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EdWorkingPaper No. 22-585

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VERSION: June 2022

Suggested citation: Sun, Min, Christopher A. Candelaria, David Knight, Zachary LeClair, Sarah E. Kabourek, and Katherine Chang. (2022). The Effects and Local Implementation of School Finance Reforms on Teacher Salary, Hiring and Turnover. (EdWorkingPaper: 22-585). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/5jgs-gx39

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

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Abstract

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 2018-19—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-level funding allocations toward certificated base salaries, particularly among more senior teachers. Variability in political power, priorities, and interests of both districts and unions led to greater heterogeneity in teacher salary schedules. Teacher mobility rate was reduced in the first year of the reform, and subsequently new hiring rate was reduced in the second year. Suggestive evidence indicates that a $1,000 salary increase would have larger effects on junior teachers' hiring and their transfers between districts to a greater extent than late-career teachers.

Acknowledgement:

This study is supported by grants from William T. Grant No. 190735. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the funder.

School finance reforms (SFRs) can increase school funding, which improves students' academic outcomes, graduation rates, and earnings in adulthood (Candelaria & Shores, 2019; Jackson, Johnson, & Persico, 2016; Lafortune, Rothstein, & Schanzenbach, 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 identify the contextual factors that contribute to the variability in local strategic expenditure choices (Author, in press; Brunner, Hyman, & Ju, 2020). 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 2016-17 (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 results in substantial changes in teacher salary and generates a wide variation 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 policy making, 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 (Akiba et al., 2016; 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 and needs. 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 school finance reform efforts. To our knowledge, the current state of the literature offers very limited knowledge on both fronts.

In this paper, 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 2018-19 academic year, WA changed its state-level funding formula to allocate higher base salary funding for teachers, administrators, and support staff. This finance policy shift spurred teacher contract negotiations at individual district level across the state, resulting in unprecedented state-wide teacher salary increases. According to the National Education Association (NEA, 2021), in 2018-19, when WA state implemented the salary allocation increase for the first year, the average teacher salary climbed to be the 8th highest paid

from the 21st in the nation in 2017-18. By 2019-20, the WA average teacher salary ranked the 6th 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.

1. How did McCleary school finance reforms influence teacher salaries? Would school finance reforms differentially affect pay increase for teachers at different career stages?
2. How did McCleary-induced salary changes affect teacher recruitment and turnover?
3. How did the local collective bargaining and other contexts about McCleary finance reforms' implementation vary across districts?

We use an explanatory sequential mixed methods approach. For research question 1, we use a simulated instrument approach in conjunction with (comparative) interrupted time series 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. 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. The finding contributes to the literature on court induced SFRs by offering additional evidence on how the funds are 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 school finance reforms. Our reduced-form analyses show that districts, on average, reduced teacher turnover, particularly reducing the rate of teachers' transferring between districts but remaining as certificated teachers even in the first year of reform. McCleary finance reforms also reduced the rate of new hires in

year two of the reform. Next, our two-stage least square approach suggests that a given amount of salary increase would have larger effects on early-career and junior teachers' hiring and would reduce early and mid-career teachers' transfers between districts to a greater extent than late-career teachers.

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. To our knowledge, this is the first study in the field to combine robust quantitative evidence on SFR effects on teacher labor markets and detailed process data 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 2017–18. 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 four 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 two-year plan of fully funding salary increase with the first half in 2018-19 and the remainder of the increase in the 2019-20 school year. SB 6362 made the revision by mandating fully funding salary increase starting in 2018-19. Because this paper mainly discusses teacher salary and most McCleary-induced changes in state funded K-12 base salaries happened since 2018-19, we refer to the fall 2018 (i.e., the beginning of the 2018-19 academic year) as the onset of McCleary school finance reforms.

To fully fund basic education, of which staff salaries are a key component, 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, 2016), 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 McClearly 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 percent 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 percent also had their regionalization factor increased by 6 percent if the district is located west of the crest of the Cascade mountains. In 2018–19, this affected 111 of the 295 school districts.

Corresponding to the mandate of fully funding teacher salary starting in 2018-19, SB 6362 also 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 salary funded by the state is 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 this change of sources of teacher salaries, let alone the increases in total salaries, will have significant influence on teacher recruitment and retention.

This new funding reopened contract negotiations across the state for the 2018-19 school year, accompanied by teacher strikes in some locations, and some districts bargained annually. These local negotiations between local educator associations and districts 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' decision of joining a given district is influenced by both pecuniary and non-pecuniary 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, Gross, & Player, 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 to the pre-McCleary era, they may decide to either hire more teachers, or hire fewer teachers but with more experience and higher educational level. Alternatively, after negotiating large teacher pay increases in 2018–19, 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 percent 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 on the Quality Teacher and Education Act of 2008 in San Francisco Unified School District that this salary increase can improve a school district's attractiveness within their local teacher labor market and increase

both the size and quality of the teacher applicant pool, but this salary increase did not affect teacher retention.

The relationship between salary and teacher labor markets can be further complicated by the multi-faceted teacher salary schedules and the variation in teacher labor movements across their career stages. In the context of WA, 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 et al., 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 more 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 (e.g., 1%, 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 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.

Mechanisms that May Result in Different Salary Schedules Across Districts

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 *organizational traditions and routines*. The existing funding categories affect both the design of new policies and the district traditions, with some districts traditionally spending disproportionately higher on teacher salaries and benefits than other non-personnel costs. This pre-existing spending priority affects the district's spending priorities post-McCleary. Moreover, some school districts have routines and traditions to support collegial relationships between the district and union, while other districts may lack such collegial routines and traditions. These institutionalized resources, routines, and capacities can shape the negotiation process and 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

unions or districts. For example, if districts and unions 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 to develop teachers' culturally responsiveness 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 hubs 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 alternative mechanism for interorganizational influence is that local unions and districts compete with their peers (unions with unions, districts with districts), in order to be competitive in local teacher labor markets. 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 mainly use administrative data from 2014-15 to 2019-20. First, we compiled comprehensive district-level revenue and expenditure data from OSPI's fiscal F-196 database. Second, we obtained data on all employees in WA public school systems (certificated, classified, and administrative) from S-275 since 2014, including employee demographic characteristics, educational attainment, years of experience, certification status, and details regarding job assignments, salaries, benefits, and full-time-equivalent (FTE) status. These data files also allow us to track educators' career movement across positions, schools, and districts in the state public school systems over time. Finally, we supplemented our administrative files with the follow data: projected prototypical funding formula allocations from state-level apportionment reports, district-level regionalization factors from the WA Legislative Evaluation and Accountability Program, and McCleary-induced state-level salary allocations from HB 2242.

To explore research question 3, we conducted purposeful, comparative case studies in five districts (Maxwell, 2004; Patton, 1990; Denzin & Lincoln, 2011). Districts are selected on the basis of pre-reform 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. These cases do not mean to saturate any possible local dynamics of McCleary SFRs implementation; rather, they mean to provide representative cases to triangulate with and explain unclear quantitative findings. The interview questions pertain to McCleary local implementation, collective bargaining process, and district level resources allocation. A 45-minute semi-

structured interview was conducted with two union leaders, two superintendents, and one Chief Finance Officer (CFO) from these five districts.

Specifically, three districts—Conifer, Cedar Bay, and Eagle Creek, all pseudonyms—are located 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 non-personnel 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.

Methods

This study uses a sequential explanatory mixed methods design consisting of two phases by starting with quantitative analysis and then purposeful qualitative data analyses (Creswell & Clark, 2017). Our quantitative analyses aim to provide statewide, broad view of McCleary SRF effects on teacher salary raises and teacher hiring and retention. Next, our qualitative analysis aims to provide rich, in-depth information to explain variations and findings from 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) interrupted time series 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 set to impact districts in the 2018-19 school year.

The total state-level allocation for each district is the sum of the following three components: (1) the product of certificated staff FTE, the base salary of certificated staff, and the certificated regionalization factor; (2) the product of administrative staff FTE, the base salary of administrative staff, and the administrative regionalization factor; and (3) 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 2018-19. 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 Appendix Figure A1, 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' pre-reform characteristics by dosage terciles, averaging over three years prior to McCleary (2015-2017). Comparing to the statewide averages or the lowest dosage districts, Tercile 3 districts had a lower percentage of free and reduced lunch students, a higher percentage of students identified by Section 504 as disability, high percentages of Asian/pacific islander and Black students, higher mean certified base and total final salaries, higher total expenditure per student, and a higher enrollment. We also noticed many similarities in terms of the characteristics of students served between Tercile 2 and Tercile 1 districts.

[Insert Table 1 Here]

To compare teacher salary changes before and after the academic year 2018-19, we estimate an interrupted time series (ITS) model, simplified in equation (1):

$$w_{dt} = \theta_d + \gamma_1 \text{ year }_t + \sum_{i=2}^{3} \gamma_i \left(1[\text{ Dose }_d = i] \times \text{ year }_t\right) + \sum_{j=1}^{3} \sum_{k=2019}^{2020} \beta_{jk} \left(1[\text{ Dose }_d = j] \times 1\left[\text{ year }_t = k\right]\right) + \varepsilon_{dt} \quad (1)$$

where w_{dt} 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 CPI deflator in real 2018 fiscal-year dollars (Author, 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 $year_t$ is a linear time trend variable that is equal to the calendar year minus 2018 (i.e., the spring of the 2017-18 school year); therefore, $year$ takes value 1 in 2018-19. Because we discretize our continuous measure of dosage to form terciles, $Dose_d = 1$ is a bottom-tercile, low-dosage district and $Dose_d = 3$ is a top-tercile, high-dosage district. Thus, in the equation, $\gamma_1$is a linear time trend among tercile 1 districts before the state staffing allocation formula changes in 2018-19. Parameters γ_2 and γ_3 represent the pre-McCleary trend differences *relative* to tercile 1 for terciles 2 and 3.

Our parameters of interest from the interrupted times series model are the β_{jk}. We estimate McCleary effects for each tercile non-parametrically (i.e., using indicator variables), which are identified relative to their each tercile's own linear pre-McCleary trend. For example, $\beta_{3,2019}$ is the McCleary induced changed in salary for tercile 3 in 2019 relative to its pre-trend. Using the ITS model, we obtain a total of two effect estimates—years 2019 and 2020—for each tercile. We also include district fixed effects 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' political preferences (democratic or republican).

The ITS model allows us to estimate causal McCleary effects under the following assumption: the average pre-treatment 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 post-treatment trend in each tercile to the average pre-treatment trend. However, because there is no comparison group in this research design, we cannot explicitly adjust for secular shocks that affect the entire state of Washington. Despite the limitations of the research design, we still choose to report ITS results because we can better characterize the significant increases in base and total final salaries—pre- to post-McCleary—that occurred across all terciles.

To triangulate the ITS findings, we also 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 more plausible.

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

$$w_{dt} = \theta_d + \gamma_t + \theta_d \times year_t + \sum_{j=2}^{3} \sum_{k=2019}^{2020} \beta_{jk}\left(1[\text{ Dose }_d = j] \times 1[\text{ year }_t = k]\right) + \varepsilon_{dt} \qquad (2)$$

where pre-trends for tercile 1 are estimated non-parametrically with year fixed effects, γ_t. We then adjust for pre-trends among districts in terciles 2 and 3 by including district-specific linear time trends, $\theta_d \times year_t$. Our parameters of interest are still the β_{jk}; however, we only estimate

effects for terciles 2 and 3. We estimate equations (1) and (2) using weighted least squares, weighting by certificated teacher full-time equivalents (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 directly estimate the effect of a 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 two-stage least squares estimator; our

[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.

approach is similar to Johnson and Tanner (2018) and Jackson et al. (2016). Our first stage either takes the form of 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:

ITS:
$$y_{dt} = \lambda_d + \delta_1 \text{ year}_t + \sum_{i=2}^{3} \delta_i \left(1[\text{ Dose }_d = i] \times \text{ year }_t\right) + \eta \widehat{w_{dt}} + \xi_{dt} \quad (3)$$

CITS:
$$y_{dt} = \lambda_d + \delta_t + \lambda_d \times year_t + \eta \widehat{w_{dt}} + \xi_{dt} \quad (4)$$

where y_{dt} 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 two-stage least squares. As before, we weight the regression models by total certificated FTE in 2017-18, 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. Appendix Table A1 includes the full codes. 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, 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 use school district descriptive information to contextualize interview data. Our interview data analysis also informs the interpretation of quantitative findings.

Results

Teacher Salary Increases Under McCleary School Finance Reforms

Figure 1 maps the percentage changes in districts' average teacher salaries from the three years prior to McCleary to two years after McCleary.[2] Districts vary greatly in the percentages of these salary changes. While some districts made little change in average certificated teacher salaries, many districts had more than 10% salary increase from pre to post McCleary, as shown in Figure 1(a). Moreover, Figure 1(b) includes salary changes for junior teachers and Figure 1(c) includes salary changes for senior teachers. These two maps show that some districts' salary schedules moved towards being more frontloaded, while others moved towards being more backloaded.

[Insert Figure 1 Here]

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

[2] The percentage change was calculated as [(the average teacher salary in post McCleary – the average teacher salary three years prior to McCleary)/ the average teacher salary three years prior to McCleary].

trends (combined F-statistics= 1.57, p=0.09). 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 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 post-reform period as well, the variation is to a less degree than that of 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 other hand, 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 2018-19 to estimate McCleary influences on teacher salary increases and subsequently on teacher recruitment and turnover.

[Insert Figure 2 Here]

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 tercile 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.

[Insert Figure 3 Here]

Table 2 summarizes the estimates of certificated base and total final salary changes induced by McCleary school finance reforms separately in 2019 and 2020. For both salary types, the first column reflects estimates from the interrupted time series (ITS) model from Equation (1), and the second column shows estimates from the comparative interrupted time series (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 ITS results column for base salaries, there were estimated $10,100 in 2019 and $12,800 in 2020 for tercile 1 districts. In tercile 2 districts, we observed an average of $14,500 in 2019 and $17,200 in 2020, even larger increases in tercile 3 districts with an average of $18,600 in 2019 and $21,500 in 2020. In the CITS results column, tercile 2 districts are estimated to increase average base salary by additional $4,380 in 2019 and $4,430 in 2020; and tercile 3 districts are estimated to increase additional $8,500 in 2019 and $8,700 in 2020, relative to tercile 1 districts.

We observe a smaller amount of increase for teachers' total final salaries, which include all revenue sources that contribute to teacher pay. There is little difference in total salary changes across the dosage terciles. 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 used the personnel funds to substantially increase certificated teacher salaries.

[Insert Table 2 Here]

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 base salaries for late career teachers with 16 years or more years of experiences in tercile 3 districts (over $10,000 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 overserved 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 $2,000-$3,000). In other words, tercile 3 districts that were predicted to receive more state personnel funds moved towards having more backloaded salary schedules.

[Insert Table 3 Here]

Changes in Teacher Turnover Under McCleary School Finance Reforms

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 2018-19 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 2018-19 school year necessarily requires data from the 2019-20 school year, we note that teacher data are collected in the fall of the academic year; consequently, our results are not affected by the pandemic.

In Table 4 we present our turnover results. We privilege 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 Appendix Figure A2. Because the CITS model does not reflect any substantive differences between the terciles, we focus on the tercile-specific results afforded by the ITS design. However, for reference, we include the CITS results in Appendix Table A2; taking differences among the point estimates between (1) terciles 2 and 1 and (2) terciles 3 and 1 from the ITS models produce similar point estimates to the CITS estimates.

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 3-4 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 2.5 to 3 percentage points for mid-career teachers with 8-15 years of teaching experience. 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, there were almost no changes for early-career and junior teachers, because compared to senior teachers, early-career and junior teachers had the least amount of salary increases.

[Insert Table 4 Here]

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 Appendix Table A3. Again, we observed a consistent and salient pattern of reduced teacher mobility across experience bins, especially among mid-career teachers. Even for early-career teachers, we observed a 1.4 percentage point reduction in turnover in 2018-19 in tercile 3 districts. Table 5 also shows a slightly larger reduction in teachers transferring out of higher-dosage districts (tercile 2 and 3 districts) that had higher salary bumps.

[Insert Table 5 Here]

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 Appendix Table A4. 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 teaching profession or WA public school system in 2018-19 by about three-quarters of a percentage point. In general, looking at estimates across the experience profile, we do not observe any systematic patterns or trends in terms of leaving. Combining Tables 5 and 6 together, McCleary school finance reforms had more substantive effects on teacher transfers between districts than on their decisions of leaving the profession or the school system.

[Insert Table 6 Here]

Changes in Teacher Hiring Under McCleary School Finance Reforms

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 one 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 2018-19 and 2019-20 without having effect estimates conflated with the COVID-19 pandemic. Similar to the teacher turnover results, we present we present our ITS results in Table 7; CITS results appear in Appendix Table A5 and descriptive trends appear in Appendix Figure A3.

The column with "% new hires" in Table 7 shows that districts in each tercile reduced the proportions of new hires in year 2 of the McCleary reform. The reduction ranges from 2-4 percentage points of the district's certificated teacher workforce. Tercile 2 districts have the largest reduction (4 percentage points), and the reduction was particularly large for early-career teachers with three or fewer years of experience (7.5 percentage points) in 2019-20. In contrast, the reduction in tercile 1 and 2 districts are more distributed across teachers' experience levels. Tercile 3 districts that had the largest amount of predicted personnel funds increased the share of new hires who were early career (0-3) and junior teachers (4-7) in 2018-2019.

Notably, new hire estimates for 2019-20, which show declines, likely reflect a labor market response to decreased turnover in 2018-19. Because turnover is a leading indicator (i.e., measured from year *t* to *t*+1) and new hires is a lagging indicator (i.e., measured from year *t*-1 to *t*), our results suggest new hires faced challenges in obtaining employment in the second year of the McCleary reforms. Thus, while both years of estimates reflect the impact of McCleary, the second year incorporates the market dynamics associated with changes in turnover in the 2018-19 academic year.

[Insert Table 7 Here]

Associating Salary Increases with Teacher Turnover and Hiring

Lastly, we use two-stage least squares (2SLS) to directly estimate the extent to which salary increases affect teacher turnover and hiring rates. In these analyses, we exclude all data from 2019-20. 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. And while we can technically include 2019-20 for hiring, we previously noted that the second year incorporates market dynamics from a decrease in turnover the previous year. Thus, to only capture the pure McCleary effect, we only use the 2018-19 data in the post period.

With respect to estimation, we found that IV-CITS models generate estimates with the same directions as those in IV-ITS, but none of the IV-CITS estimates were statistically significant; see Appendix Table A6 for these results. The imprecision is understandable because McCleary effects on teacher turnover and hiring are similar in each dosage tercile as shown in Table 4-7. Put simply, the IV-CITS models are underpowered to identify statistically 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 causal relationships 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 0.10 percentage point, and an increase of $1,000 in total final salary would reduce teacher turnover by 0.27 percentage points. To put this into policy-relevant units, the average base salary increases of $18,000 would reduce turnover rate by 1.8 percentage points. The effects were observed for almost all teacher career groups except for early-career teachers with 0-3 years of experiences.

[Insert Table 8 here]

We associate changes in salary with teacher mobility and leaving in Appendix Tables A7 and A8, respectively. In Appendix Table A7, we observe consistent evidence that a $1,000 salary increase reduces teacher mobility rates across all experience bins. While we observe that salary particularly reduced early career (0-3)'s mobility in Appendix Table A7, salary increases particularly reduce the very senior teachers (with 23+ years of experience)'s likelihood of leaving teaching profession or the system altogether in Appendix Table A8.

We assess the relationship between salary changes and new hires in Table 9. Although the coefficient for the percent of all new hires (out of the entire teacher workforce in the district) is statistically non-significant, the $1,000 base salary increase has significantly positive effects for recruiting early and junior teachers with 0-7 years of teaching experiences. The effects of $1,000 salary increase diminished to almost zero for late-career teachers with 16 and more years of teaching experiences.

[Insert Table 9 Here]

Robustness and Sensitivity Analyses

Falsification tests. While our legislative document analysis suggests that McCleary-induced salary reforms began in the 2018-19 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 2017-18 and set the omitted year to be 2016-17. As shown in panel (a) of Appendix Figure A4, we find no evidence of an effect of median base salary increases in 2017-18. The results align with our takeaways from Figure 2 and Figure 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 2019-20. We show that delaying the start of treatment to after academic year 2018-19 violates the assumption of parallel trends. The event study in panel (b) of Appendix Figure A4 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 2019-20.

Alternate dosage measures. Besides our preferred dosage measure, we developed four alternate dosage measures: (1) a measure that adds local levy amounts and state-level local effort assistance (LEA) funding to our preferred measure; (2) a dosage measure that incorporates regionalization factors that were targeted for the 2019-20 academic year; (3) a measure that considers only certificated instructional salary allocation increases (i.e., it excludes classified and administrative increases); and (4) 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; see Appendix Tables A9 and A10. We note, however, that our preferred measure systematically gives us the largest Kleibergen-Paap F-statistics. 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.

In addition, we estimate our models using dosage quintiles instead of terciles in Appendix Tables A9 and A10. 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. Second, we find that we reject the Hansen J test when using quintiles. In other words, we reject the null hypothesis that over-identifying restrictions are valid.

Exogeneity of spending. Not relying on exogeneous variation in teacher salaries may produce biased estimates in our instrumental variable analyses. For example, if there were factors that simultaneously affect labor market outcomes (i.e., turnover and hiring) and salary, then our estimates may reflect spurious correlations instead of casual estimates. For example, high-poverty school districts might compensate their teachers with higher salaries (as a compensating differential) and yet often experience higher turnover and hire higher percentage of new teachers (e.g., Boyd et al., 2011). This type of omitted variables would bias the salary effects on teacher hiring and turnover. While we cannot fully test the exclusion restriction, we do assess whether our instrumented salary measure predicts demographic changes in student poverty that are associated with our outcomes of turnover and hiring. We conduct this test by predicting the percentage of turnover and new hires using the fitted values of a regression of these outcomes on district-level measures of the number of free and reduced-price lunch students, the estimated number of children in poverty, and the logarithms of these measures; the coefficients from these regressions appear in Appendix Table A11. In Appendix Table A12, we find that both our IV-ITS and IV-CITS estimates, which use only exogeneous variation in salaries, are not related to the changes in predicted outcomes at the 5 percent significance level. Thus, we have confidence that our instrumental variable analyses are uncovering causal relationships.

Local Mechanisms Shape McCleary Implementations

We then relied on qualitative evidence to help 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 in order 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. 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. Conversely, 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 their longevity.

Next, *organizational culture and contexts influenced decision-making.* For example, we find evidence of inertia towards back-loading teacher salary schedules in part because more 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 claims of inertia and rent-seeking behavior. However, some districts were mindful of this and actively worked to create more equity in the salary schedule. 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."* 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.

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 non-certificated 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 makes reference 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 to others.

Finally, we observe *evidence of inter-organizational influence* on bargaining based on nearby districts. Districts desire to remain salary competitiveness 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".

Discussion and Conclusion

Our work makes several key contributions to understanding school finance reforms 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), and prior literature suggests that states with strong teacher unions are more likely to increase teacher salaries in the context of school finance reforms (Cook et al., 2021; Cowen & Strunk, 2015; Rose & Sonstelie, 2010). WA teachers, on average, had a 29% of an increase in certificated base salary from pre-McCleary reform to post reform, compared to the estimated 7%- 20% increase in teacher salaries associated with union power or collective bargaining outcomes in prior studies. From this perspective, WA McCleary SRF serves as an important case study of how to structure salary schedules to recruit and retain teachers (Cowen & Strunk, 2015).

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 is at the center of the entire McCleary reform, because McCleary plaintiff claims that teachers' salary should be funded through state basic education funds that are stable, transparent, and equitable across districts. 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 and better inform policy design of salary schedules. 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 towards being more frontloaded, while many districts moved towards being more backloaded. Political power, priorities and interests of both district and union representatives shaped teacher salary schedule 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 other hand, 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 and junior teachers were more racially diverse than senior teachers. They decided to substantially increase early 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, teachers' hiring and turnover decisions are responsive to McCleary-induced salary increases. We observed a significant reduction of teacher turnover during McCleary years, which might result in fewer vacancies and thus a reduction in teacher hiring in the subsequent year. Our findings also reveal that a given amount of salary increase would have a higher leverage to influence early-career and junior teachers' decisions. For example, the $1,000 increase in teacher salary would more likely recruit early-career and junior teachers, and would

reduce early and mid-career teachers' transfers between districts to a greater extent than late-career teachers. Yet the backloading salary schedules reduced the very late career teachers' decision of leaving the profession or WA system, which is consistent with interview data that high raises for the most experienced teachers potentially delay their retirement or disincentivized them to pursue administrative positions in schools. We hope that district and union leaders can use this information to think about strategically allocating salary resources to achieve their teacher workforce development goals. For example, if the goal is to efficiently use salary resources to recruit and retain junior teachers who are more racially diverse, a frontloading salary schedule would better achieve that goal. If the goal is to retain the most experienced teachers, then backloading salary schedule may make sense.

Although this study is constrained by a short post-reform period due to the COVID-19 pandemic, our empirical evidence with a combination of descriptive and causal, qualitative and quantitative offer compelling 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. With that said, to offer additional insights about McCleary reforms, our team is examining additional questions: For example, would low-income or historically marginalized communities of color receive more resources under McCleary SFRs? How would the allocations to teacher salary influence other spending categories, such as principals' salary, educational technology, and curriculum? Ultimately, what are the effects of McCleary SFRs on student academic outcomes and future earnings? Our team also encourages other researchers to bring new evidence to further shed light on related issues. Together, 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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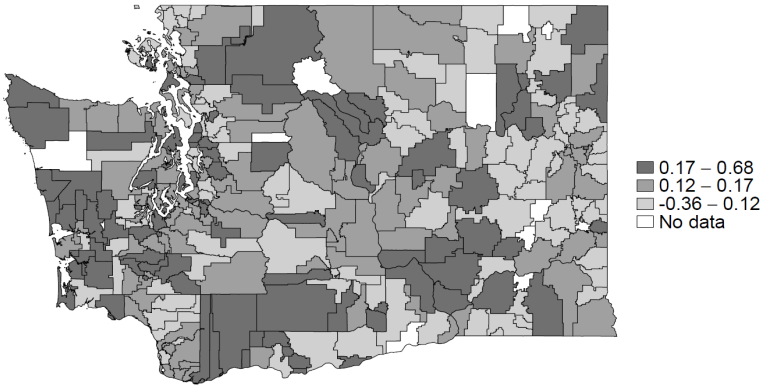
Figure 1. Percentage changes in district average certificated base salaries from pre to post McCleary school finance reforms

(a). All teachers

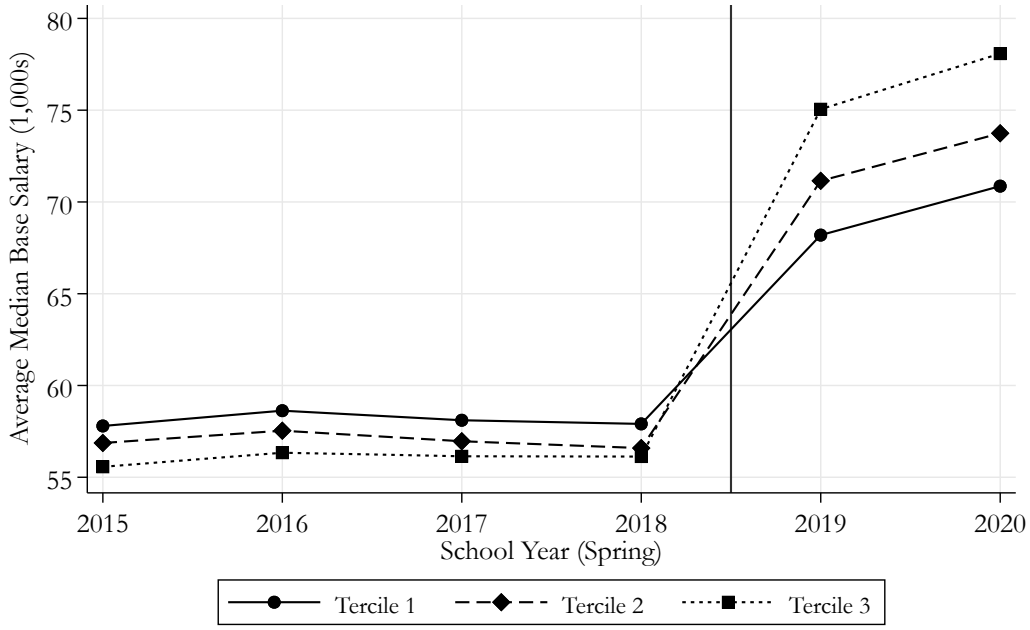


(b). Teachers with 0-6 years of teaching experience

(c). Teachers with 16 and more years of teaching experience

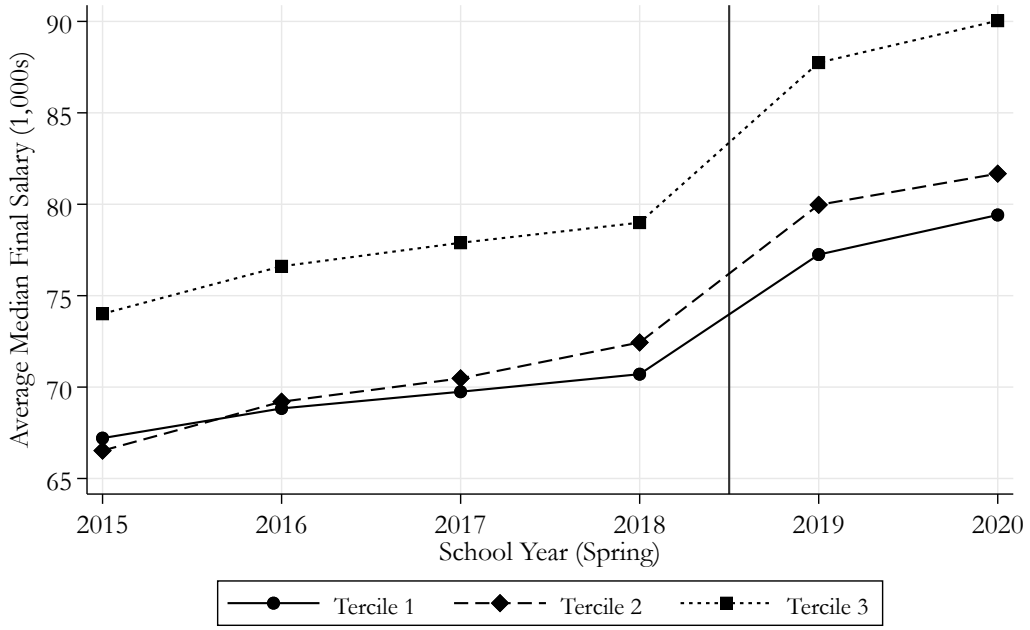
Notes. Salary data come from the S-275 personnel data files and are in real 2017-18 academic year dollars (CPI adjusted). The data includes teachers with 0.9 to 1.1 full-time equivalents (FTEs) whose primary duties were classroom instruction. Pre-reform salaries include district averages in three years from 2015-16 through 2017-18; and post-McCleary salaries include district averages in 2018-19 and 2019-20. For example, one district with a positive value of 0.14 indicates that this given district in post-McCleary years increased average teacher salaries by 14% from its pre-reform average salary. Another district with a negative value of 0.14 indicates that this given district decreased its average salary by 14% from pre to post reform years. "No data" signifies that the district had no classroom teachers with teaching experience in the specified range for either/both the 3-year pre-McCleary or 2-year post-McCleary periods.

Figure 2. The trends of average teacher base salaries across McCleary reform dosage terciles



Note: Averages are weighted by teacher certificated FTE in academic year 2017-18.

(a) Certificated base salaries



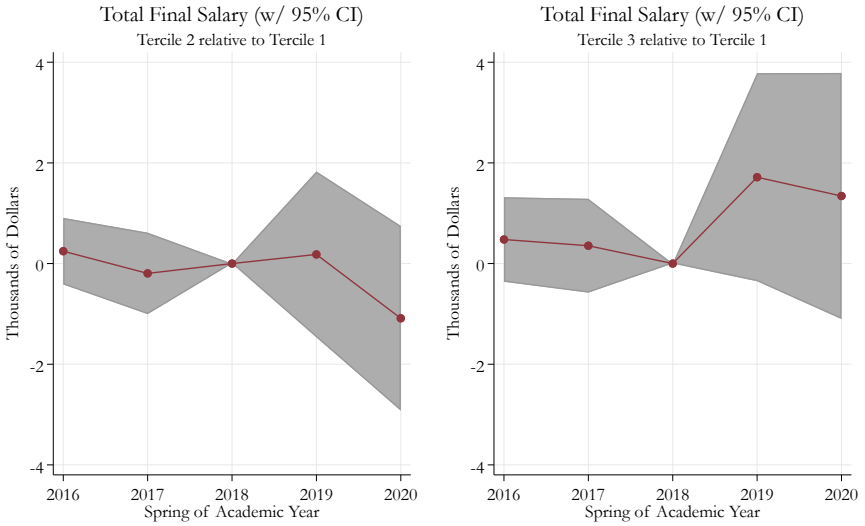
Note: Averages are weighted by teacher certificated FTE in academic year 2017-18.

(b). Total final salaries

Notes. Salaries are in thousands of real 2017-18 academic year dollars (CPI adjusted) and are weighted by total teacher certificated FTE in the 2017-18 academic year. This figure includes salaries of teachers with a minimum of 0.5 FTE. The year on the horizontal axis includes the spring of the school year (e.g., 2014-15 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, including the 2019 regionalization factor.

Figure 3. Formalized difference in district average salary based on the simulated instrument in an event study framework

(a) Median Base Salary



(b) Median Total Final Salary

Notes. 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 2017-18 academic year dollars (CPI adjusted). All models include district fixed effects, year fixed effects, and district-specific linear trends. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.

Table 1. Pre-reform district characteristics by McCleary dosage

	Tercile 1	Tercile 2	Tercile 3	Total
Pct. Black	1.59	3.00	4.36	3.25
	(1.88)	(3.13)	(5.43)	(4.24)
Pct. Hispanic	20.3	19.0	16.9	18.4
	(16.3)	(14.1)	(8.92)	(12.8)
Pct. Native American	2.12	1.15	1.37	1.48
	(4.53)	(0.96)	(3.43)	(3.24)
Pct. Asian and Pacific Islander	0.61	1.21	1.14	1.03
	(0.86)	(1.54)	(1.31)	(1.32)
Pct. White	67.0	64.4	59.2	62.8
	(16.8)	(17.3)	(19.5)	(18.4)
Pct. Multiracial	6.81	7.89	8.22	7.77
	(3.46)	(4.71)	(3.14)	(3.82)
Pct. Mobile	5.93	4.77	4.39	4.89
	(2.69)	(2.20)	(1.72)	(2.22)
Pct. FRPL	56.5	47.3	40.0	46.4
	(13.1)	(13.8)	(19.0)	(17.3)
Pct. SPED	15.7	15.0	14.4	14.9
	(2.31)	(2.40)	(2.50)	(2.47)
Pct. Bilingual	6.88	6.98	9.35	7.99
	(7.87)	(6.31)	(8.53)	(7.79)
Pct. Section 504	3.25	3.59	4.34	3.83
	(1.55)	(1.73)	(2.16)	(1.94)
District Enrollment	4,645.3	7,595.0	1,0620.3	8,189.6
	(5,548.0)	(7,656.4)	(8,743.9)	(8,065.4)
Median Cert. Base Salary (1000s)	61.3	62.0	64.1	62.8
	(6.92)	(7.91)	(11.2)	(9.36)
Median Total Final Salary (1000s)	70.1	73.2	81.2	75.9
	(6.71)	(7.03)	(10.1)	(9.68)
State Revenue/Pupil	9,542.9	9,229.9	9,174.7	9,282.1
	(1,464.8)	(1,414.1)	(1,706.1)	(1,562.3)
State and Local Revenue/Pupil	1,1432.9	1,1318.7	1,1934.4	1,1613.6
	(1,250.1)	(1,176.8)	(1,527.7)	(1,382.6)
Current Expenditures/Pupil	12,093.8	11,724.2	12,399.9	12,107.3
	(1,416.3)	(1,298.2)	(1,594.4)	(1,486.3)

Notes. Standard deviations are in parentheses. Summary statistics are not weighted.

Table 2. Estimates of salary increase using simulated instruments

	Base Salary		Total Final Salary	
	ITS	CITS	ITS	CITS
Tercile 1:				
Pre-trend	-0.019		1.14***	
	(0.094)		(0.16)	
McCleary Effect 2019	10.1***		5.27***	
	(0.88)		(0.66)	
McCleary Effect 2020	12.8***		6.30***	
	(1.15)		(0.56)	
Tercile 2:				
Pre-trend: Dev. from T1	-0.12		0.76***	
	(0.14)		(0.21)	
McCleary Effect 2019	14.5***	4.38***	5.55***	0.28
	(0.61)	(1.17)	(0.41)	(0.85)
McCleary Effect 2020	17.2***	4.43**	5.35***	-0.95
	(0.72)	(1.49)	(0.59)	(0.89)
Tercile 3:				
Pre-trend: Dev. from T1	0.17		0.48	
	(0.12)		(0.25)	
McCleary Effect 2019	18.6***	8.51***	6.81***	1.54
	(1.22)	(1.65)	(0.75)	(1.10)
McCleary Effect 2020	21.5***	8.70***	7.48***	1.18
	(1.20)	(1.82)	(0.92)	(1.18)
Year Fixed Effects		X		X
District Linear Trends		X		X
District-by-Year Obs.	1,770	1,770	1,770	1,770
Number of Districts	295	295	295	295
Adj. R-sq.	0.89	0.94	0.93	0.96

*Note*s. Dependent variables are district median certificated base or total final salaries in thousands of real 2017-18 academic year dollars (CPI adjusted). The year represents the spring of the school year (e.g., 2018-19 school year is represented as 2019). All models include district fixed effects. Pre-trends for Terciles 2 and 3 are deviations from the Tercile 1 pre-trend. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 3. Effects on base teacher salary increases for different experience levels

	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+)
Base salary								
Tercile 2:								
McCleary Effect 2019	4.38***	2.85***	3.33***	3.42**	4.30**	5.34***	5.14***	4.81***
	(1.17)	(0.74)	(0.90)	(1.08)	(1.32)	(1.43)	(1.35)	(1.30)
McCleary Effect 2020	4.43**	2.26*	2.92**	2.04	3.34*	4.08**	3.82**	3.67**
	(1.49)	(1.02)	(1.05)	(1.18)	(1.58)	(1.57)	(1.46)	(1.29)
Tercile 3:								
McCleary Effect 2019	8.51***	5.43***	7.95***	7.68***	9.59***	10.6***	11.0***	10.9***
	(1.65)	(1.14)	(1.24)	(1.42)	(1.89)	(1.89)	(1.90)	(1.79)
McCleary Effect 2020	8.70***	4.91***	7.98***	7.57***	9.87***	11.3***	12.1***	12.4***
	(1.82)	(1.41)	(1.35)	(1.49)	(1.84)	(1.92)	(2.05)	(1.63)
Total final salary								
Tercile 2:								
McCleary Effect 2019	0.28	0.027	-0.20	0.069	0.49	1.52	0.87	0.60
	(0.85)	(0.64)	(0.76)	(0.90)	(1.06)	(0.88)	(0.89)	(0.94)
McCleary Effect 2020	-0.95	-0.65	-1.13	-1.37	-0.63	-0.22	-1.07	-1.55
	(0.89)	(0.94)	(0.89)	(1.05)	(1.20)	(0.99)	(0.98)	(1.02)
Tercile 3:								
McCleary Effect 2019	1.54	0.86	2.15*	1.59	2.62*	3.03*	3.61**	3.54**
	(1.10)	(0.91)	(1.08)	(1.20)	(1.28)	(1.27)	(1.27)	(1.16)
McCleary Effect 2020	1.18	0.30	2.01	0.77	2.81	2.89*	3.22*	3.22**
	(1.18)	(1.16)	(1.22)	(1.27)	(1.44)	(1.23)	(1.28)	(1.13)
Year Fixed Effects	X	X	X	X	X	X	X	X
District Linear Trends	X	X	X	X	X	X	X	X
District-by-Year Obs.	1,770	1,562	1,541	1,564	1,589	1,543	1,492	1,650
Number of Districts	295	266	266	270	277	268	258	278

*Note*s. Dependent variables are district median certificated base salaries in thousands of real 2017-18 academic year dollars (CPI adjusted) by experience bin. The year represents the spring of the school year (e.g., 2018-19 school year is represented as 2019). All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18. Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 4. Changes in Teacher Turnover Under McCleary School Finance Reforms (ITS 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+)
Tercile 1:								
Pre-trend	0.051	-0.21	0.100	-0.086	-0.39	-0.076	0.11	0.38
	(0.13)	(0.35)	(0.32)	(0.27)	(0.26)	(0.32)	(0.39)	(0.29)
McCleary Effect 2019	-1.34**	0.88	-2.55**	-1.32	-0.24	-0.50	-0.28	-3.65**
	(0.52)	(1.21)	(0.97)	(1.22)	(1.02)	(1.11)	(1.28)	(1.28)
Tercile 2:								
Pre-trend:	0.018	0.51	-0.44	0.40	1.01**	-0.18	-0.30	-0.40
	(0.19)	(0.47)	(0.42)	(0.39)	(0.38)	(0.40)	(0.48)	(0.48)
McCleary Effect 2019	-1.34*	0.15	-1.14	-3.04**	-2.63**	-0.045	-1.06	-1.84
	(0.52)	(0.91)	(0.97)	(0.93)	(0.93)	(0.74)	(0.90)	(1.25)
Tercile 3:								
Pre-trend:	0.33	1.07*	-0.023	0.83*	0.88*	0.095	-0.15	-0.23
	(0.20)	(0.42)	(0.40)	(0.35)	(0.34)	(0.40)	(0.46)	(0.39)
McCleary Effect 2019	-1.92***	-0.89	-0.87	-3.12***	-2.54***	-1.88*	-1.56	-2.61***
	(0.54)	(1.05)	(0.67)	(0.90)	(0.70)	(0.76)	(0.97)	(0.76)
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277
Adj. R-sq.	0.47	0.22	0.23	0.21	0.10	0.13	0.058	0.096

Notes. Dependent variable in column 1 of "district" 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 WA 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., 2018-19 school year is represented as 2019). The estimates come from interrupted time series models. All models include district fixed effects. Pre-trends for Terciles 2 and 3 are deviations from the Tercile 1 pre-trend. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 5. Changes in Teacher Movers Under McCleary School Finance Reforms (ITS Models)

	% 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:								
Pre-trend	-0.18	-0.83**	-0.79**	-0.17	-0.094	-0.24	0.032	0.22
	(0.094)	(0.29)	(0.29)	(0.22)	(0.17)	(0.17)	(0.17)	(0.12)
McCleary Effect 2019	-0.98***	-0.71	-0.46	-2.11**	-1.04	-0.55	-0.18	-0.99**
	(0.28)	(0.78)	(0.69)	(0.66)	(0.60)	(0.46)	(0.66)	(0.34)
Tercile 2:								
Pre-trend	0.16	0.33	0.47	0.16	0.33	0.30	0.27	-0.10
	(0.12)	(0.38)	(0.35)	(0.27)	(0.23)	(0.23)	(0.23)	(0.14)
McCleary Effect 2019	-1.15***	-0.64	-1.12	-1.97***	-1.95***	-0.66	-1.15*	-0.31
	(0.31)	(0.63)	(0.61)	(0.46)	(0.58)	(0.46)	(0.53)	(0.28)
Tercile 3:								
Pre-trend	0.30*	0.81*	0.84*	0.44	0.40	0.27	0.054	-0.24
	(0.14)	(0.34)	(0.36)	(0.27)	(0.21)	(0.22)	(0.22)	(0.13)
McCleary Effect 2019	-1.17**	-1.42*	-0.96	-1.73**	-1.80***	-0.89	-0.43	-0.37
	(0.36)	(0.63)	(0.65)	(0.62)	(0.45)	(0.46)	(0.46)	(0.22)
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277
Adj. R-sq.	0.45	0.21	0.17	0.16	0.15	0.17	0.081	0.15

Notes. Dependent variable in column 1 of "district" 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., 2018-19 school year is represented as 2019). The estimates come from interrupted time series models. All models include district fixed effects. Pre-trends for Terciles 2 and 3 are deviations from the Tercile 1 pre-trend. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18. Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 6. Changes in Teacher Leavers Under McCleary School Finance Reforms (ITS 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+)
Tercile 1:								
Pre-trend	0.23*	0.62**	0.89**	0.088	-0.29	0.17	0.074	0.17
	(0.12)	(0.23)	(0.29)	(0.23)	(0.22)	(0.25)	(0.37)	(0.30)
McCleary Effect 2019	-0.35	1.59	-2.09*	0.79	0.80	0.053	-0.099	-2.66*
	(0.46)	(1.01)	(0.85)	(1.16)	(0.76)	(1.06)	(1.17)	(1.19)
Tercile 2:								
Pre-trend	-0.14	0.18	-0.91*	0.24	0.68*	-0.48	-0.57	-0.30
	(0.17)	(0.31)	(0.36)	(0.37)	(0.32)	(0.32)	(0.44)	(0.45)
McCleary Effect 2019	-0.19	0.79	-0.024	-1.06	-0.69	0.62	0.085	-1.53
	(0.36)	(0.63)	(0.65)	(0.86)	(0.72)	(0.61)	(0.67)	(1.17)
Tercile 3:								
Pre-trend	0.032	0.26	-0.86**	0.39	0.47	-0.17	-0.20	0.0093
	(0.14)	(0.28)	(0.31)	(0.28)	(0.27)	(0.31)	(0.44)	(0.39)
McCleary Effect 2019	-0.76*	0.53	0.091	-1.38*	-0.75	-0.99	-1.13	-2.24**
	(0.32)	(0.66)	(0.51)	(0.59)	(0.52)	(0.54)	(0.85)	(0.74)
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277
Adj. R-sq.	0.27	0.19	0.16	0.11	0.035	0.059	0.014	0.075

Notes. Dependent variable in column 1 of "district" is the percentage of leavers who either left the teaching workforce or left the WA 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., 2018-19 school year is represented as 2019). The estimates were come from interrupted time series models. All models include district fixed effects. Pre-trends for Terciles 2 and 3 are deviations from the Tercile 1 pre-trend. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18. Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 7. Changes in Teacher Hiring Under McCleary Reforms (ITS Models)

	% New Hires	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								
Pre-trend	0.044	-1.93***	-0.33	-0.26	0.014	0.35	0.14	-0.076
	(0.10)	(0.45)	(0.21)	(0.22)	(0.19)	(0.27)	(0.20)	(0.10)
McCleary Effect 2019	0.008	1.11	0.38	0.27	0.89	-1.80	-0.24	0.19
	(0.40)	(1.60)	(0.71)	(0.65)	(0.70)	(0.95)	(0.65)	(0.35)
McCleary Effect 2020	-2.48***	-3.39	-0.90	-0.79	-0.92	-2.60*	-0.74	0.27
	(0.56)	(2.21)	(0.87)	(0.92)	(0.76)	(1.04)	(0.83)	(0.50)
Tercile 2:								
Pre-trend	0.006	0.070	0.17	0.23	0.062	-0.37	-0.11	0.089
	(0.18)	(0.69)	(0.27)	(0.28)	(0.25)	(0.31)	(0.25)	(0.14)
McCleary Effect 2019	-0.32	0.028	-0.36	0.95	0.051	-0.21	0.39	0.48
	(0.40)	(1.41)	(0.57)	(0.58)	(0.58)	(0.48)	(0.39)	(0.29)
McCleary Effect 2020	-4.14***	-7.54***	-1.91**	-2.08**	-2.15**	-1.50*	-0.86	-0.56
	(0.48)	(2.07)	(0.70)	(0.74)	(0.70)	(0.58)	(0.56)	(0.37)
Tercile 3:								
Pre-trend	-0.055	0.55	-0.13	0.37	0.17	-0.20	0.091	0.18
	(0.18)	(0.66)	(0.25)	(0.27)	(0.21)	(0.28)	(0.23)	(0.12)
McCleary Effect 2019	0.61	3.10	1.37***	0.075	0.36	-0.074	-0.41	-0.32
	(0.43)	(1.67)	(0.40)	(0.45)	(0.42)	(0.34)	(0.36)	(0.21)
McCleary Effect 2020	-1.72**	-1.34	0.55	-1.13	-1.06**	-1.50***	-0.94*	-0.61**
	(0.57)	(2.15)	(0.52)	(0.60)	(0.38)	(0.41)	(0.39)	(0.23)
District-by-Year Obs.	1,770	1,562	1,541	1,564	1,589	1,543	1,492	1,650
Number of Districts	295	266	266	270	277	268	258	278
Adj. R-sq.	0.44	0.19	0.16	0.16	0.11	0.11	0.016	0.067

Note. Dependent variable in column 1 of "district" 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., 2018-19 school year is represented as 2019). The estimates were based on interrupted time series models. Pre-trends for Terciles 2 and 3 are deviations from the Tercile 1 pre-trend. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18. Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 8. Associating salary increases with teacher turnover by experience (IV-ITS 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+)
Base Salary (1000s)	-0.10***	-0.033	-0.080*	-0.19***	-0.13***	-0.058*	-0.062*	-0.12***
	(0.023)	(0.062)	(0.036)	(0.042)	(0.029)	(0.026)	(0.031)	(0.030)
KP F-stat	310.8	271.7	309.8	379.1	377.6	321.7	315.4	350.1
Hansen J: P-val	0.80	0.54	0.15	0.74	0.38	0.36	0.92	0.22
Final Salary (1000s)	-0.27***	-0.088	-0.21*	-0.48***	-0.33***	-0.14*	-0.15	-0.32***
	(0.059)	(0.19)	(0.089)	(0.11)	(0.081)	(0.065)	(0.076)	(0.073)
KP F-stat	110.2	50.1	78.9	86.8	106.0	193.0	182.7	179.1
Hansen J: P-val	0.95	0.53	0.21	0.59	0.29	0.32	0.89	0.38
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277

Notes. 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 turnover on instrumented median base salary in thousands of real dollars. In the bottom panel, 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 total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 9. Associating salary increases with teacher hiring by experience (IV-ITS 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+)
Base Salary (1000s)	0.016	0.17	0.055*	0.023	0.018	-0.016	-0.008	-0.0005
	(0.018)	(0.10)	(0.022)	(0.021)	(0.017)	(0.014)	(0.013)	(0.0077)
KP F-stat	310.8	271.7	309.8	379.1	377.6	321.7	315.4	350.1
Hansen J: P-val	0.35	0.47	0.14	0.40	0.56	0.18	0.36	0.095
Final Salary (1000s)	0.039	0.54	0.14**	0.061	0.051	-0.046	-0.020	-0.002
	(0.046)	(0.33)	(0.052)	(0.056)	(0.044)	(0.035)	(0.030)	(0.019)
KP F-stat	110.2	50.1	78.9	86.8	106.0	193.0	182.7	179.1
Hansen J: P-val	0.35	0.51	0.15	0.42	0.60	0.19	0.36	0.096
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277

Notes. 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 total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Online Appendix

Figure A1. Dosage variation across district

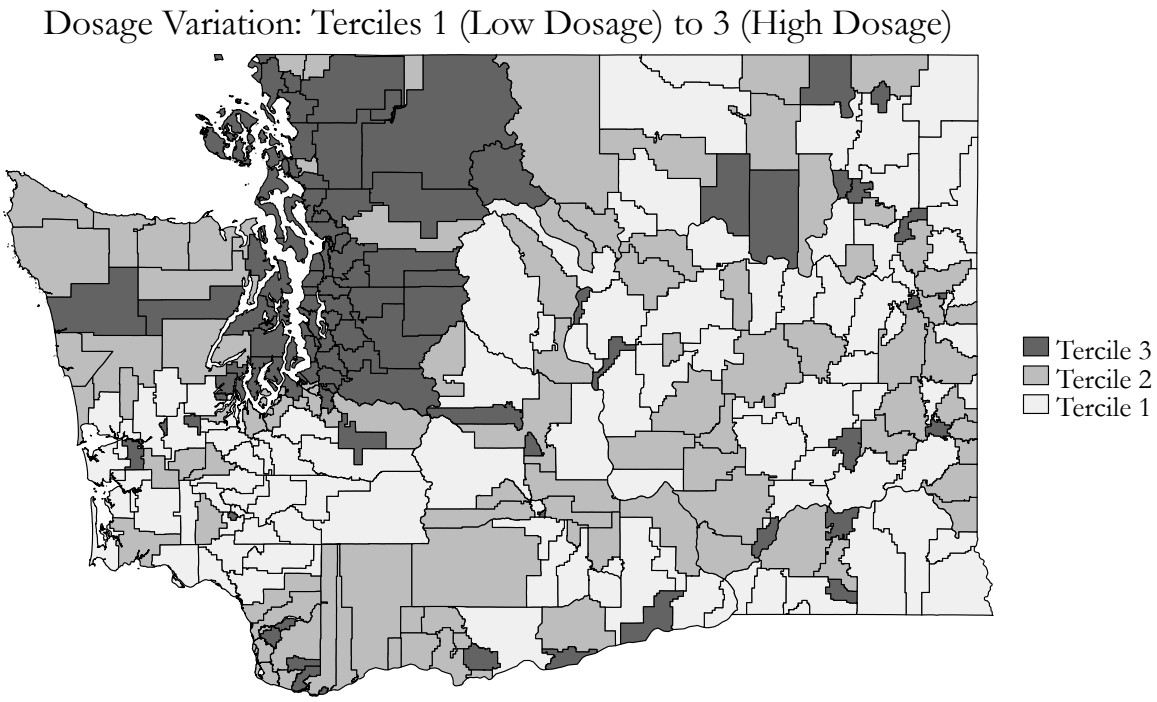
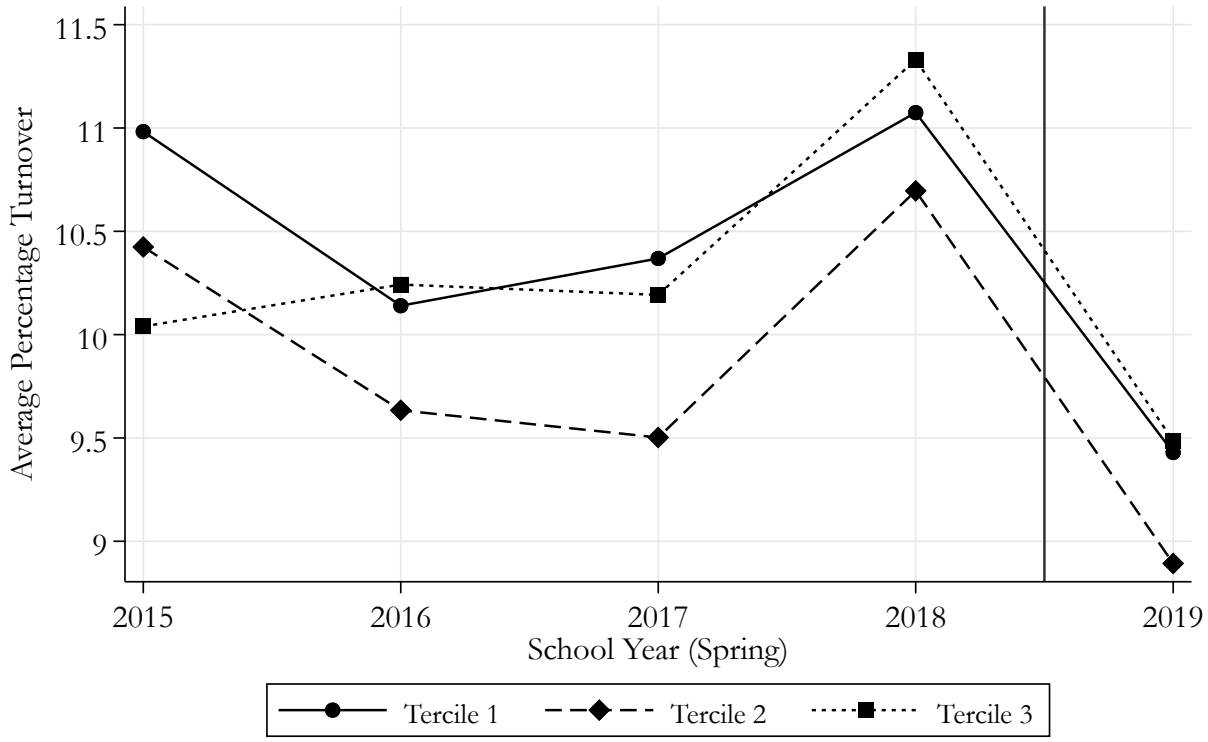
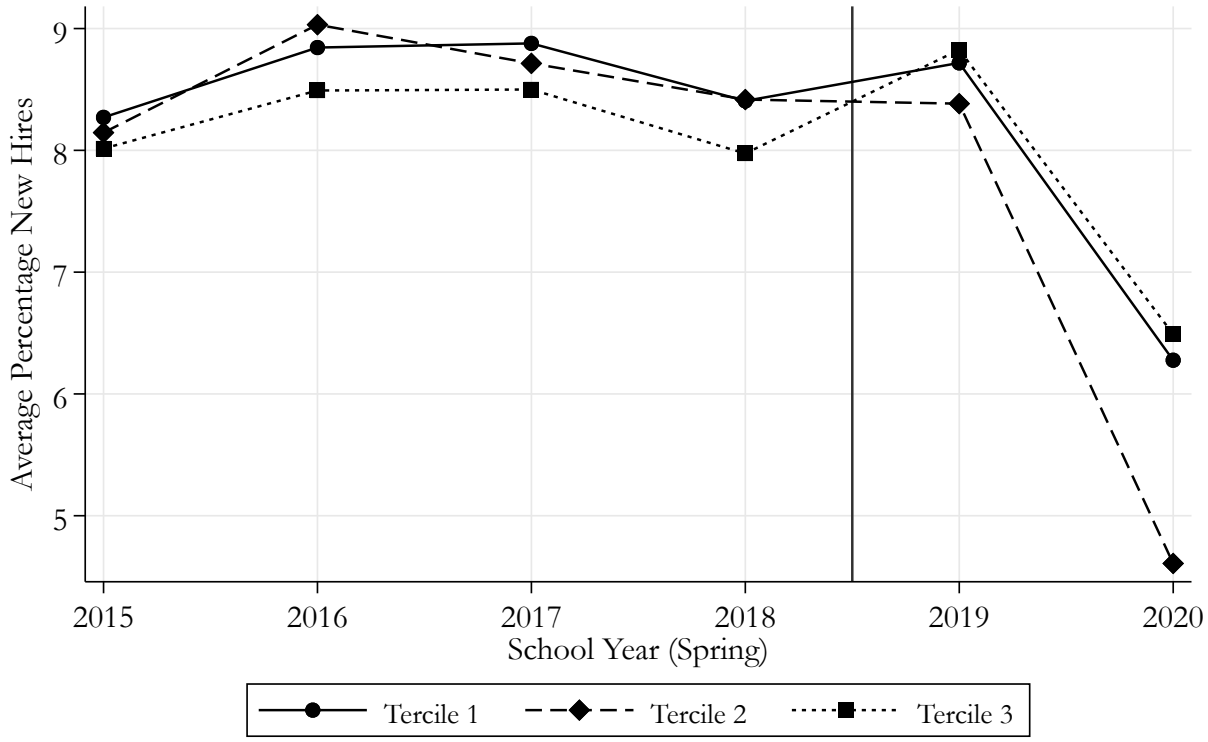


Figure A2. Average trends of percentage of teacher turnover by dosage tercile



Note: Averages are weighted by teacher certificated FTE in academic year 2017-18.

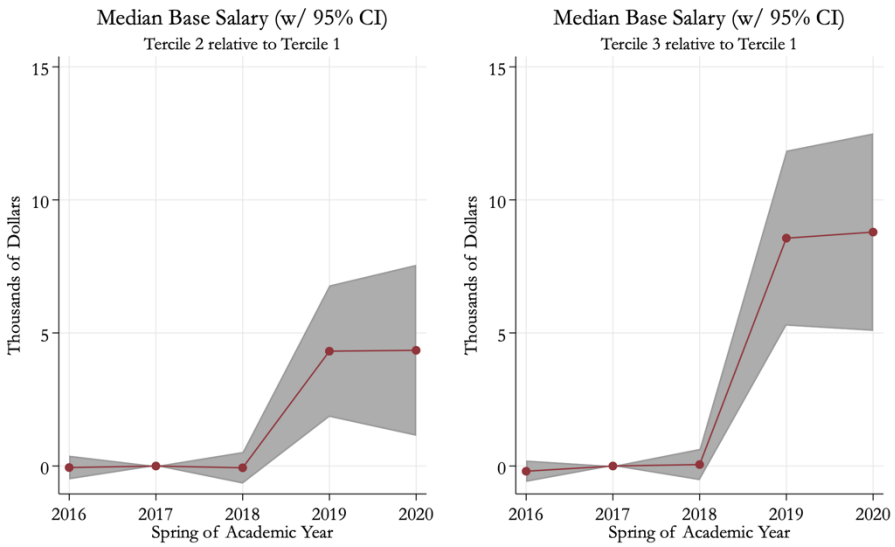
Figure A3. Average trends of percentage of teacher hiring (new hires) by dosage tercile



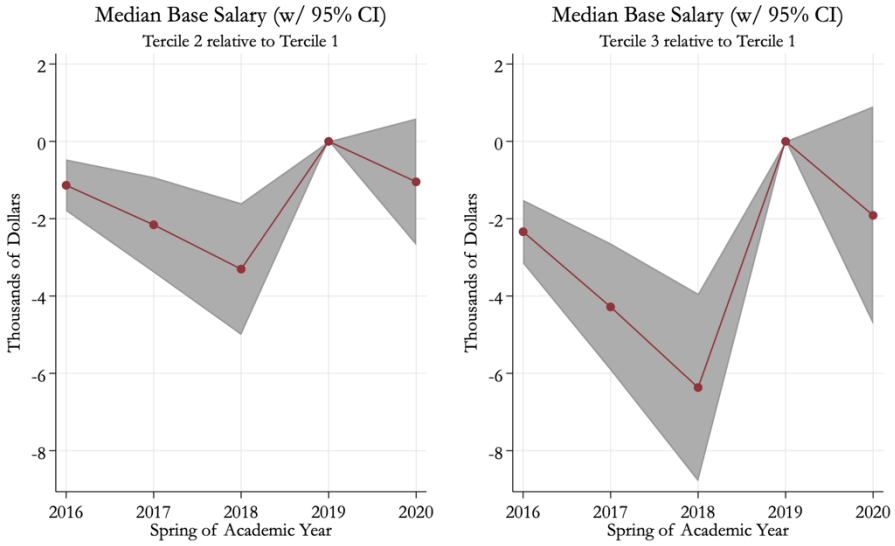
Note: Averages are weighted by teacher certificated FTE in academic year 2017-18.

Figure A4. Falsification Tests

(a) Test 1: Set first treatment year as 2018



(b) Test 2: Set first treatment year as 2020



Notes. 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. Salaries are in thousands of real 2017-18 academic year dollars (CPI adjusted). All models include district fixed effects, year fixed effects, and district-specific linear trends. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.

Table A1. Qualitative data codebook

Conceptual Framework Element	Code	Code Description
Theme: Changes in resource equity		
Resource equity (revenue and expenditures)	Change in revenue from the state level	State and McCleary changes
	Change in revenue from the local level	Property tax revenues and levy revenues
	Change in overall student-directed expenditures	Change in funds that are spent for/on students overall
	Change in non-teacher personnel salaries	Change in salaries for paraprofessionals, principals, transportation, other non-teaching staff
	Change in non-personnel expenditure (such as technology, online learning, staff and student health)	Includes technology, online learning, health of staff/students
	Change in professional development expenditures	Increase or decrease in professional development spending
	Change in certificated teacher salaries	Increase or decrease in certificated teacher salaries
Resource equity (teacher characteristics)	Front-/back-loaded salary schedules	When the balance of early-career vs. late career salary schedules change
	Salary changes based on education level/experience	Differences from education (BA, MA, PhD), changes aimed specifically at certain experience bands
Resource equity (student characteristics)	Identification of prioritized underserved students in SFR	Which students or groups of students are prioritized by the district
	Resource changes for ELL, SpEd, Foster, & Low-Income students	Reference to spending on specific student groups
Resource equity (principal characteristics)	Resource changes at the school/principal level	Changes in resource allocation at the school or principal level
Theme: Web of policy actors influencing local implementation		
Policy actors and their power/ voice	Power/influence of local policy actor (union/district/state/other)	Reference to influence of an individual/group changing someone's decision-making or approach to a situation
	Experience/longevity of local policy actor	Comparison or reference to importance of much/how long a policy actor has been involved in the district/SFR/bargaining
Organizational traditions and contexts	Union's resources	Reference to union's FTE, funding, number of bargaining units, or other resources

	Historical/current context	History, routines, rules, regulations that have existed before (inertia), as well as current conditions
	Local voter preferences	How voters interact with local property taxes and other levies after McCleary or COVID
Sensemaking	Influence of past actions/ beliefs on a new decision	Interviewee references a current decision they made based on/in response to past/previous experience
	Opportunities for groups to construct new meaning	Activities/meetings/gatherings that are aimed at staff/organizations making sense of the SFR or COVID (budgeting process, bargaining, salary schedules, resource allocation)
	Constraints of personal/institutional learning in the current social context	Challenges in re-imagining what interviewee/organizations will do after McCleary influx or during/after COVID
Inter-organizational influence	Reference to other district/organization's practices, or decision impacted by it	Reference to behaviors (current or precedent) of other district or local/regional organization's practices (not state- or federal-level government organizations)

Table A2. Changes in Teacher Turnover Under McCleary School Finance Reforms (CITS 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+)
Tercile 2:								
McCleary Effect 2019	-0.0039	-0.80	1.41	-1.65	-2.42	0.49	-0.95	1.80
	(0.82)	(1.70)	(1.55)	(1.72)	(1.56)	(1.50)	(1.76)	(2.00)
Tercile 3:								
McCleary Effect 2019	-0.58	-1.86	1.65	-1.77	-2.32	-1.48	-1.47	1.02
	(0.84)	(1.80)	(1.33)	(1.71)	(1.39)	(1.51)	(1.81)	(1.67)
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277
Adj. R-sq.	0.49	0.24	0.25	0.26	0.10	0.20	0.10	0.15

Notes. Dependent variable in column 1 of "district" 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 WA 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., 2018-19 school year is represented as 2019). The estimates come from comparative interrupted time series models. All models include district fixed effects, year fixed effects, and district-by-year linear time trends. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A3. Changes in Teacher Movers Under McCleary School Finance Reforms (CITS Models)

	% 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 2:								
McCleary Effect 2019	-0.17	-0.008	-0.70	0.13	-0.91	-0.13	-1.02	0.65
	(0.46)	(1.13)	(1.03)	(0.90)	(0.94)	(0.73)	(0.94)	(0.49)
Tercile 3:								
McCleary Effect 2019	-0.18	-0.80	-0.52	0.40	-0.75	-0.45	-0.29	0.59
	(0.51)	(1.12)	(1.06)	(1.02)	(0.85)	(0.73)	(0.90)	(0.45)
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277
Adj. R-sq.	0.48	0.23	0.23	0.21	0.14	0.23	0.12	0.15

Notes. Dependent variable in column 1 of "district" 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., 2018-19 school year is represented as 2019). The estimates come from comparative interrupted time series models. All models include district fixed effects, year fixed effects, and district-by-year linear time trends. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A4. Changes in Teacher Leavers Under McCleary School Finance Reforms (CITS 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+)
Tercile 2:								
McCleary Effect 2019	0.16	-0.79	2.11+	-1.78	-1.50	0.62	0.074	1.14
	(0.65)	(1.34)	(1.21)	(1.62)	(1.18)	(1.37)	(1.52)	(1.87)
Tercile 3:								
McCleary Effect 2019	-0.40	-1.06	2.17	-2.16	-1.57	-1.03	-1.19	0.43
	(0.63)	(1.36)	(1.11)	(1.46)	(1.04)	(1.34)	(1.63)	(1.57)
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277
Adj. R-sq.	0.31	0.21	0.15	0.15	0.12	0.089	0.053	0.14

Notes. Dependent variable in column 1 of "district" is the percentage of leavers who either left the teaching workforce or left the WA 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., 2018-19 school year is represented as 2019). The estimates come from comparative interrupted time series models. All models include district fixed effects, year fixed effects, and district-by-year linear time trends. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A5. Changes in Teacher Hiring Under McCleary School Finance Reforms (CITS 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+)
Tercile 2:								
McCleary Effect 2019	-0.33	-1.27	-0.72	0.72	-0.83	1.60	0.65	0.30
	(0.62)	(2.33)	(1.00)	(0.96)	(0.99)	(1.17)	(0.83)	(0.51)
McCleary Effect 2020	-1.67*	-4.47	-0.95	-1.23	-1.21	1.13	-0.043	-0.84
	(0.81)	(3.33)	(1.23)	(1.29)	(1.14)	(1.31)	(1.10)	(0.68)
Tercile 3:								
McCleary Effect 2019	0.60	1.83	1.00	-0.18	-0.46	1.74	-0.098	-0.48
	(0.65)	(2.52)	(0.90)	(0.87)	(0.89)	(1.11)	(0.81)	(0.45)
McCleary Effect 2020	0.76	1.79	1.48	-0.35	-0.057	1.07	-0.088	-0.85
	(0.88)	(3.39)	(1.11)	(1.20)	(0.93)	(1.23)	(1.01)	(0.60)
District-by-Year Obs.	1,770	1,562	1,541	1,564	1,589	1,543	1,492	1,650
Number of Districts	295	266	266	270	277	268	258	278
Adj. R-sq.	0.48	0.20	0.18	0.19	0.13	0.15	0.022	0.12

Notes. Dependent variable in column 1 of "district" 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., 2018-19 school year is represented as 2019). The estimates come from comparative interrupted time series models. All models include district fixed effects, year fixed effects, and district-by-year linear time trends. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A6. Associating salary increases with teacher hiring and turnover

	IV-ITS				IV-CITS			
Endogenous Variable:	Base Salary		Final Salary		Base Salary		Final Salary	
Dependent Variable	% Turnover	% New Hires	% Turnover	% New Hires	% Turnover	% New Hires	% Turnover	% New Hires
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Salary (1000s)	-0.10***	0.016	-0.27***	0.039	-0.079	0.094	-0.42	0.56
	(0.023)	(0.018)	(0.059)	(0.046)	(0.10)	(0.088)	(0.60)	(0.66)
KP F-stat	310.8	310.8	110.2	110.2	13.8	13.8	1.09	1.09
Hansen J: P-val	0.80	0.35	0.95	0.35	0.65	0.24	0.89	0.51
Year Fixed Effects					X	X	X	X
District Linear Trends					X	X	X	X
District-by-Year Obs.	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

Notes. Models under the heading IV-ITS are based on equation (3); models under the heading IV-CITS are based on equation (4). The endogenous variable for which we instrument is either median base salary in thousands of real dollars or median final salary in thousands of real dollars. We regress each dependent variable, either the percentage of district-level teacher turnover or the percentage of district-level teacher new hires on the instrumented endogenous variable. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A7. Associating salary with teacher mobility by experience bins (IV-ITS Models)

	% 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+)
Base Salary (1000s)	-0.070***	-0.099*	-0.067*	-0.12***	-0.096***	-0.039*	-0.030	-0.022**
	(0.015)	(0.040)	(0.032)	(0.026)	(0.019)	(0.016)	(0.016)	(0.0079)
KP F-stat	310.8	271.7	309.8	379.1	377.6	321.7	315.4	350.1
Hansen J: P-val	0.59	0.85	0.83	0.29	0.67	0.99	0.40	0.094
Final Salary (1000s)	-0.18***	-0.31*	-0.16*	-0.32***	-0.25***	-0.097*	-0.070	-0.056**
	(0.040)	(0.13)	(0.080)	(0.066)	(0.053)	(0.038)	(0.038)	(0.020)
KP F-stat	110.2	50.1	78.9	86.8	106.0	193.0	182.7	179.1
Hansen J: P-val	0.90	0.83	0.70	0.51	0.55	0.99	0.36	0.12
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277

Notes. 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 mobility on instrumented median base salary in thousands of real dollars. In the bottom panel, 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 total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A8. Associating salary with teacher leavers by experience bins (IV-ITS 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+)
Base Salary (1000s)	-0.033*	0.066	-0.012	-0.067*	-0.030	-0.019	-0.032	-0.10***
	(0.013)	(0.040)	(0.026)	(0.030)	(0.021)	(0.019)	(0.027)	(0.028)
KP F-stat	310.8	271.7	309.8	379.1	377.6	321.7	315.4	350.1
Hansen J: P-val	0.66	0.45	0.065	0.46	0.31	0.19	0.59	0.48
Final Salary (1000s)	-0.085*	0.22	-0.043	-0.17*	-0.073	-0.045	-0.078	-0.26***
	(0.035)	(0.13)	(0.065)	(0.080)	(0.055)	(0.049)	(0.066)	(0.069)
KP F-stat	110.2	50.1	78.9	86.8	106.0	193.0	182.7	179.1
Hansen J: P-val	0.62	0.58	0.071	0.40	0.29	0.18	0.60	0.64
District-by-Year Obs.	1,475	1,298	1,284	1,311	1,327	1,290	1,244	1,374
Number of Districts	295	266	266	270	277	267	258	277

Notes. 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 leavers on instrumented median base salary in thousands of real dollars. In the bottom panel, 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 total teacher certificated FTE in each experience bin in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A9. Alternate Dosage Measures: IV-ITS

	Main Dosage	Dosage Alt. 1	Dosage Alt. 2	Dosage Alt. 3	Dosage Alt. 4	Main (Quintiles)
Dependent Var.: % New Hires						
Base Salary (1000s)	0.016	0.017	0.016	0.016	0.016	0.017
	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)
KP F-stat	310.8	219.4	298.8	301.3	302.2	188.0
Hansen J: P-val	0.35	0.19	0.23	0.29	0.31	0.058
Dependent Var.: % Turnover						
Base Salary (1000s)	-0.10***	-0.10***	-0.10***	-0.10***	-0.10***	-0.10***
	(0.023)	(0.022)	(0.023)	(0.023)	(0.023)	(0.022)
KP F-stat	310.8	219.4	298.8	301.3	302.2	188.0
Hansen J: P-val	0.80	0.26	0.52	0.78	0.79	0.42
District Fixed Effects	X	X	X	X	X	X
Year Fixed Effects						
District Linear Trends						
District-by-Year Obs.	1,475	1,475	1,475	1,475	1,475	1,475
Number of Districts	295	295	295	295	295	295

Notes. 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 new hires on instrumented median base salary in thousands of real dollars. In the bottom panel, 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 alternate dosage measures, as described in the text. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A10. Alternate Dosage Measures: IV-CITS

	Main Dosage	Dosage Alt. 1	Dosage Alt. 2	Dosage Alt. 3	Dosage Alt. 4	Main (Quintiles)
Dependent Var.: % New Hires						
Base Salary (1000s)	0.094	0.17	0.097	0.11	0.11	0.13
	(0.088)	(0.12)	(0.094)	(0.093)	(0.093)	(0.092)
KP F-stat	13.8	10.1	12.3	12.3	12.4	7.56
Hansen J: P-val	0.24	0.42	0.13	0.24	0.26	0.060
Dependent Var.: % Turnover						
Base Salary (1000s)	-0.079	-0.0042	-0.072	-0.075	-0.080	-0.076
	(0.10)	(0.100)	(0.11)	(0.11)	(0.11)	(0.10)
KP F-stat	13.8	10.1	12.3	12.3	12.4	7.56
Hansen J: P-val	0.65	0.19	0.40	0.64	0.64	0.37
District Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
District Linear Trends	X	X	X	X	X	X
District-by-Year Obs.	1,475	1,475	1,475	1,475	1,475	1,475
Number of Districts	295	295	295	295	295	295

Notes. Each estimated model is based on the IV-CITS model in equation (4). In the top panel, we regress the percentage of district-level teacher new hires on instrumented median base salary in thousands of real dollars. In the bottom panel, 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 alternate dosage measures, as described in the text. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.
Significance: + $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A11. Regressions results from models used to create fitted valued for exogeneity tests

	Pred. Turnover	Pred. New Hires
N. FRL	-0.00018	0.00019
	(0.00052)	(0.00032)
N. Children in Poverty	0.00026	-0.00069
	(0.00059)	(0.00037)
Log(N. FRL)	5.20**	-0.49
	(1.98)	(1.89)
Log(N. Child Poverty)	0.39	0.43
	(0.91)	(0.77)
Constant	-35.2*	9.15
	(15.2)	(16.0)
Year Fixed Effects	X	X
District Linear Trends	X	X
District-by-Year Obs.	1,770	1,770
Number of Districts	295	295

Note: Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table A12. Tests of exogeneity

	Pred. % Turnover	Pred. % New Hires
ITS Model		
Base Salary (1000s)	-0.00032	0.0059
	(0.0036)	(0.0050)
District Fixed Effects	X	X
Year Fixed Effects		
District Linear Trends		
CITS Model		
Base Salary (1000s)	-0.025	0.042
	(0.018)	(0.026)
District Fixed Effects	X	X
Year Fixed Effects	X	X
District Linear Trends	X	X
District-by-Year Obs.	1,475	1,475
Number of Districts	295	295

Notes. Models in the top panel are based on the IV-ITS model in equation (3); models in the bottom panel 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, either the percentage of district-level teacher turnover or the percentage of district-level teacher new hires on the instrumented endogenous variable. All models include district fixed effects. Robust standard errors in parentheses are clustered by district. Regressions are weighted by total teacher certificated FTE in academic year 2017-18.
Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$