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Public teacher compensation is largely determined by fixed salary schedules that were designed to avoid payment inequalities based on demographic characteristics. Yet, recent research shows female teachers earn less than their male peers after controlling for experience, education, and school characteristics. Building on this literature, this paper examines teacher salaries to provide empirical evidence of the extent of gender wage gaps in the teaching profession and the sources of those gaps. Using data from two waves of the National Teacher and Principal Survey, we show that on average male teachers have an advantage of over $700 in base pay and of $1,500 in supplemental compensation, compared to female teachers with similar characteristics and in similar contexts. Additionally, our estimations indicate that male teachers are both more likely to take on extra duties and receive compensation for those activities than female teachers, and the gap increases when schools have a male principal. Finally, an analysis of wage gaps across collective bargaining contexts suggests that wage gaps are positive for both base pay and extra duties, though the magnitudes of each vary across different CBA contexts. Our results provide insight into teacher compensation policies.

Key words: teacher labor markets, gender pay inequalities

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I. Introduction

In 1963, President John F. Kennedy signed the Equal Pay Act to reduce gender-based wage discrimination in the workplace. Yet, more than five decades later women still earn lower wages than men. The National Women's Law Center reports women were paid 83 cents per hour for every dollar men receive in 2020, amounting to a loss of $10,435 per year, and $417,400 over a forty-year career (National Women's Law Center, 2021). These gaps are widespread across industries, and even persist in occupations in which wages are largely determined by salary schedules, including teaching.

Descriptive studies indicate female educators in U.S. schools earn, on average, about $12,000 less than their male counterparts, and $8,000 less once individual characteristics have been considered (Fox et al., 2019). The gap in raw earnings decreases to roughly $5,000 when the authors focus on K-12 teachers only. Studies exploring the gender gap in Pennsylvania and Missouri also find pay differentials, but of a lesser magnitude (Sadler & Carter, 2018, Ransom & Lambson, 2011). In recent years, policy debates on teacher compensation reform have considered paying teachers for student performance to attract strong individuals into teaching or increasing teacher salaries overall to make them more competitive and retain teachers already in the classroom. Gender-based wage inequalities within the profession, however, have gained little policy attention and the small literature examining this issue falls short in identifying their source.

Gender gaps could emerge from either the labor-supply side or the labor-demand side. Supply-related pay differentials are those that arise due to differences in human capital, personality/individual traits, choices on where to work, or career stoppages for childrearing (Cha 2013; Hayter, 2014, Budig & England, 2001, Marchitello, 2018). Pay differences arising from the labor-demand side, however, signal employer preferences, and outright discrimination is a likely factor behind these gaps (Graf et al., 2018; Barnet-Verzat & Wolff, 2008). In other words, the presence of a gender gap alone is not necessarily a signal of discrimination, though discrimination could be one of many factors contributing to wage gaps.

Salary schedules determining compensation are ubiquitous in the teaching profession, and often these schedules are determined through collective bargaining agreements (CBAs) negotiated between teacher unions and school districts. Historically, salary schedules were adopted to curb school districts' practices of differentially paying teachers according to subject area, grade level, gender, or race (Kelly & Odden, 1995). Consequently, gender- and race-based pay gaps are low in teaching compared to other professions, but they still persist (Hansen and Quintero, 2017). Given the limited opportunity for school districts to differentiate teacher salaries, most prior studies have inferred that any gender-based wage gaps in teaching are likely to arise from compensation for additional school duties that the majority of teachers perform as part of their jobs (Sadler & Carter, 2018; Ransom & Lambson, 2011; Fox et al., 2019). Schools likely have a greater opportunity to differentiate pay by gender on these additional duties because they are often voluntary (to some degree) and have compensation arrangements not typically covered in CBAs.

Using national teacher survey data from 2015-16 and 2017-18, this study examines teachers' school-based earnings in depth and provides empirical evidence on the magnitude and source of wage gaps in the teaching profession. We explore both supply and demand factors that may contribute to gaps in all sources of teacher compensation coming from the school district: base pay, summer job, merit pay, and taking on extra duties. We address the following research questions. First, we ask whether wage gaps arise from base pay or from compensation that is not set under the salary schedule. Second, we ask whether differences in pay from additional compensation are due to men self-selecting into these positions (labor supply) or due to men being compensated at a higher rate (labor demand). Lastly, we explore whether differences in CBA context across states moderate the gender wage gaps and the probability of receiving additional compensation.

We find female teachers' base pay is over $700 lower than male teachers' base pay after controlling for teacher, school, district, and state characteristics. Across supplemental income categories, taking on extra duties is the one that contributes the most to the gender wage gap, where men who work extra duties earn over $1,200 more than their female counterparts even after adjusting for observable characteristics. These findings are supported by prior work

exploring pay differences between races and among principals (Grissom et al., 2021; Grissom & Keiser, 2011).

Our findings contribute to three strands of the literature on teacher compensation. First, we expand on the recent research on pay gaps among K-12 educators by exploring all sources of compensation (e.g., summer pay, merit pay, and extra duties). Prior research on wage inequalities among teachers has typically analyzed either base pay or aggregate pay, but has not explored differences between these two. For example, Sadler and Carter (2018) analyze base pay in Pennsylvania find a state-wide wage gap of $505, which increases notably in the largest districts. Ransom and Lambson, (2011) and Fox et al. (2019) use aggregate earnings to estimate the gender gap in Missouri and nationwide, respectively. Both estimate wage gaps that are significantly larger, leading the authors of both to hypothesize the estimated wage gaps are due to differentials in compensation coming from non-teaching duties in the school (and in Fox et al. 2019, teachers' earnings beyond school sources). Due to data limitations, however, neither study provides direct empirical evidence of wage gaps due to different income sources. Since 54% of teachers receive supplemental income through the school (based on our calculations), carefully examining that source of payment provides new insight into wage gaps.

Second, we offer evidence on plausibly discriminatory payment practices due to differential employee treatment using supplemental school compensation. When decomposing the gender wage gap by different supply-side factors we show roughly three-quarters of the wage gap in compensation coming from extra duties is unexplained, while only a third of the wage gap in base salary remains unexplained. This finding suggests that additional forms of compensation outside of the salary schedule provide a more likely channel for school leaders to discriminate against women. Indeed, our findings indicate men are both more likely to perform extra work and get paid for it than women, all else equal. Additionally, we find that male teachers are more likely to receive compensation for those duties when they work for a male principal. These results are aligned with a broader literature on labor markets suggesting a negative association between female representation in managerial positions and wage inequalities among nonmanagerial workers (Cohen & Huffman, 2007; Droganova, 2018).

More broadly, this paper adds evidence to the research on CBAs and teacher compensation. While a large body of literature has documented that teacher unions or CBAs are

associated with better teacher conditions and higher pay (Quinby, 2017; Lovenheim, 2009; Hoxby, 1996; Merkle & Phillips, 2018), little is known about CBAs and compensation inequalities within the profession. Two recent studies suggest that CBAs can reduce wage differentials between male and female teachers because they protect women from having to directly negotiate their salary and ensure higher salaries for more experienced teachers, who are typically women (Biasi & Sarsons, 2022; Han, 2020). Building on this work, we estimate wages across CBAs context (illegal, permissible, required, other) and use district size as a proxy for contract restrictiveness (Strunk et al., 2018). Our findings from this analysis suggest that gender wage gaps are positive for both base pay and extra duties across CBA contexts, though we see a somewhat compensatory pattern of wage gaps across these dimensions. Base pay gaps are small in small districts where CBAs are illegal while wage gaps in extra duties are large in this context. We observe the opposite pattern in large districts where CBAs are legal.

The remainder of this paper proceeds as follows: Section 2 briefly reviews the literature on the factors that contribute to gender wage gaps. Section 3 and 4 describe the data and methods we use to answer the research questions, respectively. Section 5 provides results from these analyses and Section 6 discusses the results.

II. Multiple factors contribute to gender wage gaps

Pay differentials between males and females can arise from either labor supply-side factors or demand-side factors. Because teacher contracts are largely negotiated between local teacher unions and school leaders through CBAs, the nature of these contracts and whether they are legal in each state may also shape gender wage gaps, though in unclear ways. We consider each of these elements in turn below.

Supply-side factors

First, we consider whether gender differences in the availability of workers and their qualifications contributes to observed wage gaps. Differences in education attainment have historically contributed to gender pay gaps across occupations. Indeed, the increase in employed women with a college degree, from 16% in 1980 to 40% in 2018, helped to close the gap across all industries by nearly 20 percentage points (Kochhar, 2020). Because teachers are paid on step-and-lane salary schedules, where additional education moves teachers to higher lanes, one could

expect gender gaps to emerge if male teachers report higher levels of education than female colleagues.

Gender differences in personality traits have also been shown to contribute to the gender pay gap. Several studies from outside education illustrate that women tend to be more agreeable, more risk-averse, and less competitive than men (Niederle & Versterlund, 2007; Jung et al., 2018, and Risse et al., 2018), which drives women away from jobs with higher salaries or pay-for-performance schemes. A laboratory experiment corroborates these findings for teachers: Using a task to measure risk behaviors, Bowen et al., (2015) find that prospective female teachers are significantly more risk averse than females entering other professions. Perhaps men's competitiveness and their lower risk aversion may lead them to sort into districts with higher salaries or with merit-pay schemes, or may motivate their disproportionate representation in secondary positions that offer higher salaries contributing to gender wage differentials (Taie & Goldring, 2017). Ransom and Lambson's (2011) analysis of wage gaps in Missouri supports the hypothesis that male teachers switch jobs across districts, sorting to those with higher pay.

Another critical source of the gender wage gap is work stoppages for childrearing. Evidence shows that women are more likely to interrupt their careers due to changes in family composition and stay out of work longer when experiencing such interruptions (Hayter, 2014). A longitudinal study in Germany of doctors' career paths found that interruptions were mostly reported by women with children (Evers & Sieverding, 2014). These career interruptions are associated with fewer total years of experience, less seniority, and more part-time work, which negatively impacts wages (Budig & England, 2001). Since salary schedules directly reward experience, one could expect a motherhood penalty in the teaching profession and, thus, higher average pay for male teachers.

Demand-side factors

The demand-side factors generally explain the wage gap through employers' differential treatment of women (i.e., discrimination), which has historically been explained by two theories. In Becker's (1957) seminal work on labor market discrimination, this practice arises due to employers' distaste of work typically performed by women. Conversely, the statistical discriminatory theory posits that discrimination is the product of a rational response to imperfect information (Arrow, 1971). Statistical discrimination is evident when managers discriminate

based on motherhood. Experimental evidence in which evaluators had to assess the résumés of job applicants with identical qualifications but different parental status demonstrates that mothers were perceived as less competent and less committed, meanwhile, fathers were perceived as more committed and were recommended for higher salaries (Correll et al., 2007). In teaching, principals could see mothers as less productive, with lower capability to commit to work, and therefore consider them less available for duties associated with additional pay.

Another source of discrimination could arise from gender stereotypes that posit men as the breadwinners, therefore they should earn more money than women. Experimental studies show that participants tend to allocate significantly higher salaries to men than to women (Alksnis et al., 2008), which confirms an automatic association between masculinity and wealth, reinforcing gender gaps. Compensation under the discretion of the principal could be a source of discrimination when principals value males' work more than females' work, or offer higher wages to males to retain them in the school or in the profession.

External factors: Intermediary role of CBAs

In addition to supply and demand factors, the policy context in which compensation is set may attenuate or contribute to gender wage gaps. In 41 states and the District of Columbia, collective bargaining negotiations are required or permitted when a majority of employees vote in favor of union representation. Under these negotiations, teacher unions and school leaders establish legally binding contracts that govern teacher compensation along with other aspects of working conditions including staffing assignments, length of the workday and year, and time devoted to professional development (Podgursky, 2011). Supporters of teacher unions and CBAs argue that the nature of these contracts will protect teachers from arbitrary staffing decisions of administrators, give teachers a voice, and ensure fair wages and benefits (Ravitch, 2007; National Education Association, 2020). Scholars, however, have reported inconclusive findings on whether CBAs and teacher unions ensure better salaries for teachers. While most correlational studies report positive effects of CBAs and teacher unions on teacher compensation or instructional expenditures (Merkle & Phillips, 2018; Marianno et al., 2021), evidence attempting to identify causal effects finds small or null effects (Quinby, 2017; Lovenheim, 2009; Frandsen, 2016 Hoxby, 1996; Paglayan, 2019).

In relation to wage inequalities, bargaining negotiations between district leaders and teacher unions could potentially yield more equal wage outcomes. By defining the steps and lanes of the salary schedule, they ensure that male and female teachers with similar characteristics (experience and education) who do the same work receive the same salary. Additionally, the negotiations between teacher union representatives and districts prevent individual teachers from directly negotiating their salaries with district leaders. Since women have a lower average propensity to negotiate than men (Babcock & Laschever, 2009; Croson & Gneezy, 2009), CBAs should, in theory, ensure more equal salaries. Indeed, changing to compensation schemes in which individual teachers negotiate their salaries showed an increase in the gender wage gap in Wisconsin after the enactment of Act-10, which ended collective bargaining in the state (Biasi & Sarsons, 2022).

Nonetheless, CBAs may not achieve equal salaries for similar women and men if the contract does not address all sources of compensation. For example, in more than 20 states, CBAs must negotiate work hours, grievance policies, and insurance and fringe benefits, but only six states mandate the negotiation of the conditions and compensation related to extracurricular activities in CBAs (National Council on Teacher Quality, 2019). This omission of extra duties in most states opens a source for school leaders to disproportionally assign extracurricular activities to male teachers or pay higher supplemental earnings to males than females who take on those assignments.

Conversely, contracts may also contribute to gender wage inequalities if the issues negotiated benefit male teachers over female teachers. This could result from the composition of union leadership who engages in the negotiating process (Babcock & Engberg, 1999). If this group disproportionately represents men, it is more likely that the interests of men will be favored in negotiations. For instance, the 2019 contract in Newark Public School District in New Jersey – a state in which collective bargaining for extracurricular activities is mandatory – stipulated that male and female coaches shall receive the same pay for similar services; however, high school basketball coaches receive $10,000 while elementary coaches get $4,600 (Newark Teachers Union, 2019). Since female teachers are less likely to teach in high school, this compensation policy could disparately impact them even if it is gender neutral on its face.

Our analysis explores variations in CBA legality across states to see whether gender pay gaps are associated with the CBA context. Because we recognize that there are unobserved factors correlated with allowing CBAs in a state, our estimates do not show a causal relationship.

III. Data

This study utilizes administrative teacher-level data from the 2015-16 and 2017-18 waves of the National Teacher and Principal Survey (NTPS), a national representative survey conducted by the National Center of Education Statistics. The NTPS contains variables on teacher demographic characteristics, level of education attainment, main teaching assignment, and a set of questions on teacher compensation, including teacher's base salary and teacher's income coming from different sources such as summer jobs, taking on extra duties, and merit pay or other pay-for-performance model. These variables on teacher compensation enable us to examine salary differences between male and female teachers and determine whether male teachers are more likely to receive extra payment than similarly qualified female teachers.

Our sample is comprised of 60,530 full- and part-time regular teachers across the nation.[2] Table 1 reports the characteristics of the teachers in our sample. Overall, male and female teachers have similar years of experience and education credentials, which are the primary inputs of salary schedules.

There are notable gender differences in subject specialty, where female teachers are more likely than male teachers to teach English (13% vs. 8%, respectively), Special Education (12% vs. 7%), and in Elementary grades (59% vs. 23%). Conversely, female teachers are less likely to teach Math and Science (13% vs. 24%) and Social Studies (4% vs. 15%).

School-level variables from the Common Core of Data were merged with the NTPS survey responses to provide a window into the context in which teachers work. We use student body demographics (the share of nonwhite students, the share eligible for participation in the free and reduced-price meals program), district per-pupil expenditures, and district enrollment size as

[2] Only survey respondents with non-missing observations on all explanatory variables and dependent variables are retained for the analysis. As required by IES data security restrictions, all sample sizes reported in the text and tables have been rounded to the nearest 10.

control variables that could potentially shape compensation decisions. The share of nonwhite students and the share of students eligible for free- or reduced-price lunch are binned into four mutually exclusive categories roughly corresponding to quartiles. Overall, Table 1 shows men and women teach in roughly similar schools, with a slightly higher representation of men in schools serving few low-income students, higher expenditures per student, and in smaller districts.

We also use the teacher contract database from the National Council on Teacher Quality (NCTQ) to gather information of CBA context across states (National Council on Teacher Quality, 2019). CBAs tend to be illegal in most southern states, while in northeastern and western states these contracts are required if a majority of teachers vote for union representation. States where a CBA is required have a higher representation of men than women. NCTQ data on characteristics of salary schedules in the largest districts in the country were also used in a supplemental analysis, described below and in the Appendix.

Table 2 focuses on the five different income measures that will be used as dependent variables in the analysis below (base pay and four different types of extra compensation). The columns report the average amount and proportion of teachers reporting each type ofcompensation by gender. Except for merit pay, all other types of compensation show men receive both higher wages and are more likely to earn the compensation.

IV. Methods

RQ1: Where do gender wage gaps arise among teachers?

We use a linear regression model to estimate teacher salaries as a function of teacher and school characteristics, and district and state fixed effects. The Mincer equation to be estimated has the following form:

$$W_{i,s,d,st,t} = \beta_0 + \beta_1 Male_{i,s,d,st,t} + \beta T_{i,s,d,st,t} + \theta S_{s,d,st,t} + \gamma_{st} + \varphi_d + \delta_t + \varepsilon_{i,s,d,st,t} \quad (1)$$

Where W_i is the CPI-adjusted annual salary (using 2017 dollars) for teacher *i* in school *s* in district *d* in state *st* at time *t*. Male is an indicator for whether the teacher is identified as male; T is a vector of teacher characteristics such as race/ethnicity, years of experience, age, educational attainment, main teaching assignment (English, Math and Science, Social Studies, Special Education), level of teaching (Elementary), route for entering into the profession, holding a state certificate, and number of days in the contract. S is a vector for school and district characteristics: per pupil expenditure, district size, and percent of students eligible for free- or reduced-price lunch. This vector attempts to account for male teachers disproportionally sorting into schools with higher resources. We include a survey wave fixed effect (δ), a district fixed effect (φ), and a state fixed effect (γ) to account for differences in salary schedules, resources, and other unobserved characteristics across states. We cluster standard errors at the state level.

Next, we examine whether wage gaps arise in supplemental income by estimating analogous models to Equation 1 where the dependent variable corresponds to a source of supplemental income. The NTPS reports the following four types of supplemental income coming from school resources: working during the summer in a teaching position, working during the summer in a non-teaching position, taking on extra duties (e.g., leading extracurricular activities), or merit pay or other compensation tied to students' performance. Other sources of income such as summer and non-summer jobs outside the school system are not part of this analysis since those salaries are determined outside the teacher labor market. These models are estimated for both the full sample and for teachers who received additional compensation to account for selection into these activities.

RQ2: To what extent are men more likely to receive compensation off the salary schedule?

The second part of the analysis seeks to understand whether male teachers are more likely to receive supplemental compensation. To that end, we estimate the probability of receiving additional compensation as a function of teacher and school characteristics.

$$P_{i,s,st,t,j} = \beta_0 + \beta_1 Male_{i,s,,st,t,j} + \beta_2 MalePrincipal_{i,s,st,t,j} + \beta_3 Male_{i,s,st,t,j} * MalePrincipal_{i,s,,st,t,j} + \beta T_{i,s,d,st,t} + \theta S_{s,d,st,t} + \gamma_{st} + \varphi_d + \delta_t + \varepsilon_{i,s,st} \quad (2)$$

Where $P_{i,s,,st,t,j}$ is whether teacher i in school s in state st at time t received additional compensation for activity j. Male is an indicator for whether the teacher identifies as male, β_1 is male's probability, relative to female's probability, for receiving additional compensation. In addition to the teacher and school characteristics included in Equation 1, we include here a variable indicating whether the principal identifies as male and an interaction term between male teacher and male principal. Prior evidence suggests gender gaps decrease when teachers work under a female teacher and a potential racial bias where principals are more inclined to pay teachers who share their same race/ethnicity for extra duties (Biasi & Sarsons, 2022; Grissom & Keiser, 2011). Extending this logic to gender wage differentials in supplemental compensation, if β_3 is positive and significant, then male teachers are more likely to receive additional compensation than their female counterparts when the school is led by a male principal. We also include wave, district, and state fixed effects.

The results from this estimation, however, assume that all teachers who engaged in extra-curricular activities received compensation for doing so. Yet, we might expect gender differences in their likelihood to engage in the activity and receive compensation for it. On one hand, women tend to volunteer at work more often than men, so female teachers may engage in additional activities on the job but be less likely to receive compensation for doing so (Babcock et al, 2017). Conversely, women's disproportionate share of household responsibilities may deter them from taking on extra duties or being assigned to them. To examine gender differences in their likelihood to take on extracurricular activities, we estimate Equation 3 using detailed items collected only in the 2015-16 wave. This survey asked teachers both whether they received additional compensation and whether they engaged in extracurricular activities, enabling us to differentiate male teachers' greater participation from their receipt of higher wages compared to female teachers. Further details on these specifications are presented with the results below.

RQ3: To what extent do CBAs moderate gender wage gaps and teachers' probability of receiving additional compensation?

We explore whether gender wage gaps vary across CBA context by estimating a model similar to Equation 1 but including a set of dummy variables for CBA context.

$$W_{i,s,st,t} = \beta_0 + \beta_1 Male_{i,s,d,st,t} + \alpha CBA'_s + \vartheta LargeDistrict_{i,s,st,t} + \varphi Male_{i,s,st,t} * CBA_s + \omega Male_{i,s,st,t} * CBA_s * LargeDistrict_{i,s,st,t} + \beta T_{i,s,st,t} + \theta S_{s,st,t} + \gamma_{st} + \delta_t + \varepsilon_{i,s,st,t} \quad (3)$$

W_i is the CPI-adjusted annual salary for teacher *i* in school *s* in state *st* at time *t*. CBA takes the value of 1 if the state law requires or permits collective bargaining and 0 otherwise. $Male_{i,s,st,t} * CBA_s$ captures variation in gender wage gaps across CBA context. Since prior evidence suggests district size largely determines contract restrictiveness within states (Strunk et al., 2018), and our survey data does not enable us to include district fixed effects without dropping observations from small districts, we include a triple interaction term $Male_{i,s,st,t} * CBA_s * LargeDistrict$ to capture both CBA and contract restrictiveness. Similar to the other equations, we include teacher and school characteristics, and state and wave fixed effects.

Then, we use a similar specification to estimate the probability of a teacher receiving additional compensation.

$$P_{i,s,st,t} = \beta_0 + \beta_1 Male_{i,s,st,t} + \alpha CBA'_s + \vartheta LargeDistrict_{i,s,st,t} + \varphi Male_{i,s,st,t} * CBA_s + \omega Male_{i,s,st,t} * CBA_s * LargeDistrict + \beta T_{i,s,st,t} + \theta S_{s,st,t} + \gamma_{st} + \delta_t + \varepsilon_{i,s,st,t} \quad (4)$$

Where $P_{i,s,st,t,j}$ is whether teacher i in school *s* in state *st* at time *t* engaged in any extracurricular activity.

V. Results

RQ1: Where do gender wage gaps arise among teachers?

We begin our analysis by exploring gender differences in base pay, using stepwise regression models. Column 1 of Table 3 shows the raw male wage differential (only including a year fixed effect for the survey wave); Column 2 adds individual demographics, qualifications, and assignment variables; Column 3 includes all Column 2 variables plus school and district characteristics; Column 4 adds state-level collective bargaining variables; and Column 5 includes state fixed effects. The point estimates on the explanatory variables are consistent with expectations regarding salary schedules: wages increase with education level and experience. After accounting for age and education, age is still positively associated with wages, and several notable characteristics are associated with lower pay, including teaching English, Special Education, and Elementary grades. Large districts and those with higher per-pupil expenditures tend to pay more, though no significant difference arose between states based on the CBA policy context.

Focusing on the estimated male wage differential reported in the top row of the column, each additional set of control variables slightly reduces its magnitude, though fails to explain it entirely. The state fixed effects model in Column 5, which is our preferred model as it includes all variables and observations, estimates a wage differential of over $700 unexplained by observable characteristics. In other words, our vector of explanatory variables explains about two-thirds of the original gender gap in Column 1, leaving one-third of the gap remaining.

Column 6 reports the model when using a set of district fixed effects. Note that when we run this model, the sample size decreases slightly as singleton survey respondents in small districts are dropped. Despite this difference, the estimated male wage differential is slightly larger in Column 6 (not smaller, as we otherwise expect with fixed effects on a smaller level of geography). Hence, we conclude that differences in men's earnings across districts are not

lurking behind the unexplained third of the gender wage gap, and we will rely on the full sample with state fixed effects as our preferred model moving forward.

Table 4 similarly examines each of the four remaining sources of teacher income with stepwise regression models. The column headings in this table parallel those from Table 3 above (and for completeness, we include district fixed effects in Column 6). Note that each row represents a different dependent variable, and each point estimate and standard deviation combination represent the point estimate of interest on male teachers from a single regression model. Table 4 includes two panels, which we discuss separately.

Panel A presents the point estimates on male teachers when estimated across all teachers, including those who report zero or missing income from that particular source. The male point estimate only narrows slightly as we move from the raw gaps in Column 1 to the preferred state fixed effects model in Column 5. Less than a quarter of the variation in our male estimate is explained by observable characteristics in these models, indicating that the gap on these outcomes is much less likely to be due to supply-side differences like men having the requisite experience or working in a higher-wage setting. Leaving so much of the earnings differential unexplained suggests more space for discriminatory practices, which we explore below. An exception here is that merit pay shows no significant difference between genders.[3]

Panel B presents the estimated gender wage differential from models that exclude those with zero or missing income from each source. Hence, these are interpreted as gender gaps among those who report income for performing each corresponding task. The estimated differentials are considerably larger here, and the inclusion of the full set of explanatory variables explains slightly more of the original raw gap estimates in Column 1 (no more than a third), though like Panel A, most of the raw gap remains unexplained in these models. Again, the exception to this is income from merit pay, which does not leave a significant point estimate in Column 5.

[3] The estimated wage gap could be partially driven by charter schools where teacher salaries are often not determined by salary schedules, and therefore, could be more likely to display wage gaps. To rule out this possibility, we estimated base salary using Equation 1 and included an interaction term between male and charter school status. Our findings indicate that male teachers earn more than comparable female teachers in traditional public schools, and the gender wage gap is only marginally significant in charter schools. We also find a smaller wage gap in compensation for extra duties in charter schools than in traditional public schools. Together, these results suggest that charter schools are not driving our main results. See Table A1, Columns 1 and 3.

Consistent with prior work, our results show that other sources of income within the school system appear to contribute more to wage gaps among teachers rather than base pay alone, holding other observables constant. The estimated male wage differential in Column 5 is larger for both extra duties ($1,762) and non-teaching summer work ($1,104) than the comparable differential in base pay ($714, from Table 3). Including the significant male point estimate of $490 from summer teaching, four of the five different income sources have significant wage differentials favoring men, combining for a total of $4,000 among those who earn these various incomes. Recall that because not all teachers participate or are eligible for all income types, few individual teachers likely experience total gaps of this magnitude.

In sum, male teachers still earn more money than female teachers even after controlling for many individual, school, and state characteristics.[4] The estimated results show that 33% of the wage gap in base salary is unexplained, which is somewhat higher than the unexplained fraction among professors in higher education institutions, estimated between 19-24% of the unconditional wage gap in 1999 (Barbezat & Hughes, 2005), and statistically equivalent to zero more recently (Koedel & Pham, 2022). Even more is left unexplained in supplemental income sources. We observe the largest unexplained pay differentials in categories that encompass many different types of activities, and men's performance of work could still be behind these income differences. Extra duties, for instance, includes serving as an athletic coach, as a department chair, leading a student group, or other extra responsibility beyond classroom teaching. The estimated wage gaps, therefore, could be due to differential work within a category - where female teachers perform extra duties that have systematically lower compensation - or due to principals valuing men's work more than women's work. Luckily, one of the surveys has some items that can provide useful insight here to disentangle some of these possible explanations.

The 2015-16 NTPS wave has information on which specific extra duties men and women were involved with. We observe notable gender differences in the frequency of athletic coaching, sponsoring a student group, and serving in a district-wide committee. About 40% of men serve

[4] Gender wage gaps could also originate from school districts with vacancies in male-dominated fields (i.e., social studies) offering higher wages to attract male teachers into these schools. In regressions omitted for brevity, we explored this hypothesis by including a control variable on whether a school has vacancies in STEM fields or social studies and find a statistically significant difference in the wage gap in base pay between schools with vacancies in male-dominated fields and schools with no vacancies in these areas. We do not find differences in payment for extra duties.

as coaches and 47% sponsor a student group, compared to 8% and 38% of women serving as coaches and sponsoring student groups, respectively. Half of women serve in a district-wide committee, while 40% of men are involved in this activity.

Because both men and women are typically involved in more than one of these activities and the reported pay for extra duties is aggregated in the teacher questionnaire, it is not easy to determine salary differences within extra duties across all teachers. Accordingly, we calculate the wage gap for teachers who reported being engaged in only one activity and assume the reported earnings for extra duties are associated with that activity only. Table 5 reports the raw and estimated wage gap for teachers who served only as coaches, sponsors of a student group, or in a district- or school-wide committee.

Among teachers who engaged in only one extra duty, we still observe notable wage gaps even after controlling for our vector of explanatory variables. Among teachers who only coached, men earn $1,647 more than their female counterparts. Similarly, men who sponsored a student group had a $1,008 advantage over women. Note that a wage gap favoring men is evident (though not statistically significant) for service on committees. Thus, regardless of whether the activity attracts more men (coaches and student group sponsors) or women (committee service), men report higher compensation for it. Though these estimations are based on a small number of observations and cannot be generalized, they suggest that women suffer a wage penalty even when compensated for what appears to be the same work.

Finally, we note that differential hours and workload could still be drivers behind the wage gaps presented in Table 5, even within the same task. To address this possibility, we analyzed reported extra hours worked across the three additional work categories and find only slight differences in the distributions by gender. In the Appendix (see Table A2 and accompanying text) we detail additional analyses that consider the role of work hours in driving observed wage gaps. In short, reported hours worked do not explain the earnings gaps favoring men on these extra duties.

RQ2: To what extent are men more likely to receive compensation off the salary schedule?

The wage gaps observed in the previous section motivate us to examine how differential labor supply versus labor demand factor into these outcomes. We do this by first investigating whether the probability of seeking (or receiving) additional compensation varies across gender. Consistent with evidence on teacher moonlighting (Winters, 2010), men could be more likely to seek other forms of compensation in the school, even after controlling for observable characteristics. This may explain the pattern observed in Table 4 above, where merit pay (which is not an extra duty volunteered for) showed no significant wage differential but the other three sources did. Thus, men's differential propensity to seek out ways to supplement income could be a driving factor here.

In Table 6, columns 1 to 4 present male teachers' probability, relative to female teachers' probability, of receiving compensation for merit pay, working over the summer, working in non-teaching positions over the summer, and taking on extra duties, respectively.[5] We find male teachers are as likely as female teachers to receive compensation for merit pay and for teaching positions over the summer. Yet, we find that men are 2.7 and 10 percentage points more likely to receive additional compensation for non-teaching positions over the summer and for extra duties, respectively. Further, these probabilities increase by 1.6 and 2.5 percentage points, respectively, when the principal identifies as male, corroborating prior findings on race (Grissom & Keiser, 2011).[6]

Gender differences in receiving compensation for additional work could emerge from societal expectations in which men are expected to be the household breadwinner. Consequently, principals could systematically offer positions associated with additional income to male teachers, or men may choose to get involved in extracurricular activities to supplement their base salary while women's household responsibilities may deter them from doing so.

To better understand gender differences in receiving additional compensation, we again take advantage of certain items on the 2015-16 NTPS wave that asks teachers both whether they engaged in activities related to extra pay and whether they received extra pay. The last two

[5] We estimate the model using OLS and logit models. For ease of interpretation, we report the estimates from the OLS regression. The results from the logit model are consistent and available upon request..

[6] In the appendix, we report estimates corresponding to the magnitude of the gender wage gap by income source including male teacher – male principal interactions (see Table A3). Though most income sources did not show significant differences, the interacted wage gaps were large and significant for extra duty pay, amounting to nearly $500 compared to otherwise similar female colleagues.

columns of Table 6 show the probability of male teachers, relative to female teachers, of taking on extra duties and of receiving compensation for those activities. In other words, these columns decompose the receipt of additional pay into two discrete steps: choosing to provide additional work (column 5) and then being paid for that work (column 6). The predicted probabilities indicate men are more likely than women to both supply extra work and get paid for it. While principal's gender is not associated with a greater probability of men's taking on extra duties, we do find male teachers being more likely to receive extra income than female teachers when the school has a male principal. Thus, it appears that male principals do not systematically exert discretion in assigning extracurricular activities to men, but they may be willing to pay male teachers more often and/or at a higher rate.

We also hypothesized that women's household responsibilities may contribute to explain male teachers' higher probability of receiving additional income. To test this hypothesis, ideally, we would look at teachers' marital status and number of young children, however, the NTPS does not provide information on any of those variables. Thus, we use teacher's age as a proxy for motherhood and childcare responsibilities. Specifically, we divide teacher's age into six groups according to our own calculations of fertility rates for teachers in the American Community Survey and estimate both the probability of receiving compensation for taking on extra duties and the probability of taking on extra duties for each age group. Figure 1 shows the results of the estimation—where the left panel shows differential sorting into performing extra duties and the right panel shows differential likelihood of being compensated conditional on performing extra duties.

The right panel of Figure 1 shows that male teachers are more likely than women to be compensated for additional work and this difference is statistically equivalent across age groups. Males' probability of receiving extra income, relative to females' probability, oscillates between 8 percentage points and 16 percentage points across ages. This pattern of women being less likely to be compensated for work to support the institution is also observed among college professors and in laboratory settings (Guarino & Borden, 2017; Babcock et al., 2017). Conversely, men's probability of taking on extra duties, relative to women, declines as teachers age (see left panel). For example, male teachers in their 20's are 12 percentage points more likely to take on extra duties than their female counterparts, whereas 37- to 42-year-old male teachers

are 8 percentage points more likely to get involved in extra activities in comparison to female teachers. After this age group, the probability of working extra duties is statistically the same for men and women. The statistically significant gender gaps in participation coincide with ages when women's fertility peak and are most likely to have young children in the household. This suggests traditional household gender roles where women shoulder disproportionate household responsibilities (Craig & Mullan, 2011) explain gendered differentials in participation in additional duties at school (Borck, 2014). Thus, gender-based differences in labor supply is a partial explanation for gender wage gaps on these extra duties, though certainly not all of it (as evidenced in the right panel of Figure 1).

RQ3: To what extent do CBAs moderate gender wage gaps and teachers' probability of receiving additional compensation?

We now turn our focus to examine whether CBAs may reduce gender wage gaps since these contracts are intended to protect teachers from discrimination and prevent individual teachers from negotiating their salaries with school leaders. We would expect that states where CBAs are permissible or legal have smaller wage gaps in comparison to states where contract negotiation is illegal. Additionally, we take district size as a proxy for contract restrictiveness (Strunk et al., 2018).[7] Interacting both CBA states and district size provide four distinct categories, where we expect union strength to be lowest in small districts in non-CBA states and highest in large districts in CBA states. Given prior evidence suggesting an association between unions and smaller gender pay gaps, we expect to find smaller gaps in large districts and CBA states in comparison to smaller districts in states where CBAs are legal or permissible. However, as shown in Figure 2 our results do not support these hypotheses (the full table of results from which this figure is derived is presented as Appendix Table A4).

Figure 2 shows two sets of bars: the blue bars represent estimated men's wage differentials on base pay, the red bars represent these estimates on extra duties; 95% confidence

[7] CBA states here are those that either allow or require CBAs when a majority of employees vote for union representation; large districts are those with 25,000 or more enrolled students.

intervals are also represented. Contrary to expectations, the gender wage gap in base pay is largest in large districts in CBA states—these are contexts most likely to have restrictive contracts governing salary schedules. The estimated wage gap, however, exceeds $2,000. All other categories also have positive and significant wage gaps favoring men, though they are not nearly as large. Extra duties also show positive and significant wage gaps in all four categories, though they are smallest in large districts in CBA states. Interestingly we see a somewhat compensatory pattern of wage gaps here, where low estimated gaps on the base salary correspond to high estimated gaps on extra duties (or vice versa).

We also estimate whether CBAs and contract restrictiveness moderate the probability of receiving supplemental income. Figure 3 shows the resulting point estimates on male teachers' likelihood of taking on extra duties (yellow bars) and receiving extra compensation for that effort (blue bars; the full table of results is presented as Appendix Table A5). As above, we limit the sample here to survey respondents in the 2015-16 NTPS wave for which we have sufficient information to break this decision into these two component parts. Across all contexts, men are more likely to perform extra duties than women and are even more likely to be compensated for that effort. While the differences in performing those duties do not vary much across these contexts, smaller districts appear to be marginally more likely to compensate men for their extra work compared to large districts.[8]

The overall findings from this section show men consistently earn more money and are more likely to participate in additional wage-earning opportunities, regardless of the collective bargaining context. Contrary to expectations, however, we do not find any evidence that contract restrictiveness (as proxied by state CBA laws and district enrollment) narrows wage gaps in base pay. We did not see any consistent narrowing of either payments or likelihoods of performing supplemental jobs for income based on contract restrictiveness. We acknowledge that part of this contrary finding could be a product of the data we use, which is not representative at the district level, thus we are not able to capture unobserved heterogeneity across districts and states that may influence both contract restrictiveness and wage gaps. Our findings, however, should

[8] To acknowledge variation in salary schedules across school districts, we use the teacher contract database of NCTQ to further investigate wage gaps across different types of payment schemes in the 140 largest school districts. We find that the most restrictive context (step and lane) shows wage gaps that appear to favor male teachers over female teachers. See Appendix for further details.

caution that the contract mechanisms that are widely believed to equalize pay among teachers appear to show little efficacy in practice.

VI. Conclusion

We find that men earn more than female teachers after accounting for many supply-side factors, despite the ubiquity of salary schedules aimed at reducing pay differentials. We provide evidence of gender wage gaps in both base pay and compensation not set under the salary schedule. Our estimates show that, on average, male teachers have an advantage of over $700 in base pay and of over $1,500 in supplemental compensation, compared to female teachers with similar characteristics and in similar contexts. Even though the gender wage gap among teachers is smaller than in other occupations, this result is still meaningful as teachers are government workers and constitute one of the largest professions in the country. We encourage school leaders and researchers to further examine what practices contribute to pay differentials.

We also report gender differences in the choice to participate in additional work. Men are more likely to be involved in extracurricular activities than female teachers, particularly when they are under 42 years old, suggesting childrearing responsibilities play a role in women's willingness to perform extra work. But even conditioning on participation in extra duties at school, our results show that men are more likely to receive any supplemental compensation and their compensation amounts are systematically higher for the same activities. Further, the estimated probabilities of men receiving supplemental pay are higher in schools with male principals, suggesting male supervisors favor men's labor over women's labor—our clearest evidence of discriminatory compensation.

This study presents a picture of teacher wage gaps nationwide, and is the first to investigate these wage gaps by income source and highlight the central role of supplemental compensation that occurs off of the salary schedule. Our findings point to gender discrimination playing a probable role, particularly in supplemental earnings. Due to data limitations, however, we acknowledge that important variations in compensation practices within districts and schools may still be lurking beneath the surface. For example, our findings are based on teachers' self-

reported earnings, and the wage gaps we report may be overestimated if social norms led male teachers to systematically inflate their salaries. Yet, our findings are broadly consistent with magnitudes in prior research using administrative data (e.g., Fox et al., 2019). Also, we can observe only reported pay differences, not inequalities in hiring decisions or job access which may indirectly contribute to teachers' earnings differentials that we observe. Further, the notable pay differentials in income for extra duties could arise from men doing activities that require specialized skills, which are not adequately captured in the survey data. Further research using more detailed data sources could be useful to better understand pay differentials in the teaching profession.

Future work might investigate whether labor market policies, including pay transparency, including supplemental pay in collective bargaining contract negotiations, and salary history bans can reduce gender wage gaps among K-12 teachers. For example, requiring school districts to report payroll data -including all sources of income – could bring transparency into teacher salaries and subsequently reduce gender wages gaps. In a new study, Obloj and Zenger (2022) find that pay transparency significantly decreased wage inequity in higher education institutions. Though our findings suggests that wage gaps arise across different CBAs contexts, we found lower wage gaps in supplemental income – the greatest sources of gaps – in stronger union contexts. Expanding the sources of pay included in contract negotiations between unions and districts may be an important step to reduce gender wage gaps. Salary history bans offer another potential policy lever, especially in contexts where individual bargaining is common. These bans have been increasingly adopted by states in recent years, and recent evidence of public sector employees from 36 states suggests modest reductions in gender wage gaps resulted after implementation (Davis et al., 2021). In summary, the stubborn persistence of gender wage gaps even in contexts where many practices have been taken to explicitly counter pay differentiation—like teaching—warrants further policy experimentation to determine what can be done to fully close them.

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Appendix

Appendix Table A1 examines whether charter schools may de driving gender wage gaps, as they are widely known to be less restrained on their hiring and compensation practices in comparison to traditional public schools. In Table A1, we present regression results for base salary, the likelihood of being paid for extra duties, and (among those receiving compensation) the amount of compensation for extra duties. Charters generally pay lower amounts to all teachers and, if anything, gender wage gaps favoring males are significantly lower than those in traditional public schools (the point estimate on base pay is not significant, though it is negative).

Appendix Table A2 investigates whether gender differences in hours worked explain wage gaps in supplemental pay categories. Our corresponding estimations in the main text (Table 5) do not consider hours worked by teachers on these extra duties. Theoretically, male teachers could systematically take on extra duties that demand more hours to fulfill and that these differences are the drivers of the estimated additional compensation gap, even if they are performing comparable tasks (e.g. sponsoring a student group). We explored and accounted for this issue in two different ways. First, we estimated the wage gap for coaches, student group sponsors and school committee members mirroring the results shown in Table 5 while controlling for the reported hours worked (beyond that required for fulfilling their main teaching responsibilities). The change in the magnitude of the gap was negligible when accounting for reported hours worked. Second, we calculated the hours worked on extra duties for this sample of teachers and estimated the hourly wage rate for teachers engaged in these activities (extra duty annual compensation in the numerator, divided by the produce of weekly extra hours and 36 weeks in the school year in the denominator). These results are presented in the first six columns of Table A2. Reported weekly hours worked are roughly the same across all categories (the t-test for the gender difference was only marginally significant in the case of coaching hours). When looking at the implied hourly wage rate, female teachers consistently earn less than their male peers across the three activities shown in Table A2. Results for coaching and student group sponsors are statistically significant. The last pair of columns serve as suggestive evidence that the wage gap estimates for all extra duty compensation for all teachers earning it in the 2015-16 sample are not driven by differences in the hours worked. Across the sample, male teachers work

only 1.13 more hours per week on extra duties, but earn nearly twice the amount for every hour worked ($9.16 vs $4.86). The differences of both these measures are significant.

Appendix Table A3 estimates the magnitude of the gender wage gap across different income sources when controlling for male principal and male teacher – male principal interactions. The results suggest that only extra duty pay amounts are significantly associated with male gender congruence.

Appendix Table A4 is the full set of results corresponding to Figure 2 in the main text, exploring how the gender wage gap varies across different state CBA and district contexts.

Appendix Table A5 is the full set of results corresponding to Figure 3 in the main text, exploring how the propensity for receiving supplemental compensation varies across different state CBA and district contexts.

Appendix Table A6 explores the wage gap and probability of receiving supplemental compensation based on characteristics of the salary schedule. Our analysis in the main text of the relationship between CBA context and gender wage gaps does not consider variations in salary schedule across districts. To explore the possibility that more flexible salary schedules may be driving gender wage gaps, we use data from NCTQ. NCTQ's teacher contract database contains salary information of the 150 largest school districts in the nation. For our analysis, we were able to merge 140 school districts that represent 18% of our sample (not all districts were represented among NTPS survey respondents). According to NCTQ's database, these school districts use different type of schemes for teacher compensation, ranging from no set salary schedule to the traditional step and lane payment. To investigate whether these differences in the type of salary schedule change our main findings, we divide the pay schemes reported by NCTQ into the following four categories: no salary schedule, teacher evaluation ratings determine salary increases, salary schedule with some modification (e.g., payment is not differentiated by education), and traditional step and lane salary schedule. Next, we estimate teacher salary as a function of teacher and school characteristics, and include an interaction term between type of salary schedule and male teacher as follows:

$$W_{i,s,st,t} = \beta_0 + \beta_1 Male_{i,s,d,st,t} + \alpha SalarySchedule'_s + \omega Male_{i,s,st,t} * SalarySchedule_s + \beta T_{i,s,st,t} + \theta S_{s,st,t} + \gamma_{st} + \delta_t + \varepsilon_{i,s,st,t} \quad (4)$$

Table A6 and **Figure A1** present the results of this analysis. Given that salary schedules aim at protecting teachers from discriminatory practices in compensation, one would expect to observe no or small gender wage gaps in districts that use the traditional step and lane salary schedule, with larger gaps observed in districts with other contract types. Yet. similar to the findings reported in the CBA analysis, the most restrictive schedule type (step and lane) shows base pay wage gaps that favor male teachers over female teachers (differences with other contract types are only marginally significant). We do not find a clear pattern for compensation related to extra duties. Additionally, we estimate the probability of teachers receiving compensation for extra duties and we find no differences in males' probability, relative to women, of getting paid for extra duties across salary schedule context (Table A6, Column 2).

Tables

Table 1: Summary statistics

	(1) Males	(2) Females	(3) All
Panel A: Individual and qualification characteristics			
Nonwhite teachers	0.20	0.19	0.19
Advanced degree	0.55	0.56	0.56
School years taught	13.94	13.64	13.71
Teacher's age	42.72	42.04	42.20
Alternative certification	0.24	0.16	0.17
Regular state certificate	0.90	0.91	0.91
Panel B: Teacher assignment characteristics			
English teachers	0.08	0.13	0.12
Math and science teachers	0.24	0.13	0.15
Social studies teachers	0.15	0.04	0.06
Special Education teachers	0.07	0.12	0.11
Elementary school	0.23	0.59	0.50
Part time teacher	0.02	0.02	0.02
Contract days	189.55	188.03	188.39
Panel C: School characteristics			
0-35% FRPL students	0.34	0.31	0.32
35-50% FRPL students	0.19	0.18	0.18
50-75% FRPL students	0.27	0.28	0.28
75-100% FRPL students	0.21	0.23	0.23
0-35% of nonwhite students	0.44	0.42	0.43
35-50% of nonwhite students	0.13	0.13	0.13
50-75% of nonwhite students	0.17	0.19	0.18
75-100% of nonwhite students	0.26	0.26	0.26
$<$ 5000 students in district	0.39	0.36	0.37
5000 to 25000 students in district	0.33	0.34	0.34
$>$ 25000 students in district	0.29	0.30	0.29
Per pupil expenditures	11868.90	11667.88	11715.06
Panel D: Collective bargaining status			
CBA illegal	0.23	0.26	0.25
CBA permissible	0.08	0.09	0.09
CBA required	0.67	0.63	0.64
CBA other	0.02	0.02	0.02
N	15470	45060	60530

Note: Descriptive statistics of the overall sample (combining the 2015-16 and the 2017-18 NTPS waves and using nationally representative weights). School characteristics come from the Common Core of Data and CBAs status comes from the National Council on Teacher Quality contract database. The sample includes only survey respondents with non-missing observations on all explanatory variables and dependent variables. All sample sizes reported have been rounded to the nearest 10.

Table 2: Summary statistics of teacher compensation

	Male		Female		Total	
	Amount	Proportion	Amount	Proportion	Amount	Proportion
Base salary	56252.14	1	54213.68	1	54692.12	1
	(18172.78)	(0.00)	(17665.21)	(0.00)	(17806.47)	(0.00)
Extra duties	2385.42	0.57	780.76	0.39	1157.39	0.43
	(3874.28)	(0.49)	(2077.52)	(0.49)	(2699.70)	(0.49)
Merit pay	92.68	0.06	93.70	0.07	93.46	0.07
	(567.74)	(0.24)	(571.60)	(0.26)	(570.69)	(0.26)
Summer teaching position	419.11	0.14	317.39	0.13	341.27	0.13
	(1829.23)	(0.35)	(1369.70)	(0.33)	(1490.95)	(0.34)
Summer non-teaching position	324.98	0.09	103.39	0.05	155.40	0.06
	(1530.67)	(0.29)	(816.55)	(0.21)	(1033.91)	(0.24)
Total school related income	59474.33	1	55508.93	1	56439.65	1
	(19143.79)	(0.00)	(18056.24)	(0.00)	(18394.08)	(0.00)
N	15470		45060		60530	

Note: Columns 1,3, and 5 present average compensation by source of income. Columns 2, 4, and 6 present the proportion of teachers who reported receiving compensation for each source of income. Standard deviations are in parentheses. Data come from the 2015-16 and 2017-18 NTPS. National representative weights are used. All sample sizes reported have been rounded to the nearest 10.

Table 3: Adjusted wage gap on base salary

	(1)	(2)	(3)	(4)	(5)	(6)
	Raw gap	Individual characteristics	School characteristics	CBA	State FE	District FE
Male teachers	2038.529***	1572.712***	1120.775***	957.456***	713.840***	763.832***
	(170.569)	(336.331)	(331.049)	(228.444)	(151.061)	(142.710)
Panel A: Individual characteristics						
Age 31-36		270.032	1045.488***	965.430***	649.345***	832.989***
		(280.527)	(173.137)	(152.986)	(225.607)	(247.943)
Age 37-42		2288.287***	3166.485***	3051.147***	2581.712***	2684.537***
		(510.218)	(432.625)	(389.325)	(412.799)	(446.700)
Age 43-48		2845.170***	3780.538***	3701.277***	3169.134***	3314.828***
		(805.176)	(720.911)	(667.780)	(522.899)	(538.666)
Age 49-54		3052.403***	4136.386***	4027.145***	3575.599***	4016.020***
		(818.174)	(710.028)	(637.596)	(563.502)	(583.426)
Age $\geq$ 55		3815.147***	4694.181***	4539.666***	4277.358***	4778.415***
		(1043.889)	(867.562)	(761.135)	(584.932)	(583.087)
Nonwhite teachers		1723.707	1515.477*	1488.595*	325.719	-248.379
		(1495.011)	(797.075)	(809.217)	(255.173)	(178.814)
4-5 years of experience		640.032*	578.969**	607.069**	408.734**	350.562**
		(363.462)	(265.932)	(267.422)	(193.886)	(172.656)
6-10 years of experience		3172.176***	2529.798***	2486.747***	2309.070***	2279.812***
		(582.333)	(598.149)	(573.651)	(541.941)	(494.693)
11-20 years of experience		10831.205***	9478.437***	9350.711***	8771.414***	8498.753***
		(1491.977)	(1407.856)	(1320.478)	(1103.650)	(998.961)
> 20 years of experience		16460.454***	15313.344***	15262.345***	14890.922***	14706.263***
		(1468.892)	(1333.169)	(1288.395)	(1162.790)	(1014.650)
Alternative certificate		-1303.084*	-570.012	-48.215	-56.004	-169.419
		(681.391)	(842.858)	(583.501)	(226.222)	(168.942)
Regular state certificate		749.336	741.467**	947.375***	1603.808**	1317.299***
		(540.586)	(327.127)	(292.092)	(603.938)	(426.936)
Advanced degree		9093.398***	5918.981***	5807.145***	5607.188***	4657.165***
		(1194.181)	(616.853)	(651.082)	(528.457)	(437.822)
English teacher		-1011.916**	-503.388	-482.456	-390.848**	-390.771**
		(452.233)	(383.437)	(378.004)	(188.541)	(162.577)
Math and science teacher		-210.988	41.530	82.761	-62.626	-142.823
		(244.990)	(195.633)	(213.463)	(161.215)	(149.589)
Social studies teacher		-740.963***	-62.029	36.090	-16.564	-171.135
		(264.577)	(260.381)	(222.884)	(214.246)	(271.487)
Special Education teacher		-84.810	-830.694***	-829.017***	-938.035***	-802.521***
		(432.564)	(275.978)	(276.397)	(210.596)	(152.744)
Elementary school		-1150.525***	-665.170	-636.396	-467.997**	-662.611***
		(409.994)	(419.677)	(396.737)	(220.805)	(178.240)
Part time teacher		-19569.856***	-20653.210***	-20859.801***	-21250.881***	-21156.953***
		(921.029)	(804.666)	(930.843)	(1336.823)	(1245.599)
Contract days		-25.188**	-16.181*	-12.101*	2.562	3.599*
		(11.962)	(9.634)	(6.997)	(2.500)	(2.079)
Panel B: School characteristics						
35-50% FRPL students			-3331.358***	-3269.526***	-2505.607***	-14.653
			(449.035)	(420.874)	(510.835)	(195.441)
50-75% FRPL students			-3993.910***	-3761.200***	-2946.075***	99.840
			(516.240)	(589.151)	(651.309)	(220.136)
75-100% FRPL studentsL			-2763.853***	-2537.007**	-2960.169***	189.979
			(984.901)	(1041.179)	(716.672)	(223.402)
Per pupil expenditures (ln)			25630.013***	22862.332***	15152.001***	8567.231***
			(2127.630)	(3399.130)	(3817.522)	(2139.590)
5,000 to 25,000 students in district			5330.402***	5597.367***	4904.819***	-1246.251
			(1221.386)	(1244.030)	(484.419)	(1531.496)
> 25000 students in district			5950.375***	6318.963***	6060.790***	786.852
			(1147.909)	(1500.963)	(674.038)	(1637.519)
Panel C: Collective bargaining status						
Permissible				-2047.136		
				(2270.437)		
Required				3671.984		
				(3414.721)		
Other (TN)				-1890.378		
				(1769.253)		
cons	54222.540***	44419.067***	-195362.430***	-172873.220***	-97120.443**	-37645.370*
	(106.050)	(3110.741)	(20107.226)	(30252.325)	(37599.550)	(20003.917)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	Yes	No
N	60530	60530	60530	60530	60530	60280

Note: Cells contain point estimates of the estimated wage gap in our 6 models. Model 1 presents the average difference in salary between men and women without covariates. The other five columns present point estimates of the wage gap adding successively a set of covariates. The reference category for CBA status is Illegal. The reference category district size is enrollment less than 5000. All the estimations include the survey wave fixed effect. Standard errors, reported in parentheses, are clustered at the state level. Data come from the 2015-16 and 2017-18 NTPS. All sample sizes reported have been rounded to the nearest 10.*** p<0.01, ** p<0.05, * p<0.10.

Table 4: Adjusted wage gap across supplemental pay

	(1) Raw gap	(2) Individual characteristics	(3) School characteristics	(4) CBA	(5) State FE	(6) District FE	N
Panel A: All teachers							
Merit pay	-1.116	-1.856	3.051	2.336	2.588	0.530	60530
	(5.472)	(8.350)	(6.779)	(5.963)	(5.646)	(4.569)	
Summer teaching	101.780***	111.313***	107.600***	105.439***	104.523***	80.734***	60530
	(14.293)	(23.080)	(22.924)	(22.837)	(22.236)	(25.318)	
Non-teaching job summer	221.535***	189.154***	186.420***	185.580***	185.731***	179.390***	60530
	(9.874)	(20.963)	(20.658)	(20.700)	(20.884)	(21.161)	
Extra duties	1604.680***	1269.095***	1252.704***	1247.234***	1244.832***	1203.672***	60530
	(25.056)	(92.122)	(89.255)	(90.033)	(91.760)	(84.109)	
Panel B: Teachers who reported supplemental pay							
Merit pay	167.957***	118.792	124.525	133.423*	106.807	54.113	4480
	(63.155)	(85.186)	(81.905)	(78.674)	(77.173)	(48.392)	
Summer teaching	635.230***	528.794***	520.039***	483.736***	489.636***	424.300**	8050
	(85.853)	(112.677)	(115.672)	(119.739)	(124.717)	(174.479)	
Non-teaching job summer	1266.069***	1129.839***	1113.236***	1111.587***	1103.958***	941.604***	3640
	(114.324)	(195.919)	(195.262)	(200.074)	(212.328)	(280.351)	
Extra duties	2151.836***	1772.631***	1755.499***	1754.391***	1762.169***	1678.373***	27060
	(45.063)	(115.405)	(113.583)	(115.161)	(118.294)	(105.168)	

Note: Cells contain point estimates of the estimated wage gap. The raw gap is the average difference for each type of salary between men and women without controls. The other 5 rows present point estimates of the wage gap adding successively a set of covariates. Individual characteristics include age, experience, race/ethnicity, holding an advanced degree, licensure, entry route int the profession, teacher subject specialty, student level, and number of days in the contract. District/School characteristics include student demographics, per-pupil expenditure, district enrollment, and school level. CBA status include a set of dummy variables for whether CBA is required or permissible. The State FE column includes the covariates in rows 1-3 and the state-fixed effects. Column 6 include district fixed effects. All the estimations include the survey wave fixed effect. Sample sizes reported are for models 1 to 5 and have been rounded to the nearest 10. The number of observations in the District FE specification in Panel A decreases by 230. In Panel B the observations decrease by 1480 in the summer teaching row, 910 in the extra duties row, 370 in the merit pay row, and 1330 in the non-teaching job row. Data come from the 2015-16 and 2017-18 NTPS. All specifications include nationally representative weights. Standard errors, reported in parentheses, are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.

Table 5: Estimated payment gaps by specific activities

	Coaching		Sponsor student group		School committee	
	Raw gap	Adjusted gap	Raw gap	Adjusted gap	Raw gap	Adjusted gap
Male teachers	2013.684***	1646.527***	1137.741***	1008.507***	1101.288***	474.188
	(258.480)	(285.196)	(155.695)	(226.818)	(340.554)	(540.401)
State FE	No	Yes	No	Yes	No	Yes
N	850		1270		640	

Note: The table reports the salary and wage gap for teachers who served only as coaches, sponsors of a student group, or in a district- or school-wide committee in the 2015-16 school year and reported receiving compensation. The regressions presented in the adjusted gap columns include covariates mirroring Table 4. The 2017-18 NTPS did not ask teachers for the specific extracurricular activities in which they were involved. All sample sizes reported have been rounded to the nearest 10. Standard errors, reported in parenthesis, are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.

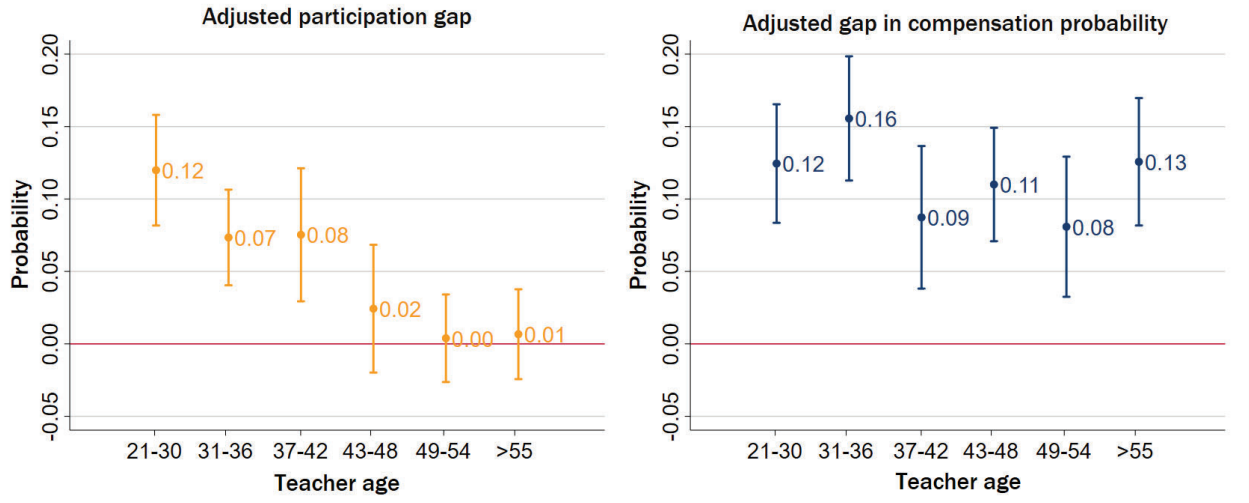
Table 6: Probability of teachers receiving additional compensation

	(1)	(2)	(3)	(4)	(5)	(6)
	Merit pay	Teaching over the summer	Non-teaching job over the summer	Extra duties	Taking on extra duties (only 2015-16)	Receiving compensation for extra duties conditional on taking on extra duties (only 2015-16)
Male teacher	-0.0007	0.0046	0.0273***	0.1003***	0.0512***	0.0913***
	(0.003)	(0.007)	(0.005)	(0.009)	(0.008)	(0.014)
Male principal	0.0044	-0.0033	-0.0044*	0.0029	0.0028	0.0043
	(0.003)	(0.005)	(0.002)	(0.007)	(0.006)	(0.009)
Male teacher × Male principal	-0.0069*	0.0140	0.0160**	0.0248**	-0.0116	0.0359*
	(0.004)	(0.009)	(0.006)	(0.010)	(0.009)	(0.018)
Year FE	Yes	Yes	Yes	Yes	No	No
State FE	Yes	Yes	Yes	Yes	Yes	Yes
N	60530	60530	60530	60530	25570	21050

Note: Columns 1 to 4 present point estimates of the OLS estimation of teachers' probability of receiving compensation for each source of supplemental pay. Columns 5 and 6 use only the 2015-16 NTPS. Column 5 shows the point estimates of teachers' probability of taking extra duties, and Column 6 shows the point estimates of teachers' probability of receiving compensation conditional on engaging in extra duties. All models include controls for teacher, district, and school characteristics and a state-fixed effect. Estimations from models 1-4 include the survey wave effect. Data come from the 2015-16 and 2017-18 NTPS. All models used nationally representative weights and sample sizes are rounded to the nearest 10. Standard errors, reported in parentheses, are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.

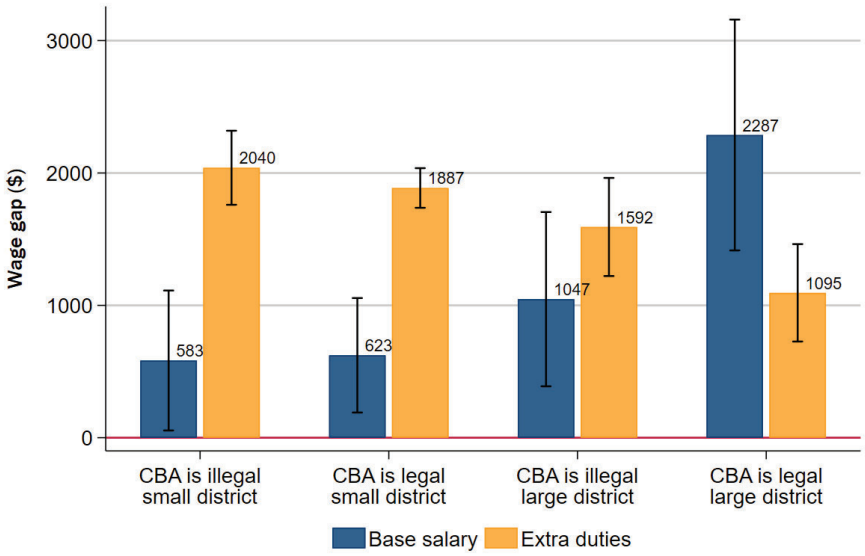
Figures

Figure 1: Men more likely to be compensated for extra work



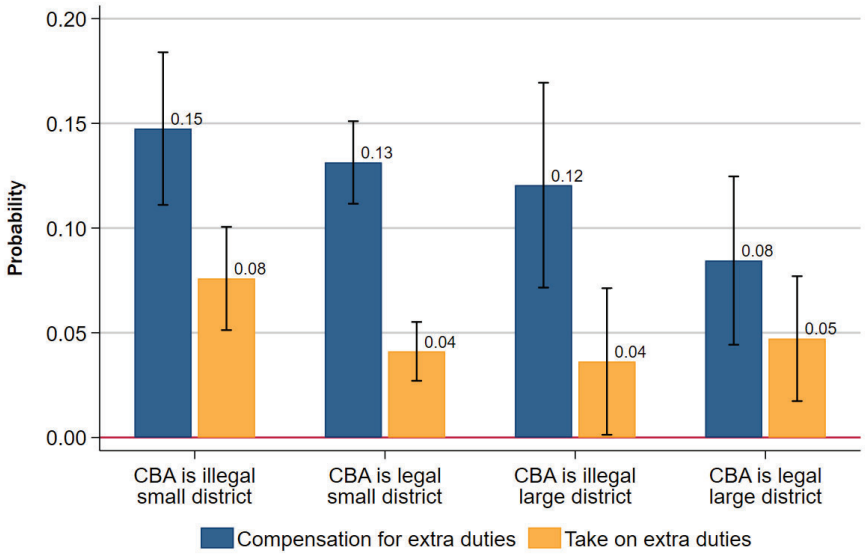
Note: The left panel presents point estimates of male teachers' probability, relative to women, of taking on extra duties across age groups. The right panel presents points estimates of male teachers' probability, relative to female teachers, of receiving compensation conditional on performing extra duties. The OLS estimations include covariates for teacher, district, and school characteristics and state-fixed effects. Data come from the 2015-16 NTPS, 95% confidence intervals are presented.

Figure 2: Gender wage gaps manifest differently across CBA contexts



Note: The bars present point estimates of gender wage gaps across CBAs contexts after controlling for teacher, school, and district characteristics, and state fixed effects. The estimation of gaps for extra duties (yellow bar) includes only teachers who reported receiving this type of supplemental income. 95% confidence intervals presented. Data come from the 2015-16 and 2017-18 NTPS, the Common Core of Data, and NCTQ's Collective Bargaining Agreement dataset.

Figure 3: Estimated differences in male probability by state CBA status and district size (2015)



Note: The bars represent point estimates of gender differentials in the probability of taking on extra duties (yellow bars) and being compensated for extra duties conditional on participation in these activities (blue bars) across CBA context. OLS estimations control for teacher, school, and district characteristics, and state fixed effects. Data come from the 2015-16 NTPS, the Common Core of Data, and NCTQ's Collective Bargaining Agreement dataset.95% confidence intervals are presented.

Table A1: Estimated wage gap and probability of receiving compensation for extra duties by school sector

	(1)	(2)	(3)
	Base salary	Probability of compensation for extra duties	Compensation for extra duties conditional on receiving compensation for extra duties
Male teacher	719.1244***	0.1207***	1809.5407***
	(156.578)	(0.008)	(120.438)
Charter school	-2496.4045**	-0.0309**	117.5893
	(1211.093)	(0.013)	(105.941)
Male teacher × Charter school	-215.7439	-0.1003***	-1046.8586***
	(324.742)	(0.020)	(224.416)
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
N	60530	60530	27060

Note: Column 1 presents the point estimates of teachers' salaries. Column 2 presents the OLS estimates of teachers' probability of receiving compensation for extra duties. Column 3 shows the point estimates of teacher compensation for taking on extra duties among teachers who reported being compensated for them. All models include an interaction term between male and charter schools to examine differentials by school sector. Models include covariates for teachers, schools, and district characteristics, state and wave fixed effects. Data come from the 2015-16 and 2017-18 NTPS. All specifications include nationally representative weights. Sample sizes are rounded to the nearest 10. Standard errors, reported in parentheses, are clustered at the state level. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table A2: Estimated hours teachers worked on extra duties

	Coaching		Sponsor student group		School committee		All teachers	
	Male	Female	Male	Female	Male	Female	Male	Female
Average hours	16.93	15.57	13.80	14.50	14.31	13.74	16.34	15.21
	(10.30)	(8.93)	(8.10)	(8.46)	(8.87)	(8.10)	(9.22)	(8.62)
Average hourly rate	11.72	7.28	7.12	4.57	5.15	4.60	9.16	4.86
	(18.20)	(8.32)	(10.22)	(12.20)	(6.62)	(15.01)	(14.74)	(9.86)
N	850		1270		640		11610	

Note: The table reports the extra duty hours worked for teachers who served only as coaches, sponsors of a student group, or in a district- or school-wide committee in the 2015-16 school year and reported receiving compensation for it. The 2017-18 NTPS did not ask teachers for the specific extracurricular activities in which they were involved. All sample sizes reported have been rounded to the nearest 10. Standard deviations reported in parenthesis

Table A3: Estimated wage gap across supplemental pay by principals' gender

	(1)	(2)	(3)	(4)	(5)	(6)
	Base salary	Merit pay	Teaching over the summer	Non-teaching job over the summer	Extra duties	Extra duties conditional on doing extra duties (only 2015-16)
Male teacher	445.2317	54.8422	488.0312***	1329.4107***	1465.3141***	1058.2444***
	(276.797)	(121.579)	(168.580)	(326.355)	(145.896)	(125.899)
Male principal	155.5791	19.5239	202.5803*	145.2103	105.6837**	-6.5907
	(188.225)	(59.018)	(103.012)	(139.916)	(43.381)	(40.621)
Male teacher × Male principal	444.3115	94.9568	-14.0327	-377.0984	466.4271***	639.0790***
	(296.448)	(149.846)	(216.782)	(270.951)	(99.584)	(116.024)
Year FE	Yes	No	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
N	60530	4480	8050	3640	27060	21050

Note: Models 1 to 5 present the point estimates of the estimated wage gap across supplemental pay (Similar to Table 4, Panel B). Model 6 presents the point estimates of the wage gap only for those who reported performing extra duties. The variable indicating participation in extra duties (not only compensation) is only available for 2015-16 and the estimation only includes teachers who report participating in extra duties, whether they get paid for them or not. We include an interaction term to account for teacher and principal gender match. All models include covariates for individual, district, and school characteristics, state and survey fixed effects. Sample sizes are rounded to the nearest 10. All specifications include nationally representative weights. Standard errors, reported in parentheses, are clustered at the state level. Data come from the 2015-16 and 2017-18 NTPS. *** p<0.01, ** p<0.05, * p<0.10.

Table A4: Payment differences by CBA context

	(1)	(2)	(3)	(4)	(5)
	Base salary	Merit pay	Summer teaching	Non-teaching job over the summer	Extra duties
Male teacher	583.464**	135.090	488.223	1513.259***	2039.526***
	(269.784)	(192.007)	(544.519)	(437.599)	(142.709)
Male teacher × CBA state	39.172	-37.663	43.869	-140.321	-152.799
	(337.214)	(215.233)	(540.188)	(467.630)	(159.707)
Male teacher × Large district	463.078	-13.983	-503.736	-788.751	-447.402*
	(422.126)	(306.860)	(553.811)	(537.820)	(233.259)
CBA state × Large district × Male teacher	1201.204*	125.682	715.418	-525.557	-344.733
	(646.746)	(343.931)	(647.089)	(637.588)	(311.088)
CBA state	2670.430***	-767.246***	272.387**	-113.163	42.971
	(175.391)	(115.925)	(138.611)	(252.801)	(71.063)
Large district	3833.102***	143.956	284.872*	-437.311*	-176.213*
	(203.753)	(155.169)	(166.141)	(263.078)	(93.325)
CBA state × Large district	-1303.756***	247.589	228.271	791.837**	245.801**
	(306.769)	(174.980)	(205.503)	(331.403)	(124.159)
Year FE	Yes	Yes	Yes	Yes	Yes
N	60530	4480	8050	3640	27060

Note: Cells present point estimates of the estimated wage gap. The estimated gap includes covariates for teacher, district, and school characteristics and state fixed effects and survey wave fixed effects. The reference category for large district are small districts (student enrollment less than 25,000. The reference category for CBA are states where CBAs are illegal or other (TN). The wage gaps for supplemental compensation are conditional on teachers who received income for these categories. Data come from the 2015-16 and 2017-18 NTPS. Nationally representative weights are used and sample sizes are rounded to the nearest 10. Standard errors, reported in parentheses, are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.

Table A5: Probability of receiving compensation by CBA context

	(1)	(2)	(3)	(4)	(5)	(6)
	Merit pay	Teaching over the summer	Non-teaching job over the summer	Extra duties	Doing extra duties (only 2015-16)	Extra duties conditional on doing extra duties (only 2015-16)
Male teacher	-0.010	-0.012	0.030***	0.148***	0.076***	0.127***
	(0.007)	(0.010)	(0.008)	(0.014)	(0.013)	(0.020)
Male teacher × CBA state	0.008	0.025**	0.016*	-0.017	-0.035**	-0.005
	(0.008)	(0.011)	(0.008)	(0.016)	(0.014)	(0.022)
Male teacher × Large district	0.007	0.034**	-0.019	-0.045**	-0.040*	-0.005
	(0.011)	(0.016)	(0.011)	(0.022)	(0.022)	(0.033)
CBA state × Large district × Male teacher	-0.020	-0.014	0.003	-0.021	0.046*	-0.045
	(0.015)	(0.020)	(0.014)	(0.027)	(0.027)	(0.041)
CBA state	0.013***	0.005	-0.003	0.070***	0.005	0.092***
	(0.004)	(0.005)	(0.003)	(0.008)	(0.009)	(0.012)
Large district	-0.011*	0.011	0.000	-0.002	0.017	0.002
	(0.006)	(0.008)	(0.005)	(0.010)	(0.012)	(0.017)
CBA state × Large district	0.070***	-0.043***	0.003	-0.032**	-0.043***	-0.027
	(0.008)	(0.009)	(0.006)	(0.013)	(0.015)	(0.021)
Year FE	Yes	Yes	Yes	Yes	No	No
N	60530	60530	60530	60530	25570	21050

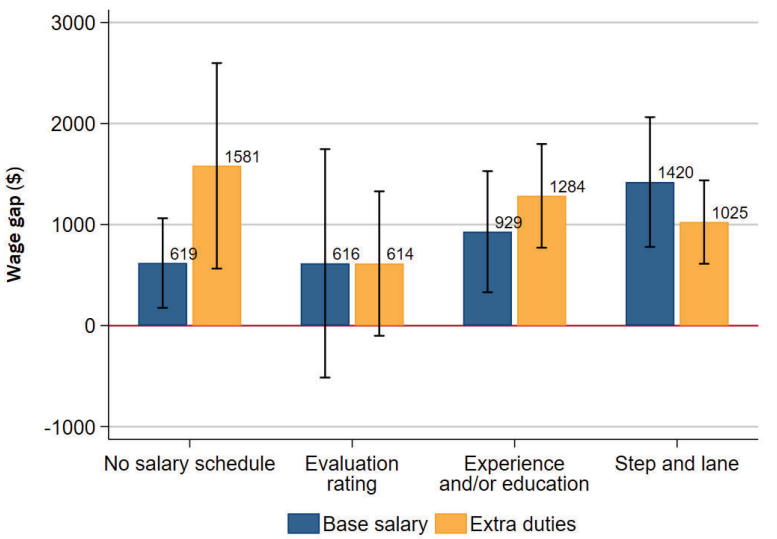
Note: Columns 1 to 4 contain point estimates of the OLS estimation of teachers' probability of receiving compensation for each source of supplemental pay. Columns 5 and 6 use only the 2015-16 NTPS. Column 5 shows the point estimates of teachers' probability of taking extra duties, and Column 6 shows the point estimates of teachers' probability of receiving compensation conditional on engaging in extra duties. All models include controls for teacher, district, and school characteristics and a state fixed effect. Estimations from models 1-4 include the survey wave fixed effect. Data come from the 2015-16 and 2017-18 NTPS. All models used nationally representative weights and sample sizes are rounded to the nearest 10. Standard errors, reported in parentheses, are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.

Table A6: Estimated wage gap and probability of taking on extra duties by type of salary schedule (among the largest school districts in the US)

	(1)	(2)	(3)
	Base salary	Probability of receiving compensation for extra duties	Extra duties
Male teacher	618.9366***	0.0468***	1581.0021***
	(220.633)	(0.010)	(505.924)
Evaluation rating	-1107.5107*	-0.0635*	-499.0655**
	(595.512)	(0.033)	(202.651)
Experience and/or education based	-2957.7373***	-0.0340**	-564.1761*
	(638.062)	(0.013)	(286.452)
Step and lane	-3842.5432***	-0.0071	-797.4440***
	(888.116)	(0.036)	(257.241)
Male teacher × Evaluation rating	-2.8958	0.0526	-967.1338
	(613.403)	(0.049)	(592.802)
Male teacher × Experience and/or education based	310.0052	0.0316	-297.1361
	(241.228)	(0.032)	(456.216)
Male teacher × Step and lane	801.2226*	0.0277	-556.4553
	(432.576)	(0.017)	(598.293)
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
N	10620	10620	4060

Note: Column 1 presents the point estimates of teachers' salaries. Column 2 presents the OLS estimates of teachers' probability of taking on extra duties. Column 3 shows the point estimates of teacher compensation for taking on extra duties among teachers who reported receiving compensation for extra duties. The estimated gap includes covariates for teacher, district, and school characteristics and state fixed effects and survey wave fixed effects. The reference category for salary schedules is not traditional salary schedules. Data come from the 2015-16 and 2017-18 NTPS and the National Council on Teacher Quality contract database. The sample is restricted to the 140th largest school districts in the nation that are in the NCTQ database. Standard errors, reported in parentheses, are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.

Figure A1: Gender wage gaps manifest differently across salary schedules



Note: The bars present point estimates of gender wage gaps across salary schedule contexts after controlling for teacher, school, and district characteristics, and state fixed effects. The estimation of gaps for extra duties (yellow bar) includes only teachers who reported receiving this type of supplemental income. Source: NTPS 2015 and 2017, the Common Core of Data, and NCTQ's Teacher Contract database. 95% confidence intervals are presented.