The Effect of Teachers' Unions on Teacher Stress: Evidence from District-Teacher Matched Data

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Abstract

This study examines the effect of teachers' unions on the stress that teachers experience in their schools. Relying on a nationally representative district-teacher matched dataset in pre-pandemic periods, we employ principal factor analysis to assess to teacher stress and use both contractual status and union membership to measure union strength. Based on multilevel linear model, we find that teachers' unions are negatively associated with teacher stress. We then exploit natural experiments that occurred in several U.S. states to identify the effect of legal and institutional changes weakening the strength of teachers' unions on teacher stress. Using the difference-in-difference estimation, we find that the new legislation in these states significantly increases teacher stress, and that the magnitudes of this negative impacts are greater for male, more experienced and qualified, secondary school, and STEM-subject teachers.

JEL Codes: I10, I20, J45, J51

Key Words: teacher stress, teachers' unions, collective bargaining, meet and confer, union membership

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According to teachers' self-ratings and comparisons of stress across professions, teaching is a high-stress profession, and many teachers experience serious emotional and mental problems related to the stress in their schools (AFT & BAT, 2017; OECD, 2020). The teacher stress problem has recently received renewed attention, as recent studies indicate that the COVID-19 pandemic might have contributed to worsened teachers' stress: Teachers are required to work more hours in a challenging working environment, juggling frequent technical difficulties in an online platform, and even find suitable approaches to reach, provide support, and deliver instruction to their students (Bakerman, 2020; Carver-Thomas, Leung, & Burns, 2021; Diliberti, Schwartz, & Grant, 2021; Hodges, et al. 2020; Authors 1, 2020b; Barnum, 2021).

Stress is the most common reason for leaving teaching early, and it is also associated with job absenteeism and the poor performance of teachers (Farmer, 2020; Greenberg, et al. 2016; Madigan & Curran, 2020). Moreover, teacher stress has been also shown to have a negative influence on student well-being (Becker, et al., 2014; Ramberg, et al., 2020). Thus, it is important to investigate what influences job-related stress among our teachers and which factors can help decrease teacher stress.

Teachers' unions aim to offer more favorable employment conditions (higher pay and better working conditions), bargain for more resources for professional development and greater autonomy in classrooms, and improve general well-being (Allegretto & Tojerow, 2014; Author2, 2019; West, 2015; Moore-Johnson, et al., 2007). Teachers' unions also provide teachers with a "voice" to express their concerns in the workplace (Freeman et al. 2007; Addison & Belfield, 2004). Through these channels, teachers' unions can reduce job-related stress. On the other hand, teacher stress may be greater in a highly unionized setting, because of formal due processes and political disagreements among members (Flavin & Hartney, 2015; Paglayan, 2019). These

seemingly opposite mechanisms through which teachers' unions may influence teacher stress motivate our study.

This study examines the effect of teachers' unions on the stress that teachers experience in their schools. Relying on a nationally representative dataset in pre-pandemic periods, we first document teacher stress and describe the relationship between teacher unionization and teacher stress by various teacher subgroups, such as gender, experience, and school level, as well as teaching subject. If teachers' unions were to reduce teacher stress, any environmental changes that reduce union strength could lead to higher teacher stress. Exploiting natural experiments that occurred in Idaho, Indiana, Tennessee, and Wisconsin in 2010-2011, we then identify the effect of legal and institutional changes weakening the strength of teachers' unions on teacher stress, based on difference-in-difference estimation.

We find that teachers' unions, assessed by various metrics, are negatively associated with teacher stress. We also find that new anti-union state legislations significantly increase teacher stress, and that the magnitudes of the negative impacts are greater for male, more experienced, qualified, secondary school, and STEM-subject teachers.

Literature

Teacher Stress – Why It Matters

Analyzing the literature on teacher stress faces one significant framing question, which is how stress is defined and measured. Often, the definition and metrics of stress are based on subjective assessments of one's stress, as opposed to formal diagnoses or tests conducted by healthcare professionals. For instance, self-assessment of stress can be done through one survey question about stress by evaluating several situations potentially conducive of stress, or by

observing respondents' reactions to stressful events (Allen & Van Der Velden, 2005; Crosswell & Lockwood, 2020; WHO, 2020). Stress is often proxied by burnout, emotional exhaustion, anxiety, low morale, or dissatisfaction, and, in some cases, it is assessed as a component of these items (Maslach & Leiter, 2016; Kelly & Northrop, 2015; Authors 2, 2021).

Despite this variation in stress measurement, the general consensus is that teaching is a profession characterized by high levels of stress, burnout, and emotional exhaustion and that stress has important consequences on teachers' health, work lives, and student outcomes (Chang, 2009; Madigan & Curran, 2020; Greenberg, et al., 2016). Teachers see themselves at a high risk of stress and with poor mental health. Teachers report they are exposed to a high risk of stress and occupational burnout, fatigue, and depressed mood (Ramberg, et al., 2020; Kovess-Masféty, et al., 2006). Recent data from more than 4,000 respondents to a survey administered by AFT and BAT show that 58 percent of the respondents in the public sample noted that their mental health was "not good" for seven or more of the past 30 days (data from 2017, up from 34 percent in 2015, AFT & BAT, 2017).

Stress is the main factor contributing to job dissatisfaction, job-related illness, and early retirement (Farmer, 2020). Stress can also lead to lower productivity, greater absenteeism, burnout, depersonalization from the job, low morale, lower quality classroom interaction, as well as students' diagnosed behavior problems and poorer performance (Hanson, 2013; Greenberg, et al. 2016; McLean & Connor, 2015).

In addition, teacher stress influences teacher turnover (Greenberg, et al., 2016). While causal evidence is limited in the teaching sector, the conceptual model that underlies these relationships is borrowed from the organizational management literature examining the links between occupational stress and employee attrition (see Holt et al., 2020 for further discussion).

Kelly and Northrop (2015) find that teacher stress and burnout are positively correlated with school problems and lack of support, and, ultimately, with novice teachers' attrition. According to the Phi Delta Kappan (PDK) poll in 2019, approximately 20 percent of teachers who had considered leaving the profession selected stress, pressure, or burnout as the main reason. On the contrary, teachers with greater morale and job satisfaction are less likely to quit (Authors 2, 2021). Thus, to the extent that teacher stress is negatively associated with job satisfaction or morale in their schools, stress can contribute to teachers' voluntary attrition. Excessive turnover and voluntary attrition reduce resources that could be used for other, more productive, purposes.[1] In addition, instability in a school's teacher workforce due to high turnover diminishes teacher effectiveness and education quality, negatively affecting student achievement (Ronfeldt, Loeb, & Wyckoff, 2013; Jackson & Bruegmann, 2009; Kraft & Papay, 2014; Sorensen & Ladd, 2020).

This close link between teacher turnover and stress is also found in other countries. International comparative evidence indicates that teachers who report experiencing stress in their work 'a lot' are twice as likely as colleagues with lower levels of stress to report that they will stop working as teachers in the next five years (OECD, 2020).

Several studies find the negative association between teacher stress and student outcomes. A recent meta-analysis by Madigan and Curran (2020) reveals that teacher burnout has a significantly negative relationship with students' academic performance. Herman, Hickmon-Rosa, and Reink (2018) report that teachers in high stress, high burnout, and low-coping classes were associated with the poorest student outcomes. McLean and McDonald Connor (2015) also show that teachers' depressive symptoms were predictors of poor student achievement in mathematics. Two studies using large-scale assessments from Germany find that teachers' emotional exhaustion and well-being are important predictors of students' achievement

in mathematics and reading at the elementary level (Klusmann, Richter, & Lüdtke, 2016; Arens & Morin, 2016). Ramberg et al. (2020) find negative associations between school-level teacher stress, fatigue, and depressed mood and students' school satisfaction. Arens and Morin (2016) also find that teachers' emotional exhaustion is negatively associated with students' school satisfaction and perception of teacher support.

The existing evidence also discusses where teacher stress comes from, and most studies focus on work-related aspects. Demands on teachers constantly increase and are changing, which requires that they continually adapt their knowledge and practice: Some changes in demand come from the need to teach changing curriculums, new skills, and meet administrative requirements (Jerrim et al., 2020; OECD, 2019; Authors 1, 2019b). Other factors, such as long work hours, excess administrative work, lack of resources, accountability, and other policies add to the burden (Jerrim & Sims, 2021; Ryan, et al., 2017; McCarthy, 2019; etc.). Loeb et al. (2005) indicate that the strongest predictor of teacher stress is how teachers perceive their workplace characteristics. Teacher stress may also come from the fact that school climates are complex; teachers are critical actors in the safety net protecting children, and their students' behaviors also affect their mental health (Collie, Shapka, & Perry, 2012; Authors 1, 2019a). Relatedly, some of the roles teachers play, such as counselor and social worker, are listed among the most stressful occupations in the U.S. (Williams, 2021).[2]

Teachers' Unions and Teacher Stress

Considering the significant relationship between teacher stress and educational outcomes, identifying factors that can reduce teacher stress should be of interest to researchers, educators, and policymakers. To our knowledge, researchers have overlooked the relationship between

teachers' unions, the institutional landscape, and teacher stress. Because stress can be seen as an early indicator reflecting multiple root causes that could affect teachers' odds to be in the profession and their effectiveness, it should be of unions' interest to examine such a relationship so that they can help reduce teacher quits or raise job quality (morale, job satisfaction and career agency, influence, prestige, and others).

According to the "exit-voice" hypothesis, workers can decide to leave their employer (exit-option) or express discontent with their employment conditions (voice-option), and unions can serve as a means for employees to address the problems they face at the workplace (Hirschman, 1970; Freeman & Medoff, 1984). This theory suggests that, by providing employees with a "voice," a channel to express their concerns and preferences in the workplace, unions can help reduce the quit rates of employees (Batt, Colvin, & Keefe, 2012; Freeman et al. 2007; Freeman, 1980). This "voice" channel also improves communication between employers and employees and enhances workers' commitment to the organization (Gunderson, 2015; Batt, Colvin, & Keefe, 2012; Freeman et al. 2007; Addison & Belfield, 2004). Therefore, teachers' unions should also be able to reduce teacher stress because of their role as a mediator between teachers and their districts.

In addition, teachers' unions aim to offer more favorable employment conditions and improve well-being, ultimately reducing teacher stress. Numerous studies show that unions significantly raise teacher salaries (Allegretto & Tojerow, 2014; Baugh & Stone, 1982; Freeman & Valletta, 1988; Hirsch, Macpherson, & Winters, 2011; Strunk, 2011; West, 2015). Researchers also find that unions improve working conditions and raise non-wage benefits (Freeman & Medoff, 1984; Eberts & Stone, 1984; Hirsch, Macpherson, & DuMond, 1997; Podgursky, 2003; Budd, 2007; Author 2, 2019).

Moreover, teachers' unions empower teachers, allowing greater control in their classrooms and influence in school policies, provide a more supportive work environment, and offer more resources for professional development (Moore-Johnson, et al., 2007; Jones, Bettini, & Brownell, 2016; Lyon, 2020; NEA, 2012). Through these functions, teachers' unions are able to raise teacher morale and professionalism, which potentially reduces job-related stress.

In contrast, unions may raise teacher stress through several channels. Teachers' unions boost the political engagement of their members (Flavin & Hartney, 2015; Paglayan, 2019), but this may lead to political conflicts and misrepresentation of some teachers with opposing views. Teachers' unions often support more formalized evaluation processes in response to accountability plans (Cowen & Strunk, 2015), and the lack of flexibility may add to teachers' stress as well.

Considering these potentially opposite mechanisms through which teachers' unions influence teacher stress, our study makes the first rigorous attempt to empirically test and examine the causal impact of teachers' unions on teacher stress. Because teachers with different backgrounds and characteristics, including gender, experience, and school level, as well as teaching subject, may perceive stress differently, and union effects may vary by teacher subgroup, we also conduct a separate analysis for each of these subgroups.

Data

The primary data source of this study is the *Schools and Staffing Survey* (SASS). The SASS, administered by the National Center for Education Statistics (NCES), is nationally representative data that cover about a third of U.S. public school districts. The SASS data are

multilevel format, where teachers are grouped within their schools and the schools are grouped within their corresponding school districts. In the 2011-2012 SASS, approximately 37,230 teachers are nested in 4,600 districts.

We first construct a district-teacher matched dataset by linking data on teachers and their districts within each wave of three survey years (2003-2004, 2007-2008, and 2011-2012 school years) of the SASS, and combine three waves to create a pooled district-teacher matched dataset. For a tighter analysis, we restrict our sample to regular full-time teachers.

Our information on teacher stress comes from the SASS' teacher-level questionnaires. There are five survey questions that are related to teacher stress, burnout, and emotional exhaustion, and they ask teachers to what extent they agree, ranging from strongly agree to strongly disagree, with each of the following statements:

1) The stress and disappointments involved in teaching at this school aren't really worth it.
2) If I could get a higher paying job, I'd leave teaching as soon as possible.
3) I think about transferring to another school.
4) I don't seem to have as much enthusiasm now as I did when I began teaching.
5) I think about staying home from school because I'm just too tired to go.

We employ principal components analysis (PCA) to aggregate these five questions into a single factor to assess each teacher's stress. We code the factor such that a greater value indicates greater teacher stress. The principal factor explains 66% of total variance of teacher stress, and it is mostly defined by items 1 and 4 above. The Cronbach's Alpha scale is 0.774, which is well above the rule of thumb of 0.7, indicating that the items have relatively high internal consistency.

Although this proxy measure for stress does not explicitly measure the absolute level of teacher stress, this approach helps us assess teachers' self-evaluation of their mental and

emotional health, associated with stress and burnout in their workplace. This might be a better way of assessing their own occupational stress, because stress is largely subjective, and what is more important may be how individual teachers perceive their level of stress, rather than how experts measure the absolute level of stress.

The SASS' teacher-level questionnaires also contain information on various problems observed in schools. Using the PCA, we also construct a school problem factor, which represents a set of obstacles or barriers to teaching and learning, such as student absenteeism, lack of parental involvement, poor student health, etc. (see Appendix II for detailed questionnaires included for school problems). For this school problem factor, a greater value indicates more serious school problems.[3]

Since workers' employment conditions depend on the economic situation of employers (Eberts & Stone, 1985), it is important to consider the financial status of local school districts in the analysis of the effect of teachers' unions. Thus, we link the SASS with the *Local Education Agency (School Districts) Finance Survey* (F-33), which detail annual fiscal data on public elementary and secondary education for every school district in the U.S. By using the districts' finance information, we can compare the districts with similar financial status, such as total district revenue.

Additionally, we merge information of the NCES' *Comparable Wage Index* (CWI), which measures the salaries of occupations that are comparable to teaching in the local labor market (Taylor & Fowler, 2006). The CWI is available at the district level, so it provides the mean for geographical comparisons for locality differences such as cost of living and other labor market conditions. The CWI also assesses the opportunity cost of teaching over a nonteaching career in the district.[4]

We assess district-level union strength in two metrics. First, we look at the contractual status between unions and their districts based on the district-level SASS. There exist three types of contractual status between teachers' unions and districts: a collective bargaining agreement (CB), a meet-and-confer agreement (MC), and no agreement (NA). According to the statistics reported in Table 1, approximately 60% of teachers are covered by CB. When CB is not available (either because there is no CB law or CB is banned for public school teachers, according to states' labor laws), meet-and-confer (MC) can be an alternative, and 11% of teachers are covered by MC. During MC, unions and districts exchange views and discuss proposals which can lead to an agreement, but unlike the CB contracts, MC agreement is typically legally unenforceable and no formal contract takes place afterwards. However, in some cases, both districts and unions mutually understand the MC agreement as implicitly binding.[5]

Our second measure for teacher unionization is union membership rate (union density). Based on information on individual teachers' union membership status from the SASS, we construct union density by each district. The union density can be a good metric, especially in the absence of CB, because unions can engage in political activities, such as lobbying school districts for better compensation packages and working conditions and electing school board members who are positively inclined to unions' requests. We also use individual teacher's union membership status as an additional measure for teacher unionization.

Our pooled district-teacher matched SASS dataset offers a rich set of control variables for public school teachers and their districts, in addition to these focus variables. Table 1 provides summary statistics of key variables, including the union measures.

Figure 1 presents the mean values of teacher stress by teacher characteristic. On average, female teachers express higher stress than male teachers. Less-experienced teachers, compared to

more experienced teachers, report lower stress. Teachers with Highly Qualified Teacher (HQT) certification express higher teacher stress than teachers without it.[6] Secondary school teachers report a greater stress level than primary school teachers. Teachers of Science, Technology, Engineering, and Math (STEM) subjects experience higher stress, compared to non-STEM teachers. The differences in teacher stress between teacher characteristics in each teacher subgroup are statistically significant, at least at the 5% level.

Figure 2 describes the relation between teacher stress and teachers' unions, assessed by the district's contractual status and teachers' union membership status. Overall, teachers' stress is the lowest in the districts covered by a CB contract and highest in the districts that have neither a CB nor a MC. Teacher stress in the MC districts falls in the middle of the two. Union teachers exhibit a lower stress level than non-union teachers. All differences in teacher stress among teacher unionization (CB vs. NA; MC vs. NA; union vs. non-union status) are statistically significant at the 1% significance level. Figure 3 depicts the relationship between teacher stress and union density using the scatter plot and a fitted line. Teacher stress has a weakly negative association with union density. In general, the patterns shown in both Figures 2 and 3 suggest that teachers' unions are inversely related to teacher stress.

Empirical Strategies

Ordinary Least Squares (OLS) Regression

Based on employment of the pooled district-teacher matched data, we first run OLS regressions to see the general direction of the association between teacher unionization and

teacher stress of the following equation, controlling for an extensive set of teacher and district characteristics that are presented in Table 1:

$$Stress_{ikt} = \beta_0 + \beta_1 Union_{kt} + \beta_2 X_{ikt} + \beta_3 Z_{kt} + \lambda_t + \varepsilon_{ikt,} \quad (1)$$

where *I*, *k*, *and t* indicate teachers, districts, and years, respectively. $Stress_{ikt}$ represents the level of stress teacher *i* experiences at his/her district *k* in year *t*, with the scale of 1 – 4 (1 being lowest and 4 being highest). $Union_{kt}$ measures the strength of teacher unionization of district *k* in year *t*, either by contractual status or union density. X_{ikt} is the vector of control variables at the teacher level, and Z_{kt} is the vector of control variables at the district level. λ_t is the year dummy, distinguishing between our three waves, and ε is the error term reflecting variation not accounted for in the model.

Multilevel (Hierarchical) Linear Model

This OLS estimator, however, will suffer from omitted variable bias if certain characteristics of districts are associated with both teacher unionism and teacher stress. For instance, teachers in larger districts are able to unionize more efficiently, due to the lower cost of organizing (more members to be covered by a single union representative), potentially allowing more resources for teachers, which leads to overestimation of union influence on teacher stress in large districts. The industrial/occupational base of the local economy, such as urbanism of districts, may also play an important role, because urban districts can offer a greater variety of non-teaching career options, compelling districts to pay their teachers more competitively, which eventually reduces teacher stress. To address these endogeneity issues, we control for district

size (measured by K-12 student enrollment), cost of living (measured by CWI), financial resources (measured by total district revenue), and the occupational base (measured by urbanism) of each district.

Even though we control for these various factors to minimize potential omitted variable bias, there may exist unobservable factors that can still pose an endogeneity problem. One such factor is political inclination, such as the general attitude towards provision of public education. For instance, if the districts that have been favoring the Democratic party for the past several decades tend to adopt public policies that allocate more resources to public education, the OLS regressions will overestimate the union effects. If, on the other hand, districts with less educational resources are more likely to produce a pro-union atmosphere, partly because more teachers would want to unionize for greater bargaining power and support in those districts, the OLS estimates will be biased downward.

Teachers in the same district may share these common cultural and political experiences that are unobservable. When this commonality is large, teachers in the same district may have the same value of the district-level residual, and the standard OLS estimates will suffer from the bias. To examine if the commonality among teachers within the same district is large or small, we estimate intraclass correlation (ρ), a summary of the proportion of the outcome variability that is attributable to differences across districts.[7] When ρ is large (close to 1), the within-district variation among teachers is so small that teachers in the same district behave almost identically. When ρ is small (close to 0), the teachers in the same district are almost independent from each other, and the simple OLS regression could suffice for the analysis. In our models, we estimate the between-district variance component ($\hat{\sigma}_u^2$) to be 0.101 and within-district variance component ($\hat{\sigma}_\varepsilon^2$) to be 0.225, yielding the intra-class correlation (ρ) of 0.309. This sizable value of ρ implies

that teachers within the same district do not behave independently of one another, and that there exist unobservable omitted factors in the error term. Thus, the multilevel models are preferred to the OLS models.

We then conduct the likelihood ratio test, which demonstrates that the random slope is not necessary for our samples. Thus, we treat the effect of teachers' unions similarly for all districts in our teacher-level analysis, and the model estimates a single regression line representing the population average while the district-specific intercept shifts this regression line up or down. Thus, we estimate the following multilevel mixed-effects linear model:

$$Stress_{ikt} = (\beta_0 + u_k) + \beta_1 Union_{ik} + \beta_2 X_{ik} + \beta_3 Z_k + \lambda_t + \varepsilon_{ikt}, \qquad (2)$$

where *i, k, and t* indicate teachers, districts, and years, respectively. Model (2) estimates a single coefficient for each independent variable (fixed effects), so the effect of teachers' unions is assumed to be the same (β_1) for all districts. However, the model allows a district-specific intercept (u_k) for each district (random effects). This model is "mixed-effect" because it has both fixed effects and random effects components. We use robust standard errors with school districts as the second level, and all models use scaling of sampling weights of both teachers' and districts' final sampling.

Difference-in-Differences

For further corroboration, we exploit the change in state legislation that occurred in Idaho, Indiana, Tennessee, and Wisconsin, in order to carry out a difference-in-difference (DID)

estimation of the causal impact of change in the legal framework of teachers' collective bargaining rights in those states on teacher stress.

In 2010-2011, state legislators in these four states launched unprecedented initiatives substantially restricting or entirely prohibiting the CB rights of public sector employees, including teachers, and ultimately weakening their unions. In Idaho, CB was no longer permitted unless the union could validate that at least half of a district's teachers are union members. The new legislation also limited CB to salaries and benefits. Indiana passed right-to-work laws, which prohibit mandatory union membership and ban unions from requiring non-members to pay a "fair share" of union dues, and only wage and wage-related items can be bargained under the new law. Tennessee passed the "Professional Educators' Collaborative Conferencing Act," banning the CB rights of public school teachers. Wisconsin enacted "Act 10," which eliminated the agency shop and restricted CB so that only wage and wage-related items can be bargained, while requiring teachers' unions to obtain annual recertification. It also capped the annual growth in base pay to the rate of inflation. These legal changes are so momentous that researchers refer to this as "union reform" (Roth, 2019).

The natural experiment that occurred in these states enables us to analyze the causal impact of changes in legal institutions from union reforms on teacher stress. If teachers' unions indeed reduce teacher stress, we should be able to observe that the legal and institutional changes weakening teachers' unions in these states raise teacher stress. To test this hypothesis, we employ the DID estimation of the following equation, using the treatment group composed of the four states and the control group of all other states:

$$Stress_{ist} = \alpha_0 + \alpha_1 Treat_{ist} + \alpha_2 After_{ist} + \alpha_3 (Treat_{ist} * After_{ist}) + \varepsilon_{ist}, \quad (3)$$

where *i*, *s*, and *t* indicate teachers, states, and years, respectively. *Treat* equals to 1 for the treatment group and 0 for the control group, and *After* equals to 1 if the school year is 2011-2012 and up and 0 if the year is before 2011-2012. α_3 gives us the DID estimator for the effect of the weakening of teachers' unions on teacher stress.

We run separate analyses for various subgroups of teachers to see whether union effects differ by those groups. All DID models are weighted by teachers' final sampling weight, and standard errors are clustered at the state level.

The DID estimates the effect of a legal change on teacher stress by comparing the average change over time in teacher stress in the districts affected by the legal change (the treatment group) to the average change over time in teacher stress in unaffected districts (the control group). The treatment and control groups may have been different in some ways prior to the legal change, and the DID takes this into consideration by deducting the common time trend effect in both groups.

Therefore, to implement the DID, we should make sure that the trends of treatment and comparison groups in pre-treatment teacher stress should be the same, although those two groups may have different levels of teacher stress prior to the legal changes. Figure 4 presents the testing of the parallel-trend assumption by describing the pre- and after-treatment trend of teacher stress in the three periods. The pre-treatment trend for teacher stress is relatively constant for both the treatment and control groups before the legal changes in 2010-2011. After the legal changes, the teacher stress levels show upward trends for both groups. However, the increase in teacher stress of the treatment group is considerably greater than that of the control group for the 2011-2012

school year. Although only three data points are observed in Figure 4, a visual inspection shows that the parallel-trend assumption is likely to be satisfied.

Results

The relationship between teacher stress and teacher unionization using simple means (see Figures 2 and 3) of course may be affected by other district characteristics that may be correlated with the presence of teachers' unions. To examine if this is the case, we compare teacher and district characteristics by union status. As expected, the mean characteristics of these districts differ by contract status, according to statistics reported in Table 2. Teachers in districts covered by CB or MC agreement tend to be more male, white, educated, experienced, working at traditional public schools rather than charter schools, and facing less severe school problems. CB districts, compared to NA districts, are more likely to have larger student enrollment, fewer black students, fewer students with disadvantaged family background (assessed by students under free/reduced-price lunch programs), greater district revenue, and be more urban with higher living costs.

Our first attempt to deal with these confounding factors is to estimate the relationship between teacher unionization and teacher stress with OLS regressions, controlling for various teachers and district characteristics. Table 3 summarizes the estimated results. Columns (1) through (3) present the simple correlation between teacher unionization and teacher stress as a baseline. In column (1), the strength of teachers' unions is measured by contractual status (CB/MC/NA), where NA is the reference group. Teachers covered by CB report a substantially lower stress level, relative to teachers in the NA districts. MC also reveals a negative association

with teacher stress, although the magnitude of its association with teacher stress is much weaker than with CB. Column (2) uses union density for the union measure. Teachers in districts with higher union density reveal lower stress than teachers in districts with lower union density. In Column (3), unionization is measured by the individual teacher's union membership status. Union teachers, compared to non-union teachers, reveal significantly lower levels of stress.

Columns (4) through (6) report the regression results after controlling for various teachers and district characteristics. The coefficients for CB and MC appreciably fall with the inclusion of the control variables, but they still have sizable magnitudes and maintain statistical significance. For instance, in column (4), compared to the stress factor of teachers in the NA districts, the stress factor of teachers in the CB districts is lower by 0.067, which is about 13% of the standard deviation of the teacher stress factor. This effect size for MC reduces to 2.5% of the standard deviation. Considering that CB is a stronger form of union representation than MC, this finding suggests that the vigor of teachers' unions, as opposed to a simple union presence, matters for teacher stress.

Controlling for teacher and district characteristics does not make much difference in the results for union density and union membership in columns (5) and (6). Higher union membership is an indicator for stronger union presence because greater membership translates into a greater financial capacity for unions, allowing them to wield greater bargaining and political power. Thus, the findings in columns (5) and (6) suggest that teachers' unions are able to influence teachers' mental and emotional well-being even in the absence of CB contracts.

Teachers' unions can influence teacher compensation and working conditions, so better pay and improved working conditions may be the main mechanism through which unions affect teacher stress. Moreover, if the Great Recession in 2008 had affected union and non-union

teachers differently, it would have been largely through teacher pay and work hours.[8] Therefore, in columns (7) through (9), as a robustness check, we control for teachers' base salary and working hours required for base salary. We also control for school problem factor, because unionized districts report fewer problems in their schools (see Table 2). Not surprisingly, higher base salary, shorter working hours, and fewer school problems are associated with lower levels of teacher stress. All coefficients for union measures are somewhat smaller than those in columns (4) through (6), after controlling for these three key factors, but they still remain statistically significant, except for MC, which loses significance. This suggests that union effects on teacher stress may go well beyond pay and working conditions, and there may be other channels, such as union voice, through which unions influence teacher stress.

The results in Table 3 also show that, on average, female, more experienced, better educated, and secondary school teachers have higher levels of stress. Compared to white teachers, Hispanic and Black teachers show lower levels of stress, whereas Asian teachers report higher stress. Teachers in larger districts with a higher proportion of students under free/reduced-price lunch programs, and more Black students tend to report higher stress.

To control for unobservable commonalities among teachers within the same district, we employ multilevel models, and Table 4 presents the estimated results. As seen in Table 3, teachers' unions are predicted to reduce teacher stress. In Columns (1) through (3), the magnitudes of the coefficients for teacher unionization are similar to those presented in Table 3, but even MC shows a statistically significant association with teacher stress in the multilevel models. Columns (4) through (6) show that, even after controlling for teacher pay, working conditions, and school problem factor, there exists a negative relationship between all the

measures of teacher unionization and teacher stress, and they are statistically significant at, at least, the 5% significance level.

The results presented in Tables 3 and 4 strongly suggest that teachers' unions can reduce teacher stress. If this finding reflects a true relationship, any shock weakening unions may lead to the opposite result to teacher stress. The unanticipated legal changes that occurred in ID, IN, TN, and WI in 2010-2011 allow us to examine the causal impact of weakening unionism on teacher stress, and we employ the DID design using the four states as a treatment group and other remaining states as a control group.

Table 5 presents the DID estimation in two panels. Panel A reports the baseline DID estimates. Before the legal changes, no significant difference in teacher stress exists between the treatment and control states. After the legal changes, however, teacher stress levels in both groups rise, but the increase in teacher stress is much greater in the treatment group than in the control group. The DID estimate shows that new state regulations increased teacher stress by 0.053, which is about 10% of the standard deviation of teacher stress.

Panel B reports the results after controlling for various teacher and district characteristics included in Tables 3 and 4. On average, the stress level is greater for the treatment group than for the control group before the legal changes, and it rises in both groups after the legal changes. The increase in teacher stress in the control group may be due to spillover effects of the legal reforms in the treatment group, as unionized teachers in other states may also feel threatened by the reforms, increasing their stress as well. This initial difference in stress between the control and treatment groups (0.041) becomes twice as big (0.085) after the legal change. This leads to a DID estimate of 0.044, with the impact size of 9% of standard deviation, and it is statistically significant at the 1% level.

Teachers in unionized districts differ from teachers in non-unionized districts in various ways (see Table 2), so union effects on stress may be greater for certain groups of teachers than for other groups. For instance, teachers in unionized districts (covered by either CB or MC agreement) are more male, educated, and experienced, so the union impact on stress may be bigger on teachers with those characteristics. We test this hypothesis in Table 6, which reports the DID estimation separately for various teacher subgroups. On average, the impact of the legal changes is somewhat greater for male teachers than for female teachers. Compared to novice teachers, senior teachers experience greater increase in stress from the legal changes. The impact of the legal changes is concentrated on teachers who have HQT certificates. Secondary school teachers, relative to primary school teachers, report a larger increase in stress after the legal changes. STEM subject teachers also experience a greater impact from the legal changes than non-STEM teachers.

Before the legal changes, the four treatment states had "duty-to-bargain" laws, which mandate that school districts bargain with unions that gain recognition as bargaining agents by winning majority support in an election among teachers. As a sensitivity analysis, we use an alternative control group, which includes all other states that also mandate CB.[9] Tables A1 in Appendix I present the summarized results from the DID estimation based on this new control group. The alternative results are very similar to those presented in Tables 5 and 6, and the new DID estimates are slightly smaller in magnitude.

In 2010-2012, Nebraska, New Hampshire, New Jersey, and Oklahoma also passed laws weakening the unionism of public sector employees. The terms of the legal changes in these four comparison states, however, are more subtle compared to the changes in ID, IN, TN, and WI. For instance, Nebraska passed legislation that requires local unions to have periodic certification

votes of their members. In New Hampshire, more years are required for tenure. To the extent that only tenured teachers are eligible for certain benefits such as maternity leave, this law affects teacher unionization. New Jersey's new law limited public employees' ability to bargain over health care, and employee pension and health care contribution have increased. Oklahoma eliminated mandatory CB of public sector workers.

Author 2 (2020) shows that the new state legislation in ID, IN, TN, and WI dramatically reduced the strength of teachers' unions, and teachers' CB coverage decreased by 23 percentage points. According to the authors' calculation, on the other hand, the CB coverage of NE, NH, NJ, and OK has remained relatively constant after their legal changes. The change in CB coverage after the legal changes is about a 6-percentage-points increase (from 80% to 86%) in NE, 5-percentage-points decline (from 88% to 83%) in NH, 2-percentage-points decline (from 81% to 79%) in NJ, and 4-percentage-points decline (from 22% to 18%) in OK. After the legal changes, the average union density of ID, IN, TN, and WI fell by 7 percentage points, whereas the union density in NE, NH, NJ, and OK increased by 5 percentage points.

What happens to teacher stress for these comparison states after their legal changes? Being in a state that experiences a legal battle may also raise teacher stress, even though the legal change has no significant effect on union strength. If so, our study may be capturing the effect of labor unrest and uncertainty of the volatile teacher labor market, as well as the effect of anti-union legal changes on teacher stress.

In Figure 5, we plot the trend of teacher stress in these comparison states. The teacher stress level is largely consistent, with a slight fall, instead of rise, after the legal changes in NE, NH, NJ, and OK. This suggests that changes in the strength of teachers' unions are the key

source of the variation in teacher stress, and any legal changes that leave teacher unionization intact are not likely to make a considerable impact on teacher stress.

As a sensitivity analysis, we drop these four states from our control group and re-estimate our DID model. The results are robust to this alternative specification of the control group. The new results have slightly larger estimates in magnitude than those presented in Tables 5 and 6, and they lead to the same conclusion: weakening teacher unionization raises teacher stress.

Discussion and Conclusion

This study examines the effect of teachers' unions on teacher stress. Relying on a nationally representative district-teacher matched dataset in pre-pandemic periods, and using principal factor analysis of survey questions that are related to teacher stress, burnout, and emotional exhaustion, we find that teachers' unions are negatively associated with teacher stress. Teacher stress is significantly lower in districts that are covered by CB than in districts with no such coverage. Districts with a higher union membership rate show decreased levels of teacher stress, compared to districts with a lower union membership rate. Union teachers, compared to non-union teachers, report lower stress level. We also find that legal and institutional changes weakening teachers' unions significantly raise teacher stress.

What are the channels through which teachers' unions are able to reduce teacher stress? Unions raise teacher compensation and improve working conditions, which may contribute to decreasing teacher stress. Our findings indicate that unions' positive influence on teacher pay and working conditions does play a role, but it is not the main mechanism through which unions reduce teacher stress.

Unions serve as a channel for teacher voice. Teachers' unions provide more supportive leadership relationships, improve school climate, advocate for professional development, and increase teacher morale. Thus, teachers' unions also correlate with teachers' overall well-being, a critical pillar of teachers' stress and their mental health.

During the COVID-19 pandemic, unions may have been playing an important role in ameliorating teacher stress and burnout problems, while raising awareness of public health. For instance, during the pandemic, unionized districts were more likely to support mask mandates in schools and request careful guidelines for safely reopening schools (AFT, 2020a & 2020b; NEA, 2020). Carver-Thomas et al. (2021) claim that districts with staffing problems during the pandemic were likely to suffer from the same problems after the pandemic, because of teachers' increasing resignations, retirements, turnover, and vacancies due to workload, burnout, and concerns regarding safety. Diliberti et al. (2021) find that four in ten voluntary early leavers selected stress and disappointments as their reason for leaving, both before and during the pandemic. Insufficient pay to merit the risks or stress, child care responsibilities, health conditions that put them at greater risk for illness under COVID-19, and challenges of remote instruction can also add to stress. There also has been more discussion on providing adequate support for teachers' mental health during and after the pandemic (CASEL, 2020; Authors 1, 2020a; Stratford, 2020; AFT & NEA, 2021). These studies suggest that teachers' unions may create a more supportive atmosphere in the workplace, potentially reducing teacher stress and teacher turnover in unionized districts in the post-pandemic world. This topic is left for future study employing more recent data.

In further improving the workplace environment, teachers' unions should take seriously the issue of mental well-being of teachers and provide members with more assistance in dealing

with excess stress and burnout by offering counseling and other in-depth services. Given their essential role in reducing teacher stress, unions may consider discussing these items during a collective bargaining agreement (or a meet-and-confer when collective bargaining is unavailable) to help with teachers' psychological and mental health.

It is noteworthy that our CB and MC status simply indicates whether the given type of agreement was in place in each district. These agreements might vary in terms of specific provisions, such as salary schedule, teacher evaluation, rules governing teacher hiring and firing, and grievance procedures (Moe, 2009; Marianno & Strunk, 2018). Our estimated relationships between contractual status and teacher stress identify an average impact across potentially heterogeneous agreements, so it will be also important for future research to examine the impact of the restrictiveness of bargaining contracts, compared with other union contracts that have fewer restrictions, on teacher stress.

Because the SASS has been collected once every four years, this study's DID estimation is not able to address the potential impact of other confounding educational policies, such as school reforms regarding teacher evaluation and school accountability, that may have been passed in both the control and treatment states between the 2007-2008 and 2011-2012 school years. Our estimates, therefore, assume that all states, regardless of teacher unionization, can engage in school reforms to improve student outcomes, but the treatment states with anti-union laws add extra strain on teacher stress. Moreover, because the 2011-2012 SASS may be too soon to capture the full effects of the anti-union legal changes that occurred in 2010-2011, our study may be offering a lower bound estimate.[10] Thus, we are not taking into account any potential changes in the teacher composition that may be driven by different teacher turnover patterns and the relative credentials of the teaching workforce over time. For further analysis, future studies

may explore within-state variation based on a full set of districts from annual panel data spanning longer periods for states that do not experience other concurrent policy changes.

Notes

1. Filling a vacancy costs $21,000 on average (Carver-Thomas & Darling-Hammond, 2017; Learning Policy Institute, 2017), and Carroll (2007) estimates the total annual cost of U.S. teacher turnover at $7.3 billion per year.
2. Mental health counselors, social workers are among the top listed (Williams, 2021). For a discussion regarding how teacher stress compares with stress in other occupations, see Holt et al. (2020), AFT & BAT (2017), Kovess-Masféty et al. (2006), and Jerrim et al. (2020). For a literature review on teacher burnout and teacher emotion, including the factors that lead to burnout, see Chang (2009).
3. The principal factor 1 explains 53% of the total variance of school problems, and it is mostly defined by items h (poverty), and i (students come to school unprepared to learn) in the "School Problems" questionnaires in Appendix II. The Cronbach's Alpha scale for the school problem factor is 0.886.
4. The CWI measures the salaries of occupations that are comparable with teaching in the local labor market, using the baseline estimates from the 2000 U.S. Census and annual data from the Bureau of Labor Statistics' Occupational Employment Survey. The basic idea is that all workers will ask for higher wages in areas with a higher cost of living or a lack of amenities. For example, if accountants in a certain area are paid 5% more than the national average accountant wage, teachers in the same area should also be paid 5% more than the national average teacher wage.
5. For example, in Arizona, where CB is not permitted, about half of districts have MC agreements with teachers, and all teachers, including those who opt out of MC, are covered by the same MC agreements.
6. The HQT requirement is a provision under No Child Left Behind (NCLB). Generally, to be HQT, teachers must meet the state's requirements: i) have a bachelor's degree; ii) hold full state certification or licensure, including alternative certification; and iii) demonstrate competency in the subject area they teach, such as passing a subject area test administered by the state.
7. Intra-class correlation ρ is a summary of the proportion of the outcome variability that is attributable to differences across schools, and it is calculated as $\hat{\rho} = \frac{\hat{\sigma}_u^2}{\hat{\sigma}_u^2 + \hat{\sigma}_\varepsilon^2}$, ranging between 0 and 1.
8. Several studies have found that unions made sizable wage and benefit concessions to save jobs in dealing with the financial crisis during the Great Recession in 2008-2009 (Freeman & Han, 2012; Roche, Teague, & Coughlan, 2015; Visser, J. 2016). Moreover, unions are often able to arrange work-sharing, which encourages employers to temporarily reduce the work hours of their employees instead of laying them off, in order to save jobs and avert layoffs during an economic downturn (Freeman and Gottschalk, 1998; Goodstein, 1996; Glassner & Keune, 2010; Zwickl, Disslbacher, & Stagl, 2016).

9. As of 2010, there are 30 other states with duty-to-bargain laws. They include Alaska, California, Connecticut, Delaware, Florida, Hawaii, Illinois, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Vermont, and Washington.
10. According to authors' calculation, based on the Teacher Follow-up Survey (TFS) which follows teachers who left the teaching sector one year after the SASS is collected, teacher attrition (voluntary quit) rate in the treatment states increases from 2.6% in the 2007-2008 school year to 4.1% in the 2012-2013 school year. This increase in teacher attrition, however, did not lead to changes in teacher credentials, measured by teacher experience, education level, and certification status, at least during our study period.

References

Authors 1 (2019a, 2019b, 2020a, 2020b)

Authors 2 (2021)

Author 2 (2019, 2020)

Addison, J. T. & Belfield, C. R. (2004). Union Voice. *Journal of Labor Research*, 25 (4), 564-596.

Allegretto, S. A., & Tojerow, I. (2014). Teacher Staffing and Pay Differences: Public and Private Schools. *Monthly Labor Review*, September 2014.

Allen, J.,& Van Der Velden, R. (2005). The Role of Self-Assessment in Measuring Skills. ROA. REFLEX Working Paper Series No. 2ROA External Reports

American Federation of Teachers and Badass Teachers Association (AFT & BAT) (2017) *Educator Quality of Work Life Survey,* Washington, D.C., American Federation of Teachers.

AFT & NEA (2021). Learning Beyond COVID-19: A Vision for Thriving in Public Education, Washington, D.C., American Federation of Teachers and National Education Association.

American Federation of Teachers (AFT). (2020a). *A Plan to Safely Reopen America's Schools and Communities: Guidance for Imagining a New Normal for Public Education, Public Health and Our Economy in the Age of COVID-19.*

American Federation of Teachers (AFT). (2020b). *A Time to Act: The Importance of Investment in Public Education and Other State and Local Services in the Time of COVID*-19.

Arens, A. K., & Morin, A. J. S. (2016). Relations between teachers' emotional exhaustion and students' educational outcomes. *Journal of Educational Psychology, 108*(6), 800–813. https://doi.org/10.1037/edu0000105.

Bakeman, J. 2020. "Taking Attendance During COVID-19 School Closures; It's Complicated." April 8. *WLRN*.

Barnum, M. (2021). Despite pandemic, there's little evidence of rising teacher turnover — yet, Chalkbeat, April, 6, 2021.

Batt, R., Colvin, A., & Keefe, J. (2002). Employee voice, human resource practices, and quit rates: Evidence from the telecommunications industry. Industrial and Labor Relations Review, 55, 573-594. https://doi.org/10.1177/001979390205500401

Baugh, W. & Stone, J. (1982). Teachers, Unions, and Wages in the 1970s: Unionism Now Pays. *Industrial and Labor Relations Review 35*, 368-376.

Becker, E., Goetz, T., Morger, V., & Ranellucci, J. (2014) The importance of teachers' emotions and instructional behavior for their students' emotions – An experience sampling analysis, *Teaching and Teacher Education*, 43, 15-26, ISSN 0742-051X, https://doi.org/10.1016/j.tate.2014.05.002.

Budd, J. W. (2007). The Effect of Unions on Employee Benefits and Non-Wage Compensation: Monopoly Power, Collective Voice, and Facilitation, in James T. Bennett and Bruce E. Kaufman, eds., *What Do Unions Do? A Twenty-Year Perspective* Piscataway. pp. 160-192. NJ: Transaction Publishers.

Carver-Thomas, D., Leung, M., & Burns, D. (2021). *California teachers and COVID-19: How the pandemic is impacting the teacher workforce*. Learning Policy Institute.

CASEL (2020). Reunite, Renew and Thrive: SEL Roadmap for Reopening School, Chicago, IL: Collaborative for Academic, Social, and Emotional Learning, July 2020.

Chang, ML. (2009). An Appraisal Perspective of Teacher Burnout: Examining the Emotional Work of Teachers. *Educational Psychology Review*, 21**,** 193–218. https://doi.org/10.1007/s10648-009-9106-y

Collie, R. J., Shapka, J. D., & Perry, N. E. (2012). School climate and social–emotional learning: Predicting teacher stress, job satisfaction, and teaching efficacy. *Journal of Educational Psychology*, *104*(4), 1189–1204. https://doi.org/10.1037/a0029356

Cowen, J. M., & Strunk, K. O. (2015). "The Impact of Teachers' Unions on Educational Outcomes: What We Know and What We Need to Learn*." Economics of Education Review* 48, 208–223.

Crosswell, A. D., & Lockwood, K. G. (2020). Best practices for stress measurement: How to measure psychological stress in health research. *Health psychology open*, 7(2), 2055102920933072. https://doi.org/10.1177/2055102920933072

Diliberti, M. K., Schwartz, H. L. & Grant, D. (2021). *Stress Topped the Reasons Why Public School Teachers Quit, Even Before COVID-19*. Santa Monica, CA: RAND Corporation. https://www.rand.org/pubs/research_reports/RRA1121-2.html.

Eberts, R. W. & Stone. J. (1984). *Unions and Public Schools: The Effect of Collective Bargaining on American Education*. Lexington, MA: Lexington Books.

Farmer, D. (2020). Teacher Attrition: The Impacts of Stress, *Delta Kappa Gamma Bulletin*. 87 (1), pp. 41-50.

Flavin, P., & Hartney, M. T. (2015). When Government Subsidizes Its Own: CB Laws as Agents of Political Mobilization. *American Journal of Political Science* 59, 896–911. doi:10.1111/ajps.12163

Freeman, R. B. (1980). "The Exit-Voice Tradeoff in the Labor Market: Unionism, Job Tenure, Quits, and Separations." *Quarterly Journal of Economics*, 94 (4): 643-673. https://doi.org/10.2307/1885662

Freeman, R. B. & Han, E. S. (2012). The War Against Public Sector Collective Bargaining in the U.S. *The Journal of Industrial Relations*, 54 (3): 386-408. https://doi.org/10.1177/0022185612442279.

Freeman, R. B., & Gottschalk, P. (1998). Generating Jobs: How to Increase Demand for Less-skilled Workers. New York: Russell Sage Foundation.

Freeman, R. B., Boxall, P., & Haynes, P. (2007). What Workers Say: Employee Voice in the Anglo-American in the Anglo-American Workplace. Cornell University Press. Ithaca, NY.

Freeman, R. B. & Medoff, J. L. (1984). *What Do Unions Do?* New York: Basic Books.

Freeman, R B. & Valletta, R. (1988). NBER Public Sector Collective Bargaining Law Dataset in Richard Freeman and Casey Ichniowski, eds. *When Public Sector Workers Unionize*. Chicago, IL: University of Chicago Press.

Glassner, V., & Keune, M. (2010). Negotiating the crisis? Collective bargaining in Europe during the economic downturn. ILO Working Papers 994542053402676, International Labour Organization.

Goodstein, E. (1996). Jobs and the environment: An overview. *Environmental Management* 20, 313–321. https://doi.org/10.1007/BF01203840.

Greenberg, M. T., Brown J. L., & Abenavoli, R.M. (2016). *Teacher Stress and Health Effects on Teachers, Students, and School*s. Edna Bennett Pierce Prevention Research Center, Pennsylvania State University

Gunderson, M. (2015). Two Faces of Union Voice in the Public Sector. *Journal of Labor Research* 26, 393–413. https://doi.org/10.1007/s12122-005-1012-6

Hanson, K. (2013). Turnover in Teachers: Stress, Burnout, and Fixing the Problem, BU Journal of Graduate Studies in Education, Volume 5, Issue 2, 2013, https://files.eric.ed.gov/fulltext/EJ1230755.pdf

Herman, K. C., Hickmon-Rosa, J., & Reinke, W. M. (2018). Empirically Derived Profiles of Teacher Stress, Burnout, Self-Efficacy, and Coping and Associated Student Outcomes. *Journal of Positive Behavior Interventions*, 20(2), 90–100. https://doi.org/10.1177/1098300717732066

Hirsch, B. T., Macpherson, D. A. & Winters, J. V. (2011). Teacher Salaries, State Collective Bargaining laws, and Union Coverage. Paper presented at Association for Education Finance and Policy (AEFP) Meetings. Seattle.

Hirsch, B. T., Macpherson, D. A., & DuMond, J. M. (1997). Workers' Compensation Recipiency in Union and Nonunion Workplaces. *Industrial and Labor Relations Review 50*(2), 213-36.

Hirschman. A. (1970). *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Cambridge, MA: Harvard University Press.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). "The Difference Between Emergency Remote Teaching and Online Learning." *Educause Review*, March 27, 2020.

Holt, S. B., Wang, R. & Gershenson, S. (2020). Stress Test: Examining the Evolution of Teachers' Mental Health Over Time. (EdWorkingPaper: 20-243). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/4rr0-k714

Jackson, K. ^ Bruegmann, E.. (2009). Teaching Students and Teaching Each Other: The Importance of Peer Learning for Teachers. *American Economic Journal Applied Economics* 1 (4), 85–108. DOI: 10.1257/app.1.4.85

Jerrim, J., Taylor, H., Sims, S. & Allen, R. (2020) *Has the mental health and wellbeing of teachers in England declined over time? New evidence from three datasets*, UCL Institute of Education

Jerrim, J., & Sims, S. (2021). School accountability and teacher stress: international evidence from the OECD TALIS study. *Educational Assessment, Evaluation and Accountability*. https://doi.org/10.1007/s11092-021-09360-0

Jones, N.D., Bettini, E. & Brownell. M.T. (2016). *Can Collaborative School Reform and Teacher Evaluation Reform Be Reconciled?* Albert Shanker Institute.

Kelly, S., & Northrop, L. (2015). Early Career Outcomes for the "Best and the Brightest": Selectivity, Satisfaction, and Attrition in the Beginning Teacher Longitudinal Survey.

American Educational Research Journal, 52(4), 624–656. https://doi-org.tc.idm.oclc.org/10.3102/0002831215587352

Klusmann, U., Kunter, M., Trautwein, U., Lüdtke, O., & Baumert, J. (2008). Teachers' occupational well-being and quality of instruction: The important role of self-regulatory patterns. *Journal of Educational Psychology*, 100 (3),702–715. https://doi.org/10.1037/0022-0663.100.3.702

Kovess-Masféty, V., Sevilla-Dedieu, C., & Rios-Seidel, C. (2006). Do teachers have more health problems? Results from a French cross-sectional survey. *BMC Public Health* 6, 101. https://doi.org/10.1186/1471-2458-6-101

Kraft, M. A., & Papay, J. P. (2014). Can Professional Environments in Schools Promote Teacher Development? Explaining Heterogeneity in Returns to Teaching Experience. *Educational Evaluation and Policy Analysis* 36 (4), 476–500. https://doi.org/10.3102%2F0162373713519496

Loeb, S., Darling-Hammond, L. & Luczak J. (2005). How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education 80* (3), 44–70. https://doi.org/10.1207/s15327930pje8003_4

Lyon, M. (2020). "Teacher's Political Voices: The Effects of Policies Hindering Unionization on Teachers, Students, and State Politics." Columbia University Working Paper.

Madigan, D.J. & Curran, T. (2020) Does Burnout Affect Academic Achievement? A Meta-Analysis of Over 100,000 Students, *Educational Psychology Review*, DOI: 10.1007/s10648-020-09533-1

Marianno, B. D., & Strunk, K. O. (2018). The End of a Bad Bargain? Revisiting the Relationship between Collective Bargaining Agreements and Student Achievement. *Economics of Education Review* 65, 93-106. https://doi.org/10.1016/j.econedurev.2018.04.006

Maslach, C., & Leiter, M. P. (2016). Understanding the burnout experience: recent research and its implications for psychiatry. *World psychiatry: official journal of the World Psychiatric Association (WPA)*, 15(2), 103–111. https://doi.org/10.1002/wps.20311

McCarthy, C.J. (2019). Teacher stress: Balancing demands and resources. *Phi Delta Kappan*, 101 (3), 8-14.

McLean, L. & Connor, C. M. (2015) Depressive Symptoms in Third-Grade Teachers: Relations to Classroom Quality and Student Achievement, *Child Development* 86 (3), 945-954, https://doi.org/10.1111/cdev.12344Ci

Moe, T. (2009). Collective Bargaining and the Performance of Public Schools. *American Journal of Political Science* 53, 156-74. https://www.jstor.org/stable/25193873

Moore-Johnson, S., Donaldson, M.L., Munger, M.S., Papay, J.P. & Qazilbash, E.K. (2007). *Leading the Local: Teacher Union Presidents Speak on Change, Challenges.* Education Sector.

National Education Association Foundation (NEA Foundation). 2012. *Peer Assistance and Review: All Teachers on the Road to Instructional Leadership in Columbus (OH) "100% Project Schools."* May 2012.

National Education Association (NEA). (2020). *All Hands On Deck: Guidance Regarding Reopening School Buildings*, July 2020.

OECD (2020), *TALIS 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals*, Paris, TALIS, OECD Publishing, https://doi.org/10.1787/19cf08df-en

OECD (2019). *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*. Paris: TALIS, OECD Publishing. https://doi.org/10.1787/1d0bc92a-en.

Paglayan, A.S. (2019). Public-Sector Unions and the Size of Government. *American Journal of Political Science* 63, 21-36. doi:10.1111/ajps.12388.

Phi Delta Kappan (PDK). (2019). *Frustration in the Schools: Teachers Speak Out on Pay, Funding, and Feeling Valued. The 51st Annual PDK Poll of the Public's Attitudes Toward the Public Schools*. Supplement to Kappan magazine.

Podgursky, M. J. (2003). Fringe Benefits: There is More to Compensation than a Teacher's Salary. *Education Next 3*(3), 71-76.

Ramberg, J., Brolin Låftman, S., Åkerstedt, T. & Modin, B. (2020).Teacher Stress and Students' School Well-being: the Case of Upper Secondary Schools in Stockholm, *Scandinavian Journal of Educational Research*, 64:6, 816-830, DOI: 10.1080/00313831.2019.1623308.

Roche, W. K., Teague, P., & Coughlan, A. (2015). Employers, trade unions and concession bargaining in the Irish recession. *Economic and Industrial Democracy*, 36(4), 653-676.

Ronfeldt, M., Loeb, S., & Wyckoff, J.. (2013). How Teacher Turnover Harms Student Achievement. *American Educational Research Journal* 50 (1), 4–36. https://doi.org/10.3102/0002831212463813

Roth, J. (2019). "Union Reform and Teacher Turnover: Evidence from Wisconsin's Act 10." Retrieved from: https://scholar.harvard.edu/jroth/publications/union-reform-and-teacher-turnover-evidence-wisconsins-act-10. Working paper.

Ryan, S. V, von der Embse, N.P., Pendergast, L.L., Saeki, E., Segool, N., & Schwing, S. (2017) Leaving the teaching profession: The role of teacher stress and educational accountability policies on turnover intent, *Teaching and Teacher Education*, 66, 1-11.

Sorensen, L. C., & Ladd, H. F. (2020). The Hidden Costs of Teacher Turnover. AERA Open. https://doi.org/10.1177/2332858420905812

Stratford, B. (2020). *As Schools Reopen, Addressing COVID-19–Related Trauma and Mental Health Issues Will Take More Than Mental Health Services*. Child Trends, July 2020.

Strunk, K. O. (2011). Are Teachers' Unions Really to Blame? Collective Bargaining Agreements and Their Relationsihps with District Resource Allocation and Student Performance in California. *Education Finance and Policy*, 6 (3), 354-398.

Taylor, L. L., & Fowler, W. J. (2006). *A comparable wage approach to geographic cost adjustment*. Washington, DC: National Center for Education Statistics.

Visser, J. (2016). What Happened to Collective Bargaining During The Great Recession? IZA *Journal of Labor Policy*, 5(1), 1-35.

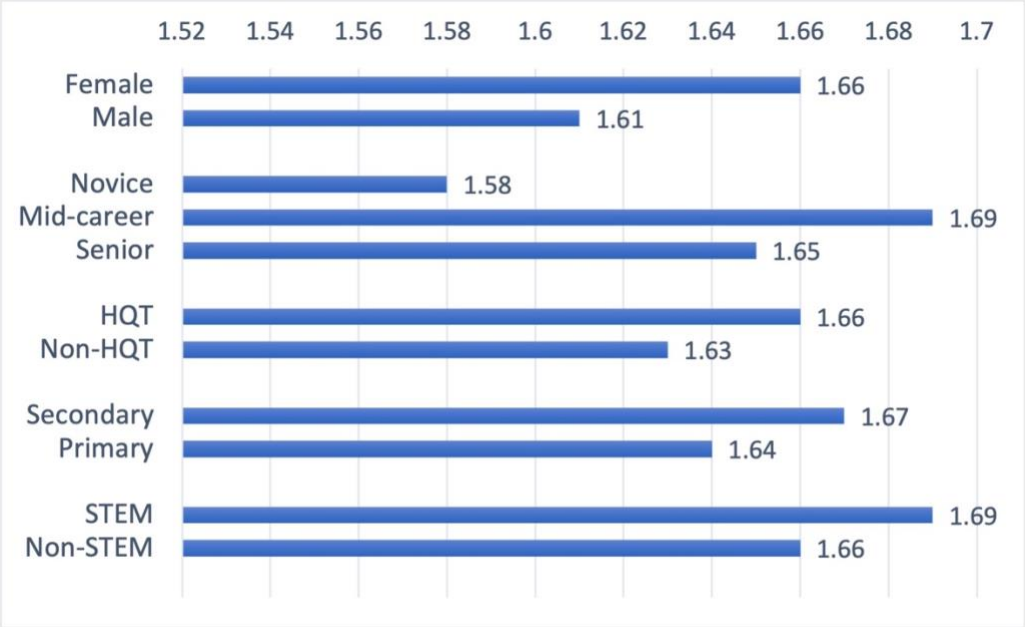
West, K. L. (2015). Teachers' unions, compensation, and tenure. *Industrial Relations: A Journal of Economy and Society 54*(2), 294-320.

Williams, G. (2021). *The 25 Most Stressful Jobs*, U.S. News. Accessed April, 8 2021.

World Health Organization (WHO) (2020). *Occupational health: Stress at the workplace*, Accessed March 6, 2022.

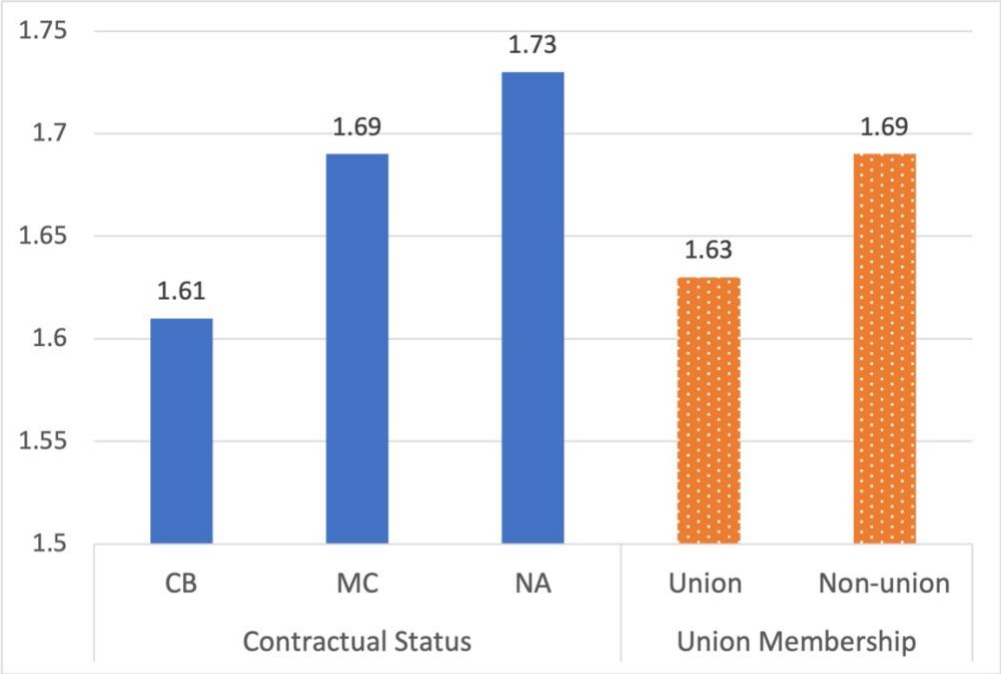
Zwickl, K., Disslbacher, F., & Stagl, S. (2016) Work-Sharing for A Sustainable Economy. *Ecological Economics*, 121, 246-253.

Figure 1: Teacher Stress by Teacher Characteristic



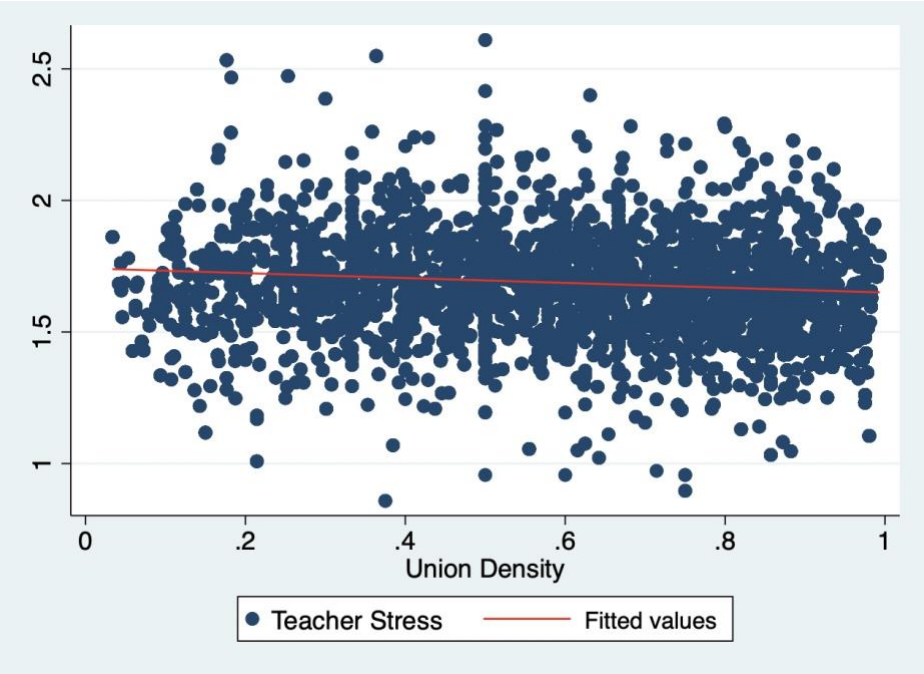
Note: All numbers are weighted by teachers' final sampling weights.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Figure 2: Teacher Stress and Teacher Unionization



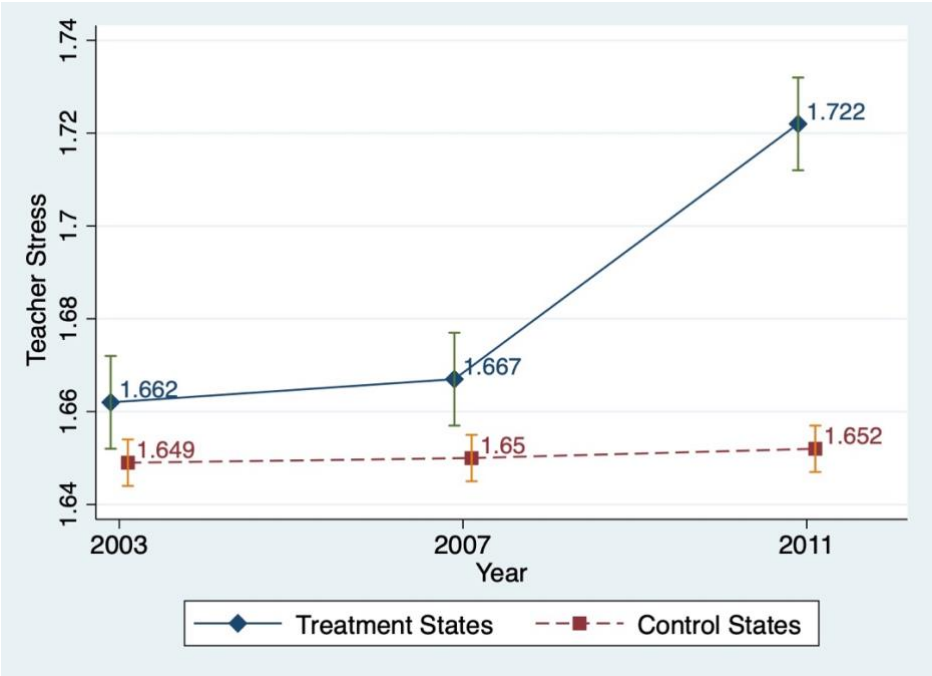
Note: All numbers are weighted by teachers' final sampling weights.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Figure 3: Teacher Stress and Union Density



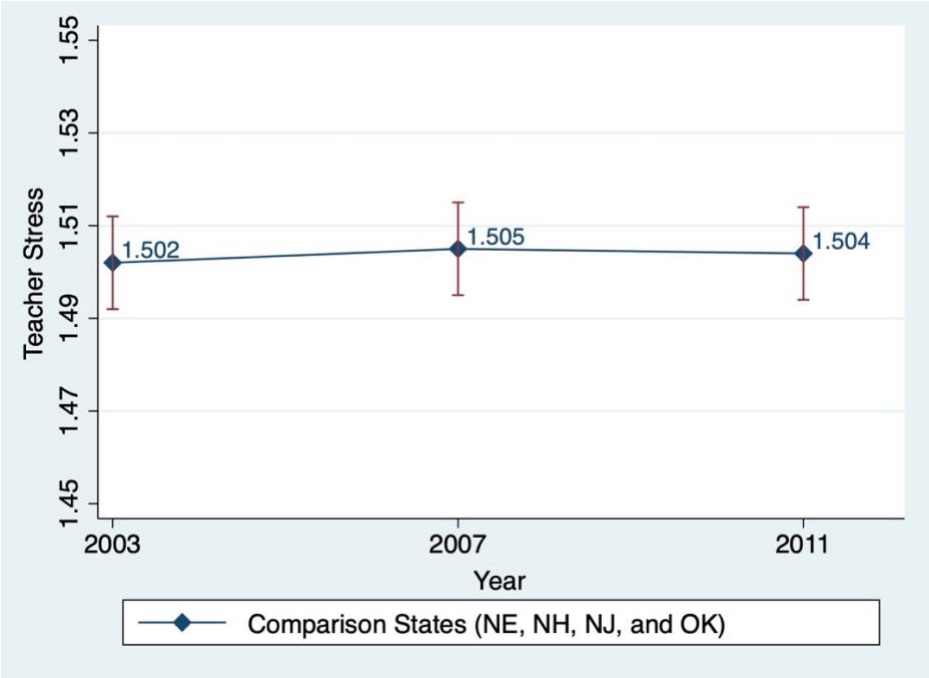
Note: All numbers are weighted by teachers' final sampling weights.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Figure 4: Test of Parallel Trend Assumption



Note: All numbers are weighted by teachers' final sampling weights.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Figure 5: The Trend of Teacher Stress in States in Comparison Group



Note: All numbers are weighted by teachers' final sampling weights.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Table 1 – Descriptive Statistics for US Public School Teachers and Their Districts

	N	Mean	SD	Min	Max
Public School Teachers					
Teacher Stress factor	101,480	1.659	0.501	0.858	3.434
Male	102,480	0.321	0.467	0	1
Experience	102,480	13.89	10.11	1	54
Hispanic	102,480	0.0425	0.202	0	1
Black	102,480	0.0612	0.240	0	1
Asian	102,480	0.0202	0.141	0	1
Other	102,480	0.0263	0.160	0	1
Master's degree and above	102,480	0.494	0.500	0	1
Secondary school	102,480	0.704	0.456	0	1
School problem factor	102,480	2.420	0.804	-0.121	4.424
Charter school	100,060	0.0364	0.187	0	1
STEM teacher	63,900	0.284	0.451	0	1
Highly Qualified Teacher (HQT)*	65,890	0.838	0.368	0	1
School Districts					
Enrollment (grade K-12)	97,400	27,394	93,134	2	1.100e+06
Hispanic students	97,400	0.124	0.203	0	1
Black students	97,400	0.136	0.226	0	1
Asian students	97,400	0.0321	0.0837	0	0.993
Other students	97,400	0.119	0.205	0	1
Eligible for free/reduced-price lunch	97,400	0.416	0.267	0	1
Total revenue (in $ million)	97,400	357.85	1502.36	0.003	21023.7
Comparable Wage Index (CWI)	96,980	1.128	0.152	0.762	1.669
Urban	97,400	0.228	0.420	0	1
Suburb	97,400	0.457	0.498	0	1
Rural	97,400	0.315	0.464	0	1
Union Measures					
Collective bargaining (CB)	96,730	0.607	0.488	0	1
Meet and confer (MC)	96,730	0.110	0.313	0	1
No agreement (NA)	96,730	0.276	0.447	0	1
Union membership rate (union density)	96,730	0.719	0.288	0	1

Notes: N is rounded to the nearest ten. Sample includes regular full-time teachers
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS). *Information on HQT is not available in the 2003-2004 SASS.

Table 2 – Teacher and District Characteristics by Contractual Status

VARIABLES	CB (SD) [N=57,960]	MC (SD) [N=11,820]	NA (SD) [N=26,950]	Differences in Mean CB – NA (SE)	MC – NA (SE)
Male	0.322 (0.467)	0.313 (0.464)	0.290 (0.453)	0.032***(0.003)	0.023***(0.005)
Hispanic	0.041 (0.198)	0.040 (0.197)	0.044 (0.206)	-0.003***(0.001)	-0.004**(0.002)
Black	0.039 (0.194)	0.052 (0.221)	0.110 (0.312)	-0.070***(0.001)	-0.058***(0.003)
Asian	0.026 (0.160)	0.010 (0.101)	0.010 (0.102)	0.016*** (0.001)	-0.00 (0.001)
Other	0.024 (0.153)	0.027 (0.163)	0.028 (0.165)	-0.004***(0.001)	-0.0004 (0.002)
Experience	12.31 (10.25)	14.17 (10.18)	13.15 (10.06)	1.158***(0.073)	1.014***(0.113)
MA and above	0.517 (0.499)	0.492 (0.499)	0.444 (0.496)	0.072***(0.003)	0.047***(0.005)
Secondary school	0.691 (0.462)	0.690 (0.464)	0.702 (0.457)	-0.011***(0.003)	-0.012***(0.005)
Charter school	0.020 (0.138)	0.006 (0.080)	0.086 (0.280)	-0.067***(0.001)	-0.079***(0.003)
School problem factor	2.365 (0.808)	2.398 (0.791)	2.495 (0.792)	-0.130***(0.006)	-0.095***(0.009)
HQT	0.827 (0.377)	0.843 (0.364)	0.833 (0.373)	-0.005 (0.003)	0.010**(0.05)
STEM subjects	0.272 (0.444)	0.260 (0.438)	0.275 (0.446)	-0.003 (0.004)	-0.014**(0.006)
K-12 enrollment (in 1,000)	36.87 (117.2)	12.74 (21.82)	12.70 (22.25)	24.18***(0.71)	0.04 (0.24)
% Hispanic students	12.8 (20.3)	12.2 (19.9)	11.6 (20.8)	1.2***(0.15)	0.5**(0.2)
% Black students	9.8 (13.4)	11.9 (21.4)	22.5 (28.4)	-12.7***(1.6)	-10.6***(0.3)
% Asian students	4.2 (10.4)	1.8 (3.3)	1.5 (3.3)	2.7***(0.06)	0.03***(0.04)
% Other students	12.2 (20.2)	13.3 (22.6)	10.9 (21.1)	1.3***(0.15)	2.4***(0.2)
% Free/reduced-price lunch	37.6 (26.1)	41.8 (25.8)	51.3 (25.9)	-13.7**(0.2)	-9.6***(0.3)
CWI	1.15 (0.16)	1.10 (0.13)	1.09 (0.13)	0.055***(0.001)	0.010***(0.01)
Total revenue (in $million)	500.39 (1968.94)	135.37 (226.34)	143.91 (263.02)	356.47***(11.95)	-8.54***(2.85)
% Urban	23.0 (42.1)	23.3 (42.3)	20.6 (40.4)	2.5***(0.30)	2.7***(0.46)
% Suburb	50.4 (49.9)	39.5 (48.8)	37.5 (48.4)	12.9***(0.35)	2.03***(0.54)
% Rural	26.5 (44.1)	37.1 (48.3)	41.9 (49.3)	-15.4***(0.33)	-4.80***(0.055)

Notes: Standard deviation and standard error are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. N is rounded to the nearest ten. Sample includes regular full-time teachers.
Sources: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Table 3 – The relationship between teacher unionization and teacher stress

Dependent Variable: Teacher Stress Factor

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Collective bargain	-0.087***			-0.066***			-0.058***		
	(0.005)			(0.005)			(0.005)		
Meet and confer	-0.034***			-0.013*			-0.010		
	(0.007)			(0.007)			(0.007)		
Union density		-0.118***			-0.107***			-0.090***	
		(0.007)			(0.008)			(0.008)	
Union member			-0.028***			-0.026***			-0.018***
			(0.004)			(0.005)			(0.005)
Male				-0.044***	-0.045***	-0.047***	-0.042***	-0.044***	-0.045***
				(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Experience				0.003***	0.003***	0.003***	0.004***	0.004***	0.004***
				(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
MA and above				-0.003	-0.001	-0.003	0.011**	0.011***	0.012***
				(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Hispanic				-0.021*	-0.021*	-0.021*	-0.020*	-0.020*	-0.020*
				(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Black				-0.024**	-0.015	-0.014	-0.025**	-0.017*	-0.017*
				(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Asian				0.051***	0.044***	0.040***	0.052***	0.045***	0.042***
				(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Other				0.059***	0.055***	0.057***	0.057***	0.053***	0.055***
				(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Charter school				0.0278*	-0.010	0.0268*	0.018	-0.004	0.018
				(0.0144)	(0.0144)	(0.0143)	(0.014)	(0.014)	(0.014)
Secondary school				0.035***	0.035***	0.036***	0.035***	0.034***	0.035***
				(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Log(CWI)				-0.172***	-0.135***	-0.192***	-0.076***	-0.054**	-0.086***
				(0.021)	(0.021)	(0.021)	(0.023)	(0.023)	(0.023)
Log(enrollment)				0.014***	0.017***	0.018***	0.015***	0.018***	0.018***
				(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)

Log(total revenue)				0.019***	0.017***	0.017***	0.019***	0.017***	0.018***
				(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
% Free/reduced-price lunch				0.081***	0.071***	0.066***	0.084***	0.075***	-0.072***
				(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
% Hispanic students				0.021	0.017	0.020	0.027*	0.023	0.027*
				(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
% Black students				0.103***	0.106***	0.123***	0.107***	0.109***	0.124***
				(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
% Asian students				0.041	0.041	0.025	0.051*	0.049*	0.039
				(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
% Other students				0.001	-0.011	-0.004	0.006	-0.005	0.002
				(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)
Suburb				0.006	0.007	0.010*	0.006	0.007	0.010*
				(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Rural				0.021***	0.026***	0.030***	0.022***	0.027***	0.030***
				(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Year=2007				-0.014***	-0.016***	-0.012**	-0.008	-0.010**	-0.006
				(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Year=2011				-0.008	-0.009	-0.006	0.007	0.003	0.009
				(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Log(base salary)							-0.109***	-0.097***	-0.118***
							(0.011)	(0.011)	(0.010)
Log(required hours)							0.060***	0.077***	0.088***
							(0.022)	(0.021)	(0.021)
School problem factor							0.180***	0.180***	0.179***
							(0.003)	(0.003)	(0.003)
Constant				0.815***	0.860***	0.784***	1.696***	1.546***	1.644***
				(0.034)	(0.034)	(0.033)	(0.147)	(0.143)	(0.143)
Observations	91,720	102,480	102,480	86,470	90,390	90,390	86,470	90,390	90,390
Adjusted R^2	0.011	0.010	0.009	0.164	0.164	0.163	0.165	0.165	0.164

Notes: Observation number is rounded to the nearest ten. *** p<0.01, ** p<0.05, * p<0.1. Errors are clustered at the state level (presented in parentheses). Sample includes regular full-time teachers. All models are weighted by teachers' final sampling weights.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Table 4 – The relationship between teacher unionization and teacher stress

Multilevel Model

Dependent Variable: Teacher Stress Factor

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Collective bargain	-0.0711***			-0.0646***		
	(0.0061)			(0.0061)		
Meet and confer	-0.0184**			-0.0168**		
	(0.0086)			(0.0085)		
Union density		-0.104***			-0.0916***	
		(0.0090)			(0.0091)	
Union member			-0.0179***			-0.0130***
			(0.0049)			(0.0049)
Log(base salary)				-0.0867***	-0.0768***	-0.0948***
				(0.0118)	(0.0116)	(0.011)
Log(required hours)				0.0446**	0.0594***	0.0691***
				(0.0228)	(0.0222)	(0.0222)
School problem factor				0.181***	0.181***	0.180***
				(0.0031)	(0.0031)	(0.0031)
Observations	86,470	90,390	90,390	86,470	90,390	90,390
Number of groups	6,460	6,460	6,460	6,460	6,460	6,460

Notes: Observation number is rounded to the nearest ten. *** p<0.01, ** p<0.05, * p<0.1. Errors are clustered at the state level (presented in parentheses). Sample includes regular full-time teachers. The estimation is based on two-level multilevel model, with school districts as the second level and teachers as the first level. All models use scaling of sampling weights of both teachers' and districts' final sampling. Control variables are the same as Table 3.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Table 5 – The Effect of Weakening Teachers' Unions on Teacher Stress

Dependent Variable: Teacher Stress Factor

	Before Legal Changes	After Legal Changes	Diff-in-Diff = After – Before
Panel A: Baseline DID			
Treatment group	1.666	1.722	0.056***
	(0.010)	(0.016)	(0.015)
Control group	1.648	1.652	0.004
	(0.003)	(0.005)	(0.004)
Difference (Treatment – Control)	0.018	0.071***	**0.053*** **
	(0.011)	(0.014)	**(0.017)**
Panel B: Augmented DID With Controls			
Treatment group	1.127	1.184	0.057***
	(0.009)	(0.016)	(0.016)
Control group	1.086	1.099	0.013*
	(0.003)	(0.006)	(0.007)
Difference (Treatment – Control)	0.041***	0.085***	**0.044*** **
	(0.010)	(0.015)	**(0.016)**

Notes: Standard errors are clustered at the state level (presented in parentheses). *** p<0.01, ** p<0.05, * p<0.1. The treatment group includes ID, IN, TN, and WI, and the control group includes all other states. All models are weighted by teachers' final sampling weights. Control variables include male, experience, MA and above, Hispanic, black, Asian, other, charter school, secondary school, school problem factor, log(CWI), log(enrollment), log(total revenue), % free/reduced-price lunch, % Hispanic students, % black students, % Asian students, % other students, suburb, and rural.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Table 6 – The Effect of Weakening Teachers' Unions on Teacher Stress, by Teacher Subgroup

Dependent Variable: Teacher Stress Factor

Teacher Characteristics	Subgroup	Augmented DID
Gender	Male	0.055***
		(0.017)
	Female	0.040**
		(0.020)
Experience	Novice (Exp<6)	0.053**
		(0.022)
	Mid-career (6≤Exp≤20)	0.031
		(0.025)
	Senior (Exp>20)	0.075***
		(0.030)
Qualification	HQT	0.054***
		(0.020)
	Non-HQT	0.030
		(0.031)
School Level	Secondary	0.050***
		(0.018)
	Primary	0.029
		(0.031)
Teaching Subject	STEM	0.094***
		(0.032)
	Non-STEM	0.038*
		(0.022)

Notes: Standard errors are clustered at the state level (presented in parentheses). *** p<0.01, ** p<0.05, * p<0.1. The treatment group includes ID, IN, TN, and WI, and the control group includes all other states. All models are weighted by teachers' final sampling weights. Control variables are the same as Table 5.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Appendix I: Sensitivity Analysis

Table A – The Effect of Weakening Teachers' Unions on Teacher Stress

Dependent Variable: Teacher Stress Factor

Teacher Characteristics	Subgroup	Augmented DID
All	Regular full-time teachers	0.043***
		(0.016)
Gender	Male	0.052***
		(0.020)
	Female	0.036**
		(0.018)
Experience	Novice (Exp<6)	0.061***
		(0.025)
	Mid-career (6≤Exp≤20)	0.023
		(0.026)
	Senior (Exp>20)	0.071**
		(0.031)
Qualification	HQT	0.050**
		(0.022)
	Non-HQT	0.030
		(0.031)
School Level	Secondary	0.050***
		(0.019)
	Primary	0.027
		(0.039)
Teaching Subject	STEM	0.084***
		(0.033)
	Non-STEM	0.033
		(0.025)

Notes: Standard errors are clustered at the state level (presented in parentheses). *** p<0.01, ** p<0.05, * p<0.1. The treatment group includes ID, IN, TN, and WI, and the control group includes all other states that also have duty-to-bargain laws. All models are weighted by teachers' final sampling weights. Control variables include male, experience, MA and above, Hispanic, black, Asian, other, charter school, secondary school, school problem factor, log(CWI), log(enrollment), log(total revenue), % free/reduced-price lunch, % Hispanic students, % black students, % Asian students, % other students, suburb, and rural.
Source: Pooled district-teacher matched datasets based on the 2003-2004, 2007-2008 and 2011-2012 Schools and Staffing Survey (SASS).

Appendix II: Factor Survey

Questionnaires for principal factors for teacher stress and school problems.

Teacher Stress: To what extent do you agree or disagree with each of the following statements?

1. Strongly Agree to 4. Strongly Disagree (%)

a. The stress and disappointments involved in teaching at this school aren't really worth it.
b. If I could get a higher paying job I'd leave teaching as soon as possible.
c. I think about transferring to another school.
d. I don't seem to have as much enthusiasm now as I did when I began teaching.
e. I think about staying home from school because I'm just too tired to go.

School Problems: To what extent is each of the following a problem in this school?

1. Serious Problem to 4. Not a Problem (%)

a. Student tardiness
b. Student absenteeism
c. Student class cutting
d. Teacher absenteeism
e. Students dropping out
f. Student apathy
g. Lack of parental involvement
h. Poverty
i. Students come to school unprepared to learn
j. Poor student health

Source: 2003-2004, 2007-2008, and 2011-2012 *Schools and Staffing Survey* (SASS).