Evaluating the Relationship Between State Teacher Salary Allotment Types and Levels of Teacher Sorting

Prepared for the North Carolina Justice Center Education and Law Project

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Executive Summary

North Carolina is one of eight states that funds its K–12 public schools using a "resource allocation" model in which districts receive funding through different categorical allotments Each allotment has its own formula, and the funding is usually earmarked for a specific purpose.

One of the most contentious of these allotments is the one for classroom teacher salaries, which made up almost half of all state-allotted education expenditures in the 2017–18 fiscal year. Instead of providing districts with a lump sum to pay teacher salaries, the state of North Carolina allocates a set number of teaching positions to each district and commits to paying the full salary and benefit amounts for those positions.

In a 2016 report, the North Carolina General Assembly's Program Evaluation Division found that North Carolina's use of a position allotment resulted in a distribution of resources that favored wealthy counties and led to teacher sorting, where more qualified teachers are concentrated in high-wealth districts and less-qualified teachers are concentrated in low-wealth districts. The PED used this finding to recommend that North Carolina fund teacher salaries through a dollar allotment instead of through a position allotment; however, there has been little research into whether levels of teacher sorting are actually lower in dollar-allotment states.

In this paper, I try to evaluate the relationship between the type of teacher salary allotment a state uses and the level of teacher sorting in that state. To do this, I regress three different measures of teacher quality—the percentage of novice teachers, the percentage of certified teachers, and the percentage of chronically absent teachers—onto district-level child poverty rates and onto district-level child poverty rates interacted with the type of teacher salary allotment. This allows me to statistically test whether the relationship between child poverty rates and teacher characteristics differs based on the type of teacher salary allotment a state uses.

I use publicly available federal data from the U.S. Department of Education and the U.S. Census Bureau and run 12 multivariate regression models with different controls.

I find positive relationships between a district's child poverty rate and both its percentage of novice teachers and its percentage of chronically absent teachers and a negative relationship between child poverty and the percentage of certified teachers. However, there are no statistically significant differences in the relationship between child poverty and teacher sorting across states using dollar allotments versus those using position allotments.

Policy Question

Is the phenomenon of "teacher sorting," where more highly qualified teachers are concentrated in higher-wealth school districts and less qualified teachers are concentrated in lower-wealth school districts, correlated with the type of teacher salary allotment a state uses?

School Finance in North Carolina

Historical Background

North Carolina's 1868 constitution laid out the state's commitment to public education, guaranteeing "the right to the privilege of education" for all children and confirming that it was the state's duty to "guard and maintain that right" ("North Carolina Constitution" 1868). However, the General Assembly's involvement in school finance was initially limited: the state would pass legislation allowing counties to issue bonds, but counties were responsible for raising the necessary money (Walls 1998).

By 1931, the state realized this model wasn't sustainable. Counties had been hit hard by the Great Depression, and they no longer had the capacity to keep schools open without additional support. That year, the General Assembly put forward the School Machinery Act, which provided a minimum level of funding to every county in the state to cover the cost of operating schools (North Carolina Department of Public Instruction 1993, 14).

Counties still needed to fund school construction and maintenance, but all other costs fell to the state—a dramatic reversal from the previous system and one that ensured that North Carolina didn't have to close any public schools because of the Depression (Davis 2010). That legislation also set the stage for the current school funding system, where the state provides more than 60% of funding for public school expenditures (North Carolina Department of Public Instruction 2019, 4).

Current Model

Today, North Carolina is one of eight states that fund K–12 public schools using a "resource allocation" model (Dachelet 2019). Unlike the more common "foundation formula" model, where states set a minimum amount that must be spent per student and fill in the gap if districts cannot meet that minimum, states using resource allocation models fund districts through different categorical allotments, each of which has its own formula, with funding earmarked for a specific purpose (North Carolina Association of School Administrators 2017, 2–3). Taken together, these allotments make up the pool of state funding districts then distribute to individual

schools. By some counts, North Carolina has almost 40 different allotments supporting everything from textbooks to transportation (North Carolina Association of School Administrators 2017, 2–3).

The largest and most unique of these allotments is the one for classroom teacher salaries, which was almost 44 percent of all state-allotted education expenditures in the 2017–18 fiscal year (North Carolina Department of Public Instruction 2019, 5). Teacher salaries in North Carolina are funded through position allotments, meaning districts are given a set number of positions, or "months of employment," and the state commits to paying the full salary and benefit amounts for those positions (see Table 1, below, for the allotted student-teacher ratios in FY 2018–19) (North Carolina Association of School Administrators 2017, 2–3).

Table 1. Number of students per state-allotted teaching position, by grade span.

Grades	Students per Teacher
K	18
1	16
2–3	17
4–6	24
7–8	23
9	26.5
10–12	29

Proponents of this model argue that position allotments enable districts to hire the most qualified candidates for every position without needing to take salary into consideration: a veteran teacher with decades of experience and Board certification costs a district the same amount—one position—as a brand new teacher (North Carolina Association of School Administrators 2017, 4). By contrast, states using dollar allotments give districts a set amount of funding that is then used to pay for a range of expenses, including teacher salaries.

Regardless of the type of allotment that is used, many districts choose to supplement state funding for teacher salaries with local funds. This can put lower-wealth districts, which may not have the tax base or property wealth needed to raise funds locally, at a disadvantage when it comes to recruiting highly qualified teachers (Childress 2019).

The *Leandro* Decision and Its Effects

In 1994, plaintiffs in five rural, low-wealth North Carolina counties filed a lawsuit, *Leandro v. State*, arguing that the state's K–12 funding model denied students in lower-wealth districts their constitutional right to an adequate education.

In 2002, a judge ruled in favor of the plaintiffs and ordered the state to provide three things:

1. Well-trained teachers in every classroom,
2. A well-trained principal in every school, and
3. The necessary resources to ensure that all children "have an equal opportunity to obtain a sound basic education."

Since that ruling, there have been annual hearings to determine whether the state is meeting all three requirements, but there has been little substantive progress. (Lecker 2018)

As part of its 2015–17 work plan and in response to ongoing conversations around the *Leandro* ruling, the Program Evaluation Division (PED) of the North Carolina General Assembly was asked to take an in-depth look at school funding in North Carolina (Program Evaluation Division 2016, i). The PED analyzed allotment and expenditure data; interviewed school administrators, school finance experts, and staff at the North Carolina Department of Public Instruction; surveyed all local education agencies (LEAs) and charter schools; and conducted extensive reviews of current policies and other state models (Program Evaluation Division 2016, 2).

In November 2016, the PED submitted its final report to the General Assembly, which included 12 specific findings about school funding in the state (Program Evaluation Division 2016, 1). Its first finding was about the classroom teacher allotment—specifically that North Carolina's use of position allotments resulted in a "distribution of resources across LEAs that favors wealthy counties" (Program Evaluation Division 2016, 14).

The PED argued that the *number* of positions was allotted equitably to all LEAs; however, because teacher salaries are determined through the statewide salary schedule, which uses teacher experience, education, and certification to determine actual salary amounts, the calculated *value* of the allotments differed: in the 2014–15 fiscal year, for example, Hoke County Schools received an average of $53,402 per teacher from the state position allotment, while Dare County Schools received an average of $68,160 per teacher (Program Evaluation Division 2016, 17).

In its report, the PED argued that North Carolina's use of position allotments exacerbated the issue of teacher sorting (Program Evaluation Division 2016, 16). Research has shown that teachers with strong credentials are more likely to gravitate toward more affluent schools with

more advantaged students (Program Evaluation Division 2016, 15). In states using dollar allotments, districts need to juggle various budgetary priorities, and spending more money on teacher salaries can mean spending less on other expenses. However, in states using position allotments, districts have a potentially unlimited pool of funding, because the state covers the full salary and benefit amounts for whichever teachers a district chooses to hire.

Position allotments could therefore increase the level of teacher sorting in a state by enabling affluent districts to hire as many highly qualified teachers as they can, without worrying about the impact those teachers' salaries would have on the district's budget. Dollar allotments—at least in theory—could instead incentivize affluent districts to hire teachers with a mix of qualifications and experience levels as a way to save money for other uses.

The PED used its findings to recommend that the state convert funding for classroom teacher salaries from a position allotment to a dollar allotment (Program Evaluation Division 2016, 19). More specifically, the PED suggested multiplying the number of teachers that LEAs receive through the current allotment formula by the average of all teacher salaries paid through the current allotment (Program Evaluation Division 2016, 19). Every district would therefore get the same amount in teacher funding per student.

However, what the PED report does not address—and what my client hopes this project will help answer—is whether dollar allotments actually result in less teacher sorting than position allotments, as the PED theorized. States using dollar allotments and foundation formulas also experience teacher sorting, and even states that are actively trying to target funding to at-risk student populations have not succeeded at eliminating funding disparities altogether (North Carolina Association of School Administrators 2017, 47).

The WestEd Report

In February 2018, Superior Court Judge David Lee appointed an "independent, non-party consultant" to develop recommendations that would help the state meet its constitutional obligations to provide a sound basic education to all. The plaintiffs and state defendants jointly nominated WestEd to develop the *Leandro* Action Plan, with additional contributions from the Learning Policy Institute and the Friday Institute for Educational Innovation at North Carolina State (WestEd 2019, 2).

WestEd staff spent more than a year analyzing data, conducting interviews, and meeting with stakeholders, with the goal of developing a plan that would include actionable recommendations to help the state meet the three *Leandro* requirements (WestEd 2019, 4). It submitted its final recommendations to Judge Lee in June 2019, and Judge Lee made the recommendations public in December 2019.

The final report identified eight "critical needs," seen in Figure 1 below. Overall, WestEd recommended the state invest an additional $8 billion over the next eight years to meet its *Leandro* obligations: $3.2 billion for short-term K–12 operating expenditures, $3.7 billion for ongoing K–12 operating expenditures, and $1.2 billion for early childhood education (WestEd 2019, 138).

Figure 1. The eight critical need areas identified in WestEd's Leandro *Action Plan.*

WestEd and its partners also offered specific findings and recommendations for each of the need areas. With regard to the classroom teacher allotment, WestEd confirmed the PED's findings that wealthier districts receive more through the allotment, on average, than lower-wealth districts; however, the district chief financial officers they interviewed were largely supportive of the allotment and believed it allowed school leaders to hire more qualified teachers (WestEd 2019, 38). In its sequenced action plan, WestEd therefore recommended that the state keep the classroom teacher allotment but allow for more flexibility in how districts can use that funding (WestEd 2019, 140).

Literature Review

There is evidence that measures of teacher quality—specifically, years of teaching, selectivity of undergraduate education programs, teacher test scores, and teacher licensure—are associated with higher student achievement; however, higher-poverty schools have less qualified teachers than lower-poverty schools, and teachers tend to move over the course of their careers from schools with large poor or minority populations to schools that are more affluent (Jackson 2009, 214). The phenomenon of teacher sorting, where more qualified teachers are concentrated in higher-wealth districts and less qualified teachers are concentrated in lower-wealth districts, can therefore negatively affect outcomes for disadvantaged student populations.

These perceived negative effects of teacher sorting have led researchers to look deeply at the phenomenon itself. Much of the analysis on teacher sorting has been done within states as opposed to across states, meaning little attention has been paid to possible differences associated with using one type of salary allotment over another. However, the within-state comparisons are still useful in demonstrating the prevalence of teacher sorting and its possible effects on student achievement.

Prevalence of Teacher Sorting

In 2000, the Public Policy Institute of California (PPIC) issued a report titled "Equal Resources, Equal Outcomes? The Distribution of School Resources and Student Achievement in California." PPIC found that there were significant disparities between schools in the levels of teacher education and experience and in the percentage of teachers lacking state-approved credentials. For example, while there was almost no difference in average class size between the 25th- and 75th-percentile schools, there was a 19-percentage-point difference in the number of teachers lacking a full credential (Betts, Rueben, and Danenberg 2000, ix).

PPIC also found that urban schools in California had higher percentages of novice teachers, teachers with a bachelor's degree or less, and teachers without full credentials than suburban or rural schools (Betts, Rueben, and Danenberg 2000, xiii). This difference was especially striking when looking at education levels: more than 25 percent of teachers in urban schools had a bachelor's degree or less, compared to 12 percent in suburban schools and 11 percent in rural schools (Betts, Rueben, and Danenberg 2000, xiv). Similar findings emerged when looking at socioeconomic status (SES), with the lowest-SES schools having less experienced and less educated teachers than the highest-SES schools (Betts, Rueben, and Danenberg 2000, xv). PPIC argued that these inequalities were not a result of intentional spending decisions at the school or district level but rather because there were "have-not" schools that had less of all the measures PPIC was analyzing (Betts, Rueben, and Danenberg 2000, xii).

Lankford, Loeb, and Wyckoff identified similar patterns when looking at teacher data for New York state. The researchers analyzed teacher quality on a number of attributes and found that some schools had considerably more qualified teachers than others and that nonwhite and poor students—particularly those in urban areas—were more likely to have less qualified teachers (Lankford, Loeb, and Wyckoff 2002, 54). Additionally, schools with teachers considered low quality in one attribute were more likely to have teachers that were low quality in all other attributes (Lankford, Loeb, and Wyckoff 2002, 42).

The researchers also proposed four possible reasons as to why teacher characteristics might vary across schools—all of which could apply to other states as well:

1. Residents may have different preferences, and different schools may try to hire different types of teachers depending on the needs of that community.
2. There may be variation in how efficient district hiring practices are. Districts that are more aggressive or that offer jobs earlier in the year may recruit higher-quality teachers.
3. Schools may exert different levels of political power. Parent groups, for example, may be more effective at getting low-quality teachers transferred or fired at some schools than at others.
4. Teachers have preferences about what and where to teach, and those preferences may be influenced by salary, class size, amount of preparation time, school facilities, and student characteristics. (Lankford, Loeb, and Wyckoff 2002, 38–39)

Effects on Student Achievement

Teacher quality—particularly certification and years of experience—has been shown to impact student achievement. A 2000 study by Goldhaber and Brewer used data from the National Education Longitudinal Study of 1988 to look at 12th-grade student performance in classrooms with teachers with standard certifications and non-standard certifications (emergency, private, or no certification) (Goldhaber and Brewer 2000, 133). They found that having a teacher with a standard certification in math resulted in a 1.3-point increase in math test scores compared to having a teacher with a private or out-of-subject certification. The size of this increase was slightly larger than the effect of having a teacher with a bachelor's or master's degree in math (Goldhaber and Brewer 2000, 139). In 2016, the Learning Policy Institute reviewed 30 additional studies that had been published within the last 15 years and found positive and statistically significant relationships between teachers with seven or more years of experience and student achievement (Kini and Podolsky 2016, 16).

These effects are particularly salient when discussing achievement among disadvantaged student populations, as studies on teacher sorting consistently find that nonwhite and poor students have less experienced teachers who are certified at lower rates (Lankford, Loeb, and Wyckoff 2002,

54). A 2005 study found that districts in North Carolina with high proportions of minority students had higher proportions of novice teachers (those with zero to three years of experience) than districts with fewer minority students (Clotfelter, Ladd, and Vigdor 2005, 381; North Carolina Department of Public Instruction 2015, 4). The researchers hypothesized that black students' increased exposure to novice teachers resulted in lower achievement for those students and partially contributed to the black-white achievement gap (Clotfelter, Ladd, and Vigdor 2005, 391).

Researchers identified similar patterns when analyzing three large urban school districts, finding that black, Hispanic, poor, and low-achieving students were more likely to be taught by novice teachers (Kalogrides and Loeb 2013, 313). A 2015 study of districts in Washington state found similar effects when looking at teacher experience, licensure exam scores, and value-added estimates of effectiveness: teacher quality was "inequitably distributed among every indicator of student disadvantage—free/reduced price lunch status, underrepresented minority, and low prior academic performance," with disadvantaged students more likely to be taught by low-quality teachers (Goldhaber, Lavery, and Theobald 2015, 293).

Data

I collected most of the data listed below from federal databases in order to eliminate state-level variations in the type or amount of data collected and make cross-state comparisons easier. I then combined the datasets by matching on each district's unique NCES identifier.

State Selection

To ensure appropriately large sample sizes, I first wanted to identify two states that used state-level position allotments to fund teacher salaries and two states that used state-level dollar allotments.

Identifying states using position allotments was the more difficult task, as dollar allotments are the most common way of funding teacher salaries in the United States. After conversations with Michael Griffith, former School Finance Strategist with Education Commission of the States, and a number of state departments of education, I selected North Carolina and West Virginia as the states with the most traditional position allotment systems (North Carolina Department of Public Instruction 2018, 57; West Virginia Department of Education n.d., 1).

To make valid cross-state comparisons, I then needed to identify two states using dollar allotments that were as similar to North Carolina and West Virginia as possible. I used a combination of the following three resources to assess state similarity:

- A nearest-neighbor analysis using 19 dimensions of political salience, including per capita income, race/ethnicity, and unemployment rate (Silver 2008);
- A 50-state survey of school finance policies and programs, compiled by Dr. Deborah A. Verstegen at the University of Nevada, Reno (Verstegen 2018); and
- The "state share" of public school revenue, which is the percentage of revenue public schools receive from the state (National Center for Education Statistics 2018). Dr. Eric Houck, an expert on education finance at the University of North Carolina at Chapel Hill, recommended this metric for inclusion.

I also looked at whether states reported data on charter schools separately from data on traditional public schools. Because charter schools in North Carolina receive all of their funds through dollar allotments, not position allotments (Nordstrom 2017, 17), I needed to be able to exclude charter school data from my final analysis.

Ultimately, I had to make a qualitative decision about which characteristics were most important to consider for my analysis. On the advice of Dr. Houck and other school finance experts, I prioritized finding states with similar "state shares" to North Carolina and West Virginia that reported charter school data separately. I then used the Verstegen survey to confirm that those states were dollar-allotment states. If multiple states met those criteria, I used the nearest-neighbor analysis to narrow the pool down to only the most similar.

For the purposes of this analysis and using the method listed above, I determined that Michigan was the dollar-allotment state most similar to North Carolina and Kentucky was the dollar-allotment state most similar to West Virginia.

Analytic Sample

The analytic sample consisted of 115 traditional public school (TPS) districts in North Carolina, 55 TPS districts in West Virginia, 535 TPS districts in Michigan, and 162 TPS district in Kentucky, for a total of 867 districts.

Teacher Quality Measures

Because there is no federally reported aggregate measure of the level of teacher sorting in a district, I used measures from the 2015 U.S. Department of Education's Civil Rights Data Collection (CRDC) "Staff" report as proxies. This report includes district-level information on the total number of teachers, the number of teachers in their first year of teaching, the number of teachers in their second year of teaching, the number of teachers with state certification, and the number of teachers absent 10 or more days each school year. These metrics—particularly teacher experience and teacher certification—have been used in prior studies to assess levels of teacher sorting and are also associated with student performance.

I used these data to create three new variables for inclusion in my regression equations:

1. The percentage of novice teachers in each district (the sum of teachers in their first year and teachers in their second year divided by the total number of teachers)
2. The percentage of certified teachers (the number of teachers with state certification divided by the total number of teachers)
3. The percentage of chronically absent teachers (the number of teachers absent 10 or more school days divided by the total number of teachers)

I then multiplied each of these variables by 100 to make the regression results easier to interpret.

District Poverty Measure

I also collected data on district-level poverty. Although many analytic studies use the percentage of students who qualify for free or reduced-price lunch (FRPL) as a proxy measure for district poverty, the FRPL measure is becoming increasingly inaccurate. Community Eligibility means more schools are able to offer free lunches to all their students, even those from families earning more than 185 percent of the federal poverty line (Snyder and Musu-Gillette 2015).

I chose to instead use the Small Area Income and Poverty Estimates (SAIPE) available through the U.S. Census Bureau. These data are single-year estimates of the number of school-age children in poverty for all 13,000+ school districts in the United States and may provide a more accurate picture of district-level poverty than FRPL. For this analysis, I relied on the "Ages 5 to 17 in Families (by school district)" report for my four target states in the year 2013.

District Characteristics

For some regression models, I included district-level characteristics as control variables.

I collected much of these data from the U.S. Department of Education's National Center for Education Statistics' Elementary/Secondary Information System (ElSi). Specifically, I used the 2014–15 school year report on the number of students in different race/ethnicity categories (American Indian/Alaska Native, Asian or Asian/Pacific Islander, Hispanic, Black, White, and Hawaiian Native); the number of students who were classified as limited English proficient or English language learners; the number of students with individualized education programs; and the number of students who qualified for free or reduced-price lunch.

To make comparisons across districts and states easier, I created variables for each of the above group's percentage of the total student population by dividing the total for each demographic by the total number of students in the district and multiplying by 100.

I also wanted to include counselor-to-student ratio as a control variable. The CRDC database reports the total number of counselors in each district, so I divided this number by the total number of students in a district to get a ratio. See Table 2 below for mean values for each included variable, separated by state.

Table 2. State and district characteristics, by state and allotment type.

	Position Allotment		Dollar Allotment	
	North Carolina	West Virginia	Michigan	Kentucky
State Characteristics				
Number of districts[†]	115	55	535	162
District Characteristics				
Number of teachers	945.47	344.80	135.17	252.00
	(1584.10)	(309.38)	(200.44)	(1818.26)
Percent novice teachers	9.08	11.08	7.49	10.88
	(4.97)	(4.26)	(9.03)	(6.13)
Percent certified teachers	97.92	95.93	99.26	99.51
	(2.95)	(4.08)	(5.13)	(1.31)
Percent absent teachers	4.91	4.98	3.67	5.13
	(2.40)	(1.72)	(7.21)	(3.16)
Child poverty rate	27.45	24.69	19.90	28.43
	(7.55)	(5.70)	(9.32)	(9.60)
Counselor-to-student ratio	0.003	0.003	0.002	0.002
	(0.0007)	(0.003)	(0.001)	(0.0009)
Percent LEP	5.18	0.56	2.78	1.59
	(3.75)	(0.21)	(6.49)	(2.23)
Percent IEP	13.64	16.25	12.86	15.10
	(2.25)	(2.72)	(4.42)	(3.52)
Percent FRPL	66.38	47.70	48.78	60.63
	(19.48)	(7.66)	(18.63)	(13.42)
Percent American Indian	1.55	0.10	1.70	0.10
	(5.03)	(0.21)	(6.04)	(0.12)
Percent Asian	1.40	0.39	1.43	0.72
	(1.95)	(0.47)	(3.36)	(0.96)
Percent Hispanic	13.68	1.04	5.93	4.11
	(8.58)	(1.36)	(8.40)	(3.86)
Percent Black	24.41	2.58	7.39	5.04
	(21.23)	(2.93)	(16.27)	(7.83)
Percent White	55.40	94.32	80.61	87.01
	(22.13)	(5.14)	(20.70)	(12.80)
Percent Hawaiian	0.10	0.03	0.08	0.06
	(0.09)	(0.04)	(0.19)	(0.10)

[†] Represents the number of districts included in my analysis and differs slightly from the current number of school districts in Michigan and Kentucky. The difference is due to missing student characteristic data for some districts.

Econometric Model

I used the following multivariate regression model to assess whether the relationship between child poverty and teacher sorting differed by teacher salary allotment type at the state level:

$$Y_i = \beta_0 + \beta_1 Poverty_i + \beta_2 Position_i + \beta_3 (Poverty \times Position)_i + \beta_4 \boldsymbol{x} + \varepsilon_{ij},$$

where the outcome Y_i is the percentage of novice teachers, the percentage of certified teachers, or the percentage of chronically absent teachers in district *i*; $Poverty_i$ is the child poverty rate in district *i*; $Position_i$ is an indicator for whether school district *i* is located in a position-allotment state; $(Poverty \times Position)_i$ is an interaction term to allow for differential effects; and the vector $\boldsymbol{x}$ contains state indicator variables, as well as the district-level controls listed in Table 2.

The coefficient β_1 is the estimated treatment effect for states using dollar allotments, and the sum of β_1 and β_3 is the estimated treatment effect for states using position allotments. β_3 by itself shows whether the relationship between child poverty and teacher sorting differs between the two allotment systems.

Analysis

I ran different forms of this regression for each of the three proxy measures of teacher sorting as my outcome variable: percentage of novice teachers (those teaching for two years or fewer), percentage of teachers with state certification, and percentage of teachers absent more than 10 days in a school year.

For each outcome variable, the first specification includes no controls, the second includes state fixed effects, the third includes fixed effects and sociodemographic controls, and the fourth includes an interaction term. For all three sets of results, specification (4) is my preferred model because it directly addresses my research question. However, the other specifications give broader insight into the relationship between child poverty and teacher characteristics (and therefore teacher sorting) more generally.

Child Poverty and Percentage of Novice Teachers

Given the prior teacher sorting literature, I hypothesized that the relationship between the child poverty rate and the percentage of novice teachers would be positive, meaning that higher rates of child poverty in a district would be correlated with higher percentages of novice teachers.

The results of regressing the percentage of novice teachers onto district poverty are shown in Table 3, below. I initially ran a regression with no controls (column 1), and the results were significant at the 1 percent level: a 1 percentage point increase in a district's child poverty rate was associated with a 0.145 percentage point increase in a district's percentage of novice teachers.

After adding state fixed effects (column 2), the results were still statistically significant at the 1 percent level; however, the strength of the relationship diminished slightly: with state indicators, a 1 percentage point increase in a district's child poverty rate was associated with a 0.109 percentage point increase in a district's percentage of novice teachers.

Table 3. Relationship between child poverty rate and the percentage of novice teachers in a district.

	No controls	State fixed effects	Fixed effects and controls	Interaction term
	(1)	(2)	(3)	(4)
Child poverty	0.145***	0.109***	0.0713	0.119*
	(0.0354)	(0.0393)	(0.0654)	(0.0638)
Poverty × position				0.0844
				(0.0864)
Position				-1.828
				(2.055)
Observations	867	867	867	867
R^2	0.031	0.049	0.068	0.045
State indicator variables	No	Yes	Yes	No
Sociodemographic controls	No	No	Yes	Yes

Notes: Robust standard errors are in parentheses. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively. Child poverty is a continuous variable ranging from 0 to 100. Position is an indicator variable that takes on the value of 1 if a district is located in a position-allotment state and a 0 if a district is located in a dollar-allotment state. State indicator variables are dummy variables for each of the states included in this analysis, with the indicator taking on a value of 1 if a district is that state and a 0 if it is not. Sociodemographic controls include the counselor-to-student ratio, district enrollment, the percentage of students classified as limited English proficient or English language learners, the percentage of students with individualized

education programs, the percentage of students who qualify for free or reduced-price lunch, and the percentage of students who are American Indian/Alaska Native, Asian or Asian/Pacific Islander, Hispanic, Black, White, or Hawaiian Native.

Once I included sociodemographic controls (column 3), the relationship between a district's child poverty rate and its percentage of novice teachers became even smaller in magnitude and was no longer statistically significant.

Finally, I ran a regression that included an interaction term to account for possible differential effects of child poverty in dollar-allotment states and position-allotment states (column 4). In this regression, the coefficient on child poverty was statistically significant at the 10 percent level, indicating that a 1 percentage point increase in the child poverty rate was correlated with a 0.119 percentage point increase in the percentage of novice teachers in dollar-allotment states.

However, the coefficient on the interaction term itself was not statistically significant, so I cannot rule out the possibility that the effect of child poverty on the share of novice teachers is the same in dollar-allotment and position-allotment states.

Finally, even the most comprehensive regression model only has an R^2 value of 0.068, indicating that there are likely variables affecting the percentage of novice teachers in a district measure that were not captured in any of my regressions.

Child Poverty and Percentage of Certified Teachers

I expected that the relationship between the child poverty rate and the percentage of certified teachers would be negative, meaning that higher rates of child poverty in a district would be correlated with lower percentages of certified teachers.

The results of these regressions can be seen in Table 4, below. I first ran a regression with no controls (column 1), and the results were statistically significant at the 1 percent level: a 1 percentage point increase in a district's child poverty rate was correlated with a 0.025 percentage point decrease in a district's percentage of certified teachers.

This relationship was statistically significant at the 5 percent level after adding state indicators (column 2), though the effect was smaller: a 1 percentage point increase in the child poverty rate was associated with a 0.017 percentage point decrease in a district's percentage of certified teachers.

Table 4. Relationship between child poverty rate and the percentage of certified teachers.

	No controls	State fixed effects	Fixed effects and controls	Interaction term
	(1)	(2)	(3)	(4)
Child poverty	-0.0247***	-0.0169**	-0.00461	-0.00233
	(0.00927)	(0.00834)	(0.0144)	(0.0136)
Poverty × position				-0.0640
				(0.0464)
Position				-0.570
				(1.194)
Observations	867	867	867	867
R^2	0.003	0.044	0.049	0.040
State indicator variables	No	Yes	Yes	No
Sociodemographic controls	No	No	Yes	Yes

Notes: Robust standard errors are in parentheses. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively. Child poverty is a continuous variable ranging from 0 to 100. Position is an indicator variable that takes on the value of 1 if a district is located in a position-allotment state and a 0 if a district is located in a dollar-allotment state. State indicator variables are dummy variables for each of the states included in this analysis, with the indicator taking on a value of 1 if a district is that state and a 0 if it is not. Sociodemographic controls include the counselor-to-student ratio, district enrollment, the percentage of students classified as limited English proficient or English language learners, the percentage of students with individualized education programs, the percentage of students who qualify for free or reduced-price lunch, and the percentage of students who are American Indian/Alaska Native, Asian or Asian/Pacific Islander, Hispanic, Black, White, or Hawaiian Native.

After adding sociodemographic controls, the relationship between the child poverty rate and my teacher quality measure once again became smaller in magnitude and no longer statistically significant.

There were no statistically significant results in the regression that included an interaction term (column 4), so I again cannot rule out the possibility that the effect of child poverty on the percentage of certified teachers is the same in position-allotment and dollar-allotment states.

Child Poverty and Percentage of Chronically Absent Teachers

I expected that the relationship between the child poverty rate and the percentage of teachers absent 10 or more days in a school year would be positive, meaning that higher rates of child poverty in a district would be correlated with higher percentages of chronically absent teachers.

The results of these regressions are in Table 5, below. This relationship appears to be the weakest of the three proxies for teacher sorting that I have identified.

Table 5. Relationship between child poverty rate and the percentage of chronically absent teachers.

	No controls	State fixed effects	Fixed effects and controls	Interaction term
	(1)	(2)	(3)	(4)
Child poverty	0.0485*	0.0264	-0.0300	-0.00915
	(0.0251)	(0.0267)	(0.0410)	(0.0418)
Poverty × position				0.0478
				(0.0441)
Position				-0.786
				(0.936)
Observations	867	867	867	867
R^2	0.006	0.014	0.030	0.022
State indicator variables	No	Yes	Yes	No
Sociodemographic controls	No	No	Yes	Yes

Notes: Robust standard errors are in parentheses. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively. Child poverty is a continuous variable ranging from 0 to 100. Position is an indicator variable that takes on the value of 1 if a district is located in a position-allotment state and a 0 if a district is located in a dollar-allotment state. State indicator variables are dummy variables for each of the states included in this analysis, with the indicator taking on a value of 1 if a district is that state and a 0 if it is not. Sociodemographic controls include the counselor-to-student ratio, district enrollment, the percentage of students classified as limited English proficient or English language learners, the percentage of students with individualized education programs, the percentage of students who qualify for free or reduced-price lunch, and the percentage of students who are American Indian/Alaska Native, Asian or Asian/Pacific Islander, Hispanic, Black, White, or Hawaiian Native.

The regression with no controls (column 1) indicated a statistically significant positive relationship at the 10 percent level: a 1 percentage point increase in the child poverty rate was associated with a 0.049 percentage point increase in the percentage of chronically absent teachers.

However, this relationship was no longer statistically significant once state indicators were added (column 2). The addition of sociodemographic controls (column 3) and an interaction term (column 4) once again diminished the magnitude of the relationship, and the results were still not statistically significant. Again, the lack of statistical significance on the interaction term coefficient means I cannot rule out the possibility that the effect of child poverty on the

percentage of chronically absent teachers (those absent 10 or more days in a school year) are the same in dollar-allotment and position-allotment states

Discussion

In conducting this analysis, I wanted to determine whether there was a statistically significant difference in the relationship between child poverty and teacher sorting (using three proxy measures of teacher quality) across states using dollar allotments to fund teacher salaries versus those using position allotments.

For all three outcome variables—percentage of novice teachers, percentage of certified teachers, and percentage of chronically absent teachers—any statistically significant relationships I observed in the more basic regression models disappeared after controls were added, indicating that district-level observables explained the correlation between child poverty and the level of teacher sorting.

However, the coefficient of interest is the one on the interaction term, as seen in specification (4) for each of the outcome variables. In all three models, the coefficients on the interaction terms were not statistically significant, which means I cannot rule out the possibility that the effect of child poverty on a district's level of teacher sorting is the same between position-allotment states and dollar-allotment states.

This finding demonstrates that the type of teacher salary allotment a state uses may not affect the level of teacher sorting in a state. Other factors, including observable district characteristics, likely play a much larger role.

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