How the Political Power of Teacher Unions Affects Education*

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Abstract

Teacher unions play an important role in determining the quality of public education, especially when they have political power. However, the effects of the unions on education outcomes are theoretically ambiguous and empirical evidence is limited, particularly in developing countries. This paper studies how politically powerful teacher unions affect public education, focusing on the largest corporatist teacher union in Mexico and a performance-pay program regarded as the union's patronage tool for rewarding teachers based on their electoral support. We show that the number of public secondary school teachers who got promoted in the program increased in the municipalities supporting the union-affiliated candidate during the 2006 presidential election, compared to less supportive municipalities, after that election. However, we also show that the increased promotion was not associated with improved learning outcomes, suggesting that the implementation of the program was distorted by the political influence of the union.

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1 Introduction

Teacher unions are an essential input in the education production function. Through collective actions, they negotiate with governments to ask for more education resources, which can enhance the quality of education. However, they may exacerbate 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 are amplified if teacher unions have strong political power.

However, qualitative research suggests that teacher unions can negatively affect the quality of education in developing countries. One reason is that teacher unions often act as political brokers as 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 (Beteille, 2009; Pierskalla and Sacks, 2020). 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. As a result, the unions gain control over the education systems and can distort education policies to serve their own interests. The implemented policies may be suboptimal and fail to improve the quality of education.

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 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. 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 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.

Therefore, we focus on the political economy of the education sector in Mexico to uncover how the SNTE exercised its political power to influence public education. In particular, we study whether the implementation of a pay-for-performance program, known as the Carrera

Magisterial (CM), was impacted differentially by the degree of electoral support provided by teachers in the 2006 presidential election. 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, as qualitative research has indicated, the SNTE manipulated the implementation of the CM to reward teachers for their loyalty to the union based on their electoral support. We examine this manipulation quantitatively by analyzing the number of public secondary school teachers participating in the CM around the 2006 presidential election, in which the SNTE strengthened its clientelism with the winning party.

Our empirical strategy is difference-in-differences with two-way fixed effects. Our cross-sectional variation comes from the vote shares for the winning party in the 2006 presidential election at the municipality level, which serves as a proxy for teachers' electoral support during the election. We then examine whether participation in the CM differentially trended after the election across the vote shares. Our identification assumption is that in the absence of the election, teachers would have participated in the CM similarly over time across municipalities with different levels of the vote shares. We provide both qualitative and quantitative arguments to support this assumption.

We show that after the 2006 presidential election, public secondary schools in municipalities with high vote shares had 5 to 6 percent more teachers promoted within the CM compared to those in low-vote-share municipalities, while the total number of teachers participating in the CM did not trend differentially. We then explore the drivers of the effects. We show that student test scores in a national standardized exam significantly declined for schools in high-vote-share municipalities, suggesting that teachers got promoted in spite of students' worse learning outcomes, contradicting the original goals of the CM. Additionally, we observe that the main effects were not replicated after the 2012 presidential election, in which the winning party differed from the 2006 election and the SNTE lost its political power. Furthermore, the main effects were muted in states controlled by dissident teacher unions. These findings corroborate our hypothesis that the SNTE had discretion over participation in the CM when they wielded political power, which may have had adverse effects on learning outcomes.

This paper contributes to three strands of literature. First, the paper is related to the 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 exacerbate the quality of education. Second, the paper fits to the literature on the sources of political power of trade unions (Larreguy et al., 2017; Feigenbaum et al., 2018). We construct our identification strategy that is aligned with their insights, and estimate the consequences of such political power for one of the largest teacher unions in the world. Finally, the paper provides quantitative evidence on how the SNTE affected the quality of education (Hecock, 2014; Chambers-Ju and Finger, 2016).

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 the slightly positive effects of the CM for secondary school students due to the increased 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 those papers by showing that when the CM did not operate as originally designed, it could have a negative impact on learning outcomes for secondary school students. This finding is consistent with intuitions behind the adverse effects of the union's discretionary hires, highlighting the importance of understanding the political influence of teacher unions and its implications for education outcomes.

The remainder of the paper is structured as follows. Section 2 provides details descriptions for the SNTE, the Mexican presidential elections, and the CM. Section 3 explains our empirical strategy. Section 4 shows our estimation results. Section 5 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.[1] 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

[1] See Britton (1979); Cook (2010) for the history of the unification of Mexican teacher unions.

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), which were the other major political parties at that time.[2]

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). Following the election, the SNTE claimed credit for their contribution to the PAN's win and started receiving political favor from the PAN government.

In the 2012 Mexican presidential election, the PRI won the presidency while the SNTE failed to form a political alliance with the PRI. The elected president then did not appoint SNTE members to the government in an effort to limit the influence of the SNTE on 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.[3]

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.

2.2 Carrera Magisterial

The Carrera Magisterial (CM) was a pay-for-performance system for public school teachers introduced in 1993 to improve the quality of public education by evaluating teachers' performance.[4] Participation in the CM was voluntary, and those who opted for the CM were

[2]In the 2000 presidential election, the PRI lost the presidency to the PAN for the first time in the history.

[3]See Domínguez et al. (2009, 2015) for detailed descriptions about the 2006 and 2012 presidential elections and Chapter 4 in Reimers (2021) about education reforms implemented after the 2012 election.

[4]The positive effects of a pay-for-performance program on education outcomes have been reported in various countries. For instance, Lavy (2009); Muralidharan and Sundararaman (2011) showed improvement in learning

evaluated annually based on six factors: highest degree earned, years of seniority, peer review, scores on a test after pedagogical development courses, scores on a test about teachers' subject knowledge, and classroom average scores on a standardized student achievement test.[5] 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) since 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 within 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 within the CM. While inclusion into the CM was based on whether the total points were above the predetermined cutoff, promotion within the CM was decided arbitrarily by the committees.

In each state, both the SNTE and the state-level education authority formed an evaluation 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 much to use for incorporation or promotion in the CM. Teachers were then incorporated and promoted in the CM until the budgets were exhausted. The CM is no longer in effect as the government constituted following the 2012 election announced the replacement of the CM in 2013, which led to its abolishment in 2015 (Scott et al., 2018).

Previous research argued that the CM not only failed to incentivize teachers to put more effort into teaching but also became a patronage tool for the SNTE to reward teachers for their loyalty. Given that the SNTE partly chose the evaluation committee members, it was plausible that financial incentives were provided to their favored teachers through the CM. Moreover, teachers expected to be rewarded by the SNTE through the CM if they showed their loyalty.[6] This mutual understanding helped the SNTE establish a strong relationship with its members. As a result, the implementation of the CM was arguably suboptimal in achieving the initial policy goals.

outcomes when a pay-for-performance program was implemented.

[5]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 design of the CM itself was an example of how the SNTE affected education policies.

[6]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).

Given that the SNTE regained political connections with the ruling government after 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 Empirical strategy

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 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 political parties cannot fully control their workers who are in charge of local campaigns and thus evaluate their workers' effort based on voting results (Enos and Hersh, 2015; Larreguy and Marshall, 2016). If this applies to our Mexican context, then the SNTE rewarded teachers differently based on the actual voting outcomes as teachers' effort levels were not perfectly observable to the SNTE. We construct our identification strategy based on this argument.

Our hypothesis is that during the 2006 presidential election, the SNTE used their members to sway votes toward the PAN, and incorporated them into or promoted them within the CM in order to reward their political effort inferred from the voting outcomes by exploiting the relationship with the PAN. This motivates us to examine participation in the CM before and after the election across the vote shares for the PAN. Our empirical strategy is thus difference-in-differences estimation with two-way fixed effects:

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

where the index is i for school, m for municipality, and t for year. CM_{imt} represents either the total number of teachers in the CM or the number of teachers promoted within the CM.

High PAN $VS_{m,2006}$ is the dummy variable taking 1 if the vote share for the PAN in the 2006 election at the municipality m is higher than the median vote share for the PAN in our sample.[7] γ_i is the school by time shift fixed effects and $\gamma_{g(i)s(m)t}$ is the school-type $g(i)$ by state $s(m)$ by year fixed effects.[8] While the former fixed effects absorb time-invariant differences across schools, the latter control for any school-type specific shocks in each state, such as education policies. Standard errors are clustered at the municipality level.

The parameters of interest are β_t from 2006 to 2011, the dynamic effects of being in the high-vote-share municipalities between the 2006 and 2012 presidential elections. The identification assumption is that participation in the CM in the high-vote-share municipalities would trend in the same way as in the low-vote-share municipalities in the absence of the presidential election in 2006. Intuitively, this assumption holds in our context as if there were not the election, the SNTE would not be able to observe teachers' loyalty levels. Therefore, the SNTE would not differentially reward teachers with the CM. We provide more supporting evidence on this assumption by showing the estimates of β_t before the 2006 election.

3.2 Data

We use multiple administrative data 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.[9] These censuses provide data on the number of teachers in each stage of the CM hierarchy. We use the number of teachers in the entry stage and in the stages above that for our outcome variables. We also obtain various school-level student and teacher characteristics from these censuses.

We also collect voting data for the presidential elections in 2006, 2012, and 2018.[10] The data contain the total number of votes and 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 vote shares for the three major parties (PAN, PRI, and PRD).

In order to examine learning outcomes during the study period, we obtain data on the Mexican Evaluation of Scholastic Achievement of Educational Institutions (ENLACE) for the

[7] In our data, the mean and median vote shares are around 0.30.

[8] In Mexico, public schools operate in 4 time shifts and have 3 types (public standard, public televised, and private).

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

[10] Although row 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).

academic years from the 2005-2006 to 2013-2014 academic years. The ENLACE is a national standardized test conducted by the SEP for those years. Initially, the ENLACE was administered only for students in grades 3 to 6 and 9, but since the 2008-2009 year, it was expanded to include students in grades 7 and 8. The subjects were initially Spanish and Math for everyone, and starting from the 2007-2008 year, one more subject was added for students in grades 7 to 9.[11] The scores were standardized to have a national mean of 500 and a standard deviation of 100. All students in primary and secondary schools, whether they are private or public, were mandatory to take the ENLACE every year.[12] While the ENLACE was a low-stakes exam for students, it was not for teachers because the classroom average scores were used to compute merit points in the CM (de Hoyos et al., 2021).

By combining these datasets, we construct our main datasets at the school and grade levels. We supplement our datasets with the population census in 2005 to control for demographic differences between the high and low-vote-share municipalities. We then restrict our attention to public secondary schools that provided general or televised education during our study period.[13] The resulting samples consist of more than 20000 schools in 2005.

Two maps in Figure 1 depict the cross-sectional variation in the vote shares for the PAN at the municipality level and the classification of municipalities based on our independent variable in Equation (1). There are several notable differences across municipalities. First, the vote shares were generally higher in the northern part of the country than in the southern part. This can be explained by the fact that the CNTE, the major dissident teacher union, operated in the southern states. Second, the vote shares varied within states. The within-state variation allows us to include state fixed effects, which should remove aggregate shocks at the state level such as decentralized education policies. Moreover, given that the allocation of budgets for the CM was determined at the state level, it is ideal for examining how participation in the CM changed after the election within states, which supports our identification strategy.

However, the geographical division of the distribution of the vote shares for the PAN creates two distinct groups of municipalities. Panel A in Table 1 shows the demographic characteristics of the two groups before the election. These characteristics are largely different across the groups, For example, the high-vote-share municipalities had, on average, larger populations and

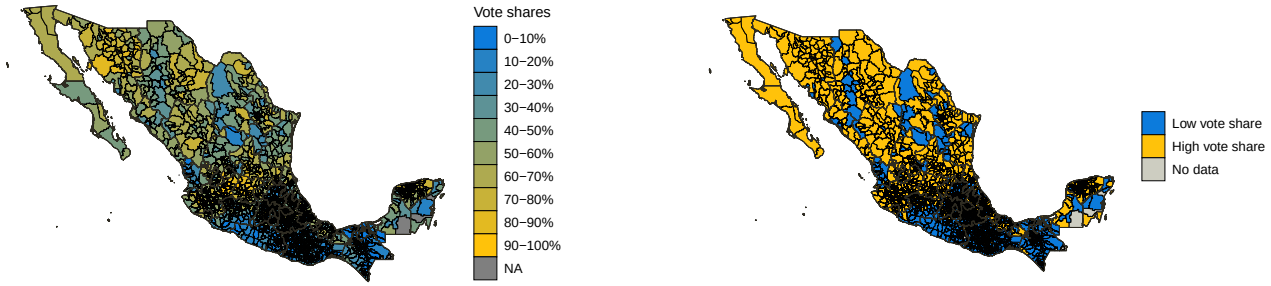
[11]The additional subject was science in 2007-2008, history in 2009-2010, geography in 2010-2011, science in 2011-2012, and society in 2012-2013.

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

[13]Other types of secondary schools mainly comprise technical schools and community schools.

Figure 1: Vote shares for PAN in 2006 election at municipality level

(a) Cross-sectional variation (b) High vs Low vote shares



Note: Both figures are constructed based on the vote shares for the PAN in the 2006 presidential election at the municipality level. Figure 1-(a) classifies municipalities into deciles while Figure 1-(b) based on whether the vote shares are higher than the median vote share, which is 0.30. The bold black lines indicate state boundaries.

smaller shares of the indigenous population. Moreover, there were on average more secondary schools in those municipalities, whereas the share of televised schools was lower.

Regarding participation in the CM, Panel B shows that public schools in the high-vote-share municipalities had more teachers participating in the CM, even before the election. Other school characteristics unrelated to the CM such as the number of students, the number of teachers, and those with graduate degrees, also differed across the groups.

In our analysis, we account for those differences at the municipality and school levels by including the two-way fixed effects. Moreover, in Appendix A, we show robustness to dynamic effects of these pre-election characteristics by further including year fixed effects interacted with the municipality characteristics in 2005 and time-variant school characteristics.

4 Estimation Results

4.1 Effects on CM

We present our difference-in-differences estimates of the effects of being in the high-vote-share municipalities on participation in the CM after the 2006 presidential election. Two figures in Figure 2 plot the estimated coefficients over one election cycle around the 2006 election. The coefficient for the year before the election is normalized to 0. We find that after the election, the total number of teachers participating in the CM did not increase differentially across

Table 1: Municipal and school characteristics in 2005

	(1) High vote share	(2) Low vote share
A: Municipality characteristics		
Total population	57229.444	30211.217***
Male (share)	0.482	0.478
Age 15 to 60 (share)	0.551	0.527***
Age above 60 (share)	0.102	0.109***
Indigenous (share)	0.094	0.239***
No formal education (share)	0.078	0.118***
Primary education (share)	0.317	0.308
Secondary education (share)	0.127	0.107***
High school or higher (share)	0.123	0.095***
Number of schools	13.929	9.322***
Public schools (share)	0.932	0.970***
Televised schools (share)	0.686	0.796***
Obs.	1161	1113
Joint F-test		0.000
B: School characteristics		
Teachers in CM	2.314	1.788***
Promoted teachers in CM	0.580	0.431***
Total enrollment	176.383	144.041***
Number of teachers	7.411	5.883***
Teachers with graduate degrees	0.409	0.223***
Obs.	13461	9597
Joint F-test		0.069

Note: State fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. The stars indicate t-tests on whether the treatment and control groups are different on average. Joint F-test reports the p-values from F-tests on whether the variables in the table are balanced across the groups jointly.
*** p<0.01 ** p<0.05 * p<0.1

public secondary schools in the high- and low-vote-share municipalities, whereas the number of teachers who got promoted within the CM significantly increased for those in the high-vote-share municipalities. Furthermore, both outcomes did not trend statistically differently across the groups before the election at a significance level of 0.05, supporting our parallel trend assumption.

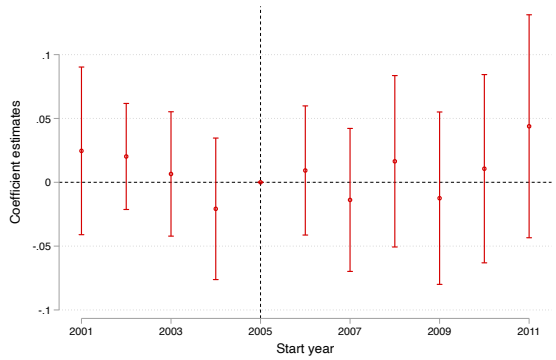
These results suggest that, after the victory of the presidential election by the political party affiliated with the SNTE, teachers were rewarded not through the incorporation into the CM but the promotion within the CM.[14] Moreover, consistent with the fact that teachers were never

[14]The muted effects on the incorporation into the CM while the positive effects on the promotion within the CM can be explained by a clear threshold to determine the eligibility, as only the former required teachers to

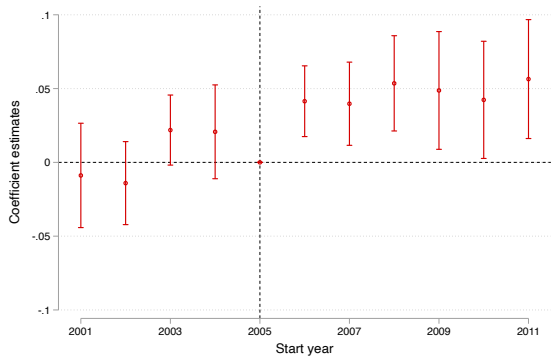
downgraded once promoted, the effect size remained constant over the post-election years.

Figure 2: Dynamic effects on participation into CM

(a) Total # of teachers in the CM (Incorporation)



(b) # of teachers promoted in CM (Promotion)



Note: Both figures plot the estimates of the coefficients with 95 percent confidence intervals when running Equation (1). Figure 2-(a) shows the estimation results for the total number of teachers registered to the CM, whereas Figure 2-(b) for the number of teachers who got promoted at least once within the CM.

To interpret the size of the effects, we present regression results using dummy variables for 2-year bins in Table 2. First, as seen in Figure 2-(a), we find null effects on the total number of teachers incorporated into the CM. Second, regarding the number of teachers promoted within the CM, we find a statistically significant increase of 0.03 after the election. This translates into a 5.4 percent increase relative to the mean number of promoted teachers in public secondary schools in the high-vote-share municipalities before the election ($= 0.03/0.58$). The size of the positive effect remained stable in the following years with a peak of 6.7 percent at 3 to 4 years after the election. In Appendix A, we also show that the estimates are robust when controlling for municipality and school characteristics (Table A.1), as well as when using the shares of teachers incorporated and promoted in the CM as the dependent variable (Table A.2).

4.2 Effects on ENLACE

Provided that promotion within the CM was determined partly based on student test scores in the ENLACE, one explanation for the increase in the number of teachers promoted within the CM is that their students had higher scores in the ENLACE over the post-election years. To investigate this hypothesis, we run regression similar to Equation (1) with the grade-level average of the standardized test scores of Spanish and math in the ENLACE as the dependent

pass a predetermined threshold.

Table 2: Dynamic effects on participation in CM

	(1) Total # of teachers in CM (Incorporation)	(2) # of teachers promoted in CM (Promotion)
2001-2004 × High vote share	0.0100	0.00313
	(0.0189)	(0.0108)
2006-2007 × High vote share	0.00193	0.0373***
	(0.0260)	(0.0131)
2008-2009 × High vote share	0.00634	0.0479***
	(0.0325)	(0.0176)
2010-2011 × High vote share	0.0315	0.0461**
	(0.0407)	(0.0198)
Obs.	255668	255668
Mean of outcome in 2005	2.314	0.580

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2005 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1

variable. Specifically, our new regression equation is as follows:

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

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

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

Table 3 presents the reduced-form effects of being in the high-vote-share municipalities on the test scores. We find that the test scores declined both for Spanish and Math approximately by 0.05 standard deviation, 4 years after the election. While the magnitude of the decline is substantial, we do not claim that the decline was solely due to the increase in the number of teachers promoted within the CM. For example, Akhtari et al. (2022) found that political

turnover lowered test scores by 0.05 to 0.08 standard deviation through the replacement of headmasters and teachers with worse characteristics. Our analysis does not exclude the possibility of an analogous mechanism at play as the political environment could have changed significantly due to the relationship with the SNTE, although the winning party remained unchanged from the 2000 election. However, these results suggest that students in the high-vote-share municipalities did not perform well after the 2006 election, compared to those in the low-vote-share municipalities, and if anything, their learning outcomes were worse off.

Table 3: Dynamic effects on ENLACE test scores

	(1) Spanish	(2) Math
2006-2007 × High vote share	-0.387	0.306
	(1.160)	(1.252)
2008-2009 × High vote share	-4.001***	-1.655
	(1.505)	(1.687)
2010-2011 × High vote share	-5.449***	-5.843**
	(1.880)	(2.414)
Obs.	334133	334133

Note: Clustered standard errors (municipalities) in parentheses. Grade-school-time-shift fixed effects and grade-school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools.
*** p<0.01 ** p<0.05 * p<0.1

To investigate the heterogeneous effects across the distributions of the test scores, we estimate the effects on the ratios of students in the top and bottom quartiles of the national distribution of the test scores to the total number of students at the grade level. Table 4 shows that the fraction of the bottom quartile students increased nearly by 2 percentage points or 3 to 5 percent from the pre-election means for both subjects while the fraction of the top quartile students decreased by 0.09 to 0.6 percentage points. Together with the overall negative effects on the grade-level average scores, these results imply that teachers may have exerted less effort in teaching because they got promoted within the CM through the political activities during the election, resulting in the overall decline of learning outcomes. Consistent with this mechanism, in Table A.3 in Appendix A, we find null effects on learning outcomes of students in private schools, as private school teachers usually did not belong to the SNTE and were not eligible for the CM.

Table 4: Dynamic distributional effects on ENLACE test scores

	Bottom quartile		Top quartile	
	(1) Spanish	(2) Math	(3) Spanish	(4) Math
2006-2007 × High vote share	0.00437	0.00224	-0.0000879	-0.000550
	(0.00579)	(0.00602)	(0.000190)	(0.000456)
2008-2009 × High vote share	0.0199***	0.00915	-0.000304	-0.00200
	(0.00682)	(0.00710)	(0.000277)	(0.00125)
2010-2011 × High vote share	0.0235***	0.0195**	-0.000938*	-0.00658**
	(0.00757)	(0.00874)	(0.000488)	(0.00280)
Obs.	333142	333142	333142	333142
Mean of outcome in 2005	0.454	0.594	0.00206	0.00157

Note: Clustered standard errors (municipalities) in parentheses. Grade-school-time-shift fixed effects and grade-school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2005 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1

4.3 Effects on CM after 2012 presidential election

Our estimation results in Tables 3 and 4 suggest that the increase in the number of teachers promoted within the CM cannot be explained by better performance of their students in the ENLACE. To further corroborate our hypothesis that the SNTE relied on the relationship with the PAN to reward teachers with the CM, we examine whether the effects on the CM promotion were driven solely either by the SNTE or the PAN using the 2012 presidential election. As explained in Section 2.1, in the 2012 presidential election, the PRI won the presidency, whereas the SNTE tried in vain to form an alliance with the PRI. Following the election, the new president distanced the government from the SNTE by not appointing SNTE members to core positions of the SEP, which effectively weakened the political power of the SNTE. We exploit this situation to test whether our main effects were replicated after the 2012 election by examining participation in the CM differentially across municipalities classified based on the vote shares for the PRI in that election. This allows us to answer whether the main effects were driven by the SNTE or the winning party alone. We also test whether the main effects were specific to the PAN by grouping municipalities based on the vote shares for the PAN in that election.

Tables 5 and 6 show our estimation results. Note that we do not look at the effects after

2015 as the CM was abolished in 2015. In Table 5, we find null effects both on incorporation and promotion in the CM after the 2012 election when grouping municipalities based on the vote shares for PRI, suggesting that neither the ruling party nor the SNTE alone could affect the operation of the CM. In Table 6, we also find null effects after the election when grouping municipalities based on the vote shares for the PAN. These results are aligned with the explanation that the close relationship between the political party and the SNTE is a key channel through which the SNTE affected the implementation of the CM, as we observed in Table 2.

Table 5: Dynamic effects on CM after 2012 election: PRI vote share

	(1) Incorporation	(2) Promotion
2007-2010 × High vote share (PRI)	0.00122	0.0247**
	(0.0252)	(0.0109)
2012-2013 × High vote share (PRI)	0.0291	0.00165
	(0.0191)	(0.00923)
2014-2015 × High vote share (PRI)	0.0245	0.00849
	(0.0368)	(0.0150)
Obs.	222249	222249
Mean of outcome in 2011	1.135	0.376

Note: Clustered standard errors (municipalities) in parentheses. Grade-school-time-shift fixed effects and grade-school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2011 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2011.
*** p<0.01 ** p<0.05 * p<0.1

4.4 Heterogeneous effects on CM by presence of dissident unions

As explained in Section 2.1, there have been dissident teacher unions criticizing the SNTE's political power since the 1980s. We thus examine the heterogeneity of our main results on the CM participation across the presence of such unions. We use data from Larreguy (2017) to classify states based on whether dissident teacher unions governed state education. Among 32 states, 7 states were controlled by the dissident unions.[15]

Table 7 shows that participation in the CM did not change differentially across the presence of the dissident unions, as none of the estimated coefficients on the interaction terms are

[15]The 7 states are 5 states controlled by the CNTE and Baja California and Tabasco controlled by other dissident unions.

Table 6: Dynamic effects on CM after 2012 election: PAN vote share

	(1) Incorporation	(2) Promotion
2007-2010 × High vote share (PAN)	-0.0639***	-0.0102
	(0.0239)	(0.0129)
2012-2013 × High vote share (PAN)	-0.00313	0.0119
	(0.0178)	(0.00807)
2014-2015 × High vote share (PAN)	-0.0183	0.00917
	(0.0371)	(0.0142)
Obs.	222249	222249
Mean of outcome in 2011	1.762	0.591

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2011 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2011.
*** p<0.01 ** p<0.05 * p<0.1

statistically significantly different from 0. We further run F-tests to examine whether the total effects for the dissident states are different from 0 and find that the null hypotheses are largely not rejected. These results are also supportive of our hypothesis that the SNTE played an essential role in the operation of the CM after the 2006 election.

4.5 Additional robustness checks

We conduct several robustness checks. First, we test whether school attributes that are not related to the CM differentially changed across the groups of municipalities after the 2006 election as placebo checks. Table A.4 in Appendix A examines the effects on the total number of teachers, the share of teachers with graduate degrees, and the total school enrollment. We find that none of the outcomes trended differentially over the post-election years. Second, we replace the state fixed effects in our main specification with more granular geographical fixed effects. In Mexico, there are 300 electoral districts for electing federal legislators, and they are defined within states. Table A.5 in Appendix A shows that our main findings remain unchanged by using the electoral-district fixed effects.

Table 7: Heterogeneous effects on CM in dissident union states

	(1) Total # of teachers in CM	(2) # of teachers in CM promoted
2001-2004 × High vote share	0.00889	0.0000365
	(0.0188)	(0.0101)
2006-2007 × High vote share	-0.000169	0.0338**
	(0.0274)	(0.0137)
2008-2009 × High vote share	-0.0117	0.0283*
	(0.0349)	(0.0167)
2010-2011 × High vote share	0.0135	0.0435**
	(0.0461)	(0.0207)
2001-2004 × High vote share × Dissident	0.00763	0.0180
	(0.0636)	(0.0388)
2006-2007 × High vote share × Dissident	0.0133	0.0200
	(0.0758)	(0.0389)
2008-2009 × High vote share × Dissident	0.0940	0.102*
	(0.0890)	(0.0583)
2010-2011 × High vote share × Dissident	0.0940	0.0155
	(0.0964)	(0.0591)
Obs.	255668	255668
Jointly 0 in 2006-2007	0.853	0.140
Jointly 0 in 2008-2009	0.314	0.020
Jointly 0 in 2010-2011	0.204	0.287

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. We report p-values from F-tests about coefficients for dissident states being 0.
*** p<0.01 ** p<0.05 * p<0.1

5 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 improves if they lobby for education resources or deteriorates if they engage in rent-seeking activities for their own interests. In this paper, we provide one example of the negative effects of teacher unions by focusing on the largest teacher union in Mexico and the implementation of a pay-for-performance program known as a patronage tool for the union to reward their members for their electoral support. We examine the rates of participation in the program across municipalities with the

varying degree of the union members' political support, before and after the 2006 Mexican presidential election, in which the candidate supported by the union won the presidency so that the union's influence on the government surged in the post-election period.

Our difference-in-differences estimates first reveal that after the 2006 election, the total number of public secondary school teachers incorporated in the CM did not differentially change across the degree of teachers' electoral support during that election, which is proxied by the municipality-level vote shares for the candidate affiliated with the SNTE. However, our estimation results show that the number of teachers promoted within the CM statistically significantly increased by 5 to 6 percent over the post-election years. Corroborating our hypothesis that the changes in participation in the CM were due to the SNTE's political power, we demonstrate that the positive effect on the promotion was not associated with higher average test scores in a national standardized test. In fact, students' learning outcomes were worse off for schools in the more supportive municipalities after the election, contradicting the goals of the CM. Additionally, we show that the promotion was not possible without the relationship between the SNTE and the ruling party. Finally, we find null effects on participation in the CM in states controlled by other teacher unions opposing the political power of the SNTE. These results suggest that the SNTE manipulated the implementation of the CM for their own interests by exploiting a quid-pro-quo relationship with the ruling party established during the election, which may have resulted in the lower quality of public education.

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Appendix

A Supplementary tables and figures

Table A.1: Dynamic effects on participation in CM with control variables

	Total # of teachers in CM			# of teachers promoted in CM		
	(1)	(2)	(3)	(4)	(5)	(6)
2001-2004 × High vote share	0.0100	-0.00335	0.00121	0.00313	-0.000481	0.0000249
	(0.0189)	(0.0168)	(0.0166)	(0.0108)	(0.00937)	(0.00932)
2006-2007 × High vote share	0.00193	0.0145	0.0118	0.0373***	0.0320***	0.0317***
	(0.0260)	(0.0228)	(0.0225)	(0.0131)	(0.0117)	(0.0117)
2008-2009 × High vote share	0.00634	0.00418	0.000546	0.0479***	0.0397**	0.0392**
	(0.0325)	(0.0270)	(0.0265)	(0.0176)	(0.0161)	(0.0160)
2010-2011 × High vote share	0.0315	0.0174	0.00770	0.0461**	0.0335*	0.0325*
	(0.0407)	(0.0327)	(0.0320)	(0.0198)	(0.0188)	(0.0187)
Municipality Control	No	Yes	Yes	No	Yes	Yes
School Control	No	No	Yes	No	No	Yes
Obs.	255668	255668	255668	255668	255668	255668
Mean of outcome in 2005	2.314			0.580		

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Municipality Control includes 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 and are interacted with year fixed effects. School Control includes the numbers of students in each grade. Mean of outcome in 2005 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1

Table A.2: Dynamic effects on shares of teachers participating in CM

	(1) Incorporation	(2) Promotion
2001-2004 × High vote share	-0.00208	-0.000829
	(0.00354)	(0.00191)
2006-2007 × High vote share	-0.0000103	0.00658***
	(0.00454)	(0.00235)
2008-2009 × High vote share	-0.000191	0.00736***
	(0.00629)	(0.00281)
2010-2011 × High vote share	-0.00416	0.00310
	(0.00721)	(0.00329)
Obs.	237920	237920
Mean of outcome in 2005	0.357	0.0860

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2005 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1

Table A.3: Dynamic effects on ENLACE: private schools

	Test score		Bottom quartile		Top quartile	
	(1) Spanish	(2) Math	(3) Spanish	(4) Math	(5) Spanish	(6) Math
2006-2007 × High vote share	4.476	3.997	-0.00324	-0.00417	0.00522	0.00617*
	(3.240)	(3.261)	(0.00902)	(0.0110)	(0.00471)	(0.00347)
2008-2009 × High vote share	2.572	1.240	-0.00590	-0.00738	0.000354	-0.00196
	(3.219)	(3.900)	(0.00976)	(0.0144)	(0.00377)	(0.00473)
2010-2011 × High vote share	3.900	3.031	-0.0153	-0.00788	0.000910	0.00689
	(3.405)	(4.245)	(0.0109)	(0.0137)	(0.00477)	(0.00718)
Obs.	55267	55267	55157	55157	55157	55157
Mean of outcome in 2005			0.157	0.304	0.0356	0.0190

Note: Clustered standard errors (municipalities) in parentheses. Grade-school-time-shift fixed effects and grade-school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2005 shows the averages of each outcome variable for private secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1

Table A.4: Dynamic effects on placebo outcomes

	(1)	(2)	(3)
	Total # of teachers	Share of graduate teachers	Total enrollment
2001-2004 × High vote share	0.0448	-0.000652	0.431
	(0.0340)	(0.00145)	(0.681)
2006-2007 × High vote share	0.0190	-0.00126	0.401
	(0.0383)	(0.00195)	(0.925)
2008-2009 × High vote share	0.0846	-0.00229	0.792
	(0.0530)	(0.00259)	(1.325)
2010-2011 × High vote share	-0.0321	0.000924	2.318
	(0.0656)	(0.00320)	(1.800)
Obs.	255668	255668	255668
Mean of outcome in 2005	7.411	0.0490	176.4

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in all regressions. Sample comprises general and televised public secondary schools. Mean of outcome in 2005 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1

Table A.5: Dynamic effects on CM with granular fixed effects

	Incorporation		Promotion	
	(1)	(2)	(3)	(4)
2001-2004 × High vote share	0.0100	-0.0188	0.00313	-0.00206
	(0.0189)	(0.0171)	(0.0108)	(0.00904)
2006-2007 × High vote share	0.00193	0.0132	0.0373***	0.0159
	(0.0260)	(0.0221)	(0.0131)	(0.0111)
2008-2009 × High vote share	0.00634	0.0440*	0.0479***	0.0338**
	(0.0325)	(0.0254)	(0.0176)	(0.0134)
2010-2011 × High vote share	0.0315	0.0872***	0.0461**	0.0393**
	(0.0407)	(0.0297)	(0.0198)	(0.0164)
Obs.	255668	216531	255668	216531
State or District FEs	State	District	State	District
Mean of outcome in 2005	2.314	2.314	0.580	0.580

Note: Clustered standard errors (municipalities) in parentheses. School-time-shift fixed effects and school-type-state-year fixed effects are included in columns (1) and (3) and School-time-shift fixed effects and school-type-district-year fixed effects are included in columns (2) and (4). Sample comprises general and televised public secondary schools. Mean of outcome in 2005 shows the averages of each outcome variable for public secondary schools in the high vote share municipalities in 2005.
*** p<0.01 ** p<0.05 * p<0.1