How the Political Power of Teacher Unions Affects Education*

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Abstract

This paper studies the effects of politically powerful teacher unions on public education by focusing on Mexico's largest corporatist teacher union and its use of a performance-pay program as a patronage tool. We find that after the 2006 presidential election, teacher promotions disproportionately increased in municipalities where the union-affiliated candidate received a plurality of votes. This pattern is consistent with the hypothesis that the program's implementation was distorted by the union's strengthened political alliance with the ruling party. We also show that the increased promotions negatively affected student learning outcomes by crowding out teachers' incentives to invest effort in teaching.

Keywords: Teacher union, Performance-pay program, Clientelism, Mexico, Test Scores

JEL codes: I28, O17, P17

*The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of the authors' current affiliations. All remaining errors are our own.

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1 Introduction

Teacher unions are an essential input in the education production function. On the one hand, they collectively negotiate with governments to ask for more education resources, which can enhance the quality of education. On the other hand, they may undermine the quality of education if they engage in rent-seeking behaviors for their own interests. Whether teacher unions do good or harm to education is thus ex ante ambiguous, and both effects can be amplified if teacher unions have strong political power.

However, qualitative research suggests that teacher unions are likely to have adverse effects on the quality of education in developing countries. One reason is that teacher unions manipulate the implementation of education policies to serve their own interests through their political power gained by acting as political brokers; they can leverage their influence over teachers to sway voters during elections. This is particularly salient in developing countries where teachers are likely to be the most educated individuals in local communities, and voters seek their advice on whom to vote for. For example, Béteille (2009) conducted a field work in India and revealed that teachers engaged in political activities when they served as polling station officers.[1] Pierskalla and Sacks (2020) showed that teachers were temporality hired to support electoral activities in Indonesia. This ability to mobilize voters makes the unions attractive to political parties and helps them to establish quid-pro-quo relationships with the ruling governments. By exploiting such political connections, the unions can distort education policies to serve their own interests. As a result, the implemented policies may be suboptimal and fail to improve the quality of education. However, quantitative evidence on this mechanism has not been provided adequately. Our paper provides one piece of empirical evidence in the context of Mexico.

Mexico is an example of a developing country with a strong teacher union and the low quality of education. First, Mexico's education system was historically influenced by the National Educational Workers Union (SNTE), the largest teacher union in the country, which historically held a corporatist relationship with the ruling governments. Second, Mexico suffered from the low quality of public education, despite a considerable share of public expenditures allocated to education. Specifically, total expenditures on pre-tertiary education amounted to 3.7 percent of the country's GDP in 2008, comparable to the OECD average of 3.8 percent. However, Mexico was ranked the lowest among all OECD countries in the Programme for International

[1] See Neggers (2018) for how polling station officers affect voting in India.

Student Assessment (PISA) in 2009 (Santiago et al., 2012; OECD, 2019). Although more than 90 percent of education expenditures were spent on the compensation of teachers and other education personnel, their accountability for the poor learning outcomes was not openly discussed in politics until the SNTE lost its political influence in the 2012 presidential election (Chambers-Ju and Finger, 2016).

In this paper, we empirically investigate how the SNTE's political power negatively affects the public education quality in Mexico. In particular, we study the implementation of a pay-for-performance program, the Carrera Magisterial (CM), which was influenced by political alliances between the SNTE and the ruling government. The CM was designed to improve the quality of public education by incentivizing teachers to exert effort in teaching. Teachers voluntarily applied for the program and were evaluated by several metrics to determine their eligibility for inclusion and promotion in the CM. However, qualitative research has shown that the SNTE used career incentives to mobilize teachers for electoral support, indicating that the implementation of the CM could be seen as a potential example of this strategy.[2]

We examine this manipulation quantitatively by analyzing the share of public secondary school teachers participating in the CM around the 2006 presidential election. The 2006 presidential election provides a compelling context for our study because the SNTE-supported candidate won the presidency by such a narrow margin that the union's support may have been decisive. By leveraging this contribution, the SNTE reinforced its clientelism with the ruling party throughout the post-election period, maintaining its influence until the 2012 presidential election, when it lost political connections to the ruling party, and its leader was arrested for embezzlement (Chambers-Ju and Finger, 2016; Larreguy et al., 2017).

Our empirical strategy employs a difference-in-differences estimation with two-way fixed effects, leveraging this political context. The cross-sectional variation exploits whether the union-affiliated candidate received a plurality of votes in the 2006 presidential election in each municipality. We then examine whether participation in the CM exhibited differential trends after the election across this plurality status. Our identification assumption is that, in the absence of the union-affiliated candidate receiving a plurality of votes, participation in the CM would have followed similar trends across the two groups of municipalities. We support this assumption with quantitative evidence. After documenting the differential participation in the

[2]For example, Coyoli (2024) argued that the SNTE opposed the introduction of a new policy that would have reduced its discretion over teachers' career progression, as it could have limited the use of career incentives to mobilize teachers electorally.

CM, we examine its implications for student learning outcomes.

We show that after the 2006 presidential election, public secondary schools in municipalities where the union-affiliated party received a plurality of votes had a 0.8 to 0.9 percentage point (or 10 percent) increase in the share of promoted teachers in the CM, relative to municipalities where other major parties received a plurality of votes. Conversely, the overall share of teachers participating in the CM did not trend differentially.

After conducting a series of robustness checks, we examine concurrent changes in student learning outcomes. we find that students in union-aligned municipalities scored, on average, 0.03 standard deviations lower in Spanish and Math following the election. We argue that these results are consistent with a moral hazard mechanism where incentives to obtain promotions through patronage connections crowded out teachers' intrinsic motivation to invest effort in teaching, which may have been disproportionately harming lower-achieving students.

The main contribution of this paper is to fill a gap in the emerging literature on the political economy of public education in developing countries. The literature attempts to understand the relationship between the quality of public education and patronage relationships between politicians and teachers. On the one hand, by exploiting close elections or exogenous election timings, a limited number of papers have empirically demonstrated that politicians gain significant influence over public education systems after elections, which effectively holds constant any feedback effects from teachers to politicians after elections (Fagernäs and Pelkonen, 2020; Akhtari et al., 2022; Davies, 2025). On the other hand, political science research sheds light on the usefulness of teachers as political machines organized by teacher unions. However, most of this research provides qualitative discussion and lacks empirical analyses on the consequences of political activities by teachers on public education quality (Kingdon and Muzammil, 2009, 2013; Kingdon et al., 2014; Larreguy et al., 2017; Feigenbaum et al., 2018). This paper bridges these two perspectives and quantifies the distortion of the implementation of public education policies due to the political alliances between teacher unions and ruling governments, using an identification strategy leveraging local variation in the electoral support that teacher unions can deliver.

More broadly, this paper also contributes to two strands of literature in political economy. First, our identification builds on a large body of theoretical research examining whether politicians target core or swing voters to establish patronage relationships, as reviewed by Golden and Min (2013). In our context, this applies to the relationship between the SNTE

and teachers, where the SNTE rewarded teachers based on their electoral effort. One of our main findings shows that teachers in municipalities where the PAN received a majority of votes were not differentially rewarded following the 2006 presidential election, suggesting that the SNTE may have targeted "swing" teachers. Second, our results for the simultaneous decline in student learning outcomes speak to the empirical literature on the effects of discretionarily selected bureaucrats (Xu, 2018; Colonnelli et al., 2020; Akhtari et al., 2022). While prior work has shown that such bureaucrats tend to be relatively less competent, we find that teacher qualifications did not change concurrently, which suggests that a different mechanism—reduced teaching effort due to distorted promotion incentives—underlies our results.[3]

This paper additionally makes secondary contribution to two strands of literature. First, the paper is related to the broad literature on the impact of teacher unions on education outcomes (Hoxby, 1996; Lovenheim, 2009; Kingdon and Teal, 2010; Brunner et al., 2020). Previous research in the literature has shown that the unions can increase resource allocation to education, whereas the increased allocation does not necessarily lead to the improvement of learning outcomes. We examine a different channel through which the unions can undermine the quality of education. Second, related to our primary contribution, the paper provides quantitative evidence on how the SNTE distorted the implementation of education policies. In particular, previous research qualitatively suggests that the CM was a patronage tool for the SNTE to reward public school teachers for their electoral support (Hecock, 2014; Chambers-Ju and Finger, 2016). We add the first quantification of this theory to the literature.

The closest comparisons to our paper are Santibanez et al. (2007) and Estrada (2019). Santibanez et al. (2007) investigated the effects of the CM on education outcomes and found slightly positive effects for secondary school students driven by the increased teacher effort induced by the CM. Estrada (2019) estimated the negative effects of teachers hired at the discretion of the SNTE on education outcomes for televised secondary schools. We differ from Santibanez et al. (2007) by showing that the CM did not operate as originally designed when the SNTE had a strong connection with the central government. We extend Estrada (2019) by providing evidence on why and how the SNTE sought to reward teachers, while still documenting similar negative effects on student test scores. Our analysis thus highlights the importance of understanding the political influence of teacher unions over the implementation of education policies and its implications for student learning outcomes.

[3]There are exceptions in the literature showing that patronage relationships can improve bureaucratic performance by providing access to necessary resources (Coyoli, 2024; Toral, 2024).

The remainder of the paper is structured as follows. Section 2 provides detailed descriptions about the SNTE, the Mexican presidential elections, and the CM. Section 3 explains our empirical strategy. Section 4 shows our results on participation in the CM, while Section 5 presents our results on student learning outcomes. Section 6 concludes.

2 Background

2.1 SNTE and Mexican Presidential Elections

The National Educational Workers Union (SNTE) was founded in 1943 through the consolidation of hundreds of regional teacher unions across the country.[4] From its inception, the SNTE held a corporatist relationship with the Revolutionary Institutional Party (PRI). While the SNTE provided electoral support to the PRI by mobilizing local teachers for grass-roots political campaigns, the PRI allowed the SNTE to play an important role in making education policies. This was evident from the fact that the SNTE leaders held key positions in the Ministry of Public Education (SEP). However, in 1992, in response to political challenges the PRI faced, the SNTE started seeking new political alliances with the National Action Party (PAN) and Democratic Revolutionary Party (PRD), the other major political parties at that time.[5]

In the 2006 Mexican presidential election, the SNTE switched its political alliance from the PRI to the PAN for the first time. The longstanding corporatist relationship between the SNTE and the PRI temporarily ended in 2005 because the PRI forced Elba Esther Gordillo, the leader of the SNTE at that time, to step down from her position as the secretary general of the party. As a result, Gordillo publicly announced that the SNTE would support the PAN in the 2006 election and sought to sway votes away from the PRI. The election was highly competitive and was won by a PAN candidate by an extremely small margin (36.69 percent for the winner and 36.09 percent for the runner-up). Given the narrow margin of victory relative to the number of votes the SNTE could have mobilized, the union claimed credit for contributing to the PAN's victory and subsequently began receiving political favor from the PAN government (Larreguy et al., 2014).

In the 2012 Mexican presidential election, however, the PRI won the presidency while the SNTE failed to form a political alliance with the PRI.[6] The elected president then did not

[4] See Britton (1979) and Cook (2010) for the history of the unification of Mexican teacher unions.
[5] In the 2000 presidential election, the PRI lost the presidency to the PAN for the first time in the history.
[6] As Larreguy et al. (2014) note, similar to the 2006 presidential election, the margin of victory in the 2012

appoint SNTE members to the government in an effort to limit the influence of the SNTE over a set of education reforms. Furthermore, Gordillo was accused of embezzlement from the union. After these events, the SNTE was stripped of its political power at the federal level.[7]

To criticize the corporatist relationship between the PRI and the SNTE and advocate for teachers' interests, dissident teachers left the SNTE and formed the National Educational Workers Coordinator (CNTE) in the 1970s and 1980s. The CNTE controlled local teacher unions in several southern states, such as Chiapas, Mexico City, Guerrero, Michoacán, and Oaxaca. In addition to the CNTE, there were other small unions that operated independently of the SNTE.[8]

2.2 Carrera Magisterial

The Carrera Magisterial (CM) was a pay-for-performance program for public school teachers introduced in 1993 to improve the quality of public education by evaluating teachers' performance.[9] Participation in the CM was voluntary, and those who opted in were evaluated annually based on six factors: highest degree earned, years of seniority, peer review, performance on a test following pedagogical development courses, performance on a subject knowledge test, and classroom average scores on a standardized student achievement test.[10] All of the measures were newly developed for the CM, except for the student achievement tests, which were replaced with the Mexican Evaluation of Scholastic Achievement of Educational Institutions (ENLACE) in 2008. Each measure had merit points, and the total points were used to determine teachers' eligibility for incorporation in the CM as well as promotion in the CM. Teachers at the entry level of the CM received an annual bonus of approximately 20 percent of their salaries, and those promoted to the highest level received more than 200 percent. Once incorporated into the CM, teachers were never forced to exit the CM nor were they downgraded in the CM. While inclusion into the CM was based on whether the total points were above the predetermined cutoff, promotion in the CM was decided arbitrarily by the committees.

In each state, both the SNTE and the state-level education authority formed an evaluation

election was also considerably smaller than the number of votes the SNTE could deliver to the PRI candidate.

[7]See Domínguez et al. (2009, 2015) for detailed descriptions about the 2006 and 2012 presidential elections.

[8]Note that public school teachers are, in principle, affiliated with the SNTE.

[9]Positive effects of pay-for-performance programs on educational outcomes have been documented in various countries. See, for example, Lavy (2009) and Muralidharan and Sundararaman (2011).

[10]The original format of the CM evaluated teachers solely based on their students' test scores. However, after consulting the SNTE, the SEP modified it to include non-performance measures in the evaluation metrics. Thus, the evolution of the CM's design itself was an example of how the SNTE affected education policies.

committee and made the final decisions on each application. In order to finance the CM, the SEP allocated budgets for the CM to each state without imposing any conditions on how the funds should be distributed between incorporation and promotion in the program. Teachers were then incorporated and promoted in the CM until the budgets were exhausted. The CM was effectively discontinued after the government formed following the 2012 election announced a new education reform in 2013, which formally replaced the CM by 2015. Qualitative studies have concluded that this reform successfully shifted control over public education away from the SNTE (Scott et al., 2018; Reimers, 2021; Coyoli, 2024).

Previous research has highlighted that the SNTE exploited career incentives as a patronage tool to reward teachers for their loyalty, particularly in the context of electoral support (Chambers-Ju and Finger, 2016; Larreguy et al., 2017). Given that the SNTE partly chose the evaluation committee members, it is plausible that the CM was leveraged to mobilize teachers in elections. Furthermore, teachers anticipated that demonstrating loyalty would result in rewards from the SNTE through the CM.[11] This mutual understanding allowed the SNTE to establish a strong tie with its members. Consequently, if this mechanism reduced teachers' effort to improve classroom learning outcomes, the implementation of the CM was arguably suboptimal in achieving its initial policy goals.

Given that the SNTE regained political connections with the ruling government by delivering decisive electoral support the 2006 presidential election, it is plausible that the SNTE gained discretion over the implementation of the CM in the post-election period. Therefore, in our empirical analysis, we examine whether participation in the CM varied across the degree of electoral support provided by teachers during that election.

3 Empirical Strategy

3.1 Difference-in-Differences Estimation

A major empirical challenge to identifying the SNTE's manipulation of the CM is that we do not perfectly observe teachers' electoral support during the 2006 presidential election. Furthermore, we need exogenous variation in the degree of teachers' electoral support. Ideally, we want to randomly assign different levels of electoral support to teachers and examine whether they are

[11] This was suggested in the interviews with teachers and SEP officials: "*If you are loyal to the union..., teachers believe you will get your merit pay points, regardless of whether you deserve them*" (Hecock, 2014, 76).

rewarded differentially after the election through the CM.

In order to address these empirical challenges, we leverage a principal-agent problem between the SNTE and teachers. Empirical evidence in political science has demonstrated that when political parties cannot fully control their workers who are in charge of local campaigns, they evaluate their workers' effort based on voting results, as they are one of the most informative tools to measure their loyalty (Enos and Hersh, 2015; Larreguy and Marshall, 2016). If this applies to our context, then the SNTE rewarded teachers differently based on the actual voting outcomes that allowed the union to infer teachers' effort levels. We construct our identification strategy based on this argument.

Our hypothesis is that if teachers swayed votes toward the PAN during the 2006 presidential election, the SNTE rewarded them through the CM by leveraging its relationship with the PAN, inferring teachers' political efforts from local voting outcomes. This motivates us to focus on whether the PAN received a plurality of votes in each municipality, as this indicates a local victory in a national election. We thus examine participation in the CM before and after the election across municipalities grouped by this plurality status. Accordingly, our empirical strategy employs a difference-in-differences estimation with two-way fixed effects:

$$\text{CM}_{imt} = \beta_t \times \text{PAN Plurality}_{m,2006} + \gamma_i + \gamma_{g(i)s(m)t} + \varepsilon_{imt}, \tag{1}$$

where the index is i for school, m for municipality, and t for year. CM_{imt} represents either the share of teachers in the CM or the share of promoted teachers in the CM. $\text{PAN Plurality}_{m,2006}$ is the dummy variable taking 1 if the PAN received a plurality of votes in the municipality m in the 2006 presidential election. γ_i is school $\times$ time-shift fixed effects and $\gamma_{g(i)s(m)t}$ is school-type $g(i)$ $\times$ state $s(m)$ $\times$ year fixed effects.[12] While the former fixed effects absorb time-invariant differences across schools, the latter account for school-type-specific shocks within each state across years, including the effects of concurrent education policies, which is an important advantage of leveraging within-state variation. Moreover, as explained in Section 2.2, since the CM budget was allocated at the state level, it is natural to examine how participation in the CM evolved across municipalities within states rather than across states. This also

[12]In Mexico, public schools are classified into multiple types (General, Televised, Community, Technical, and Occupational for public and private) and operate in 4 time-shifts in each of which different students are enrolled. Accordingly, we treat each school–shift pair as the unit of analysis.

supports our identification strategy relying on cross-municipality variation. Standard errors are clustered at the municipality level.

The parameters of interest are β_t from 2006 to 2011, which capture annual changes in CM participation in PAN-plurality municipalities relative to non-PAN-plurality municipalities during the period following the 2006 presidential election up to the next presidential election in 2012. The identification assumption is that participation in the CM in PAN-plurality municipalities would trend in the same way as in non-PAN-plurality municipalities in the absence of the PAN receiving a plurality of votes in 2006. Intuitively, this assumption is plausible in our context, as in the absence of a measure of teachers' electoral efforts, the SNTE would have no basis for differentially rewarding them through the CM. We provide more supporting evidence on this assumption by showing the estimates of β_t prior to the 2006 election.

Note that municipality-level voting results in the presidential election did not directly affect the implementation of the CM. For example, they did not lead to the appointment of municipal officials by the SNTE. However, the absence of such formal mechanisms at the municipality level allows us to test our hypothesis by examining within-state variation in the implementation of the CM, which is another advantage of our identification strategy.

3.2 Data

We use multiple administrative datasets to construct our sample of analysis. The information about participation in the CM is obtained from the annual Mexican school censuses ("Formato 911") from the 1998-1999 to 2018-2019 academic years.[13] These censuses provide data on the number of teachers in each stage of the CM hierarchy. We construct two outcome variables for the 2001–2011 period, which is one election cycle before and after the 2006 election: the share of teachers in the CM and the share of teachers promoted in the CM (i.e., those not in the entry stage). We also obtain other school-level student and teacher characteristics from these censuses over the same period.

We also collect data on voting results for the presidential elections in 2006 and 2012.[14] The data contain the total number of votes as well as the number of valid votes for every candidate at the municipality level. Combining them with the information about party coalitions, we construct panel data of voting results for the three major parties (PAN, PRI, and PRD).

[13]The data are publicly available from Xaber: https://www.xaber.org.mx/

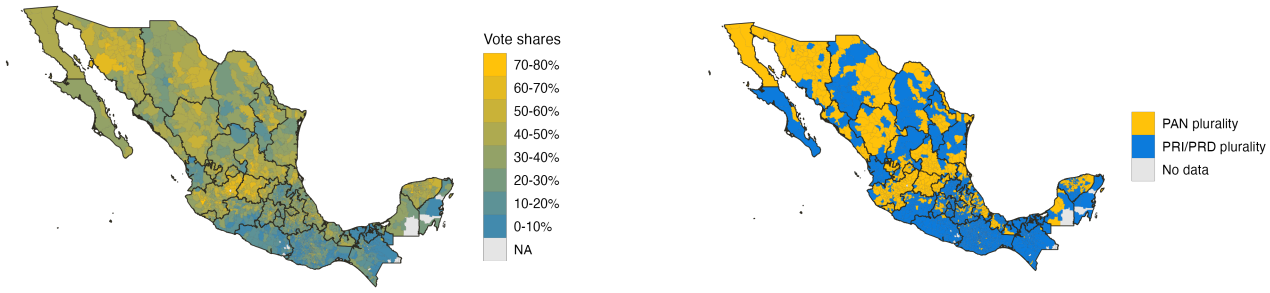
[14]Although election data are publicly available on the website of the Instituto Nacional Electoral (INE), we use cleaned secondary data constructed by Larreguy (2017) and Magar (2018).

By combining these datasets, we construct our main dataset at the school level. We further supplement our dataset with the population census in 2005 to control for demographic differences across municipalities. We then restrict our attention to public general and televised secondary schools that provided general education during our study period.[15] The resulting sample consists of more than 20,000 schools in 2005.

Two maps in Figure 1 illustrate cross-sectional variation in PAN vote shares and the municipalities where the PAN received a plurality of votes in the 2006 presidential election. Several notable patterns emerge across municipalities. First, vote shares for the PAN were generally higher in the northern part of the country than in the south, reflecting the party's historical strength in northern Mexico.[16] Consistent with this pattern, PAN-plurality municipalities were also concentrated in the north. Second, there is substantial within-state variation in plurality status, allowing us to examine variation in how the SNTE rewarded teachers across municipalities.

Figure 1: PAN Vote Shares and Plurality Status Across Municipalities in the 2006 Presidential Election

(a) Vote Shares for PAN (b) Where PAN Received a Plurality of Votes



Notes: The two figures are based on municipality-level voting results in the 2006 presidential election. Figure 1-(a) groups municipalities into deciles according to the vote share for the PAN, while Figure 1-(b) indicates whether the PAN received a plurality of votes in each municipality. The bold black lines indicate state boundaries.

However, this geographical division by the plurality status creates two distinct groups of municipalities. Panel A in Table 1 shows the demographic characteristics of the two groups prior to the 2006 election. These characteristics substantially different across the groups. For

[15] Other types of secondary schools primarily comprise technical schools.
[16] We thank an anonymous referee for pointing this out.

example, PAN-plurality municipalities had, on average, larger populations and smaller shares of the indigenous population. Moreover, these municipalities had, on average, a greater number of secondary schools and a lower share of televised schools.

Regarding participation in the CM, Panel B shows that public schools in PAN-plurality municipalities had a higher share of teachers participating in the CM, even prior to the election. Other school characteristics unrelated to the CM such as enrollment, the number of teachers, and the share of teachers with graduate degrees, also differ across the two groups.

In our analysis, we account for those differences by including school fixed effects. Moreover, we conduct robustness checks by additionally controlling for these pre-election municipal characteristics interacted with year fixed effects.

Table 1: Summary Statistics of Municipal and School Characteristics in 2005

	(1) PAN plurality	(2) PRI or PRD plurality
A: Municipality characteristics		
Total population	72821	30694***
Male (share)	0.482	0.479
Age 15 to 60 (share)	0.553	0.533***
Age above 60 (share)	0.104	0.107**
Indigenous (share)	0.070	0.209***
No formal education (share)	0.073	0.109***
Primary education (share)	0.319	0.309
Secondary education (share)	0.129	0.112***
High school or higher (share)	0.126	0.101***
Number of schools	16.490	9.663***
Public schools (share)	0.922	0.964***
Televised schools (share)	0.669	0.772***
Obs.	714	1571
Joint F-test		0.000
B: School characteristics		
Teachers in CM (share)	0.363	0.293***
Promoted teachers in CM (share)	0.089	0.064***
Total enrollment	188	147***
Number of teachers	7.988	5.964***
Teachers with graduate degrees (share)	0.052	0.045**
Obs.	9568	13836
Joint F-test		0.000

Notes: State fixed effects are included in all regressions. Observations are restricted to general and televised public secondary schools. The asterisks indicate statistical significance based on t-tests of the null hypothesis that the two groups of municipalities have equal means. The Joint F-test rows report p-values from F-tests of the null that all the variables in each panel of the table are jointly balanced across the groups.
*** p<0.01 ** p<0.05 * p<0.1

4 Effects on CM Participation

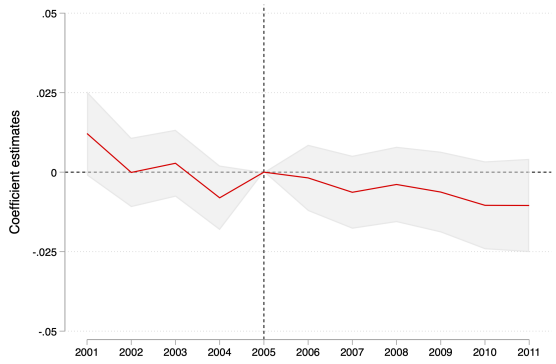
4.1 Main Results

We present our difference-in-differences estimates of the effects of being in PAN-plurality municipalities on participation in the CM following the 2006 presidential election. Two figures in Figure 2 plot the estimated coefficients over one election cycle around the 2006 election. The coefficient for 2005, a year before the election, is normalized to 0. We find that after the election, the share of teachers participating in the CM did not increase differentially across municipalities by the plurality status, whereas the share of promoted teachers in the CM significantly increased for those in PAN-plurality municipalities. Furthermore, both outcomes did not trend statistically differently across the plurality status before the election at a significance level of 0.05, supporting the parallel trend assumption.

These results suggest that, following the victory of the SNTE-supported candidate in the presidential election, teachers were rewarded through promotions in the CM rather than through new incorporations into the CM.[17] Moreover, consistent with the fact that teachers were never downgraded once promoted, the effect size remained constant over the post-election years.

Figure 2: Dynamic Effects on CM Participation—Event-Study Estimates

(a) Share of Teachers in CM



(b) Share of Promoted Teachers in CM

Notes: The two figures plot coefficient estimates from Equation (1). The shaded areas represent the corresponding 95% confidence intervals. Figure 2-(a) shows the results for the share of teachers registered in the CM, while Figure 2-(b) presents the results for the share of teachers who were promoted at least once in the CM.

[17] The muted effects on the incorporation into the CM while the positive effects on the promotion in the CM can be explained by the existence of a clear eligibility threshold, as only incorporation decisions required teachers to meet a predetermined standard.

To interpret the magnitude of the effects, we present regression results using dummy variables for binned years in Table 2. First, we confirm that the pre-trends of both outcome variables are not statistically distinguishable from 0. Second, we find null effects on the share of teachers into the CM. Third, regarding the share of promoted teachers in the CM, we find a statistically significant increase of 0.8-0.9 percentage points following the election. Since the mean share of promoted teachers in PAN-plurality municipalities prior to the election was 8.9%, this corresponds to an increase of approximately 10%.[18] The size of the positive effect remained stable in the subsequent years with a peak of 9.5 percentage points (an increase of 10.8%) three to four years after the election.

Table 2: Dynamic Effects on CM Participation

	(1)	(2)
	Share of teachers in CM	Share of promoted teachers in CM
2001-2005 × PAN Plurality	0.00287	0.00122
	(0.00395)	(0.00208)
2006-2008 × PAN Plurality	-0.00220	0.00891***
	(0.00478)	(0.00282)
2008-2010 × PAN Plurality	-0.00319	0.00953***
	(0.00573)	(0.00305)
2010-2012 × PAN Plurality	-0.00858	0.00825**
	(0.00685)	(0.00378)
Obs.	241650	241650
Mean of outcome in 2005	0.363	0.0886

Notes: Clustered standard errors (municipalities) are reported in parentheses. School × time-shift fixed effects and school-type × state × year fixed effects are included in all regressions. Observations are restricted to general and televised public secondary schools. The omitted year is 2005–2006. The Mean of outcome in 2005 row reports the average of each outcome variable for public secondary schools in 2005 located in municipalities where PAN received a plurality of votes in the 2006 presidential election.
*** p<0.01 ** p<0.05 * p<0.1

4.2 Robustness Checks

4.2.1 Majority Municipalities

We first examine whether the SNTE rewarded differently in PAN-majority municipalities to corroborate our findings in Table 2 that the SNTE rewarded teachers using the CM based on their inferred electoral efforts. In these municipalities, where the PAN required less electoral

[18]Note that the corresponding pre-election mean of the number of teachers in the CM and the number of promoted teachers are 2.4 and 0.6 per school, respectively.

effort to secure a plurality of votes, we expect that the SNTE would have been less likely to reward teachers in the same manner as in more contested municipalities. To test this, we augment Equation (1) by including interaction terms between the binned year dummies and an indicator for whether the PAN received a majority of votes in each municipality.

We find that those interaction terms have negative coefficients when estimating the effects on promotions. Furthermore, we show that the effects in PAN-majority municipalities are not statistically different from 0. These results are consistent with the interpretation that the SNTE rewarded teachers based on their electoral efforts (Table 3).

Table 3: Heterogeneous Effects on CM Participation—PAN-Majority Municipalities

	(1)	(2)
	Share of teachers in CM	Share of promoted teachers in CM
2001-2005 × PAN Plurality	0.00289	0.000842
	(0.00406)	(0.00217)
2006-2008 × PAN Plurality	-0.00179	0.00930***
	(0.00496)	(0.00295)
2008-2010 × PAN Plurality	-0.00427	0.0103***
	(0.00601)	(0.00315)
2010-2012 × PAN Plurality	-0.0101	0.00884**
	(0.00727)	(0.00391)
2001-2005 × PAN Majority	-0.000157	0.00240
	(0.00557)	(0.00355)
2006-2008 × PAN Majority	-0.00229	-0.00177
	(0.00750)	(0.00405)
2008-2010 × PAN Majority	0.00565	-0.00365
	(0.00904)	(0.00442)
2010-2012 × PAN Majority	0.00788	-0.00284
	(0.0107)	(0.00606)
Obs.	241650	241650
Jointly 0 in 2006-2008	0.601	0.075
Jointly 0 in 2008-2010	0.882	0.157
Jointly 0 in 2010-2012	0.839	0.338

Notes: Clustered standard errors (municipalities) are reported in parentheses. School × time-shift fixed effects and school-type × state × year fixed effects are included in all regressions. Observations are restricted to general and televised public secondary schools. The omitted year is 2005-2006. We report p-values from F-tests on the null that the estimated effects for municipalities where PAN received a majority of votes in the 2006 presidential election are equal to 0.
*** p<0.01 ** p<0.05 * p<0.1

4.2.2 Dissident States

Our second robustness check examines our main effects in states where dissident teacher unions operate. As explained in Section 2.1, dissident teacher unions have criticized the SNTE's political power since the 1980s. In states with strong dissident unions, therefore, we expect that the SNTE lacked the capacity to reward teachers through the CM. We thus examine the heterogeneity of our main results for CM participation across the presence of dissident unions. To do this, we use data from Larreguy (2017) to classify states based on whether dissident unions governed state education systems. Among the 32 states, 7 were controlled by dissident unions.[19] We then augment Equation (1) by including interaction terms between the binned year dummies and an indicator for dissident states.

Table 4 shows that teachers were not disproportionately promoted in PAN-plurality municipalities within dissident states following the election. The estimated coefficients of the interaction terms mostly have the opposite sign of the main effects, indicating that participation in the CM in PAN-plurality municipalities increased less in these states than in the SNTE-governed states. We further run F-tests to examine whether the total effects for the dissident states are different from zero, and find that the null hypotheses are not rejected. Therefore, participation in the CM in the dissident states did not change differentially across the plurality status following the election. We interpret these results as additional supporting evidence for our hypothesis that the SNTE played an essential role in the operation of the CM after the 2006 election.

[19] Among the 7 states, 5 are controlled by the CNTE while Baja California and Tabasco controlled by other dissident unions.

Table 4: Heterogeneous Effects on CM Participation—Dissident States

	(1)	(2)
	Share of teachers in CM	Share of promoted teachers in CM
2001-2005 × PAN Plurality	0.00335	0.00147
	(0.00409)	(0.00222)
2006-2008 × PAN Plurality	-0.00244	0.00970***
	(0.00492)	(0.00297)
2008-2010 × PAN Plurality	-0.00371	0.00911***
	(0.00599)	(0.00321)
2010-2012 × PAN Plurality	-0.00731	0.00941**
	(0.00728)	(0.00406)
2001-2005 × PAN Plurality × Dissident	-0.00513	-0.00303
	(0.0146)	(0.00622)
2006-2008 × PAN Plurality × Dissident	0.00249	-0.00896
	(0.0170)	(0.00896)
2008-2010 × PAN Plurality × Dissident	0.00564	0.00432
	(0.0197)	(0.00974)
2010-2012 × PAN Plurality × Dissident	-0.0141	-0.0131
	(0.0211)	(0.00922)
Obs.	241650	241650
Jointly 0 in 2006-2008	0.997	0.931
Jointly 0 in 2008-2010	0.918	0.143
Jointly 0 in 2010-2012	0.281	0.654

Notes: Clustered standard errors (municipalities) are reported in parentheses. School × time-shift fixed effects and school-type × state × year fixed effects are included in all regressions. Observations are restricted to general and televised public secondary schools. The omitted year is 2005-2006. We report p-values from F-tests on the null that the estimated effects for municipalities in the dissident states are equal to 0.
*** p<0.01 ** p<0.05 * p<0.1

4.2.3 After the 2012 Presidential Election

The third robustness check tests whether our main effects are replicated around the 2012 presidential election. As explained in Section 2.1, the PRI won the presidency in the 2012 presidential election, while the SNTE's attempt to form an alliance with the PRI was unsuccessful. Following the election, the new president distanced the government from the SNTE by not appointing SNTE members to important positions of the SEP, which effectively weakened the SNTE's political influence over education systems.

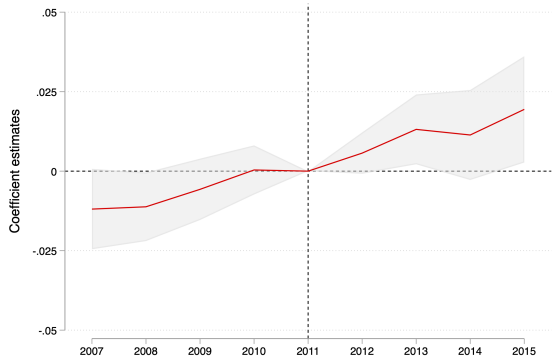
We exploit the 2012 election context to examine whether the main effects could have oc-

curred in the absence of a political alliance. First, if either the SNTE or the winning party could reward teachers without an alliance, we would expect to observe similar changes in CM participation following the election in municipalities where the PRI received a plurality of votes. Second, if the original effects were solely driven by the PAN, we would expect to see increased CM participation in PAN-plurality municipalities after the election. In both tests, finding no detectable changes in CM participation across municipalities after the 2012 election would provide further support for our hypothesis.

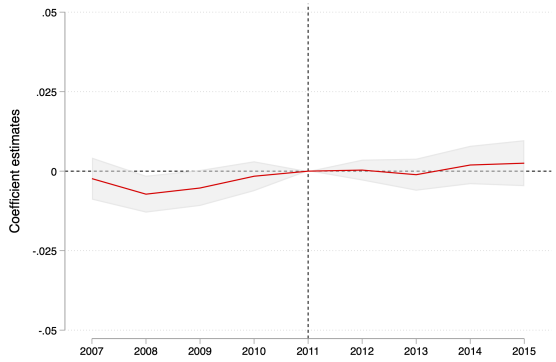
Figures 3 and 4 present the estimation results. We do not examine effects beyond 2015, as the CM was abolished that year. The figures show no differential trends following the election, suggesting that the close relationship between the political party and the SNTE was a key channel through which the SNTE influenced the implementation of the CM.

Figure 3: Dynamic Effects on CM Participation—PRI-Plurality Municipalities in the 2012 Presidential Election

(a) Share of Teachers in CM



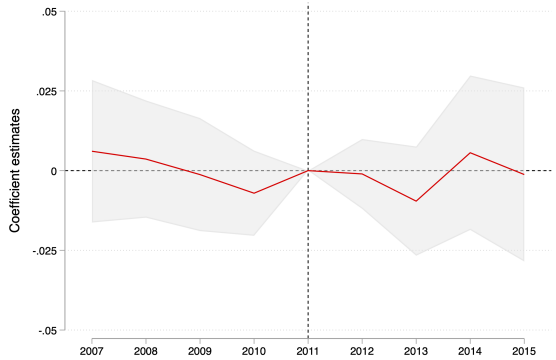
(b) Share of Promoted Teachers in CM



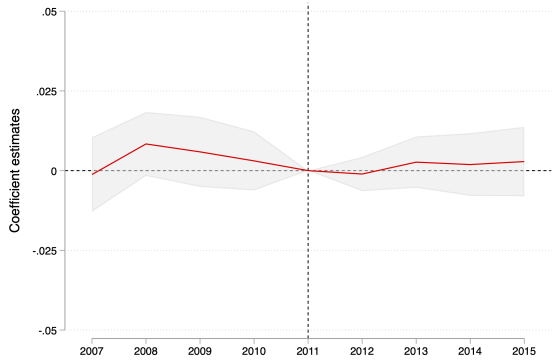
Notes: The two figures plot coefficient estimates from Equation (1) with two modifications: (1) the cross-sectional variation is defined by whether PRI received a plurality of votes in each municipality in the 2012 presidential election or not, and (2) the time-series variation spans the years from 2007 to 2015, which ends with the formal replacement of the CM. The shaded areas represent the corresponding 95% confidence intervals. Figure 3-(a) shows the results for the share of teachers registered in the CM, while Figure 3-(b) presents the results for the share of teachers who were promoted at least once in the CM.

Figure 4: Dynamic Effects on CM Participation—PAN-Plurality Municipalities in the 2012 Presidential Election

(a) Share of Teachers in CM



(b) Share of Promoted Teachers in CM



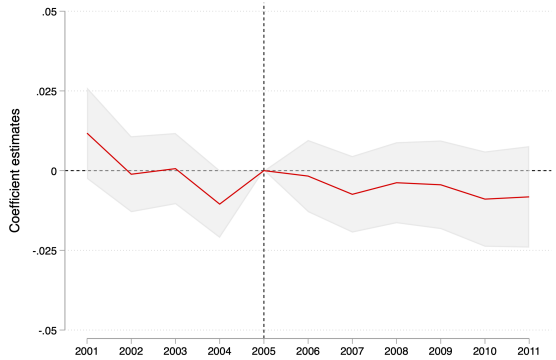
Notes: The two figures plot coefficient estimates from Equation (1) with two modifications: (1) the cross-sectional variation is defined by whether PAN received a plurality of votes in each municipality in the 2012 presidential election or not, and (2) the time-series variation spans the years from 2007 to 2015, which ends with the formal replacement of the CM. The shaded areas represent the corresponding 95% confidence intervals. Figure 4-(a) shows the results for the share of teachers registered in the CM, while Figure 4-(b) presents the results for the share of teachers who were promoted at least once in the CM.

4.2.4 Alternative Fixed Effects

Finally, we test the robustness of our results by controlling for more granular fixed effects. First, Figure 5 presents the results when we include interaction terms between year fixed effects and the pre-election municipality characteristics that exhibit statistically significant differences across the plurality status in Table 1. We find that our main effects remain robust to the inclusion of these additional controls. Second, we replace the school-type $\times$ state $\times$ year fixed effects in Equation (1) with school-type $\times$ district $\times$ year fixed effects. In Mexico, there are 300 electoral districts for electing federal legislators, each defined within a single state. Figure 6 shows that our main effects are also robust to these alternative fixed effects.

Figure 5: Dynamic Effects on CM Participation—Controlling for Pre-election Municipality Characteristics

(a) Share of Teachers in CM

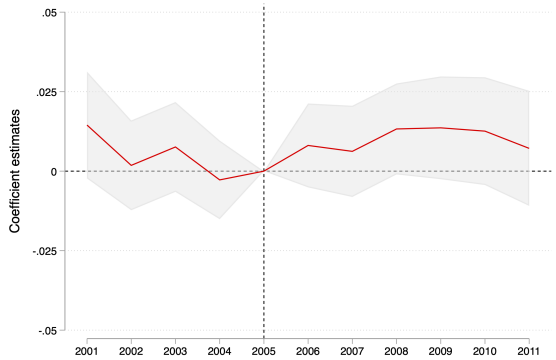


(b) Share of Promoted Teachers in CM

Notes: The two figures plot coefficient estimates from Equation (1) with the following municipality characteristics interacted with year fixed effects: total population, male population, populations of ages between 15 and 60 and ages above 60, indigenous population, populations with no formal education, primary education, secondary education, and high school or higher education, all of which are measured in 2005. The shaded areas represent the corresponding 95% confidence intervals. Figure 5-(a) shows the results for the share of teachers registered in the CM, while Figure 5-(b) presents the results for the share of teachers who were promoted at least once in the CM.

Figure 6: Dynamic Effects on CM Participation—Replacing State Fixed Effects with District Fixed Effects

(a) Share of Teachers in CM



(b) Share of Promoted Teachers in CM

Notes: The two figures plot coefficient estimates from Equation (1) with replacement of state fixed effects with district fixed effects. The shaded areas represent the corresponding 95% confidence intervals. Figure 6-(a) shows the results for the share of teachers registered in the CM, while Figure 6-(b) presents the results for the share of teachers who were promoted at least once in the CM.

5 Effects on Learning Outcomes

5.1 Main Results

After presenting the estimates of the SNTE's influence on CM participation following the 2006 presidential election, we next examine how the resulting increase in promotions affected student learning outcomes. To do this, we use data on the Mexican Evaluation of Scholastic Achievement of Educational Institutions (ENLACE) for the academic years from 2005-2006 to 2013-2014, which was a national standardized test conducted by the SEP during this period.

While the ENLACE initially covered students in grades 3 to 6 and grade 9, beginning in the 2008-2009 year, it was expanded to include students in grades 7 and 8. The exam originally assessed Spanish and Math for all students, but starting in 2007–2008, an additional subject was included for students in grades 7 to 9.[20] Scores were standardized to have a national mean of 500 and a standard deviation of 100. All students in primary and secondary schools, both private and public, were required to take the ENLACE every year.[21] While the ENLACE was a low-stakes exam for students, it was not the case for teachers because the classroom average scores were used to compute merit points in the CM (de Hoyos et al., 2021).

To estimate the effects on the ENLACE scores, we run regressions similar to Equation (1) at the grade level:

$$\text{Score}_{kimt} = \beta_t \times \text{PAN Plurality}_{m,2006} + \gamma_{ki} + \gamma_{kg(i)s(m)t} + \varepsilon_{imt},$$

where k denotes grade level ($k \in 7, 8, 9$), i denotes school, m denotes municipality, and t denotes year. Thus, γ_{ki} represents grade $\times$ school $\times$ time-shift fixed effects and $\gamma_{kg(i)s(m)t}$ represents grade $\times$ school-type $\times$ state $\times$ year fixed effects.

Several remarks about this regression are in order. First, we cannot examine the pre-trends of the ENLACE scores, as the ENLACE data are available only from the 2005-2006 academic year onward.[22] Second, test scores for grades 7 and 8 are available only after the 2008-2009 year, whereas scores for grade 9 are available for all years between 2005-2006 and 2011-2012. We use all grades to estimate the average effects on test scores, and test robustness by restricting

[20] The additional subject was science in 2007-2008, history in 2009-2010, geography in 2010-2011, science in 2011-2012, and society in 2012-2013.

[21] In Mexico, primary school is from grades 1 to 6 and secondary school is grades 7 to 9.

[22] Average scores for both subjects in 2005 were higher in PAN-plurality municipalities compared to non–PAN-plurality municipalities: 473.1 vs. 463.2 for Spanish, and 488.6 vs. 480.5 for Math.

the sample to grade 9 students only.

Columns (1) and (2) of Table 5 present the estimated effects on Spanish and Math scores. We find that test scores began to decline for both subjects by approximately 0.03 standard deviations four years after the election, although the effects are statistically significant only for Spanish. The magnitude of these effects is sizable and comparable to Akhtari et al. (2022), who found that political turnover in Brazil lowered test scores by 0.05 to 0.08 standard deviations through the replacement of headmasters and teachers with worse characteristics.

The next four columns present the results for the shares of students in the bottom and top quartiles to examine distributional effects. We find that the share of students in the bottom quartile increased by approximately 2 percentage points (a 4 percent increase relative to the pre-election mean), while the share of students in the top quartile did not change differentially across the plurality status. These results suggest that the decline in average test scores was driven by worsening performance among low-achieving students. We discuss potential underlying mechanisms in greater detail in Section 5.2.

Table 5: Dynamic Effects on Learning Outcomes

	Test score		Bottom quartile share		Top quartile share	
	(1)	(2)	(3)	(4)	(5)	(6)
	Spanish	Math	Spanish	Math	Spanish	Math
2006-2008 × PAN Plurality	-0.293	-0.371	0.00904	0.00641	0.0000528	-0.000136
	(1.177)	(1.290)	(0.00645)	(0.00731)	(0.000231)	(0.000433)
2008-2010 × PAN Plurality	-3.326**	-1.950	0.0186***	0.0122	-0.000317	-0.00108
	(1.445)	(1.617)	(0.00715)	(0.00799)	(0.000299)	(0.00111)
2010-2012 × PAN Plurality	-3.614**	-3.069	0.0214***	0.0161*	-0.000249	-0.000603
	(1.697)	(2.239)	(0.00774)	(0.00935)	(0.000394)	(0.00233)
Obs.	335340	335340	334348	334348	334348	334348
Mean of outcome in 2005	473.1	488.6	0.458	0.588	0.00194	0.00155

Notes: Clustered standard errors (municipalities) are reported in parentheses. Grade × school × time-shift fixed effects and grade × school-type × state × year fixed effects are included in all regressions. Observations are restricted to general and televised public secondary schools. The omitted year is 2005–2006. The Mean of outcome in 2005 row reports the average of each outcome variable for public secondary schools in 2005 located in municipalities where PAN received a plurality of votes in the 2006 presidential election.
*** p<0.01 ** p<0.05 * p<0.1

We conduct three robustness checks to corroborate our findings. First, we examine the main effects for private schools. Since private-school teachers typically did not belong to the SNTE and were ineligible for CM promotions, the absence of similar effects among private schools supports the interpretation that the CM influenced test scores. As shown in Table 6, we find

no decline in average test scores following the election for private-school students. Second, we restrict the sample to students in grade 9 only, as ENLACE data are available for all years only for this grade. Table 7 shows that our main results remain robust against this restriction. Finally, we examine changes in school characteristics unrelated to CM promotions as placebo checks. As shown in Figure 7, the total number of teachers, the share of teachers holding graduate degrees, and total enrollment did not exhibit differential trends across the plurality status following the election, ruling out the possibility that simultaneous changes in the school environment explain our results.

Table 6: Dynamic Effects on Learning Outcomes—Private Schools

	Test score		Bottom quartile share		Top quartile share	
	(1)	(2)	(3)	(4)	(5)	(6)
	Spanish	Math	Spanish	Math	Spanish	Math
2006-2008 × PAN Plurality	10.11***	6.999**	-0.00618	-0.00958	0.00997**	0.00749**
	(3.325)	(3.232)	(0.0108)	(0.0125)	(0.00494)	(0.00339)
2008-2010 × PAN Plurality	3.959	-0.838	-0.00323	0.00725	0.00352	0.00102
	(3.128)	(3.879)	(0.0106)	(0.0152)	(0.00386)	(0.00441)
2010-2012 × PAN Plurality	6.640*	0.598	-0.0122	0.00835	0.00681	0.00709
	(3.447)	(4.229)	(0.0117)	(0.0144)	(0.00500)	(0.00763)
Obs.	55281	55281	55171	55171	55171	55171
Mean of outcome in 2005	569.6	570.0	0.161	0.304	0.0350	0.0194

Notes: Clustered standard errors (municipalities) are reported in parentheses. Grade × school × time-shift fixed effects and grade × school-type × state × year fixed effects are included in all regressions. Observations are restricted to private secondary schools. The omitted year is 2005–2006. The Mean of outcome in 2005 row reports the average of each outcome variable for private secondary schools in 2005 located in municipalities where PAN received a plurality of votes in the 2006 presidential election.
*** p<0.01 ** p<0.05 * p<0.1

Table 7: Dynamic Effects on Learning Outcomes—Grade 9 Only

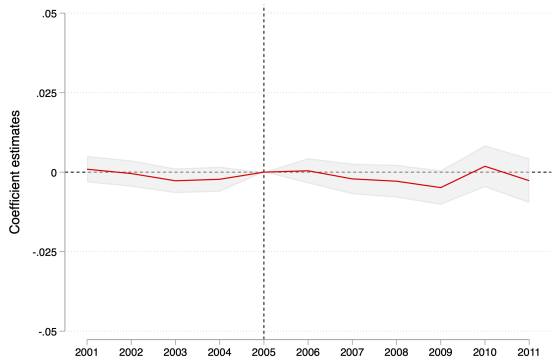
	Test score		Bottom quartile share		Top quartile share	
	(1) Spanish	(2) Math	(3) Spanish	(4) Math	(5) Spanish	(6) Math
2006-2008 × PAN Plurality	-0.314	-0.378	0.00916	0.00654	0.0000548	-0.000127
	(1.139)	(1.248)	(0.00624)	(0.00707)	(0.000223)	(0.000418)
2008-2010 × PAN Plurality	-3.515**	-1.694	0.0194***	0.0131*	-0.000294	-0.00141
	(1.369)	(1.530)	(0.00697)	(0.00759)	(0.000278)	(0.000941)
2010-2012 × PAN Plurality	-3.474**	-3.347	0.0209***	0.0155	-0.000268	-0.000250
	(1.749)	(2.293)	(0.00787)	(0.00959)	(0.000447)	(0.00250)
Obs.	154074	154074	153628	153628	153628	153628
Mean of outcome in 2005	473.1	488.6	0.458	0.588	0.00194	0.00155

Notes: Clustered standard errors (municipalities) are reported in parentheses. School × time-shift fixed effects and school-type × state × year fixed effects are included in all regressions. Observations are restricted to grade 9 of general and televised public secondary schools. The omitted year is 2005–2006. The Mean of outcome in 2005 row reports the average of each outcome variable for grade 9 of public secondary schools in 2005 located in municipalities where PAN received a plurality of votes in the 2006 presidential election.
*** p<0.01 ** p<0.05 * p<0.1

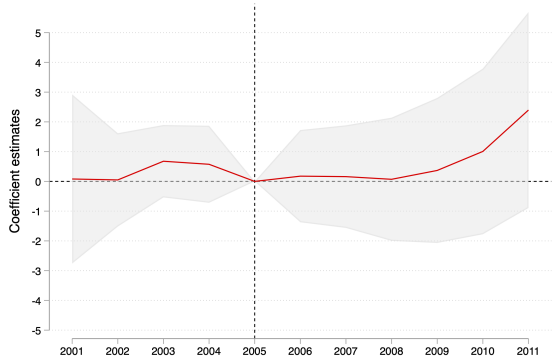
Figure 7: Dynamic Effects on School Characteristics

(a) Number of Teachers

(b) Share of Teachers with Graduate Degrees



(c) Enrollment



Notes: The three figures plot coefficient estimates from Equation (1) using the following school characteristics as dependent variables: the number of teachers, the share of teachers with graduate degrees, and total enrollment. The shaded areas represent the corresponding 95% confidence intervals. Figure 7-(a) shows the results for the number of teachers. Figure 7-(b) presents the results for the share of teachers holding a graduate degree. Figure 7-(c) displays the results for the number of students enrolled in grades 7 to 9.

5.2 Discussion

In this section, we explore two potential mechanisms through which increased promotions in the CM may have adversely affected test scores: negative selection and moral hazard. Negative selection refers to the possibility that individuals who were relatively less competent but were loyal to the SNTE became teachers and promoted through their patronage connections (Xu, 2018; Colonnelli et al., 2020; Akhtari et al., 2022). Conversely, moral hazard could arise if promotions in the CM, tied to political activities, reduced teachers' morale, leading to decreased effort in teaching. We present evidence inconsistent with negative selection and suggest that moral hazard more plausibly explains our findings regarding the test scores.

First, our results for the share of students in bottom and top quartiles in Table 5 are not

consistent with the negative selection story. We show that the share of students in bottom quartile increased relatively in PAN-plurality municipalities, while the share in top quartile did not change differentially across the plurality status. If teachers promoted through their patronage connections were relatively less competent, we would expect to observe a decline in the share of students in the top quartile as well.

Second, we find no differential changes in teacher credentials following the election. As shown in Figure 7, we show that the share of teachers holding graduate degrees did not change differentially across municipalities by the plurality status following the election. This is also inconsistent with the negative selection story.

In sum, we find that that the increased promotions in the CM due to the patronage relationship had a negative impact on learning outcomes. We argue that these results are more consistent with the moral hazard story, which attributes the lower average test scores to reduced effort in teaching because of the increased incentives to engage in the patronage activities.

6 Conclusion

This paper studies the effects of the political power of teacher unions on education. When teacher unions can influence education policies, the quality of education may improve if they lobby for education resources or deteriorate if they engage in rent-seeking activities to serve their own interests. In this paper, we provide one example of the negative effects of teacher unions by examining the largest teacher union in Mexico and its influence over the implementation of a pay-for-performance program, which was used as a patronage tool to reward members for their electoral support.

To do this, we employ a difference-in-differences estimation to investigate whether the union rewarded teachers by incorporating them into the program based on their electoral support inferred from local voting outcomes. Specifically, we compare participation in the program across municipalities by whether the union-supported candidate received a plurality of votes in the 2006 Mexican presidential election, an election in which the union arguably played a decisive role in delivering electoral support. We then compare how these differences evolved before and after the election.

Our difference-in-differences estimates first reveal that after the 2006 election, the share of public secondary school teachers participating in the CM did not differentially change across the

plurality status. However, the share of promoted teachers in the CM statistically significantly increased by 0.8-0.9 percentage points (or an increase of approximately 10% relative to the pre-election mean) over the post-election years. We then demonstrate that student test scores simultaneously declined by 0.03 standard deviation in PAN-plurality municipalities following the election. Finally, we argue that the increased promotions in the CM contributed to the decline in student learning outcomes by crowding out teachers' intrinsic incentives to invest effort in teaching.

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Declaration of interests

The authors have no competing interests to declare regarding submitting the paper titled "How the Political Power of Teacher Unions Affects Education" to Education Economics.

Data Availability Statement

Data and programs for replication are available here.

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