Research Article

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The Effects and Local Implementation of School Finance Reforms on Teacher Salary, Hiring, and Turnover

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Knowing how policy-induced salary schedule changes affect teacher recruitment and retention will significantly advance our understanding of how resources matter for K–12 student learning. This study sheds light on this issue by estimating how legislative funding changes in Washington state in 2018–2019—induced by the McCleary court-ordered reform—affected teacher salaries and labor market outcomes. By embedding a simulated instrumental variables approach in a mixed-methods design, we observed that local collective bargaining negotiations directed new state funding allocations to substantially increase certificated base salaries, particularly for senior teachers with 16 years or more of teaching experience. Variability in political power, priorities, and interests of both districts and unions led to greater heterogeneity in teacher salary schedules. Suggestive evidence shows that state average teacher turnover rate was significantly reduced in the first year of reform. The McCleary-induced salary increase particularly reduces mid-career teachers' (8–15 years of teaching experience) mobility rate and late-career teachers' (23+ years of teaching experience) leaving rate. The McCleary-induced base salary increase has mostly null effects on teacher hiring in the first 2 years of implementation.

Keywords: *school finance reforms, instrumental variable, teacher salary, teacher labor market, local implementation, mixed-methods*

S HOOL finance reforms (SFRs) can increase school funding, which improves students' academic outcomes, graduation rates, and earnings in adulthood (Candelaria & Shores, 2019; Jackson et al., 2016; Lafortune et al., 2018). However, the most valuable evidence to inform policymaking extends beyond knowing the effects of SFRs on student outcomes. It is equally, if not more, important to gain a nuanced understanding of strategic expenditure choices made by local districts and schools, and to identify the contextual factors that contribute to the variability in local strategic expenditure choices (Brunner et al., 2020; Shores et al., 2023). For example, previous studies find that under SFRs, districts and states with strong teacher unions tend to spend more on improving teacher salaries, benefits, and other working conditions (Brunner et al., 2020; Eberts & Stone, 1984). Because salaries and benefits for instructional staff were about 54% of total current expenditures and about 90% of instructional expenditures in 2016–2017 (National Center for Education Statistics [NCES], 2020), understanding how changes in funding allocations affect teacher salary schedules, recruitment, retention is essential for informing discussions about how resources matter for student learning.

To date, few studies provide rigorous evidence on the impacts of state policies that dramatically increase salary for all teachers on teacher workforce (Britton & Propper, 2016; Loeb & Page, 2000). Several factors contribute to the dearth of these policy studies in education. In many school districts, teacher salaries largely align with teacher experience and educational level and are highly regulated by district or state salary schedules. Scholars often lack a natural experiment in which an exogenous shock induces substantial changes in teacher salary and generates wide variability across districts, allowing for the estimation of salary effects on teacher recruitment and retention. Moreover, it is difficult to examine the relationship between teacher salary and teacher labor market outcomes, even with panel data. Many time-varying changes that affect teacher salary also affect teacher recruitment and retention. For example, teacher salaries can be set in a compensating way by paying teachers more to work in less desirable working conditions. In this case, the wage effect is likely to be underestimated. The wage effect can also be overestimated if better resourced school districts use higher salaries to attract teachers, which may coincide with supportive school-working conditions (e.g., school leadership and culture; Hendricks, 2014).

To make evidence more relevant for policymaking, educational leaders would also benefit from studies on effective ways of structuring salary schedules, mainly in terms of setting pay scale systems for teachers at different stages in their careers (Hanushek, 2016). This type of information will help district leaders strategically set up salary schedules to develop the teacher workforce to meet student learning goals. Other useful evidence pertains to the political dynamics and local implementations that shape the variation in salary schedules across local communities. This detailed evidence on policy implementation will critically inform evidence-based iterative improvement of SFR efforts. To our knowledge, the current state of the literature offers very limited knowledge on both fronts.

In this article, we leverage a unique window of opportunity in Washington state (WA) to examine the effects of increased state funding on teacher salaries and on attracting and retaining teachers. Beginning in the 2018–2019 academic year, WA changed its state funding formula for basic education and infused more than $7 billion of state funding into the public school system in the next 4 years (Morton, 2017). This policy spurred teacher contract negotiations at individual district level across the state, resulting in unprecedented statewide teacher salary increases. According to the National Education Association (2021), in 2018–2019, when WA state implemented the salary allocation increase for the first year, the average teacher salary climbed to be the eighth highest paid from the 21st in the nation in 2017–2018. By 2019–2020, the WA average teacher salary ranked the sixth highest in the nation. This expansion of state funding for teacher salaries generates a unique opportunity for estimating the relationship between teacher salaries and teacher labor markets. Specifically, we examine the following questions:

Research Question 1: How did McCleary SFRs influence teacher salaries? How did the reforms differentially affect pay increase for teachers at different career stages?

Research Question 2: How did McCleary-induced salary changes affect teacher recruitment and turnover?

Research Question 3: How did the local collective bargaining and other contexts about McCleary SFRs' implementation vary across districts?

We use an explanatory sequential mixed-methods approach. For Research Question 1, we use a simulated instruments in conjunction with (comparative) interrupted time series (ITS) models. Our findings show that the McCleary SFRs induced substantial increases in average teacher salary and increased the variability of average certificated base salaries across districts. Although the funding formula change was targeted to support all basic education programs, local political negotiations between teacher associations and districts drove a significant increase in teacher salary expenditures. Moreover, senior teachers with 16 or more years of experience increased their salaries the most in districts with higher predicted state personnel funding for salaries. These findings contribute to the literature on court induced SFRs by offering additional evidence on how the funds can be used to increase teacher salaries and for which groups of teachers.

For Research Question 2, we use a two-stage simulated instrumental variables approach to examine changes in teacher hiring and turnover rates under McCleary SFRs. The reduced-form analyses show that teacher turnover was reduced on average across the state even in the first year of reform. Our two-stage least square (2SLS) approach suggests that the McCleary-induced salary increase reduces mid-career teachers' (8–15 years of teaching experience) mobility rate and late-career teachers' (23+ years of teaching experience) leaving rate. The McCleary-induced base salary increase has mostly null effects on teacher hiring in the first 2 years of implementation.

For Research Question 3, we used comparative case studies in five WA districts to identify how local resource allocation was shaped by the political power, priorities, and interests of both districts and teachers' unions. Since senior te-achers often serve leadership positions in the unions and WA has a back-loaded retirement benefit system, it is not surprising to observe the larger raises for very experienced teachers. On the contrary, we also observed some local unions having equity priorities by intentionally protecting junior teachers' interest. To our knowledge, this is the first study in the field to combine robust quantitative evidence on SFR effects on teacher labor markets with qualitative interview data from a purposive, selected sample of districts to explain how local negotiations shape salary schedules.

Policy Background

In 2007, the McCleary family, the Venema family, and the Network for Excellence in Washington Schools (backed by the Washington Education Association [WEA]—the state educator union) jointly filed a lawsuit arguing that the state had not fulfilled Article IX, Section 1 of the WA constitution: "It is the paramount duty of the state to make ample provision for the education of all children residing within its borders." On January 5, 2012, the state supreme court ruled in favor of the plaintiff, stating that basic education should be funded via dependable and regular tax sources from the state rather than relying on local levy dollars that are dependent upon the whim of the electorate and only temporary. By August 13, 2015, the state supreme court found the state legislature in contempt for having not fully funded basic education and ordered that the legislature develop and implement reforms consistent with their decision no later than 2017–2018.

On July 6, 2017, the WA governor signed House Bill (HB) 2242, a landmark K–12 spending increase, which infused more than $7 billion of state funding into the public school system for the next 4 years. Then in 2018, legislators passed Senate Bill (SB) 6362 to address a range of concerns that districts had voiced around HB 2242. In particular, HB 2242 had a 2-year plan of fully funding salary increase with the first half in 2018–2019 and the remainder of the increase in the 2019–2020 school year. SB 6362 made the revision by mandating fully funding salary increase starting in 2018–2019. Because this article mainly discusses teacher salary and most McCleary-induced changes in state funded K–12 base salaries happened since 2018–2019, we refer to the fall 2018 (i.e., the beginning of the 2018–2019 academic year) as the onset of McCleary SFRs.

To fully fund basic education, HB 2242 increased the state property tax and altered the "levy lid" system by putting caps on the amount of funds that districts can raise through local property taxes. Local stakeholders refer to the increase in state property tax and decrease in local property tax as the "levy swap." The purpose of the levy swap was to reduce the extent to which local tax revenues contribute to funding disparities. As part of the reformed levy lid system, HB 2242 caps local levy revenues at $2,500 per student, preventing districts with high property values from raising exorbitant amounts of local revenues in the 2019 calendar year. WA districts had historically relied on local levies to supplement the insufficient state funds. In addition to the levy lid, to further balance the inequality of local finance capacity, the state modified its local effort assistance (LEA) to further offset the funds that low-wealth districts are not able to generate through local property tax elections.

Although other aspects of basic education were included in the HB 2242 and SB 6362 (such as K–3 class size reduction and special education), one dominant focal goal of the funding formula change was to stabilize state funding for teacher salaries. From 1987 to the time of McCleary reforms, teacher salary schedules in some districts were augmented through Time, Responsibility, and Incentive (TRI) pay (or supplemental pay), which was funded through local levies. Teacher unions could negotiate with districts to add TRI pay through these categories on top of state-funded teacher salaries. Supplemental pay typically amounted to 20% of teachers' total salary (Third Sector Intelligence, Inc, 2015), representing one of the leading sources of inequality in teacher compensation prior to McCleary. To address this inequality, HB 2242 and SB 6362 significantly increased K–12 staff salary allocations for all districts.

The McCleary legislative reforms also accounted for cost-of-living differences between districts using an adjustment mechanism known as the regionalization factor. Districts with housing values above the state median received an additional 6% to 24% increase over the state's base funding allocation for salaries. In addition, districts sharing a boundary with a district that had a regionalization factor more than 6% also had their regionalization factor increased by 6% if the district is located west of the crest of the Cascade mountains. In 2018–2019, this affected 111 of the 295 school districts.

Corresponding to the mandate of fully funding teacher salary starting in 2018–2019, SB 6362 required that enrichment levies may only be used to enhance basic education. Consequently, districts could not use local funds to pay for costs associated with basic education, such as paying teachers for their essential teaching duties. This shift from relying on local supplementary funding to state-funded basic education has profound meaning for the teacher workforce. First, the district base salary schedules are often the most salient information accessible to teachers when they look for jobs, particularly for new-to-profession teachers. Second, the certificated base salaries are a stable source of income for teachers and paid to teachers to perform their basic education duties. In contrast, TRI pay was funded by local levies, which are subject to local voters' preferences; thus, TRI pay was less stable and transparent. More importantly, teachers typically must perform extra responsibilities to get TRI pay (such as organizing student clubs, coaching junior teachers). We anticipate that the removal of TRI pay will have significant influence on teacher recruitment and retention.

This new funding reopened contract negotiations across the state in the 2018–2019 school year, accompanied by teacher strikes in some locations. Some districts bargained almost annually in the next few years. These local negotiations, following the funding formula changes, resulted in double digit increases in teacher salary in many districts and wider variations in teacher compensation policy designs across districts. In sum, the McCleary reforms represent significant policy changes in how districts receive state funding, namely by reducing local capacity to raise revenue, providing additional state funding for teacher salaries, and instituting the state's first attempt to provide cost-of-living adjustments to local districts.

Literature Review and Conceptual Framework

In this section, we first hypothesize how salary increases may affect teacher recruitment and turnover, and how salary effects may vary for teachers at different career stages. We then use literature from sense-making and policy implementation to explain the differential salary schedule across districts.

Teacher Salary and Labor Market

The efficiency wage theory suggests that salary increases provide an incentive for employees to increase their effort in ways that are conducive to organizational performance (Akerlof & Yellen, 1986). On the supply side of the teacher labor market, teachers' decisions of joining a given district are influenced by both pecuniary and nonpecuniary returns. Increased salary may attract individuals into the district (Chingos & West, 2012; Loeb & Page, 2000). This mechanism can also apply to retention, in that a teacher would be less likely to search or accept an outside offer if their salaries are high enough in their current school district (Hendricks, 2014, 2015). Higher teacher salaries may motivate teachers to spend higher effort in teaching, which can result in better performance (Hendricks, 2014). High-performing teachers become more likely to stay in the district or teaching profession due to deriving satisfaction from being excellent on the job (Goldhaber et al., 2011; Sun, 2018).

On the demand side, individuals' choices are bounded by resources and vacancies in schools and districts (Guarino et al., 2011). If districts have a net increase in resources that can be spent on teacher salary compared with the pre-McCleary era, they may decide to either hire more teachers or hire fewer teachers but pay them more. After negotiating large teacher pay increases in 2018–2019, some school districts project budget shortfalls and fewer vacancies, which might result in less teacher hiring or vacancy to support teacher mobility.

Prior empirical studies offer some evidence on the relationships between increased salary on teacher labor markets. Falch (2011) found that the wage premium of about 10% reduces the probability of voluntary quits by about 6 percentage points. One recent study by Hendricks (2014) provides more rigorous estimations of base salary and teacher turnover using panel data and control for changes in district characteristics and changes in local teacher labor markets. Increase in teacher base salary reduces teacher turnover. The pay effect is largest for less experienced teachers, decreases with experience, and disappears once a teacher reaches about 19 years of experience. Moreover, Hough and Loeb (2013) provide evidence that a salary increase associated with the Quality Teacher and Education Act of 2008 in the San Francisco Unified School District improved the district's attractiveness within their local teacher labor market and increased both the size and quality of the teacher applicant pool. However, the increase did not affect teacher retention.

The relationship between salary and teacher labor markets can be further complicated by the multifaceted structure of teacher salary schedules and the variation in teacher labor movements across their career stages. In WA context, although the state defines the minimum starting salary and maximum salary, teacher salary schedules are bargained at the local level, which results in a wide variation of post-McCleary teacher salary schedules across districts. WA school districts, like most other districts in the nation, have "step and lane" salary schedules for teachers. As teachers gain years of experience, they advance down to the rows of the schedule, receiving pay increases at each "step"; as they gain education, they advance across the schedule's "lane" or columns, with pay increases to reward the attainment of advanced graduate degrees or some other accumulation of credits (Grissom & Strunk, 2012).

Teacher collective bargaining influences multiple dimensions of teacher compensation, including starting and maximum salaries, the number of steps and lanes, the pay increase associated with moves along the steps and lanes, and the possibility and design of additional pays based on additional qualifications (e.g., national board certification), or duties, or performance (Cowen & Strunk, 2015; Grissom & Strunk, 2012; Guthery, 2018; West & Mykerezi, 2011). Some districts with *frontloading* give larger raises early in a teacher's career and smaller raises later; others with *backloading* concentrate raises among veteran teachers; still others take a *linear* approach that gives the same percentage of raises across experience and education levels.

The distribution of those increases across the salary schedule matters for teacher labor markets. One hypothesis is that larger raises for early-career teachers may increase the recruitment and retention of these teachers: as teachers consider their initial job placements, they respond more to starting salaries than to future rewards, perhaps because they discount future earnings or because they factor in the probability of leaving the profession (Zabalza, 1979). Moreover, early-career teachers have the highest probability of turnover (Sun, 2018). The impact of higher salaries earlier in the career can be more influential for high-quality teachers, who are more likely to acquire higher opportunity wages in the nonteaching labor market (Chingos & West, 2012; Goldhaber & Brewer, 1997; Grissom & Strunk, 2012). Given teacher salary raises when they gain experience, districts get more purchasing power in the market for teacher quality by raising early-career teacher salaries (Vigdor, 2008).

Yet, districts that bargain collectively with teachers' unions are more likely to have backloaded salary structures because of the political power of experienced teachers in the union (Grissom & Strunk, 2012). One argument for backloaded salary is that teachers gain effectiveness with more years of experience and such effectiveness gain via experience should be rewarded. Another strong motivation for bargaining backloaded salary is related to the *retirement benefits*. Like many states, under WA's modified defined benefit plan and after an eligible teacher retires, they will receive monthly benefits based on a formula that takes into account years of services, an average final salary (typically the last 3 years), and a multiplier which varies spending on plan participation (Washington State Department of Retirement Systems, 2020). Since this retirement plan is backloaded, it incentivizes teacher unions to bargain for higher pay for late career years to secure higher retirement pay (Costrell & Podgursky, 2010; McGee & Winters, 2019). One can imagine that when the reform increases teacher salary for late careers to a greater degree, senior teachers could potentially delay their retirement to secure a higher retirement payment.

Conceptualizing District Local Mechanisms That Influence Teacher Salary Schedules

Several district dynamics may lead to differential salary schedules across the state when district salary schedules are bargained at local level. First, districts vary in their composition of *policy actors and their knowledge, expertise, interests, formal roles in the organization, and power/voice* in collective bargaining (Pritchett & Filmer, 1999). Local actors possess different powers that can be derived from their experience and knowledge, longevity in the district, local connections, strategies, and the resources that they can mobilize (Malen, 2006). For example, during collective bargaining, one member (such as either from the district or the union) may have extensive bargaining experiences and connections with local interest groups and state legislators, which gives them more power in negotiations when their counter bargainer has recently stepped into the role. For another example, senior teachers who have more power in the teaching profession and are more likely to serve on the bargaining team than junior teachers (Malen, 2006). They are more likely to bargain for the interest of senior teachers. Capturing the composition and power distribution among these stakeholders is a key starting point for understanding the dynamics of political negotiations at the local level.

Second, policymakers operate within *school districts' existing budgeting structure*, *organizational culture*, *and routines* (Feldman & Rafaeli, 2002). For example, traditional funding categories affect how districts allocate the new funding. Some districts who used to disproportionately allocate more funding on teacher salaries than other nonpersonnel costs would probably continue to have the same funding allocation structure in post-McCleary. Moreover, organizational culture includes patterns of values or codes of conduct that shape actions of policy actors (Firestone & Gonzalez, 2007). In the negotiation context, union and district leaders can have adversarial relationships and center their conversations on teachers' compensation issues only; alternatively, they can have a shared value of focusing on student learning and collaboratively identify relevant staffing needs for better supporting students' well-being in schools. Similarly, some districts have routines of practices that support the development of shared expectations of each other's behaviors during negotiations, while others may not have such routines (Feldman & Rafaeli, 2002). These institutionalized routines, culture, and practices can shape the negotiation outcomes.

Third, negotiation is a process of *balancing a variety of priorities* brought by both districts and unions. Although negotiations for salary and benefits are common and central to many collective bargaining processes, there are other priorities that may be of interest to either union or district. For example, if the district and union both prioritize racial equity in schools, they may agree on salary schedules that allow for strategically recruiting and retaining teachers of color, or they may limit salary increases and instead reserve more resources for professional development by lowering the expectations of cross-board salary increases.

Fourth, while the first three factors focus on an intra-organizational system, we also attend to *inter-organizational influence*. Inter-district influence occurs through multiple mechanisms (Berry & Berry, 2017). For example, active learning occurs when one union or district derives information about the effectiveness (or success) of a policy or strategy from previously adopting peers. The state union actively uses its organizational structure to disseminate effective examples, train local association bargainers, and encourage mutual learning. One district or union also sets bargaining targets based on what was possible in other districts (e.g., the percentage raise of teacher salary). Comparably, the Washington Association of School Administrators—an association of district superintendents and other central office administrators—also actively disseminates information and supports local school districts. Moreover, WA has nine statutory regional service agencies (Education Service Districts, or ESDs) that serve as another type of hub to facilitate learning among district administrators and directly support them in bargaining and school finance policy, among a host of other professional learning experiences. Another mechanism for interorganizational influence is that districts compete for teacher talents and desire to make their salary schedules competitive. These inter-organizational dynamics can influence the variation across districts, where some districts are more resourceful than others.

Data and Sample

To answer Research Questions 1 and 2, we use a combination of administrative data files, state-level data, legislative reports, and data from the American Community Survey (ACS). To construct our salary measures and labor market outcomes, we use data on teachers' years of experience, job assignments, salaries, benefits, and full-time-equivalent (FTE) status from OSPI's S-275 database between academic years 2013–2014 and 2019–2020. Using these data, we can track educators' career movement across positions, schools, and districts in the state public school systems over time. To construct our simulated instruments, we use district-level revenue data from OSPI's fiscal F-196 database, OSPI's projections of prototypical funding formula allocations (before the reforms went into effect), district-level regionalization factors from the WA Legislative Evaluation and Accountability Program, and state-level salary allocations enacted in HB 2242. Finally, to control for state-wide economic conditions, we use 1-year estimates of the unemployment rate from the ACS via the Census Bureau, and we compute the total amount of expenditures that are not spent on K–12 education per capita via state audit reports from the Office of the Washington State Auditor.

To explore Research Question 3, we conducted purposeful, comparative case studies in five districts (Maxwell, 2004; Patton, 1990). Districts were selected based on prereform per-pupil expenditures, poverty and demographics of student population served, geographic diversity, and quantitative descriptive analyses about post-McCleary changes in salary increase. These five districts include two groups of neighboring districts located in two regions of the state so that we can study regional issues and inter-district competition and learning. The sampling does not mean to collect state representative samples; rather, we aim to purposefully select districts to maximize "information richness" that deepens our understanding local dynamics of McCleary SFRs implementation and provides detailed information to triangulate with quantitative findings (Creswell & Plano Clark, 2017; Miles & Huberman, 1994). To further diversify perspectives, we reached out to multiple roles in the districts who know the most about budget allocations and collective bargaining. A 45-minute semi-structured interview was conducted with two union leaders, two superintendents, and one Chief Finance Officer (CFO) from these five districts. Besides interviews, we collected other district documents, such as collective bargaining agreements, budgets and local levy documentation, and public media reportings.

Specifically, three districts—Conifer, Cedar Bay, and Eagle Creek, all pseudonyms—are in one region of the state that shares the same geographic teacher labor market. Conifer serves a diverse student population, high local property values and strong voter support on local levies, a significantly higher per-pupil spending than the state average, and smaller class sizes than the state average. Post-McCleary, the percentage increase of Conifer's average teacher salary is close to that of the state average and moves toward being front-loaded. Cedar Bay is a medium-large size district that neighbors Conifer. Cedar Bay has significant increases in teacher salaries after McCleary, and it also has the tradition of spending a disproportionately higher share of expenditure on staff salaries and benefits than nonpersonnel costs, compared with the state average. Next, Eagle Creek is the third district that is in the same geographic region, but it serves an even wealthier student population and has a student enrollment size that is between Conifer and Cedar Bay.

The second region includes two districts—Upper Valley and Plainview. Upper Valley is one of the largest districts in that region with large populations of low-income students, English learners, and students of color. This district provides class size close to the state average and has a significantly older teacher workforce with the state average. Post-McCleary, the district salary schedule moved toward even more backloaded. Plainview, a smaller school district than Upper Valley, shares the regional teacher market, serves a similar student population, and faces similar issues. Also, similarly, in the post-McCleary reform period, this district's salary schedule moved toward being more backloaded.

In 2022, we conducted another round of interviews with a diverse, more representative group of 24 stakeholders who were state legislators, other state-level policymakers, school district administrators, teacher union representatives, teachers, policy advocates, and community leaders. We coded the new interview data that pertain to McCleary SFRs and their local implementation, using the codebook developed for coding these five interviews. We obtained very similar information, reflecting again a "saturation" of ideas we achieved in our initial sample. Since the 2022 interviews occurred in a different time, used different sampling methods, and were guided by different interview questions and aims (see Sun et al., 2023), we decide to not feature in this article.

Finally, to conduct some of our robustness checks, we obtain additional data on student demographics, staff-per-student ratios, and economic conditions. Student demographics data come from the WA state report card, which are compiled by OSPI and made available through WA's open data portal. Using the Common Core of Data's nonfiscal district universe surveys, which are available from the NCES, we construct staff-per-student ratios. And for additional economic conditions at the district level, we obtain 5-year averages of unemployment rates and median household from the ACS Education Tabulations, which are available through NCES.

Method

This study uses a sequential explanatory mixed-methods design consisting of two phases: starting with quantitative analysis and then purposeful qualitative data analyses (Creswell & Plano Clark, 2017). Our quantitative analyses aim to provide statewide, broad view of McCleary SFR effects on teacher salary raises and teacher hiring and retention. Next, our qualitative analyses aim to explain variation and elucidate findings from our quantitative analyses. We now discuss each phase of our analysis with respect to our research questions.

Quantitative Analysis

For Research Question 1, we estimate the extent to which McCleary SFRs affected teacher salaries. We use (comparative) ITS approaches that leverage simulated instruments of district-level "dosage" of McCleary SFRs. To construct these instruments, we first simulate the state-level allocation of resources for all staff salaries—certificated, administrative, and classified—that are set to impact districts in the 2018–2019 school year.

The total state-level allocation for each district is the sum of the following three components: (a) the product of certificated staff FTE, the base salary of certificated staff, and the certificated regionalization factor; (b) the product of administrative staff FTE, the base salary of administrative staff, and the administrative regionalization factor; and (c) the product of classified staff FTE, the base salary of classified staff, and the classified regionalization factor. The FTE of district-level staff is determined solely by the state's prototypical class size formula.

We calculate FTE for all staff by applying the prototypical formula to projected enrollment in September 2018–2019. Having projected enrollment at the beginning of the year, as opposed to actual enrollment during the year, ensures that enrollment decisions made by parents (and possibly school leaders) are not endogenous to the increased funding allocations provided by HB 2242. We then scale the amount of staff funding by the total projected district enrollment in September 2019. Finally, we take our continuous dosage measure and generate three indicator variables that reflect three terciles of the allocations to allow for nonlinearities in dosage. Tercile 1 represents low-dosage districts, Tercile 2 medium-dosage, and Tercile 3, high-dosage. In Online Appendix Figure A1 in the online version of the journal, we graphically show the spatial variability of these dosage terciles across WA state.

Who are the districts in these different terciles? Table 1 illustrates districts' characteristics by dosage terciles during the prereform years 2014–2015 to 2017–2018. All summary statistics are weighted by average certificated FTE over the prereform period, the same weight we used in the rest of the analysis. Compared with the averages of districts in Terciles 1 and 2 and the statewide average, Tercile 3 districts had lower percentages of Hispanic, White, free and reduced-price lunch students, but a higher proportion of Black/African American students. While Tercile 3 districts had the highest median total final salaries, they had the lowest median base salaries relative to the other terciles and the statewide average. Tercile 1 districts had the highest average teacher experience and the highest teacher turnover rate. Tercile 2 districts, on the contrary, had the lowest turnover rate during the prereform period.

To compare teacher salary changes before and after the academic year 2018–2019, we estimate the following ITS model:

$$w_{dt} = \theta_d + X_t'\varphi + \sum_{i=1}^{3}\gamma_i \; 1[\;\; ose_d = i] \times year_t\big) + \sum_{j=1}^{3}\sum_{k=2019}^{2020}\beta_{jk} \; 1[\;\; ose_d = j] \times 1[year_t = k]\big) + \varepsilon_{dt} \qquad (1)$$

where $w_{\;t}$ represents district median base salaries or median total final salaries for certificated teachers in thousands of real 2018 fiscal-year dollars for district *d* in year *t*. The final total salaries are a combination of both base salaries and supplemental salaries funded by all sources. Salary variables are inflation-adjusted using the Consumer Price Index (CPI) deflator in real 2018 fiscal-year dollars (Shores & Candelaria, 2020) and then expressed in thousands. We decided to use the dollars in thousands to facilitate policy implications.

We explicitly adjust for pre-McCleary linear time trends for each tercile. The term $ye\;r_t$ is a linear time trend variable that is equal to the calendar year minus 2018 (i.e., the spring of the 2017–2018 school year); therefore, $ye\;r$ takes value 1 in 2018–2019. Because we discretize our continuous measure of dosage to form terciles, $ose_d =$ is a bottom-tercile, low-dosage district and $ose_d =$ is a top-tercile, high-dosage district. Thus, in the equation, γ is the coefficient on the linear time trend among Tercile 1 districts before the state staffing allocation formula changes in 2018–2019. Parameters γ and γ represent coefficients on the pre-McCleary trends for Terciles 2 and 3.

Our parameters of interest from the ITS model are the $\beta_{\;k}$. We estimate McCleary effects for each tercile nonparametrically (i.e., using indicator variables), which are identified relative to each tercile's own linear pre-McCleary trend. For example, $\beta_{3\,2019}$ is the McCleary-induced changes in salary for Tercile 3 in 2019 relative to its pretrend. Using the ITS model, we can obtain a total of two effect estimates—Years 2019 and 2020—for each tercile.

We also include district fixed effects, θ , to account for local labor market conditions that are relatively time-invariant, such as alternative wage opportunities in a local area and competitiveness of the labor market (i.e., the degree to which teachers who earn high salaries are living in areas that other professions earn high pay as well), cost of living, and local residents'

TABLE 1

Prereform District Characteristics by McCleary Dosage Tercile

Variables	Tercile 1	Tercile 2	Tercile 3	Total
Pct. Black	1.57	2.70	6.68	4.44
	(2.04)	(2.82)	(6.17)	(5.20)
Pct. Hispanic	32.1	26.1	17.0	22.8
	(26.1)	(21.9)	(8.24)	(18.8)
Pct. White	57.0	57.9	52.9	55.3
	(23.9)	(20.4)	(17.1)	(19.8)
Pct. FRPL	60.9	53.9	39.6	48.2
	(16.3)	(15.1)	(18.4)	(19.1)
Pct. SPED	14.5	14.6	14.0	14.3
	(2.35)	(1.98)	(2.23)	(2.20)
District enrollment	7,136.5	13,549.0	20,113.0	15,552.6
	(6,675.8)	(9,718.2)	(14,496.9)	(12,907.3)
Mean district teacher experience	14.2	13.3	13.1	13.4
	(1.95)	(1.69)	(1.90)	(1.89)
Median cert. base salary (1,000s)	58.1	57.0	56.0	56.7
	(3.94)	(3.96)	(4.54)	(4.32)
Median total final salary (1,000s)	69.1	69.7	76.9	73.1
	(5.09)	(6.11)	(7.24)	(7.49)
Pct. turnover	10.7	10.1	10.5	10.4
	(4.19)	(3.66)	(3.19)	(3.56)
Pct. new hires	8.58	8.56	8.24	8.41
	(3.28)	(3.19)	(2.54)	(2.91)
State revenue/pupil	9,087.1	8,816.0	8,158.3	8,544.4
	(1,722.8)	(1,411.0)	(1,019.8)	(1,363.8)
State + Local revenue/pupil	11,046.5	10,917.9	11,258.9	11,110.1
	(1,977.1)	(1,512.0)	(1,435.2)	(1,582.3)
Current expenditures/pupil	11,711.9	11,562.3	11,953.7	11,783.2
	(1,936.5)	(1,709.3)	(1,505.5)	(1,668.5)
District unemployment rate	7.51	6.52	5.49	6.21
[ACS: 5-year average]	(2.26)	(1.83)	(1.25)	(1.85)
District median household Income	53,909.5	58,893.2	79,830.4	68,234.5
[ACS: 5-year average]	(10,205.3)	(11,056.7)	(20,257.1)	(19,825.3)
State unemployment rate	5.70	5.70	5.70	5.70
	(0.60)	(0.60)	(0.60)	(0.60)
Log(state non-K–12 exp. per capita)	8.42	8.42	8.42	8.42
	(0.027)	(0.027)	(0.027)	(0.027)

Note. Standard deviations are in parentheses. Prereform period is academic years 2014–2015 to 2017–2018. Summary statistics are weighted by certificated FTE averaged over the prereform period. Five-year averages from the ACS are for calendar years 2013 to 2017. ACS = American Community Survey; FTE = full-time equivalent; FRPL = Free and Reduced Priced Lunch; SPED = Special Education.

political preferences (democratic or republican). Finally, we include time-varying measures of Washington's unemployment rate and the logarithm of state-level expenditures per capita on everything except K–12 education, both of which are represented by vector $_t$. These variables control for economic trends in the state.

The ITS model allows us to estimate causal McCleary effects under the following assumption: the average pretreatment trend for each tercile serves as a valid counterfactual for what would have happened in the absence of the McCleary reform. In other words, our McCleary effect estimates reflect the difference between the average posttreatment trend in each tercile and the average pretreatment trend, after netting out the state-level economic control variables. However, because there is no comparison group in this research design, the ITS models cannot explicitly adjust for other secular shocks that affect the entire state of Washington beyond these state-level economic controls. Despite this limitation, we still choose to report primarily ITS results because we can better characterize the significant increases in base and total final salaries—pre- to post-McCleary—because the McCleary reforms occurred across all districts.

To triangulate the ITS findings, we will estimate a comparative interrupted time series (CITS), where the comparison group consists of Tercile 1 districts—the low-dosage districts. Because the CITS model differences out the effect of Tercile 1 to form a difference-in-differences research design, we obtain stronger causal warrant because we can explicitly adjust for secular shocks that affect WA through the inclusion of year fixed effects. However, the tradeoff is that this CITS approach offers a limited perspective of McCleary impacts because the McCleary reforms influence all WA districts and the cross-tercile differencing removes a substantial portion of the policy treatment effect. Particularly, when CITS estimates can be closely approximated by differencing ITS point estimates across terciles, the key identifying assumptions for ITS seem plausible.

In our analyses, the CITS model takes the following form:

$$w_{dt} = \theta_d + \gamma_t + \sum_{i=2}^{3} \gamma_i \ 1[\ \ ose_d = i] \times year_t) + \sum_{j=2}^{3} \sum_{k=2\ 19}^{2\ 2} \beta_{jk} \ 1[\ \ ose_d = j] \times 1[year_t = k]) + \varepsilon_{dt} \tag{2}$$

where pretrends for Tercile 1 are estimated nonparametrically with year fixed effects, γ We then adjust for pretrends among districts in Terciles 2 and 3 by including tercile-specific linear time trends, which are identified relative to the nonparametric trend for Tercile 1. Our parameters of interest are still the β_k; however, we only estimate effects for Terciles 2 and 3. We estimate Equations 1 and 2 using weighted least squares, weighting by certificated teacher FTE. We also estimate cluster-robust standard errors at the district level to correct for general forms of heteroskedasticity and for arbitrary serial correlation over time within districts.

Beyond estimating our ITS and CITS models on overall median district salary measures, we also estimate the heterogeneity in salary increases by teacher experience level. We separately estimate our equations on seven experience groups: early-career (0−3 years of teaching experience), junior (4−7), mid-career 1 (8−11), mid-career 2 (12−15), late-career 1 (16−19), late-career 2 (20−22), and late-career 3 (23 and above). To perform this heterogeneity estimation, we generated district-year data files for each experience group and estimated separate effects of McCleary salary increases using Equations 1 and 2. We chose this experience-bin grouping to align with prior literature about the relationship between teacher experience, salary, and turnover (Hendricks, 2015). Moreover, as informed by our interview data, this approach of grouping teachers aligns with how WA educators refer to different career stages in a teacher's life cycle in the district, which makes the findings resonate with policymakers and educational leaders.[1]

For Research Question 2, we estimate the effects of McCleary-induced teacher salary increases on teacher recruitment and turnover rates leveraging reduced-form and instrumental variable approaches. Our reduced-form models are similar to Equations 1 and 2 but replace outcomes with measures of hiring and turnover. Next, we estimate the effect of McCleary-induced salary increase on hiring and turnover by embedding our simulated instrumental variables—the dosage terciles—within the ITS and CITS frameworks. We operationalize this strategy using a 2SLS estimator; our approach is similar to Johnson and Tanner (2018) and Jackson et al. (2016). Our first stage takes the form of either Equation 1 or Equation 2, where the endogenous outcome variable is salary. In the second stage, we model teacher labor market outcomes as a function of the endogenous salary variable. For reference, we show the second stage for the ITS and CITS models below:

$$\text{ITS}: y_{dt} = \lambda_d + X'_t \varphi + \sum_{i=}^{3} \delta_i \; [\; ose_d = i] \times year_t) \quad (3)$$
$$+\eta \hat{w}_{dt} + \xi_{dt}$$

$$\text{CITS}: y_{dt} = \lambda_d + \delta_t + \sum_{i=2}^{3} \delta_i \; [\; ose_d = i] \times year_t) \quad (4)$$
$$+\eta \hat{w}_{dt} + \xi_{dt}$$

where y_t is either a measure of recruitment or turnover. In these equations, η captures the estimated McCleary-induced salary effects on teacher labor market outcomes. We estimate our instrumental variables models using 2SLS. As before, we weight the regression models by total certificated FTE in 2017–2018, and we estimate standard errors by clustering at the district level and correcting for general forms of heteroskedasticity. As with Research Question 2, we capture the heterogeneous effects of salary increase on teacher retention and recruitment, by estimating our models by experience bin. Estimating the heterogeneity effects allows us to understand the extent to which McCleary reforms influence teacher labor workforce development by influencing the salary schedule.

Qualitative Analysis

The qualitative analysis employed constant comparative methods including both deductive and inductive schemes (e.g., Conrad et al., 1993; Glaser, 1965). First, a coding frame was developed based on our conceptual framework and interview protocol. Codes were organized around research questions and included categories such as resource equity, power of policy actors, sensemaking, and inter-organizational influence. Online Appendix Table A1 in the online version of the journal includes the full codes, along with code descriptions.

Two coders then tested the framework on a selection of data, and adjusted definitions and codes, through an iterative process. Once a final code frame was determined, the two coders coded the five interviews. Some interview data were double coded to determine inter-rater reliability and support consistency in the coding process. In cases of disagreement, the coders discussed discrepancies with each other and the larger research team to determine final codes.

To ensure the integration of qualitative and quantitative analyses, the two coders produced analytic memos documenting early findings. These memos were discussed by all team members to inform ongoing sensemaking and triangulation with quantitative analysis approaches and results. We used school district descriptive information and district documents to contextualize interview data.

Results

Teacher Salary Increases Under McCleary SFRs

Figure 1 displays percentage changes in districts' median teacher salaries from pre- to post-McCleary reforms. We compute the prereform baseline by averaging median salaries between academic years 2014–2015 and 2017–2018. Districts varied greatly in the percentages of these salary changes. Although a handful of districts experienced declines in salaries, the majority experienced increases between 0% and 25% from pre- to post-McCleary, as shown in Figure 1A. A small number of districts had base salary increases above 50%. Moreover, districts also vary greatly in the percentages of salary changes by teachers experience levels. Figure 1B includes salary changes for early career and junior teachers (0–7 years of experience), Figure 1C includes salary changes for mid-career teachers (8–15 years of experience), and Figure 1D includes salary changes for late-career teachers (16+ years of experience). These three maps indicate that some districts' salary schedules moved toward being more frontloaded, while others moved toward being more backloaded.

Figure 2 graphs the salary trends by McCleary dosage terciles. Before the reform, there was little difference in certificated base salary across different dosage groups, close to parallel trends. This is not surprising because the major driver for salary differences in pre-McCleary era stemmed from TRI pay supplemented by local revenue, not from the state-funded source. After the reform, certificated base teacher salary increased dramatically for all WA districts by an average of roughly $18,000. Meanwhile, the disparities across districts grew as well, particularly between the high-dosage districts (Tercile 3) and

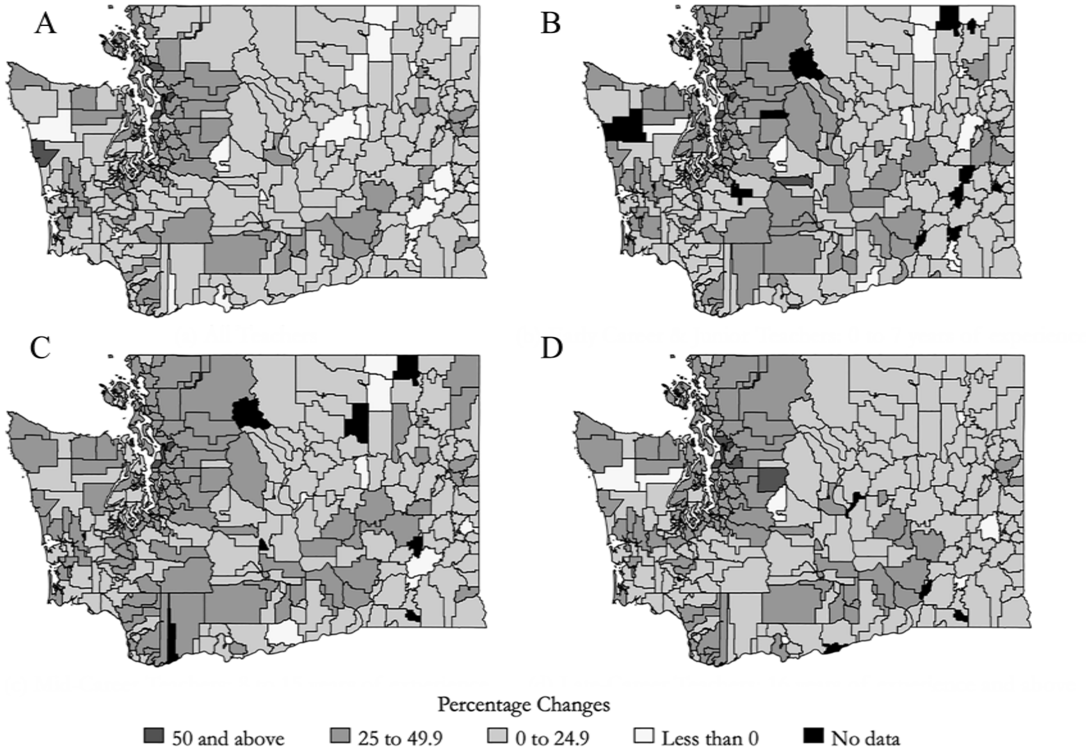

FIGURE 1. *Percentage change in median district certificated base salaries after McCleary reforms.*
Note. Salary data come from the S-275 personnel data files and are in real 2017–2018 academic year dollars (CPI adjusted). The data include teachers with 0.5 to 1.1 full-time equivalents (FTEs) whose primary duties were classroom instruction. Prereform salaries are an average of district-level median base salaries between 2014–2015 and 2017–2018; post-McCleary salaries are district median salaries in 2018–2019. "No data" signifies that the district had no classroom teachers with teaching experience in the specified range for either or both the 4-year pre-McCleary period and academic year 2018–2019 in the post-McCleary period. (A) All teachers. (B) Early-career and junior teachers: 0 to 7 years of experience. (C) Mid-career teachers: 8 to 15 years of experience. (D) Late-career teachers: 16 years of experience and above. CPI = Consumer Price Index.

the low-dosage districts (Tercile 1). The observed difference between Tercile 3 and Tercile 1 districts amounts to about $8,000 in 2020.

Although the variation in teachers' average total final salaries increased in the postreform period as well, the change is less than certificated base salaries. All teachers' total final salaries increased, but Tercile 3 districts increased to a greater extent than the lower dosage districts in Tercile 1 (by about $1,700 as shown in Figure 2). Because teachers in all districts received more pay in terms of both base and total final salaries, we will rely on our ITS models to characterize absolute salary increases across the terciles. Our CITS models, on the contrary, will reflect the extent to which there are relative increases in salaries between the terciles. Taken together, Figures 1 and 2 provide descriptive evidence that we can use the punctuation in 2018–2019 to estimate McCleary influences on teacher salary increases and subsequently on teacher recruitment and turnover.

Next, to formalize the patterns across dosage terciles, we add treatment effect leads and lags to Equation 2 to estimate the differences in salaries for Terciles 2 and 3, relative to Tercile 1 in an event study framework. We show these results in Figure 3. The graphs in Panels A and B provide compelling evidence that the differential changes in certificated base salary across terciles are more pronounced—particularly the contrast between Tercile 3 and Tercile 1—than those in total final salaries.

Table 2 summarizes the estimates of certificated base and total final salary changes induced by McCleary SFRs separately in 2019 and 2020.

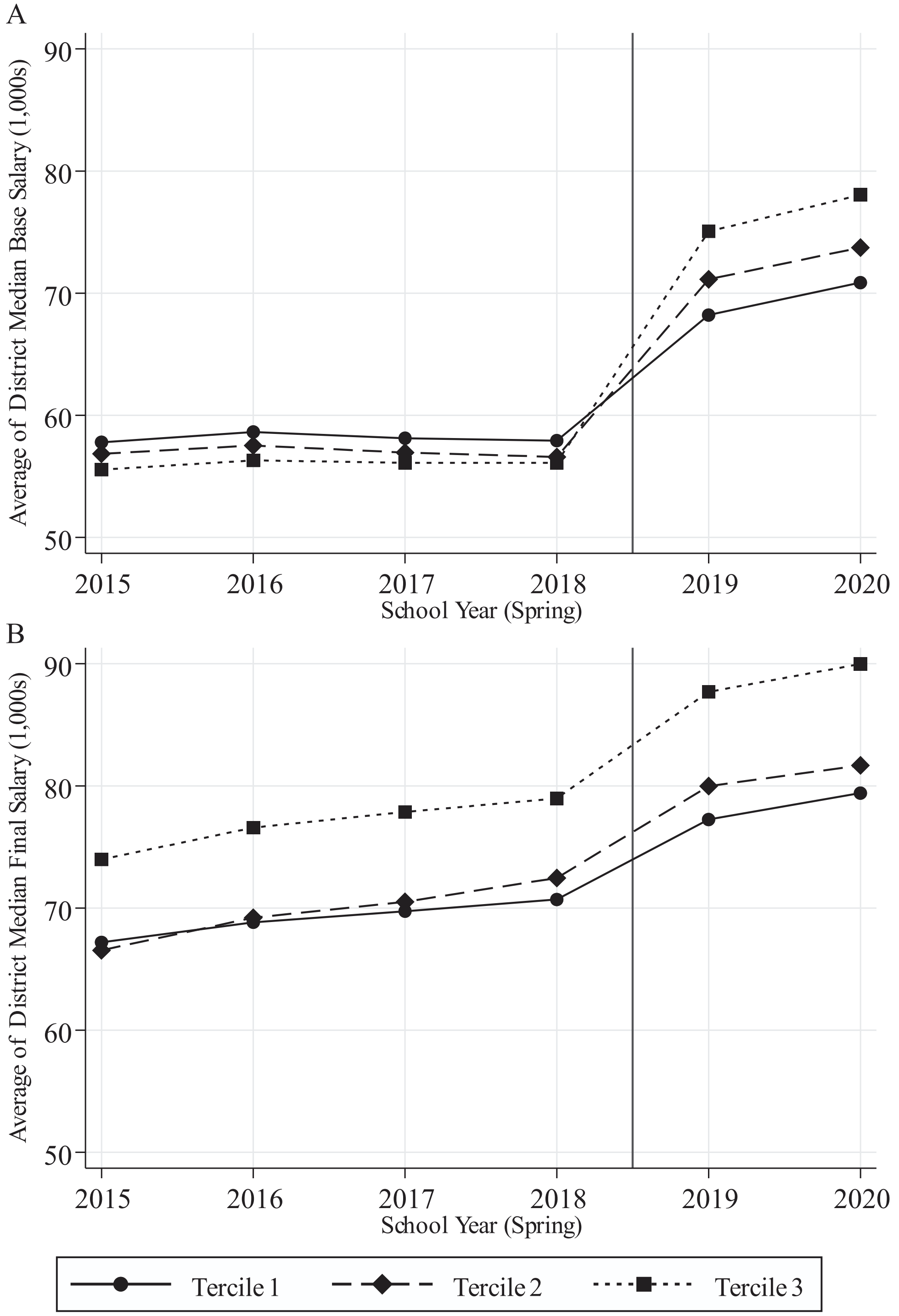

FIGURE 2. *Average of median district salaries by McCleary reform dosage terciles.*
Note. Salaries are in thousands of real 2017–2018 academic year dollars (CPI adjusted) and are weighted by the average of teacher certificated FTE between academic years 2014–2015 and 2017–2018. This figure includes salaries of teachers with 0.5 to 1.1 FTE. The year on the horizontal axis includes the spring of the school year (e.g., 2014–2015 school year is represented as 2015 in the figure). The terciles are based on the dosage measure—namely the predicted state school funding based on the new state prototypical school funding formula under McCleary, which includes the 2019 regionalization factor. (A) Certificated Base Salaries. (B) Total Final Salaries. CPI = Consumer Price Index; FTE = full-time equivalent.

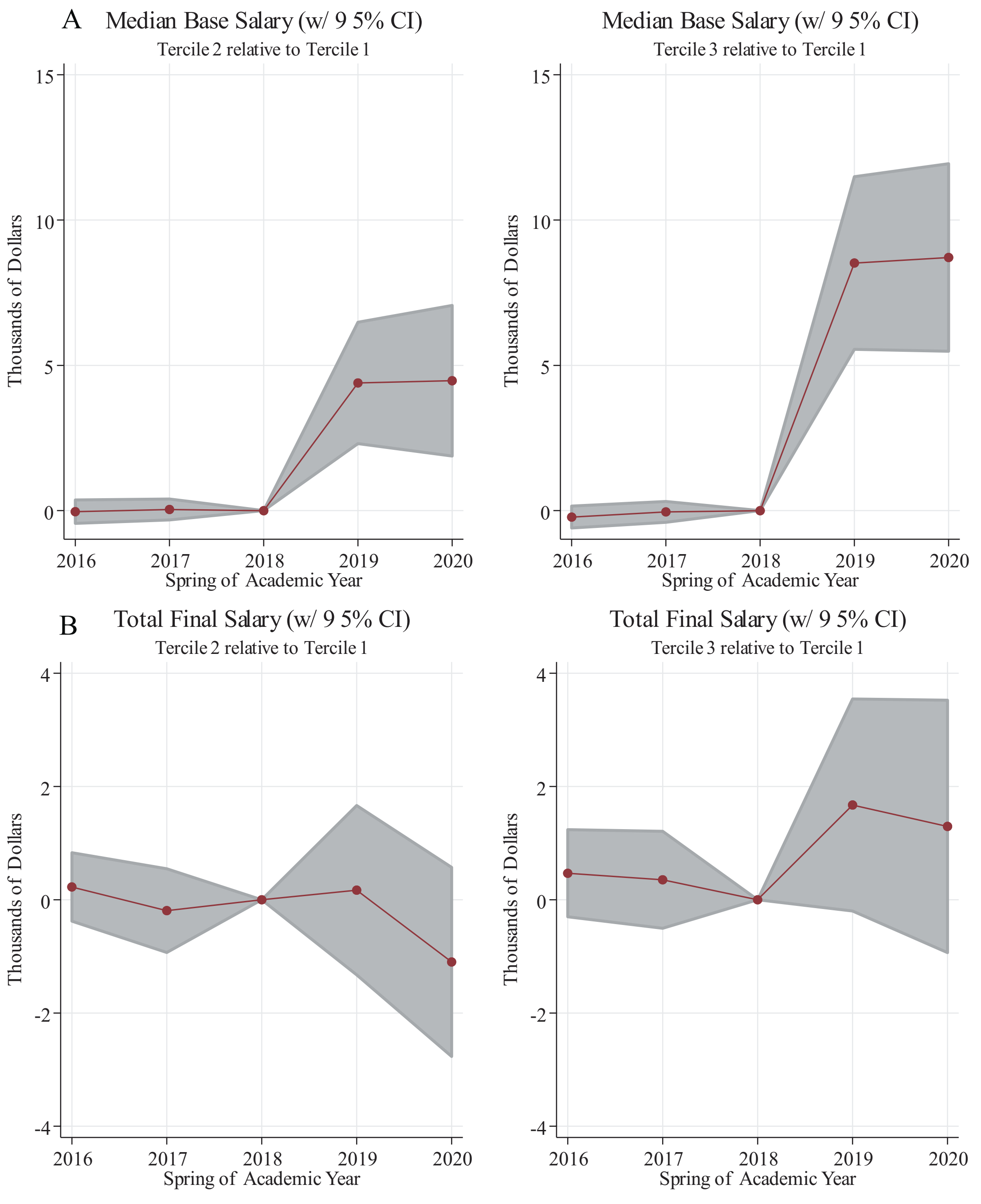

FIGURE 3. *Formalized difference in salaries across terciles based on simulated instruments in an event study framework.*

Note. Solid connected dots reflect the coefficients on academic year indicator variables interacted with an indicator for dosage in either Tercile 2 (left) or Tercile 3 (right); the reference group is Tercile 1. Confidence intervals reflect 95% confidence intervals that are robust to heteroskedasticity and are clustered at the district level. Panel A shows the event study for base salaries and Panel B shows the event study for total final salaries. Salaries are in thousands of real 2017–2018 academic year dollars (CPI adjusted). All models include district fixed effects, year fixed effects, and tercile linear trends. Regressions weighted by the average of teacher certificated full-time equivalent between 2014–2015 and 2017–2018. CPI = Consumer Price Index.

TABLE 2

Estimates of Salary Increase Using Simulated Instruments

	Base salary (1000s)			Total final salary (1000s)		
Effect estimates	ITS	ITS	CITS	ITS	ITS	CITS
Tercile 1						
Pretrend	−0.012	−0.25		1.14***	0.19	
	(0.093)	(0.71)		(0.16)	(2.11)	
McCleary effect 2019	10.1***	10.8***		5.28***	5.99***	
	(0.88)	(0.90)		(0.66)	(0.67)	
McCleary effect 2020	12.8***	13.4***		6.29***	8.04*	
	(1.14)	(1.39)		(0.55)	(3.20)	
Tercile 2						
Pretrend	−0.14	−0.38	−0.12	1.91***	0.95	0.76***
	(0.097)	(0.71)	(0.14)	(0.14)	(2.11)	(0.22)
McCleary effect 2019	14.5***	15.1***	4.37***	5.54***	6.26***	0.27
	(0.61)	(0.62)	(1.08)	(0.41)	(0.44)	(0.77)
McCleary effect 2020	17.2***	17.9***	4.44**	5.33***	7.08*	−0.96
	(0.72)	(1.23)	(1.35)	(0.59)	(3.30)	(0.81)
Tercile 3						
Pretrend	0.15*	−0.090	0.16	1.63***	0.67	0.49
	(0.069)	(0.71)	(0.12)	(0.19)	(2.20)	(0.25)
McCleary effect 2019	18.7***	19.3***	8.54***	6.77***	7.49***	1.50
	(1.22)	(1.24)	(1.51)	(0.75)	(0.71)	(1.00)
McCleary effect 2020	21.5***	22.1***	8.72***	7.42***	9.17*	1.13
	(1.20)	(1.67)	(1.66)	(0.92)	(3.54)	(1.07)
Tercile linear trends	X	X	X	X	X	X
State controls		X			X	
Year fixed effects			X			X
District-by-Year obs.	1,770	1,770	1,770	1,770	1,770	1,770
Number of districts	295	295	295	295	295	295
Adj. R^2	.89	.89	.89	.93	.93	.93

Note. Dependent variables are district median certificated base or total final salaries in thousands of real 2017–2018 academic year dollars (CPI adjusted). The year represents the spring of the school year (e.g., 2018–2019 school year is represented as 2019). All models include district fixed effects. Time-varying state controls are the logarithm of non-K–12 state government expenditures per capita and the unemployment rate. Our preferred ITS model includes these time-varying state-level controls. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated FTE between academic years 2014–2015 and 2017–2018. ITS = interrupted time series; CITS = comparative interrupted time series; FTE = full-time equivalent; CPI = Consumer Price Index.

**p* .05. ***p* .01. ****p* .001.

For each salary type, we include three models. The first two columns include estimates from ITS models. Column 2, reflects our preferred ITS model from Equation 1, which includes time-varying state control variables. We provide ITS model estimates without these state controls in Column 1 for reference. Column 3 shows estimates from the CITS model from Equation 2, where Tercile 1 is the comparison group.

Across these model specifications, we consistently observe that teacher salaries increased significantly statewide from pre- to post-McCleary. Moreover, we consistently observe larger increases in base salaries in districts that are predicted to receive higher state-funded personnel salary funds—namely in Tercile 3 and 2 districts, relative to Tercile 1 districts. For example, as shown in Column 2, the ITS results for base salaries show estimated salary increases of \$10,800 in 2019 and \$13,400 in 2020 for Tercile 1 districts. In Tercile 2 districts, we observed an average of \$15,100 in 2019 and \$17,900 in 2020, and even larger increases of an average of \$19,300 in 2019 and \$22,100 in 2020 in Tercile 3 districts. In the CITS results column, Tercile 2 districts are estimated to increase average base salary by additional \$4,370 in 2019 and \$4,440 in 2020; and Tercile 3 districts are estimated to increase additional \$8,540 in 2019 and \$8,720 in 2020, relative to Tercile 1 districts.

We observe a smaller amount of increase for teachers' total final salaries for all districts, which include all revenue sources that contribute to teacher pay. There is little difference in total salary changes comparing Terciles 2 and 3 with Tercile 1 districts. We note that the WA state's prototypical school funding formula articulates the rules by which the state allocates financial resources to school districts; it is not a spending plan for school districts. These estimates suggest that districts on average used the McCleary-induced funds to substantially increase certificated teacher salaries.

We then further examine whether the base salary bumps are uniform for teachers at different career stages. We estimated Equation 2 separately for teachers in each of the seven groups: early-career (0−3 years of teaching experience), junior (4−7), mid-career 1 (8−11), mid-career 2 (12−15), late-career 1 (16−19), late-career 2 (20−22), and late-career 3 (23 and more). Table 3 shows that salary increases disproportionately benefited more experienced teachers, especially those with greater than 16 years of experience. Particularly when comparing the estimated additional base salary increases between Tercile 1 and Tercile 3 districts, we observed that the estimated McCleary increases in average median base salaries for late-career teachers with 16 years or more years of experiences in Tercile 3 districts (about \$12,000+ for base salaries) were twice as much as the increases for early teachers with 3 years or fewer years of experience (about \$5,000 for base salaries). We Observe similar patterns for total final salaries—namely a larger increase for the most senior teachers in Tercile 3 districts but with a less degree of raises (such as additional \$3,000). In other words, Tercile 3 districts that were predicted to receive more state personnel funds moved toward having more backloaded salary schedules.

Changes in Teacher Turnover Under McCleary SFRs

To examine McCleary reforms on teacher labor markets, we start by examining teacher turnover. We define turnover as either moving to another district in the next year (i.e., mobility) or leaving the teaching workforce or the WA public school system altogether in the next year (i.e., leaving). Because teacher turnover is computed between years t and $t + 1$, we report results only for the 2018–2019 school year. Including subsequent years would conflate turnover effects induced by McCleary with the COVID-19 pandemic, so we restrict our sample accordingly. And even though our measure of turnover for the 2018–2019 school year necessarily requires data from the 2019 to 2020 school year, we note that teacher data are collected in the fall—specifically, in October—of the academic year; consequently, our results are not affected by the pandemic.

In Table 4, we present our turnover results. We privilege the ITS model results because all terciles experienced similar percentage point declines in the first year of the McCleary reforms. We show the relevant declining percentage turnover trends by dosage tercile in Online Appendix Figure A2 in the online version of the journal. The CITS model estimates also show that there are not any substantive differences between Terciles 2 and 3 relative to Tercile 1. By taking differences among the point estimates between (a) Terciles 2 and 1 and (b) Terciles 3 and 1 from the ITS models produce similar point estimates to the CITS estimates in Online Appendix Table A2 in the online version of the journal.

As shown in Table 4, we observe a significant reduction in teacher turnover during the first McCleary year, especially among teachers with 8 or more years of teaching experience. For example, in Tercile 1 districts, there was a reduction of about 4.77 percentage points in turnover rate for teachers with more than 23 years of teaching experience. Moreover, in Tercile 2 and 3 districts, there was a reduction of about 3 percentage points for mid-career and late-career teachers.

TABLE 3

Effects on Base Teacher Salary Increases for Different Experience Levels

Effect estimates	All	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Panel A								
Base salary (1000s)								
Tercile 2								
McCleary effect 2019	4.37***	2.95***	3.26***	3.31***	4.36***	5.48***	5.02***	4.86***
	(1.08)	(0.68)	(0.86)	(0.99)	(1.20)	(1.27)	(1.27)	(1.17)
McCleary effect 2020	4.44**	2.32*	2.93**	2.10	3.31*	4.19**	3.80**	3.72**
	(1.35)	(0.93)	(1.00)	(1.07)	(1.41)	(1.40)	(1.32)	(1.17)
Tercile 3								
McCleary effect 2019	8.54***	5.55***	7.84***	7.74***	9.62***	10.7***	10.9***	10.9***
	(1.51)	(1.06)	(1.12)	(1.31)	(1.72)	(1.70)	(1.73)	(1.61)
McCleary effect 2020	8.72***	4.92***	7.97***	7.80***	9.72***	11.6***	12.2***	12.5***
	(1.66)	(1.28)	(1.25)	(1.37)	(1.66)	(1.74)	(1.84)	(1.47)
Panel B								
Total final salary (1000s)								
Tercile 2								
McCleary effect 2019	0.27	0.0039	−0.24	0.059	0.61	1.57*	0.71	0.58
	(0.77)	(0.59)	(0.67)	(0.82)	(0.96)	(0.78)	(0.76)	(0.87)
McCleary effect 2020	−0.96	−0.69	−1.09	−1.33	−0.56	−0.15	−1.15	−1.60
	(0.81)	(0.88)	(0.79)	(0.97)	(1.09)	(0.89)	(0.86)	(0.93)
Tercile 3								
McCleary effect 2019	1.50	0.79	2.11*	1.55	2.63*	3.08**	3.44**	3.59***
	(1.00)	(0.85)	(0.95)	(1.05)	(1.16)	(1.12)	(1.14)	(1.07)
McCleary effect 2020	1.13	0.30	2.00	0.76	2.69*	2.86*	3.15**	3.21**
	(1.07)	(1.08)	(1.07)	(1.14)	(1.31)	(1.10)	(1.15)	(1.03)
Tercile linear trends	X	X	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X	X	X
District-by-Year obs.	1,770	1,607	1,590	1,609	1,603	1,583	1,527	1,657
Number of districts	295	279	282	283	282	280	269	281
Tercile 1 districts	99	98	98	99	97	97	96	99
Tercile 2 districts	98	98	96	95	96	97	94	97
Tercile 3 districts	98	83	88	89	89	86	79	85

Note. Dependent variables are district median certificated base salaries in thousands of real 2017–2018 academic year dollars (CPI adjusted) by experience bin. The year represents the spring of the school year (e.g., 2018–2019 school year is represented as 2019). All specifications are comparative interrupted time series models and include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018. CPI = Consumer Price Index.

**p* .05. ***p* .01. ****p* .001.

This finding is consistent with anecdotal observations from our case study interviewees, who noted that salary increases for senior teachers delayed their retirements or disincentivized them from seek administrative positions. In contrast, we did not observe McCleary-induced salary effects on the turnover of early-career and junior teachers, likely because compared with senior teachers, early-career and junior teachers had the least amount of salary increases.

We then decompose different types of turnover. Table 5 includes the ITS estimates of changes in the percentage of teachers who moved to another district but remained as certificated teachers in the next school year, which we refer to as mobility; CITS results appear in Online Appendix Table A3 in the online version of the journal. Again, we observe a consistent and salient pattern of reduced teacher mobility on average and especially among mid-career

TABLE 4

Changes in Teacher Turnover Under McCleary School Finance Reforms (Interrupted Time Series Models)

Effect estimates	% turnover (all)	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Tercile 1								
McCleary effect 2019	−1.62**	0.80	−3.21**	−1.68	−0.57	−0.95	−0.79	−4.77***
	(0.55)	(1.25)	(1.06)	(1.27)	(1.11)	(1.22)	(1.34)	(1.39)
Tercile 2								
McCleary effect 2019	−1.61**	0.19	−1.70	−3.30***	−2.88**	−0.21	−1.28	−2.79*
	(0.55)	(1.02)	(1.09)	(0.90)	(0.96)	(0.82)	(1.09)	(1.37)
Tercile 3								
McCleary effect 2019	−2.19***	−0.69	−1.47	−3.31**	−2.73***	−2.42**	−1.90	−3.50***
	(0.56)	(1.11)	(0.78)	(1.03)	(0.80)	(0.86)	(0.99)	(0.92)
Tercile linear trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Dependent variable in Column 1 (all) is the percentage of turnover teachers who left their district in the next school year, as either moved to another district or left the teaching workforce or left the Washington state public school system altogether. The dependent variables in the rest of the columns are the percentage of turnover out of the total number of teachers in that experience bin. The year represents the spring of the school year (e.g., 2018–2019 school year is represented as 2019). The estimates come from interrupted time series models. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018.
*p .05. **p .01. ***p .001.

teachers. Next, Table 6 includes ITS estimates of the changes in teacher leavers who either left the teaching workforce or left the WA public school system altogether in the next school year; CITS results appear in Online Appendix Table A4 in the online version of the journal. On average, across all teachers (see Column 1), we observe largely null McCleary effects among Tercile 1 and Tercile 2 districts. Teachers in Tercile 3 districts, however, reduced their likelihood of leaving the teaching profession or WA public school system in 2018–2019 by about 1.17 percentage points. Looking at estimates across the experience profile, we once again observe a significant reduction of leaving rate for late-career teachers with 23+ years of experience. Combining Tables 5 and 6 together, McCleary SFRs are estimated to have substantive effects on mid-career teachers' transfers between districts and late-career teachers' likelihood of leaving the profession or the school system.

Changes in Teacher Hiring Under McCleary SFRs

We next examine changes in teacher hiring. We define district-level new hires as teachers who were employed in a different district in the previous year or teachers who have less than 1 year of experience and are new to the profession in the current year. Unlike teacher turnover, we compute the percentage of new hires retrospectively, between years $t-1$ and t. Consequently, we can report McCleary effects for the academic years 2018–2019 and 2019–2020 without having effect estimates conflated with the COVID-19 pandemic. Similar to the teacher turnover results, we present our ITS results in Table 7. CITS results appear in Online Appendix Table A5 in the online version of the journal and descriptive trends appear in Online Appendix Figure A3 in the online version of the journal. Overall, estimates in Table 7 show a largely null effect on the percentage of new hires in post-McCleary 2019 and 2020.

TABLE 5

Changes in Teacher Movers Under McCleary School Finance Reforms (Interrupted Time Series Models)

Effect estimates	% of movers (all)	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Tercile 1								
McCleary effect 2019	−0.84**	−0.19	−0.43	−2.42***	−0.96	−0.46	−0.15	−1.04**
	(0.30)	(0.84)	(0.71)	(0.71)	(0.66)	(0.56)	(0.68)	(0.39)
Tercile 2								
McCleary effect 2019	−1.01**	−0.25	−1.01	−2.31***	−1.96**	−0.38	−0.97	−0.30
	(0.31)	(0.68)	(0.68)	(0.53)	(0.62)	(0.55)	(0.58)	(0.31)
Tercile 3								
McCleary effect 2019	−1.02**	−0.93	−0.94	−2.04**	−1.77***	−0.86	−0.33	−0.30
	(0.37)	(0.79)	(0.67)	(0.70)	(0.48)	(0.50)	(0.55)	(0.19)
Tercile linear trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Dependent variable in Column 1 (all) is the percentage of teachers that moved to another district but remained as certificated teachers in the next school year. The dependent variables in the rest of columns are the percentage of movers out of the total number of teachers in that experience bin. The year represents the spring of the school year (e.g., 2018–2019 school year is represented as 2019). The estimates come from interrupted time series models. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018.

**p* .05. ***p* .01. ****p* .001.

Associating Salary Increases With Teacher Turnover and Hiring

Finally, we use 2SLS to directly estimate the extent to which salary increases affect teacher turnover and hiring rates. In these analyses, we exclude all data from 2019 to 2020. We exclude this second year of the McCleary effect because we do not want to conflate our estimates with the pandemic, especially with respect to our turnover measure. While we can technically include 2019–2020 for hiring, we note that the second year incorporates market dynamics from a decrease in turnover the previous year. Thus, to only capture the McCleary effect, we use the 2018–2019 data in the post period.

The IV-CITS models generate estimates with the same directions as those in IV-ITS (Table 8), but none of the IV-CITS estimates are statistically significant (see Online Appendix Table A6 in the online version of the journal). This imprecision is understandable because the IV-ITS and IV-CITS models leverage different contrasts when partialling out exogenous variation in salaries based on the simulated instruments. Specifically, IV-ITS estimates partial out exogenous variation in salaries by leveraging differences in the terciles relative to their own pretrends—these are first differences. The IV-CITS estimates, however, partial out exogenous variation in salaries by leveraging first and second differences. These second differences are between Terciles 2 and 1 and between Terciles 3 and 1. For example, as reported in Table 2, the ITS results for base salary reflect increases of $10,800, $15,100, and $19,300 for Terciles 1, 2, and 3, respectively, in the academic year 2018–2019; however, the CITS results reflect an estimated base salary difference of $4,370 between Terciles 2 and 1 and $8,540 between Terciles 3 and 1. Put simply, the IV-CITS models are underpowered to identify statistically

TABLE 6

Changes in Teacher Leavers Under McCleary School Finance Reforms (Interrupted Time Series Models)

Effect estimates	% of leavers (all)	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Tercile 1								
McCleary effect 2019	−0.78	0.98	−2.78**	0.74	0.39	−0.50	−0.65	−3.73**
	(0.48)	(1.02)	(0.92)	(1.14)	(0.81)	(1.14)	(1.17)	(1.28)
Tercile 2								
McCleary effect 2019	−0.60	0.44	−0.69	−0.98	−0.93	0.16	−0.30	−2.49
	(0.40)	(0.75)	(0.77)	(0.86)	(0.74)	(0.66)	(0.86)	(1.29)
Tercile 3								
McCleary effect 2019	−1.17***	0.24	−0.53	−1.27	−0.96	−1.56*	−1.57	−3.20***
	(0.35)	(0.67)	(0.65)	(0.68)	(0.62)	(0.66)	(0.90)	(0.90)
Tercile linear trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Dependent variable in Column 1 (all) is the percentage of leavers who either left the teaching workforce or left the Washington state public school system altogether in the next school year. The dependent variables in the rest of columns are the percentage of leavers out of the total number of teachers in that experience bin. The year represents the spring of the school year (e.g., 2018–2019 school year is represented as 2019). The estimates were come from interrupted time series models. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018.
**p* .05. ***p* .01. ****p* .001.

significant effects with respect to cross-tercile differences. In this section, we mainly state the results from the IV-ITS models, which provide suggestive evidence of the relationship between salary and teacher labor market outcomes.

As shown in Table 8, a McCleary-induced increase of $1,000 in base salary would reduce teacher turnover rate by 0.11 percentage points, and an increase of $1,000 in total final salary would reduce teacher turnover by 0.28 percentage points. To put this estimate into policy-relevant units, a back-of-the-envelope calculation suggests that the average base salary increase of $18,000 would reduce turnover rate by 2 percentage points. In other words, the McCleary-induced base salary increase is estimated to reduce the state average teacher turnover rate to 8.4 percentage points from the prereform state average turnover rate of 10.4 percentage points, equivalent to 19% of reduction. These effects were observed for almost all teacher experience groups except for early-career teachers with 0 to 3 years of experience.

We also further examine turnover by associating changes in salary with teacher mobility and leaving in Tables 9 and 10, respectively. Table 9 shows consistent evidence that salary increase reduces teacher mobility rates on average, particularly for mid-career (8–15) teachers' mobility. Table 10 shows that salary increases particularly reduce late-career teachers' (with 23+ years of experience) likelihood of leaving the teaching profession or the state public school system altogether.

Finally, we assess the relationship between salary changes and new hires in Table 11. Although the coefficient for the percent of all new hires (out of the entire teacher workforce in the district) is not statistically significant, the $1,000 base salary increase has significantly positive effects for recruiting junior teachers with 4 to 7 years of teaching experience: a $1,000

TABLE 7

Changes in Teacher Hiring Under McCleary School Finance Reforms (Interrupted Time Series Models)

Effect estimates	% of new hires (all)	Early (–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Tercile 1								
McCleary effect 2019	0.46	1.64	0.90	0.87	1.40	−1.78*	−0.12	0.20
	(0.44)	(1.61)	(0.78)	(0.71)	(0.79)	(0.88)	(0.69)	(0.34)
McCleary effect 2020	3.10	−7.13	5.44	0.99	−0.014	0.92	0.44	2.65
	(3.31)	(12.8)	(4.76)	(4.09)	(3.88)	(4.21)	(4.51)	(2.28)
Tercile 2								
McCleary effect 2019	0.18	0.75	0.018	1.46*	0.41	−0.22	0.42	0.52
	(0.46)	(1.56)	(0.65)	(0.66)	(0.65)	(0.56)	(0.47)	(0.33)
McCleary effect 2020	1.49	−11.0	4.20	−0.29	−1.29	1.99	0.14	1.82
	(3.32)	(12.9)	(4.77)	(3.92)	(3.67)	(3.96)	(4.59)	(2.21)
Tercile 3								
McCleary effect 2019	1.09*	3.79*	1.73**	0.64	0.77	−0.045	−0.49	−0.28
	(0.52)	(1.91)	(0.54)	(0.58)	(0.50)	(0.43)	(0.41)	(0.23)
McCleary effect 2020	3.89	−4.61	6.62	0.67	−0.16	2.10	0.083	1.74
	(3.27)	(12.6)	(4.68)	(3.98)	(3.72)	(3.80)	(4.50)	(2.22)
Tercile linear trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,770	1,607	1,590	1,609	1,603	1,583	1,527	1,657
Number of districts	295	279	282	283	282	280	269	281
Tercile 1 districts	99	98	98	99	97	97	96	99
Tercile 2 districts	98	98	96	95	96	97	94	97
Tercile 3 districts	98	83	88	89	89	86	79	85

Note. Dependent variable in Column 1 (all) is the percentage of new hires out of the total number of teachers in the district. The dependent variables in the rest of columns are the percentage of new hires out of the total number of teachers in that experience bin. The year represents the spring of the school year (e.g., 2018–2019 school year is represented as 2019). The estimates were based on interrupted time series models. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018.
**p* .05. ***p* .01. ****p* .001.

increase in base salary would increase hiring by 0.08 percentage points among this group. While the result is not statistically significant among early-career teachers, we have suggestive evidence that the hiring of teachers with 0 to 3 years of experience would increase by 0.23 percentage points with a $1,000 increase in base salary. For late-career teachers with 16 and more years of teaching experience, the effects of the salary increase diminish to almost zero.

Robustness and Sensitivity Analyses

Exogeneity of Teacher Salaries. Not relying on exogenous variation in teacher salaries may produce biased estimates in our instrumental variable analyses. If there are factors that simultaneously affect labor market outcomes (e.g., turnover) and salary, then our estimates may reflect spurious correlations instead of causal estimates. For example, consider school districts that compensate teachers with higher salaries as a compensating differential for less-than-optimal working conditions. If these working conditions also cause teachers to turnover at a higher rate (e.g., Boyd et al., 2011), then the effects of salary on labor market outcomes would be biased.

While we cannot fully test the exclusion restriction, we do assess whether instrumented salary predicts student demographics and staffing ratios

TABLE 8

Associating Salary Increases With Teacher Turnover by Experience (IV-ITS Models)

Models	% turnover (all)	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Panel A: Base salary								
Base salary (1,000s)	−0.11***	−0.028	−0.11*	−0.19***	−0.13***	−0.079*	−0.075*	−0.16***
	(0.023)	(0.070)	(0.044)	(0.046)	(0.033)	(0.031)	(0.034)	(0.037)
KP *F*-stat	315.5	254.0	343.1	426.4	387.0	333.7	319.3	371.0
Hansen J: *p*-value	0.72	0.64	0.089	0.74	0.44	0.27	0.98	0.11
Panel B: Final salary								
Final salary (1,000s)	−0.28***	−0.057	−0.28**	−0.46***	−0.32***	−0.18*	−0.17*	−0.38***
	(0.056)	(0.19)	(0.11)	(0.11)	(0.083)	(0.075)	(0.080)	(0.086)
KP *F*-stat	136.3	58.4	86.7	103.5	123.1	209.2	235.6	215.3
Hansen J: *p*-value	.95	.62	.15	.62	.34	.23	.95	.26
Tercile trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Each estimated model is based on the IV-ITS model in Equation 3. In Panel A, we regress the percentage of district-level teacher turnover on instrumented median base salary in thousands of real dollars. In Panel B, we regress the percentage of district-level teacher turnover on instrumented median final salary in thousands of real dollars. Across the columns, results are reported by experience bin. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018. IV = instrumental variable.
**p* .05. ***p* .01. ****p* .001.

that are correlated with working conditions other district factors that affect salary and labor market decisions. Table 12 reports the results of this exercise. Panel A reports results when we estimate Equation 3, the IV-ITS model, and Panel B reports results from Equation 4, the IV-CITS model. Across both panels, we find no evidence that instrumented salaries predict the percentages of free and reduced-price lunch, Black, Hispanic, or special education students. We also find no relationship between instrumented salaries and teachers per 1,000 students, counselors per 1,000 students, and administrators per 1,000 students.

We also conduct exogeneity test by first predicting turnover and new hires as a function of our demographic and staffing ratios and then regressing each of these predicted variables on instrumented salary.[2] Intuitively, this prediction method combines each of our covariates into a regression-weighted index, allowing for a convenient way to summarize potential violations of exogeneity in terms of our outcome variables. As shown in the last two columns of Table 12, we find that both our IV-ITS and IV-CITS estimates, which use only exogenous variation in salaries, are not related to the changes in predicted turnover and new hiring at the 5% significance level. Taken together, these findings rule out some plausible alternative explanations and add additional confidence in our instrumental variable analyses.

Falsification Tests. While our legislative document analysis suggests that McCleary-induced salary reforms began in the 2018–2019 school year, one might conjecture that district leaders and unions anticipated the salary reforms, which may have affected base salary negotiations in the year before. To address this concern, we assign the first reform year to be 2017–2018 and set the omitted year to be 2016–2017. As shown in Panel (a) of Online Appendix Figure A4 in the online

TABLE 9

Associating Salary With Teacher Mobility by Experience Bins (IV-ITS Models)

Models	% movers (all)	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Panel A: Base salary								
Base salary (1,000s)	−0.058***	−0.057	−0.061	−0.13***	−0.089***	−0.032	−0.022	−0.017*
	(0.016)	(0.052)	(0.035)	(0.031)	(0.020)	(0.018)	(0.020)	(0.0074)
KP *F*-stat	315.5	254.0	343.1	426.4	387.0	333.7	319.3	371.0
Hansen J: *p*-value	.75	.82	.90	.26	.66	.89	.50	.092
Panel B: Final salary								
Final salary (1,000s)	−0.14***	−0.15	−0.15	−0.33***	−0.22***	−0.077	−0.049	−0.045*
	(0.036)	(0.14)	(0.085)	(0.072)	(0.049)	(0.043)	(0.046)	(0.017)
KP *F*-stat	136.3	58.4	86.7	103.5	123.1	209.2	235.6	215.3
Hansen J: *p*-value	.93	.77	.79	.51	.55	.87	.47	.11
Tercile trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Each estimated model is based on the IV-ITS model in Equation 3. In Panel A, we regress the percentage of district-level teacher mobility on instrumented median base salary in thousands of real dollars. In Panel B, we regress the percentage of district-level teacher mobility on instrumented median final salary in thousands of real dollars. Across the columns, results are reported by experience bin. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent between academic years 2014–2015 and 2017–2018. IV = instrumental variable.
**p* .05. ***p* .01. ****p* .001.

version of the journal, we find no evidence of an effect of median base salary increases in 2017–18. The results align with our takeaways from Figures 2 and 3.

One may also be concerned that the timing of the reform was specified too early: instead of 2018–19, it could be that the first year of treatment should be 2019–2020. We show that delaying the start of treatment to after the academic year 2018–2019 violates the assumption of parallel trends. The event study in Panel (b) of Online Appendix Figure A4 in the online version of the journal shows that after adjusting for district fixed effects, year fixed effects, and district-specific linear trends, all three terciles were trending differently prior to treatment when we assign the year of treatment as 2019–2020.

Alternate Dosage Measures. Besides our preferred dosage measure, we developed four alternate dosage measures: (a) a measure that adds local levy amounts and state-level LEA funding to our preferred measure; (b) a dosage measure that incorporates regionalization factors that were targeted for the 2019–20 academic year; (c) a measure that considers only certificated instructional salary allocation increases (i.e., it excludes classified and administrative increases); and (d) a measure that considers only certificated teacher salary allocation increases, an even more restrictive measure than (3). Taken together, all four measures provide similar inferences about the relationships between McCleary effects on teacher salary and labor markets (Online Appendix Tables A8 and A9 in the online version of the journal). We note, however, that our preferred measure systematically gives us the largest Kleibergen-Paap *F*-statistics.[3] We take this as suggestive evidence that it is the total state-level allocation for staffing salaries—certificated, administrative, and classified—that best predict teacher salaries.

TABLE 10

Associating Salary With Teacher Leavers by Experience Bins (IV-ITS Models)

Models	% of leavers (all)	Early (0−3)	Junior (4−7)	Mid 1 (8−11)	Mid 2 (12−15)	Late 1 (16−19)	Late 2 (20−22)	Late 3 (23+)
Panel A: Base salary								
Base salary (1,000s)	−0.056***	0.030	−0.048	−0.061	−0.043	−0.046	−0.053	−0.14***
	(0.015)	(0.045)	(0.037)	(0.032)	(0.025)	(0.024)	(0.031)	(0.035)
KP *F*-stat	315.5	254.0	343.1	426.4	387.0	333.7	319.3	371.0
Hansen J: *p*-value	.71	.71	.028	.49	.47	.22	.65	.30
Panel B: Final salary								
Final salary (1,000s)	−0.14***	0.097	−0.14	−0.14	−0.100	−0.11	−0.12	−0.34***
	(0.037)	(0.13)	(0.091)	(0.080)	(0.062)	(0.059)	(0.073)	(0.083)
KP *F*-stat	136.3	58.4	86.7	103.5	123.1	209.2	235.6	215.3
Hansen J: *p*-value	.71	.77	.039	.43	.42	.19	.67	.51
Tercile trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Each estimated model is based on the IV-ITS model in Equation 3. In Panel A, we regress the percentage of district-level teacher leavers on instrumented median base salary in thousands of real dollars. In Panel B, we regress the percentage of district-level teacher leavers on instrumented median final salary in thousands of real dollars. Across the columns, results are reported by experience bin. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent between academic years 2014–2015 and 2017–2018. IV = instrumental variable.
**p* .05. ***p* .01. ****p* .001.

In addition, we estimate our models using dosage quintiles instead of terciles in Online Appendix Tables A8 and A9 in the online version of the journal. While our results are similar in both direction and magnitude to the tercile results, we prefer terciles for two reasons. First, the Kleibergen-Paap *F*-statistics are larger for terciles than for quintiles.[4] Second, we find that we reject the Hansen J test when using quintiles. In other words, we reject the null hypothesis that overidentifying restrictions are valid.

Weights. We weight the analysis by the average of certificated FTE between academic years 2014–2015 and 2017–2018 because we want to get an estimate that reflects the average teacher in the state and in each tercile. Moreover, we want to ensure that we leveraged all data in the state, which means including both small and large districts. Typically, researchers drop small districts with less than some arbitrary number of staff (or students) because the data are typically noisy. Our weights allow us to use all district observations in estimation, down-weighting potential outliers.

In Online Appendix Table A10 in the online version of the journal, we replace our certificated teacher FTE weights with student enrollment weights, which like the certificated teacher FTE weights are time-invariant. Specifically, the enrollment weight is an average of student enrollment during the prereform years of 2014–2015 to 2017–2018. As shown in Panel A, changing the weight variable to an alternative measure of district size produces a very similar set of results. The magnitudes of the coefficients and signs are all the same.

We also assess whether weights are not needed after excluding small districts. For this test, we drop all district with less than 200 students in

TABLE 11

Associating Salary Increases With Teacher Hiring by Experience (IV-ITS Models)

Models	% new hires (all)	Early (0–3)	Junior (4–7)	Mid 1 (8–11)	Mid 2 (12–15)	Late 1 (16–19)	Late 2 (20–22)	Late 3 (23+)
Panel A: Base salary								
Base salary (1,000s)	0.045	0.23	0.082**	0.053	0.036	−0.011	−0.010	−0.00092
	(0.024)	(0.12)	(0.030)	(0.029)	(0.022)	(0.017)	(0.016)	(0.0091)
KP *F*-stat	315.5	254.0	343.1	426.4	387.0	333.7	319.3	371.0
Hansen J: *p*-value	.47	.49	.19	.31	.40	.15	.31	.092
Panel B: Final salary								
Final salary (1,000s)	0.11	0.64	0.21**	0.13	0.096	−0.034	−0.024	−0.0029
	(0.058)	(0.36)	(0.072)	(0.074)	(0.053)	(0.042)	(0.037)	(0.021)
KP *F*-stat	136.3	58.4	86.7	103.5	123.1	209.2	235.6	215.3
Hansen J: *p*-value	.45	.53	.23	.38	.47	.16	.31	.092
Tercile trends	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,331	1,325	1,349	1,337	1,323	1,272	1,381
Number of districts	295	278	281	283	281	279	269	280
Tercile 1 districts	99	98	98	99	96	97	96	99
Tercile 2 districts	98	98	95	95	96	96	94	96
Tercile 3 districts	98	82	88	89	89	86	79	85

Note. Each estimated model is based on the IV-ITS model in Equation 3. In the top panel, we regress the percentage of district-level teacher hiring on instrumented median base salary in thousands of real dollars. In the bottom panel, we regress the percentage of district-level teacher hiring on instrumented median final salary in thousands of real dollars. Across the columns, results are reported by experience bin. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent in each experience bin between academic years 2014–2015 and 2017–2018. IV = instrumental variable.

**p* .05. ***p* .01. ****p* .001.

Panel B, which resulted in 234 districts in our estimation sample. As shown in the table, upon removing smaller districts and including no regression weights, our results are qualitatively similar. Among the IV-ITS estimates, we find that the absolute values of our point estimates increase, and statistical significance levels do not change. And for the IV-CITS results, we continue to find that results are statistically insignificant. The only sign that changes is for the percentage of new hires (which is now negative), but again, the result is not significant at conventional levels.

Sensitivity of Results to the Exclusion of the Puget Sound Region. As shown in Online Appendix Figure A1 in the online version of the journal, many of the dosage Tercile 3 districts are highly concentrated in the Puget Sound region of Washington. Given the extent of clustering in this region, we identify all districts that are part of the Puget Sound Education Service District Region and drop them from our analytic sample to assess how our IV results change. Online Appendix Table A11 in the online version of the journal identifies the 32 districts we drop. As shown, 25 (78%) of these districts belong to Tercile 3.

After excluding these 32 districts, we find that our IV results are largely unaffected. Online Appendix Table A12 in the online version of the journal shows that our IV-ITS coefficients become slightly larger in absolute value, retain their sign, and remain statistically significant. The IV-CITS results remain statistically insignificant. Overall, we have evidence that clustering patterns in the Puget Sound region are not driving our results.

TABLE 12

Tests of Exogeneity

Models	Pct. FRPL	Pct. Black	Pct. Hispanic	Pct. SPED	Teachers per 1,000 students	Counselors per 1,000 students	Administrators per 1,000 students	Pred. turnover	Pred. new hires
Panel A: ITS									
Base salary (1,000s)	0.038	0.0041	0.00041	0.0096	0.0090	0.0029	−0.0027	−0.00048	0.0051
	(0.020)	(0.0032)	(0.0061)	(0.0053)	(0.016)	(0.0020)	(0.0033)	(0.0030)	(0.0037)
Tercile linear trends	X	X	X	X	X	X	X	X	X
State controls	X	X	X	X	X	X	X	X	X
Panel B: CITS									
Base salary (1,000s)	0.015	−0.018	0.042	0.0094	0.090	0.014	−0.000089	0.0085	0.032
	(0.059)	(0.028)	(0.032)	(0.020)	(0.071)	(0.0072)	(0.0087)	(0.016)	(0.017)
Tercile linear trends	X	X	X	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X	X	X	X
District-by-Year obs.	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475
Number of districts	295	295	295	295	295	295	295	295	295

Note. Specifications in Panel A are based on the IV-ITS model in Equation 3; specifications in Panel B are based on the IV-CITS model in Equation 4. The endogenous variable for which we instrument is the median base salary in thousands of real dollars. We regress each dependent variable on the instrumented endogenous variable. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by the average of teacher certificated full-time equivalent between academic years 2014–2015 and 2017–2018. ITS = interrupted time series; CITS = comparative interrupted time series; FRPL = Free and Reduced Priced Lunch; SPED = Special Education; IV = instrumental variable.
**p* .05. ***p* .01. ****p* .001.

Findings on Local District Mechanisms That Shape Salary Negotiations

The qualitative evidence helps us unpack the mechanisms in local school districts that explain the variations among districts. Interviews with staff in the five districts present broad patterns that arose from local contexts and policy actors' roles. Wherever possible, we triangulate these claims with relevant data from our quantitative analyses to spot-test hypotheses derived from qualitative findings, uncover underlying processes behind quantitative results, as well as surface new forms of meaning unavailable via quantitative data (Edin & Pirog, 2014).

As suggested by both union and district interviewees, teachers' unions at the state and local levels coordinated quickly and collectively to communicate a unified goal of raising teacher salaries as their top or sole priority post-McCleary. Interviewed district leaders implied that the increased state investment under McCleary legislative efforts should be used for funding all the components of basic education, while the salary negotiations led districts to spend the resources on increasing salaries. For example, a district leader in Eagle Creek noted, "There are still areas of underfunding, and when you should provide more funding and it goes right back into salaries . . . things still remain underfunded (e.g., special education, ELL or gifted, and professional development) and so that's the challenge." Union representatives spoke about receiving research and information from the state union representative assigned to their district, and spending time studying the financial reports from the district so that they knew how much money was coming in for certificated salaries and how much a salary increase the district could afford.

Interview data also reveal several local mechanisms that explain the variation in salary increases across districts and align with the four mechanisms in the Conceptual Framework section. First, we found evidence that districts *varied in their composition of policy actors and their interests, formal roles in the organization, experience, and power/voice in collective bargaining*. Experience and longevity of members on the bargaining team influenced bargaining outcomes in at least two out of five districts. In the Upper Valley school district, the district administrator noted that the skill level of the union and district leaders could influence negotiations. The district hired a private company negotiator, which led to the district having the upper-hand during McCleary negotiations.

Next, *organizational culture and contexts influenced decision-making*. For example, we find evidence of back-loading teacher salary schedules partly because experienced teachers were more likely to be at the bargaining table. Three of the five case study districts increased the backloading nature of their salary schedules due to a previous backloaded schedule (i.e., before McCleary reforms) and rent-seeking behavior. However, two districts that front-loaded salaries used a racial equity and experience equity framework to disrupt existing patterns and make the case for disproportionately increasing early-career schedules. In Cedar Bay, the Union Representative recalled needing to actively make the case for shrinking the gap in pay between new teachers and top earners:

> . . . the basics of the job are the same for everybody and you're probably better at it after twenty years than a new person is and you probably have more education and yes, that should be recognized and honored but it's not that you're going to spend two times the amount of time.

In Conifer, the Union Representative described that there was "a genuine focus on racial equity." The bargaining "prioritized issues in [our] conversation of how we were going to dive into it to make it racially equitable." They went on to state that when putting together the bargaining team, the process was "very intentionally focused on ensuring racial equity with teachers' voice . . . the table was larger than it has historically been for bargaining." Moreover, union–district relationships matter negotiation outcomes. In Cedar Bay, the long-time union representative discussed the mutual respect and give-and-take nature of their district negotiations, which they credited to the district's collaborative culture and routine.

Respondents described their approach to bargaining from a *perspective of varying priorities*. Individuals' interests and understanding of the goals of McCleary varied, which influenced their goals during bargaining. For example, the union representative in Cedar Bay communicated a desire to raise certificated teacher salaries, while the union representative in Conifer school district understood the goals of McCleary as fully funding not just certificated teachers but also the entire basic education programs (which means including staffing other noncertificated teachers). While the Plainview superintendent expressed an understanding of McCleary being intended for increasing teacher compensation, the CFO in Eagle Creek understood the reform differently as rather than substantially increasing teachers' total salaries, the increased state funding was meant to reduce the district's reliance on local levies to compensate teachers:

> It wasn't intended to raise a salary, but that is what it does in this environment when you are bargaining and for districts, you have a choice of either providing those funds to your teachers or they go on strike.

The CFO here also refers to key power differentials between the union and district that may help to theorize why certain districts (like Eagle Creek) experienced such high teacher salary gains compared with others.

Finally, we observe *evidence of inter-organizational influence* on bargaining based on nearby districts. Districts desire to remain salary competitive to neighboring districts, which reflects inter-organizational influence. All case study districts referred to the practices of nearby districts. The Eagle Creek CFO noted that their district "set the standard" as the first district to settle through McCleary. The CFO said they provided a 15% salary increase, and that they were eventually surprised when nearby districts reached up to a 20% increase, so that the standard set by Eagle Creek was actually surpassed. The Upper Valley Superintendent also reflected on this "domino effect," as it influenced salary negotiations in their district.

Discussion and Conclusion

Our work makes several key contributions to understanding SFRs and teacher labor market outcomes. First, when new state resources were allocated to schools under McCleary SFRs, we observed that local collective bargaining processes directed the new resources to significantly increase teacher salaries. Larger salary increases occurred in districts that were predicted to receive more state personnel funds under the new funding formula. WA has one of the strongest teachers' unions in the nation (Brunner et al., 2020; Winkler et al., 2012). Prior literature suggests that states with strong teacher unions are more likely to increase teacher salaries in the context of SFRs and local politics serve as an important explanation for the flypaper effects—namely, the strength of local unions in ensuring that funds stick where they hit (Brunner et al., 2020; Cook et al., 2021; Cowen & Strunk, 2015; Rose & Sonstelie, 2010). WA teachers, on average, had a 29% increase in certificated base salary from pre-McCleary reform to post reform, compared with the estimated 7% to 20% increase in teacher salaries associated with union power or collective bargaining outcomes in prior studies. On the contrary, WA has a wide variation in local politics, demographics, and economy, which results in a great heterogeneity of local union–district relationships as revealed from our qualitative case studies. From this perspective, WA McCleary SRF serves as an important case study of how collective bargaining and SFRs affect salary schedules, which in turn affect teacher labor market outcomes. Results from WA may have implications to other states who had similar political, demographic, and economic characteristics.

A second aspect that makes our study unique is that we separated certificated base salary from total final salary to examine whether the policy has achieved its intent—namely using state revenue to replace TRI pay—the local source that funded differential total salaries prior to McCleary reforms. We observed that the amount of increase in total salaries was lower than the amount of increase in base salary, suggesting the substitution of state sources for local sources to fund teacher salaries. This funding-source substitution aligns with the intent of McCleary reform, because the McCleary plaintiff claims that teachers' salary should be funded through state basic education funds that are stable, transparent, and equitable across districts and the "levy swap" aims to increase state revenue and cap local revenue. This increase in teacher base salary, however, did not achieve policymakers' original goal of reducing inequalities in teacher salaries; on the contrary, we observed a widened disparity in both total and certified base salaries across districts in post-McCleary years.

Third, our study adds new empirical evidence to the literature on salary schedules and informs discussions about their design. Our analysis reveals that senior teachers with 16 years of teaching experiences, on average, received a larger amount of salary increases, as much as doubling the additional salary increases, than early-career (0–3 years) and junior teachers (4–7 years). The state salary schedules, on average, became more backloaded. This finding also aligns with prior studies that strong unions are positively associated with salary increases for experienced teachers (Cowen, 2009; Rose & Sonstelie, 2010). Despite the average trend, local collective bargaining in a state, like WA, that allows local districts and their teacher unions to negotiate their own salary schedules, inevitably leads to a wide variation across districts. Some districts' salary schedules moved toward being more frontloaded, while many districts moved toward being more backloaded.

Political power, priorities, and interests of both district and union representatives shaped teacher salary schedules and relevant policies. Since senior teachers often serve leadership positions in the unions and WA has a back-loaded retirement benefit system, it is not surprising to observe the larger raises for very experienced teachers. On the contrary, we also observed some local unions having equity priorities by intentionally protecting junior teachers' interest. These teachers' unions have deliberately recruited junior teachers to the bargaining team, focusing their efforts on bargaining for beginning teachers' salary, or reducing the number of steps (e.g., years) so that teachers can achieve the maximum salary faster. Moreover, some districts observed that early-career and junior teachers were more racially diverse than senior teachers. They decided to substantially increase early-career and junior teachers' pay to attract and retain teachers of color. The findings highlight the importance of understanding local implementation, political negotiations, and districts' strategic goal of workforce development.

Fourth, teacher turnover seems responsive to McCleary-induced salary increases. Our ITS models reveal a significant reduction of teacher turnover across dosage tercile districts in the first year of post-McCleary SFRs. The findings further reveal that the salary increase reduced the transfers across districts but remaining in teaching profession for mid-career teachers with 8 to 15 years of teaching experience to a greater extent than the effects for other career stages. Salary increases reduced the rate of leaving the teaching profession or the state for late-career teachers who had 23+ years of teaching experiences than other career stages. The McCleary-induced base salary increase had limited effects on teacher hiring in the first 2 years of implementation, except for junior teachers with 4 to 7 years of experience. And while there is suggestive evidence of a McCleary-induced effect on hiring for early-career teachers with 0 to 3 years of experience, the results are not statistically significant at conventional levels.

We call upon district and union leaders to think strategically about allocating salary resources to achieve their teacher workforce development goals, because our findings suggest that salaries could be a policy lever for teacher retention. Different districts may have different needs. For example, high-need districts that serve a disproportionate share of low-income or historically marginalized students of color might experience the loss of experienced teachers to other districts (e.g., Goldhaber et al., 2015). They may need to strategically increase experienced teachers' salary to be competitive. In contrast, districts aiming to recruiting early-career and junior teachers to diversify their teacher workforce may want to frontload their salary schedule. We therefore suggest districts to examine their needs and strategically design their salary schedules.

Although this study is constrained by a short postreform period due to the COVID-19 pandemic, our empirical evidence, using a combination of quantitative and qualitative methods, offers suggestive evidence of the effects of the McCleary reforms on teacher labor markets, and the local politics and other dynamics that led to variations in teacher salary changes. To obtain additional insights about McCleary reforms, we encourage the exploration of the following research questions: Do low-income or historically marginalized communities of color receive more resources? How do the allocations of teacher salary influence other spending categories, such as principals' salary, educational technology, and curriculum? What are the effects of McCleary SFRs on student academic outcomes and future earnings? Systematic, in-depth understanding of the effects and mechanisms of how resources matter in public school systems best supports evidence-based resources allocation in schools.

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Notes

1. We tried other ways of grouping teachers into experience bins. Our way of grouping teachers offers sufficient sample size in each experience-district-year cell, which increases the precision of the estimation.

2. Results from this prediction regression appear in Online Appendix Table A7 in the online version of the journal.

3. The Kleibergen-Paap F-statistic measures whether our instrumental variables are weak. If there is a weak relationship between our instruments and the endogenous salary variable, our results could be biased. Larger KP F-statistics suggest stronger instruments.

4. The Hansen J-statistic determines the validity of overidentifying restrictions in our instrumental variables models. Given that we have one endogenous variable, salary, and multiple instruments, we want to ensure the collection of instruments are identifying the same population parameter. We report the p-value associated with this statistic, where the null hypothesis is that the instruments are valid.

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