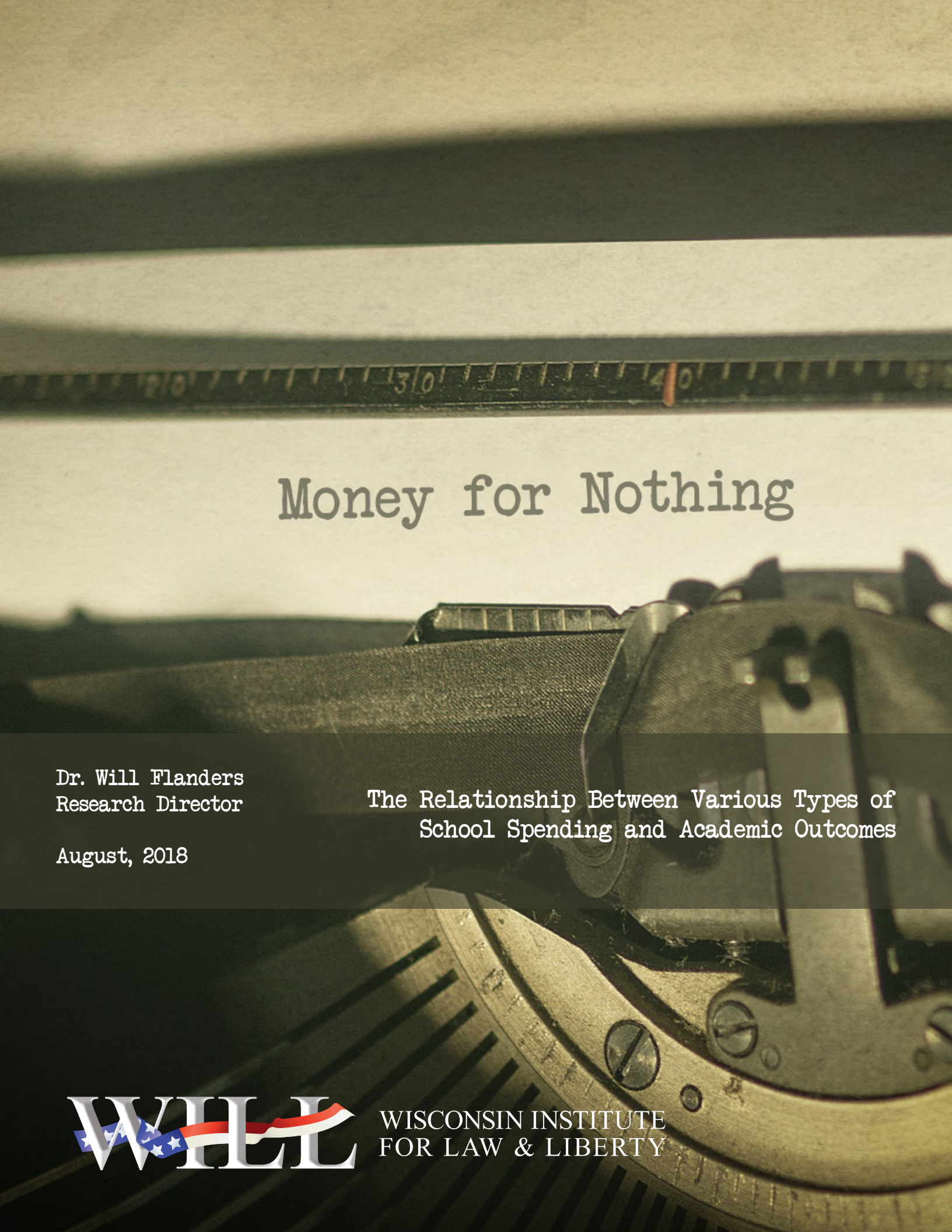

Dr. Will Flanders
Research Director

August, 2018

The Relationship Between Various Types of School Spending and Academic Outcomes

WISCONSIN INSTITUTE
FOR LAW & LIBERTY

Policy Report

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Money for Nothing

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Executive Summary

The debate over school spending is taking place all over the country. Gubernatorial candidates like state Superindentent Tony Evers tout how much more they would spend on Wisconsin schools,[1] while teachers in Milwaukee have threatened to go on strike for increased pay.[2] While much is made on both sides of the aisle about the need to increase school spending, far less is known about what types of school spending is – or is not – effective at increasing student outcomes. For this study, we seek to better understand the relationship between test scores for students in Wisconsin's K-12 public school districts and their share of non-teaching positions, per stuent spending, and teacher pay. To do this, we use data from Open The Books with data gathered from the Wisconsin Department of Public Instruction over the past six years. Key findings include:

The number of non-teaching positions varies extensively across school districts. Some districts have as few as 20% non-teachers on staff, while other districts have more than 68% non-teachers.

The number of non-teachers on staff has a negative effect on student performance. When it comes to English proficiency on state exams, districts with more non-teachers have lower proficiency rates than districts with a higher percentage of teachers.

Per student spending has a negative effect on student performance. When proper control variables are included in the model, school districts that spend more per student have lower academic proficiency in both math and English.

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[1]Wisconsin Department of Public Instruction. 2017. "Ever's Statement on Governor's Proposed Budget for Education." https://dpi.wi.gov/news/releases/2017/evers-statement-governor-s-proposed-budget-education

[2] Johnson, Annysa. 2018. MPS Teachers Union Raises Specter of Walkouts Over Budget Cuts." https://www.jsonline.com/story/news/education/2018/05/04/mps-teachers-union-raises-specter-walkouts-over-budget-cuts/577454002/

Teacher pay has kept up with inflation. Despite claims to the contrary, average teacher pay in Wisconsin is similar to six years ago, accounting for inflation.

Teacher pay has no relationship with student performance on state mandated exams. Across six years of data, no relationship as found of average teacher pay on student outcomes.

Previous research by WILL has shown that school districts have expanded spending on non-teachers in the aftermath of the passage of Act 10. Our research provides evidence that this is a misallocation of school resources, and that school districts should consider devoting more money to other areas. That said, our research also suggests that current pay systems in the state are not sufficiently rewarding high quality teachers to significantly impact student outcomes. More work is needed to determine effective resource allocations.

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Introduction

The school spending debate is taking place across the country; from West Virginia to Oklahoma. Wisconsin is no exception. Gubernatorial candidates like state Superindentent Tony Evers tout how much more they would spend on Wisconsin schools,[3] while teachers in Milwaukee have threatened to go on strike for increased pay.[4] To a population that has very limited knowledge about how much is actually being spent on Wisconsin schools, more spending sounds good.[5] However, in this paper we ask how effective is the manner in which we are currently spending money?

An increasingly common argument is that administrative costs are increasing faster than spending in the classroom, and that this is having a negative effect on student outcomes. Previous research by WILL has shown that this has indeed been the case in Wisconsin, with spending on administrative staff increased in the aftermath of Act 10.[6] That said, the effect of this spending pattern on academic performance is yet to be determined. As a counter to more administrative spending, more spending on teacher pay is often proposed. Using six years of data on Wisconsin school districts, we test both of these claims.

We combine data from Open the Books with data gathered directly from the Wisconsin Department of Public Instruction to highlight the changes that have occurred in the share of staff that are non-teachers over the past six years, as well as what has happened with teacher pay in Wisconsin over that same time frame. We then examine the relationship between these factors and student outcomes on Wisconsin's state exams.

Non-Teaching Staff Over Time

We define "non-teaching staff" as any staff in a school district that does not have direct contact with students on a constant basis as part of their job. For our purposes, this excludes teachers, paraprofessionals, and substitutes (though few substitutes work a sufficient number of days to be included in our analysis). The state Department of Public Instruction (DPI) keeps records of every staff member in the state for a number of years. We exclude those who work less than 100% of Full Time Equivalence (FTE). The percentage of staff in schools that is non-teaching has not changed significantly over the past few years, varying in the narrow range from as high as 46% to as low as

[3]Wisconsin Department of Public Instruction. 2017. "Ever's Statement on Governor's Proposed Budget for Education." https://dpi.wi.gov/news/releases/2017/evers-statement-governor-s-proposed-budget-education

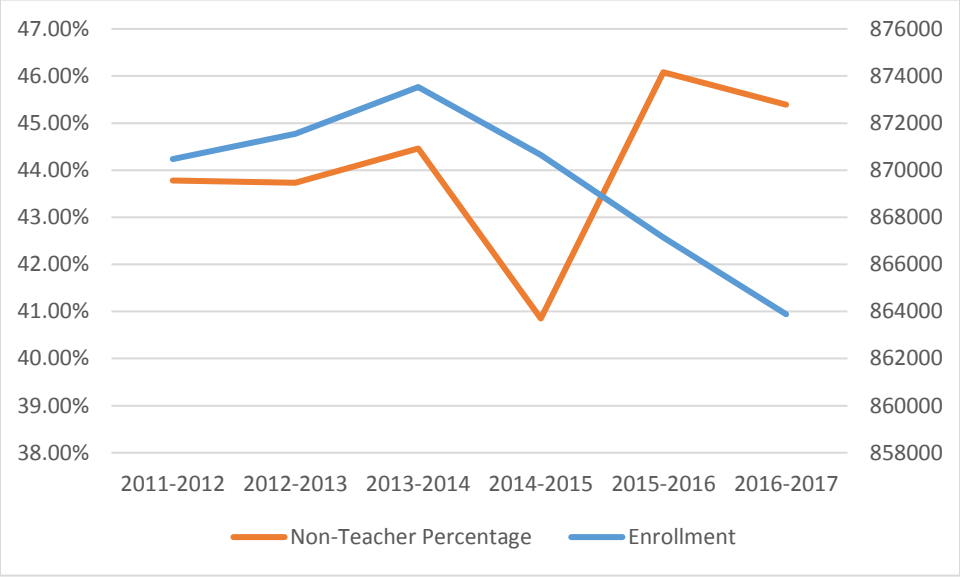
[4] Johnson, Annysa. 2018. MPS Teachers Union Raises Specter of Walkouts Over Budget Cuts." https://www.jsonline.com/story/news/education/2018/05/04/mps-teachers-union-raises-specter-walkouts-over-budget-cuts/577454002/

[5] Flanders, Will. 2018. "Message Matters: How effective Messages on Education Reform Shape Opinion." WILL Policy Paper.

[6] Lueken, Marty, Will Flanders & CJ Szafir. 2017. "The Impact of Act 10 on Wisconsin's Education Workforce: A comprehensive statewide analysis of Act 10's effect on students per teacher and teacher experience, salary, and benefits."

40%. These year-to-year variations appear to stem less from changes in the composition of the workforce and more from the cutoff point of FTE status used in this analysis.[7]

Figure 1. Average Percentage of Staff in Non-Teaching Positions Over Time



The pay levels of non-teaching staff in schools can be quite high, particularly in administrative offices. Table 1 below shows the top 10 school district salaries and how that compares to the average teacher salary in their district using the most recent year of data from Open the Books.

Table 1. Top 10 School District Employees by Salary, 2016

Salary	District	Name of Employee	Position	Teacher Pay	% Teacher Pay
$262,992	Kenosha	Kroetz Joshua	Social Worker	$55,485	473.99%
$245,000	Milwaukee	Driver Darienne	District Admin	$50,351	486.58%
$237,946	Madison Metro	Cheatham Jennifer	District Admin	$46,338	513.50%
$210,125	Racine Unified	Haws Ladarla	District Admin	$46,387	452.98%
$198,700	Kenosha	Savaglio-Jarvis Susan	District Admin	$55,485	358.12%
$191,000	Marathon Co	Hartwig Eric	District Admin	$35,759	534.13%
$190,000	Green Bay Area	Langenfeld Michelle	District Admin	$47,726	398.11%
$186,436	Arrowhead UHS	Myrah Laura	District Admin	$56,887	327.73%
$182,935	Peshtigo	Eparvier Kim	District Admin	$39,768	460.01%
$181,549	Hamilton	Cooke Kathleen	District Admin	$60,717	299.01%

All but one of the top ten employees in pay is a district administrator – or superintendent. The one exception is a Social Worker in Kenosha who was the highest paid school district employee in the state during the 16-17 school year. There are many districts where the pay level of administrators is

[7] Different FTE cutoff points do not significantly change the findings reported later.

4 times that of teachers, and over $200,000. On average throughout the state, administrators earn 305% of the average teacher in their district.

That said, there is significant district-to-district variation in the share of non-teaching employees by school district. Figure 2 below shows a histogram of the share of non-teaching staff by school district. As can be clearly seen, some districts have as low as 14% of their staff not in the classroom, while other districts have more than 60% of their staff in jobs other than working directly with kids.

Figure 2. Non-Teaching Staff as Share of Total Staff, Histogram

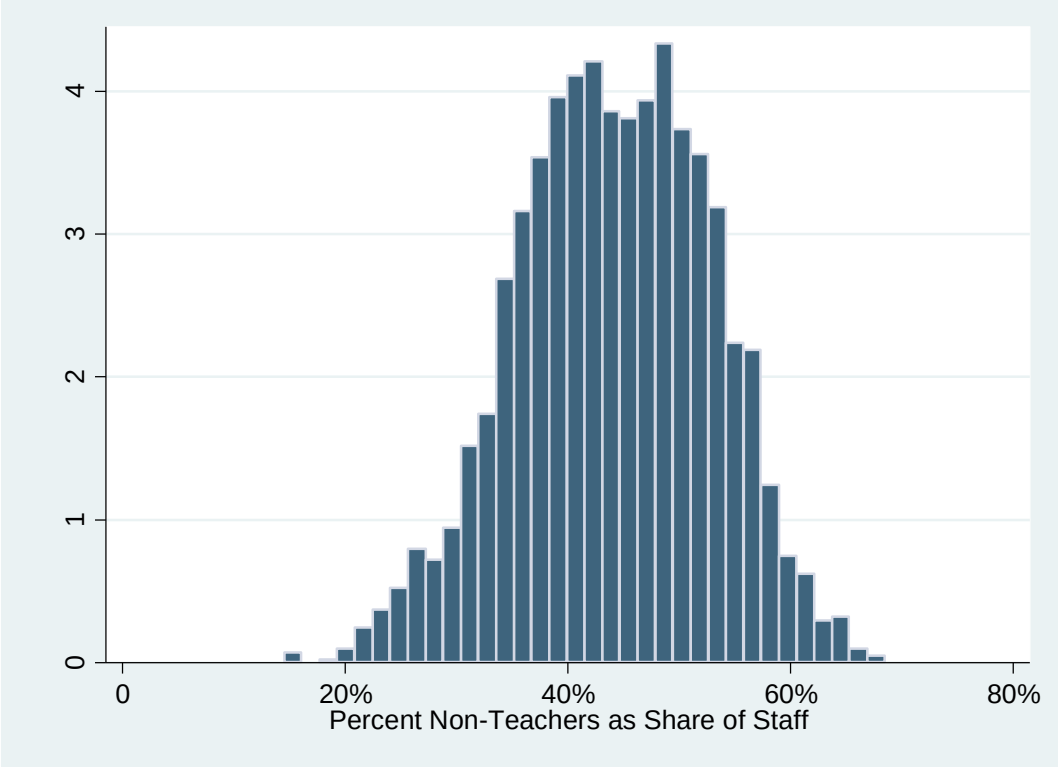


Table 2 on the following page lists the top 10 and bottom 10 districts in the state for share of non-teaching staff over the years of this analysis. Note that this is the average over six years, not the share in a single year.

Table 2. Highest and Lowest Percentage of Non-Teaching Staff

Lowest Percentage		Highest Percentage	
District	Non Teachers	District	Non-Teachers
Gilman	22.77%	Lake Geneva Genoa City UHS	62.41%
Northwood	24.66%	Lakeland UHS	61.22%
Linn J4	25.17%	Osceola	60.96%
Kimberly Area	27.33%	Random Lake	58.86%
Yorkville J2	27.54%	Tri-County Area	58.82%
Woodruff J1	27.78%	Muskego- Norway	58.58%
Monticello	28.02%	Spring Valley	58.31%
Phelps	28.27%	East Troy Community	58.29%
Williams Bay	29.29%	Wabeno Area	58.21%
Herman #22	29.49%	Norwalk. Ontario. Wilton	57.72%

What are the correlates of having a larger share of non-teaching staff? To answer that question, we conducted a statistical analysis with the share of non-teachers as the dependent variable, and a host of other variables that could plausibly relate to that number as the independent variables. This analysis is included in Table 1 below. Note that control variables for year were also included in this analysis but excluded from the table for ease of readership.

Some of the variables we might expect to have an effect on the share of non-teachers do not seem to do so. For example, there is no relationship to the share of students with disabilities or the share of students that are economically disadvantaged and the share of non-teachers. We do observe a significant effect of the number of non-white students and non-teachers. Going from a hypothetical school that was 100% white to one that was 0% white would be expected to increase the percentage of non-teaching staff by 3%. But perhaps most interesting are the findings for urbanicity. Urban schools have a lower percentage of non-teaching staff on average, while rural and small town schools have a higher percentage. This be could suggestive of over-staffing in smaller school districts.

Table 3. Correlates of more Non-Teaching Staff

VARIABLES	Share of non-Teachers
Economically Disadvantaged	0.00984
	(0.0135)
Non-White	-0.0307**
	(0.0139)
Students with Disabilities	0.0633
	(0.0579)
English Language Learners	-0.0728
	(0.0468)
Urban	-0.0412***

	(0.0101)
Small Town	0.0315***
	(0.00534)
Rural	0.00864*
	(0.00449)
Enroll	1.43e-06***
	(5.11e-07)
Constant	0.457***
	(0.0153)
Observations	2,527
R-squared	0.068

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

It is also important to know what sort of role these non-teaching staff play in the school. Many of the individual categories are small, but there are a few categories that make up the bulk of the total non-teaching positons. The top five largest are listed below.

Table 4. Job Category of Non-Teaching Staff

Other Support Staff	50.01%
Program Aide	4.66%
Other Professional Staff	2.89%
Principal	2.49%
Speech Pathologist	1.90%

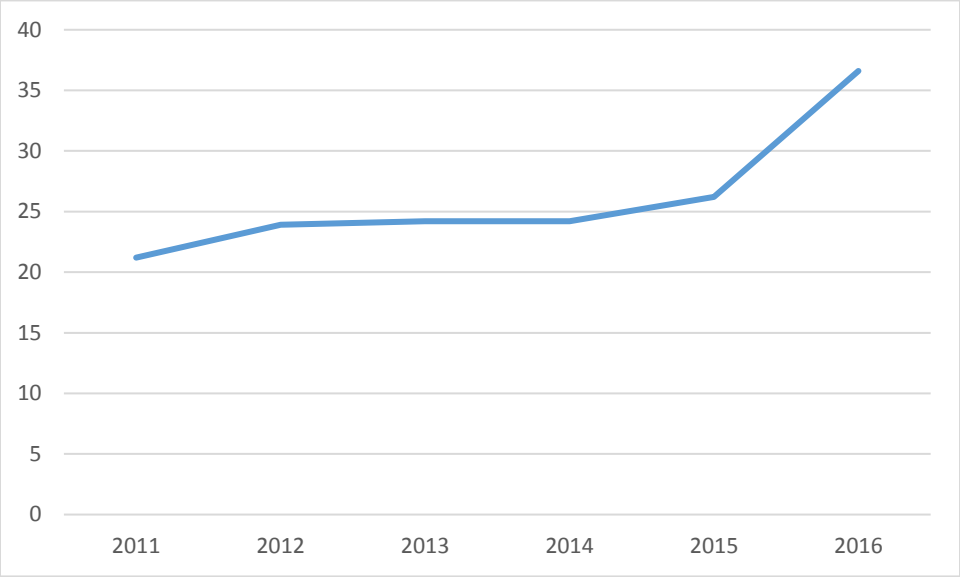
By far the largest and most ambiguous category is "Other Support Staff." Jobs classified under this header include a wide variety of occupations, ranging from "Research/Analyst" to "Clerical Staff" and "Cafeteria Workers." A full list of the positions under this label from DPI is found in table 5 on the following page.

Table 5. Occupations Classified as "Other Support Staff"

No Description Beyond Position	Cafeteria Worker
Bus Driver - Special Education	Athletic Trainer
Clerical/Support Staff - Special Education	Athletic Coach
Computer Support	Advisor to Student Club
Health Room Aide/Assistant	Business Office Professional Staff
Security Staff - Law Enforcement Officer	Transportation
Security Staff - Security Guard	Recreation Department
Bus Driver	Research/Analyst
Clerical/Support Staff	Extra-curricular Staff
Plant Maintenance and Operation Personnel	Short Term Substitute (Paraprofessional)

It is in this subset of non-teachers that we see substantial increases in employment since 2011, as depicted in Figure 3 below. Unfortunately, the data currently available to us does not allow us to further drill down into this category to see the specific jobs that this growing group of the public education workforce holds. However, given that it seems unlikely there has been an increased demand for things like bus drivers and cafeteria workers, one can speculate that the growth is coming more from the clerical and business office professional staff subgroups.[8]

Figure 3. Share of "Other Staff" as Percentage of All Non-Teaching Staff



Since 2011, Other Staff has increased from 23.9% of all non-teaching staff to over 36%. The spike in the Other Staff category occurs concurrently with the spike in non-teaching staff overall, suggesting that growth in this area may play a significant role in overall growth.

Methods

With the findings in Table 1 suggesting that non-teaching staff share is unrelated to variables typically thought of as having an impact on student performance, what effect does a larger non-teaching staff have on student outcomes, if any? To answer that question, I collected data on student proficiency rates by school district on Wisconsin's state standardized tests over the past six years in both mathematics and English/Language Arts. I then conducted a time series analysis with fixed effects for each school district.[9] Formally, let d represent a particular school district and let y represent a particular year of analysis.

$$Proficiency_{dy} = \alpha + \beta_{1dy}(non\ teachers) + \beta_2(Control\ Variables)$$

[8] One may note that short-term substitutes that are paraprofessionals are also included here. While regular substitutes have their own category, those substituting for paraprofessionals are lumped in this group. This represents a limitation on our research.

[9] While the fixed effects model seems most appropriate, a random effects model is included in the appendix. The results do not differ substantially from those reported in Table 3.

A positive coefficient on β_1 would indicate that having more non teachers on staff increases student proficiency while a negative coefficient would suggest that more non teachers is negative correlated with student proficiency. We also include control variables that are plausible alternative explanations for proficiency differences between school districts. These include the share of students who are economically disadvantaged, the share of students who are non-white, the share of students with disabilities, and the share of students who are English language learners. To capture any effect of school district size, we control for each district's enrollment. To account for variation in test scores over time, especially important given the changes in the test that occurred over the time frame of analysis,[10] indicator variables for each year are also included. Similar analyses were conducted to determine the relationship of teacher salary and per student spending with outcomes.

Results: Share of Non-Teachers and Academic Proficiency

The results from the analysis described above are included in Table 3 below. Again, note that year indicator variables are included in the analysis but excluded from the table.

Table 6. Correlation of Proficiency and Share of Non-Teachers

VARIABLES	Math Proficiency	ELA Proficiency
Non Teacher Share	-0.00485	-0.216***
	(0.0286)	(0.0641)
Enrollment	2.38e-07	1.20e-06
	(7.55e-07)	(1.69e-06)
Non-White Students	-0.0782***	-0.445***
	(0.0219)	(0.0494)
Economically Disadvantaged Students	0.0794***	0.409***
	(0.0261)	(0.0592)
Disabled Students	0.0343	0.491**
	(0.0937)	(0.211)
English Language Learner Students	0.0467	0.133
	(0.105)	(0.238)
Constant	0.383***	0.111*
	(0.0284)	(0.0637)
Observations	2,498	2,478
R-squared	0.009	0.065
Number of Districts	428	428

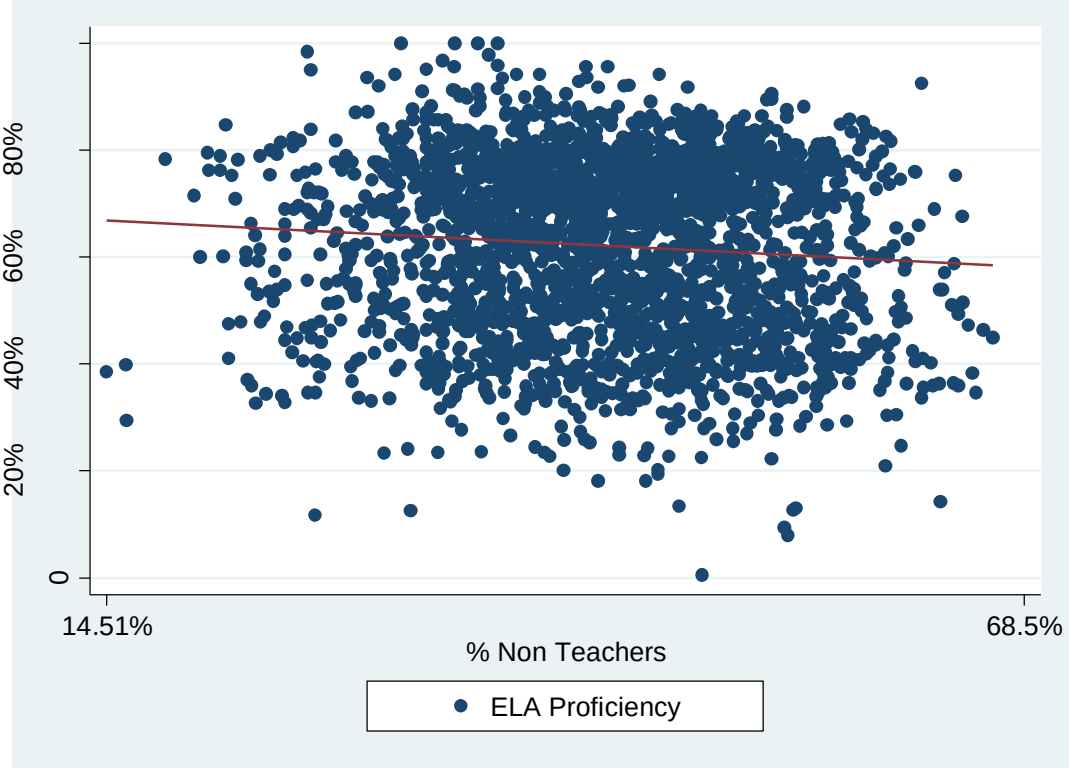
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[10] Wisconsin utilized three tests from 2011-16: the WKCE, the Badger Exam, and the Forward Exam. Proficiency rates, on average are 5% lower on the Forward Exam relative to the other two tests. The year indicator variable compensates for this difference.

As a robustness check, first note that many variables work as would be expected in an analysis of Wisconsin education data. Similar to the findings of our school performance study earlier this year and last year, economic status has a large effect on student outcomes. Going from a school with no economically disadvantaged kids to a school with 100 percent economically disadvantaged kids would be expected to reduce proficiency on the state exams by 7.94% in math and 40.9% in English. Rates of disability and English language learner status also significantly reduce performance.

But most pertinent for our purposes is the *Non Teachers* variable highlighted in grey. While a higher number of non-teachers is not correlated with changes in performance in math, it is correlated with a significant, negative proficiency impact in English. Moving from a school with the highest share of non-teaching staff (68.5%) to the lowest (14.5%) would be expected to result in 11.5% higher proficiency for students in that district. Figure 4 below visually depicts the bivariate relationship between the percent of non-teachers and English proficiency. Blue dots represent school districts, while the red line represents the best fitted line of the relationship between the two variables.

Figure 4. Correlation, % Non-Teachers and ELA Proficiency



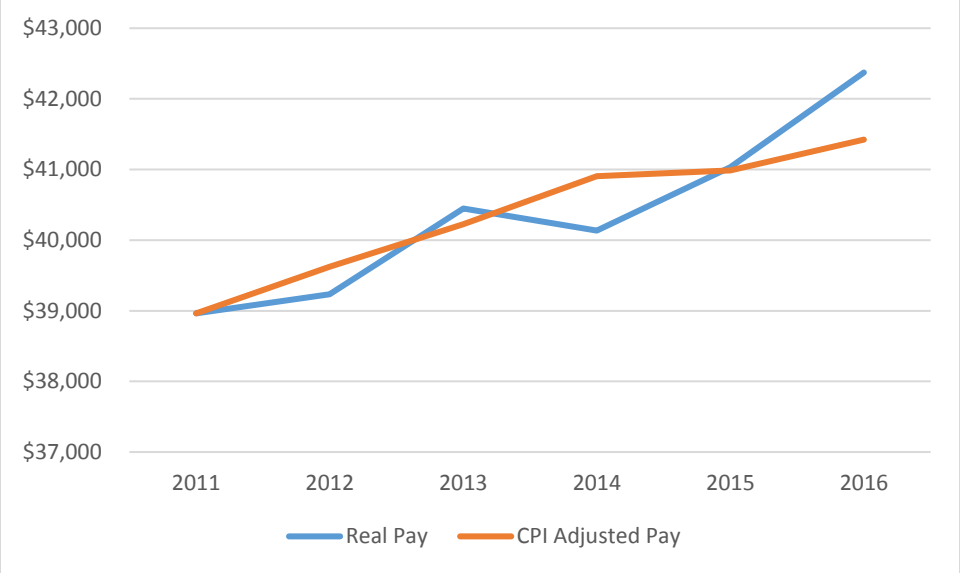
It should perhaps be highlighted that the findings here regarding non-teaching staff are the exact opposite of what would be found for teaching staff. In other words, having a higher share of teaching staff is related to an increase in proficiency in Wisconsin in ELA.

Results: Teacher Pay & Academic Proficiency

Having established that spending more on administrators is not an effective strategy for improving proficiency, a remaining question is whether other sorts of spending can lead to positive outcomes. One major type of spending that has seen advocacy on both the left and right of late is increasing the rate of pay for teachers. What has happened to teacher pay in Wisconsin in recent years has been the subject of much discussion, with some making the case that teachers have suffered under the collective bargaining reform package known as Act 10.[11] But a look at the data calls that into question. Figure 5 below shows average teacher pay in Wisconsin since 2011.

The blue line represents actual teacher pay, while the orange line represents inflation adjusted pay from the 2011 baseline using a calculator available from the Bureau of Labor Statistics.[12] While there is some switching of positions between these lines, it suggests that pay, in general, has kept up with inflation over the past six years.

Figure 5. Teacher Pay over Time, Wisconsin



However, it might still be possible to argue for higher pay for teachers if higher pay is correlated with better outcomes for students. To answer that question, we compare teacher pay in Wisconsin's school districts with academic outcomes in the state using the same set of control variables as the prior analysis.

[11] DePillis, Lauren. 2017. "Here's what happened to teachers after Wisconsin gutted its unions." CNN http://money.cnn.com/2017/11/17/news/economy/wisconsin-act-10-teachers/index.html

[12] https://www.bls.gov/data/inflation_calculator.htm

Table 7. Teacher Pay and Student Proficiency

VARIABLES	ELA Proficiency	Math Proficiency
Teacher Salary	-9.17e-06***	-1.44e-06***
	(8.89e-07)	(4.06e-07)
Enrollment	2.58e-06	4.62e-07
	(1.66e-06)	(7.56e-07)
Non-White Share	-0.412***	-0.0725***
	(0.0484)	(0.0219)
Economically Disadvantaged Students	0.337***	0.0657**
	(0.0583)	(0.0263)
Disabled Students	0.387*	0.0222
	(0.207)	(0.0934)
English Language Learners	0.106	0.0477
	(0.232)	(0.105)
Constant	0.452***	0.450***
	(0.0697)	(0.0317)
Observations	2,478	2,498
R-squared	0.106	0.015
Number of Districts	428	428

Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<.1

The results here are perhaps surprising. In Wisconsin, school districts with higher pay have worse student outcomes than districts with lower pay. Coupled with the evidence that teacher pay has kept up with inflation, this calls into question the notion that additional public school spending should be devoted to *blanket* salary increases.

Results: Per Student Spending & Academic Proficiency

In our final analysis, we add the combined state and local spending in each district over the six years of study to our model from Table 7. Even after accounting for per pupil spending, teacher pay remains negatively predictive of academic performance. However, when it comes to per student spending, an independent negative effect is found in the case of mathematics ($p<.05$). No effect of per student spending was found in ELA, however the exclusion of teacher salary from the model, with which salary is highly correlated, leads to a significant finding.[13]

[13] An alternative model with lagged per student spending shows a negative effect of per student spending even with the inclusion of teacher salary. We have decided to include the more conservative results here due to questions of the length of lag that would be appropriate.

Table 8. Per Student Spending

VARIABLES	ELA Proficiency	Math Proficiency
Teacher Salary	-1.61e-06***	-7.69e-07**
	(4.36e-07)	(3.44e-07)
Per Student Spending	-1.47e-07	-3.80e-06**
	(2.15e-06)	(1.88e-06)
Enrollment	2.63e-07	3.79e-07
	(8.21e-07)	(6.41e-07)
Non-White Students	0.102***	0.0174
	(0.0255)	(0.0189)
Economically Disadvantaged Students	-0.291***	-0.204***
	(0.0242)	(0.0204)
Disabled Students	-0.277**	-0.322***
	(0.111)	(0.0819)
English Language Learner Students	-0.0115	-0.00341
	(0.0848)	(0.0775)
Constant	0.746***	0.658***
	(0.0456)	(0.0344)
Observations	2,477	2,496
Number of Districts	428	428

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Conclusions

Perhaps the most unexpected finding in this paper was the negative relationship between teacher pay and student performance. For proponents of systems such as merit pay, this may come as something of a surprise. However, it is important to note here that this paper cannot confirm or deny the benefits of merit pay, as many school districts throughout the state do not use such systems. What can be said is that, to the extent pay schemes can be effective at altering student performance, the systems currently being utilized in Wisconsin are not meeting that goal.

Additionally, it is clear that the additional resources school districts are devoting to spending outside of classroom activities are having a neutral to negative relationship to student performance. School systems may wish to devote more resources to activities that touch students directly and less to activities that affect them only tangentially. That said, this paper has not identified any specific expenditures that have this positive impact. Future work by WILL will examine this question in more depth.

If policymakers wish to continue to spend more money on Wisconsin schools, it is clear that a new approach is needed. The highest spending districts in the state have some of the worst performance outcomes once appropriate control variables are included in the analysis.