Teachers’ Unions, School Board Politics, and District Performance

Ying Shi  
Stanford University*  

John D. Singleton  
University of Rochester†

Draft - Please do not cite or quote without authors’ permission

Abstract

Teachers’ unions are increasingly scrutinized in education policy, but there exists limited evidence that establishes their causal influence or the mechanisms through which they affect district inputs and student outcomes. This paper addresses the gap by examining a key channel: school board representation. We rely on a new identification strategy based on ballot order in school board elections to overcome the empirical challenge of distinguishing between the effect of unions on districts from district conditions that are more amenable to unions’ influence. First stage results document that a union-aligned candidate randomly assigned to the top of the ballot leads to a significant shift in union representation on the school board. Moreover, preliminary evidence suggests that this heightened union strength in turn results in more favorable working conditions for teachers, including fewer required instructional days and steeper pay gradients.

*Shi: Center for Education Policy Analysis; 520 Galvez Mall, 421 CERAS Building, Stanford University, Palo Alto, CA 94305 (Email: yingsh@stanford.edu; Phone: 281-687-0926)
†Singleton: Department of Economics, 280 Hutchinson Road, Box 270156, Rochester, NY 14627 (Email: john.singleton@rochester.edu; Phone: 303-549-3983)
1 Introduction

Teachers’ unions have long sought to exert influence over the working conditions of public school teachers, in turn potentially influencing the allocation of district resources and student learning. This influence has recently fallen under increased scrutiny in the wake of mounting evidence that quality teachers are a key input to student learning (Rockoff, 2004; Rivkin et al., 2005; Hanushek and Rivkin, 2012; Chetty et al., 2014). Sitting at the core of recent legal cases is the question of whether employment protections and benefits for teachers advocated by unions adversely impact student performance. In California, the long-running *Vergara v. California* case reviewed a plethora of evidence linking teacher quality to student outcomes in weighing whether teachers’ rights to select job protections violate the rights of students to a quality education. Nonetheless, despite this heightened interest in the public and by policymakers, there remains limited empirical evidence that causally links channels of union influence to student outcomes (Cowen and Strunk, 2015).

Our paper examines the effect of teachers’ unions on education inputs and student outcomes. In doing so, we provide two contributions to existing work on this topic. First, we present evidence regarding the mechanisms through which teachers’ unions exert influence. Unions and locally elected school boards engage in collective bargaining over teachers’ working conditions, including salary schedules, benefits, and retention, and teachers’ unions devote sizable resources to elect favorably disposed board members (Howell, 2005). We thus examine the representation of unions’ interests on school boards and provide estimates of their causal effect on district resource allocation and student outcomes. Second, to overcome omitted sources of bias in examining the influence of teachers unions, we leverage a new source of random variation arising from school board elections. This strategy allows us to address the key empirical challenge of distinguishing between the effects of unions from the conditions of a district that may be more amendable to unions’ presence and influence.

Our research design proceeds in three steps. In the first step, we exploit California’s random assignment of the order that school board candidates appear on election ballots to isolate exogenous changes in the share of elected members who are former educators. This step thus draws upon and extends an extensive literature establishing the importance, particularly in non-partisan contests, of ballot order for vote shares (Alvarez et al., 2006; Ho and Imai, 2006, 2008; Meredith
and Salant, 2013). Second, we use this source of variation, under the assumption that former educators are likely to be aligned with union priorities, to examine union influence on inputs into student learning. This set of intermediary outcomes, such as elements of collectively bargained teacher salary schedules, allows us to identify changes in resource allocation under greater union strength.\(^1\) Finally, we use our identification strategy to estimate the collective impact of these mechanisms by quantifying the effect of union influence on student performance.

We use a novel combination of electoral and school district data to conduct the analysis. Data on school board races and candidate attributes, such as incumbency and previous occupations, are obtained from the California Elections Data Archive (CEDA). We are able to construct school board membership rosters for all candidates in contested elections going as far back as 1999. We then match school board election results to the corresponding randomized ballot ordering using records gathered from the California Secretary of State’s office. Intermediate outcomes on teacher salary schedules derive from annual Salary and Benefits Schedule for the Certificated Bargaining Unit (Form J-90) and district-level student performance measures, namely scores on statewide standardized exams, come from the California Department of Education.

Preliminary results confirm the power of the new ballot order instrument in shifting board member composition and subsequently affecting educational inputs such as teacher salaries. In the first stage, having an union-aligned candidate at the top of the ballot increases the proportion of school board members who are union-aligned by 3 percentage points. The magnitude of the first candidate advantage is meaningful, given that a typical California school board roster comprises three to seven members. Furthermore, reduced form results document the consequences of compositional shifts for an important input into student learning: teacher work conditions and pay. Having an union-aligned candidate at the top of the ballot leads to fewer scheduled or required service days per school year and a higher salary gradient over the first 5 or 10 years of teachers’ careers. Taken together, these findings suggest that school board representation is a verifiable causal channel of influence for teachers’ unions. Moreover, the effects on teacher outcomes are consistent with unions acting in the interest of their membership base.

Our empirical approach and findings contribute to several strands of literature. Previous re-
\(^{1}\)As we note later, it also provides a validity test of our assumption that former educators are union aligned as we should otherwise expect to find no effects.
search aimed at identifying the causal impact of teachers’ unions typically relies on approaches that exploit variation in the timing of unionization, such as union certification elections and the passage of state laws on collective bargaining (Hoxby, 1996; Lovenheim, 2009). Other work has used district size variation within state and local labor markets as a source of fluctuations in union influence (Brunner and Squires, 2013). While these approaches overcome identification challenges, such variation is limited with respect to understanding the mechanisms of union influence. In contrast, we focus on school board representation as a key channel of influence. In doing so, we hypothesize that the share of union-aligned board members plays an important role in the negotiation of collective bargaining agreements, which regulate school inputs ranging from teacher compensation to working conditions. Findings on the role of board composition can potentially inform the design of effective school district governance structures.

Our focus on schools boards and education inputs as mechanisms thus connects with prior work that examines the restrictiveness of collectively-bargained contracts, a continuous measure of union strength (Moe, 2009; Strunk and Reardon, 2010; Goldhaber et al., 2014). Strunk and Grissom (2010) present evidence that links such restrictiveness to both the presence and activity of teachers’ unions in local elections. We contribute by developing and implementing an empirical strategy to estimate the causal relationship between union influence on district resource allocation as well as student outcomes. Separately, our study also complements a parallel literature that uses quasi-experimental election variation to examine effects of local government representation on public goods, including school boards and education (Beach and Jones, 2017; Macartney and Singleton, 2017).²

The paper begins with an overview of institutional context and data sources in Section 2 before detailing the theoretical motivations and empirical strategy in Section 3. We summarize results in Section 4 and conclude with Section 5.

2 Background and data

In this section, we describe the institutional context, school boards in California, and data sources assembled for our analysis. Due to the prevalence of teachers’ unions, a large sample of local

²Our empirical approach potentially provides an alternative to regression discontinuity designs, particularly when electoral attributes render them difficult to apply to closely contested races.
education agencies (LEAs), and identifying variation generated by electoral processes, California provides a uniquely suitable setting. We combine data on outcomes and characteristics of California school districts with records on school board electoral contests, including ballot order, to facilitate our research design.

2.1 Institutional context

Nearly all school districts in California participate in collective bargaining with the California Teachers Association (CTA) or the California Federation of Teachers (CFT). Among public school teachers, approximately 90% are full voting members while the remainder are agency fee payers. Unions in California have substantial latitude over key district inputs in the collective bargaining process. These employment negotiations cover dimensions such as teacher salary and benefit schedules, instructional hours, class size, assignment and transfer policy, and curriculum content. In the case of salaries, all Californian teachers are compensated according to a step-and-column salary schedule that rewards them for additional years of experience (step) and educational credits attained (column or lane). Beyond this shared framework, substantial differentiation in pay is possible via negotiations over certification type, degree type, non-instructional work, and other skills (Strunk, 2013).

The second notable feature of the California context is its substantial number of school districts and board members. Nearly 5,000 members are currently distributed across 944 LEAs, with individual boards almost always comprising three, five, or seven members. Members are responsible for hiring and evaluating superintendents and other personnel, establishing budget priorities and making funding allocation decisions, engaging in collective bargaining, and determining academic curricular direction. Not surprisingly, the amount of influence wielded by particular board members depend on district attributes such as size. 15 of the largest public school districts have

---

3 The CTA and CFT are state affiliates of the National Education Association and the American Federation of Teachers, respectively. The CTA is the largest teachers’ union in the state with a membership of over 325,000, while the CFT has nearly 85,000 members.

4 According to 2016 Labor Organization Annual Reports filed with the Department of Labor (Form LM-2), the CFT had 95,198 members and fee payers, of which 84,804 were members. In contrast to states with right-to-work legislation, California authorizes unions to collect mandatory agency fees from non-members to cover the costs of contract negotiations and administration. Agency fee payers opt out of fees associated with the union’s political or lobbying activities, comprising one-third of the approximately $1000 fee. The collectively bargained contract is binding for all teachers in the unit regardless if they are members.

5 Estimates come from the California School Boards Association. The aggregate membership count includes the 58 county-level offices of education, as well as other ancillary boards.
average daily attendance of over 40,000 in 2011 while 40% serve fewer than 1,000 students (Ehlers et al., 2011). Districts also differ in their classification of grade configuration. The most popular type is elementary school districts covering K-6 or K-8 schools, followed by unified districts comprising both elementary and high schools.

A final advantage of the California context is the natural experiment created by the ballot order assignment process. In 1975, the state began to rely on randomized alphabets to determine candidate ordering on ballots (California Election Code Section 13112). The Secretary of State’s office conducts a randomized drawing of letters on the 82nd day before an election, and the resulting alphabet applies throughout candidates’ last and first names. Nonpartisan races such as school board elections taking place on major election dates all abide by this alphabet ordering, in contrast to mandated rotation of ballot positions across assembly districts for candidates running for statewide offices.

2.2 Data

We combine multiple electoral and education data sources for our analysis. Comprehensive nonpartisan election data in California provides attributes of school board races and candidates over a period of two decades. This base sample enables the construction of board membership rosters. We then link district-year level data to corresponding randomized alphabets and outcome variables of interest, such as teacher salary schedules.

2.2.1 Ballot order and school board composition

School board elections and candidate data comes from the California Elections Data Archive (CEDA). CEDA covers all races, including non-partisan school board elections, from 1995 to the present day. Election attributes include district name, election date, a list of candidates for each race with their corresponding vote counts, and rank order of outcomes. Candidate characteristics include incumbency status, type of term served, election outcome, and ballot designation in ad-

---

6 School board candidates must file a declaration of candidacy between 113 to 88 days before the election date. As such, the alphabet drawing always takes place after the election entry-deadline and candidates cannot base their decisions to run on their ballot placement.

7 For statewide offices and U.S. Congressional candidates, candidate ordering rotates across each of the 80 Assemblies. Assembly 1 uses the official randomized alphabet while Assembly 2 moves the top-listed candidate to last place, and so on. In contrast, local elections and races for state Senate and Assembly seats do not rotate cross districts.
dition to full names. Ballot designation provides candidates an unique three-word opportunity to describe their principal profession, vocation, or occupation to potential voters.\textsuperscript{8} We characterize candidates as educators if the words ‘teacher’ or ‘educator’ appears anywhere in the designation. We assume that experience as an educator elevates the likelihood that the candidate is aligned with the priorities set forth by teachers’ unions.

We match election dates to a database of randomized alphabet drawings for major elections from 1998 - 2014 collected using press releases from the California Secretary of State’s office. Alphabet orderings up to 2003 are corroborated using Ho and Imai (2008).\textsuperscript{9} We determine the ballot order by applying the alphabet throughout candidates’ last and first names. Multiple sample ballots confirm that the predicted order coincides with actual candidate orderings.

A necessary component for testing the validity of our instrument in a first stage is the ability to observe how school board composition changes over time. We take advantage of the longitudinal nature of the data to construct board member rosters for each district.\textsuperscript{10} The staggered nature of board terms ensures that seats are usually available every two years. We assume that members serving full terms remain for 4 years, while those serving short terms remain for the length of time it takes to reach the next election. These assumptions give us starting and end term dates for each elected board member, which are aggregated for a given district to create the final membership roster.\textsuperscript{11} From there we construct the share of all candidates who were educators in a given election, along with other electoral attributes such as the share of all candidates who are incumbents.

\subsection*{2.2.2 School district attributes}

District characteristics come from the California Department of Education (CDE). CDE documents student enrollment and composition by grade, race/ethnicity, and sex. We control for enrollment to account for the positive correlation between district size and bargaining power which in turn

\textsuperscript{8}Candidates are bound by California regulations to truthfully represent their current professions. Word choice must be approved by election officials and can be challenged in court.

\textsuperscript{9}The full list of randomized alphabets is shown in Table A1.

\textsuperscript{10}Since CEDA data does not report uncontested elections, our rosters are limited to those members who ever participated in a contested race with at least two candidates.

\textsuperscript{11}Our predicted list can underestimate board size if an individual occupies a seat that was never contested, and overestimate board size if members step down or are removed before reaching the term limit. Verification with district websites shows a tight correspondence between constructed and actual membership rosters.
has consequences for teacher salary schedules (Rose and Sonstelie, 2010; Brunner and Squires, 2013). Other district-level factors associated with union activity involve socio-demographic and community attributes (Babcock and Engberg, 1999). As such we account for the proportions of students by ethnicity and free and reduced lunch status using CDE data.

2.2.3 District expenditures and teacher outcomes

We analyze the effect of unions on teacher salary and benefits, a primary educational input within the scope of board oversight. Teacher-related expenditure data comes from the annual report Salary and Benefits Schedule for the Certificated Bargaining Unit, or Form J-90. We focus on instructional time, returns to teacher education and experience under the step and column salary schedule, and bonus availability. Teacher classroom time is measured by actual instructional days and the number of scheduled or required service days. We examine starting salaries for novice teachers at a select level of educational attainment and compute the salary gradient for those who advance from 1 to 5 years of tenure. We plan to extend these analyses to examine the impact of union strength on pay premiums at different experience levels. Existing evidence underscores the importance of distinguishing between frontloaded and backloaded schedules, in which the experience gradient is higher for novice and senior teachers, respectively (Babcock and Engberg, 1999; Ballou and Podgursky, 2002; Grissom and Strunk, 2012). Moreover, we will examine union influence on the key outcome of student achievement using district-level data from the California Department of Education.

To construct the analytic sample, we collapse unique candidate and election date observations to the school board level defined by school district and election year combinations. In doing so we compute board attributes such as membership composition and election characteristics such as the share of incumbents. The sample is then matched to teacher outcomes in the two years following each election as well as district controls such as the proportion of students who are under-represented minorities and the proportion eligible for free and reduced lunch. The final sample spans elections in 1996 - 2015 and includes 4,870 unique school board elections.
2.2.4 Descriptive statistics

Table 1 presents summary statistics for both board elections and school inputs, namely teacher outcomes. The former is defined at the school board level, or unique combinations of school district and election year. We evaluate outcomes for the two years immediately following school board elections, thereby resulting in an outcome sample with approximately twice the number of observations.

In an average school board election, four candidates compete for two seats. The number of available seats can be as high as 7, while the maximum number of candidates for a given election is 28. Over one-third of all candidates are incumbents, and 12% have ballot designations classifying them as former educators. In comparison, 13% among those occupying the top ballot order position and 15% of election winners are former educators.

We examine a range of teacher outcomes spanning instructional time and salary schedules. On average, teachers spent 180 actual days in the classroom, relative to 184 scheduled or required service days based on contract stipulations.\(^1\) As we are interested in the percent change in teacher salaries, we report average log salary at different experience levels (steps). Mean salary is 10.84 and 11.01 among the reference group of teachers at BA + 60 credit hours and 5 or 10 years of experience, respectively. The salary gradient from 1 to 5 years of experience averages 1.15, although some districts observe gradients as steep as 1.37. The gradient from 1 to 10 years of experience averages 1.37. There is also substantial cross-district variation in the number of columns corresponding to semester units completed after the receipt of a bachelor’s degree and steps. Districts average 6 columns and 23 steps, although the maximum levels are 20 and 40, respectively.

3 Research design

We describe our research design aimed at understanding the causal influence of the representation of teachers’ unions on school boards on district inputs and education inputs in this section.

\(^1\)The J-90 questionnaire solicits information on service and instructional days using the following language: “Enter the number of scheduled/required service days per the contract for returning teachers” and “Enter the number of teacher instructional days (actual days in the classroom).”
Table 1: Summary statistics

<table>
<thead>
<tr>
<th>School board election characteristics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Candidates</td>
<td>4870</td>
<td>4.05</td>
<td>1.91</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>Number of Seats</td>
<td>4870</td>
<td>2.09</td>
<td>0.86</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Proportion of Candidates: Educators</td>
<td>4870</td>
<td>0.12</td>
<td>0.19</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Proportion of Candidates: Incumbents</td>
<td>4870</td>
<td>0.37</td>
<td>0.24</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Top of Ballot Educator</td>
<td>4870</td>
<td>0.13</td>
<td>0.34</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Proportion of Winners: Educators</td>
<td>4870</td>
<td>0.15</td>
<td>0.28</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Days</td>
<td>7309</td>
<td>179.65</td>
<td>1.45</td>
<td>148.00</td>
<td>186.00</td>
</tr>
<tr>
<td>Service Days</td>
<td>7309</td>
<td>183.69</td>
<td>2.24</td>
<td>153.00</td>
<td>195.00</td>
</tr>
<tr>
<td>Log Salary at Step 5</td>
<td>7177</td>
<td>10.84</td>
<td>0.14</td>
<td>10.31</td>
<td>11.50</td>
</tr>
<tr>
<td>Log Salary at Step 10</td>
<td>7138</td>
<td>11.01</td>
<td>0.15</td>
<td>10.46</td>
<td>11.54</td>
</tr>
<tr>
<td>Salary Gradient from Step 1 to 5</td>
<td>6846</td>
<td>1.15</td>
<td>0.04</td>
<td>1.00</td>
<td>1.37</td>
</tr>
<tr>
<td>Salary Gradient from Step 1 to 10</td>
<td>6795</td>
<td>1.37</td>
<td>0.08</td>
<td>1.03</td>
<td>1.68</td>
</tr>
<tr>
<td># Columns</td>
<td>7206</td>
<td>5.95</td>
<td>2.16</td>
<td>1.00</td>
<td>20.00</td>
</tr>
<tr>
<td># Steps</td>
<td>7203</td>
<td>23.47</td>
<td>7.86</td>
<td>1.00</td>
<td>40.00</td>
</tr>
</tbody>
</table>

Notes: School boards are defined at the school district and election year levels, while outcomes correspond to the two years immediately following a school board election. As such the latter is defined by unique school board and year combinations. Log salary is defined for teachers at BA + 60 credits with 5 years of experience. MA bonus is an indicator variable for whether the district offers such a bonus. The salary gradient computes the pay slope for Step 5 relative to Step 1 for BA+60.
3.1 Theoretical motivation

We are interested in estimating the causal effects of the influence of teachers’ unions on education inputs and outcomes at the district level. As a result, our primary relationships of interest can be represented by the following linear equation:

\[ Y_j = \beta U_j + \theta \omega_j + \gamma z_j + \mu_j \]  

(1)

\( U_j \) comprises union influence in school district \( j \), vector \( \omega_j \) represents observable inputs ranging from district demographic composition to school attributes, and \( z_j \) includes all unobserved components. Importantly, \( Y_j \) may include both district inputs, such as attributes of teacher salary schedules that affect student performance, as well as student outcomes themselves, ranging from test scores to dropout rates.

The interpretation of findings is facilitated by the focus on both district inputs and outcomes. For example, in rent-seeking models unions optimize outcomes for teachers by negotiating for better compensation and working conditions such as shorter instructional time.\(^{13}\) An objective function that is consistent with rent-seeking would thus obtain \( \beta > 0 \) for inputs that matter for teachers, such as salary. Moreover, such bargaining may potentially come at the expense of students (and taxpayers), in which we would expect a negative relationship between union influence and district outcomes (Hoxby, 1996). An alternative view is that teachers’ unions may advocate for different input levels or resource allocations because of an informational advantage: their proximity to students endows them with greater knowledge of the technology of education production. Unionization increases the likelihood they can realize these preferences, so we would expect positive \( \beta \)s associated with outcomes they deem to be important for student learning.\(^{14}\)

\(^{13}\)A more expansive interpretation of rent-seeking depicts unions as strategic actors in the policy-making process who behave akin to interest groups (Moe, 2009).

\(^{14}\)This relationship between student achievement, school inputs, and union strength can be made more explicit in a structural specification that accounts for the role teacher effort has on input productivity and student outcomes. Following (Hoxby, 1996), we assume the technology of student achievement is linear and additively separable in inputs:

\[ A_j = \beta_1 I_{j1} + \beta_2 I_{j2} + ... + \beta_N I_{jN} + \theta \Omega_j + \gamma Z_j + e_j + \mu_j \]

Achievement \( A \) for a given district \( j \) depends on a vector of \( N \) educational inputs \( I_{j1} \) through \( I_{jN} \), observable factors \( \Omega_j \) ranging from district socio-demographic characteristics to cohort effects, unobserved components \( Z_j \), and teacher effort \( e_j \). Each input is in turn determined by the level of unionization \( U_j \) and a vector of district characteristics summarized by \( W_j \).
Equation (1) illuminates two sources of endogeneity that may confound a causal interpretation of \( \beta \). First, the problem of simultaneity arises because union strength is co-determined by intermediate and student outcomes. Consider the selection of teachers into districts. They may choose a district because collectively-bargained salaries and benefits there are more favorable or because they prefer to work in a higher-performing district. While outcomes depend in part on union influence, they also shape teacher sorting and as a result the union membership base in a given district. Similarly, the election entry decision of school board candidates can be in response to lower-than-expected performance or other district variables, which in turn has implications for unions’ campaigning activity and CBA negotiations. Second, there may exist factors unobservable to the econometrician that are correlated with union strength while directly affecting outcomes of interest. \( z_j \) may include hard-to-observe elements such as preferences for redistribution in a neighborhood, which influences both union presence and the allocation of resources at the district level.

Recent work has pursued multiple strategies to address these sources of endogeneity, including difference-in-difference, instrumental variables, or within-state and local labor market variation in district size. The collective evidence on rent-seeking is so far mixed when examining both intermediate outcomes such as teacher salaries and student achievement or dropout rates.\(^{15}\) Even though these studies isolate plausibly exogenous variation in union strength, they are limited in their ability to identify causal channels, such as representation on local school boards, through which unions fulfill their objectives. We thus take an alternative approach that exploits a feature of California elections to isolate exogenous variation in the share of former educators on school boards.

\[
I_{jn} = \gamma_n U_j + \alpha_n W_j + \epsilon_j
\]

The productivity of any given input \( \beta_n \) is itself a function of teacher effort \( e_j \), which in turn is determined by union strength: \( \beta_n = f_n(e_j); f'_n(e_j) > 0; e_j = g(U_j) \). Evidence consistent with rent-seeking behavior includes reduced teacher effort and lower input productivity: \( g' < 0, \frac{\partial g}{\partial U} < 0 \). In contrast, unions sharing a similar objective function with parents and administrators are expected to observe the opposite effect: \( g' > 0, \frac{\partial g}{\partial U} > 0 \).

\(^{15}\)Hoxby (1996) and Brunner and Squires (2013) find that unionization increase teacher salaries of up to 5%. Others find no effect on teacher pay or any lasting impact on operating expenditures per student (Lovenheim, 2009). Mixed conclusions also prevail in analyses of student outcomes. Lovenheim (2009) finds no impact of unions on student dropout rates. In contrast, Hoxby (1996) documents a 2% increase in dropout rates despite increases to educational inputs and Lott and Kenny (2013) find that student math and reading proficiency rates are lower in states with stronger teachers’ unions.
3.2 Empirical strategy

Our novel identification strategy to estimate causal influence of teachers’ unions via the school board channel is based on an empirical regularity well established in the political science literature: ballot order matters for vote shares.\textsuperscript{16} Previous findings, for instance, quantify the first candidate advantage for winning California school board and city council elections as 4-5 percentage points (Meredith and Salant, 2013). Importantly, ballot order is randomly assigned in California. We thus combine the order of school board candidate names on election ballots with occupation information to identify whether a former educator is listed first. We then use this variable as an “instrument” which exogenously shifts the share of union-aligned candidates elected to the school board. As far as we are aware, this is the first application of the ballot order effect in a first stage setting.

With respect to equation (1), we operationalize $U_j$ as the share of school board members aligned with teachers’ unions. It is worthwhile to clarify that this share decomposes into three parts. It is the sum of the shares of seats won by educators in a given election, the seats held by incumbent former educators, and seats taken in uncontested elections: $U_j = Won_j + Incumbent_j + Uncontested_j$. CEDA data allows us to construct the share of seats that are recently won or held by incumbent educators out of all contested seats, so our ballot order instrument shifts $U_j$ through the $Won_j$ and $Incumbent_j$ channels.

We specify the following first stage to empirically test for the relationship between the ballot order and the share of union-aligned seats:

\begin{align}
\end{align}

\textsuperscript{16}The importance of ballot order has been long recognized by political scientists (Gold, 1952; Bain and Hecock, 1957). Early evidence on this subject was dominated by observational studies and laboratory experiments with limited external validity (Miller and Krosnick, 1998). In the early 2000s researchers began deriving credible causal estimates using natural experiments (Ho and Imai, 2006). While effects are largely minimal or null in US-based general elections, results show sizable effects for primary elections, nonpartisan races, or elections with low salience (Koppell and Steen, 2004; Alvarez et al., 2006; Ho and Imai, 2008). The ballot order effect is not a phenomenon limited to the academic literature. Maeroff (2010) quotes a candidate as being “delighted when my name came out first, giving me the top position on the ballot. What a fortunate piece of luck. I was as lucky as a jockey who gets the rail position in the Kentucky Derby. The names of candidates are often unknown or barely familiar to voters in school board elections and so for those who mark ballots arbitrarily from top to bottom my name would appear first.”
order instrument, which we denote $D_j$, and our proxy for union strength: \(^{17}\)

$$U_j = \pi D_j + \lambda X_j + \xi_j$$  \hspace{1cm} (2)

We define the instrument, $D_j$ using an indicator variable for being listed first on the ballot and a former educator. The exclusion restriction maintained for causal inference is that conditional on $X_j$, $D_j$ is independent of outcomes: $\text{cov}(D_j, \epsilon_j) = 0$. Threats to identification come about when shifting board composition is not the only channel via which the ballot order instrument influences outcomes. Since ballot order by design involves random assignment, the scope for district-level confounders is very limited. For instance, while districts may have different compositions of former educators and therefore different expected former educator shares, we can directly condition on the share of candidates in an election who are former educators. Exogenous variation for union strength is then arguably easier to establish using this election ballot-based instrument compared to alternative estimation strategies, namely difference-in-difference designs. The parallel trends assumption requires that in the absence of treatment, both treated and untreated groups would experience the same time trends conditional on observables. If states institute broad policy changes that affect both laws facilitating unionization and educational outcomes, then hard-to-observe changes in the policy environment can confound attempts to estimate causal influence by virtue of directly affecting student outcomes while being correlated with the timing of unionization. In contrast, the randomized ballot ordering at the core of our instrument is unlikely to affect educational outcomes via any channel except for shifts in school board composition.

4 Results

In this section, we present preliminary results of our analysis. We first present first stage estimates aimed at establishing that randomized ballot order shifts the representation of union-aligned board members. We also examine the validity of our design with a placebo test that examines

\(^{17}\)One factor that impacts the power of our first stage is the possibility of changed campaigning tactics in response to candidates’ assigned ballot order. For instance, those at the top of the ballot may scale back their campaigns because they believe the reduced effort will be offset by their relative order advantage, while those near the bottom of the ballot may increase their effort. Even if these behavioral changes are present, their influence is limited to the time frame of 82 days between the alphabet drawing and election date. Furthermore, the hypothesized direction of these responses would attenuate the magnitude of our results, such that they underestimate the true ballot order effect.
the relationship with educators on the school board who are not up for election. We then present reduced-form estimates that examine the causal effects on teachers’ working conditions, including instructional days, salaries, and pay gradients.

4.1 First stage

First stage results examine the effect of the ballot order instrument on school board composition, our proxy for union strength. We estimate Equation 2 using an indicator for a former educator listed at the top of the ballot. Coefficients correspond to three dependent variables: 1) the proportion of winners in a given school board election who are educators, 2) the proportion of all school board members who are educators (that were elected in a contested election and therefore observed in CEDA elections data), and 3) the proportion of school board members not up for election who are educators. The first measure is a subset of the full school board by construction, since we only observe the share of educators among winners in a single election. The second measure uses longitudinal elections data to create the full roster of school board members, and therefore is our “treatment” variable in the second-stage analysis. In contrast, the final measure is a placebo test because ballot position should have no bearing on the composition of already elected members. We thus use this final specification to test for instrument validity.

Table 2 reports first stage coefficients corresponding to the three previously described measures. We run specifications with and without additional covariates for a total of six estimates. Being an educator at the top of the electoral ballot increases the proportion of educators among election winners by 7 percentage points in both specifications. While the addition of control variables increases precision, their inclusion has no bearing on the estimate magnitude. When taking into account the full board instead of restricting to available seats, being a first-listed educator increases the proportion of educators on the board by 3 percentage points. This precisely measured source of variation in school board composition generated from ballot order assignment is plausibly exogenous, conditional on election characteristics such as the share of candidates who are former educators. Further evidence of the validity of our instrument comes from the final set of placebo estimates. Being an educator at the top of the ballot has no discernible effect on the composition of incumbent board members. This is to be expected given that higher ballot order
confers no advantages for this group.

### Table 2: First stage

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Ballot Educator</td>
<td>0.067***</td>
<td>0.067***</td>
<td>0.034***</td>
<td>0.032***</td>
<td>-0.002</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.016)</td>
<td>(0.010)</td>
<td>(0.010)</td>
<td>(0.006)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Controls</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Observations</td>
<td>4,870</td>
<td>4,870</td>
<td>4,870</td>
<td>4,870</td>
<td>4,870</td>
<td>4,870</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.576</td>
<td>0.600</td>
<td>0.348</td>
<td>0.409</td>
<td>0.022</td>
<td>0.141</td>
</tr>
</tbody>
</table>

Notes: The first specification includes the share of candidates who are former educators. The second specification augments the model by including a quadratic of the share of candidates who are former educators, the share of incumbents, district size, the share of students who are black, Hispanic, or Asian, the share of students who are eligible for free and reduced lunch, missing indicators for ethnicity and free and reduced lunch status, election year and month, the number of seats and candidates, and county fixed effects. Standard errors are clustered at the district level. *** p < 0.01, ** p < 0.05, * p < 0.1

### 4.2 Reduced form

After establishing a robust first stage relationship that being an educator at the top of the ballot increases the proportion of former educators or union-aligned board members, we estimate the effect of the ballot order instrument on several dimensions of teacher outcomes, from instructional time during the academic year to salary premiums. Table 3 presents these reduced form results. All specifications include controls for the shares of candidates who are former educators, the shares of incumbents in the race, district size, student composition by ethnicity and free and reduced lunch eligibility, election date, the number of seats and candidates, and county fixed effects.

The first candidate advantage among educators leads to 0.3 fewer service days. The analogous estimate for the number of instructional days is more precise and cannot rule out a small decrease, even though it is statistically insignificant. Next we turn to the effect that an educator candidate at the top of the ballot has on log salaries. Both coefficients for salaries corresponding to 5 and 10 years of experience are insignificant, although positive. In addition to salary levels, we examine changes in the salary gradient as teachers with a given level of education (BA and 60 credit hours)
progress through their careers. We find that having an educator at the top of the election ballot increases the gradient by 0.5 percentage points among those who advance from Step 1 to 5 years of experience. The magnitude is 0.8 percentage points for teachers who move from Step 1 to 10. Taken together, these results suggest that having more union-aligned school board members slightly reduce the number of required service days for teachers and increase the slope of teacher salaries.

**Table 3: Reduced form results**

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days of:</td>
<td>Log salary</td>
<td>Salary gradient</td>
<td>Number of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instr.</td>
<td>Service</td>
<td>Step 5</td>
<td>Step 10</td>
<td>Step 1 to 5</td>
<td>Step 1 to 10</td>
<td>Columns</td>
<td>Steps</td>
</tr>
<tr>
<td>Top of Ballot Educator</td>
<td>-0.087</td>
<td>-0.254**</td>
<td>0.003</td>
<td>0.004</td>
<td>0.005**</td>
<td>0.008*</td>
<td>0.271*</td>
</tr>
<tr>
<td>(0.066)</td>
<td>(0.117)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.158)</td>
<td>(0.397)</td>
</tr>
<tr>
<td>Observations</td>
<td>7,309</td>
<td>7,309</td>
<td>7,177</td>
<td>7,138</td>
<td>6,846</td>
<td>6,795</td>
<td>7,206</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.200</td>
<td>0.272</td>
<td>0.769</td>
<td>0.781</td>
<td>0.352</td>
<td>0.399</td>
<td>0.213</td>
</tr>
</tbody>
</table>

Notes: Log salary outcomes are for teachers with a BA degree and equivalent of 60 credit hours. Salary gradients are computed for teachers of varying years of experience at this education level. All specifications include a quadratic of the share of candidates who are former educators, the share of incumbents, district size, the share of students who are black, Hispanic, or Asian, the share of students who are eligible for free and reduced lunch, missing indicators for ethnicity and free and reduced lunch status, election year and month, the number of seats and candidates, and county fixed effects. Teacher outcomes are measured in the two years following a school board election. Standard errors are clustered at the district level. *** p < 0.01, ** p < 0.05, * p < 0.1

**5 Conclusion**

In this paper we present the first causal evidence of unions’ influence over district outcomes through the channel of shifting school board representation. School boards emerge as the most prominent channel of effecting change because they have substantial latitude in local educational decision-making and they are the entity with which unions engage in collective bargaining negotiations. Consequently, the scope of union influence vis-à-vis boards includes key educational inputs such as teacher pay and working conditions. The ability to estimate their causal contribution, however, has been beset by identification challenges. We are able to address these difficulties using a novel ballot order-based instrument. By relying on random ballot order assignment in California local elections, our instrument generates exogenous variation in union strength as proxied...
by the share of union-aligned school board members.

We present evidence of meaningful first candidate advantages in the first stage. Union-aligned candidates at the top of the ballot are significantly more likely to win and therefore increase the proportion of union-favored board members. Our results suggest that this has a number of consequences for teacher policies governed by collective bargaining. In the two years immediately following board elections, an incremental union-aligned candidate at the top of the ballot leads to a small decrease in the number of scheduled or required service days and higher growth in teacher salaries. These findings are consistent with teachers’ unions maximizing benefits for their membership base.

Even though the ballot order instrument was used in this context to study the influence of teachers’ unions, its applications are potentially wide-ranging. The ability to identify exogenous sources of variation in the composition of elected public officials enables better understanding of the relationship between governance structures and the provision of public goods, of which education is only one example. Future research can examine the ways in which ethnic or partisanship composition on these governing bodies affect decision-making and resource allocation.
References


### Table A1: Alphabet ordering: 1998 - 2014

<table>
<thead>
<tr>
<th>Election date</th>
<th>Ordering</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/2/98</td>
<td>L W U J X K C N D O Q A P T Z R Y F E V B H G I M S</td>
</tr>
<tr>
<td>3/7/00</td>
<td>O P C Y I H X Z V R S Q E K L G D W J U T M B F A N</td>
</tr>
<tr>
<td>11/7/00</td>
<td>I T F G J S W R N M K U Y L D C Q A H X O E B V P Z</td>
</tr>
<tr>
<td>3/5/02</td>
<td>W I Z C O M A Q U K X E B Y N P T R L V S J H D F G</td>
</tr>
<tr>
<td>11/5/02</td>
<td>H M V P E B Q U G N D K X Z J A W Y C O S F I T R L</td>
</tr>
<tr>
<td>3/2/04</td>
<td>V A X E U I G S L C T K F W P O B N Y R Z D H M J Q</td>
</tr>
<tr>
<td>11/2/04</td>
<td>J M Z R N L P Q O H I G X D F K E S C W T U A B V Y</td>
</tr>
<tr>
<td>11/8/05</td>
<td>G K X H N C S P V R T B L A O M I D E Z J F Y W Q U</td>
</tr>
<tr>
<td>11/7/06</td>
<td>G O H D U J B M C I E N X Z W R L Y F Q A P T S K V</td>
</tr>
<tr>
<td>11/6/07</td>
<td>D F X K Z L R E Q T U B S I P J N V H W O G A Y M C</td>
</tr>
<tr>
<td>6/3/08</td>
<td>H E A N O V P J U L S M X B C T I K R Q D Y F W G Z</td>
</tr>
<tr>
<td>11/4/08</td>
<td>R X M W S J L H A Z I D F Y G V C K N E O P U Q B T</td>
</tr>
<tr>
<td>6/5/12</td>
<td>U N A D I V X W Q G O Z L T R K S J H M C B F P Y E</td>
</tr>
<tr>
<td>11/6/12</td>
<td>I X C A O U Z S W H K T D F Q V G M R J L Y E B P N</td>
</tr>
<tr>
<td>11/5/13</td>
<td>G W C O K H Z A T S V Y E F Q U D N M X B I R P L J</td>
</tr>
</tbody>
</table>

**Notes:** Randomized alphabets up to 2003 are corroborated using Ho and Imai (2008), while remaining alphabets come from the California Secretary of State’s office.