Explaining the Variation[1] in Non-Classroom Staff in Texas Public Schools

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Abstract

This paper begins to address a gap in the education literature regarding non-classroom staff. I study non-classroom staff across Texas and find substantial variation in the staff-to-student ratio at both the school and district level. This variation has significant ramifications for per-student spending. For instance, the difference between the 10th and 90th percentile districts in terms of spending is approximately $700 for support staff and $300 for educational aides. However, much of this variation remains a puzzle. It cannot be explained by exogenous school and district demographics, student achievement, or revenue increases. Although I do find that non-classroom staff are correlated with policy choices like smaller school size (controlling for population density) and more Special Education students, these correlations capture only a small fraction of variation. The wide variation in spending suggests that some staffing models are likely more cost-efficient than others. If Texas can incentivize or teach local decision makers to make cost-efficient hiring choices, it may thus be able to reduce unnecessary costs and improve quality of education by better allocating the cost savings.

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Introduction

Spending on education in the United States has increased consistently over the last few decades. Between 1970 and 2005, per pupil spending in U.S. Public Schools increased approximately 100%, from about $5,500 to $11,000 (2005 USD) (Hoxby, 2014). At the same time, however, there has been almost no corresponding increase in overall student achievement as measured by the National Assessment of Educational Progress (NAEP) across the same period (National Center for Education Statistics, 2012).[2] These trends defy the intuition that directing more resources towards education will necessarily generate higher-quality schooling and, consequently, better student outcomes.

Why do resources appear not to matter to the quality of education in the United States? One hypothesis that may explain this puzzle is that *how* schools use resources is just as important as *how many* resources are available to them. Much research exists on how to efficiently allocate resources to teachers, especially in terms of their years of experience, higher education degree, and value-add (Hanushek, 2002). However, public schools also employ a wide range of other staff, for instance: counselors, curriculum specialists, interpreters, and nurses. These personnel, collectively termed "non-classroom staff," make up 20% of public school employees and 10% of payroll, based on data from Texas.

There is very little research on these staff. Still, non-classroom staff matter because they can add substantially to a school's payroll, which may burden taxpayers or crowd out competing expenditures like better teachers, classroom materials, or facilities. In addition, the existing research suggests that the number of non-classroom staff has risen over the last few decades and

[2] The NAEP is the largest and oldest nationally representative student assessment test in the United States. It is the only test that permits researchers to track nationwide student achievement as far back as the 1970s. At the national level, scores on the mathematics test have hovered within eight points of the original 1978 score of 300 on a 500-point scale and currently sit at 306.[2] Reading scores reflect a similar trend, remaining within five points of the original 1971 score of 285 out of 500 and currently lying at 287.

that variation in the staff-to-student ratio is considerable (Hanushek and Rivkin, 1996; Scafidi, 2009). Therefore, this thesis attempts a comprehensive study of non-classroom staff-to-student ratios in one very large state, Texas. I work within a single state to ensure that student achievement, financial, and personnel data are comparable across schools. Fortunately, Texas is diverse across many dimensions and contains over 1000 school districts.

Broadly, I attempt to quantify the variation in non-classroom staff-to-student ratios and explain the variation in those ratios. To quantify the variation, I address two questions: a) how much variation exists in non-classroom staff-to-student ratios? and b) what are the implications for payroll expenditure per student?

To explain the variation in non-classroom staff-to-student ratios, I test three hypotheses. First, I assess whether the variation in non-classroom staff-to-student ratios explained by exogenous circumstances over which schools/districts have little or no control, for example: local population density or socio-demographics. If these factors explain a large amount of variation, then the ratios are likely a product of exogenous circumstance, even though the causality is unclear. Second, controlling for the exogenous circumstances, I test whether higher non-classroom staff-to-student ratios associated with higher student achievement. If this were the case, I would again not understand the causal mechanisms, but that the presumption would be that non-classroom staff raises achievement through some channel (health, mental health, non-cognitive skills, etc.) even if they are not involved in explicit instruction. Third, I investigate whether non-classroom staff-to-student ratios increase substantially when a district receives a revenue "windfall." If this is the case, non-classroom staff may be hired when budgets are "loose" either because of political patronage, because it is easier to quickly hire staff than to hire classroom teachers, or because schools are chronically understaffed and use excess budget to fill their needs.

Finally, I address a second set of fundamentally different questions regarding policy variables that are under a school/district's control. These policy choices include how schools are organized (school size given population density) and how likely students are to be classified into special programs like as English as a Second Language, Special Education, etc. Although these endogenous policy variables do not help identify causal effects, they may reveal how districts with relatively more non-classroom staff behave differently than their peers. For instance, two districts may have the same number of English Learners and comparable student achievement, but one district might opt for extensive English language programming that requires many staff, while another opts to mainstream English Learners much earlier, necessitating fewer staff.

This thesis contributes to the literature in a number of ways. First, I make a comprehensive study of non-classroom staff in a large and diverse state. It is the first study to investigate the consequences, likely exogenous causes, correlations with achievement, and endogenous policy choices relating to variation in non-classroom staff. Second, I exploit not only cross-sectional variation (across district and schools) but also variation over time in districts' revenue per student to understand the causal effect of a budget loosening. This effect has also never been studied.

I find that there is significant variation among non-classroom staff-to-student ratios, with considerable implications for payroll. However, I am unable to explain the majority of this variation. Therefore, my work demonstrates the variation in staffing ratios is a genuine puzzle and there are many factors that may lead to the high variation. For example, it may be that some schools employ more non-classroom staff because they are efficiently substituting them for teachers. At the same time, some poorly run schools may simply accumulate an inefficient excess of non-classroom staff. In any case, the variation suggests that Texas may be able to save a significant amount of school spending while keeping achievement constant. In other words, if Texas were able to incentivize its districts to adopt an efficient staffing model, it might be possible to raise achievement even if budgets stayed the same.

Economic Motivation

Several hypotheses can explain the increase in non-classroom staff over recent decades. These explanations fall into two categories: those in which the increase is intended to enhance productivity and those in which it is not.

Three hypotheses make up the first category. First, staff increases may be the result of an attempt to substitute educational inputs efficiently. The leaders of a school or district may recognize that it costs less to hire non-teaching staff (for example, educational aides or after-school care supervisors) to perform some responsibilities that teachers would otherwise assume. In this case, we would expect that the school or district employ fewer teachers per student than districts with lower staff-to-teacher ratios or that their teachers could concentrate more on teaching.

Second, the increase in staff may be due to the fact that schools are asked to perform a wider array of social functions. Schools currently function as delivery channels for a variety of social services—for example, physical and mental healthcare, food and nutrition programs, and daytime childcare for working parents. As these programs have expanded, it is quite plausible that schools and districts have expanded their staff to run them. Unlike the previous hypothesis, this one does not necessarily imply a change in the number of teachers or their responsibilities. In addition, it is not clear that these functions would have a direct effect on student achievement.

At the same time, however, these services may be complements to teaching, and thus result in higher achievement.[3]

A final hypothesis in this category is that schools are now paying more attention to struggling students. "Struggling" can refer to students in an array of situations: for example, those from disadvantaged backgrounds, those at risk of dropping out, those learning English, or those in need of Special Education. This focus has been increasingly evident in the expansion of Special Education since the 1970s. In order to increase the attention paid to struggling students, schools may have expanded the number of staff dedicated to this task. If this hypothesis were true and the programs worked as intended, we would expect to see an increase in academic performance among these groups.

At the same time, an increase in staff may not result from the intention to increase the productivity of a school. Instead, it could result from a variety of external forces that lead to a staffing "bloat." These factors include unions and political patronage. In general, unions make it difficult for schools to fire teachers. Anecdotal evidence suggests that if a principal would like to remove a teacher from the classroom, they often cannot fire them, so instead, they may move them to a support staff role. If this hypothesis plays out in practice, this effect would likely raise only the number of teacher support staff—not the number of professional staff like trained counselors or nurses. In addition, we would expect to see higher numbers of non-classroom staff in districts with greater union presence.

There is also anecdotal evidence of political patronage within the school system. This may occur at the school or district level. A newly instated superintendent may, for example, offer

[3] For example, if a school nurse helps ensure that students get sick less frequently, they can spend more time in the classroom, which should result in greater learning (assuming they are learning in the first place). While this difference may be negligible on the individual level, if the nurse helps prevent infection from spreading across the school, this effect could be important in the aggregate.

jobs within her new district to those who helped her get the position. This practice would not lead to bloat if she were simply filling available positions, yet it would if she were creating positions. We can also imagine a situation in which principals or other school or district leaders would be inclined to offer steady, non-strenuous staff jobs to friends or relatives.

These hypotheses are plausible because schools can face weak incentives to operate as efficiently as possible. In economic theory, markets force firms to operate on the frontier of their production possibility curve by incentivizing them to maximize profit to remain competitive. While pressure from parents, superintendents, and policymakers can induce schools to improve performance, it is unclear that schools are subject to any pressure with strength analogous to that of a market. Therefore, unlike firms in a competitive market, schools may not have the incentive to maximize their intended outcome—in this case, student learning. If this is true, schools may not optimize their resources, which could explain why increased resources have not lead to improved student achievement.

Literature Review

The literature on the effect of non-classroom personnel is sparse. What is known about these staff on the national level comes from literature investigating the persistent increase in education spending. In the earliest such paper, Hanushek and Rivkin (1996) use historical records and U.S. Department of Education data to illustrate that per student expenditure in the United States increased by approximately 3% annually from 1890-1990. Further, by decomposing the spending growth, they reveal that the key drivers of this increase, on aggregate, were falling student-teacher ratios, rising real teacher salaries, and higher non-classroom spending. Due to the quality of available data, the authors were only able to conduct a limited analysis of expenditure on non-classroom spending, which grew at 5% annually between 1960 and 1990. However, their results indicate that spending on “other instructional expenditure,” which includes both learning materials and support staff (our variable of interest) grew from 7% to 12% of school expenditures, which is consistent with an increase in the number of non-classroom staff during this time.

In a more recent report, Scafidi (2012) specifically highlights the increase in administrative personnel and non-classroom staff across the United States between 1992 and 2009. Using data from the U.S. Department of Education’s National Center for Education Statistics, he shows that between 1992 and 2009, the number of K-12 students in public school grew by 17%, while the number of administrators and other staff grew at a rate of 46%. For Texas, he reports these numbers to be 37.2% and 171.8%, respectively. Although the author readily implies that this increase in administrators and non-classroom staff has been an inefficient use of resources because there has been little corresponding improvement on the NAEP over the same period, he presents no causal evidence to back this claim. Therefore, like Hanushek and Rivkin (1996), this work is useful for understanding the broader trends in non-classroom staff growth, yet it does not show a causal relationship (or lack thereof) between the increase in non-classroom staff and student achievement. Further, neither work is able to explain the underlying causes driving the increase in non-classroom staff, which could indicate whether the increased spending on staff is an efficient use of resources.

In addition to this literature, a small body of work considers the effect of specific types of non-classroom personnel on student achievement. These works are useful to understand which hypotheses about the effect of an increase in non-classroom staff play out in practice. One subset of this literature focuses on the effect of counselors on student outcomes. Using data from a single county in Florida, Carrell and Carrell (2006) find that a higher counselor-to-student ratio decreases disciplinary problems within schools. They use a fixed-effects model to exploit changes in the counselor-to-student ratios within a single school from 1995-1999. While they succeed in controlling for between-school variation, it is possible that their estimates are biased by unobserved factors that affect both the counselor-to-student ratio and the amount of disciplinary problems.[4] To estimate the effect of school counselors on behavioral outcomes and student achievement, Carrell and Hoekstra (2014) exploit within-school variation in the number of counselors over time in a single county in Florida. The variation depends on the number of counseling interns supplied to each school by the Department of Counselor Education at the University of Florida. Although it is likely not random which schools receive counselors, it is plausible that the number of counseling interns in the program each year—and therefore the variation of interns within the same school across years—is random. Their study finds that one additional counselor can reduce disciplinary infractions and increase boy's academic achievement by approx. 1% on standardized tests. This literature suggests that the hypothesis that non-classroom staff can help struggling students has merit. Furthermore, it suggests that counselors, at least, improve non-academic student outcomes and may also complement academic achievement.

In addition to counselors, Special Education has been the subject of inquiry. Hanushek, Kain, and Rivkin (2001) use a dataset that follows several cohorts of Texas elementary students across multiple years. Because the data allows individual students to be tracked, they follow students as they enter and leave Special Education, allowing them to estimate program effectiveness through a school-by-grade-by-year fixed effects model. They find that Special Education significantly improves math scores. While the counselor and Special Education

[4] For example, we could imagine a reform-minded principal hires an additional counselor, while simultaneously taking other measures to improve their school environment and reduce behavioral issues.

literature supports the hypothesis that at least some staff increase student achievement, the current literature is limited because it only focuses on subsets of the total school staff. It does not, to my knowledge, consider how staff and programs that are less visible within schools affect student achievement. In addition, it does not indicate why some schools have many more or many fewer staff members than others.

Empirical Strategy

In all analyses, I study two types of non-classroom staff: support staff and educational aides, which each make up approximately 10% of staff in Texas.[5] Support staff are generally professional, student facing staff; for example, guidance counselors, nurses, and librarians. Educational aides account for both teacher's assistants and translators.

Variation in Non-Classroom Staff-to-Student Ratios and Expenditure per Student

I first quantify the variation in non-classroom staff-to-student ratios and the variation in expenditure per student due to staff payroll. To do so, I construct a series of kernel distributions that illustrate the spread of the staff ratios and the related expenditure per student. Staff ratios are reported on both the district and the school level, whereas expenditure is only defined on the district level. Therefore, I show both district- and school-level staff ratios, but only district-level expenditure.

Exogenous Demographic Factors

Second, I evaluate the relationship between the staff-to-student ratios and exogenous school and district characteristics. Such correlations would indicate that the variation in staff ratios is driven by factors outside of the schools' control. I estimate a simple OLS regression of school- and district-level demographics on the non-classroom staff-to-student ratio. Since I use

[5] See Appendix 1 for all district-level and school-level staff that fall into these categories. See Appendix 2 for a list of staff that are included in school-level-only calculations.

school-level staff data, my analysis illustrates the relationship between the demographic variables and *the staff employed at the school-level*. My estimates therefore do not capture variation in staff who are employed at the district level. To obtain the staff ratio, I simply divide the number of support staff and educational aides within a school by total students. I use the following regression:

$$(\textit{Non-classroom staff / Student})_{sd} = \beta_0 + \beta_1 D_d + \beta_2 D^2_d + \beta_3 L_d + \beta_4 I_d + \boldsymbol{R_s \beta_5} + \boldsymbol{T_d \beta_6} + \boldsymbol{E_d \beta_7} + \varepsilon_{sd} \qquad (Eq.\ 1)$$

where D_s is the district population density and D^2_s is its square to control for a non-linear functional form. L_d denotes the percentage of people within a district who rate their English ability as "not very good" on the Census survey. I_d denotes the median household income within a district. $\boldsymbol{R_s}$ is a vector containing the percentages of students of each race in the school. I use "white" as my reference dummy. $\boldsymbol{T_s}$ is a vector of dummy variables indicating the district type (urban, suburban, rural, city, etc.) for each district. I use "suburban" as my reference dummy. $\boldsymbol{E_d}$ is a vector containing the percentages of people within a district who have obtained a maximum of a certain education level (less than high school, high school, college, etc.) I use "high school" as my reference dummy. Note that all variables except the race dummies are reported on the district level, so my regressions largely indicate the relationship between school-level staff ratios and district-level characteristics.

In this and the subsequent analyses, I estimate separate regressions for support staff and educational aides. For each staff type, I estimate four specifications: one specification that includes data for all schools and three additional specifications that include data for only high schools, middle schools, and elementary schools. My rationale is that each school type has plausibly different staffing needs (for example, elementary schools may need more educational aides than high schools because children need more supervision), which may be masked in the regression containing all schools.

Standardized Test Performance

I also analyze the relationship between standardized test scores and non-classroom staff. Presumably, if non-classroom staff ratios correlate with higher test scores when observable school characteristics are held constant, then unobservably better off schools have more staff on average. Although this evidence would not be conclusive, it could suggest a causal relationship between staff and student achievement. To test this, I regress test scores from the statewide standardized test, Texas Assessment of Knowledge and Skills (TAKS), on the non-classroom staff to student ratio. My regression is as follows and control variables are defined as before:

$$Score_{sd} = \beta_0 + \beta_1 D_d + \beta_2 D^2_d + \beta_3 L_d + \beta_4 I_d + \boldsymbol{R_s \beta_5} + \boldsymbol{T_d \beta_6} + \boldsymbol{E_d \beta_7} + (Non\text{-}classroom\ staff\ /\ Student)_{sd} + \varepsilon_{sd} \quad (Eq.\ 2)$$

I again run separate regressions for support staff and educational aides. For each staff type, I run separate regressions for reading scores and math scores in each of 4^{th}, 7^{th} and 8^{th} grade, meaning that I run twelve separate regressions (six for support staff and six for educational aides). Including scores from both elementary and middle school is again important because staff plausibly play different roles in different grades.

Differences in Funding

Third, I examine the impact of a change in funding on the non-classroom staff-to-student ratio. If staff ratios increase because of an exogenous increase in funding, then it would indicate that schools hire more staff when budgets are looser. To test this, I exploit a change in school funding laws that occurred in the 1993-1994 school year. The law, aptly named “Robin Hood,” was designed to equalize school funding across districts by redistributing local property taxes. It addressed the fact that some districts are able to raise more money per student from their tax bases than others. In general, Robin Hood allowed the state to "recapture" tax revenue over a certain threshold from "property wealthy" districts and redistribute those funds to "property poor" districts. Through the redistribution, property poor districts experienced an exogenous increase in funding in the years after Robin Hood became law. I exploit this change to identify the impact of a revenue increase on the non-classroom staff-to-student ratio.

Schools react to such a change in funding based on how they conceptualize it. I provide two different models of the increase in revenue, which illustrate two ways that schools might think about an increase in funding. The first model illustrates the scenario in which schools conceptualize state funding as a fraction of their overall expenditure. In this case, I model the increase in funding as the difference in the ratio of total state funding compared to total expenditure in a base year, before and after an increase in state funding. I use the 1991-1992 school year as my base year. It may have been preferable to use 1992-1993, but the data are missing in that school year. I use 1996-1997 as my comparison year, including a few years lag time to ensure that the law was implemented fully and that schools were indeed getting their redistribution payments. I calculate this difference for each school district, yielding a data point for each district. My calculation is as follows:

$$\frac{Total\ State\ Aid_{96-97}}{Total\ Expenditure_{91-92}} - \frac{Total\ State\ Aid_{91-92}}{Total\ Expenditure_{91-92}}$$

(Eq. 3)

I compare this ratio to the difference between the staff ratios in the years before and after Robin Hood, which I again calculate for each district. I use the following equation:

$$\frac{Non-Classroom\ Staff_{96-97}}{Total\ Students_{96-97}} - \frac{Non-Classroom\ Staff_{91-92}}{Total\ Students_{91-92}}$$

(Eq. 4)

To understand whether a change in funding leads to a change in the non-classroom staff-to-student ratio, I graph the difference in funding versus the difference in the staff ratio using a scatter plot in which each point represents a district. Districts that experience larger increases in funding will have larger differences in state aid, and those that experience a larger increase in non-classroom staff will have larger differences in their staff ratios. Therefore, if schools hire more non-classroom staff when they experience an increase in funding, then the graph will show a positive relationship between the two values.

I use nearly identical methodology in my second model, which illustrates the increase in revenue as a percentage increase in total state aid. This model captures the case in which schools consider state aid on its own, rather than directly in relation to expenditures. I take the natural log of total state aid per student, then take the difference between that ratio for years before and after Robin Hood, again 1991-1992 and 1996-1997. My equation is as follows:

$$\ln(Total\ State\ Aid_{96-97}) - \ln(Total\ State\ Aid_{91-92})$$

(Eq. 5)

I also plot this difference against the difference in the staff ratios across the same years, derived in Eq. 4 in a district-level scatter plot. As before, if schools hire more non-classroom staff when their state aid increases in percentage terms, then this graph will show a positive relationship between funding and the non-classroom staff ratio.

Endogenous Policy Choices

Finally, I examine the relationship between non-classroom staff and endogenous policy choices, including school size and the fraction of students placed in special programs. Correlations between staff counts and these variables would indicate that certain decisions made by schools and districts are linked to variation in the staff ratio. To estimate these correlations, I add variables for school size and the fraction of students in each special program to Eq. 1, yielding:

$$(\textit{Non-classroom staff / Student})_{sd} = \beta_0 + \beta_1 D_d + \beta_2 D^2{}_d + \beta_3 L_{\,d} + \beta_4 I_d + \boldsymbol{R_s \beta_5} +$$

$$\boldsymbol{T_d \beta_6} + \boldsymbol{E_d \beta_7} + \beta_{8\ sd} + \beta_9 S^2{}_{sd} + \beta_{10} P_{sd} + \beta_{11} G_{sd} + \beta_{12} A_{sd} + \beta_{13} V_{sd} + \varepsilon_{sd} \qquad \textit{(Eq. 6)}$$

where S_{sd} is the number of students in each school and $S^2{}_{sd}$ is its square. The variables P_{sd}, G_{sd}, $A_{sd},$ and V_{sd} represent the percentage of students enrolled in a special program, respectively: Special Education, “Gifted and Talented” (the state honors program), English as a Second Language, and Vocational Education. The other variables are the same as in Eq. 1.

Data

The ideal data to study variation in non-classroom staff would contain school-level observations for each type of staff, including full-time equivalent (FTE) count, base salary, and any supplementary pay. It would also contain the share of each district-level staff member allocated to each school in FTE terms.[6] In addition, it would contain a full set of demographic, financial, and standardized test performance data at both the district and the school level. This study actually relies on administrative data compiled by the Texas Education Agency (TEA), which provides nearly complete records of the desired information, at least relative to data from

[6] In other words, if a district employed a curriculum specialist at the district level who split their time evenly between ten schools, then each of these schools would include .1 curriculum specialist FTEs in their school-level count.

other states. This information is supplemented by data from the National Center for Education Statistics (NCES) and the federal Census. Together, these records provide most of the ideal information. However, the staff and salary data has some limitations. The TEA's school-level data includes only an aggregate of all types of staff, and this number does not include the district personnel that may split their time at that school. In addition, while the district-level data are disaggregated by position, it is unclear as to what school or schools (if any) they are assigned. Therefore, it is impossible to know how district personnel are allocated among schools. The financial data also only contains base salary, not fringe benefits, which means that the salary estimates in this thesis will be less than the true expenditure. In addition, salaries vary based on Cost of Living, which adds noise to the payroll expenditures for non-classroom staff. Ideally, it would be possible to weight salaries by Cost of Living in each district to make them comparable across geographies. Unfortunately, such granular Cost of Living data do not exist except for within the largest cities in the United States. While it would be possible to weight districts in large cities like Houston or Austin, it is not possible for rural areas.

The majority of my analysis relies on a school-level panel dataset spanning the years between the 2002-2003 school year and the 2012-2013 school year, the most recent year available. This data contains observations for each of the ~8,500 schools and their ~1000 districts in the public school system. It is based largely on data from the TEA's Academic Excellence Indicator System (AEIS),[7] which includes FTE counts and salaries for school-level staff, student demographics, and test score data. The student demographics are complete, and the staff data includes observations for 98% of districts. Test score data is complete from the 2002-

[7] Note that this source is referred to as the Texas Academic Performance Report (TAPR) after the 2012-2013 school year.

2003 school year to the 2010-2011 year. However, the state adopted a new standardized test in the 2011-2012 school year, so I do not use test data after those years to maintain consistency.

To this data, I add information on district urbanization from the TEA's District Type data, which categorizes all districts in Texas into nine categories of urbanization (for example, major urban, independent town, suburban, etc.) The data is available for the 2007-2008 year onward, so I use the 2007-2008 information to impute the previous years. Any differences in categorization due to the data limitations should be negligible because the number of districts in any given category of urbanization varies by only 1-3% across all years of available data. Finally, I incorporate district-level demographic variables such as median household income and average education level from the NCES's School District Demographics System as controls. When merged with the AEIS and District Type data from the TEA, approximately 95% of the NCES data matches. Of those districts that do not match, the vast majority are the charter schools contained in the TEA data. To create my variables of interest, the staff-to-student ratio and the educational aide-to-student ratio, I simply divide the staff count and educational aide count by the student count within each school or district. See Tables 1 & 2 for summary statistics on staff and student demographics.

Table 1: TAPR School-Level Staff Statistics

	Average Full Time Equivalents (FTEs) per School			
	All Schools	Elementary Schools	Middle Schools	High Schools
Teaching Staff	39.32	34.10	41.66	56.80
	(29.12)	(12.62)	(21.17)	(54.22)
Support Staff	4.43	4.04	4.55	6.10
	(3.92)	(2.38)	(3.23)	(6.63)
Educational Aides	7.10	8.09	5.96	6.37
	(5.41)	(5.11)	(3.79)	(6.64)
Administrative Staff	2.24	1.86	2.50	3.21
	(1.69)	(0.91)	(1.37)	(2.73)

Values represent the mean FTEs for each type of school personnel in the 2012-2013 school year. Standard errors are in parenthesis.
Source: TAPR Administrative and Demographic Data, 2012-2013

Table 2: TAPR School-Level Demographics

	Average % of Students per School			
Demographics	All Schools	Elementary Schools	Middle Schools	High Schools

General				
Economically Disadvantaged	62.50	65.92	60.87	55.43
	(26.65)	(26.93)	(25.59)	(25.62)
At Risk	47.51	46.79	38.87	55.84
	(24.05)	(22.29)	(18.77)	(26.8)
Special Programs				
Gifted & Talented	6.36	5.34	9.35	6.95
	(7.19)	(6.01)	(8.52)	(7.96)
Special Education	10.04	8.40	10.17	12.12
	(10.71)	(6.95)	(8.93)	(14.24)
Career & Technical Education	16.79	0.05	14.25	61.47
	(12.57)	(0.86)	(16.46)	(30.62)
Race				
African American	12.57	12.65	12.70	12.24
	(17.45)	(17.67)	(16.81)	(17.57)
Asian	2.59	2.98	2.56	1.88
	(6.04)	(6.6)	(5.19)	(5.13)
Hispanic	49.38	51.75	47.95	45.79
	(30.58)	(30.65)	(29.99)	(30.9)
Native American	0.44	0.41	0.46	0.50
	(1.06)	(0.69)	(1.46)	(1.28)
Pacific Islander	0.12	0.13	0.11	0.10
	(0.61)	(0.66)	(0.64)	(0.49)
White	33.13	30.19	34.58	37.90
	(28.52)	(27.42)	(28.55)	(30.26)
Two or More Races	1.78	1.89	1.64	1.59
	(2.58)	(2.3)	(1.91)	(3.65)
Language Abilities				
Bilingual/ESL	15.79	23.30	0.09	4.85
	(19.41)	(21.82)	(11.52)	(9.31)
Limited English Proficient (LEP)	16.23	23.81	9.55	5.11
	(19.47)	(21.78)	(11.73)	(9.46)

Values represent the average percentage of students in each school that fit into each category. Standard errors are in parenthesis.
Source: TAPR Administrative and Demographic Data, 2012-2013

To study the variance of all staff employed at the district level, I use data provided by TEA's Texas Pubic Education Information Management System (PEIMS), which includes FTE and salary data for both school- and district-level for the 2012-2013. See Table 3 for summary statistics.

Table 3: PEIMS District-Level Staff Statistics

	Average FTEs per District	Average Base Pay	Average Expenditure per Student
Totals			
Total Personnel	523.65	$38,152.61	$6,099.57
Total Administrative Staff	20.72	$73,835.63	$647.53
Total Teaching Staff	267.12	$43,996.57	$3,690.43
Total Educational Aides	53.57	$18,838.87	$355.92
Total Support Staff	51.26	$50,560.51	$582.10
Auxiliary	141.99	$23,241.54	$914.11
Support Staff			
Counselor	10.96	$55,021.12	$157.81
Educational Diagnostician	7.23	$57,510.85	$103.63
Librarian	6.84	$51,797.23	$65.26

Lssp/Psychologist	5.00	$57,765.92	$43.63
Othr Non-Instr District	16.80	$56,716.38	$188.49
School Nurse	7.07	$42,214.08	$73.06
Speech Thrpst/Speech-Lang Path	7.97	$52,979.34	$79.10
Teacher Facilitator	15.54	$56,613.72	$85.16
Work-Based Learning Site Coor	0.56	$51,898.42	$15.29
Department Head	5.65	$55,827.66	$57.14
Other Camp Prof Personnel	9.96	$49,879.40	$147.34
Truant Off/Visit Teacher	3.08	$49,350.27	$20.84
Social Worker	3.83	$51,709.96	$22.45
Occupational Therapist	2.92	$60,269.45	$23.96
Psychological Associate	1.89	$55,954.64	$36.64
Physical Therapist	2.03	$63,587.12	$18.73
Corrective Therapist	1.09	$53,875.08	$19.22
Audiologist	1.34	$60,138.45	$8.10
Orientatn/Mobility Spec (Coms)	1.45	$54,399.77	$9.20
Music Therapist	1.35	$53,309.45	$2.09
Teacher Appraiser	2.72	$58,744.20	$108.96
Art Therapist	0.39	$43,409.14	$2.28
Recreational Therapist	0.98	$51,774.40	$7.32
Athletic Trainer	2.13	$49,646.86	$16.19

Sourcce: PEIMS Staff & Salary Data, 2012-2013

Finally, I create a panel dataset spanning 1991-1992 to 1996-1997 to study the effect of the “Robin Hood” school finance law that took effect in the 1993-1994 school year. Specifically, I combine the abovementioned PEIMS district-level staff data from 1991-1992 to 1996-1997 with the TEA’s Summary of Finances variables for total state aid and average daily attendance for those years. I also use the current expenditure variable from the Census Bureau’s Elementary and Secondary Education data from school year 1991-1992.

Findings

I. Variation in the Staff Count and Expenditure per Student

The results reveals significant variation among the number of and expenditure on support staff and educational aides within Texas counted at the district level. For personnel counted at the school level only, variation among educational aides remains high, but both the number of and variation within support staff decreases substantially. Graphs 1 and 2 illustrate the support-staff-per-student and educational-aide-per-student ratios for staff counted at the district level. There are an average of 1 support staff and 1.5 educational aides per 100 students at this level.

Both ratios also show substantial variation: there are nearly 5 times as many staff per 100 students at the 90th percentile (1.9) than at the 10th percentile (.4). For educational aides per student, there are almost 3.5 times as many educational aides per student at the 90th percentile (2.7) as there are at the 10th percentile (.8). This variation illustrates that staffing numbers are not uniform across districts, but it do not reveal why.

There are substantially fewer support staff per student counted at the school-level than at the district level. Graph 3 shows that, on average, the ratio of school-level support staff per 100 students is . 6, with a 10th percentile ratio of .2 and a 90th percentile of 1.3. In contrast, Graph 4 the distribution for educational aides employed at the school level is more similar to the district level distribution. This difference suggests that most support staff are employed at the district level, rather than the school level, while educational aides tend to be tied to specific schools. Because the time that district-level staff spend attending to each school is not recorded on the school level, my analysis of within-district staff allocation is limited. This issue is less pressing for educational aides.

Graphs 5 and 6 illustrate per pupil expenditure for staff counted at the district level. Due to data limitations, I was unable to make these calculations for staff employed at the school level. As expected given the high variation in staff ratios, substantial variation exists in per student expenditure on support staff and educational aides. Schools spend an average of $531 per student on support staff salaries and $279 on salaries of educational aides each year, without including fringe benefits. The 90th percentile districts ($963 per student) spend $753 or 4.5 times more on support staff salaries than the 10th percentile districts ($210 per student). Although per student spending on educational aides is lower than spending on support staff, the relative variation in spending in among districts is slightly higher: 90th percentile districts ($464 per student) spend

$307 or 3 times more than 10th percentile districts ($157 per student). Note that this variation is not entirely due to differences in the number of staff across schools. Instead, some variation may come from differences in cost of living (and therefore salaries) across the state. Ideally, it would be possible to weight staff salaries by cost of living in each district to equalize the salary scale, but such cost of living data do not exist, as discussed above. Still, because this variation in spending corresponds to variation in staff ratios, these numbers suggest that the difference in spending is largely driven by differences in personnel count.

II. Potential Drivers of Variation in Staff Count

What explains the differences in staff per student ratios and expenditures? I analyze three sets of indicators that could help explain the variation: exogenous school and district demographics, performance on state standardized tests, and an increase in funding. Although this analysis cannot identify causal drivers of higher staff-to-student ratios, understanding the variation provides evidence for what drives the massive differences in staff-to-student ratios.

a . Exogenous Demographic Factors

The variation among non-classroom staff across schools might be driven by the characteristics of those schools themselves. That is, schools may respond to certain circumstances by hiring more staff. If this is the case, then it indicates that hiring staff is a relatively uniform response to a particular set of circumstances across the state. However, the regression (Eq. 1) reveals that the support staff and educational aides ratios are largely unexplained by most demographic variables. See Table 4 (pg. 38).

The majority of indicators offer little explanatory power. Neither population density, nor district English proficiency, education level or district type (urban, rural, suburban, etc.) are systematically correlated with either support staff or educational aide ratios. Perhaps most surprising among these is population density. It is plausible that more sparsely populated districts would still be required to have a minimum number of staff, even with fewer students, so the number of staff would vary inversely with population density. Although the data do indicate a negative correlation across all specifications, it is not statistically significant. It is also surprising that English proficiency is uncorrelated with the staff ratios because schools with more non-native speakers could plausibly use more staff to help students struggling with English.

The few variables with explanatory power are similar across support staff and educational aides. Across most specifications, non-classroom staff ratios are negatively correlated with all non-white ethnicities. The correlation for support staff is significant for Asian, Hispanic, and multiracial students across all grades and black students in high school and middle school (although the correlation for black students is significantly positive in elementary school.) The correlations for the educational aide ratios are also largely negative, although most are insignificant. One notable exception is a significant positive correlation with percent African American in elementary and middle schools. In addition, median household income is negatively correlated with both educational aides and support staff across most specifications, and it is significant for support staff, except in high school. These findings may suggest that districts with fewer resources and more disadvantaged populations are able to hire fewer staff than their peer districts. If resources are a limiting factor, the stronger negative relationship between support staff and disadvantaged schools compared to educational aides makes sense because support staff salaries are much higher than aides'.

Even still, these variables explain a very low fraction of the variation in non-classroom staff. The R^2 values range from .004 to .030, indicating that, at most, these regressions explain 3% of variation in non-classroom staff ratios. This finding indicates that unobserved factors must influence non-classroom staff ratios, since schools in nearly identical circumstances apparently employ very different numbers of staff.

b. Standardized Test Performance

If demographics cannot fully explain the difference in staff ratios, then perhaps it is explained by academic performance within schools. If two schools are identical on their observable demographics and differ only in that one has higher standardized test performance and staff ratios, it may indicate that staff are more numerous in unobservably better-off or better-managed schools. Conversely, if staff ratios are negatively associated with test scores, then staff may be associated with unobservably disadvantaged or poorly managed schools. To test whether staff are systematically correlated with academic performance, I regress standardize test scores on staff ratios and control variables (see Eq. 2). In this analysis, the support staff-to-student ratio is negatively correlated with 7th and 8th grade math scores, as well as 8th grade reading scores at the 1% level. The educational aide-to-student ratio is negatively correlated with 8th grade math and reading scores in addition to 4th grade math scores at the 1% level. The other correlations are not significant, but largely negative. See Table 5 (pg. 40).

The negative relationship between test scores and staff ratios could support a number of hypotheses explaining the variation in non-classroom staff. First, it may indicate that staff are more numerous when schools act as vehicles for social services, in addition to academic institutions. Non-classroom staff may be more common in schools in which students struggle academically because those same students are more likely to use the social services provided by schools. If this were unambiguously the case, however, it is puzzling why there were not stronger negative correlations between staff ratios and demographics like income, English ability, and education level.

Similarly, staff may be hired specifically to help students who struggle academically. If this is true, a negative relationship between test scores and staff ratios can be interpreted similarly to a negative relationship between community health and doctors. Just as doctors can be more numerous in sick populations, staff may be more numerous in academically weaker schools. On the other hand, more staff may stem from poor management practices, rather than attempts to help students. Poorly run schools may poorly prepare their students academically, as well as practice laissez-faire hiring leading to staffing bloat.

Still, these results should be interpreted with caution for support staff because some positions like librarian, coach, or art therapist are plausibly unassociated with test scores. Although other support staff like counselors or teacher facilitators may influence test scores indirectly, it is possible that the impact of some support staff cannot be captured this way. This issue is less concerning for educational aides because they work in the classroom on a student level.

c. Differences in Funding

The number of staff may also vary because of differences in funding across time or across districts. If schools view staff as normal goods, then they will hire more staff when funding increases. To test this hypothesis, I investigate the change in staff ratios in response to the Robin Hood law. Enacted in the 1993-1994 school year, the law gave some schools a windfall revenue increase after it was passed.

Schools react to an increase in funding based on how they conceptualize the change. One way that schools may think about a funding increase is by how much their budget changes relative to their previous spending levels. To model this scenario, I take the difference in state aid in the 1991-1992 and 1996-1997 school years, before and after Robin Hood, and compare it to their operational expenditure in the 1991-1992 base year (Eq. 3). I plot the ratio of state aid to expenditure in 1992-1992 between school years 1991-1992 and 1996-1997 in Graph 7, which shows that schools did experience an increase in funding due to Robin Hood. To understand the magnitude of the change, most schools received around $.50 in state aid for every $1 that they spent. After Robin Hood, the 40-50% of districts that experienced the highest increase in funding received on the order of $.75 -$1.50 for every $1 that they spent.

Surprisingly, the funding change is not associated with a change in in the staff-to-student ratio (Eq. 4). Graphs 8 and 9 illustrate that the correlation between that change and the change in both support staff-to-student and educational aide-to-student ratios is essentially flat. In addition, small districts account for most of the change in staff ratios, especially for educational aides. (These districts are denoted by smaller markers in the graphs, which are weighted by number of students in each district.) In a small district, hiring one additional staff member could change the staff/student ratio significantly, which means that their variation is much more likely to be idiosyncratic. This evidence suggests that a change in funding is not, in itself, driving differences among staff ratios.

Alternatively, schools may think about a funding increase in terms of the percentage change between the base year and the post-reform years. I model this conception as the difference in the natural log of state aid in 1991-1992 and 1996-1997 (Eq. 5). I plot the natural log of state aid for the years between 1991-1992 and 1996-1997 in Graph 10, which shows that a significant number of schools experienced an increase in funding. Again, schools do not seem to systematically alter their numbers of non-classroom staff in response to the change in funding when modeled this way. In addition, smaller districts whose staff ratios are sensitive to small changes in number of staff generate most of the variation. See Graphs 11 and 12.

The fact that staff ratios do not change when schools experience a "windfall" budget increase indicates that staffing decisions are not primarily driven by budgetary restrictions. In particular, schools do not appear to be particularly "understaffed." If they were, then we would expect to see an increase in staff when budgets become more flexible. Additionally, this may be evidence against systemic political patronage because decision makers do not choose to spend extra budget on employing friends. On the other hand, it is hard to argue that political patronage would be "systematic" in the first place because the phenomenon occurs on a case-by-case basis.

This analysis is limited because it does not test the alternative hypothesis that staff, especially educational aides, may be substitutes for teachers. In this case, districts may hire more aides when they cannot afford to hire additional teachers. Research to address this question could investigate whether staff levels rise after a decrease in funding, in parallel to falling numbers of teaching staff.

III. Endogenous Policy Choices

To understand the variation in non-classroom staff, it may also be helpful to consider the policy choices associated with higher non-classroom staff-to-student ratios. These variables are endogenous; schools control them in response to their circumstance. These choices do not reflect the root cause of the variation, but rather the channels that mediate their effects. In other words, this analysis illustrates which policy choices are associated with higher non-classroom staff ratios.

This analysis specifically explores whether school size and special programs are mediating channels for variation in non-classroom teachers (see Eq. 6). First, I study school size. A district has no or little choice about its population density, and less dense areas will logically have smaller schools so that children can get to school in a reasonable amount of time. However, regression holds population density and student achievement constant, isolating the effect of the choice of smaller schools. I also consider how schools place students in programs including Gifted and Talented, Special Education, Vocational Education, and English as a Second Language. Since schools have considerable freedom in how they classify students, differences in classification can be quite large. For example, even for less arbitrary categories like English as a Second Language, some schools make sure every student who could qualify does qualify, while others adopt a more laissez faire approach and enroll fewer students in the program.

School size explains significant variation in both support staff and educational aides, even controlling for population density. Both support and educational aide ratios are significantly negatively correlated with the number of students within a school for all schools and for each school type (high school, middle school, and elementary school). The square of total students is also highly positively correlated for both staff type and all school types, which indicates that the staff-to-student ratio falls exponentially as schools become larger. These findings suggest that in districts of comparable population density, schools that choose to organize themselves as small schools also employ more staff per student. If there are some non-divisible non-classroom staff positions, smaller schools will all else equal have higher ratios of non-classroom staff to students. In this case, the decline in the staff-to-student ratio may indicate that staff represent a high "upfront cost" with subsequent economies of scale. However, this relationship might also indicate that schools are unable or otherwise unwilling to hire more staff as their population grows. Importantly, the staff ratio reflects a choice: the small-school district presumably could have organized itself like the large-school district. The data suggest that it would have similar achievement and lower staff costs. Note that the negative relationship between total students and the staff-to-student ratio may also be accentuated by the fact that the dependent variable (staff-to-students) is an inverse function of the independent variable (total students), which means that there is necessarily a negative relationship between the two.

Across all levels of schooling, the percent of students enrolled in Special Education is positively correlated with both staff ratios. This suggests that schools with more children in Special Education employ more staff, which supports the hypothesis that schools and districts hire staff to help struggling students (at least those whose struggles can be aided by or at least classified as Special Education). With few exceptions, the other program variables are largely uncorrelated with the staff ratios. This is somewhat surprising, given that programs like English as a Second Language hypothetically require more staff. However, it is possible that some correlation is masked by other highly collinear variables. For example, English as a Second Language is likely correlated with the size of a district's Hispanic population and median household income.

Although these correlations do indicate a relationship between the staff ratio, school size, and Special Education, this regression still explains very little of the total variation in the staff ratio. The R^2 across all specifications is between .01 and .11, meaning that at most, these variables explain 11% of the variation. Therefore, much of the variation in staff ratios is still a puzzle.

A Parallel Trend in Hospitals

The healthcare sector offers a surprising and perhaps informative parallel to the variation in non-classroom staff. Like education, healthcare costs have risen steadily over the last few decades and there is significant variation in healthcare spending across the country. According to a 2009 paper by researchers from the Dartmouth Institute for Health Policy and Clinical Practice, overall inflation-adjusted Medicare spending rose by an average of 3.5% annually between 1992 and 2006. However, tremendous variation in spending underlies this growth. For example, San Francisco and East Long Island, New York reported nearly identical per capita spending in 1992. However, between 1992 and 2006 expenditure grew by 2.4% in San Francisco and 4.0% in East Long Island. The difference in growth rates lead to massive differences in spending: by 2006, East Long Island spent $1 billion more on Medicare than San Francisco (Fisher, E. S., et al., 2009).

Research suggests that the nationwide variation in healthcare spending is driven primarily by differences in healthcare providers' propensity to recommend discretionary services. In other words, regions in which physicians were more likely to prescribe treatment in borderline cases have significantly higher healthcare spending. Interestingly, increased spending does not appear to correlate with higher-quality healthcare. In a 2003 study, researchers examined the amount of end-of-life spending received by a representative sample of patients hospitalized for hip fracture, colorectal cancer, or acute myocardial infarction across the United States between 1993 and 1995. They found that patients in higher-spending regions receive 60% more care than those in lower-spending regions, mostly due to more hospital-based care and greater numbers of specialists. Even still, neither quality of care nor access to care improves with increased spending. Patients in higher-spending regions have comparable health outcomes to those in lower-spending ones (Fisher, E. S., et al., 2003a, Fisher, E. S., et al., 2003b).

This variation in healthcare spending is comparable to the variation in education spending due to non-classroom staff because both come from somewhat discretionary spending. Just as hospitals have considerable flexibility in how they treat "gray area" cases, schools have considerable flexibility in how they structure their staff, at least compared to other school inputs.

The healthcare research suggests that some care models are more cost efficient than others, delivering the same quality of care for a lower price. Moreover, since physicians ultimately make the decision of what treatment to prescribe patients, their individual decisions together drive the cost of healthcare. The same may be true for non-classroom staff in schools: some staffing models may be more cost-efficient than others, educating students to the same level while spending fewer resources on staff. In addition, school and district administrators may drive the cost of non-classroom staff in the same way that physicians drive discretionary healthcare costs. In fact, the unexplained variation in non-classroom staff provides evidence that this is the case. If so, Texas may be able to save money while maintaining the quality of education if it could incentivize school and district administrators to make cost-efficient hiring choices.

Conclusion

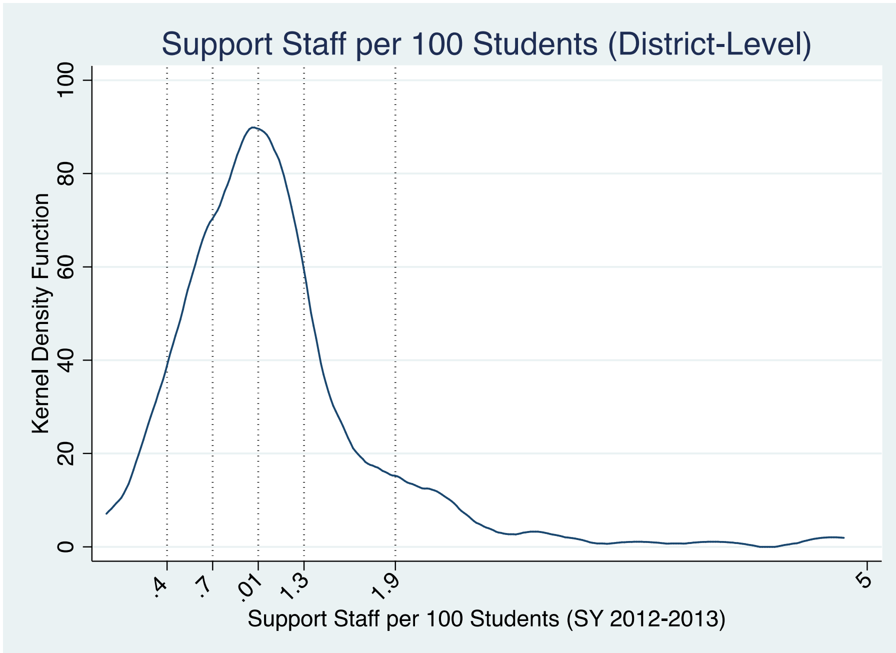
This paper begins to address a gap in the education literature regarding non-classroom staff. Specifically, it seeks to quantify the variation within the number of and expenditure on support staff and educational aides per student across Texas. In addition, it seeks explain the variation among staff-to-student ratios. I find that there is substantial variation in the staff-to-student ratio for both support staff and educational aides on the district level. This variation persists to a high degree at the school level for educational aides, but drops for support staff because fewer are employed at the school level, rather than the district level. The large variation in staff ratios across Texas has substantial ramifications for per student spending. The difference between the 10th and 90th percentile spenders is approximately $700 for support staff and $300 for educational aides.

However, the explanation for much of this variation remains a puzzle. Neither the variation in the support staff-to-student ratio nor the educational aide-to-student ratio is well explained by exogenous school and district demographics. Although districts with a high percentages of minorities and low median household income do seem to have lower staff-to-student ratios, these effects explain very little of the total variance. I also find that, if anything, higher staff ratios are correlated with lower student achievement, controlling for observable demographic characteristics. This may indicate that staff are more often placed in unobservably disadvantaged schools, although it is impossible to be certain of the causality. Interestingly, schools do not hire more non-classroom staff when budgets increase, suggesting that they are not acutely short-staffed. Non-classroom staff are also correlated with school and district characteristics dictated by policy choices, such as smaller school size (controlling for population density) and more Special Education students.

The variation in staff levels may reflect an opportunity to reduce school spending while maintaining or improving quality of education in Texas. The unexplained variation in non-classroom staff suggests that school and district administrators make very different choices about how they staff their schools, even in similar circumstances. In addition, many school administrators are often teachers by profession and therefore lack management training or expertise in human resources of budgeting. Therefore, given the wide variation in spending, some staffing models are likely more cost-efficient than others. If it can incentivize or teach local decision makers to make cost-efficient hiring choices, Texas may thus be able to reduce unnecessary costs and improve quality of education by better allocating the cost savings.

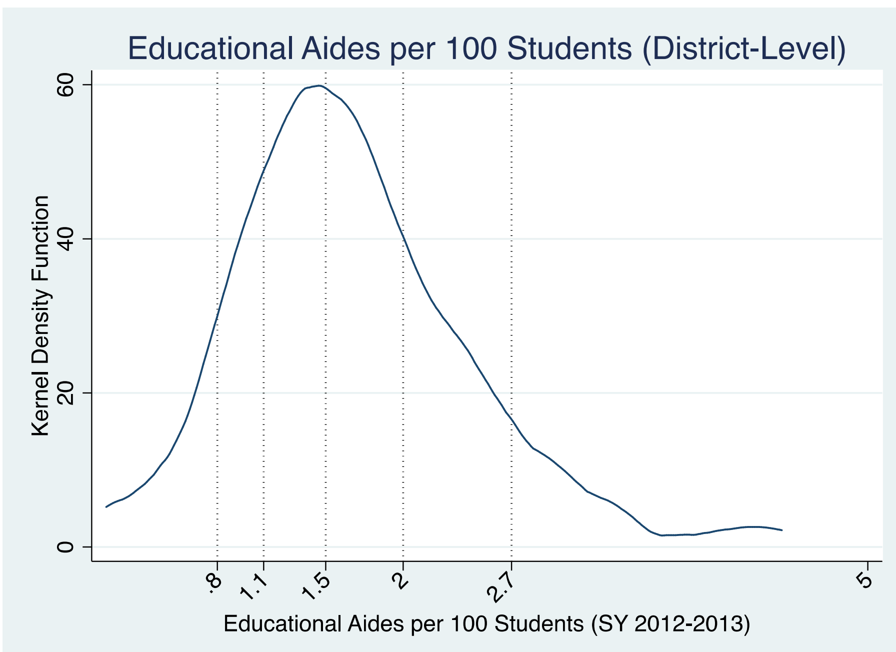
Figures and Tables

Graph 1



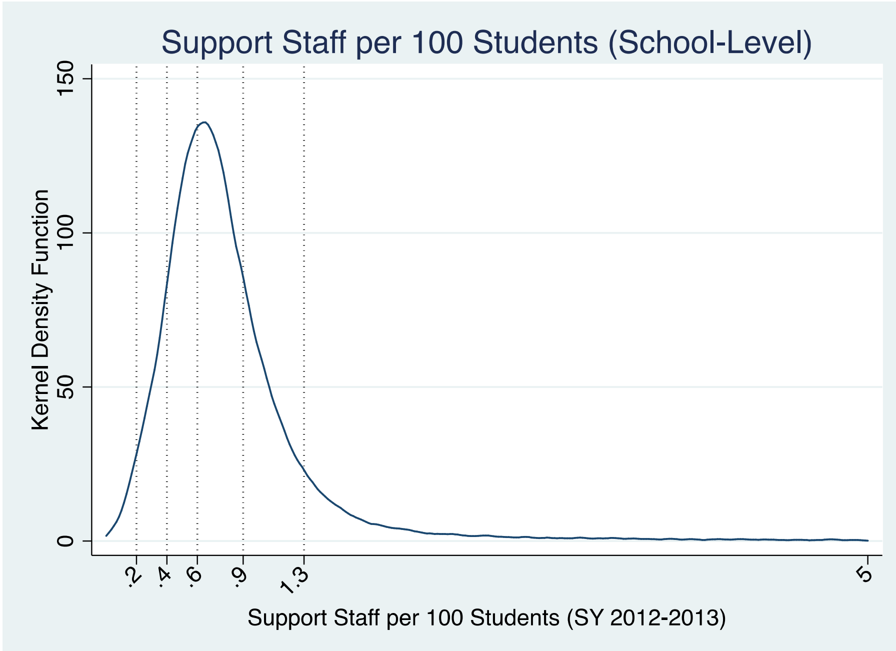
Note: Reference lines denote 10th, 25th, 50th, 75th, and 90th percentiles.
Source: PEIMS Salary and Staff Data, 2012-2013

Graph 2



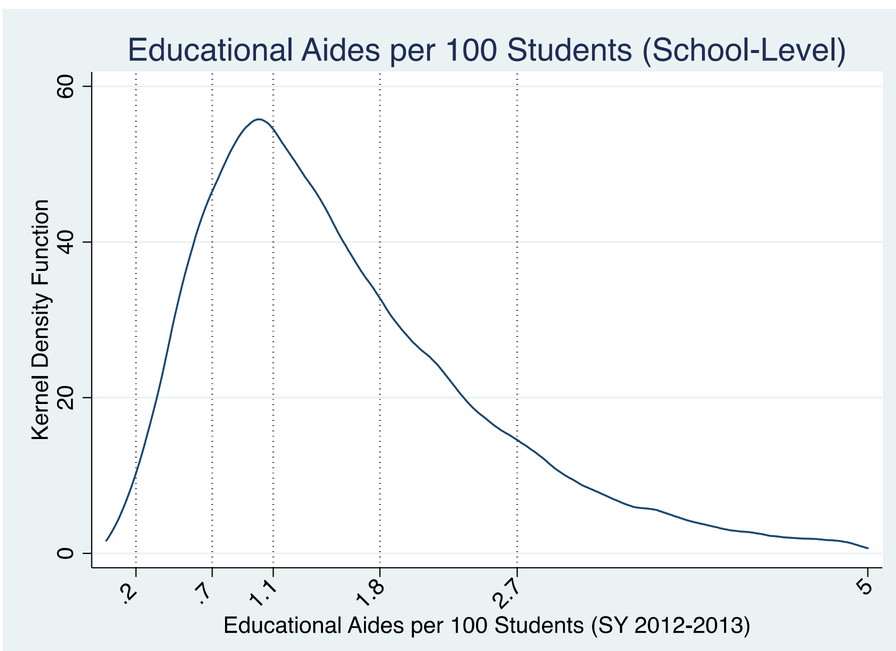
Note: Reference lines denote 10th, 25th, 50th, 75th, and 90th percentiles.
Source: PEIMS Salary and Staff Data, 2012-2013

Graph 3



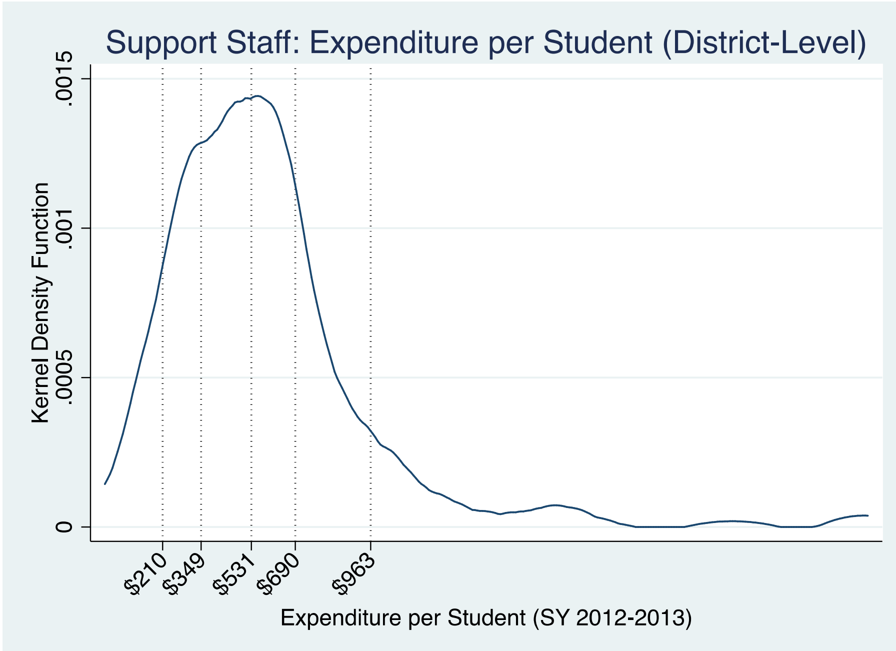
Note: Reference lines denote 10th, 25th, 50th, 75th, and 90th percentiles.
Source: TAPR Administrative and Demographic Data, 2012-2013

Graph 4



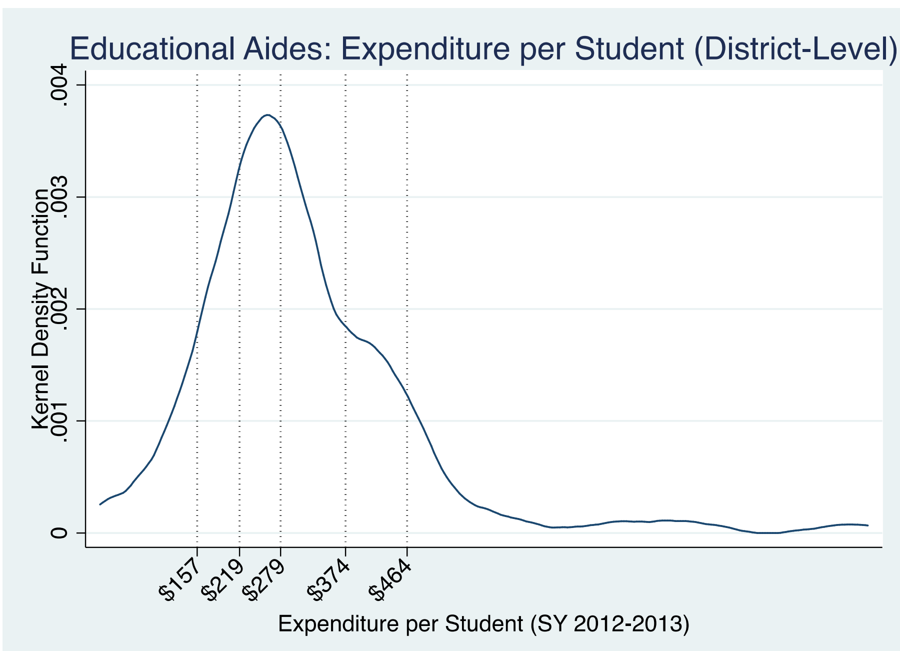
Note: Reference lines denote 10th, 25th, 50th, 75th, and 90th percentiles.
Source: TAPR Administrative and Demographic Data, 2012-2013

Graph 5



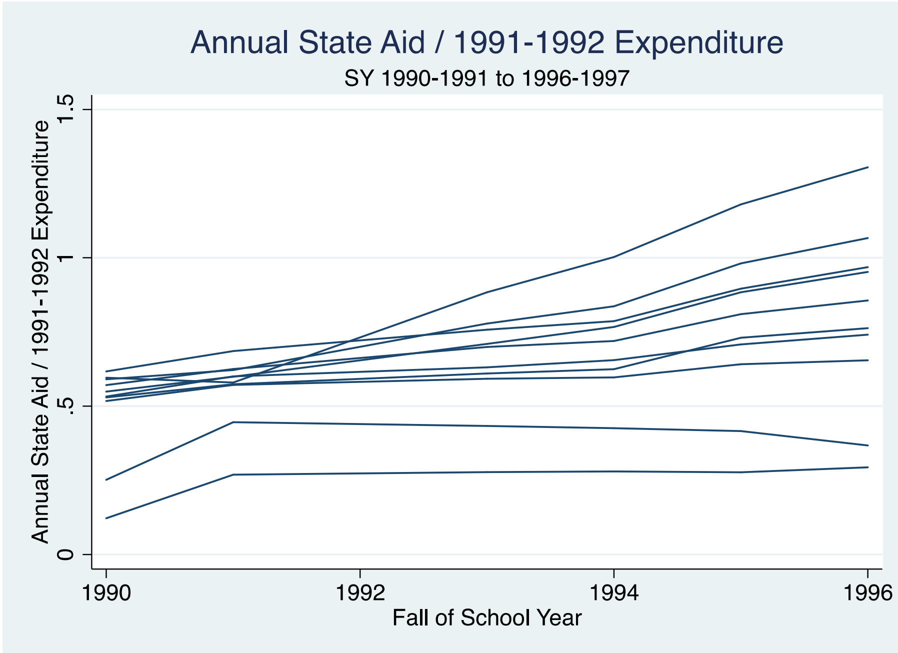
Note: Reference lines denote 10th, 25th, 50th, 75th, and 90th percentiles.
Source: PEIMS Salary and Staff Data, 2012-2013

Graph 6



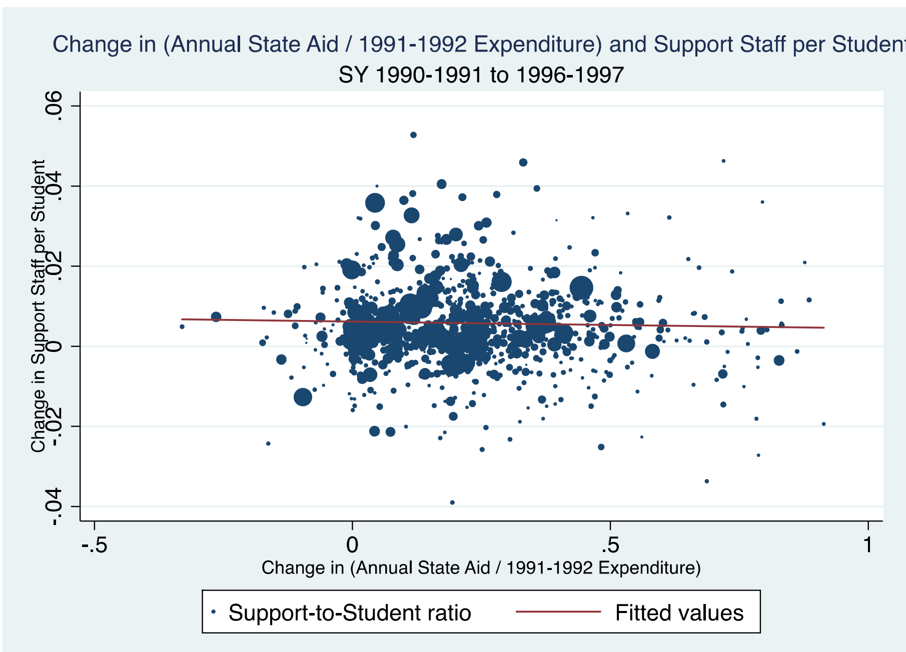
Note: Reference lines denote 10th, 25th, 50th, 75th, and 90th percentiles.
Source: PEIMS Salary and Staff Data, 2012-2013

Graph 7



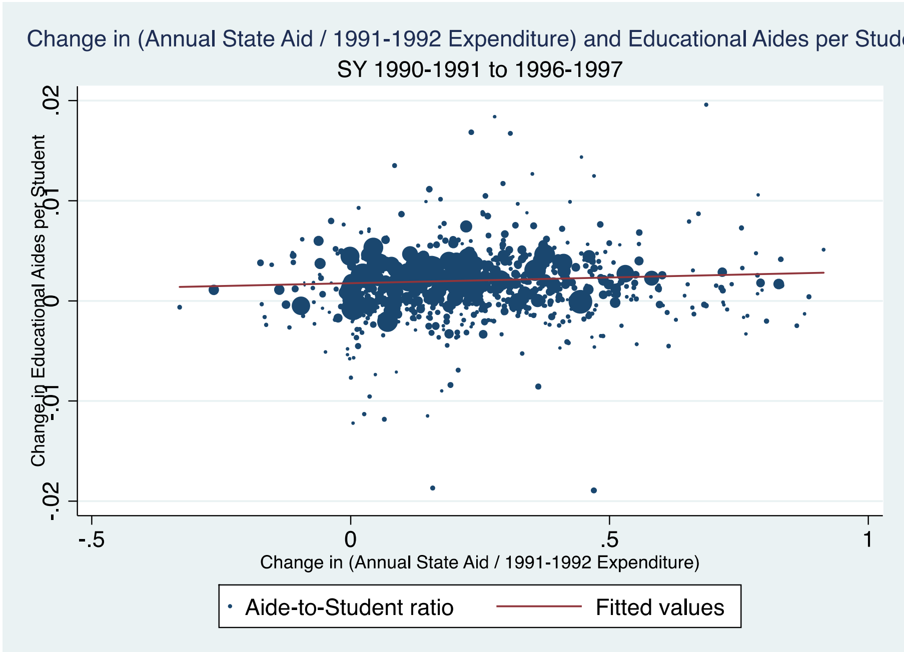
Note: Data for 1991-1992 is missing.
Source: Texas Summary of Finances, 1990-1991 thru 1996-1997, Census 1991-1992

Graph 8



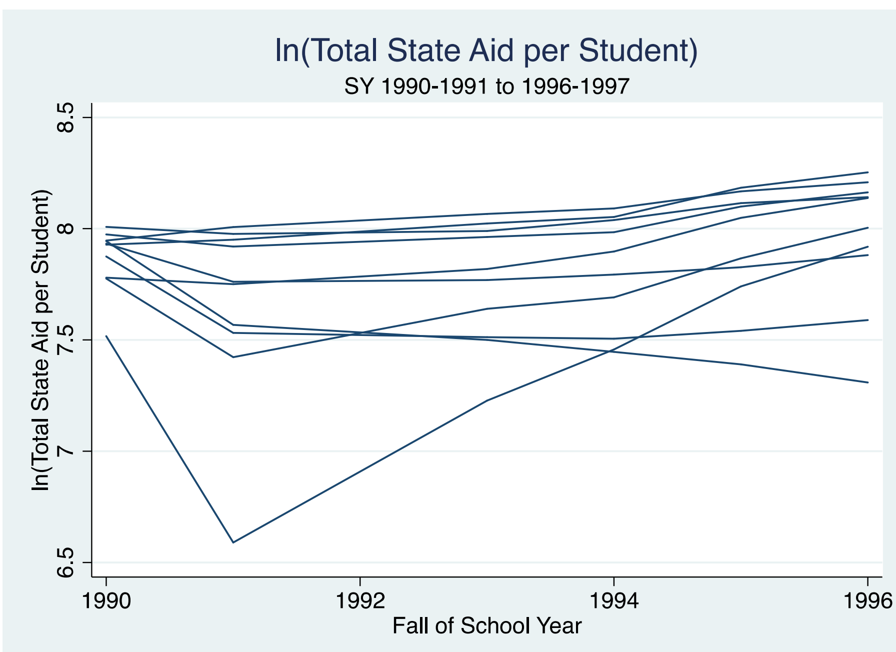
Source: Texas Summary of Finances, 1990-1991 &1996-1997, Census 1991-1992,
TAPR Administrative and Demographic Data, 1990-1991 & 1996-1996

Graph 9



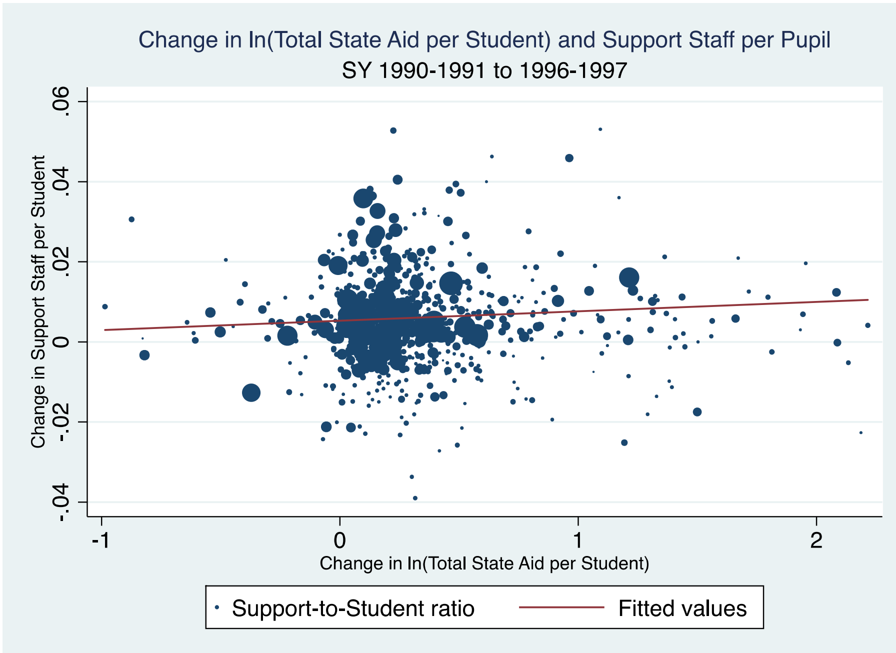
Source: Texas Summary of Finances, 1990-1991 &1996-1997, Census 1991-1992, TAPR Administrative and Demographic Data, 1990-1991 & 1996-1996

Graph 10



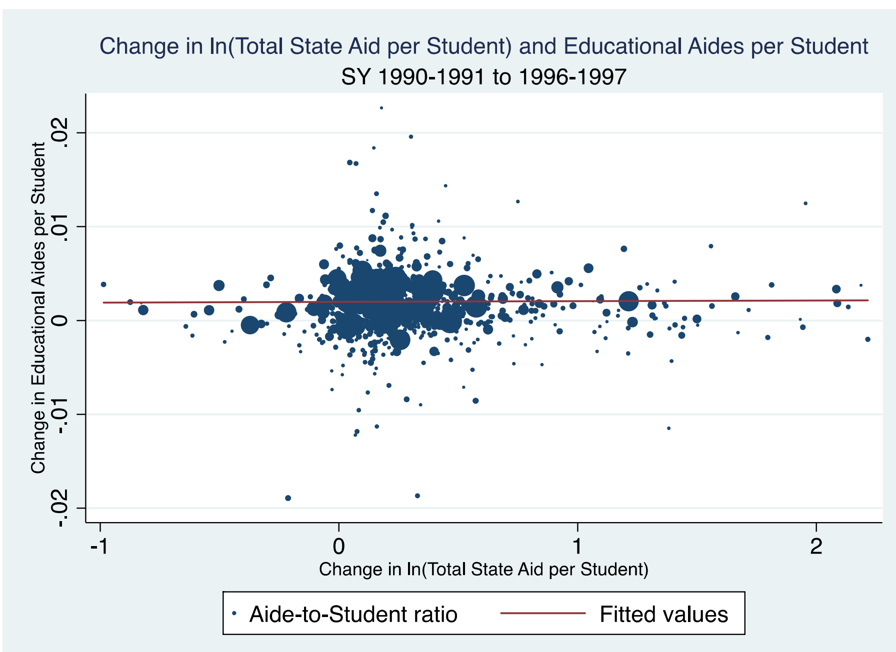
Note: Data for 1991-1992 is missing.
Source: Texas Summary of Finances, 1990-1991 through 1996-1997, TAPR Administrative and Demographic Data, 1990-1991 & 1996-1996

Graph 11



Source: Texas Summary of Finances, 1990-1991 through 1996-1997, TAPR Administrative and Demographic Data, 1990-1991 & 1996-1996

Graph 12



Source: Texas Summary of Finances, 1990-1991 through 1996-1997, TAPR Administrative and Demographic Data, 1990-1991 & 1996-1996

Table 4—Correlation between Exogenous School and District Characteristics and Staff Ratios

	(1) Support Staff / Student	(2) Support Staff / Student	(3) Support Staff / Student	(4) Support Staff / Student	(5) Aides / Students	(6) Aides / Students	(7) Aides / Students	(8) Aides / Students
Race (School-Level)								
% African American	4.58e-05	-0.000263**	-9.42e-05***	0.000165***	0.000477***	-0.000288	0.000354***	0.000714***
	(3.51e-05)	(0.000123)	(3.58e-05)	(4.29e-05)	(9.38e-05)	(0.000222)	(6.39e-05)	(0.000142)
% Asian	-0.000351***	-0.00111***	-0.000328***	-0.000123	-0.000480*	-0.00160**	-0.000262	-0.000130
	(9.63e-05)	(0.000404)	(0.000110)	(0.000109)	(0.000257)	(0.000727)	(0.000197)	(0.000360)
% Hispanic	-8.77e-05***	-0.000208**	-0.000105***	-3.39e-05	-4.97e-05	-0.000341**	1.93e-05	1.99e-05
	(2.70e-05)	(9.05e-05)	(2.79e-05)	(3.42e-05)	(7.22e-05)	(0.000163)	(4.98e-05)	(0.000113)
% Native American	-0.000881*	-0.00105	-0.000780	-0.000595	-0.00190	-0.00205	-0.00144	-0.00113
	(0.000472)	(0.00135)	(0.000530)	(0.000609)	(0.00126)	(0.00242)	(0.000945)	(0.00202)
% Pacific Islander	-0.000612	-0.00198	-0.000579	-0.000401	0.00176	-0.00430	-0.00101	0.00544
	(0.000796)	(0.00260)	(0.000742)	(0.00103)	(0.00213)	(0.00468)	(0.00132)	(0.00340)
% Multiracial	-0.00154***	-0.00190**	-0.00121***	-0.00116***	-0.00263***	-0.00323**	-0.00211***	-0.00349**
	(0.000315)	(0.000883)	(0.000333)	(0.000441)	(0.000842)	(0.00159)	(0.000594)	(0.00146)
District Characteristics								
Population Density	1.13e-06	5.20e-06	1.73e-06	6.18e-07	-2.96e-07	4.07e-06	-1.99e-06	-1.01e-06
	(1.25e-06)	(4.71e-06)	(1.22e-06)	(1.49e-06)	(3.33e-06)	(8.47e-06)	(2.18e-06)	(4.94e-06)
Population Density^2	-1.00e-10	-5.85e-10	-2.23e-10	-8.50e-11	1.79e-10	-3.67e-10	3.33e-10	2.07e-10
	(2.18e-10)	(8.25e-10)	(2.15e-10)	(2.61e-10)	(5.84e-10)	(1.48e-09)	(3.84e-10)	(8.64e-10)
District Type								
Independent Town	-0.000641	0.00193	-0.00130	-0.00132	0.00766	0.0120	0.00430	0.00477
	(0.00249)	(0.00860)	(0.00240)	(0.00308)	(0.00666)	(0.0155)	(0.00429)	(0.0102)
Major Urban	-6.33e-05	0.00630	0.00315**	-0.00266	0.00156	0.0233**	-0.00122	-0.00222
	(0.00158)	(0.00609)	(0.00160)	(0.00189)	(0.00423)	(0.0110)	(0.00286)	(0.00624)
Fast Growing	-0.00369	-0.00268	-0.00370	-0.00216	0.00151	0.000165	0.00334	0.00434
	(0.00471)	(0.0154)	(0.00433)	(0.00632)	(0.0126)	(0.0278)	(0.00773)	(0.0209)
Non-Metropolitan Stable	-0.00325	-0.00154	-0.00159	-0.00356	0.01000	0.00729	0.0192***	0.0110
	(0.00235)	(0.00793)	(0.00220)	(0.00302)	(0.00627)	(0.0143)	(0.00392)	(0.00999)
Other City	0.00141	0.00125	-3.99e-05	0.00250	0.00935**	0.00675	0.00174	0.0123*
	(0.00167)	(0.00635)	(0.00163)	(0.00201)	(0.00446)	(0.0114)	(0.00290)	(0.00664)
Other Suburb	-0.00157	0.000438	-0.00187	-0.000993	0.00602	0.00906	0.00561*	0.00691
	(0.00185)	(0.00676)	(0.00179)	(0.00224)	(0.00494)	(0.0122)	(0.00319)	(0.00743)
Rural	-0.00556**	-0.00494	-0.00349	-0.00567	0.00424	0.00367	0.00976**	0.00793
	(0.00264)	(0.00856)	(0.00252)	(0.00362)	(0.00707)	(0.0154)	(0.00450)	(0.0120)
District Demographics								
% Speaks English "Not Very Well"	-0.00606	0.00426	0.00686	-0.0179*	-0.0255	0.00630	-0.0163	-0.0440
	(0.00834)	(0.0278)	(0.00828)	(0.0104)	(0.0223)	(0.0501)	(0.0148)	(0.0346)
Median Household Income	-1.37e-07***	-1.95e-07	-1.04e-07**	-1.42e-07**	-1.37e-07	-1.92e-07	9.62e-09	-2.27e-07
	(4.78e-08)	(1.56e-07)	(4.39e-08)	(6.20e-08)	(1.28e-07)	(2.81e-07)	(7.83e-08)	(2.05e-07)

District Education Level								
Less than 9th	-0.00608	-0.00182	-0.0219	0.00270	-0.0292	-0.0298	0.0475*	-0.0627
	(0.0161)	(0.0496)	(0.0154)	(0.0215)	(0.0430)	(0.0892)	(0.0274)	(0.0712)
Less than high school	0.00520	0.0229	0.00915	0.00433	0.00375	0.00950	0.0560**	-0.00556
	(0.0157)	(0.0470)	(0.0147)	(0.0217)	(0.0420)	(0.0846)	(0.0262)	(0.0719)
Some College	0.00787	0.0302	0.00744	-0.00738	-0.00863	0.0405	0.102***	-0.0769
	(0.0125)	(0.0361)	(0.0112)	(0.0175)	(0.0333)	(0.0650)	(0.0200)	(0.0578)
Associate	0.0150	0.0384	0.0143	0.00554	-0.00834	0.0823	-0.0406	-0.0143
	(0.0196)	(0.0586)	(0.0180)	(0.0271)	(0.0523)	(0.105)	(0.0321)	(0.0898)
Bachelor	0.0227*	0.0429	0.0111	0.0219	0.00276	0.0121	0.0421**	-0.00794
	(0.0126)	(0.0383)	(0.0115)	(0.0171)	(0.0338)	(0.0689)	(0.0204)	(0.0566)
Graduate	0.0232	0.0540	0.0210	0.0152	0.0265	0.0984	0.0479	0.0195
	(0.0184)	(0.0594)	(0.0171)	(0.0241)	(0.0493)	(0.107)	(0.0305)	(0.0797)
Constant	0.0187***	0.0151	0.0164**	0.0199**	0.0344*	0.0265	-0.0285**	0.0614*
	(0.00718)	(0.0221)	(0.00664)	(0.00976)	(0.0192)	(0.0398)	(0.0118)	(0.0323)
Observations	21,776	4,081	4,641	12,505	21,776	4,081	4,641	12,505
R-squared	0.004	0.007	0.012	0.005	0.004	0.006	0.030	0.005

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5—Correlation between TAKS Test Scores in 4th, 7th, and 8th Grades and Staff Ratios

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Reading4	Math4	Reading7	Math7	Reading8	Math8	Reading4	Math4	Reading7	Math7	Reading8	Math8
Support Staff / Student	50.69	22.26	-66.82	-194.1***	-180.9***	-176.5***						
	(34.31)	(35.69)	(49.69)	(66.12)	(26.01)	(42.63)						
Educational Aides/ Students							-16.01	-42.97***	-3.480	-20.84	-91.65***	-87.02***
							(12.53)	(8.279)	(11.29)	(15.02)	(9.016)	(15.85)
Race (School-Level)												
% African American	-0.196***	-0.178***	-0.225***	-0.302***	-0.170***	-0.296***	-0.195***	-0.178***	-0.228***	-0.311***	-0.173***	-0.301***
	(0.0102)	(0.0105)	(0.0145)	(0.0191)	(0.0139)	(0.0220)	(0.0101)	(0.0104)	(0.0143)	(0.0190)	(0.0137)	(0.0219)
% Asian	0.0259	0.0356	0.134***	0.124**	0.135***	0.211***	0.0234	0.0286	0.133***	0.122**	0.139***	0.219***
	(0.0262)	(0.0281)	(0.0450)	(0.0601)	(0.0448)	(0.0699)	(0.0262)	(0.0280)	(0.0450)	(0.0603)	(0.0439)	(0.0696)
% Hispanic	-0.168***	-0.104***	-0.155***	-0.179***	-0.0922***	-0.169***	-0.166***	-0.103***	-0.157***	-0.184***	-0.0984***	-0.175***
	(0.00817)	(0.00846)	(0.0110)	(0.0146)	(0.0107)	(0.0168)	(0.00815)	(0.00840)	(0.0109)	(0.0145)	(0.0105)	(0.0167)
% Native American	-0.608***	-0.503***	-0.459**	-0.980***	-0.229	-0.839**	-0.592***	-0.420***	-0.454**	-0.966***	-0.207	-0.801**
	(0.131)	(0.140)	(0.216)	(0.287)	(0.214)	(0.333)	(0.131)	(0.141)	(0.216)	(0.288)	(0.210)	(0.332)
% Pacific Islander	-0.429	-0.0122	0.479	1.010**	0.628*	1.133**	-0.390	0.0167	0.470	0.984**	0.626*	1.123**
	(0.296)	(0.305)	(0.349)	(0.464)	(0.342)	(0.505)	(0.296)	(0.303)	(0.350)	(0.465)	(0.336)	(0.502)
% Multiracial	0.124	-0.0497	0.308**	0.358*	0.398***	0.432*	0.121	-0.0612	0.317**	0.386*	0.431***	0.465**
	(0.111)	(0.116)	(0.155)	(0.203)	(0.152)	(0.238)	(0.111)	(0.116)	(0.155)	(0.204)	(0.149)	(0.237)
District Characteristics												
Population Density	0.000721**	0.000552	0.000485	-0.000272	0.000341	-0.000888	0.000718**	0.000598*	0.000503	-0.000209	0.000342	-0.000891
	(0.000347)	(0.000361)	(0.000506)	(0.000676)	(0.000497)	(0.000782)	(0.000347)	(0.000360)	(0.000507)	(0.000677)	(0.000488)	(0.000779)
Population Density^2	-8.27e-08	-1.27e-07**	-1.04e-07	1.70e-08	-7.05e-08	6.06e-08	-7.93e-08	-1.29e-07**	-1.10e-07	-2.33e-09	-6.58e-08	6.25e-08
	(6.01e-08)	(6.26e-08)	(9.22e-08)	(1.23e-07)	(9.06e-08)	(1.43e-07)	(6.01e-08)	(6.23e-08)	(9.21e-08)	(1.23e-07)	(8.90e-08)	(1.42e-07)
District Type												
Independent Town	-1.681**	-2.101***	-2.968***	-3.935***	-2.419**	-3.179**	-1.598**	-1.754**	-2.933***	-3.782***	-1.952**	-2.768*
	(0.739)	(0.772)	(1.014)	(1.353)	(0.997)	(1.576)	(0.745)	(0.772)	(1.016)	(1.357)	(0.979)	(1.569)
Major Urban	-0.417	-0.928**	-0.224	-0.746	-0.333	0.266	-0.590	-1.144**	-0.134	-0.497	0.00229	0.545
	(0.452)	(0.471)	(0.652)	(0.872)	(0.639)	(1.009)	(0.445)	(0.461)	(0.649)	(0.869)	(0.626)	(1.001)
Fast Growing	-1.169	-2.057*	-1.403	-2.003	-1.696	-2.220	-1.205	-1.928*	-1.243	-1.493	-0.972	-1.473
	(1.150)	(1.171)	(1.406)	(1.875)	(1.442)	(2.188)	(1.149)	(1.166)	(1.403)	(1.874)	(1.414)	(2.174)

Non-Metropolitan Stable	-2.183***	-3.529***	-2.068**	-2.979**	-2.706***	-1.728	-2.178***	-3.164***	-1.973**	-2.613**	-1.786**	-0.897
	(0.729)	(0.762)	(0.879)	(1.172)	(0.865)	(1.359)	(0.732)	(0.757)	(0.881)	(1.177)	(0.850)	(1.355)
Other City	0.101	-0.434	-1.576**	-1.860**	-1.597**	-1.835*	0.0816	-0.338	-1.625**	-1.960**	-1.352**	-1.604
	(0.481)	(0.504)	(0.678)	(0.902)	(0.662)	(1.047)	(0.481)	(0.500)	(0.678)	(0.904)	(0.650)	(1.044)
Other Suburb	-1.285**	-1.045*	-1.889***	-1.334	-1.852**	-0.330	-1.272**	-0.830	-1.826**	-1.099	-1.317*	0.139
	(0.534)	(0.561)	(0.732)	(0.979)	(0.725)	(1.130)	(0.536)	(0.558)	(0.732)	(0.981)	(0.712)	(1.124)
Rural	-2.486***	-4.131***	-2.582***	-4.217***	-2.362**	-3.430**	-2.505***	-3.732***	-2.451***	-3.752***	-1.403	-2.538*
	(0.843)	(0.872)	(0.927)	(1.226)	(0.920)	(1.430)	(0.844)	(0.862)	(0.928)	(1.229)	(0.903)	(1.423)
District Demographics												
% Speaks English "Not Very Well"	19.40***	26.44***	8.624***	23.99***	6.788**	31.08***	18.96***	26.13***	8.788***	24.38***	6.491**	30.68***
	(2.448)	(2.544)	(3.107)	(4.138)	(3.059)	(4.818)	(2.447)	(2.530)	(3.107)	(4.145)	(3.004)	(4.798)
Median Household Income	1.76e-05	-7.43e-06	1.18e-05	1.47e-05	4.98e-05***	6.14e-05**	1.49e-05	-1.35e-05	1.20e-05	1.48e-05	4.76e-05***	5.80e-05**
	(1.51e-05)	(1.63e-05)	(1.78e-05)	(2.36e-05)	(1.76e-05)	(2.76e-05)	(1.51e-05)	(1.63e-05)	(1.78e-05)	(2.36e-05)	(1.73e-05)	(2.75e-05)
District Education Level												
Less than 9th	-17.36***	-14.49***	-5.767	-8.447	-9.165*	-14.57*	-17.19***	-14.84***	-5.701	-8.316	-9.737*	-14.90*
	(5.050)	(5.221)	(5.494)	(7.299)	(5.432)	(8.524)	(5.047)	(5.200)	(5.497)	(7.316)	(5.333)	(8.487)
Less than high school	-17.61***	-21.21***	-17.36***	-13.26*	-9.818*	-18.77**	-17.36***	-21.25***	-17.68***	-14.12**	-10.57**	-19.41**
	(5.211)	(5.368)	(5.195)	(6.904)	(5.131)	(8.064)	(5.207)	(5.343)	(5.192)	(6.913)	(5.034)	(8.025)
Some College	4.780	3.946	5.532	8.877	7.878*	8.613	4.671	3.207	5.421	8.374	6.252	7.118
	(4.135)	(4.267)	(4.149)	(5.483)	(4.120)	(6.451)	(4.141)	(4.250)	(4.153)	(5.499)	(4.046)	(6.426)
Associate	17.64***	16.07**	5.160	16.20*	12.40*	18.21*	18.70***	17.29***	4.991	15.51*	9.760	16.12
	(6.333)	(6.616)	(6.513)	(8.645)	(6.771)	(10.13)	(6.312)	(6.567)	(6.519)	(8.667)	(6.646)	(10.08)
Bachelor	4.569	15.48***	7.470*	23.93***	4.620	20.75***	4.821	15.38***	7.303*	23.39***	2.991	19.24***
	(4.080)	(4.283)	(4.367)	(5.788)	(4.318)	(6.726)	(4.074)	(4.259)	(4.371)	(5.802)	(4.242)	(6.701)
Graduate	-2.001	-7.983	-0.719	-0.932	-9.255	-8.328	-1.514	-7.254	-1.051	-1.996	-11.02*	-9.883
	(5.730)	(6.029)	(6.581)	(8.741)	(6.619)	(10.22)	(5.726)	(6.003)	(6.580)	(8.755)	(6.491)	(10.16)
Constant	91.71***	91.10***	93.75***	85.20***	91.54***	81.24***	92.37***	92.31***	93.44***	84.46***	92.35***	82.02***
	(2.319)	(2.404)	(2.485)	(3.304)	(2.466)	(3.844)	(2.331)	(2.397)	(2.479)	(3.302)	(2.423)	(3.833)
Observations	3,763	3,665	1,452	1,465	1,440	1,476	3,763	3,665	1,452	1,465	1,440	1,476
R-squared	0.335	0.209	0.476	0.411	0.404	0.367	0.335	0.215	0.476	0.408	0.426	0.372

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 - Correlation between Endogenous Policy Choices and Staff Ratios

	(1) Support Staff / Student	(2) Support Staff / Student	(3) Support Staff / Student	(4) Support Staff / Student	(5) Aides / Students	(6) Aides / Students	(7) Aides / Students	(8) Aides / Students
School Size								
Total Students	-2.31e-05***	-1.60e-05***	-3.94e-05***	-0.000114***	-5.37e-05***	-2.85e-05***	-8.77e-05***	-0.000366***
	(2.56e-06)	(5.83e-06)	(4.87e-06)	(1.09e-05)	(6.87e-06)	(1.03e-05)	(8.82e-06)	(3.61e-05)
Total Students^2	6.22e-09***	3.13e-09*	1.88e-08***	7.71e-08***	1.56e-08***	6.44e-09**	4.59e-08***	2.50e-07***
	(8.64e-10)	(1.79e-09)	(2.88e-09)	(8.36e-09)	(2.32e-09)	(3.18e-09)	(5.22e-09)	(2.78e-08)
Special Programs								
% Gifted and Talented	-0.000119*	-0.000187	-6.37e-05	-4.56e-05	-0.000210	-0.000221	1.10e-05	-0.000194
	(6.92e-05)	(0.000224)	(5.85e-05)	(0.000100)	(0.000185)	(0.000397)	(0.000106)	(0.000333)
% Special Education	0.00117***	0.00165***	0.00172***	0.00118***	0.00281***	0.00405***	0.00240***	0.00181***
	(5.91e-05)	(0.000160)	(8.95e-05)	(0.000123)	(0.000159)	(0.000283)	(0.000162)	(0.000408)
% Vocational Education	2.11e-07	-7.65e-05	-1.86e-05	-0.000330	-0.000132***	-0.000266**	-6.54e-05	-0.00140
	(1.83e-05)	(6.97e-05)	(2.66e-05)	(0.000817)	(4.91e-05)	(0.000124)	(4.81e-05)	(0.00272)
% English as a Second Language	-2.34e-05	-0.000275	-1.65e-05	4.61e-05	7.33e-05	-0.000331	8.95e-05	0.000144
	(3.38e-05)	(0.000223)	(5.41e-05)	(4.22e-05)	(9.06e-05)	(0.000396)	(9.79e-05)	(0.000140)
Controls								
Race (School-Level)								
% African American	-3.09e-06	-0.000460***	-0.000187***	0.000156***	0.000362***	-0.000720***	0.000235***	0.000661***
	(3.51e-05)	(0.000123)	(3.46e-05)	(4.34e-05)	(9.42e-05)	(0.000219)	(6.27e-05)	(0.000144)
% Asian	-6.19e-05	-0.000315	4.02e-05	6.21e-05	0.000137	-2.50e-05	0.000191	0.000271
	(9.65e-05)	(0.000417)	(0.000108)	(0.000109)	(0.000259)	(0.000740)	(0.000196)	(0.000364)
% Hispanic	-6.84e-05**	-0.000236***	-0.000122***	-2.96e-05	-5.32e-05	-0.000416**	4.68e-06	2.01e-05
	(2.83e-05)	(9.13e-05)	(2.73e-05)	(3.77e-05)	(7.58e-05)	(0.000162)	(4.94e-05)	(0.000125)
% Native American	-0.000896*	-0.000940	-0.000708	-0.00108*	-0.00196	-0.00166	-0.00127	-0.00224
	(0.000467)	(0.00133)	(0.000504)	(0.000607)	(0.00125)	(0.00235)	(0.000912)	(0.00202)
% Pacific Islander	-0.00140*	-0.00249	-0.000901	-0.00146	-0.000131	-0.00522	-0.00146	0.00360
	(0.000786)	(0.00255)	(0.000703)	(0.00102)	(0.00211)	(0.00453)	(0.00127)	(0.00340)
% Multiracial	-0.00150***	-0.00183**	-0.000995***	-0.00111**	-0.00277***	-0.00312**	-0.00178***	-0.00321**
	(0.000313)	(0.000870)	(0.000317)	(0.000438)	(0.000839)	(0.00154)	(0.000574)	(0.00146)
District Characteristics								
Population Density	5.77e-07	7.10e-06	1.63e-06	-1.29e-07	-1.71e-06	6.67e-06	-1.53e-06	-1.98e-06
	(1.23e-06)	(4.67e-06)	(1.16e-06)	(1.48e-06)	(3.30e-06)	(8.28e-06)	(2.11e-06)	(4.93e-06)
Population Density^2	-9.34e-11	-1.22e-09	-4.14e-10**	-0	1.54e-10	-1.64e-09	-0	2.74e-10
	(2.16e-10)	(8.15e-10)	(2.05e-10)	(2.59e-10)	(5.78e-10)	(1.45e-09)	(3.72e-10)	(8.63e-10)
District Type								
Independent Town	-0.00202	-0.00319	-0.00261	-0.00354	0.00458	0.000974	0.00158	-0.00223
	(0.00246)	(0.00849)	(0.00229)	(0.00307)	(0.00660)	(0.0151)	(0.00415)	(0.0102)
Major Urban	-0.000266	0.00428	0.00144	-0.00267	0.00121	0.0182	-0.00583**	-0.00273
	(0.00158)	(0.00624)	(0.00157)	(0.00189)	(0.00424)	(0.0111)	(0.00285)	(0.00629)
Fast Growing	-0.00704	-0.0119	-0.00911**	-0.00396	-0.00545	-0.0178	-0.00742	-0.00281

	(0.00466)	(0.0152)	(0.00416)	(0.00628)	(0.0125)	(0.0270)	(0.00752)	(0.0209)
Non-Metropolitan Stable	-0.00783***	-0.0102	-0.00767***	-0.00818***	0.00108	-0.00920	0.00749*	-0.00322
	(0.00235)	(0.00800)	(0.00219)	(0.00303)	(0.00631)	(0.0142)	(0.00397)	(0.0101)
Other City	0.000591	-0.00253	-0.000394	0.00266	0.00737*	-0.00306	0.00104	0.0123*
	(0.00165)	(0.00627)	(0.00154)	(0.00200)	(0.00441)	(0.0111)	(0.00279)	(0.00664)
Other Suburb	-0.00301	-0.00473	-0.00365**	-0.00153	0.00321	-0.00129	0.00213	0.00446
	(0.00183)	(0.00674)	(0.00171)	(0.00224)	(0.00491)	(0.0120)	(0.00310)	(0.00745)
Rural	-0.0130***	-0.0159*	-0.0142***	-0.0187***	-0.0104	-0.0164	-0.0127***	-0.0333***
	(0.00273)	(0.00886)	(0.00272)	(0.00381)	(0.00732)	(0.0157)	(0.00492)	(0.0127)
District Demographics								
% Speaks English "Not Very Well"	0.00942	0.0409	0.0313***	-0.0105	0.00494	0.0792	0.0130	-0.0284
	(0.00844)	(0.0282)	(0.00822)	(0.0108)	(0.0226)	(0.0501)	(0.0149)	(0.0359)
Median Household Income	-6.65e-08	-1.35e-07	-5.16e-08	-5.88e-08	9.13e-09	-5.76e-08	7.82e-08	-2.06e-08
	(4.73e-08)	(1.54e-07)	(4.20e-08)	(6.17e-08)	(1.27e-07)	(2.72e-07)	(7.60e-08)	(2.05e-07)
District Education Level								
Less than 9th	0.00563	-0.00915	-0.0101	0.0219	-0.00713	-0.0439	0.0675**	-0.0177
	(0.0159)	(0.0489)	(0.0146)	(0.0215)	(0.0426)	(0.0867)	(0.0265)	(0.0717)
Less than high school	0.00308	0.0170	0.00976	0.000742	0.00197	-0.00293	0.0577**	-0.0157
	(0.0155)	(0.0463)	(0.0140)	(0.0216)	(0.0417)	(0.0821)	(0.0253)	(0.0720)
Some College	0.0179	0.0347	0.0233**	0.00572	0.0144	0.0495	0.128***	-0.0399
	(0.0123)	(0.0355)	(0.0107)	(0.0173)	(0.0330)	(0.0630)	(0.0193)	(0.0576)
Associate	0.0224	0.0382	0.0355**	0.00884	0.00475	0.0757	-0.00526	-0.00148
	(0.0193)	(0.0576)	(0.0171)	(0.0269)	(0.0518)	(0.102)	(0.0310)	(0.0894)
Bachelor	0.0273**	0.0576	0.0197*	0.0139	0.00892	0.0389	0.0541***	-0.0265
	(0.0125)	(0.0377)	(0.0109)	(0.0170)	(0.0335)	(0.0668)	(0.0198)	(0.0566)
Graduate	0.0141	0.0213	0.0229	0.0119	0.00737	0.0176	0.0568*	0.0165
	(0.0182)	(0.0587)	(0.0162)	(0.0239)	(0.0488)	(0.104)	(0.0294)	(0.0796)
Observations	21,776	4,081	4,641	12,505	21,776	4,081	4,641	12,505
R-squared	0.032	0.045	0.115	0.026	0.026	0.071	0.104	0.017

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Appendix 1: Complete PEIMS Staff Definitions (District Level Data)

Total Personnel – The total of Professional Staff, Paraprofessional Staff and Auxiliary Staff.

Teachers: Teaching staff are reported with the following codes:

047- Substitute Teacher - A person who serves in a classroom in the absence of a teacher certified for that assignment where the teacher has quit, died, or been terminated; or, a person who is permanently hired to substitute on an as-needed basis.
087-Teacher – A professional employee who is required to hold a valid teacher certificate or permit in order to perform some type of instruction to students.

Grade Levels **–** services provided by teachers are grouped into the following categories:

Early Education
Pre-Kindergarten
Kindergarten
Pre-Kindergarten/Kindergarten
Kindergarten/Elementary (K-6)
Elementary (Grades 1-6)
Middle School (Grades 6 - 8)
Secondary (Grades 7-12)
All Grade Levels
Unknown
Not Applicable

Support Staff: This grouping is the sum of staff reported for the following role codes and descriptions:

002 - Art Therapist - Serves as Art Therapist.
005 - Psychological Associate - Serves under the Licensed Specialist in School Psychology (LSSP) or psychologist to provide guidance and counseling services to students.
006 - Audiologist - The person who provides audiological services to students with hearing impairments.
007 - Corrective Therapist - Serves as Corrective Therapist.
008 - Counselor - Provides guidance and counseling services to students.
011 - Educational Diagnostician - Provides educational diagnostic services and individualized education program development.
013 - Librarian - Supervises library/learning resources center, or functions as one of several librarians, or learning resource specialists, on a major campus.
015 - Music Therapist - Serves as Music Therapist.
016 - Occupational Therapist - Serves as Occupational Therapist.
017 - Orientation/Mobility Spec (Coms) - Certified Orientation and Mobility Specialist (COMS)
018 - Physical Therapist - Serves as Physical Therapist.

019 - Physician - Serves as school Physician.

021 - Recreational Therapist - Serves as Recreational Therapist.

022 - School Nurse - A person that complies with TEC 21.003(b), "is licensed by the state agency that licenses that profession", [Nurse Practioner (NP), Registered Nurse (RN), Licensed Vocational Nurse (LVN)] is employed/contracted by the school district, and whose primary job responsibility is that of school nurse. Only persons licensed by the state agency that licenses nurses may be employed as a school nurse.

023 - LSSP/Psychologist - Serves as Licensed Specialist in School Psychology/Psychologist.

024 - Social Worker - Serves as the school social worker to provide comprehensive social services as a part of an education team. Social workers must be licensed by the Texas State Board of Examiners and must hold a bachelor’s or master’s degree.

026 - Speech Therpist/Speech-Language Pathologist - Serves as provider of speech-language pathology/speech therapy services.

030 - Truant Officer/Visiting Teacher - Directs activities related to promoting and improving school attendance. Such certified staff members provide home, school, and community liaison services.

032 - Work-Based Learning Site Coordinator - The code for a Career and Technical Education teacher (087) assigned to career preparation work-based learning experiences is changed from 087 to 032 when visiting a student training site for the purpose of evaluating the student and consulting the employer.

041 - Teacher Facilitator - Serves as an exemplary role model in assisting teachers with improving their classroom performance.

042 - Teacher Appraiser - Serves as an appraiser in the Texas Teacher Appraisal System.

054 - Department Head - Serves as head or chairman of a subject area department on a campus.

056 - Athletic Trainer - Serves as a trainer in the athletics program.

058 - Other Campus Professional Personnel - Serves as a professional staff member at one or more campuses. Some examples of staff who are to be shown with this role are:

- campus/community liaisons,
- campus volunteer coordinators,
- information technology staff assigned to a campus,
- dean, and
- instructional officers assigned to a campus.

064 - Specialist/Consultant - Provides technical assistance and professional development in various areas of an education service center.

065 - Field Service Agent - Provides coordinated assistance to districts and campuses.

080 - Other Non-instructional District Professional Personnel - District staff who are professional-level, non-instructional staff who cannot be classified in any other role regardless of where assigned. Physical work location is not a determining factor. The position does not involve supervising or controlling curriculum, programs, or professional personnel whose assignments require TEA certification. A degree and/or certification are not required. This includes but is not limited to:

- district director or administrative department heads and their associates or assistants,
- and any other professional-level staff in a functional area such as:
  - food service (dietician),
  - health services,
  - maintenance and operations,
  - transportation,
  - information technology (including but not limited to programmer/analysts, network specialists, data base administration, PEIMS coordinator),
  - security (including but not limited to Chief of Police, investigators),
  - business services (including but not limited to accounting, budget, Human Resources professional staff, Internal Auditor, professional payroll staff),
  - research/evaluation (including but not limited to analysts, grant writers),
  - communications (including but not limited to Public Information Officer, Community Liaison),
  - legal (including but not limited to Counsel, Hearing Officers),
  - textbooks, and
  - purchasing.

<u>Administrative Staff:</u> This grouping is the sum of staff reported for the following role codes and descriptions:

003 - Assistant Principal - Assists the principal of a particular campus in any duties the principal may deem appropriate.

004 - Assistant/Associate/Deputy Superintendent - Assists the superintendent of a particular school district in any duties the superintendent may deem appropriate. Persons assigned to this role usually perform functions associated with more than one campus.

012 - District Instructional Program Director or Executive Director - Serves under the superintendent, or higher grade instructional administrative officer, as the key specialist for a major instructional, instructional related, or pupil service program. Responsibilities may include curriculum development or supervision of programs or personnel whose assignments require certification or licensure. Only degreed, certified personnel may be placed in this category. Examples include, but are not limited to, staff serving as Director of Guidance and Counseling, Director of Curriculum, Director of Librarians, Director of Bilingual/ESL, Career and Technical Director, Director of Special Education, and Director of Social Studies.

020 - Principal - Serves as the instructional leader of the school whose duties include selecting teachers for the campus, setting education objectives, developing budgets for the campus, and working with school professionals to prepare individual development plans.

027 - Superintendent/Chief Administrative Officer/Chief Executive Officer/President - The educational leader and administrative manager of the school district.

028 - Teacher Supervisor - Provides consultant services to teachers in a grade level, adjacent grades, in a teaching field, or group of related fields.

040 - Athletic Director - Used only when the staff member with such a title is performing administrative tasks directing the athletic program. Responsibilities may include supervision of coaches and other personnel in the athletic program. It is not used when coaching duties are being performed.

043 - Business Manager - Serves as business manager or Chief Financial Officer (CFO).

044 - Tax Assessor and/or Collector - Serves as district tax assessor, tax collector, or tax assessor-collector.

045 - Director of Personnel/Human Resources - Serves as personnel or human resources director.

055 - Registrar - Serves as school or district registrar.

Total Professional

The sum of Teachers, Support Staff and Administrative Staff (see above).

Paraprofessional Staff

This grouping is the sum of staff reported for the following role codes and descriptions:

033 - Educational Aide - Performs routine classroom tasks under the general supervision of a certified teacher or teaching team.

036 - Certified Interpreter - A state or nationally certified interpreter for the deaf who translates/transliterates for students who are deaf or hard of hearing, according to ARD committee recommendations.
(Certified interpreters may be either professional or para-professional, depending on district classification.)

Auxiliary Staff

District staff who are not professional or paraprofessional in their capacity. Examples of auxiliary staff are bus drivers, custodians and cafeteria workers.

Appendix 2: Complete TAPR Staff Definitions (School-Level Data)

PEIMS Role Identifications
(In Alphabetical Order by Label)

CENTRAL ADMINISTRATORS
027...Superintendent/CAO/CEO/President

CAMPUS ADMINISTRATORS
003...Assistant Principal

EITHER CENTRAL OR CAMPUS ADMINISTRATORS*
004...Assistant/Associate/Deputy Superintendent
012...Instructional Officer
020...Principal
028...Teacher Supervisor
040...Athletic Director
043...Business Manager
044...Tax Assessor and/or Collector
045...Director - Personnel/Human Resources
055...Registrar
060...Executive Director
061...Asst/Assoc/Deputy Exec Director
062...Component/Department Director
063...Coordinator/Manager/Supervisor

PROFESSIONAL SUPPORT STAFF
002 ....Art Therapist
005 ....Psychological Associate
006...Audiologist
007...Corrective Therapist
008...Counselor

011 ....Educational Diagnostician
013...Librarian
015...Music Therapist
016...Occupational Therapist
017...Certified Orientation & Mobility Specialist
018...Physical Therapist
019 ....Physician
021...Recreational Therapist
022...School Nurse
023...LSSP/Psychologist
024...Social Worker
026...Speech Therapist/Speech-Lang Pathologist
030...Visiting Teacher
032...Work-Based Learning Site Coordinator
041...Teacher Facilitator
042...Teacher Appraiser
054...Department Head
056...Athletic Trainer
058...Other Campus Professional Personnel
064...Specialist/Consultant
065...Field Service Agent
079...Other ESC Professional Personnel
080...Other Non-Campus Professional Personnel

TEACHERS
087...Teacher
047...Substitute Teacher

EDUCATIONAL AIDES
033...Educational Aide
036...Certified Interpreter

AUXILIARY STAFF
Employment record, but no responsibility records.
* Administrators reported with these roles are categorized as central office or campus, depending on the organization ID reported
for them.