ESSER Funding and School System Jobs: Evidence from Job Posting Data

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Abstract

The Elementary and Secondary School Emergency Relief Fund (ESSER) was the largest onetime federal investment in K–12 schools in history, funneling almost $200 billion to states and school districts. We use web-scraped job posting data from Washington State to investigate the causal impact of ESSER spending on district hiring between January 2022 and September 2024. We employ an instrumental variables strategy, exploiting idiosyncrasies in the Title I funding formula to isolate plausibly exogenous variation in ESSER. We find strong evidence that ESSER funding significantly increased teacher hiring, and that this impact was greatest during the early ESSER years.

1. Introduction

In response to the COVID-19 pandemic, the federal government provided $190 billion in funding to states and school districts as part of the Elementary and Secondary School Emergency Relief Fund (ESSER)—the largest one-time federal investment in K–12 schools in history. Lawmakers intended this program to help schools safely restart in-person instruction and recover from significant pandemic-related learning losses (Jack et al., 2023; Lewis et al., 2021; National Center for Education Statistics, 2022a, 2022b). While two recent studies find positive impacts of ESSER dollars on student achievement (Dewey et al., 2024; Goldhaber & Falken, 2024), surprisingly little is known about the specific ways that Local Education Agencies (LEAs) spent these funds.

There is evidence from district spending proposals—structured plans required for districts to receive their allocated funds—that a major area of intended ESSER investment was personnel (DiMarco & Jordan, 2022), but assessing ESSER's effects on staffing is complicated by both data and methodological issues. ESSER claims data might appear to provide the most direct measure of staffing spending, but there are important limitations to the use of these data. First, the claims data categories are quite broad, such that it is not possible to discern whether funding is going towards new or existing staff salaries. Second, school spending is fungible (Brunner et al., 2022; Gordon, 2004; Lauth & Robbins, 2002), hence itemized ESSER claims may not accurately reflect positions that were *created* as a consequence of ESSER funding. Put another way, if districts use ESSER funds to pay for things they would have spent money on regardless of receiving ESSER (and used other funding to pay for), studying claims data would lead to erroneous conclusions about the causal effects of ESSER funding on school resource use. As a concrete example, LEAs in Washington claimed $288,000 of ESSER funds to pay for

superintendent salaries, but it is unlikely that any of these LEAs would have operated without a superintendent in the absence of ESSER funding.

The core question in this paper is the extent to which ESSER caused hiring by LEAs *that would not have happened without this funding*. Understanding the impact of ESSER spending on hiring sheds light on policymaker choices when provided with significant, time-limited funding. The number and jobs created by ESSER also provides an estimate of the number of jobs, in the absence of additional funding, that may be at risk with ESSER's expiration. We address this issue by collecting job postings directly from school district websites in Washington State and use these scraped job postings data as our preferred measure of LEA hiring to address the following research questions:

1. What is the relationship between ESSER spending and school district hiring across different job categories?
2. What is the causal impact of ESSER spending on school district hiring, both overall and specifically for teachers?
3. How did the impact of ESSER spending on hiring vary over time?

Our analysis of RQ1 is purely descriptive, but the positive association between ESSER and district hiring supports findings from earlier analyses that staffing was a major focus of spending plans, with a particular focus on teachers (DiMarco & Jordan, 2022; Schwartz & Bolves, 2022). Our interest in the causal impact of ESSER for RQ2 and RQ3 necessitates a more rigorous methodological approach than prior descriptive analyses that can address two sources of bias. First, naïve estimates of the relationship between ESSER spending and staffing decisions may be confounded by other unobserved differences between high-poverty and low-poverty districts that are strongly correlated with ESSER spending. High-poverty districts, for example,

face exacerbated issues such as chronic absenteeism and achievement gaps following the pandemic which could have driven them to hire more staff *in the absence of ESSER funds*. This would result in an upward bias in the relationship between remaining ESSER funds and hires. At the same time, those districts may also have limited administrative bandwidth to expand hiring operations in the short term, leading to a negative association between ESSER funds and hires. Second, the pace of ESSER spending in a district may be correlated with the number or type of hires. For example, districts may have more remaining ESSER funds because of limited administrative capacity to execute hiring processes or due to greater hiring challenges such as sparse labor supply. In this case, having more unspent ESSER dollars would be negatively correlated with hiring, resulting in a downward bias in our estimator of interest.

In our preferred specification, we account for these sources of bias by using counts of formula-eligible children (FEC) for the 2020–21 school year—the primary determinant of Title I funding—to instrument for unspent ESSER funds. The identifying assumption in these models is that the number of FEC living in a district (the majority of which come from census estimates of children in poverty from four years earlier) does not affect district hiring plans once we control for district enrollment, free or reduced-price lunch (FRPL) qualification, demographic representation, historical district revenue, and prior teacher attrition. That is, the identifying variation in remaining ESSER funds comes from the time lag in poverty data reporting for FEC, differences in populations within a district's geography versus those enrolled in its public schools, and measurement error in the construction of FEC estimates.

Using this approach, we find positive but statistically insignificant impacts of ESSER spending on district hiring overall, but we do find significant and meaningful impacts specifically for *teacher* hiring. Our estimates show that each $10,000 in unspent ESSER funds

caused districts to hire about $1,500 in additional teaching staff who they would not have otherwise, on average across the three years of our data (2022-2024); these estimated effects are strongest and only statistically significant in 2022 and 2023.

This paper contributes to our understanding of the ways school systems responded to student needs in the wake of the COVID pandemic, a topic over which there is significant speculation but little quantitative evidence. More broadly, we contribute to the literature on how school systems allocate resources when provided with a large increase in revenue (Lauth & Robbins, 2002; Sun et al., 2022). Because we examine hiring across a range of position types, our findings reflect what school systems value in the absence of constraints that might link spending to any specific areas or student types (Fisher & Papke, 2000).

Our results also have practical implications. Understanding the ways school systems responded to ESSER funding can shed light on what we might expect now that ESSER funding has ended. Our analysis suggests that districts in Washington hired roughly 8,400 new teachers because of ESSER. Although it is likely that, just as in the aftermath of the Great Recession, some of the necessary downsizing of the state's teacher workforce in the absence of these funds can be managed through attrition, we argue that the end of ESSER will once again lead to teacher layoffs, especially in the districts that received larger ESSER allocations.

2. Background on ESSER Allocations and the Washington State Context

2.1 Background on ESSER Allocations

ESSER temporarily increased federal funding for public schools to deal with the consequences of the COVID-19 pandemic. Across three waves of grants (ESSER I, II, and III), the ESSER program allocated a total of $190 billion to K-12 school systems. ESSER represents more than triple the $60 billion of federal funding allocated to districts in the 2019–20 school year (Cornman et al., 2022) and nearly four times the extra funding districts received through the

American Recovery and Reinvestment Act of 2009 (Shores & Steinberg, 2022). In Washington State, ESSER boosted district budgets by an average of about $2,300 per pupil ($760 per pupil per year), or about 20% of state-provided funding for districts in 2019–20.

The U.S. Department of Education allocated ESSER in proportion to Title I funding for 2019–20 (ESSER I) and 2020–21 (ESSER II & III). Title I comprises four distinct grant formulas, all of which are based on the number and percentage of FEC in a district area. The majority of FEC consist of the number of children in poverty ages 5 to 17 in a school district area, regardless of their public school enrollment status (Snyder et al., 2019). To be eligible for each of the four Title I grants, LEAs must be above threshold numbers and percentages of FEC. While some evidence documents schools manipulating poverty measures within LEAs (Matsudaira et al., 2012), allocations to LEAs use FEC and other time-lagged, non-manipulable measures. Allocations are scaled by the number of FEC and adjusted by state per-pupil expenditures, hold harmless provisions, and state minimum provisions (Gordon & Reber, 2023; Snyder et al., 2019).

The American Rescue Plan (ESSER III) distributed the bulk of this funding. ESSER III required LEAs to earmark 20% of their allocation for recovering learning loss, but the remaining 80% was not restricted. Federal guidance explicitly notes that districts could use the funds to support activities such as "continuing to employ existing staff of the LEA" (U.S. Department of Education, 2022, p. 12), and even funds designated for supporting learning loss could be used for this purpose. As a result, LEAs likely used some ESSER funds to maintain staffing levels in the face of contracting enrollments (Schwartz et al., 2023) as well as to hire new staff.

Analyses of ESSER spending priorities according to LEA proposals (as distinct from actual expenditures) suggest that this was the case. DiMarco and Jordan (2022) identify the three

largest budget priorities by dollar amount across a sample of 5,004 school districts nationwide as staffing, academic recovery, and facilities and operations, with staffing accounting for 27% of the total $64 billion budgeted by these districts. Spending priorities also appear to differ across LEA poverty level (Jordan & DiMarco, 2022b) and geography (Jordan & DiMarco, 2022a). For example, districts in the highest poverty quartile were the only group whose first priority was HVAC investment—all other quartiles prioritized staffing (Jordan & DiMarco, 2022b).

Two reports from Rhode Island shed light on differences between proposed and realized ESSER spending. Schwartz and Bolves (2022) use data capturing districts' proposed ESSER spending to identify priorities, similar to DiMarco and Jordan (2022). They project that if ESSER budgets for staff were entirely directed toward new hires, the grant would fund about 1,100 full-time equivalent (FTE) instructors throughout Rhode Island, approximately 10% of the instructional workforce. In a follow-up report looking at ESSER expenses, Schwartz et al. (2023) find that ESSER spending supported some new positions but predominantly (49%) paid for existing staff with overall staffing levels remaining unchanged. Similarly, DiMarco and Kelleher (2023) find that much of the ESSER spending on staff in North Carolina funded onetime bonuses (e.g., retention incentives) rather than supporting new positions.

Although these findings may not be generalizable to other contexts, it is possible that the high volume of ESSER dollars originally budgeted for staffing provided a smaller boost to hiring than initially expected in other contexts, too. There is limited national evidence about how ESSER funding influenced district spending, but data from the Bureau of Labor Statistics and Census Bureau shows that nationwide K–12 employment has grown over the last three years. Public schools now employ more full-time instructional staff than before the pandemic (Aldeman, 2023a, 2023b). But, as we emphasize above, the fungibility of funding across budget

items means that we cannot draw conclusions about the extent to which ESSER *caused* hiring: districts may have chosen to hire more or different personnel after the pandemic even in the absence of ESSER funds.

2.2 ESSER Allocations and Spending in Washington State

Districts in Washington began claiming reimbursements for ESSER-funded expenses in July 2020, March 2021, and August 2021 for ESSER I, II, and III, respectively. The three waves' deadlines to obligate funds were September 30th, 2022, 2023, and 2024. By January 2022, districts had claimed (i.e., spent and had reimbursed) 26% of total ESSER allocations—98% of ESSER I, 50% of ESSER II, and 7% of ESSER III (Washington Office of Superintendent of Public Instruction, 2023a). An additional 34%, 28%, and 12% of all ESSER funds were claimed in the 2022, 2023, and 2024 calendar years that followed (Washington Office of Superintendent of Public Instruction, 2023a). It is difficult to pin down exactly when districts incur expenses because funds flow through a chain of reporting in order to appear on state summaries (Silberstein & Roza, 2023), but these high-level totals suggest that spending volume peaked in the middle of the ESSER grant period.

Districts varied tremendously in their spending in part because the amount of funding districts received and funds as a share of total revenue differed widely across the state. Figure 1 illustrates how spending varies widely across districts due to meaningful differences in initial allocated funding *and* differential spending rates. For instance, some (wealthy) districts in Washington had small unspent allocations despite having spent relatively little of their total grant funding; Snoqualmie School District, for instance, had $517 per pupil unspent in July 2022 despite having spent only 36% of their total ESSER allocation. Others received far more funding and therefore had larger per pupil unspent amounts despite, in some cases, having spent out a

larger share of total ESSER allocations. Granger School District, for instance, still had $1,800 remaining per pupil as of July 2022 despite having spent their allocation at twice the rate (73%) of Snoqualmie. Much of the variation in unspent funds was due to the link to the Title I allocation formula. ESSER funding is allocated per FEC so relative district poverty and the share of the local population that FEC represent lead to large differences in funds per enrolled pupil.

One aspect of ESSER funding not captured in our analysis is the potential impact of state-reserved ESSER funds. ESSER funds flowed first to SEAs which withheld 10% of the grants for administrative costs and state initiatives. SEAs funneled the remaining 90% to LEAs (National Conference of State Legislatures, 2022). Washington SEA funds went toward staffing 21st Century Learning Centers, afterschool programs managed by LEAs, and community groups; the state also supported health services for regional clusters of districts (Washington Office of Superintendent of Public Instruction, 2023b). Arrangements like these pose an issue for identifying the impacts of ESSER on overall employment that may benefit districts.

In Washington, most district funding is derived from state revenue (about 75% of funding on average) with a strong equalization formula and limited caps of local levy revenue (Knight et al., 2022). This focus on funding equity is also reflected in the state use of SEA funding: Washington funneled SEA ESSER funds to districts that were getting little to no ESSER dollars according to the grant formula. All districts in Washington received at least $75,000 across the three grants due to this supplemental provision of SEA ESSER funding to districts.

3. Data and Measures

3.1 Web-Scraped Job Postings Data

We leverage novel, web-scraped job postings to measure impacts on the number of new positions and the implied costs of those positions. We scraped district websites and job boards twice weekly (Mondays and Fridays) starting in the fall of 2021 to collect information on

advertised public school jobs; we exclude posts that were already on district websites prior to 2022 to isolate those that we can observe appearing online. Thus, we have information about the district-by-calendar-year-level of job postings for the full years of 2022, 2023, and through September 30th of 2024.

Because district websites were scraped continuously, we also observe when postings are removed. We assume posts that are removed from district websites represent positions that were filled and refer to them as "filled posts" (as we note below, our results are robust to using *all* posts instead of *filled* posts). We focus on this measure of hiring throughout our analysis because we are interested in the impacts of ESSER on LEA hiring (and relatedly the budgetary burden implied by ESSER-induced hiring). Using job titles listed in postings, consistent with Goldhaber, Falken, et al. (2023), we categorize each post into one of 11 categories: administration, athletics, facilities, food services, health, paraeducator, principal, superintendent, teaching, transportation, and a catch-all, other.

In attributing jobs to district budgets, we must consider measurement issues associated with assigning filled posts to a school year or calendar year. Specifically, for the initial data of job postings in fall 2021, we cannot know when the jobs in this period were initially posted, meaning we attribute all posts that were open in the fall to that initial season, even if they were posted in the prior summer. If we construct school-year totals, we would thus be *overcounting* posts for the 2021-22 school year. The tail end of our data in 2024 introduces a different measurement issue: because we limit analyses to filled posts, and these posts have had less time to be taken down than those of prior years, we may undercount positions at the end of our period. We therefore assign posts to calendar years to minimize the potential for bias associated with each of these measurement issues (though as we note below, the findings are similar if we

instead use the school year and if we use all posts instead of filled posts). Specifically, we know from data in 2022 and 2023 that about 30% of posts that are new in the fall are filled in the following calendar year, whereas 40% of filled posts in the fall were initially posted in the preceding summer (a different school year). This suggests that the potential risk of overcounting posts by using school years (and including fall 2021) is a greater concern than that of undercounting posts by using calendar years.

Job postings data have two additional shortcomings worth mentioning. First, these data fail to cover the entirety of the ESSER funding period. School systems had access to ESSER funds from March 2020 through September 2024. Because the web scraping only began in the fall of 2021, the data we use is missing more than a full school year of the grant period. That said, we suspect ESSER-induced hiring was low in this early period for the following reasons: school systems did not yet have the lion's share of ESSER funding (ESSER III, approved in March 2021); the implementation of any large-scale budget initiatives is often lagged from the receipt of funding, as evidenced by the fact that the average district in Washington had only spent 17% of their total ESSER allocation as of July 2021; and, a majority of districts were operating remotely during this period (Goldhaber, Kane, et al., 2023). Additionally, spending is delayed by the school district budget adoption process. Funds cannot typically be spent before the district budgeting process, meaning that although ESSER II was passed in December 2020, it would not impact district hiring until after budget deliberations in the spring and summer of 2021 (Seattle Public Schools Board of Directors, 2021).

A second limitation is that job postings (including those we classify as filled posts) are only an approximation of hires. These records aren't linkable to observed hires, making them difficult to validate; earlier research has illustrated that filled postings at the district-level are

highly correlated with observed teacher hires (Goldhaber, Falken, et al., 2023), but does not assess validity for non-teaching positions. Postings do have the appeal, however, of capturing temporary hires for categories such as athletics which may not appear in administrative data.

3.2 Salary and Staffing Data in Washington

The Washington Office of Superintendent of Public Instruction (OSPI) maintains several publicly available datasets we also use for this analysis. We use OSPI's personnel dataset that tracks all staff positions in Washington public schools over time, the S-275, to construct the typical pay across different job functions in each district, which we use as a scaling factor for job posts, and to calculate the number of all new hires and new teachers hired in each district in each year, which we use as a lagged control in our models. Because this dataset is created for accounting purposes, it disaggregates the compensation of each staff member across each distinct job function they hold. Job functions are identified using program, activity, and duty root codes, as well as certification status; we provide a detailed breakdown of which activity codes and certification categories we align with each of our job posting categories in Appendix A.

We assign each position in the S-275 to the same 11 job categories specified above to calculate the *average* pay for positions within each category for all Washington districts in each year. Because newly-hired teachers are likely disproportionately novice, we also estimate a "lower bound" post cost using average position salaries among new staff. By construction, results with this outcome are attenuated in magnitude but qualitatively similar to those we present below. We describe the construction of this measure and present results using this outcome in Appendix B.

Because individuals may hold multiple position types—for example, a classroom teacher may also coach a sports team—we include the portion of annual pay attributed to each position

category in the calculations for average pay in each separate category. This means that we calculate the cost *per position*, rather than per FTE. For many job types, this is a more appropriate cost estimate because nonteaching positions are often coded as part time (see Theobald et al., 2025), extracurricular positions often do not have an associated FTE estimate, and it is common for staff to span multiple positions in a school. Because not all job posts reflect equal implied cost, our primary outcome scales each filled post by the average salary for that position type in that district in that year. We multiply our counts of filled posts in each category and district by the associated salary to approximate the future staffing costs implied by the filled job posts. These projected post costs are our preferred outcome for ease of interpretation.

We present the average number of job postings in each category for each year, average pay for each job category, and average projected post costs in Table 1. The first three columns here break down the average number of posts in a district for each year of our panel. In each year, the largest category by average posted positions is paraeducators, followed by teachers. Across years, 2022 has the highest volume of job posts. The total number of posts across all categories drops by 20% in 2023 and again in 2024, although, as we note above, we cut off 2024 posts as of September 30th, the ESSER funding obligation deadline. The rightmost three columns present average measures across all districts in all three years of data. The projected post costs show that while paraeducator positions had the largest number of posts in the typical district, the post costs of teaching position far outweighed investments in other types of staff, totaling an average $10 million in a typical district-year. By contrast, while post demand for athletic staff is generally the fourth-highest category by posts, the relatively low cost of the typical athletics position means that the projected position costs for athletics are only 5% of overall post costs across all areas.

3.3 Other Administrative Data Sources

As we note above, district context may influence district hiring needs; hence, in the models described below, we use district-by-year characteristics from Washington State Report Card data as controls. These measures include district enrollment, counts of students qualifying for FRPL, student demographics, urbanicity, and average scores on the Washington State standardized assessment (Smarter Balance Assessment Consortium assessment, SBAC). We link all covariates, which are on a school year timeline, to the calendar year corresponding to the spring of school year. In practice this means that student enrollment for 2021-22 (which is captured in fall 2021) is the control for predicting posts in the 2022 calendar year. We also calculate and include distances to the nearest Teacher Education Program (TEP) using data from the Education Demographic and Geographic Estimates (EDGE) given evidence that this proximity influences teacher vacancies (Edwards et al., 2024). To account for labor market dynamics (Rucinski, 2023), we use county-level unemployment data from the Local Area Unemployment Statistics dataset maintained by the Bureau of Labor Statistics. As a control for pre-pandemic funding, we use 2019–20 district revenue from the Common Core of Data.

Our IV analysis depends on data that the U.S. Department of Education (ED) uses to calculate Title I allocations. The ED allocates Title I funds across districts according to the count of FEC in the district's geographic area. Formula-eligible children (FEC) counts include children in poverty between the ages of 5 and 17, children receiving Temporary Assistance for Needy Families (TANF), neglected and delinquent children, and foster children. The lion's share of FEC children (97%) fall into the first category (Stephenson & Kaiser, 2018), calculated each year by the Census' Small Area Income and Poverty Estimates (SAIPE) program. SAIPE data are published with a slight delay relative to when Title I allocations are calculated: SAIPE data from 2018 determined Title I allocations in the 2020–21 school year which, in turn, impacted

ESSER II and III allocations. This is important for our instruments as we use district-level counts of FEC in Washington to instrument for a time-varying measure of unspent ESSER funding. We expand on the identifying variation isolated by this instrument below.

Finally, we use data from OSPI documenting district ESSER allocations and spending in each fiscal year; fiscal years in Washington run from July 1st through June 30th. We construct a time-varying measure we call "unspent ESSER funds" as our preferred measure of ESSER. Unspent ESSER funds are the total allocations minus cumulative spent funds as of the prior summer. For 2022 calendar-year job postings, this means we use unspent ESSER funds as of July 1st, 2021 as our predictor of interest. The benefit of this construction is that it approximates a remaining grant budget that administrators faced as they planned their hiring for the following year. While budget decisions are typically contained to a single-year cycle, the multi-year nature of this grant likely means that districts planned spending considerate of their total remaining funds and longer-term plans for the grant period.

Our sample includes 277 districts (of 295 in Washington) in 2022, 290 districts in 2023, and 289 districts in 2024 for a total of 856 district-year observations. Differences in our sample are due to an expansion of our job-scraping infrastructure in late 2022 and enrollment dropping to zero in one district in 2024. That said, in each year we observe posts for districts serving at least 99.8% of students in Washington public schools and 99.7% of staff. Omitted districts are extremely small, generally rural, and often are omitted for lacking an active, public-facing hiring website to scrape. In Figure 1, we visually present differences in per-pupil ESSER allocations across Washington State districts; in Table 2, we describe the characteristics of these districts, weighted by enrollment. Because there are vast differences in ESSER allocations per pupil across districts, Table 2 also presents differences across the subsamples of district-years in the

bottom quartile of total ESSER allocations per pupil (Column 2) and the top quartile of total ESSER allocations per pupil (Column 3). The average ESSER allocation per pupil among districts in our sample was $3,075. Districts in the top quartile by ESSER allocations per pupil received $6,105 per student, whereas those in the bottom quartile received $1,009 on average.

Not surprisingly given that ESSER allocations are tied to Title I, there are significant differences in district characteristics associated with allocations. Districts that received the highest ESSER allocations per pupil tended to be larger than the typical Washington district, were more commonly in urban settings or towns, and served higher rates of students of color, English-language learners, and students receiving FRPL. Generally, districts receiving the lowest ESSER allocations per pupil exhibit the inverse of these patterns, with a notable overrepresentation of suburban districts relative to the state average. These differences across districts are driven partly by differences in the relative poverty of the district—that is, what share of the school-age population are FEC. High-ESSER districts posted about twice as many positions across all years as their low-ESSER counterparts.

4. Empirical Methods

We use three approaches to understand the relationship between ESSER funding and LEA hiring in Washington. First, we estimate a seemingly unrelated regression (SUR) to estimate the naïve association between unspent ESSER funds and hiring for each job category we observe. This model involves a system of 11 equations, each of which takes the following generalized form:

$$Post\ Costs_{cdt} = \beta_{0c} + \beta_{1c} ESSER_{dt}^{unspent} + \beta_{2c} X_{dt} + \varepsilon_{cdt} \quad (1)$$

The outcome of Equation 1, $Post\ Costs_{cdt}$, is the projected position costs of filled posts in a category (c) in a district (d) in a year (t). Our main predictor of interest, $ESSER_{dt}^{unspent}$, captures district-by-year remaining ESSER funding as of the prior July.

The entire system includes 11 equations predicting this outcome for each observed category in a district. We also include a vector, X_{dt}, of time-varying covariates likely to be correlated with ESSER funding and district staffing needs, including a cubic of district enrollment, district-level counts of students receiving FRPL, the number of underrepresented minority (URM) students, the 2019–20 total district revenue, average SBAC scores, the change in enrollment between the prior and current school year (standardized), the county unemployment rate, indicators for district urbanicity, the number of new hires in a district as of the prior October, and a log of the distance to the nearest TEP. We intend for these covariates to capture some district-level variation in both labor market environment (e.g., unemployment and proximity to a supply of teachers) and school environments associated with variation in staffing patterns (e.g., the household income and demographic composition of enrolled students). We control for pre-pandemic district revenue to capture potential associations between sustained differences in funding and staffing, the drivers of which would be funding from federal and local sources, given the strong equalization embedded in the state funding structure. We weight all models by district enrollment and interpret estimates as those for the average student.

These SUR estimates disaggregate naïve ordinary least squares (OLS) estimates of the association between unspent ESSER and total hiring across categories, which we present alongside these results. For the coefficient on unspent ESSER to be interpreted as causal, we would need to account for all aspects of districts related to the amount of unspent ESSER funds

and to hiring. As noted above, there are good reasons to worry that "observably similar" districts according to the variables in X_{dt} may differ in ways that impact both ESSER allocations and hiring, suggesting that these estimates could suffer from omitted variable bias. Our specific concern is that if districts that receive more funds because of variation in other unobservable (to us) factors also would have more job postings in the absence of ESSER funds, then these omissions could bias our estimates of the relationship between unspent ESSER and posts.

Our solution is to instrument for unspent ESSER funds with the number of FEC within district boundaries. Using a two-stage least squares model (2SLS), our first stage of this estimation takes the following form:

$$ESSER_{dt}^{unspent} = \beta_0 + \beta_1 FEC_d + \beta_2 X_{dt} + \varepsilon_{dt} \quad (2)$$

All variables in equation 2 are defined as above and we also include the specified instrument, FEC_d, to predict district unspent funds. We present our first stage results in Table 3, which we discuss further below. Instrumenting for unspent ESSER funds using time-invariant FEC removes differences in unspent funds attributable to rates of spending, essentially assuming the rates of spending are constant across districts. This proves a strong instrument for spending, with an individual *F*-statistic of 78.45 (Andrews et al., 2019; Lee et al., 2022).

Using FEC as an instrument also accounts for covariances between student needs and hiring demand in addition to those between hiring and district spending rates. The identifying variation when we use FEC to instrument for unspent ESSER comes from three main sources. First, the number of FEC in a district's geographic area, predominantly the number of children living in poverty in 2018, differs from 2021–22 district poverty because of the time lag between when the data are available and the year of funding they determine. Second, differences between

the local population of children in a district area and those enrolled in public schools may differ if there are high rates of private school enrollment or homeschooling. Third, while FEC data are based on estimates anchored to the most recent American Community Survey, our control for students qualifying for free- or reduced-price lunch are based on observed students in the district—a difference that introduces measurement error as a source of variation.

The assumption underlying FEC as an instrument is that, after accounting for factors like the number of students qualifying for FRPL and lagged district revenue (including Title I revenue), FEC in a district only affects staffing decisions through its impact on ESSER funding. If this exclusion restriction holds—and if this variable is sufficiently predictive of ESSER—then we can estimate 2SLS models that isolate the causal effect of unspent ESSER funds on district postings. A threat to this exclusion restriction comes from the first source of identifying variation described above: if districts becoming relatively more or less economically disadvantaged in recent years (e.g., with more students qualifying for FRPL than we'd expect given prior FEC) also have different staffing trajectories and needs, then lagged FEC might not be exogenous to staffing decisions. We assume that this is not the case, but we acknowledge this as a limitation of our identification strategy when we estimate variants of equation 2.

5. Results

5.1 Associations Between Unspent ESSER Funding and Hiring Outcomes Across Categories

In Table 4 we present naïve associations between unspent ESSER and hiring outcomes for each job category. We first show a simple OLS model (Column 1) predicting total filled postings (Panel A) and post costs (in $10,000s, Panel B). These estimates suggest that a $10,000

increase in unspent ESSER is associated with a statistically significant 0.042 increase in filled posts and a $1,390 increase in total position costs across all categories.

The SUR results (Columns 2 through 11) disaggregate this overall association across job categories, shedding light on which areas are driving this association. Predictably, we find mixed impacts of ESSER allocations on category-specific filled posts and total post costs, suggesting that the impact of ESSER varies across job types. For example, we find the largest magnitude of effect for teaching positions, relative to all other position types, with a suggestive impact of $910 increased posted position costs for a $10,000 increase in ESSER allocations. We also find significant positive associations between ESSER allocations and projected position costs for several job categories, the largest of which is administrative staff ($430 increase per $10,000 of ESSER).

We take the above findings as evidence that the association between ESSER and hiring was greatest for teaching positions. The relative costliness of teaching positions is reflected in the divergence between the estimated associations for posts and post costs for teaching staff. Our estimates in Table 4 suggest that 33% of the total job posting effect (column 1) was teacher job postings (column 10) while teachers made up 65% of the overall impact for post costs. So, while other areas such as administrative staff exhibit meaningful associations in terms of number of filled positions, teaching positions appear to make up most of ESSER investments in staff.

There is one significant, negative association between ESSER allocations and projected posting costs; athletic staff position costs are estimated to be $430 lower with a marginal increase of $10,000 in unspent ESSER funds. That ESSER would reduce hiring in any area is surprising, however, recall that these results are descriptive. It may also be possible that high-need districts which received more ESSER funds are also less likely to invest in sports programs

in the wake of the pandemic, for instance because the school systems are more likely to be online (Goldhaber et al., 2022).

5.2 Causal Impacts of ESSER on Hiring Outcomes Overall and for Teachers

Our first stage results, presented in Table 3, suggest that FEC is an effective instrument for unspent ESSER funding. Specifically, in the average year a marginal increase in FEC predicts a $18,700 increase in unspent ESSER, with annual estimates ranging from $22,100 in 2022 to $14,900 in 2024. This average across years is notably similar to the descriptive weighted average funding per FEC in our sample, about $17,000 ($18,000 unweighted).

In Table 5 we present results aiming to remove the two potential sources of endogeneity we discussed above. Columns 1 and 3 present OLS estimates as a point of comparison, reiterating the estimates in Column 1 of Table 4. Columns 2 and 4 instrument for unspent ESSER funding using FEC. Considering the difference between results in column 1 and 2, we find that instrumenting diminishes our estimated impact on total filled posts (Panel A) by 52% and decreases the filled post costs estimate (in $10,000s, comparing columns 4 and 5) by 59%. Our estimates suggest that a $10,000 increase in unspent ESSER funds for districts leads to an insignificant increase of 0.020 posts and an increase in costs of $570.

When we narrow our perspective to teacher-specific outcomes in Panel B, however, we find our results are more consistent across OLS and 2SLS specifications. The 2SLS estimates using FEC to instrument for unspent ESSER are slightly larger, though statistically indistinguishable from, those in our OLS framework. We find that a $10,000 increase in unspent ESSER translates to a 0.019 increase in filled teacher postings. In terms of costs, this marginal increase in ESSER drives a $1,500 increase in posted teacher position costs. We interpret this

difference as suggestive evidence that non-teaching positions may be subject to more endogenous variation than teaching positions.

We conduct several robustness checks (results available upon request) to assess the specificity of these estimates to our modeling decisions. If we instead estimate unweighted regressions—that is, estimated relationships for the average district in Washington rather than the average student—the findings are similar, though slightly larger in magnitude for (aggregated) total posts and total post costs. Using all posts instead of limiting to filled posts returns estimates almost identical to those presented in Table 5, suggesting that right-censoring of posts does not materially impact our findings. Finally, when we assign posts to school years instead of calendar years, which offers a more intuitive time unit at the cost of introducing left-censoring of posts in 2021-22, we again find results qualitatively similar to those depicted here.

Taken together, our causal estimates suggest that 15% of ESSER funding went specifically towards teaching positions that would not have existed in the absence of this funding. These estimates are far more conservative than prior estimates from one analysis of 22 states that about 50% of ESSER was spent on personnel (Silberstein & Roza, 2023), but that figure includes spending both on new hires and existing staff, the latter of which are generally paid more and thus make up a greater expense (DiMarco & Kelleher, 2023; Schwartz et al., 2023; Silberstein & Roza, 2023).

5.3 Heterogeneous Impacts of ESSER on Teacher Job Postings

It seems likely that ESSER funding would have heterogeneous impacts on hiring. For instance, it is highly unlikely that ESSER funds would equally impact hiring across all grant years. Thus, to get a better sense of the evolution of ESSER across years, we estimate equation

(2) for each calendar year separately, allowing us to observe a flexible relationship between unspent ESSER funds and hiring outcomes over time.

We present the magnitude of these teacher-specific estimates in Figure 2 (posts) and Figure 3 (post costs). Each figure displays the predicted values of the indicated outcome in the typical district for a specific level of unspent ESSER funding. That is, we visualize the marginal differences in hiring predicted by our ESSER point estimate, with the leftmost predicted value corresponding to districts with zero predicted unspent ESSER and the rightmost predicted value corresponding to the 95th percentile of predicted unspent ESSER in each year.

Figure 2 shows how districts at the 95th percentile of predicted remaining ESSER hired about 90 and 30 more teachers they would not have hired without the ESSER funding in 2022 and 2023, and about 20 fewer teachers in 2024. In Figure 3 this same comparison illustrates a $7.2 million impact on teacher post costs of going from no predicted unspent ESSER to the 95th percentile in 2022. This drops to $2.4 million in 2023 and a decline of $2.5 million in 2024. In sum, these figures show a slowdown of the impact of ESSER funding on teacher hiring as the slope presented in each year shifts from meaningfully positive to a slight negative.

There are arguments for expecting heterogeneity across other district characteristics too. For instance, while there is relatively limited variation in per pupil spending in Washington, ESSER funding as a share of district revenues varies across districts and districts vary in terms of their student characteristics. We do not, however, find evidence that there are differential effects of ESSER on hiring across district characteristics. We assess this by again estimating our models for subsamples of our data. We find no consistent patterns in our estimated effects when we group districts into the share of students eligible for free or reduced-price lunch, the share of students in under-represented minority groups, or by pre-pandemic revenue. Our assessment is

that there is no meaningful evidence of heterogeneous effects along these dimensions of district financial situation and student characteristics, but we also have limited power to detect heterogeneity across districts because there are only 290 in the sample.

6. Discussion and Conclusions

We find strong, arguably causal, evidence that public school districts hired more teaching staff in response to the availability of ESSER funding. To put the financial magnitude of these hires into perspective, our estimates suggest that districts in Washington hired $665 million worth of teaching staff over the course of the three years that would not have been hired in the absence of the ESSER funding. Consistent with a recent review of ESSER proposed spending data (Brooks & Springer, 2024), it appears that much of this hiring activity focused on teaching positions.

Given these results, what might the end of ESSER funding mean, both for school budgets and school staffing? Nationwide, the one-year drop in per pupil funding implied by the end of ESSER is comparable to funding drops during the Great Recession that were seen over three years—about $1,400 per student from the 2011–12 to 2013–14 school years (Roza & Silberstein, 2023; Shores & Steinberg, 2022). Because personnel costs make up 76% of education expenditures (Executive Office of the President & Council of Economic Advisors, 2025), personnel are highly likely to be affected by these meaningful budget changes. Estimates of how many personnel will be affected can vary depending on the method.

Schwartz and Bolves' (2022) approach estimates the number of positions that would not have been funded if ESSER had not happened by dividing budgeted ESSER funds by the typical salary in a position type. If we apply this approach to Washington, dividing teacher salary claims by our lower bound teacher salary measure, it suggests that roughly 8,300 teaching positions were created by ESSER. However, this may overstate the number of positions likely at risk

because it assumes (a) that all funds went to support new hires rather than existing staff, and (b) that budgets are not fungible.

Aldeman (2023b) takes a different approach, exploiting changes in student–teacher ratios between the 2018–19 and 2021–22 school years. By applying his method to changes in ratios between 2018-19 and 2023-24 in Washington, we find that the state's teacher workforce needs to be reduced by about 2,400 teaching positions to return to pre-pandemic staffing levels. But this estimate likely *understates* the number of teachers at risk post-ESSER. The argument here is specific to Washington: student-teacher ratios in Washington likely would have risen in the absence of ESSER funding because, in recent years, teacher salaries have risen faster than what was guaranteed by increases in state funding in the wake of the state's McCleary reforms (Knight & Fujioka, 2023).

Our alternative is to estimate the impact of unspent ESSER funding on filled job postings to estimate the number of *teaching positions* that were created by ESSER, which will potentially be at risk when ESSER ends. We use the coefficient for unspent ESSER on teacher job postings from our 2SLS model (Table 5, Column 3) and the average unspent ESSER funding across our three panel years in Washington (about $1.5 billion) to estimate the likely statewide impact of ESSER funds on the employment over the three years that districts could use the funds. We find that unspent ESSER funding increased the number of filled teacher posts in Washington districts by 8,428 positions between 2022 and 2024, with a 90% confidence interval of 5,633 to 11,222. This point estimate is higher than our estimate using the method of Aldeman (2023b) but similar to that using the method of Schwartz and Bolves (2022).

For some additional perspective, our estimate of the number of teaching jobs created by ESSER (8,428) represents 13% of the current Washington public teaching workforce and 24% of

all new hires over this three-year period. Importantly, this estimate of ESSER-created jobs likely overstates the number of *current staff* whose jobs are at risk. That is because districts can address some staffing reductions through attrition (roughly 6,000 teachers leave the state teaching workforce in a typical year). As an example for how this can play out in practice, in the wake of the Great Recession (between 2008–09 and 2011–12), the number of teachers in Washington declined by 3,030. The state's school districts managed much of this decline by hiring fewer new teachers. Of the 15,080 teachers who left the workforce during this period, districts hired only 12,050 new teachers to replace them. As a result, only 561 teachers (i.e., about 18% of the 3,030 reduced positions) were actually laid off statewide (Goldhaber et al., 2016).

An important caveat to these back-of-the-envelope estimates is that, while we construct these numbers from our average effects, the distributions of hiring and potential layoffs are not equal across districts. As we discussed above (and is reported in Table 2), the students in districts in the top quartile by ESSER allocations serve different student populations than those in the bottom quartile. 55% of students in the average top-quartile district are URM, 20% are ELL, and 67% receive FRPL. In the bottom quartile, by contrast, the average district serves only 29%, 8%, and 30% of these student groups, respectively. If we apply the same back-of-the-envelope method based on the average unspent ESSER in these quartiles, we find that the typical district in the bottom quartile by ESSER allocations hired an additional 12 teachers across three years that they would not have hired in the absence of this funding. In the top quartile, however, the average district hired 38 additional teachers—more than triple that of the bottom quartile average. The point is that districts that received large allocations of ESSER funding did the bulk of the additional hiring; these same districts are also the most likely to face budget challenges

and the risk of layoffs now that the grant period is over. The students most likely to be affected by these layoffs are relatively disadvantaged.

Of course, in practice, layoffs occur within districts and not statewide. This complicates the extent to which policymakers can use attrition to address possible ESSER-related staffing problems. For example, as shown in Figure 1, many districts received small ESSER allocations; attrition in these districts will not address the need to reduce staff in districts where large allocations were associated with ESSER-induced hires. Similarly, within districts, attrition may not occur in the right subjects. If a district has hired elementary teachers with its ESSER funds, it cannot manage reductions with retirements in high school math departments. If districts are unable to manage reductions via attrition, it is likely that the end of ESSER funding will be followed by significant layoffs, as was the case with the Great Recession. This is concerning because typical approaches to layoffs (e.g., seniority-based, last-in-first-out layoffs and overissuing "pink slips") can have direct and indirect negative effects on student achievement (Goldhaber et al., 2016; Goldhaber & Theobald, 2013; Kraft, 2015).

To the degree that the end of ESSER leads to teacher layoffs, school districts should be exploring ways to mitigate their harm. For example, they might consider protecting teachers (and their students) from layoffs in specific shortage areas, like special education and STEM subjects; or they might protect teachers in hard-to-staff schools that can least afford to lose teachers (Bleiberg & Kraft, 2023). District and union leaders also need to be concerned about the process that governs layoff *notices*. Following the Great Recession, school districts in Washington issued about five times as many layoff notices as the number of actual layoffs. This was due to collective bargaining agreements, which often require districts to notify all teachers who might be at risk of losing their jobs before the next school year (Goldhaber et al., 2016). Yet, research

suggests that the receipt of a layoff notice induces greater mobility among teachers (Goldhaber et al., 2016), which can harm student achievement (Ronfeldt et al., 2013) and teacher performance (Strunk et al., 2018). Admittedly, given the way teacher shortages dominated the news during the pandemic layoffs seem unthinkable. But if the end of ESSER, budget constraints, and enrollment shifts create the need for layoffs, district leaders will have to find better ways to deal with them if they want to avoid unintentionally harming teachers and students.

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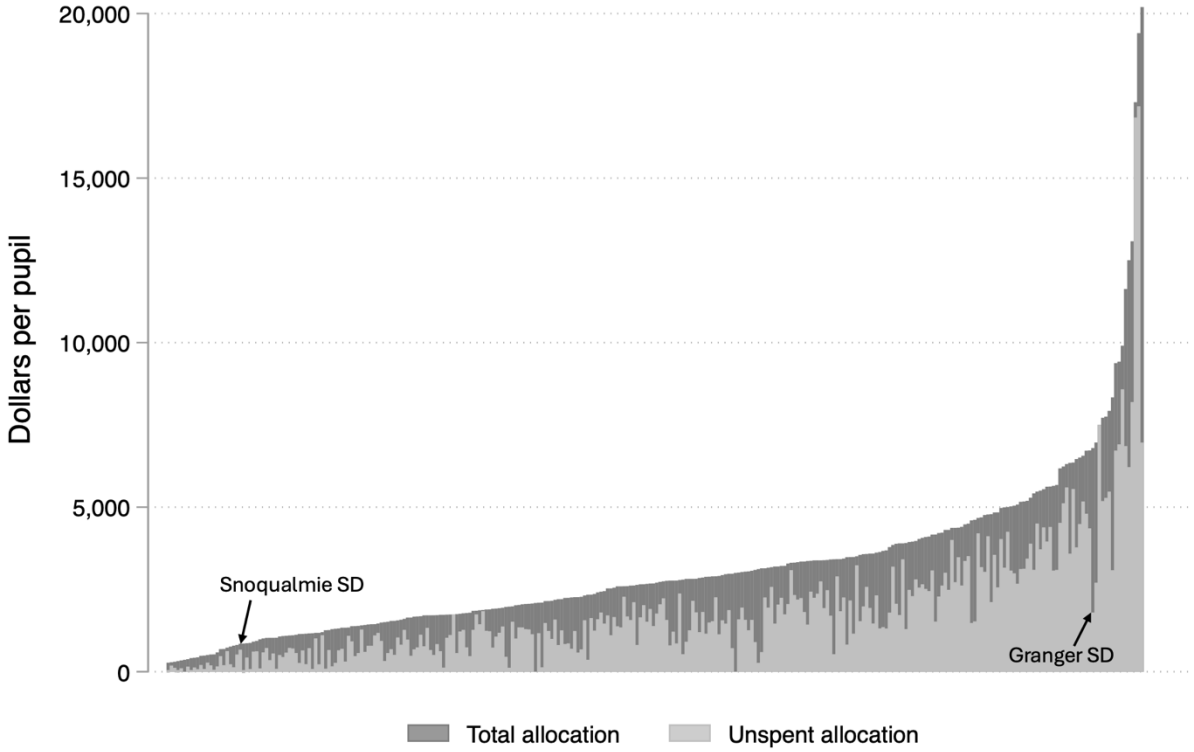
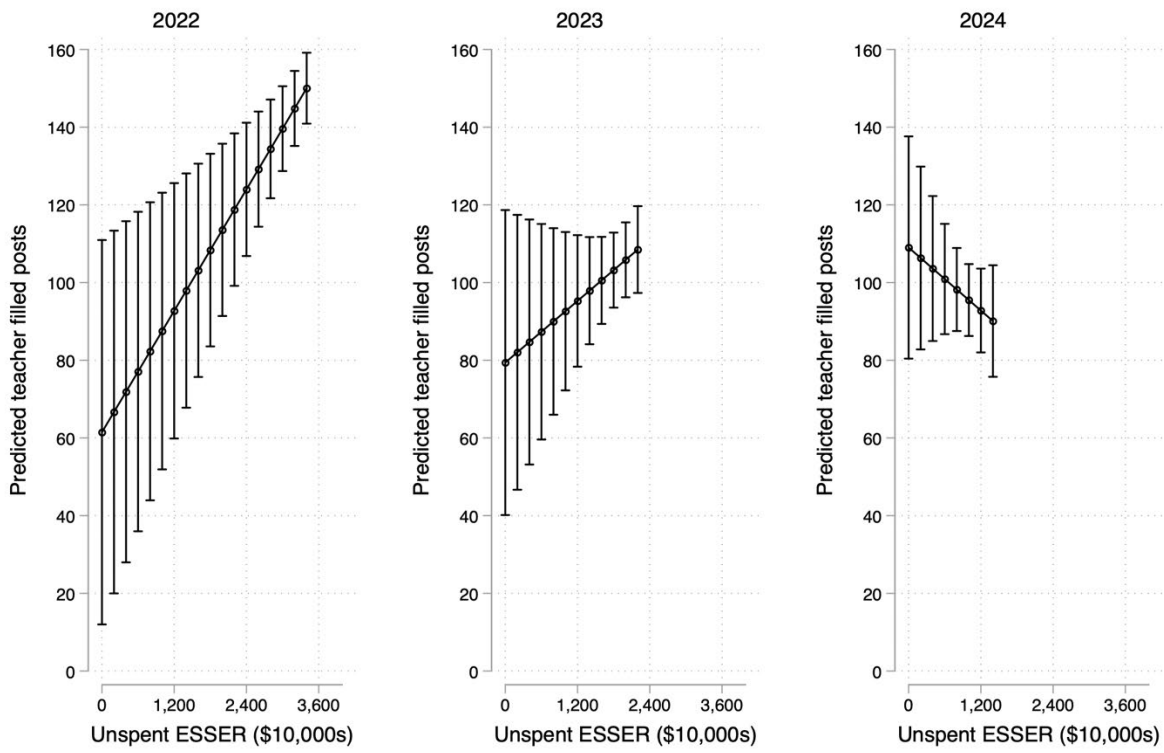
Figures and Tables

Figure 1. Total ESSER Allocations and Unspent ESSER per Pupil as of July 1st, 2022



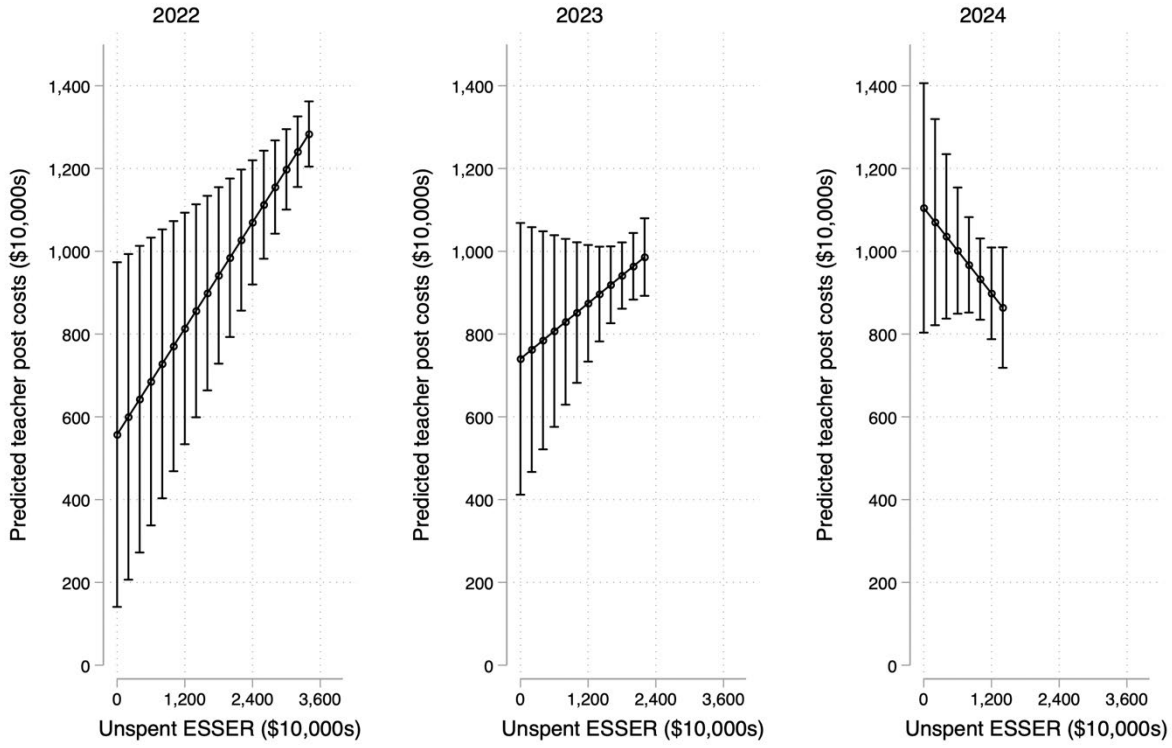
Note. Each bar represents a single district in the state. Allocations are time-invariant and scaled per pupil in 2022-23. Unspent ESSER allocations are funds remaining as of July 1, 2022 and are scaled by enrollment in 2022-23. We label the bars of two school districts (SDs) discussed in the text, Snoqualmie and Granger.

Figure 2. Predicted Filled Posts Across Unspent ESSER



Notes. Markers represent predicted outcome values for the level of unspent ESSER from our 2SLS model in which we instrument for unspent ESSER with district FEC. Each panel presents results from a single-year estimation. Brackets around each marker represent 95% confidence intervals for those predicted values. The y-axis here represents the predicted number of filled teachers posts for a typical district in the indicated year across different amounts of unspent ESSER funding. Unspent ESSER represents the range from zero to the 95th percentile of predicted values for that variable from our first stage estimation. ESSER=Elementary and Secondary School Education Relief; FEC=formula-eligible children.

Figure 3. Predicted Filled Post Costs Across Unspent ESSER



Note. Markers represent predicted outcome values for the level of unspent ESSER from our 2SLS model in which we instrument for unspent ESSER with district FEC. Each panel presents results from a single-year estimation. Brackets around each marker represent 95% confidence intervals for those predicted values. The y-axis here represents the predicted total cost of filled teachers posts for a typical district in the indicated year across different amounts of unspent ESSER funding. Unspent ESSER represents the range zero to the 95th percentile of predicted values for that variable from our first stage estimation. ESSER=Elementary and Secondary School Education Relief; FEC=formula-eligible children.

Table 1. District Average Position Demand, Pay, and Projected Costs

Category	Year-specific averages			Panel averages		
	2022 average posts	2023 average posts	2024 average posts	Posts	Salary per position	Projected post costs
Administration	49.7	34.1	23.5	35.8	59,098	2,124,649
Athletics	68.9	62.1	46.3	59.1	18,420	1,318,383
Facilities	26.6	20.7	15.3	20.9	58,173	1,205,427
Food	31.0	25.5	20.7	25.7	25,798	682,048
Health	32.2	24.6	20.4	25.7	72,434	1,889,677
Other	89.0	60.5	53.7	67.7	25,704	2,320,797
Paraeducator	148.8	139.0	103.9	130.5	30,521	4,136,981
Principal	8.5	5.5	5.1	6.4	134,570	825,547
Superintendent	0.7	0.2	0.2	0.4	241,229	99,152
Teaching	137.3	103.7	95.3	112.0	89,108	10,179,742
Transportation	9.4	8.7	5.8	8.0	40,083	298,063
Total	602.1	484.6	390.3	492.0		25,080,468

Notes. The first three columns present the average number of filled posts in the typical district, by category, for each year of the panel. The final three columns present the average filled posts in a district, average salary for a position type, and projected post costs (i.e., the product of the prior two columns) averaged across the three years in our panel. Each cell is weighted by year-specific district enrollment.

Table 2. District-Year Characteristics, Weighted by Enrollment

	All Districts	Bottom Quartile ESSER districts	Top Quartile ESSER districts
City district (%)	39.40	13.24	52.07
Rural district (%)	7.53	3.38	7.97
Suburban district (%)	39.27	72.62	21.31
Town district (%)	13.80	10.76	18.65
District enrollment (1,000s)	14.99	13.25	17.54
	(12.00)	(8.94)	(10.76)
Underrepresented minority (%)	41.32	28.87	56.10
	(18.57)	(8.69)	(21.37)
English language learners (%)	12.48	7.22	19.24
	(9.49)	(4.29)	(11.90)
Special education (%)	14.51	13.21	15.28
	(2.27)	(2.38)	(2.09)
Free or reduced-price lunch (%)	46.31	27.92	66.98
	(20.53)	(13.08)	(11.91)
ESSER II & III allocations ($1,000,000s)	34.19	10.50	68.23
	(37.37)	(8.85)	(39.79)
ESSER II & III claims ($1,000,000s)	21.21	7.90	35.17
	(25.17)	(6.21)	(20.93)
District per pupil spending ($1,000s)	15.90	15.38	16.42
	(1.58)	(1.36)	(1.39)
Total filled job posts	543.90	373.85	777.01
	(401.04)	(226.70)	(484.39)
Administration filled posts	47.00	34.10	72.58
	(42.21)	(23.44)	(63.50)
Athletics filled posts	57.89	45.94	104.03
	(48.94)	(28.68)	(75.44)
Facilities filled posts	24.56	20.73	36.80
	(25.25)	(15.63)	(39.42)
Food services filled posts	29.65	18.91	46.62
	(31.25)	(22.61)	(34.28)
Health filled posts	26.34	19.21	29.10
	(20.26)	(11.07)	(16.96)
Other filled posts	75.39	35.76	127.60
	(110.11)	(21.60)	(160.43)
Paraeducator filled posts	132.07	94.58	155.55
	(106.36)	(80.81)	(115.12)
Principal filled posts	7.94	7.38	9.91
	(7.65)	(7.87)	(9.68)
Superintendent filled posts	0.67	0.44	0.97
	(0.87)	(0.68)	(1.07)
Teacher filled posts	135.36	91.84	186.02
	(125.49)	(71.77)	(113.69)
Transportation filled posts	7.04	4.95	7.82
	(10.80)	(5.32)	(10.16)
N	276	69	69

Note. All averages are weighted by district enrollment. The first column presents average characteristics across all observed districts. The second column reports averages for districts in the bottom quartile of total ESSER allocations per pupil; the final column reports averages for districts in the top quartile of total ESSER allocations per pupil. Underrepresented minority category includes American Native, Black, Hispanic, and Multiracial students.

Table 3. First Stage Results Predicting District-By-Year Unspent ESSER Funds ($10,000s)

	(1)
Formula-eligible children	1.87***
	(0.21)
N	856
Adjusted R^2	0.85
Instrument *F*-stat	78.45

Notes. *$p<.10$; **$p<.05$; ***$p<.01$. We report standard errors, clustered by district, in parentheses. All models are weighted by enrollment and include the following district-year-level controls: district enrollment (cubic), 2019-20 district revenue, the number of free/reduced-price eligible students, the number of URM students, average SBAC scores, standardized difference in student enrollment from the prior year, average unemployment in the surrounding county, attrition of teaching staff relative to the prior year, attrition of nonteaching staff relative to the prior year, indicators for district urbanicity, total new hires as of the prior October, and log distance to the nearest teacher education program. All models include year fixed effects.

Table 4. Naïve Associations Between Unspent ESSER Funds and Hiring Outcomes

	OLS	**Seemingly unrelated regression**										
	Total	Admin	Athletic	Facilities	Food services	Health	Other	Para-educator	Principal	Super-intendent	Teachers	Transport
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Panel A. Filled posts							
Unspent ESSER	0.042***	0.008***	0.004***	0.003***	0.002***	-0.000	0.007***	0.005***	0.000***	0.000***	0.014***	-0.000**
funds ($10,000s)	(0.011)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
n	856	856										
					Panel B. Filled post costs ($10,000s)							
Unspent ESSER	0.015***	0.043***	-0.043***	0.016***	0.004***	-0.003*	0.020***	0.009**	0.003***	0.001***	0.091***	-0.001**
funds ($10,000s)	(0.003)	(0.001)	(0.004)	(0.001)	(0.001)	(0.002)	(0.005)	(0.004)	(0.001)	(0.000)	(0.008)	(0.000)
n	856	856										

Notes. *p<.10; **p<.05; ***p<.01. We report standard errors, clustered by district, in parentheses. All models are weighted by enrollment and include the following district-year-level controls: district enrollment (cubic), 2019-20 district revenue, the number of free/reduced-price eligible students, the number of URM students, average SBAC scores, standardized difference in student enrollment from the prior year, average unemployment in the surrounding county, attrition of teaching staff relative to the prior year, attrition of nonteaching staff relative to the prior year, total new hires as of the prior October, indicators for district urbanicity, log distance to the nearest teacher education program, a control for ESSER funds expended as of the prior July, and year fixed effects.

Table 5. Estimated Impacts of ESSER on Hiring Outcomes

Outcome	Filled posts		Filled post costs ($10,000s)	
Specification	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
Panel A. All job categories				
Unspent ESSER funds ($10,000s)	0.042***	0.020	0.139**	0.057
	(0.011)	(0.024)	(0.068)	(0.116)
n	856	856	856	856
Panel B. Teaching positions				
Unspent ESSER funds ($10,000s)	0.015***	0.019**	0.110***	0.150**
	(0.003)	(0.008)	(0.032)	(0.068)
n	856	856	856	856

Notes. **p<.10; **p<.05; ***p<.01*. We report standard errors, clustered by district, in parentheses. All models are weighted by enrollment and include the following district-year-level controls: district enrollment (cubic), 2019-20 district revenue, the number of free/reduced-price eligible students, the number of underrepresented minority students, average SBAC scores, standardized difference in student enrollment from the prior year, average unemployment in the surrounding county, attrition of teaching staff relative to the prior year, attrition of nonteaching staff relative to the prior year, total new hires as of the prior October (total teacher hires in Panel B estimates), indicators for district urbanicity, and log distance to the nearest teacher education program. All models include year fixed effects. Unspent ESSER funds are grant balances as of the prior July. The 2SLS specification in columns 2 and 4 use district formula-eligible children to instrument for unspent ESSER funding. 2SLS=two-stage least squares; FEC=formula-eligible children; OLS=ordinary least squares; SBAC=Smarter Balance Assessment Consortium (test scores).

Appendix A. Aligning S-275 Activity Codes with Job Posting Categories

To estimate typical costs per position type at the district-level, we have assigned activity codes in the S-275 to the 11 position categories we created for our job posting data. We also assign individuals within each activity code an indicator for certificated staff or classified staff because some activity codes (e.g., 27 Teaching) include multiple job posting categories that can be distinguished by their certification status. In the example of teaching, classroom teachers are identified as certificated staff whereas paraprofessionals are classified as teaching staff.

Table A.1 Assignment of activity codes to job posting categories

Activity Code	Classified / Certificated	Position Category
11 – Board of Directors	Classified	Administration
	Certificated	Administration
12 – Superintendent's Office	Classified	Administration
	Certificated	Superintendent
13 – Business Office	Classified	Administration
	Certificated	Administration
14 – Human Resources	Classified	Administration
	Certificated	Administration
15 – Public Relations	Classified	Administration
	Certificated	Administration
21 – Teaching & Learning Supervision	Classified	Teaching
	Certificated	Teaching
22 – Learning Resources	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
23 – Principal's Office	Classified	Administration
	Certificated	Principal
24 – Guidance & Counseling	Classified	Health
	Certificated	Health
25 – Pupil Management & Safety	Certificated	Other (nonteaching)
	Classified	Other (nonteaching)
26 – Health & Related Services	Classified	Health
	Certificated	Health
27 –Teaching	Classified	Paraeducator
	Certificated	Teaching
28 – Extracurricular	Classified	Athletics
	Certificated	Athletics
31 – Instructional Professional Development	Classified	Other (nonteaching)

	Certificated	Other (nonteaching)
32 – Instructional Technology	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
33 – Curriculum	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
41 – Food Service Supervision	Classified	Food Service
	Certificated	Food Service
44 – Food Service Operations	Classified	Food Service
	Certificated	Food Service
51 – Transportation Supervision	Classified	Transportation
	Certificated	Transportation
52 – Transportation Operations	Classified	Transportation
	Certificated	Transportation
53 – Transportation Maintenance	Classified	Transportation
	Certificated	Transportation
58 – Remote Learning	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
61 – Building Supervision	Classified	Facilities
	Certificated	Facilities
62 – Grounds Maintenance	Classified	Facilities
	Certificated	Facilities
63 – Operation of Buildings	Classified	Facilities
	Certificated	Facilities
64 – Building Maintenance	Classified	Facilities
	Certificated	Facilities
67 – Building and Property Security	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
72 – Information Systems	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
73 – Printing	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
74 – Warehousing & Distribution	Classified	Facilities
	Certificated	Facilities
75 – Motor Pool	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)
91 – Public Activities	Classified	Other (nonteaching)
	Certificated	Other (nonteaching)

Appendix B. Lower-Bound Position Cost Estimation Method and Results

Our main results use the average salary for each position category in Washington state in a year—where we bin all staff into categories according to the activity code and classified/certified status described in Appendix A. Averages are calculated at the district-level and only account for the portion of the salary that is attributable to the indicated position, allowing us to disentangle the portion of individual pay coming from their work as an athletic coach from the portion coming from their work as a teacher. It is possible, however, that when we scale counts of filled posts by these salary estimates we might overstate the costs of these positions because newly hired staff may be entering the salary schedule at a lower pay grade than the average staff member.

In this appendix, we present results using an alternative measure of salaries to estimate posted position costs which we call "lower-bound post costs." We construct the salary estimates using similar methods to those described above, with two exceptions. First, instead of using the average positions salary of all staff in a district in a category, we here use average salaries among employees who were not working in their observed district and category in the year prior. Second, we calculate the average salary amongst these newly hired staff within an Education Service District (ESD), category, and year. Washington state is divided into nine ESDs which were the 295 school districts in the state. We use this larger grouping because it captures regional differences in cost of living and pay while also avoiding missingness in the data if we calculated these averages within each district, category, and year. Table B1 repeats the structure of Table 1, summarizing the lower-bound position costs for each category in the average district. Table B2

presents results for the SUR estimation for lower-bound post costs, and Table B3 replicates our OLS and IV models for this outcome.

Table B1. District-Year Average Position Demand, Pay, and Projected Costs

Category	Average number of filled posts	Lower-bound salary per position ($)	Lower-bound projected post costs ($)
Administration	35.8	46,287	1,656,682
Athletics	59.1	4,496	259,003
Facilities	20.9	48,728	987,382
Food	25.7	17,376	437,608
Health	25.7	54,393	1,371,522
Other	67.7	11,877	880,697
Paraeducator	130.5	27,097	3,542,651
Principal	6.4	85,552	512,890
Superintendent	0.4	160,647	60,139
Teaching	112.0	67,845	7,517,068
Transportation	8.0	29,929	224,967
Total	492.0		17,450,612

Notes. Each cell presents the average outcome measure for each job category, weighted by district enrollment for all district-year observations in our sample (n=856). Projected post costs are the district-by-year-by-category product of the number of posts an estimate of position salary.

Table B2. Seemingly Unrelated Regression Associations Between Unspent ESSER Funds and Lower-Bound Post Costs ($10,000s)

	Admin	Athletic	Facilities	Food services	Health	Other	Para-educator	Principal	Super-intendent	Teachers	Transport-ation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Unspent ESSER funds ($10,000s)	0.037***	0.001***	0.011***	0.001***	-0.005***	0.006***	0.004	0.003***	0.001***	0.056***	-0.001**
	(0.002)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.004)	(0.001)	(0.000)	(0.006)	(0.000)
n	856										

Notes. *p<.10; **p<.05; ***p<.01. We report standard errors, clustered by district, in parentheses. All models are weighted by enrollment and include the following district-year-level controls: district enrollment (cubic), 2019-20 district revenue, the number of free/reduced-price eligible students, the number of URM students, average SBAC scores, standardized difference in student enrollment from the prior year, average unemployment in the surrounding county, attrition of teaching staff relative to the prior year, attrition of nonteaching staff relative to the prior year, indicators for district urbanicity, log distance to the nearest teacher education program, a control for ESSER funds expended as of the prior July, and year fixed effects.

Table B3. Estimated Impacts of ESSER Lower-Bound Filled Post Costs ($10,000s)

Specification	OLS	2SLS
	(1)	(2)
Panel A. All job categories		
Unspent ESSER funds ($10,000s)	0.114**	0.042
	(0.047)	(0.092)
n	856	856
Panel B. Teaching positions		
Unspent ESSER funds ($10,000s)	0.062**	0.093*
	(0.028)	(0.051)
n	856	856

Notes. **p<.10; **p<.05; ***p<.01*. We report standard errors, clustered by district, in parentheses. All models are weighted by enrollment and include the following district-year-level controls: district enrollment (cubic), 2019-20 district revenue, the number of free/reduced-price eligible students, the number of underrepresented minority students, average SBAC scores, standardized difference in student enrollment from the prior year, average unemployment in the surrounding county, attrition of teaching staff relative to the prior year, attrition of nonteaching staff relative to the prior year, indicators for district urbanicity, and log distance to the nearest teacher education program. All models include year fixed effects. Unspent ESSER funds are grant balances as of the prior July. The 2SLS specification in column 2 uses district formula-eligible children to instrument for unspent ESSER funding. 2SLS=two-stage least squares; FEC=formula-eligible children; OLS=ordinary least squares; SBAC=Smarter Balance Assessment Consortium (test scores).