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

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January 7, 2020

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Abstract

We study the effect of political alignment between local (municipal) and regional (departmental) politicians on false or "ghost" students, fabricated by local politicians and bureaucrats to obtain 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. Effects are larger in "autonomous municipalities" that have more discretion over resource spending, where there are weaker institutions, and where teachers and other school staff are less qualified. Also, the quality and quantity of education are not higher in aligned areas. Instead, in these places there is more subsequent electoral fraud and more complaints about disciplinary violations by public functionaries, especially in the education sector. We also find some suggestive (though less conclusive) evidence that incumbent parties and politicians have better future electoral and employment prospects in aligned areas. The findings are consistent with the interpretation that resource extraction is particularly valuable to politicians whose political network is connected to higher echelons of power, and that areas with weaker accountability and more discretion 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.

Keywords: Education, corruption, clientelism.
JEL: D7, H5, H7, I2.

*We thank Daron Acemoglu, Felipe Barrera, Ceci Cruz, Jishnu Das, Jetson Leder-Luis, Luis Martínez, Darío Maldonado, Bejamin Olken, Catherine Rodríguez, Tavneet Suri, Roman Andrés Zárate, and participants of the MIT Political Economy Lunch, World Bank 2018 ABCDE Conference, LACEA 2018 Annual Meeting, Ridge-Lacea Political Economy Network, and the First Annual Colombian Economics Conference.

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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 education quality has been less dramatic (Mbiti, 2016). According to the 2018 World Bank report, student learning -which is the main outcome of all education systems- has stagnated.[1] 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.

In this paper, we study this problem and its political determinants using within-country variation from Colombia.[2] 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 auditing to evaluate the existence all students enrolled 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, more complaints about disciplinary violations by public functionaries (especially in the education sector) and parties have better future electoral prospects.

[1] Report available here: `https://www.worldbank.org/en/publication/wdr2018`

[2] 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.

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. 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.[3] 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.[4] 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.

[3]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).

[4]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.[5]

[5]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 s for a higher proportion of ghosts in the municipality. The squares shows all places where a candidate of the elected governor competed and lost in a close race, using a 13% vote margin between winner and runner-up, corresponding roughly to our average optimal bandwidth (that varies by specification). The 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.[6]

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

4 Results

4.1 Main results and robustness: aligned mayors and ghost students

Figure 2 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 (Triangular, Epanechnikov, Uniform) and polynomials (linear or quadratic). We observe an increase of 1.3 to 1.7 percentage points in the share of ghosts (roughly as large as the mean value of this variable and a third of its standard deviation).[7]

Moreover, in Panel B we include different sets of controls (listed in Appendix Table A-1, with descriptive statistics in Appendix Table A-2). We rely here on the triangular kernel estimation with a linear polynomial, our baseline specification from here on. Column 1 has all the set of student controls (student features aggregated at the school level), Column 2 the school controls, and Column 3 the teacher controls (again, teacher features aggregated by school). In column 4 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 country). 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 the share of ghosts. Finally, column 6 includes all these controls. Results are robust to all these checks, with the coefficient for alignment changing in magnitude only modestly and

[6] 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).

[7] Regressions in this panel are at the school level, with errors clustered at the municipality level. Table A-3 runs the regression at the municipality level, finding qualitatively similar and typically statistically significant results.

our statistical precision improving.[8]

In each of these specifications, we rely as noted on the optimal bandwidth from Calonico et al. (2014). We also verify the robustness of the results to the bandwidth choice in Figure 3. The Figure shows, not only the estimated treatment effect and confidence bands, but also the number of observations as we vary the bandwidth from 50% to 150% of the optimal bandwidth (for the baseline linear polynomial bias-corrected coefficient with a triangular kernel). 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.

We relegate additional robustness checks to Appendix Table A-4. To investigate if our results are driven by outliers, in column 2 we drop all observations that are below the 0.05th or above the 99.5th percentile in the distribution of residuals in our baseline regression. We also use alternatives percentiles in columns 3 and 4 (3% and 5% of the observations). Columns 5 to 7 investigate how sensitive the results are to the "donut hole" approach of excluding the schools that are located very close to the cutoff (Cattaneo, Idrobo, & Titiunik, 2018). Finally, columns 8 to 10 exclude big cities (larger than 1 million, half million, or one hundred thousand inhabitants) where, perhaps, it might be less important for the mayor to be aligned to the governor. Our findings are robust to all of these variations.

4.2 Validation: placebo treatments, balance on covariates, and manipulation

Our approach relies on the assumption that other covariates besides our treatment variable vary smoothly at the threshold. Thus, any discontinuous change in the proportion of ghost students is only attributable to the current partisan affiliations of the mayor and governor.

Figures 4 and 5 present a series of falsification tests that help validate our identification assumption. Panel A of Figure 4 runs our standard RD analysis where the dependent variable is ghost students from the 2012 census and the treatment variable is mayor and governor party alignment in each election year from 1997 to 2011. The results reveal that only

[8] A similar analysis using a simple dummy variable for the presence of ghosts is reported in column 1 of Appendix Table A-4, using a linear polynomial and triangular kernel. The coefficient is positive (0.06) but has a large standard error of 0.19. Also, in terms of raw descriptives, the median for a ghost dummy is one under alignment and zero without alignment (inside the optimal bandwidth). In short, though not as conclusive as those in the intensive margin, some differences are also apparent in the extensive margin.

alignment in the 2011 election, and *not* alignment in precedent terms (1997, 2000, 2003, or 2007), helps predict our measure of ghosts taken in 2012. Another approach to help validate our identification assumption is running RD analyses using pre-determined baseline covariates as "placebo" outcomes of our treatment variable, a close win of the aligned mayor in 2011. Panel B of Figure 4 shows balance in a particularly important predetermined variable: political alignment in previous races. In particular, we look at whether alignment in the 2011 elections can predict the success of aligned candidates in past elections. Reassuringly, we find no discernible robust differences at the threshold between treatment and control municipalities. Figure 4 thus provides evidence that concurrent alignment (and not prior alignment or some other omitted variable of areas that typically tend to be aligned) explains the higher incidence of ghosts in aligned municipalities.

Figure 5 looks at balance in predetermined observables more systematically. Panel A shows the (standardized) RD coefficients for the effect of selecting an aligned mayor on pre-determined school characteristics, and Panel B repeats the exercise for municipal characteristics. In general, we find no clear differences in these covariates and the point estimates are close to zero (except in a few cases there is considerable imprecision so, even though the point estimates are not significant at conventional levels, we cannot rule out relatively large differences).

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 threshold in Figure 6 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.[9]

[9]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.

4.3 Fiscal autonomy and institutional quality

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 increases the treatment effect (the estimated coefficient of the interaction is 4.22, standard error 2.06, compared to a non-interacted effect for non-autonomous areas of 1.65, standard error 0.74). Importantly, since population directly determines whether a municipality is elegible to be certified, in this regression we control for population and its interaction with alignment to make sure we do not confound a potential effect of population on the proportion of ghost students.

Columns 3 to 6 of the table probe the importance of opportunities for corruption along a different dimension. In municipalities with weaker and less transparent institutions, fabricating ghosts students should be easier. We therefore interact alignment with a number of different available measures of transparency and institutional capacity: an open government index measuring the amount of information reported by municipal governments and their standards of public management (column 3); an integral performance index also evaluating public management standards and decision making with public funds (column 4); a regulatory compliance index based on whether the municipality complies with legal spending rules, comparing budgeted to effective expenses, and comparing effective expenses by sector to legally permitted limits (column 5); and a municipal transparency index that evaluates the mechanisms used by the municipalities to guide and strengthen the relationship between the citizens and the State (column 6). All of these variables are demeaned before interaction to facilitate interpretation of the main alignment effect. Notice that stronger municipal institutional quality appears to help reduce the impact of alignment on ghost students: all interaction coefficients in columns 3 to 6 are negative.

Besides municipal government transparency causing variation in ghosts prevalence, within municipalities fabricated students should be lower in better schools. While we lack good measures of school-level governance, we have data on education for teachers, general management, and principals. In Table 5 we show that there are fewer ghosts in schools with more qualified employees. In particular, Panel A interacts our treatment variable with teacher, panel B with management, and panel C with principals characteristics. In columns 1 to 4 we look at the levels of education, exploring the share (and, for the principals, a dummy)

of functionaries with: no formal diploma (column 1), no professional diploma (column 2), graduate studies (column 3), and a degree in education (column 4). Though some estimates are noisy, the pattern is quite clear: having less education produces a positive interaction with alignment, and having qualifications instead produces a negative interaction. These results fall in line with the idea that more transparent and accountable schools likely attract the best personnel.

4.4 Further implications: public service provision, electoral corruption, and future career prospects

So far we have shown that aligned municipalities have a higher share of ghosts. Also, that ghosts are especially present where there are more opportunities to take advantage of these extra resources, either because municipalities enjoy fiscal autonomy or because officials operate in contexts of weaker institutions (less transparent municipalities and schools with less qualified personnel).

These results are consistent with a number of interpretations, which could be classified in two broad sets. On the one hand, they might reflect that corruption is more prevalent in areas where there is more to gain from it and chances of being punished are smaller. Aligned mayors fabricate more ghosts than non-aligned ones because their connections to higher echelons of power provide more opportunities for clientelistic exchanges. Moreover, this diversion is stronger where there is more autonomy to use pubic funds because this facilitates maximizing the private rents from diversion, and where institutions are weak because there are slimmer chances of getting caught. These behaviors, moreover, cripples service delivery and affects citizens.

On the other hand, these findings could reflect that officials in these areas fabricate ghosts to obtain resources for the school and productively invest them. Aligned mayors could have more interest than non-aligned ones to facilitate this for several reasons, including improved coordination with governors or stronger incentives to jointly claim credit for better outcomes. Rather than corruption for personal gain, the stronger effects in autonomous municipalities would reflect more incentives to produce ghosts where there is more flexibility to productively use these resources, and the larger impact in weakly institutionalized places could just reflect the more urgent needs for extra funds in these areas.

Of course, these are two polar cases and the reality may lie somewhere in between. Indeed, local politicians and bureaucrats might grab or misallocate part of the extra money

for personal economic or political gain while also using part of the resources for the school, thus pleasing parents and eventually "getting away" more easily with corruption.

We now examine implications on other relevant outcomes that might help us distinguish between these interpretations. We first ask whether these areas receive better or worse (and less or more) education. If the net effect on public service provision is positive, then this suggests some diversion of resources is for public gain. Columns 1 to 6 in Table 6 look 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 in columns 1 to 3. Also, to increase potential precision and as an additional test, in columns 4 to 6 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. In columns 7 and 8 we look at quantity rather than quality, and examine municipal coverage rate (students enrolled in schools as a proportion of those that should be attending) in each municipality as the dependent variable. To avoid relying on fabricated enrollment figures, in column 7 we focus on enrollment numbers that correct for detected ghosts (in 2012). We also look at the numbers in 2013, since just one year after every school had been audited the likelihood of significant (new) fake students might be lower.

Most of the coefficients for alignment in Table 6 are in fact negative, suggesting that these places do not offer more education or better quality.[10] These estimations are not very precise and most coefficients are not statistically significant at conventional levels. Nevertheless, taken together they confirm that we have no evidence of better outcomes in the quality or quantity of education in aligned municipalities. They are therefore more consistent with the "corruption for private gain" story than with the "diversion for public benefit" interpretation.

In this context, we also expect that politicians using public office for private gain are more willing to engage in electoral fraud and clientelistic exchanges with voters, investing in anticipation of their future rents by manipulating elections or offering private rewards to voters in exchange for political support. In Table 7 we therefore evaluate an additional dependent variable: the risk of future electoral fraud (in 2018).[11] 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

[10]The only exception is in column 2 of Panel B, for tests scores in math in 2013, where the coefficient is positive and very close to zero.

[11]Electoral risk is based on five dimensions of anomalies in the election: atypical level of participation, abrupt changes in participation, unusual null votes and unmarked ballots, and electoral dominance.

risk of fraud. The coefficient on alignment is 0.49 (with a standard error of 0.25 in Panel A without controls, and of 0.24 in Panel B with the full battery of municipal and party controls).

More generally, if a corrupt clientelistic machine captures public service delivery in aligned municipalities, we should observe more complaints involving disciplinary problems against public functionaries in these places, and particularly in the education sector which the anecdotical evidence was used opportunistically for this purpose. We explore this in columns 2 to 4 of Table 7. We use data on citizen complaints against public functionaries from the Office of the Inspector General (*Procuraduría*). In column 2, the dependent variable is the sum of total complaints against all functionaries in a given municipality. In column 3, we look instead at complaints involving school functionaries (labeled education complaints). In column 4 we use the share of education complaints as the key outcome of interest. Apart from narrowing the focus on the education sector, an advantage of this last measure is that it may deal with permanent differences in reporting rates across municipalities (Acemoglu et al., 2016). Indeed, some areas may have lower reporting rates of public official than others. By taking the ratio between education complaints and all other complaints, any municipality-specific reporting rate cancels out. Results show consistently that aligned municipalities report more complaints against functionaries (column 2), and especially in the education sector (columns 3 and 4). Also, our estimates are more precise in Panel B, once we include controls, though as expected (given the balance in covariates) the magnitudes of the coefficients remain stable.

While this evidence is admittedly indirect, it again lends further support to the corruption for private gain story. In particular, this suggests an entrenchment of a corrupt clientelistic machine that results in a higher prevalence of future electoral fraud and the capture of public service delivery by corrupt functionaries. The evidence on electoral fraud is also relevant because, ideally, a well-functioning democracy would punish corrupt politicians and functionaries by not electing them subsequently. But with clientelism and electoral corruption these types may persist in power by targeting key voters or outright cheating.

To investigate the future electoral prospects of aligned mayors, in Table 8 we run a standard incumbency advantage analysis for aligned and non-aligned mayors. Specifically, using all local elections since 1997, we look at 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 largely 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 running), and though it is clear that incumbents have a disadvantage as expected, aligned candidates in fact don't have this handicap. So, in short, columns 1 to 6 tell 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 columns 7 and 8 we ask a different question by looking at the politicians themselves, and searching if in any subsequent period aligned politicians from our key 2011 elections are more likely to hold any public office (as councilors, members of departmental assemblies, congress or senate). Again, though the interaction is not significant, the point estimate is also positive.

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, electoral fraud, and capturing public service delivery with more corrupt functionaries.[12]

5 Conclusions

Diversion of government funds may be used for private economic and political gain and/or to pass some of the benefits on to citizens. Our findings are consistent with the following key elements, which may arise where politics are highlighted clientelistic. First, resource extraction is particularly valuable to politicians whose political network is connected to higher echelons of power. Second, areas with weaker accountability and more discretion for diversion of resources for the reproduction of the clientelistic network engage more in this

[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.

form of corruption. Third, 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. The first feature is concerning because precisely those types of better-connected politicians may persist in power, perpetuating the problem. And the second and third features are also problematic since they likely exacerbate inequalities.

Our focus on education is also important. 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 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.

References

Abadie, A., Athey, S., Imbens, G. W., & Wooldridge, J. (2017). *When should you adjust standard errors for clustering?* (Tech. Rep.). NBER Working Paper No. 24003.

Acemoglu, D., Fergusson, L., Robinson, J. A., Romero, D., & Vargas, J. F. (2016). *The perils of high-powered incentives: Evidence from colombia's false positives* (Tech. Rep.). NBER Working Paper # 22617.

Angrist, J. D., Lavy, V., Leder-Luis, J., & Shany, A. (2017). *Maimonides rule redux* (Tech. Rep.). NBER Working Paper No. 23486.

Armesto, A. (2009). Governors and mayors, particularism in the provision of local public goods in mexico and argentina. *LASA 2009*.

Banerjee, A. (1997). A theory of misgovernance. *Quarterly Journal of Economics*, *112*(4), 1289.

Bates, R. (1981). *Markets and states in tropical Africa: the political basis of agricultural policies*. Berkeley: University of California Press.

Behrman, J. R., Parker, S. W., Todd, P. E., & Wolpin, K. I. (2015). Aligning learning incentives of students and teachers: results from a social experiment in mexican high schools. *Journal of Political Economy*, *123*(2), 325–364.

Blair, G., & Imai, K. (2012). Statistical analysis of list experiments. *Political Analysis*, *20*(1), 47-77.

Bold, T., Kimenyi, M., Mwabu, G., Ng'ang'a, A., & Sandefur, J. (2013). Scaling up what works: Experimental evidence on external validity in kenyan education.

Borrella Mas, M. Á. (2015). Partisan alignment and political corruption: Theory and evidence from spain. *Working papers= Documentos de trabajo: Serie AD*(7), 1–55.

Bracco, E., Lockwood, B., Porcelli, F., & Redoano, M. (2015). Intergovernmental grants as signals and the alignment effect: Theory and evidence. *Journal of Public Economics*, *123*, 78–91.

Bracco, E., Porcelli, F., & Redoano, M. (2013). Incumbent effects and partisan alignment in local elections: a regression discontinuity analysis using italian data.

Brollo, F., & Nannicini, T. (2012). Tying your enemy's hands in close races: the politics of federal transfers in brazil. *American Political Science Review*, *106*(4), 742–761.

Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica*, *82*(6), 2295–2326.

Cattaneo, M., Idrobo, N., & Titiunik, R. (2018). A practical introduction to regression

discontinuity designs. In *Cambridge elements: Quantitative and computational methods for social science.* Cambridge: Cambridge University Press.

Cutler, D. M., & Lleras-Muney, A. (2010, January). Understanding differences in health behaviors by education. *Journal of Health Economics*, *29*(1), 1-28. Retrieved from http://ideas.repec.org/a/eee/jhecon/v29y2010i1p1-28.html

Duflo, E., Dupas, P., & Kremer, M. (2011). Peer effects, teacher incentives, and the impact of tracking: Evidence from a randomized evaluation in kenya. *American Economic Review*, *101*(5), 1739–74.

Fergusson, L., Molina, C. A., & Riaño, J. F. (2017). I sell my vote, and so what? a new database and evidence from Colombia. *Documento CEDE 20/2017, Universidad de Los Andes*.

Fergusson, L., Querubín, P., Ruiz, A., & Vargas, J. (2017). *The real winner's curse* (Documentos Cede No. 2017-5). Universidad de los Andes-Cede.

Fernández-Vázquez, P., Barberá, P., & Rivero, G. (2016). Rooting out corruption or rooting for corruption? the heterogeneous electoral consequences of scandals. *Political Science Research and Methods*, *4*(2), 379–397.

Ferraz, C., Finan, F., & Moreira, D. B. (2012). Corrupting learning: Evidence from missing federal education funds in brazil. *Journal of Public Economics*, *96*(9-10), 712–726.

Gelman, A., & Imbens, G. (2017). Why high-order polynomials should not be used in regression discontinuity designs. *Journal of Business & Economic Statistics*(just-accepted).

Glewwe, P. W., Hanushek, E. A., Humpage, S. D., & Ravina, R. (2011, October). *School resources and educational outcomes in developing countries: A review of the literature from 1990 to 2010* (NBER Working Papers No. 17554). National Bureau of Economic Research, Inc. Retrieved from http://ideas.repec.org/p/nbr/nberwo/17554.html

Hanushek, E., & Woessmann, L. (2012, December). Do better schools lead to more growth? cognitive skills, economic outcomes, and causation. *Journal of Economic Growth*, *17*(4), 267-321. Retrieved from http://ideas.repec.org/a/kap/jecgro/v17y2012i4p267-321.html

Kitschelt, H. (2000). Linkages between citizens and politicians in democratic politics. *Comparative Political Studies*, *33*(6-7), 845-79.

Klašnja, M., & Titiunik, R. (2017). The incumbency curse: weak parties, term limits, and unfulfilled accountability. *American Political Science Review*, *111*(1), 129–148.

Lee, D. S. (2008). Randomized experiments from non-random selection in us house elections.

Journal of Econometrics, *142*(2), 675–697.

Lee, D. S., & Lemieux, T. (2010a). Regression discontinuity designs in economics. *Journal of Economic Literature*, *48*(2), 281–355.

Lee, D. S., & Lemieux, T. (2010b, June). Regression discontinuity designs in economics. *Journal of Economic Literature*, *48*(2), 281-355. Retrieved from http://ideas.repec.org/a/aea/jeclit/v48y2010i2p281-355.html

Litschig, S. (2012). Are rules-based government programs shielded from special-interest politics? evidence from revenue-sharing transfers in brazil. *Journal of public Economics*, *96*(11-12), 1047–1060.

Lochner, L. (2011, January). *Non-production benefits of education: Crime, health, and good citizenship* (NBER Working Papers No. 16722). National Bureau of Economic Research, Inc. Retrieved from http://ideas.repec.org/p/nbr/nberwo/16722.html

Maiz, R., & Requejo, R. (2001). Clientelism as a political incentive structure for corruption. In *Trabajo presentado en la conferencia de primavera del european consortium for political research, grenoble.*

Mbiti, I. M. (2016). The need for accountability in education in developing countries. *The Journal of Economic Perspectives*, *30*(3), 109–132.

McCrary, J. (2008, February). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics*, *142*(2). Retrieved from http://eml.berkeley.edu/~jmccrary/mccrary2006_DCdensity.pdf

Migueis, M. (2013). The effect of political alignment on transfers to portuguese municipalities. *Economics & Politics*, *25*(1), 110–133.

Olken, B. A. (2007). Monitoring corruption: evidence from a field experiment in Indonesia. *Journal of political Economy*, *115*(2), 200–249.

Olken, B. A. (2009). Corruption perceptions vs. corruption reality. *Journal of Public economics*, *93*(7-8), 950–964.

Olken, B. A., & Pande, R. (2012). Corruption in developing countries. *Annual Review of Economics*, *4*(1), 479-509. Retrieved from http://www.annualreviews.org/doi/abs/10.1146/annurev-economics-080511-110917 doi: 10.1146/annurev-economics-080511-110917

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: a further update. *Education Economics*, *12*(2), 111-134. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/0964529042000239140 doi: 10.1080/0964529042000239140

Reinikka, R., & Svensson, J. (2004, May). Local capture: Evidence from a central government transfer program in Uganda. *The Quarterly Journal of Economics*, *119*(2), 678-704. Retrieved from `http://ideas.repec.org/a/tpr/qjecon/v119y2004i2p678-704.html`

Singer, M. (2009). Buying voters with dirty money: The relationship between clientelism and corruption.

Solé-Ollé, A., Curto-Grau, M., & Sorribas-Navarro, P. (2012). The returns to partisan alignment between layers of government.

Solé-Ollé, A., & Sorribas-Navarro, P. (2008). The effects of partisan alignment on the allocation of intergovernmental transfers. differences-in-differences estimates for spain. *Journal of Public Economics*, *92*(12), 2302–2319.

Stokes, S. (2005). Perverse accountability: a formal model of machine politics with evidence from Argentina. *American Political Science Review*, *99*(3), 315-25.

Stokes, S. (2007). Political clientelism. In C. Boix & S. Stokes (Eds.), *Oxford handbook of comparative politics* (p. 604-27). Oxford: Oxford University Press.

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

	Full sample	Close races < 13%			Full sample	Close races < 13%	
		Parties aligned	Parties not aligned			Parties aligned	Parties not aligned
Variable	(1)	(2)	(3)	Variable	(4)	(5)	(6)
A. School level				**B. Municipal level**			
Outcomes				*Outcomes*			
Ghosts_{2012} (%)	1.348	1.525	1.117	Ghosts_{2012} (%)	1.266	1.712	0.892
	(4.774)	(4.532)	(4.741)		(2.346)	(4.147)	(1.253)
Test score_{2012}	0.000	0.098	-0.102	$\text{Total coverage rate}_{2012}$	0.879	0.870	0.900
	(1.000)	(1.092)	(0.896)		(0.188)	(0.203)	(0.210)
Test score_{2013}	-0.000	0.157	-0.153	$\text{Total coverage rate}_{2013}$	0.883	0.882	0.902
	(1.000)	(1.054)	(0.880)		(0.195)	(0.204)	(0.234)
Test score_{2014}	0.000	0.156	-0.200	$\text{Risk of electoral fraud}_{2018}$	0.265	0.396	0.242
	(1.000)	(1.079)	(0.921)		(0.442)	(0.494)	(0.432)
Δ $\text{Test score}_{2012\text{-}2010}$	0.068	0.011	0.151	$\text{All complaints}_{2012\text{-}2014}$	30.111	46.057	16.773
	(0.834)	(0.783)	(0.837)		(66.223)	(116.996)	(15.236)
Δ $\text{Test score}_{2013\text{-}2010}$	0.060	0.061	0.058	$\text{Educ complaints}_{2012\text{-}2014}$	0.045	0.113	0.000
	(0.819)	(0.809)	(0.753)		(0.260)	(0.467)	(0.000)
Δ $\text{Test score}_{2014\text{-}2010}$	0.090	0.087	0.059	$\text{Educ complaints}_{2012\text{-}2014}$ (%)	0.002	0.005	0.000
	(0.802)	(0.807)	(0.758)		(0.012)	(0.023)	(0.000)
Mayor-governor party alignment				*Mayor-governor party alignment*			
Aligned (dummy)	0.313	1.000	0.000	Aligned (dummy)	0.298	1.000	0.000
	(0.464)	(0.000)	(0.000)		(0.458)	(0.000)	(0.000)
School characteristics				*Institutional quality indices*			
Teachers (%)				Open gov_{2009}	61.881	63.942	61.134
No diploma	0.021	0.022	0.037		(13.030)	(11.609)	(13.333)
	(0.114)	(0.118)	(0.155)	$\text{Integral performance}_{2009}$	56.136	55.522	55.233
No professional	0.280	0.284	0.210		(14.877)	(14.335)	(14.478)
	(0.341)	(0.362)	(0.260)	$\text{Regulatory compliance}_{2009}$	70.939	72.844	71.072
Graduate	0.183	0.211	0.185		(25.817)	(19.843)	(27.971)
	(0.245)	(0.241)	(0.215)	$\text{Mun transparency}_{2009}$	51.924	53.640	47.874
Degree in educ	0.842	0.761	0.855		(20.846)	(18.195)	(23.424)
	(0.250)	(0.334)	(0.205)				
Management (%)							
No diploma	0.017	0.011	0.017				
	(0.111)	(0.102)	(0.116)				
No professional	0.069	0.056	0.068				
	(0.234)	(0.219)	(0.229)				
Graduate	0.462	0.509	0.430				
	(0.416)	(0.407)	(0.421)				
Degree in educ	0.870	0.903	0.892				
	(0.294)	(0.259)	(0.263)				
Principal (dummy)							
No diploma	0.017	0.006	0.017				
	(0.129)	(0.075)	(0.129)				
No professional	0.048	0.023	0.034				
	(0.214)	(0.149)	(0.181)				
Graduate	0.583	0.666	0.578				
	(0.493)	(0.472)	(0.495)				
Degree in educ	0.891	0.938	0.919				
	(0.312)	(0.242)	(0.273)				

Notes: The table reports the mean values of variables in the samples described in the column heading, with standard deviations in parentheses. 13% is the Calonico et al. (2014) optimal bandwidth in our baseline specification. See the text and Appendix Table A-1 for more details and definitions.

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: Calonico et al. (2014) optimal bandwidth with bias-corrected coefficients and robust standard errors clustered at municipality level. In Panel B, regressions are weighted using a triangular kernel and linear polynomial. Student controls, school controls, teacher controls, and municipality controls are listed on Appendix Table A-1.

Table 4: Ghosts (%), heterogeneous effects with autonomous municipalities and state capacity

Dependent variable is ghost students per school (in %).	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Autonomy	Open government index	Integral performance index	Regulatory compliance	Municipal Transparency
Alignment	1.281**	1.650**	1.352***	0.974**	0.744	1.007**
	(0.590)	(0.743)	(0.427)	(0.389)	(0.640)	(0.400)
Variable in column		0.862	-0.027***	-0.025***	-0.016	-0.014**
		(1.117)	(0.009)	(0.007)	(0.011)	(0.007)
Alignment × Var in column		4.218**	-0.025	-0.034**	-0.022	-0.033***
		(2.064)	(0.019)	(0.014)	(0.019)	(0.012)
log population		-0.466				
		(0.373)				
Alignment × log pop		-1.204*				
		(0.684)				
Alignment × Poverty						
Poverty						
Observations	4383	4383	4383	4383	4383	4383
Obs. in bandwith	1338	1541	1338	1338	1338	1,338
Bandwidth	0.13	0.15	0.13	0.13	0.13	0.13

Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Robust standard errors clustered at municipality level (Calonico et al., 2014). A bandwidth of 0.15 is used in order to have enough observations to run the analysis.

Table 5: Ghosts (%), heterogeneous effects with teachers, management, and school principals

Dependent variable is ghost students per school (in %).

	No diploma	No professional	Graduate	Degree in education
	(1)	(2)	(3)	(4)
Panel A. Teachers (share)				
Alignment	1.360**	1.165***	1.225**	1.222**
	(0.606)	(0.429)	(0.493)	(0.485)
Variable shown in each column title	0.601**	0.693**	-0.303	-0.598*
	(0.290)	(0.312)	(0.606)	(0.306)
Alignment × variable shown in each column title	1.074*	1.849***	-1.427	-1.338**
	(0.584)	(0.621)	(1.095)	(0.660)
Observations	3,999	3,999	3,999	3,999
Obs. in bandwith	1,269	1,269	1,269	1,269
Bandwidth	0.13	0.13	0.13	0.13
Panel B. Management (share)				
Alignment	0.936*	0.930*	0.863*	0.958*
	(0.495)	(0.501)	(0.465)	(0.498)
Variable shown in each column title	-0.105	0.398	-0.114	0.362
	(0.389)	(0.624)	(0.296)	(0.251)
Alignment × variable shown in each column title	0.971	0.710	-1.026*	-0.448
	(0.750)	(1.202)	(0.559)	(0.478)
Observations	2,619	2,619	2,619	2,619
Obs. in bandwith	941	941	941	941
Bandwidth	0.13	0.13	0.13	0.13
Panel C. Principals (dummy)				
Alignment	1.144**	1.100**	1.575**	1.687***
	(0.452)	(0.475)	(0.641)	(0.503)
Variable shown in each column title	-0.252	-0.354*	0.370***	0.535***
	(0.322)	(0.200)	(0.127)	(0.171)
Alignment × variable shown in each column title	1.941**	1.106	-0.713	-0.581
	(0.885)	(1.130)	(0.551)	(0.536)
Observations	1,823	1,823	1,823	1,823
Obs. in bandwith	649	649	649	649
Bandwidth	0.13	0.13	0.13	0.13

Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns.

Table 6: Political alignment and school quality:
Average SABER 11 scores at the school level & Coverage rate at the municipal level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Test score levels			Test score changes			Total coverage rate	
	2012	2013	2014	$\Delta 2012-2010$	$\Delta 2013-2010$	$\Delta 2014-2010$	2012	2013
Panel A. Dependent variable is the level or change in the score of SABER 11: Language & Total coverage rate								
Alignment	-0.251	-0.359*	-0.132	-0.105	-0.384*	-0.117	-0.0769	-0.0920
	(0.311)	(0.216)	(0.235)	(0.302)	(0.212)	(0.229)	(0.104)	(0.117)
Observations	1,897	1,950	1,947	1,722	1,708	1,674	329	329
Obs. in bandwidth	502	237	361	438	431	456	128	129
Bandwith	0.110	0.0663	0.0826	0.108	0.106	0.112	0.141	0.142
Mean dependent	-.354	-.453	-.381	-.013	-.041	-.046	.894	.892
Std. dev. dependent	.932	.823	.957	.788	.741	.76	.203	.204
Panel B. Dependent variable is the the level or change in the score of SABER 11: Math								
Alignment	-0.101	0.000932	-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		
Obs. in bandwidth	393	484	404	527	322	449		
Bandwith	0.0933	0.105	0.0926	0.125	0.0848	0.111		
Mean dependent	.887	.936	.887	1.142	.855	.925		
Std. dev. dependent	2.643	2.691	2.643	4.526	2.465	2.626		

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.

Table 7: New and provisional employees, Vote buying & Inspector General complaints

Dependent variable is...	Risk of electoral fraud	Total complaints	Education complaints	Share of education complaints
	(1)	(2)	(3)	(4)
Panel A. No controls				
Alignment	0.492*	13.42	0.277	0.0159
	(0.251)	(10.47)	(0.260)	(0.0123)
Control for the previous electoral period complaints		✓	✓	
Observations	332	332	332	319
Kernel Type	Triangular	Triangular	Triangular	Triangular
Obs. in bandwidth	93	106	138	138
Mean dependent	.323	29.028	.058	.002
Std. dev. dependent	.47	80.341	.314	.014
Bandwith	0.103	0.114	0.153	0.160
Panel B. Controls				
Alignment	0.489**	12.33***	0.356*	0.0211*
	(0.240)	(3.913)	(0.210)	(0.0124)
Control for the previous electoral period complaints		✓	✓	
Observations	309	309	309	301
Kernel Type	Triangular	Triangular	Triangular	Triangular
Obs. in bandwidth	88	77	158	115
Mean dependent	.326	30.452	.07	.002
Std. dev. dependent	.471	89.512	.335	.015
Bandwith	0.106	0.0939	0.200	0.141

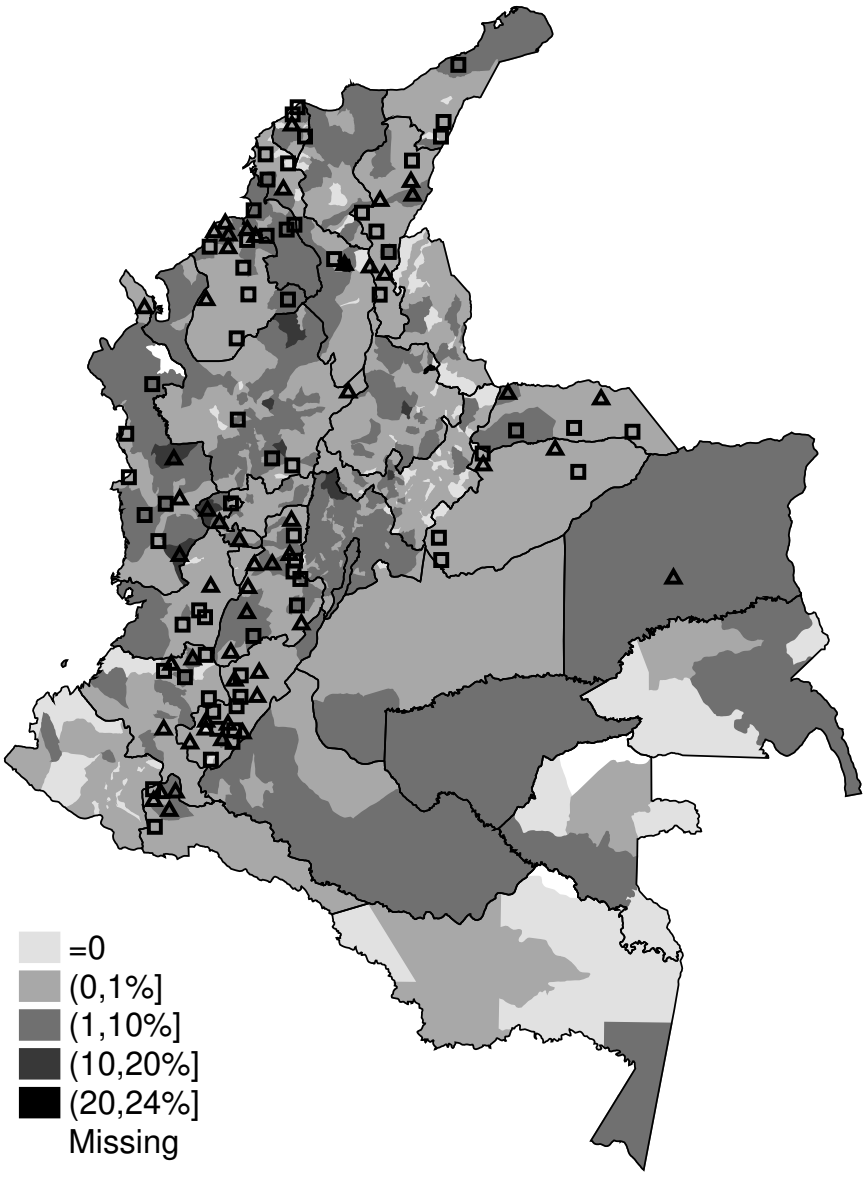
Notes: Bias corrected coefficients and robust standard errors clustered at municipality level (Calonico et al., 2014). Optimal bandwidth in all columns. Municipality and party controls are listed on Appendix Table A-1.

Table 8: Party & politicians future prospects
Municipal incumbency-advantage analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable is...	*Run...*		*In next election, ... Win...*		*Vote share..*		*After the election, ... Public jobs...*	
Panel A. No controls								
$\text{Win}_{t=0}$	0.013	0.006	-0.057***	-0.059***	-0.025**	-0.031***		
	(0.019)	(0.019)	(0.022)	(0.021)	(0.010)	(0.010)		
Alignment		0.021		0.017		0.002		
		(0.023)		(0.026)		(0.013)		
$\text{Win}_{t=0} \times$ Alignment		0.035		0.006		0.029*		
		(0.030)		(0.034)		(0.016)		
$\text{Win}_{t=2011}$							-0.215***	-0.218***
							(0.033)	(0.034)
$\text{Alignment}_{t=2011}$								-0.026
								(0.055)
$\text{Win}_{t=2011} \times \text{Alignment}_{t=2011}$								0.037
								(0.069)
Observations	11443	11443	11443	11443	11443	11443	1,824	1,824
Bandwidth	0.121	0.121	0.121	0.121	0.109	0.109	0.13	0.13
Obs. in bandwith	4804	4749	4837	4782	4477	4422	1824	1824
Panel B. Municipal controls								
$\text{Win}_{t=0}$	0.013	0.005	-0.052**	-0.054**	-0.027***	-0.033***		
	(0.018)	(0.018)	(0.022)	(0.022)	(0.010)	(0.010)		
$\text{Alignment}_{t=0}$		0.018		0.022		0.003		
		(0.023)		(0.026)		(0.013)		
$\text{Win}_{t=0} \times$ Alignment		0.048		0.007		0.033**		
		(0.029)		(0.034)		(0.016)		
$\text{Win}_{t=2011}$							-0.225***	-0.226***
							(0.035)	(0.035)
$\text{Alignment}_{t=2011}$								0.019
								(0.061)
$\text{Win}_{t=2011} \times \text{Alignment}_{t=2011}$								0.014
								(0.072)
Observations	11,075	11,075	11,075	11,075	11,075	11,075	1,724	1,724
R-squared	0.614	0.615	0.171	0.173	0.464	0.468	0.083	0.083
Bandwidth	0.136	0.136	0.124	0.1243	0.119	0.119	0.13	0.13
Obs. in bandwith	5014	4958	4743	4688	4606	4551	1724	1724

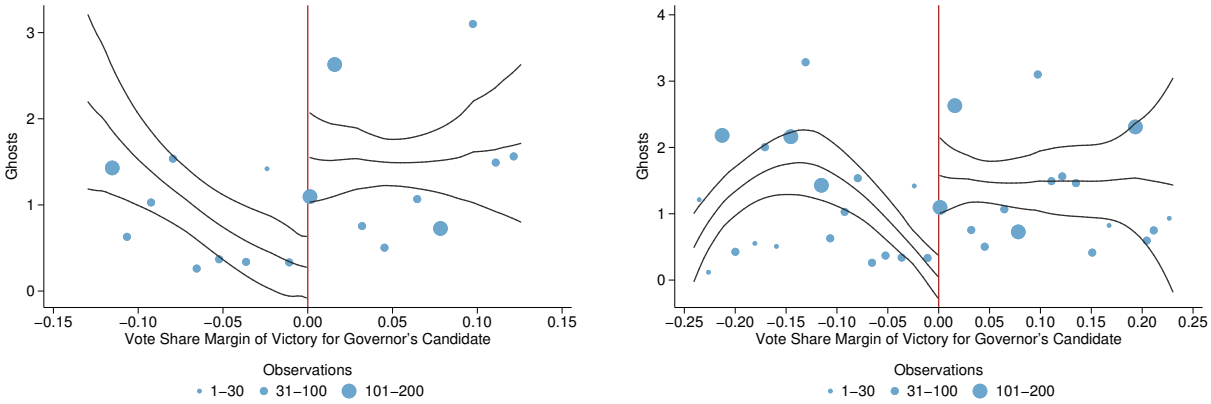
Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. For columns 1 to 6, 1997, 2000, 2003, 2007 and 2011 are the election years included and regressions include party fixed effects and year fixed effects. For columns 7 and 8, only candidates of election 2011 are included and regressions include party fixed effects. Robust standard errors clustered at municipality level (Calonico et al., 2014).

Figure 1: Ghost students in the Colombian territory



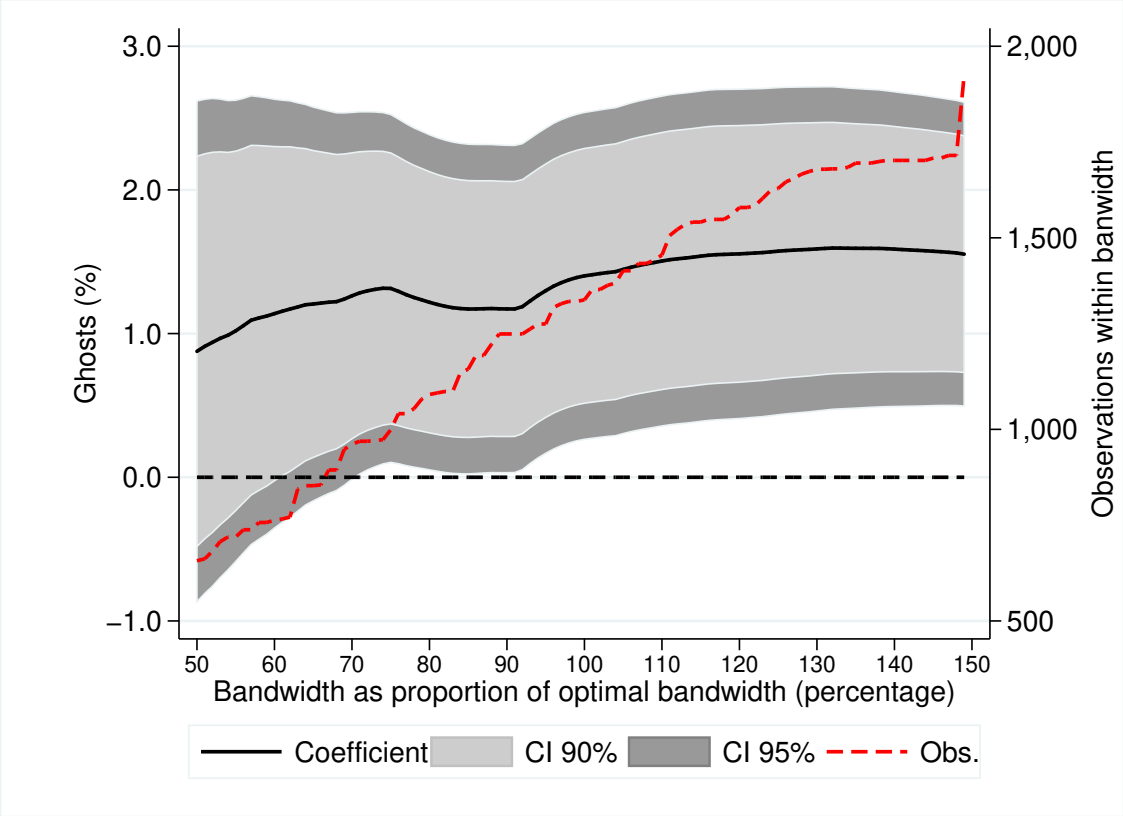
Notes: Share of ghost students per municipality (darker=more ghosts). Squares (triangles) are places where a candidate of the elected governor competed in a close race and lost (won). 13% vote margin between winner and runner-up.

Figure 2: Main results: ghosts (%): Graphical analysis



Notes: Local polynomial regression. Left: linear fit. Right: quadratic fit. Observations within Calonico et al. (2014) optimal bandwidth displayed. Bin selection method: mimicking variance, evenly spaced using spacings estimators.

Figure 3: Main results: Robustness to bandwidth choice

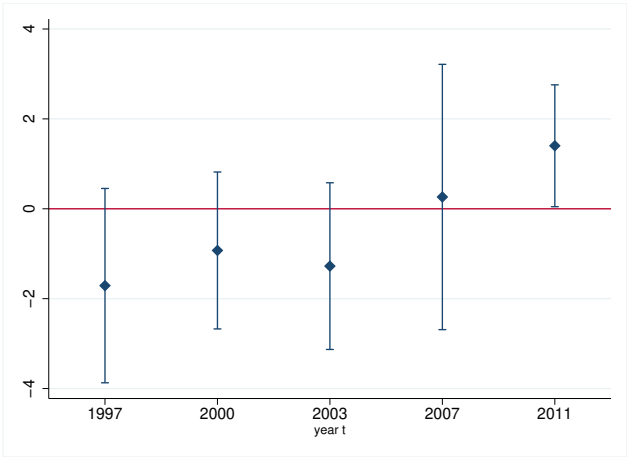


Notes: Nonparametric RDD estimators (triangular kernel and linear polynomial) with Calonico et al. (2014) bias-corrected coefficients (95% and 90% confidence bands) and robust standard errors.

Figure 4: Falsification tests
Predicting ghosts and previous alignment

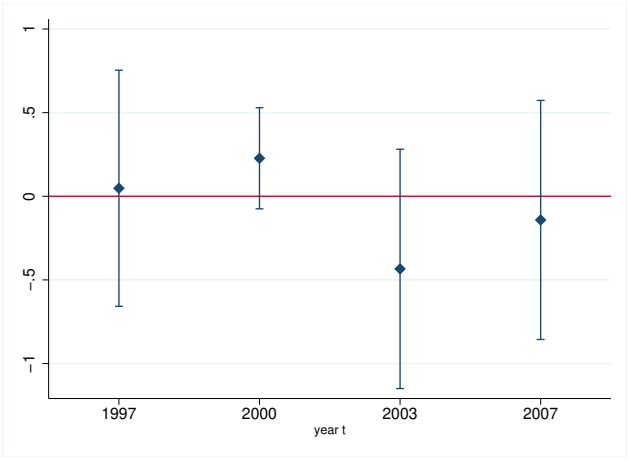
Panel A

Ghosts in 2012 (%) = f(alignment in year t)



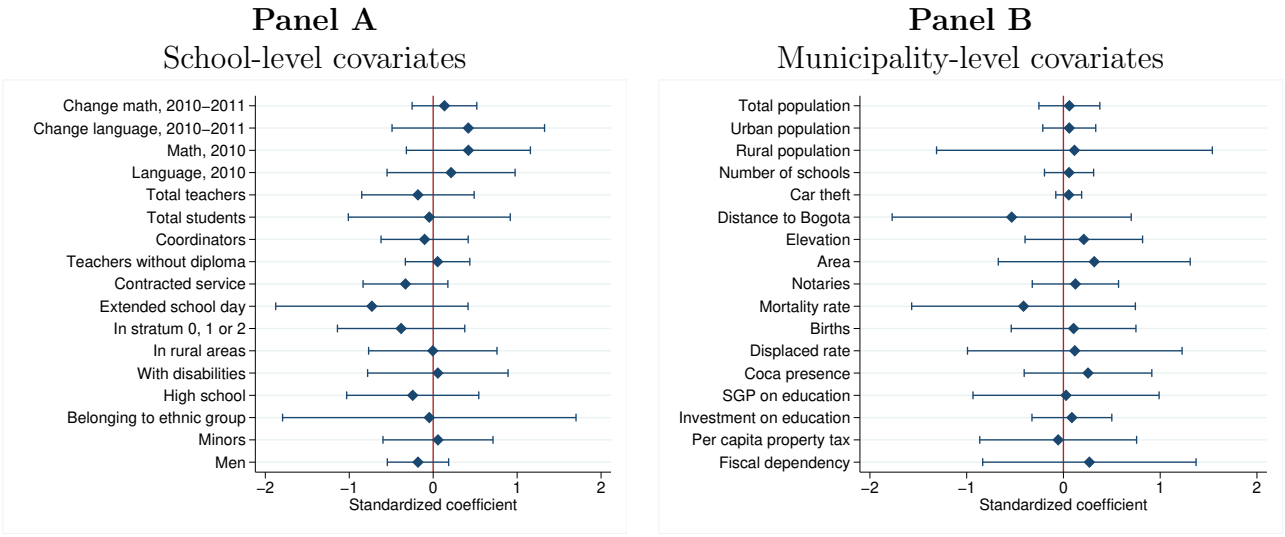
Panel B

Alignment in year t = f(alignment in 2011)



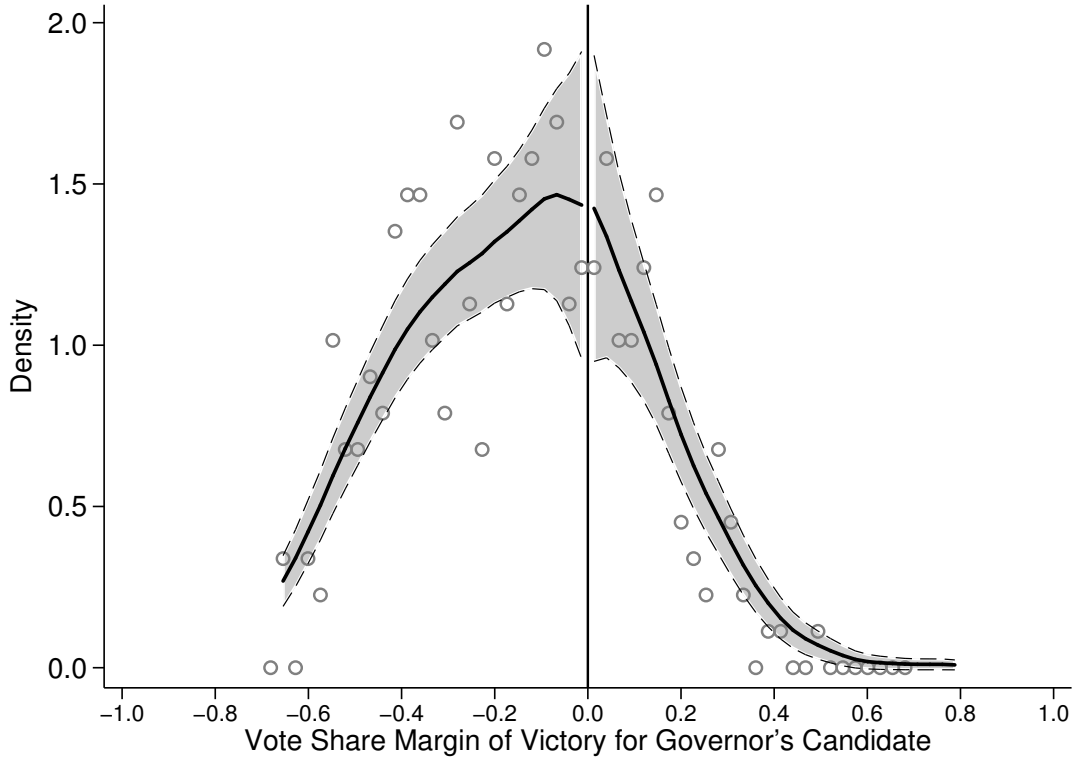
Notes: Nonparametric RDD estimators with Calonico et al. (2014) optimal bandwidth, bias-corrected coefficients (95% confidence bands) and robust standard errors (clustered at the municipality level in Panel A). In Panel A the dependent variable is ghost students from the 2012 census (in percent) and the treatment variable is mayor and governor party alignment in each election year marked in the x-axis. In Panel B the dependent variable is alignment between mayor and governor in each election marked in the x-axis and the treatment variable is mayor and governor party alignment in 2011.

Figure 5: Balance on observable variables: School and municipality level



Notes: Nonparametric RDD estimators with Calonico et al. (2014) optimal bandwidth, bias-corrected coefficients (95% confidence bands) and robust standard errors (clustered at the municipality level in Panel A). All effects are standardized.

Figure 6: Verifying manipulation
McCrary (2008) density test for running variable



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

Appendix Tables

Table A-1: Variables and Sources

Variable	Description	Source
	Main Variables	
Ghosts (%)	Ratio of fake students to total students in 2012.	Ministry of Education, 2012 Audit
Alignment	Dummy = 1 if the mayor and governor belong to the same political party.	Data from Pachón & Sánchez (2014). Own coding.
Student controls	Share of men, share of minors, share of ethnic groups, share of secondary students, share of students with disabilities, and share of strata 0-2.	
School controls	Share of students in rural locations, share of students in full-time locations, and share of students in contracted service locations.	
Teacher controls	Share of teachers with no diploma, share of coordinators, number of students and number of teachers	
Municipality and party controls	Population, rural population, notaries, elevation, distance to Bogota, area, share of votes of the governor party in the municipal council, and fixed effects for main parties	
	Education	
SABER 11 scores	Average result (standardized) of the national college-level entry exam.	Colombian Institute for the Evaluation of Education (*ICFES*)
Coverage rate	Students enrolled in schools as a proportion of those that should be attending in each municipality.	Ministry of Education
No diploma	Share of school employees (or dummy=1 for principals) that lack education titles.	Ministry of Education
No professional	Share of school employees (or dummy=1 for principals) that lack a professional education title.	Ministry of Education
Professional	Share of school employees (or dummy=1 for principals) that have at least a professional education title.	Ministry of Education
Graduate	Share of school employees (or dummy=1 for principals) that have at least a graduate level education title.	Ministry of Education
Degree in education	Share of school employees (or dummy=1 for principals) that have a degree in education.	Ministry of Education
	Municipal characteristics	

Continued on next page

Table A-1 Variables and sources: – continued from previous page

Variable	Description	Source
Autonomy	Dummy = 1 if the municipality has autonomy in the use of local resources.	Own coding.
Open government index	*Índice de gobierno abierto*. It measures the amount of information reported by municipal governments and the status in the implementation of standards that seek to promote better public management. The index is based on four components: systems of internal accountability, information management, visibility in contracting, and transparency in the accountability process.	Inspector General (*Procuraduría*)
Municipal transparency	Component of the Open government index that evaluates the mechanisms used by municipalities to guide and strengthen the relationship between the citizens and the State. Specifically, it determines if the municipal administration reports to the community and the quality of that reporting.	Inspector General (*Procuraduría*)
Integral performance index	*Índice de desempeño integral*. It evaluates four components of public management and decision making in the use of public resources: effectiveness in the accomplishment of proposals, efficiency in the use of public resources for health, education and drinking water, regulatory compliance of *SGP* regulations, and fiscal performance.	National Planning Department (*Departamento Nacional de Planeación*)
Regulatory compliance	Component of the Integral performance index based on whether the municipality complies with legal spending rules, comparing budgeted and executed resources as well as expenditure in each sector compared to what is legally permitted by the *SGP* regulations.	National Planning Department (*Departamento Nacional de Planeación*)
log population	log total population per municipality.	Colombian Statistical Agency (DANE)
Poverty	Proportion of people in poverty according to the Index of Unmet (or Unsatisfied) Basic Needs. Basic Needs are defined at the household level using indicators for housing overcrowding, dwelling physical characteristics, access to public services, proportion of economically dependent mem- bers, and children school attendance.	Colombian Statistical Agency (DANE)
Other outcomes		
Risk of electoral fraud	Dummy = 1 if a municipality had risk of electoral fraud in the 2018 senate elections. Electoral risk is based on five dimensions of anomalies in the election: atypical level of participation, abrupt changes in participation, unusual null votes and unmarked ballots, and electoral dominance.	MOE (2018)
Total complaints	Total complaints from 2012 to 2014.	Inspector General (*Procuraduría*)
Education complaints	Total complaints against schools employees measured from 2012 to 2014. Schools employees are identified using the entity of the individual involved in the complaint of the Inspector General.	Inspector General (*Procuraduría*)

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Table A-1 Variables and sources: – continued from previous page

Variable	Description	Source
Share of education complaints	Ratio of complaints against schools employees to total complaints measured from 2012 to 2014. Schools employees are identified using the entity of the individual involved in the complaint of the Inspector General.	Inspector General (*Procuraduría*)
Share of temporary teachers	Share of teachers that are hired provisionally.	Ministry of Education
Share of temporary management	Share of management that are hired provisionally.	Ministry of Education
Share of temporary employees	Share of total school employees that are hired provisionally.	Ministry of Education

Table A-2: Descriptive statistics, additional variables

	All sample			Close races < 13%					
				Parties aligned			Parties not aligned		
	N	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. School level									
Men (%)	4344	52.169	7.496	771	51.624	8.191	552	52.448	6.350
Minors (%)	4344	90.668	12.110	771	89.298	13.453	552	88.867	11.497
Ethnic (%)	4344	15.770	29.294	771	27.701	35.994	552	16.193	28.040
Secondary (%)	4344	27.272	24.710	771	28.466	25.195	552	31.623	22.190
Disabled (%)	4344	2.348	5.166	771	2.852	6.089	552	2.996	6.298
Stratum 0-2 (%)	4344	97.035	6.885	771	97.040	7.650	552	97.773	5.143
Rural (%)	4344	73.545	42.885	771	73.602	42.892	552	74.582	41.761
Full time (%)	4344	35.374	46.582	771	20.501	38.912	552	23.257	40.572
Contracted service (%)	4344	10.546	25.504	771	5.519	17.292	552	8.410	19.575
Coordinators (%)	3945	1.675	3.335	732	1.802	2.950	513	1.730	2.308
Students (#)	4344	273.438	295.793	771	314.865	327.057	552	314.098	269.231
Teachers (#)	3945	23.406	27.752	732	24.638	27.998	513	27.721	25.824
B. Municipal level									
Fiscal dependency	314	0.719	0.182	51	0.747	0.128	63	0.687	0.221
Per capita property tax	332	25.252	37.036	53	21.833	27.532	66	26.984	51.090
Coca presence	309	57.578	346.645	51	107.920	679.440	61	31.650	188.729
Notaries	329	0.748	0.765	53	0.868	1.241	66	0.636	0.485
Displaced rate	329	336.836	524.059	53	365.170	487.419	66	232.697	454.468
log rural population	332	9.064	0.976	53	9.212	0.900	66	8.964	0.954
log urban population	332	9.092	1.238	53	8.996	1.285	66	8.935	1.092
log total population	332	9.957	0.929	53	9.972	0.962	66	9.790	0.848
Births	332	519.428	947.668	53	642.094	1338.567	66	331.227	268.978
Mortality rate	332	24.714	9.964	53	24.770	8.191	66	25.720	10.610
Area	332	1155.599	3916.217	53	2154.660	8962.983	66	956.091	1735.447
Elevation	309	754.184	1565.174	51	766.196	700.176	61	520.246	576.723
Distance to Bogota	329	390.447	190.805	53	372.824	162.804	66	412.517	213.386
Car theft	332	2.280	9.497	53	2.849	12.157	66	1.182	4.184
Number of schools	332	2.042	6.387	53	2.849	9.245	66	1.076	2.296
Investment on education	323	14.205	1.360	52	14.325	1.519	65	14.041	1.059
SGP on education	323	0.155	0.154	52	0.163	0.189	65	0.115	0.040

Table A-3: Municipal-level results: ghosts (%)
Nonparametric estimators with optimal bandwidth

Dependent variable is ghost students per municipality (in %).						
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. No controls						
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
Panel B. Municipality & party controls						
Alignment	4.183**	4.719**	4.211*	4.750*	5.203*	4.044
	(2.100)	(2.230)	(2.169)	(2.508)	(2.670)	(2.569)
Observations	309	309	309	309	309	309
Obs. in bandwidth	102	77	73	143	121	124
Bandwith	0.116	0.0932	0.0883	0.166	0.142	0.145
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. Municipality and party controls are listed on Appendix Table A-1.

Table A-4: Robustness

Dependent variable is presence of ghost dummy (col. 1) and share of ghosts students (in %) per school (cols. 2 to 10).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Extensive margin	Dropping outliers *Extreme values*			Donut hole *% of the optimal bandwith*			Dropping large cities *Municipalities with a pop. of over...*		
		1 %	3 %	5 %	1 %	3 %	5 %	1 M	500 K	100 K
Alignment	0.0653	1.003**	0.756*	0.778**	1.411**	1.304*	1.331*	1.402**	1.444**	2.149**
	(0.186)	(0.464)	(0.403)	(0.305)	(0.698)	(0.685)	(0.723)	(0.692)	(0.673)	(1.049)
Observations	4,383	1,182	1,161	1,135	4,380	4,348	4,334	4,383	4,193	3,531
Bandwidth	0.112	0.112	0.112	0.112	0.130	0.125	0.124	0.130	0.151	0.120
Obs. in bandwidth	1193	1182	1161	1135	1338	1278	1278	1338	1479	987

Notes: Regressions are weighted using a triangular kernel and assuming a linear polynomial. Robust standard errors clustered at municipality level. Optimal bandwidth in all columns.