipalities have more incentives and opportunities to increase the number of ghost students. We investigate this prediction in Table 4, by incorporating an heterogenous effect of the treatment for certified municipalities. Column 1 shows the baseline estimate for reference, and column 2 interacts with an autonomous dummy. Autonomy more than doubles the treatment effect (the estimated coefficient of the interaction is 1.79, standard error 0.94, compared to a baseline non-interacted effect for non-autonomous areas of 1.36, standard error 0.77).

4.3 Other implications

So far we have shown that aligned municipalities have a higher share of ghosts, and especially so if they enjoy more autonomy in the use of local resources. We have argued that these results are in line with connected mayors having stronger incentives and more opportunities to misallocate resources (and obtain political benefits from this) than non-aligned ones. Examining implications on other relevant outcomes, as we do in this section, is useful to study the broader repercussions of alignment, as well as to verify the plausibility of our interpretation of the results.

We first ask whether these areas receive less or more (and better or worse) education. Indeed, while the increase in share of ghosts suggests there are more resources siphoned out, the net effect on public service provision need not be negative. Indeed, local politicians and bureaucrats might grab or misallocate part of the extra money for personal economic or

[10] Two caveats however are in order. First, since there are typically more than two candidates, these differences in vote shares, computed among the top two contenders, is really a smaller share of total votes. Second, most municipalities are in a low-information environment without frequent polls, and where there is considerable uncertainty regarding the outcome of the election even for those with an ex-post advantage within these margins.

political gain while also using part of the resources for the school, thus pleasing parents and eventually "getting away" more easily with corruption. Also, more generally, while useful for corruption alignment could also be useful for coordination of policies, creating better outcomes. Table 5 thus looks at whether students in aligned municipalities have better test scores in the college-level entry exams (the equivalent of the US SAT). Since the impact of alignment on scores might take some time to show up, we look at scores in 2012, 2013, and 2014. Also, to increase potential precision and as an additional test we also look at the improvements from the baseline 2010 level up to each of these years. Finally, we look at the language section in Panel A, and at math in Panel B. Most point estimates are in fact negative, suggesting that these places do not offer a better quality of education. Only 2 out of the twelve coefficients are significant, so we do not claim that these places are definitely worse. But there is certainly no evidence that the quality of education is superior.

This contradicts an alternative, more positive view of our results than the one we have put forward, suggesting instead that ghosts are in fact fabricated so as to obtain resources for the school that are then going to be productively invested.[11]

One reaction from these results is that citizens should then punish these aligned politicians, since they seem to be using alignment opportunistically for corruption without contributing much to the local population, at least as judged by outcomes in the education sector. To investigate this, in Table 6 we run an analysis (using all local elections since 1997) of the impact of narrow wins by a given party on its performance in the next election (we focus on parties, rather than candidates, since there is a one-term limit for local public executive office in Colombia). Columns 1 and 2 show that incumbent parties (narrow winners) are more likely to run again than narrow losers, and that this is in fact an effect driven by parties aligned with elected governors. Columns 3 and 4 reveal that there is an incumbency *disadvantage* in Colombia, as narrow winners are *less* likely to win subsequently than narrow losers. This disadvantage has been documented by Fergusson, Querubín, Ruiz, and Vargas (2017), and noted more broadly for Latin America by Klašnja and Titiunik (2017). Our results show that aligned incumbents cannot overcome this average disadvantage. Yet interestingly, in columns 5 and 6 we look at subsequent vote shares (set at zero for parties not

[11] Along the same lines, Appendix Table A-3 looks at the coverage rate (students enrolled in schools as a proportion of those that should be attending them) in each municipality as the dependent variable. We focus of course on the enrollment numbers once correcting for pre-existing ghosts (in 2012), and also look at the numbers in 2013, one year after every school had been audited so that enrollment numbers should be clean. These municipal-level regressions also suggest that aligned municipalities are not superior to non-aligned ones in the quantity of education they provide.

running), and though it is clear that incumbents have a disadvantage as expected, aligned candidates in fact do better. So, in short, Table 6 tells us that aligned parties (like every other incumbent in Colombia) have on average an incumbency disadvantage, but they are more likely to run again and to obtain a higher vote share than non-aligned parties. They perform, in short, better than non-aligned incumbent parties.

In Table 7 we evaluate an additional dependent variable: the risk of future electoral fraud (in 2018). Ideally we would like to use such risk in 2015, but data availability precludes using this year. This analysis, at the municipality level, reveals that aligned municipalities are more likely to later feature higher risk of fraud.

These findings are consistent with the following interpretation, that also matches our discussion of the anecdotical evidence in the context section. Aligned politicians engage more in corruption, using the funds for personal economic and political gain. Extra resources are not used to provide more or better public goods so much as to entrench the clientelistic machine, which involves vote buying and electoral fraud.[12]

5 Conclusions

The impact of education on worker income and productivity, health, crime, and economic growth has been amply studied and established (see, for example Psacharopoulos and Patrinos (2004); Cutler and Lleras-Muney (2010); Lochner (2011); Hanushek and Woessmann (2012)). This has permeated public policy, and developing countries in particular have significantly increased their spending in education in the last few decades.

However, the resulting increase in the quality of education has been less impressive. While there are many difficulties that help explain these outcomes, poor governance and weak accountability is a prime candidate. We study one particular extreme case of lack of accountability, the fabrication of fake students to fraudulently increase government outlays for education, while not translating those extra resources into more or better education. Our findings, in the context of Colombia, suggest that political incentives of networks of clientelistic exchanges can be a major determinant of this problem. They also align with the idea that such incentives can be strengthened with decentralization schemes that give greater autonomy to local governments. Since both clientelistic exchanges and moves towards

[12] We acknowledge however that other mechanisms may be driving some of our results. For example, the findings for fraud may reflect other consequences aside from corruption that distinguish aligned municipalities.

decentralization are common features of many developing countries, our findings pose great challenges for public education policy. Designing financing and provision schemes that help mitigate these incentives, and building effective monitoring institutions and instruments should be a prime concern for applied researchers and policymakers.

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Table 1: Rules for Central Government Funds

Account	**Percent of total resources**	**Transferred to**	**Distribution criteria**
Payroll	90%	Paid directly by Ministry of Education	Number of Teachers, itself a function of *student enrollment.*
Quality-enrollment (*calidad-matrícula*)	5%	Regional Secretary of Education	Performance, poverty, and *student enrollment.*
Quality-access (*calidad-gratuidad*)	5%	Schools	*Student enrollment.*

Table 2: Descriptive statistics
School level

	Parties aligned					Parties not aligned				
	Mean	*Median*	*S.D.*	*Min*	*Max*	*Mean*	*Median*	*S.D.*	*Min*	*Max*
A. All Sample										
Ghosts (%)	1.35	0.00	4.66	0.00	96.84	1.40	0.06	5.38	0.00	100.00
Ghosts (Dummy)	0.518	1	0.500	0	1	0.451	0	0.498	0	1
School characteristics...										
Extended school day (%)	41.6	0.0	48.2	0.0	100.0	21.3	0.0	39.2	0.0	100.0
Contracted service (%)	7.8	0.0	21.3	0.0	100.0	15.4	0.0	30.8	0.0	100.0
Students (#)	253	164	283	3	2640	320	233	318	4	2880
Teachers (#)	22	11	27	1	165	27	17	29	1	194
Student characteristics (% of total enrolled)										
Men	52.4	52.3	7.5	0.0	100.0	51.7	51.8	7.4	0.0	78.3
Under 18	90.9	96.4	12.1	1.7	100.0	90.1	95.7	12.3	32.6	100.0
Secondary	26.2	28.4	25.0	0.0	100.0	29.5	33.2	23.9	0.0	100.0
Disabled	2.4	0.4	5.1	0.0	97.7	2.3	0.5	5.3	0.0	94.9
Rural	76.9	100.0	40.8	0.0	100.0	67.1	100.0	45.9	0.0	100.0
Strata 0-2	97.0	100.0	6.8	35.3	100.0	97.1	99.7	7.0	42.0	100.0
Teacher characteristics (% of all teachers)										
No diploma	1.2	0.0	6.6	0.0	100.0	3.1	0.0	11.3	0.0	100.0
Coordinators	1.6	0.0	3.5	0.0	100.0	1.9	0.0	2.8	0.0	28.6
B. Close races (<10%)										
Ghosts (%)	1.31	0.08	5.05	0.00	93.12	1.61	0.13	4.80	0.00	56.19
Ghosts (Dummy)	0.534	1	0.499	0	1	0.447	0	0.498	0	1
School characteristics...										
Extended school day (%)	23.9	0.0	40.7	0.0	100.0	21.2	0.0	39.8	0.0	100.0
Contracted service (%)	10.1	0.0	20.3	0.0	100.0	4.7	0.0	16.3	0.0	100.0
Students (#)	320	268	261	6	1640	300	193	331	4	2880
Teachers (#)	28	21	26	1	120	23	14	27	1	194
Student characteristics (% of total enrolled)										
Men	52.4	52.1	6.8	6.1	84.6	51.6	51.7	8.7	0.0	78.3
Under 18	88.3	92.3	12.3	31.3	100.0	89.5	96.6	13.8	32.6	100.0
Secondary	31.0	35.2	21.8	0.0	100.0	27.3	30.5	25.5	0.0	100.0
Disabled	3.4	0.6	7.0	0.0	43.3	3.0	0.7	6.3	0.0	94.9
Rural	74.7	100.0	41.3	0.0	100.0	73.3	100.0	43.2	0.0	100.0
Strata 0-2	98.5	99.8	3.8	63.5	100.0	96.8	100.0	8.1	42.0	100.0
Teacher characteristics (% of all teachers)										
No diploma	1.9	0.0	7.9	0.0	80.0	2.2	0.0	12.0	0.0	100.0
Coordinators	1.7	0.0	2.3	0.0	14.3	1.8	0.0	3.0	0.0	28.6

Table 3: Main results: ghosts (%)
Nonparametric estimators with optimal bandwidth

Dependent variable is ghost students per school (in %).						
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. No controls						
Alignment	1.402**	1.272*	1.163	1.670**	1.510*	1.463*
	(0.692)	(0.708)	(0.730)	(0.748)	(0.783)	(0.861)
Observations	4,383	4,383	4,383	4,383	4,383	4,383
Bandwidth	0.130	0.118	0.105	0.242	0.197	0.146
Obs. in bandwidth	1338	1249	1091	2211	1926	1522
Kernel	Triangular	Epanechnikov	Uniform	Triangular	Epanechnikov	Uniform
Local polynomial Order	1	1	1	2	2	2
Panel B. Controls						
Alignment	1.336**	1.514**	1.660**	1.131**	1.206*	1.363**
	(0.561)	(0.708)	(0.659)	(0.514)	(0.696)	(0.682)
Student controls	✓			✓		✓
School controls		✓		✓		✓
Teacher controls			✓	✓		✓
Municipality and party controls					✓	✓
Observations	3,809	3,809	3,809	3,809	3,809	3,809
Bandwidth	0.101	0.140	0.164	0.127	0.0772	0.0781
Obs. in bandwidth	1044	1422	1633	1323	749	755

Notes: In Panel B, regressions are weighted using a triangular kernel and assuming a linear polynomial. Bias corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. * 10%, ** 5%, ***1%.

Table 4: Ghosts (%), alignment and autonomous municipalities

Dependent variable is ghost students per school (in %).		
	(1)	(2)
Alignment	1.371**	1.276*
	(0.590)	(0.702)
Autonomy		-1.346*
		(0.701)
Alignment × Autonomy		1.909*
		(0.989)
Observations	4,383	4,383
Bandwidth	0.119	0.119
Obs. in bandwidth	1338	1338

Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Bias-corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. Default * 10%, ** 5%, *** 1%.

Table 5: Political alignment and tests scores: Average SABER 11 scores at the school level

	(1)	(2)	(3)	(4)	(5)	(6)
	Test score levels			Test score changes		
	2012	2013	2014	$\Delta 2012 - 2010$	$\Delta 2013 - 2010$	$\Delta 2014 - 2010$
Panel A. Dependent variable is the level or change in the score of SABER 11: Language						
Alignment	-0.251	-0.359*	-0.132	-0.105	-0.384*	-0.117
	(0.311)	(0.216)	(0.235)	(0.302)	(0.212)	(0.229)
Observations	1,897	1,950	1,947	1,722	1,708	1,674
Bandwidth	0.110	0.0663	0.0826	0.108	0.106	0.112
Obs. in bandwidth	553	261	390	529	525	574
Mean dependent	0	0	0	0.0632	0.0652	0.0915
Std. dev. dependent	1	1	1	0.773	0.785	0.756
Panel B. Dependent variable is the the level or change in the score of SABER 11: Math						
Alignment	-0.101	0.000931	-0.0289	-0.0368	-0.222	-0.0570
	(0.294)	(0.194)	(0.231)	(0.173)	(0.271)	(0.205)
Observations	1,897	1,950	1,947	1,722	1,708	1,674
Bandwidth	0.0933	0.105	0.0926	0.125	0.0848	0.111
Obs. in bandwidth	437	521	437	648	394	566
Mean dependent	0	0	0	0.0520	0.0620	0.0795
Std. dev. dependent	1	1	1	0.769	0.813	0.740

Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Bias corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. * 10%, ** 5%, ***1%.

Table 6: Party future prospects?
Municipal incumbency-advantage analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable is, in next election, ...					
	Run...		*Win...*		*Vote share..*	
$\text{Win}_{t=0}$	0.0296*	0.0198	-0.0418**	-0.0429**	-0.0132*	-0.0193**
	(0.0154)	(0.0159)	(0.0180)	(0.0179)	(0.00787)	(0.00805)
Alignment		0.00826		0.00329		-0.00490
		(0.0209)		(0.0215)		(0.0104)
$\text{Win}_{t=0} \times$ Alignment		0.0525**		0.00564		0.0322**
		(0.0259)		(0.0280)		(0.0133)
Observations	5,488	5,425	5,488	5,425	5,488	5,425
R-squared	0.586	0.588	0.172	0.172	0.443	0.444

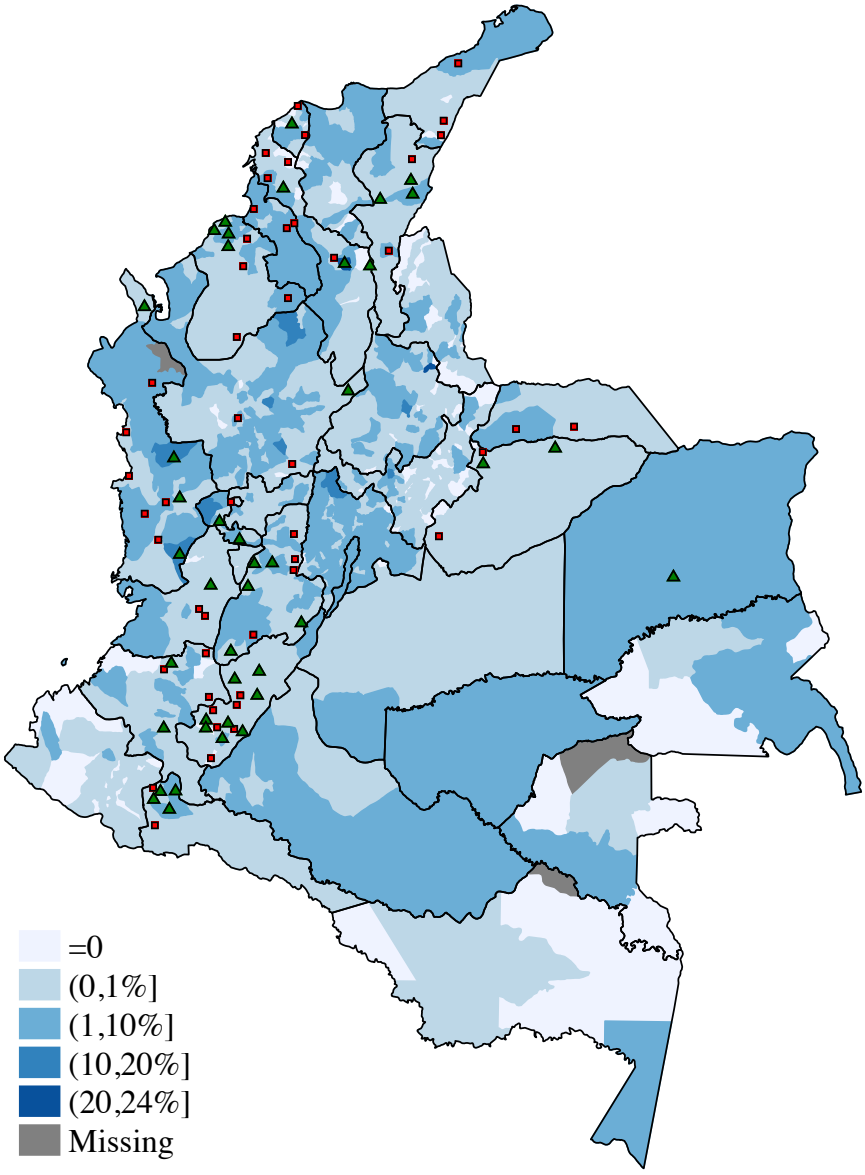
Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Regressions include party fixed effects and year fixed effects. Bias corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. * 10%, ** 5%, *** 1%. Election years included: 1997, 2000, 2003, 2007 and 2011.

Table 7: Vote buying and alignment

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable is municipal risk of electoral fraud (dummy variable for 2018)						
Alignment	0.492*	0.468*	0.366	0.524**	0.464**	0.577**
	(0.251)	(0.262)	(0.228)	(0.255)	(0.234)	(0.272)
Observations	332	332	332	332	332	332
Bandwidth	0.103	0.0889	0.107	0.197	0.218	0.146
Obs. in bandwidth	93	79	96	170	182	134
Kernel	Triangular	Epanechnikov	Uniform	Triangular	Epanechnikov	Uniform
Local polynomial Order	1	1	1	2	2	2

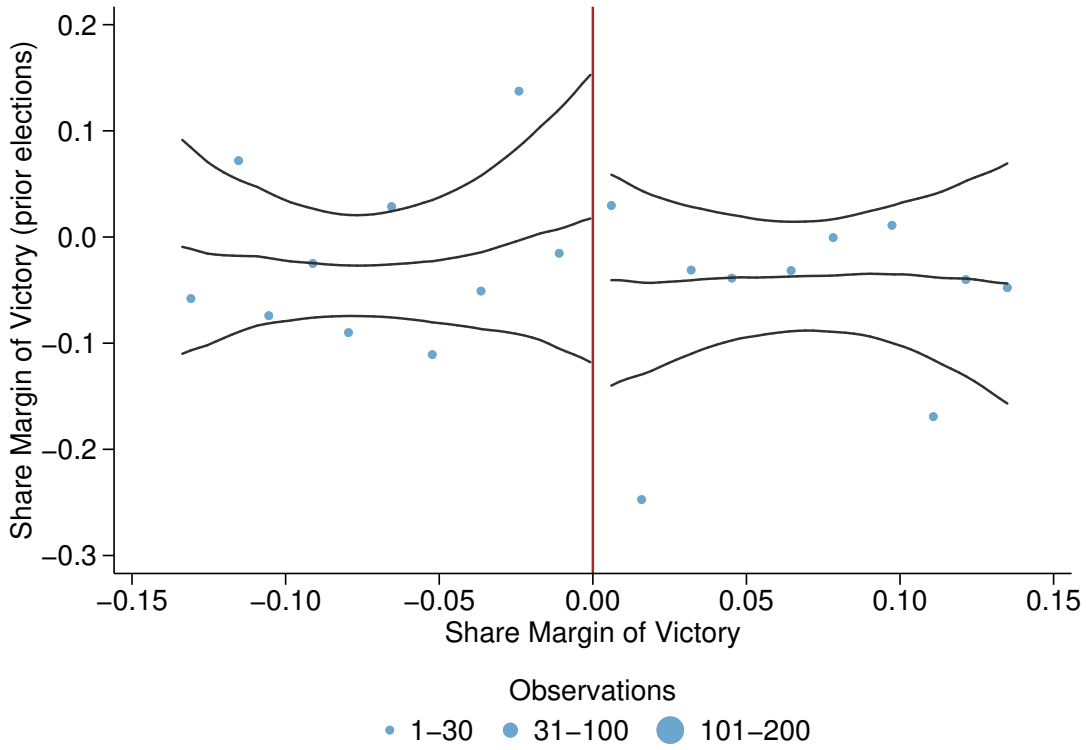
Notes: Mean for dependent variable is 1.21 and standard deviation equals 1.15. Alignment coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. * 10%, ** 5%, *** 1%.

Figure 1: Ghost students in the Colombian territory



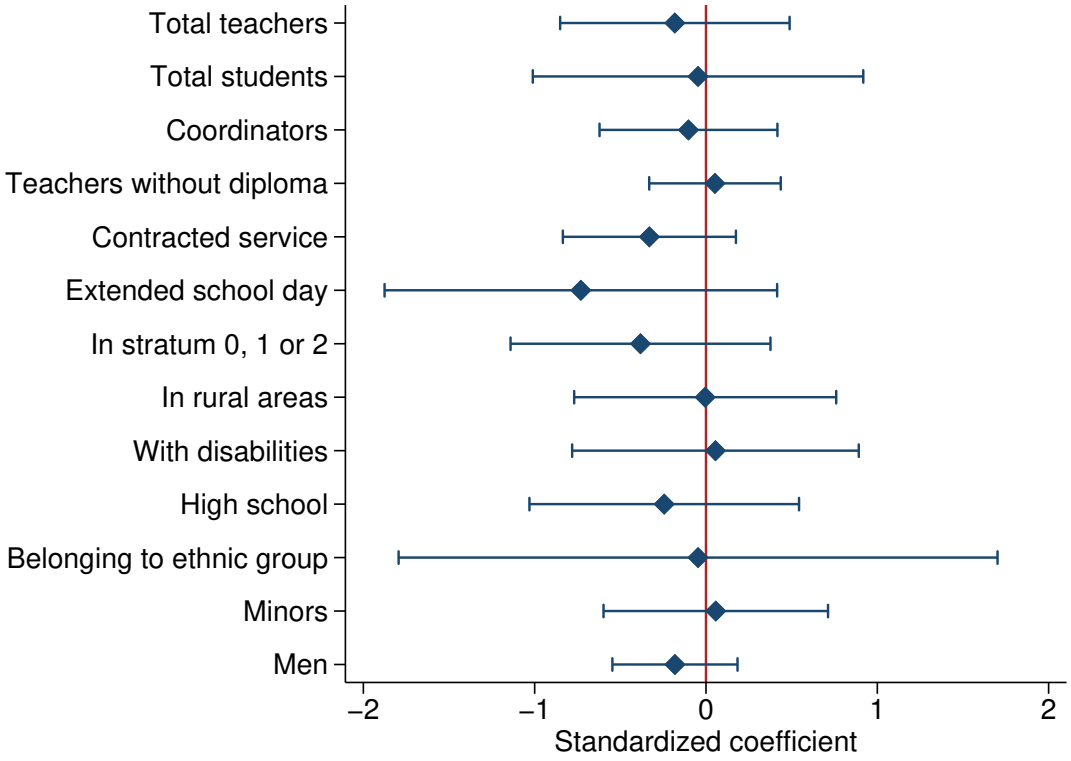
Notes: Share of ghost students per municipality (darker=more ghosts). Red squares (green triangles) are places where a candidate of the elected governor competed in a close race and lost (won). 10% vote margin between winner and runner-up.

Figure 2: A falsification test
Predicting prior mayor election results



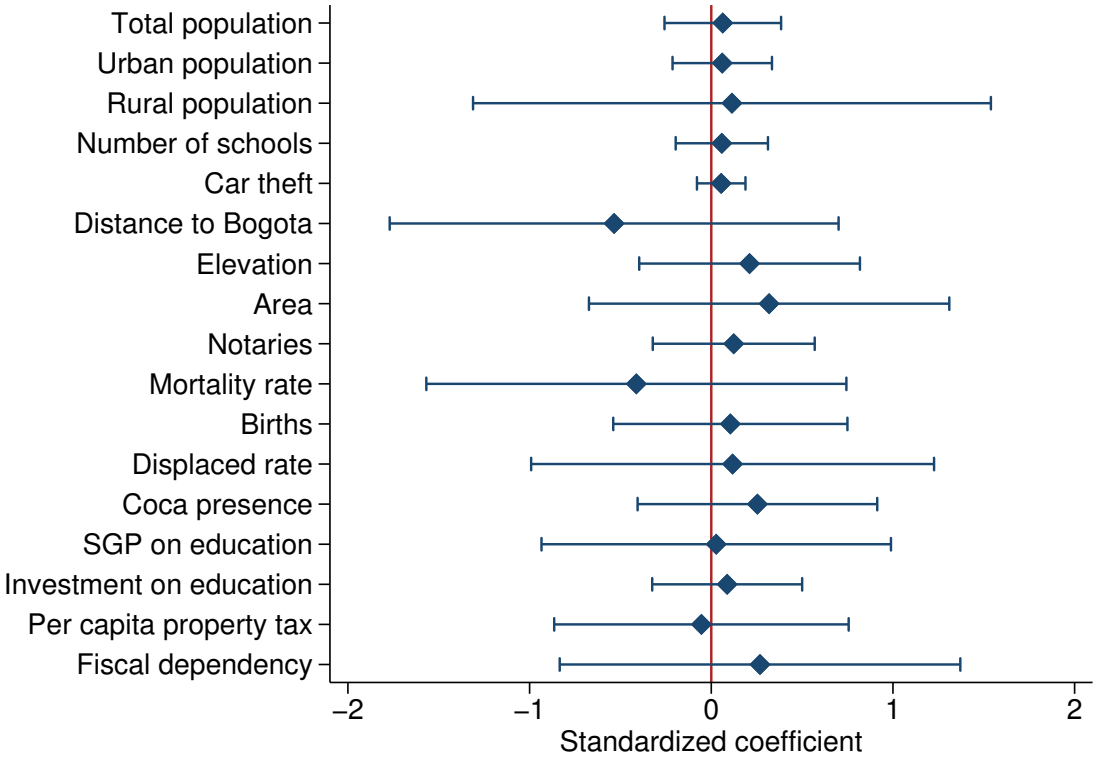
Notes: Local polynomial regression. Left: linear fit. Right: quadratic fit. Observations within CCT bandwidth displayed. Bin selection method: mimicking variance, evenly spaced using spacings estimators. Close races for elections in 1997, 2000, 2003 and 2007. The dependent variable is the vote share difference between the candidate aligned (same party) with the elected governor and that of the the strongest non-aligned contender.

Figure 3: Balance on observable variables: School level



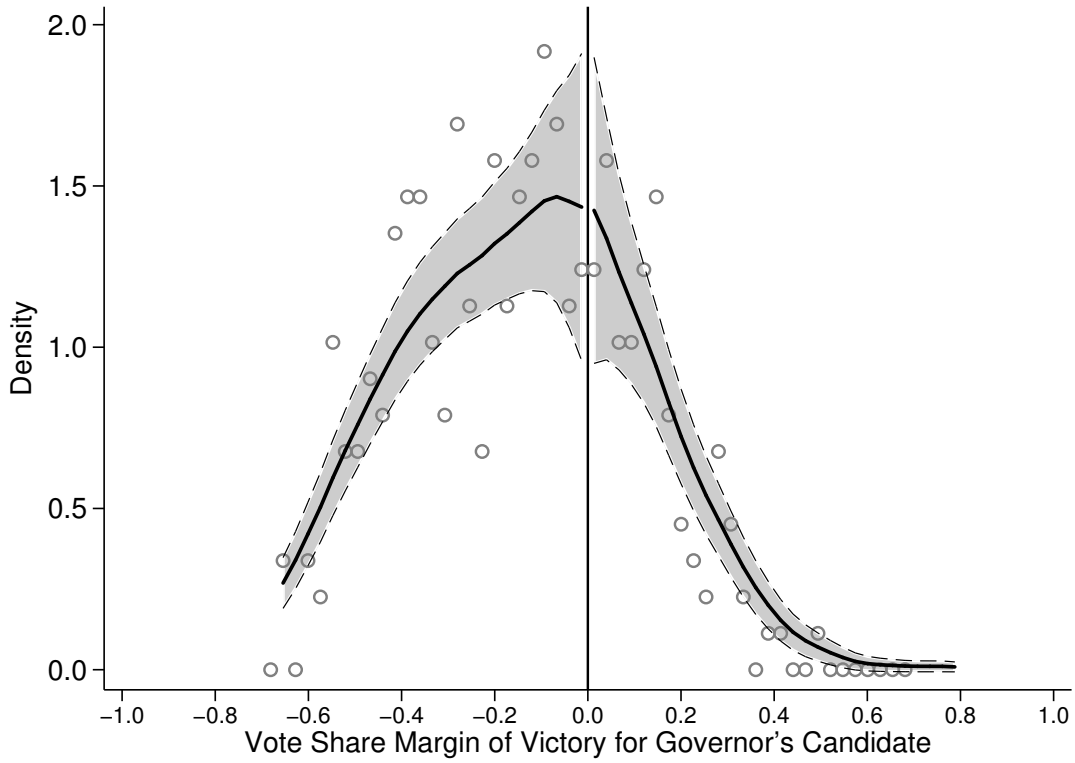
Notes: Observations within CCT bandwidth and 95% confidence interval. All effects are standardized

Figure 4: Balance on observable variables: Municipal level



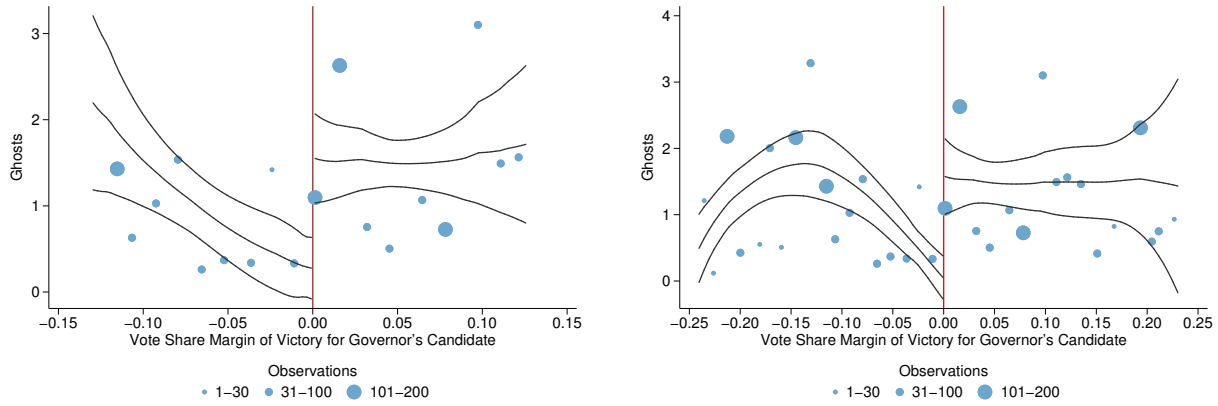
Notes: Observations within CCT bandwidth and 95% confidence interval. All effects are standardized.

Figure 5: Verifying manipulation
McCrary (2008) density test for running variable



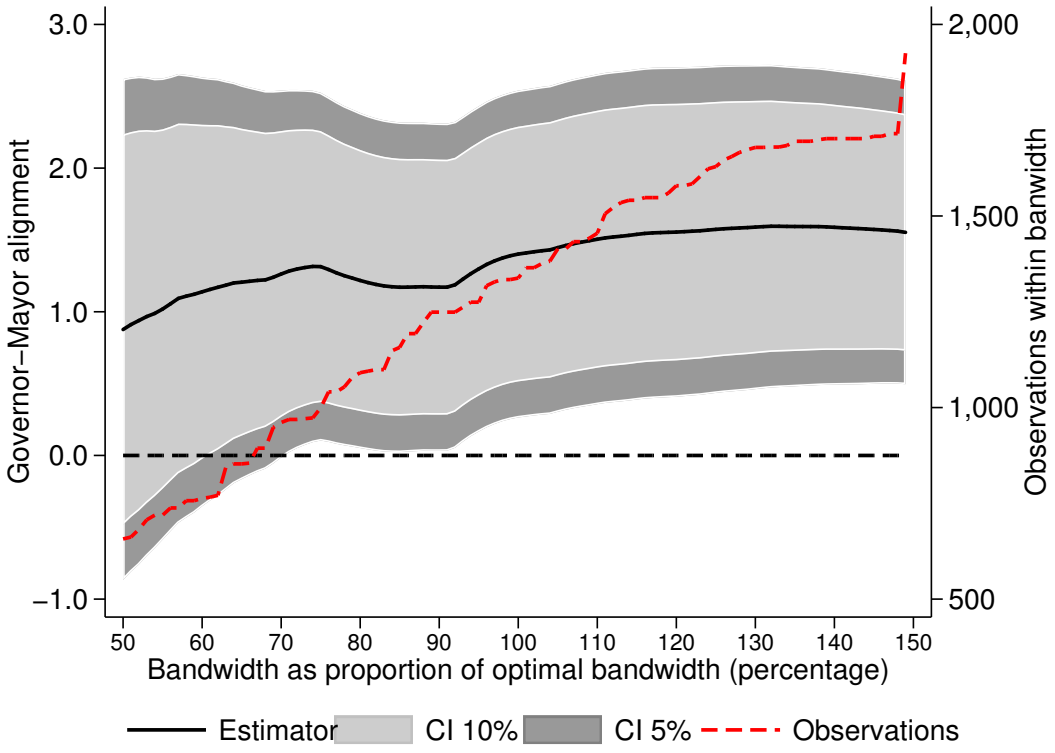
Notes: Discontinuity estimate: 0.0268 (s.e. 0.2647)

Figure 6: Main results: ghosts (%): Graphical analysis



Notes: Local polynomial regression. Left: linear fit. Right: quadratic fit. Observations within CCT bandwidth displayed. Bin selection method: mimicking variance, evenly spaced using spacings estimators.

Figure 7: Main results: Robustness to bandwidth choice



Appendix

Table A-1: Descriptive statistics
Municipal level

	Mean	*Median*	*S.D.*	*Min*	*Max*
Ghosts (%)	1.266	0.459	2.346	0	23.00
Ghosts (Dummy)	0.691	0.762	0.284	0	1
Fiscal dependency	0.719	0.758	0.182	0.0948	0.981
Per capita property tax	25.25	12.65	37.04	0	344.3
Coca presence	57.58	0	346.6	0	4,846
Notaries	0.748	1	0.765	0	7
Displaced rate	336.8	145	524.1	0	3,649
Rural population	13,096	9,193	13,766	247	134,910
Urban population	22,776	8,060	56,267	159	534,956
Total population	35,872	20,565	61,843	1,015	535,642
Births	519.4	277	947.7	11	7,765
Mortality rate	24.71	23.16	9.964	7.770	63.16
Area	6.229	6.163	1.134	2.833	11.09
Elevation	754.2	328	1,565	2	25,221
Distance to Bogota	390.4	339.7	190.8	49.91	1,271
Car theft	2.280	0	9.497	0	103
Number of schools	2.042	0	6.387	0	61
Investment on education	6.380	1.192	19.96	0.0496	162.2
SGP on education	0.155	0.118	0.154	0	0.910

Table A-2: Municipal-level results: ghosts (%)
Nonparametric estimators with optimal bandwidth

Dependent variable is ghost students per municipality (in %).						
	(1)	(2)	(3)	(4)	(5)	(6)
Alignment	3.872*	3.931*	2.232	5.270*	5.413*	3.786
	(2.382)	(2.380)	(1.919)	(2.851)	(2.867)	(2.566)
Observations	332	332	332	332	332	332
Bandwidth	0.119	0.107	0.126	0.159	0.145	0.165
Obs. in bandwidth	109	96	117	143	133	153
Kernel	Triangular	Epanechnikov	Uniform	Triangular	Epanechnikov	Uniform
Local polynomial Order	1	1	1	2	2	2

Notes: Mean of dependent variable is 1.266 and standard deviation is 2.346. Bias corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. * 10%, ** 5%, ***1%.

Table A-3: Coverage Rate

	(1) Basic	(2) Primary	(3) Middle	(4) High	(5) Total
Panel A. Dependent variable is coverage rate in 2012					
Alignment	-0.0602	-0.0244	-0.120	-0.132	-0.0769
	(0.101)	(0.0827)	(0.0951)	(0.146)	(0.104)
Observations	329	329	329	329	329
Bandwidth	0.144	0.151	0.127	0.128	0.141
Obs. in bandwidth	131	138	118	118	128
Mean dependent	0.878	0.858	0.345	0.656	0.857
Std. dev. dependent	0.200	0.199	0.152	0.209	0.196
Panel B. Dependent variable is coverage rate in 2013					
Alignment	-0.0779	-0.0178	-0.134	-0.134	-0.0920
	(0.112)	(0.0904)	(0.101)	(0.149)	(0.117)
Observations	329	329	329	329	329
Bandwidth	0.144	0.165	0.132	0.127	0.142
Obs. in bandwidth	132	153	121	117	129
Mean dependent	0.874	0.845	0.354	0.676	0.857
Std. dev. dependent	0.209	0.205	0.156	0.211	0.205

Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Bias corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. * 10%, ** 5%, ***1%.