Student Outcomes and Spending on Teachers in the Aftermath of Recession

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Abstract

This paper finds a link between the trends in K-12 spending and student success in Missouri after the Great Recession. I find that, for city schools only, changes in English Language Arts and Math proficiency rates for third graders were negatively related to changes in the number of students per teacher. According to my estimates, an increase in the average number of students per teacher in city schools accounted for almost all of the drop in the schools' average ELA proficiency, and all of the drop in their average Math proficiency. Thus, the evidence indicates that the cuts in spending on teachers in the aftermath of the Great Recession affected student outcomes in city schools, but did little to affect student outcomes in schools in other locales.

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1. Introduction

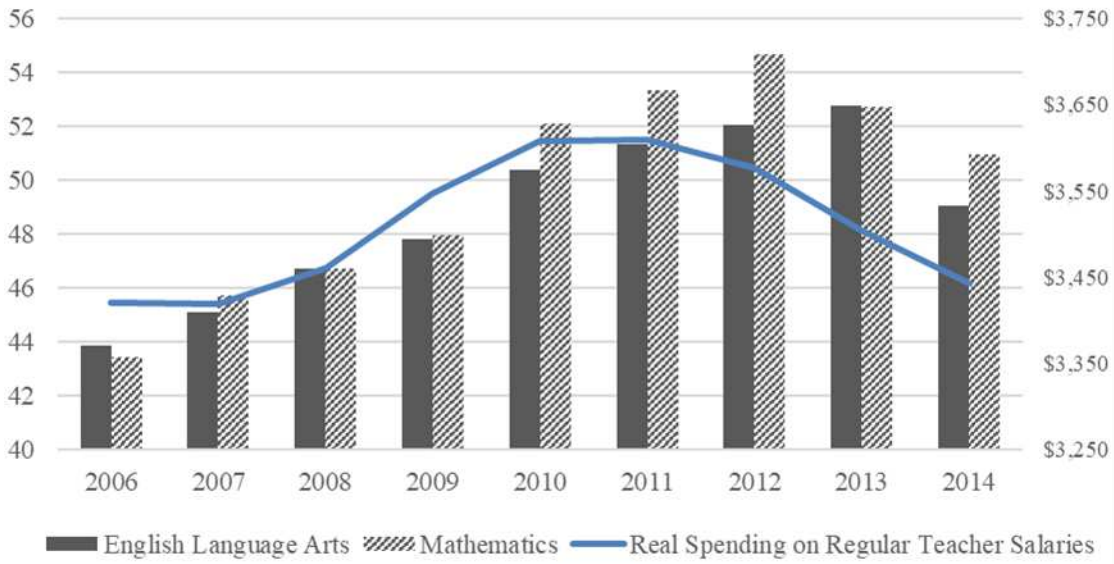
This short paper looks for evidence of a link between K-12 education spending and student outcomes in Missouri during the years following the Great Recession. There are two reasons why this period is of interest. First, several studies have argued that an erosion in student outcomes occurred in many states during the period because severe budget crises led to spending cuts for K-12 education. Second, because the spending cuts were larger and more-sustained than is typical, any negative effects on student outcomes would be exacerbated and more apparent. Thus, the period might be useful statistically given that causal links between K-12 spending and outcomes have been difficult to nail down. The current state of the literature is that some types of spending has been shown to increase some student outcomes some of the time.[1]

This period has been examined nationwide by Jackson, Wigger, and Xiong (2021), who showed that states with the largest losses in student attainment tended to have been those that had the largest cuts in spending on public schools.[2] Similarly, Shores and Steinberg (2019), who focused more on general economic conditions than on spending, found that counties with the biggest economic downturns saw the biggest declines in student outcomes. Rauscher (2020) looks at the period for Kansas and pays particular attention to differences between rural and non-rural schools.

The focus of this paper is Missouri's spending on teaching resources as measured by real per pupil spending on regular teacher salaries. As Figure 1 illustrates, this spending rose in the first years of the recession as states' education budgets were bolstered by Federal assistance, but

[1] See Hanushek (2020) and Jackson and Mackevicius (2021) for discussions of the literature.
[2] Goldstein and McGee (2020) argue that these findings are not robust to alternative data courses and might be confounded by changes in college-going rates (one measure of student attainment) due to decreased funding for state colleges and universities.

Figure 1. Spending on Teachers and Student Proficiency
2006 - 2014



Author's calculations using MO DESE data. Proficiency is for 3rd through 8th grades. Spending is regular teacher salaries per pupil averaged over the year and the previous three years, in 2014 dollars using the Midwest CPI.

began to decline after 2010 when Federal assistance ended and states were still facing tight budgets. By 2014, spending was almost 5 percent below its peak.[3] Figure 1 also shows how Missouri student outcomes, as measured by total proficiency rates for grades 3-8 in English Language Arts (ELA) and Mathematics, changed over the period. Proficiency rates in both subjects were rising through the first years of the Great Recession, but gains slowed and became losses in the years following the end of the recession.

The remainder of the paper is split into five sections. Section 2 presents the general empirical model and describes the data and associated summary statistics. Section 3 provides estimates of the model using data for all elementary schools in the state. The data set is split by locale (city, suburb, town, rural) and described in section 4. Section 5 provides locale-specific estimates, while section 6 concludes.

[3] Note that the pattern of total real current expenditures per pupil had the same and timing of this spending.

2. Data and Empirical Model

Estimates of the relationship between spending and student proficiency typically rely on the large literature on education production functions. Specifically, as summarized by Hanushek (2020), the main empirical lessons from the literature are to use panel data to control for fixed effect and to focus on value added—the gains in proficiency—from the spending. As such, I created a data set of Missouri third graders for two time periods, 2009-10 and 2013-14.[4] Each period includes two cohorts of third graders, and the values for all variables are the averages of the two cohorts. The advantage of using third graders is that it is easier to isolate the link between spending and value added because students are more likely to have been in the same school for their entire time as students. In addition, all of the later group's time in school would have been during the era of tight budgets. All data are at the building level and are from the Missouri Department of Elementary and Secondary of Education.

I consider proficiency rates in Mathematics and English Language Arts, which are the percentages of third graders in a school who were either proficient or advanced as determined by reported MAP scores. The teaching-resources variable—per pupil spending on regular teacher salaries—is the school's teacher FTE times its average regular teacher salary divided by total enrollment. To account for accumulated resources used to educate a cohort of students, the spending on a cohort is the average for the cohort's first, second, and third grades.[5]

I also estimate the model using four components of spending on teachers, which are calculated as the accumulated resources over the student's time in school: Average regular teacher salary,

[4] The choice of time periods is to coincide with the spending trend described in the introduction. In addition, because of the tests, proficiency rates through 2014 are not comparable to later years.
[5] For the 2009 cohort of third graders, for example, spending is the average over 2007, 2008, and 2009. To account for the fact that the exams are taken mid-year of third grade, the 2009 figure is given half weight.

students per teacher, average teacher experience, and the share of teachers with a master's degree or higher.[6] The available student demographic variables are the percentage of students who qualify for free or reduced lunches and the percentage of students who are not white.[7] I include all regular non-charter public schools in Missouri for which data for all variables are complete. The result is a balanced two-period panel of 979 elementary schools in 514 school districts.

Sample statistics are provided in Table 1 and indicate that average proficiency rates for third graders rose between the two periods: by 1.8 points for ELA and by 3.6 points for Math. These increases were achieved despite a small decrease in average per pupil spending on regular teacher salaries, a decrease in average regular teacher salary, and a small increase in the average number of students per teacher. On the other hand, the average share of teachers with graduate

Table 1. Sample Statistics

	2009-10	2013-14	Change
Percent proficient or better in ELA	42.0 (14.4)	43.8 (15.3)	1.8 (10.9)
Percent proficient or better in Math	45.5 (16.2)	49.2 (17.1)	3.6 (14.2)
Per pupil spending on regular teacher salaries (2014$)	3,101 (570)	2,949 (558)	-152 (365)
Average regular teacher salary (2014$)	40,756 (8,199)	40,233 (8,165)	-523 (1.982)
Students per teacher	12.6 (2.2)	12.9 (2.3)	0.25 (1.2)
Average teacher experience (years)	12.5 (2.5)	12.5 (2.4)	0.0 (1.9)
Percent of teachers with a masters or higher degree	50.7 (17.4)	56.0 (18.5)	5.3 (10.8)
Percent of students receiving free or reduced-price lunch	52.3 (22.3)	57.2 (23.0)	4.9 (5.8)
Percent of students who are non-white	23.1 (28.6)	26.1 (29.1)	3.0 (4.1)

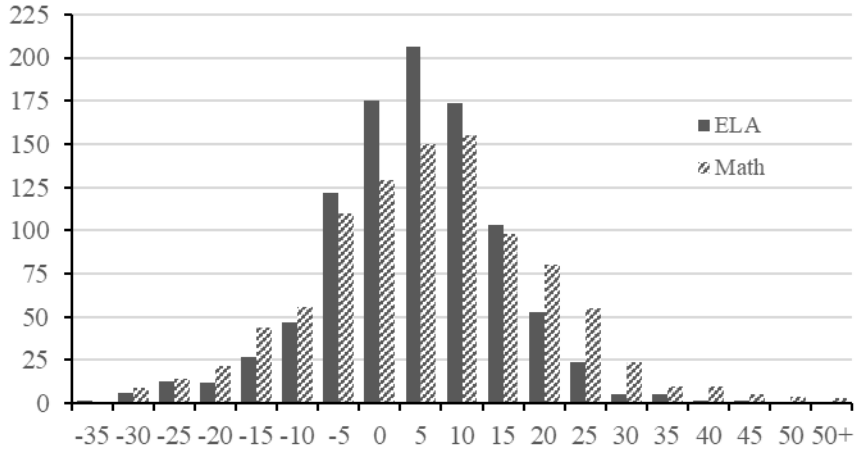
The top number in each pair is the sample mean, whereas the bottom number in parentheses is the standard deviation.

[6] Podgursky and Springer (2006, 2011) describe Missouri's K-12 financing and teacher compensation for the period.
[7] Because the period is covers recession and recovery, the share of students qualifying for free or reduced-price lunch will change because of general economic conditions. To control for the impact of general economic conditions, this variable is measured relative to the average within the period.

degrees rose. Note also that the average percentage of students who qualified for free or reduced lunch rose between the periods, as did the average percentage of non-white students.

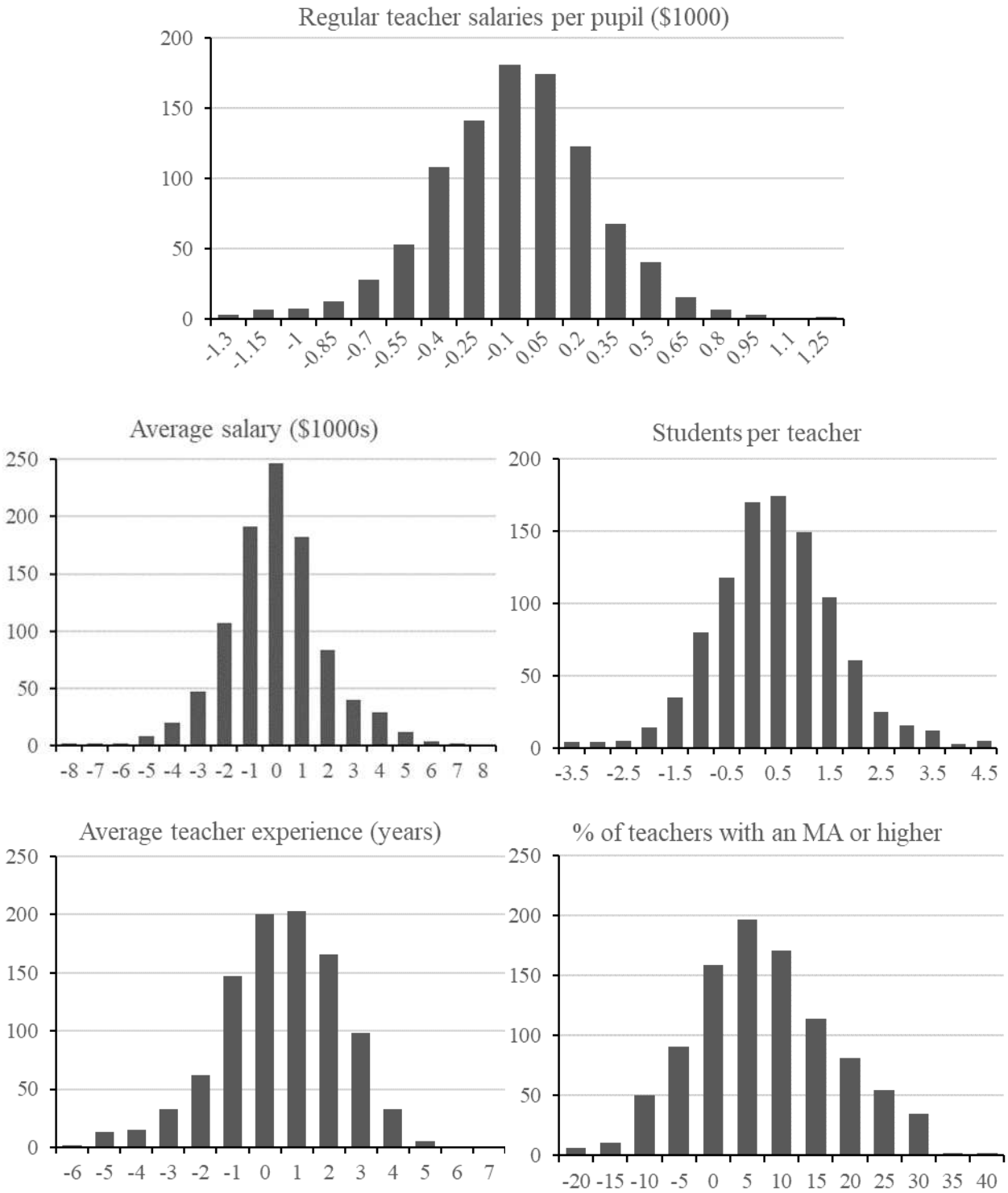
As indicated by the standard deviations reported in Table 1, there was a great deal of variation across schools in the levels and in the changes for all of these variables. The statewide averages mask the widely varying changes in proficiency at the school level illustrated by Figure 2. Of the 979 schools, 403 (41 percent) saw their ELA proficiency rates decline, and more than a quarter of these saw it decline by more than 10 points. Of the 576 schools whose ELA proficiency rate did not decline, 195 saw their rates increase by 15 points or more. The variance in changes in Math proficiency was even greater: 385 schools (39 percent) saw decreases in their Math proficiency rate, and 40 percent of these saw decrease larger than 10 points. Of the 594 schools who saw increased Math proficiency, 289 saw increases larger than 15 points.

Figure 2. Frequency Distributions: Change in Percent of 3rd Graders Proficient or Better, 2009-10 to 2013-14



As Figure 3 illustrates, changes in spending on teachers also varied a great deal across schools in that many saw changes that were much larger in absolute terms than the -$152 average change. Further, the average real salary fell by about $500, but there were 274 schools where it fell by

Figure 3. Frequency Distributions: Changes in Spending on Teachers, Building- Level, 2009-10 to 2013-14



more than $1,500, and 243 where it rose by more than $1,000. The average number of students per teacher rose by 0.2, but 260 schools saw their students per teacher ratio rise by 1 or more, and 142 saw it fall by 1 or more. Average teacher experience was unchanged, but 190 schools saw their average years of teacher experience fall by 1.5 or more, while 221 saw it rise by 1.5 or more. The only teaching input that rose was the percentage of teachers with master's degrees or higher, but almost one-third of schools saw this input fall between the two periods.

The empirical model assumes that student outcomes are the result of teaching resources, student characteristics, and other school- and time-specific effects. Specifically, for school *i* in period *t*, the proficiency rate in a subject area (P_{it}) is determined by the school's teaching resources (T_{it}); the average characteristics of the student body (S_{it}); school-specific factors such as administration, location, building quality, etc. that are fixed over time (α_i); a period effect that is common across schools (τ_t); and an error that is unrelated to the other variables (ε_{it}):

$$P_{it} = \alpha_0 + \alpha_i + \tau_t + \beta T_{it} + \gamma S_{it} + \varepsilon_{it}.$$

I estimate the model using Ordinary Least Squares and controlling for heteroskedasticity by calculating robust standard errors.

3. Estimation Results: All Schools

I estimated two versions of the model for each proficiency rate: Proficiency as a function of per pupil spending and then as a function of the four components of spending. The results are provided in Table 2 and indicate that the largest contributors to the changes in proficiency were the time effects. Independent of changes in spending on teachers and student demographics, we would have expected a school's ELA and Math proficiency rates to have risen by 2.6 and 4.5

points, respectively, through common trends. Given that the actual increases were 1.8 and 3.6, something happened to reduce proficiency gains below what would have occurred otherwise.

As the first column of results for each subject shows, proficiency was positively related to total per pupil spending, and the estimated relationships were statistically significant. A $100 decrease in per pupil spending tended to decrease a school's ELA and Math proficiency rates by about 0.29 and 0.31, respectively. For a school experiencing the average change in spending, the resulting decreases in proficiency would be about 0.44 for ELA and 0.47 for Math, all else constant. If spending had not changed, we would have expected that average ELA and Math proficiency rates would have risen by 2.1 and 3.9 points, respectively, instead of 1.8 and 3.6 points.

Table 2. Regression Results: 3rd Grade Proficiency and Spending on Teachers

	ELA		Math	
Per pupil spending on regular teacher salaries (2014$, thousands)	2.853 *		3.160 *	
	(1.033)		(1.288)	
Average regular teacher salary (2014$, thousands)		0.202		0.146
		(0.252)		(0.299)
Students per teacher		-0.671 *		-1.050 *
		(0.284)		(0.367)
Average teacher experience		0.089		0.166
		(0.293)		(0.353)
Percent of teachers with a masters or higher degree		-0.011		-0.019
		(0.293)		(0.046)
Percent of students receiving free or reduced-price lunch	-0.109 *	-0.108 *	-0.157 *	-0.156 *
	(0.039)	(0.039)	(0.047)	(0.046)
Percent of students who are non-white	-0.128	-0.126	-0.142	-0.143
	(0.084)	(0.084)	(0.118)	(0.118)
Time	2.636 *	2.525 *	4.512 *	4.468 *
	(0.469)	(0.530)	(0.605)	(0.680)
R^2 within	0.051	0.050	0.084	0.087
R^2 between	0.602	0.596	0.509	0.464
Schools	979	979	979	979

All models include school fixed effects, which are suppressed for space consideration. Numbers in parentheses are robust standard errors. Statistical significance at the 5 percent and 10 percent levels are indicated by "*" and "†", respectively.

Having established that decreases in spending in the aftermath of Great Recession were related to falling student proficiency, the next step is to see what kinds of spending were related. As the results in Table 2 indicate, the only components of spending on teachers that were related to a statistically significant extent was the number of students per teacher. All else constant, an additional student per teacher tended to mean a drop of 0.67 points in a school's ELA proficiency rate, and a 1.05 drop in a schools Math proficiency rate. These are not huge numbers and, given that the average change in students per teacher was 0.25, do not explain a great deal of what happened. Even so, we have established that spending decreases in the form of fewer teachers tended to be related to lower proficiency than would have been achieved otherwise.

4. Data by Locale

Like most states, Missouri is a mix of urban, suburban, rural, and everything in between. It is anchored by two very large metropolitan areas, has several small cities, and its land area is mostly rural. The state's public schools are as heterogeneous as the state itself. If the effects of spending, and the budget challenges from recession, differ according to the location of the school, the results from the previous section would be misleading. It is, therefore, worth exploring whether the budget challenges of the Great Recession led to different outcomes according to schools' locales. Specifically, this section shows the results if the sample is divided according schools' locale designations from the National Center for Education Statistics (NCES), which categorizes schools as either city, suburban, town, or rural (See the appendix for details).

The 410 rural schools comprise the largest group in the sample, followed by 264 suburban schools, 187 city schools, and 118 town schools. Not only do these groups differ a great deal in their numbers, but, as summarized in Table 3, they also differ a great deal in just about every

Table 3. Sample Statistics by Schools' Locales

	City Schools			Suburban Schools			Town Schools			Rural Schools		
	2009-10	2013-14	Change	2009-10	2013-14	Change	2009-10	2013-14	Change	2009-10	2013-14	Change
Percent proficient or better in ELA	34.6	33.1	-1.5	46.5	49.0	2.5	44.1	45.6	2.9	42.3	44.9	2.6
	(16.2)	(16.9)	(11.6)	(15.9)	(16.5)	(8.1)	(10.9)	(10.6)	(8.6)	(11.8)	(12.3)	(12.5)
Percent proficient or better in Math	38.5	37.3	-1.2	50.8	54.4	3.6	49.7	52.3	5.2	44.9	50.3	5.4
	(17.2)	(18.3)	(13.7)	(17.7)	(17.7)	(11.3)	(12.6)	(11.5)	(11.2)	(14.2)	(14.9)	(16.2)
Per pupil spending on regular teacher salaries (2014$)	3,309	3,030	-279	3,383	3,278	-105	2,724	2,641	-167	2,909	2,788	-120
	(585)	(495)	(403)	(623)	(592)	(373)	(351)	(337)	(264)	(453)	(500)	(353)
Average regular teacher salary (2014$)	44,258	42,974	-1,284	49,423	49,182	-242	37,796	37,496	-600	34,345	34,009	-336
	(4,143)	(4,292)	(1,820)	(5,781)	(5,644)	(2,694)	(4,307)	(4,442)	(1,596)	(5,397)	(5,365)	(1,464)
Students per teacher	12.9	13.2	0.29	14.2	14.5	0.27	13.3	13.5	0.39	11.4	11.6	0.17
	(2.1)	(2.0)	(1.6)	(1.6)	(1.5)	(1.1)	(1.6)	(1.5)	(1.1)	(2.1)	(2.2)	(1.1)
Average teacher experience (years)	13.2	12.4	-0.8	12.4	12.8	0.4	12.4	12.4	-0.1	12.3	12.5	0.2
	(2.6)	(2.5)	(2.0)	(2.4)	(2.2)	(1.7)	(2.1)	(1.9)	(1.7)	(2.6)	(2.5)	(1.9)
Percent of teachers with a masters or higher degree	51.4	55.1	3.7	63.5	70.3	6.8	52.9	55.0	4.2	42.1	47.4	5.3
	(15.2)	(15.8)	(10.2)	(12.4)	(12.3)	(9.6)	(14.3)	(15.2)	(11.8)	(17.1)	(18.3)	(11.3)
Percent of students receiving free or reduced-price lunch	66.3	73.2	6.9	39.8	44.8	5.0	55.5	57.8	4.5	53.6	57.6	4.0
	(22.0)	(23.1)	(6.3)	(25.5)	(26.4)	(4.9)	(16.5)	(16.3)	(5.0)	(16.9)	(16.8)	(6.1)
Percent of students who are non-white	50.6	54.3	3.7	34.2	39.0	4.8	15.6	17.0	2.7	6.0	7.5	1.6
	(33.8)	(32.1)	(5.6)	(29.6)	(29.3)	(4.2)	(14.3)	(14.6)	(3.0)	(8.8)	(10.1)	(2.9)

The top number in each pair is the sample mean, whereas the bottom number in parentheses is the standard deviation.

variable in the data set. Notice first that the average proficiency rate in city schools was about 12 points lower than in suburban schools. Proficiency in town schools was just below suburban schools and rural schools were in the middle between city and suburban schools. In addition, and more importantly for present purposes, the city schools saw its average proficiency rates fall between 2009-10 and 2013-14 while they were rising in the other locales.

Spending on teachers fell more in city schools in the wake of the Great Recession. Per student spending on teachers fell by an average of $279 in city schools, but only $105 in suburban schools. Average salary in city schools fell more than five times what it did in suburban schools, city schools saw lower average teacher experience, and the gain in the percent of teachers with master's degrees or higher was smaller than in the other locales. The only spending category in which the change for city schools was not the most disadvantageous was in the number of students per teacher, which rose more in town schools. These stark differences in results and spending suggest that the recession and the ensuing budget turmoil was more of a problem for city schools and that, possibly as a result, the recession's effect on student achievement was also greater in city schools.

5. Estimation Results: By Locale

Table 4 reports the locale-specific estimates of the relationship between school ELA proficiency rates and spending on teachers. Note that the time effects are large and significant for all locales except for city schools, whereas per pupil spending was significantly related to proficiency only for city schools. Put another way, the results in Table 2, which pooled all locales together, masked the differences between the locales and provided a misleading estimation of the effect of the Great Recession on ELA proficiency.

Table 4. Regression Results: 3rd Grade ELA Proficiency and Spending on Teachers, by

	City Schools		Suburban Schools		Town Schools		Rural Schools	
Per pupil spending on teacher salaries (2014$, thousands)	4.750 *		1.752		-0.877		1.642	
	(2.201)		(1.261)		(3.029)		(1.944)	
Average regular teacher salary (2014$, thousands)		-0.342		0.553 †		0.367		-0.337
		(0.783)		(0.286)		(0.922)		(0.660)
Students per teacher		-1.285 *		-0.166		0.508		-0.865
		(0.529)		(0.501)		(0.764)		(0.535)
Average teacher experience		0.660		-0.498		-0.026		-0.141
		(0.758)		(0.460)		(0.785)		(0.463)
Percent of teachers with a masters or higher degree		-0.116		-0.002		0.085		0.011
		(0.073)		(0.051)		(0.082)		(0.063)
Percent of students receiving free or reduced-price lunch	-0.137 *	-0.149 *	-0.141 *	-0.153 *	-0.209 *	-0.206 *	-0.051	-0.048
	(0.061)	(0.061)	(0.071)	(0.071)	(0.082)	(0.084)	(0.065)	(0.065)
Percent of students who are non-white	-0.131	-0.129	-0.091	-0.110	-0.004	0.090	-0.132	-0.149
	(0.155)	(0.149)	(0.139)	(0.140)	(0.239)	(0.243)	(0.216)	(0.215)
Time	0.508	0.115	3.413 *	3.738 *	2.532 *	2.086	2.919 *	2.750 *
	(1.261)	(1.382)	(0.757)	(0.789)	(1.124)	(1.356)	(0.737)	(0.894)
R^2 within	0.070	0.083	0.120	0.131	0.152	0.176	0.047	0.053
R^2 between	0.701	0.609	0.791	0.792	0.312	0.344	0.152	0.011
Number of schools	187	187	264	264	118	118	410	410

All models include school fixed effects, which are suppressed for space considerations. Numbers in parentheses are robust standard errors. Statistical significance at the 5 percent and 10 percent levels are indicated by "*" and "†".

All else unchanged, we would have expected increases in average ELA proficiency of between 2.5 and 3.7 points in the non-city locales, but no such increases for city schools. At the same time, not only did city schools see larger decreases in per pupil spending, but it was also the only locale for which the relationship between ELA proficiency and spending was statistically significant. Each $100 dollar decrease in per pupil spending tended to mean a 0.475 decrease in a city school's proficiency rate. Put another way, the $279 decrease in per pupil spending in city schools should have meant a 1.3 point drop in the average proficiency rate. Given that the drop in the actual average ELA proficiency rate was 1.5 points, the results suggest that these spending decreases in the wake of the Great Recession account for most of the drop in ELA proficiency in city schools. As the second column of results for city schools shows, the channel for spending on

teachers to affect city-school ELA proficiency appears to have been the number of students per teacher, as with the results using the full sample.

The other difference between the full-sample and locale-specific results is that there is evidence of a positive link between average teacher salary and ELA proficiency for suburban schools, but not for schools in none of the other locales. According to the estimates, the small decrease in average teacher salaries seen in suburban schools would have accounted for 0.13 points of the increase in the average ELA proficiency rate for the schools.

For estimates of the links between spending and Math proficiency, the effects of dividing the sample by locale are similar to what happened for ELA proficiency. As reported in Table 5, the time effects are statistically significant only for the non-city locales—although the point

Table 5. Regression Results: 3rd Grade Math Proficiency and Spending on Teachers, by

	City Schools		Suburban Schools		Town Schools		Rural Schools	
Per pupil spending on teacher salaries (2014$, thousands)	4.387 †		0.414		0.548		3.100	
	(2.552)		(1.841)		(3.956)		(2.405)	
Average regular teacher salary (2014$, thousands)		1.316		0.066		1.150		-0.932
		(0.881)		(0.401)		(1.223)		(0.661)
Students per teacher		-1.504 *		-0.337		1.059		-1.899 *
		(0.594)		(0.653)		(0.997)		(0.709)
Average teacher experience		-0.425		0.080		0.182		-0.050
		(0.819)		(0.649)		(1.060)		(0.571)
Percent of teachers with a masters or higher degree		-0.222 *		-0.002		-0.072		0.082
		(0.096)		(0.077)		(0.106)		(0.077)
Percent of students receiving free or reduced-price lunch	-0.054	-0.092	-0.249 *	-0.254 *	-0.234 *	-0.207 †	-0.119	-0.119
	(0.085)	(0.084)	(0.093)	(0.093)	(0.113)	(0.109)	(0.074)	(0.074)
Percent of students who are non-white	-0.384 †	-0.325 †	0.084	0.092	0.040	0.042	0.221	0.191
	(0.204)	(0.187)	(0.187)	(0.188)	(0.284)	(0.296)	(0.307)	(0.306)
Time	1.478	2.691	3.796 *	3.815 *	4.983 *	5.517 *	5.183 *	4.435 *
	(1.543)	(1.808)	(1.011)	(1.069)	(1.460)	(1.819)	(0.949)	(1.074)
R^2 within	0.051	0.089	0.125	0.126	0.211	0.238	0.110	0.127
R^2 between	0.492	0.505	0.573	0.571	0.190	0.284	0.146	0.025
Schools	187	187	264	264	118	118	410	410

All models include school fixed effects, which are suppressed for space considerations. Numbers in parentheses are robust standard errors. Statistical significance at the 5 percent and 10 percent levels are indicated by "*" and "†".

estimates for city schools are not small—and the coefficient on per pupil spending is significant only for city schools. Specifically, the decrease in per pupil spending is estimated to have decreased the average Math proficiency rate for city schools by 1.2 points, which happens to be the actual change in average proficiency. As with ELA proficiency, the channel by which spending is related to proficiency is the number of students per teacher. Note, however, that the estimated effect of the increase in the percentage of teachers with a master's degree or higher is negative. It is possible that this result is an artifact of the reduction in the number of teachers if relatively more teachers with master's degrees left the schools.

Other than the above-described effects for city schools, the only other statistically significant effect of spending on Math proficiency is for rural schools. Although overall per pupil spending did not have a statistically significant effect on Math proficiency rates, the number of students per teacher did, and the marginal effect was larger than for city schools. Given the small increase in the average number of students per teacher, the effect only amounts to about one-third of a point in the average Math proficiency rate, all else constant.

6. Conclusions

The Great Recession of 2008-09 was the deepest and most significant economic downturn since the Great Depression of the 1930s. In the aftermath of the recession, when the economy was growing slowly and state budgets were tight, educational spending and student success at the K-12 level both took downward turns. This paper used data for Missouri to detect a link between the trends in K-12 spending and student success during this period. In particular, it looked at spending on teacher salaries and proficiency in ELA and Math among third graders: Teachers are the point of the spear when it comes to affecting students, and the value added for third graders is

more easily isolated than for older students. I found that student proficiency was negatively related to the number of students per teacher in a school, but only for city schools and, to a small extent and only for Math, in rural schools.

According to my estimates, an increase in the average number of students per teacher in city schools accounted for 1.3 of the 1.5-point drop in average ELA proficiency, and all of the 1.2-point drop in Math proficiency. In addition, whereas other locales would have seen rising proficiency even if its spending on teachers had remained constant, city schools would have seen no change. Thus, the evidence indicates that the cuts in spending on teachers in the aftermath of the Great Recession affected student outcomes in city schools, but there is no evidence that it affected student outcomes in schools in other locales. In addition, the trend variable, which might be capturing changes in other types of education spending, was statistically no different from zero only for city schools

For any state, education is one of the key investments in achieving economic growth, creating opportunity for its citizens, and increasing the general well-being. Because of its effect on educational spending and success, the Great Recession was not only a burden when it occurred, but continued to be so into the future. Further, these effects were concentrated in cities, where educational success was already well behind other Missouri locales. Kraft and Bleiberg (2021) describe how the process of teacher layoffs during the Great Recession might have exacerbated the problem. For example, layoffs by seniority rather than teacher specialty and/or quality results in as mismatch of teacher skills and perhaps lowering overall teacher quality. Kraft and Bleiberg also include some reforms that should be considered alongside those outlined by Hanushek (2018) for Missouri.

Appendix: Urban-centric locale codes and definitions from the U.S. Department of Education's National Center for Education Statistics for 2010-11:

11 - City, Large: Territory inside an urbanized area and inside a principal city with population of 250,000 or more.

12 - City, Midsize: Territory inside an urbanized area and inside a principal city with population less than 250,000 and greater than or equal to 100,000.

13 - City, Small: Territory inside an urbanized area and inside a principal city with population less than 100,000.

21 - Suburb, Large: Territory outside a principal city and inside an urbanized area with population of 250,000 or more.

22 - Suburb, Midsize: Territory outside a principal city and inside an urbanized area with population less than 250,000 and greater than or equal to 100,000.

23 - Suburb, Small: Territory outside a principal city and inside an urbanized area with population less than 100,000.

31 - Town, Fringe: Territory inside an urban cluster that is less than or equal to 10 miles from an urbanized area.

32 - Town, Distant: Territory inside an urban cluster that is more than 10 miles and less than or equal to 35 miles from an urbanized area.

33 - Town, Remote: Territory inside an urban cluster that is more than 35 miles from an urbanized area.

41 - Rural, Fringe: Census-defined rural territory that is less than or equal to 5 miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster.

42 - Rural, Distant: Census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an urbanized area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster.

43 - Rural, Remote: Census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster.

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