



AN EMPIRICAL ANALYSIS

OF TEACHER SALARIES
AND

LABOR MARKET OUTCOMES
IN OKLAHOMA

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Oklahoma's teacher shortage is causing schools across the state to increase class sizes, cancel some classes and hire hundreds of teachers who aren't fully qualified in the subject or grade in which they are teaching. These are not ideal learning conditions for Oklahoma's children or desirable working conditions for the state's hard-working educators.

The Oklahoma Business and Education Coalition, in partnership with the Oklahoma State School Boards Association, commissioned this study to advance the conversation about the teacher shortage and inform the search for solutions at the state Capitol and in school districts.

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I. Scope of Analysis

This report summarizes key empirical facts regarding teacher salaries in Oklahoma using data from the Oklahoma State Department of Education, the United States Census, the National Center for Education Research, and the Texas Education Agency. The report focuses on three areas of inquiry. First, it provides descriptive information regarding teacher salaries in Oklahoma and compares them to teacher salaries in Texas and to salaries that exist for similar workers in Oklahoma's private sector. Second, this report summarizes teacher turnover and hiring rates within Oklahoma, highlighting changes in these rates that have occurred over time and differences that exist across school locale and incomes levels. Finally, this study projects the effects of various changes in teacher salaries on the composition and productivity of the teacher workforce in Oklahoma. These effects are derived relying on peer-reviewed studies of how changes in salaries affect teacher turnover rates, hire rates, and teacher productivity. This study does not consider whether Oklahoma is producing an adequate number of new teachers to meet demand.

II. Executive Summary

- Real teacher salaries in Oklahoma have decreased since 2006.
- Teacher salaries in Oklahoma are about 16 percent lower than teacher salaries in Texas and 28 lower than median salaries for similar workers in Oklahoma's private sector.
- Teacher attrition rates in Oklahoma are higher than in Texas. About eight out of 100 teachers exit Texas Public Schools each year compared to 11 out of 100 in Oklahoma.
- Within Oklahoma Public Schools, teacher attrition rates are highest in low-income schools and schools located in urban areas.
- Low-income schools and schools located in urban areas also have a more difficult time hiring experienced teachers.
- Given their relatively high attrition rates and difficulty hiring experienced teachers, low-income schools tend to be staffed by less experienced and therefore less productive teachers on average.
- To achieve teacher turnover rates that are similar to turnover rates in Texas, teacher salaries in Oklahoma would need to increase by about 12 percent.
- To equalize teacher attrition rates across low-income and high-income schools, teachers in low-income schools should be paid about 50 percent more than teachers in high-income schools.
- Teacher productivity in Oklahoma would likely increase if the state were to allocate additional funds for teacher salaries.
- Teacher productivity would likely further increase if the state adopted a minimum salary schedule that forced districts to adopt salary schedules that are increasing and concave in teacher experience — a shape that mirrors that in the private sector. This optimally-shaped salary schedule allocates relatively large annual raises for novice teachers and allocates more modest annual raises for veteran teachers.

III. Data

This analysis uses several sources of data collected by federal and state governments. The primary source of information regarding teacher salaries and teacher labor market outcomes comes from state-level departments of education. The Oklahoma State Department of Education and Texas Education Agency collect administrative data on teacher characteristics and employment within their respective public school systems. These data track, among other things, all public school teachers' experience, education, race, gender, salary, and school assignment. I use these administrative datasets for both states over the years 2006-2015. The data allow one to reconstruct teacher salary schedules, calculate teacher turnover rates, and impute the distribution of teacher hires for all public school districts across these years.

To supplement the state-level administrative files, I extract school-level data from the National Center for Education Statistics (NCES). In particular, I merge school locale characteristics and school-level free lunch eligibility with the state-level datasets. These variables come from the NCES Common Core of Data. Finally, to provide a comparison between teacher salaries and salaries that similarly skilled workers earn in Oklahoma's private sector, I use data from the American Community Survey (ACS), which is an annual population survey conducted by the United States Census Bureau. Each year, the ACS provides a representative sample of worker characteristics and salaries in each state.

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IV. Institutional Background

Like nearly all states, public school teacher salaries in Oklahoma are set at the district level. School districts almost universally pay teachers according to a salary schedule that differentiates salaries by only a teacher's experience and degree. This means that salaries within a school district only vary on these two dimensions. Two full-time teachers with the same experience and education will earn the same salary within a school district regardless of their grade or subject taught or the working conditions within their school.

Districts in Oklahoma are not free to set teacher salary schedules autonomously. The state government has adopted a minimum teacher salary schedule, which sets minimum salaries by experience and degree. Districts cannot pay salaries below the minimum stipulated by the state, but they can and often do pay salaries that exceed the minimum. Teacher unions also have a stake in determining district-level salary schedules.

The teacher labor market outcomes of interest in this analysis are primarily determined by the teachers themselves and school principals. Teacher turnover is an outcome that can be generated by a teacher choosing to leave the profession or his or her school or district. By firing teachers, turnover can also be generated by school principals or district-level administrators. This type of involuntary turnover will primarily occur among teachers with fewer than three years of experience. Because of tenure protections, it is difficult for schools to fire teachers with three or more years of experience. Like turnover, teacher hiring is an outcome that is primarily determined by teachers and school principals. Teachers apply for open positions, and school principals decide who to hire with input from existing teachers and district-level administrators.

V. Teacher Salaries in Oklahoma

Figures 2 through 9 and table 1 summarize teacher salaries in Oklahoma over time and compare them to teacher salaries in Texas and the salaries that similarly skilled workers earn in Oklahoma's private sector. Figures 2 through 7 begin by showing salaries over time. Each figure shows real salaries, which means they are inflation adjusted salaries, so that they compare real purchasing power at various points in time.

Over the period 2006-2015, most teacher salaries in Oklahoma have decreased in real terms (figure 3). For example, in 2006 the average teacher holding a bachelor's degree with five years of experience earned a salary of about \$36,000, measured in 2015 dollars. In 2015, a teacher with the same experience and degree earns about \$2,000 less, roughly \$34,000. This real salary decay is evident for nearly all teachers, regardless of their credentials.

This trend also mirrors the decay in real salaries mandated by the state minimum salary schedule (figure 2). The state has not changed the minimum salary schedule since 2009. Because state minimum salaries are expressed in nominal terms, inflation that has occurred since 2009 has decreased the buying power represented by these state-mandated minimums.

Figures 4 and 5 show the trends in real salaries awarded by Oklahoma's two largest school districts. These figures largely follow the average declines that have occurred across the state, with one exception. In 2009, Oklahoma City Public Schools increased the salaries it awards to its most senior teachers (teachers with 20 years of experience). It is not clear what caused this policy change, but this salary increase was not statewide. Real teacher salaries are nearly universally lower in 2015 relative to what they were in 2006.

The trend in real teacher salaries in Oklahoma over this period is similar to what workers in other labor markets have experienced. In Texas, changes in real teacher salaries have been mixed over this period (figure 6). Interestingly, in Texas, salaries for relatively novice teachers have increased slightly in real terms since 2006 while salaries for veteran teachers have decreased by roughly the same amount. The trend of stagnant or slightly declining real salaries is also present in Oklahoma's private sector. Among workers who are employed by private for-profit firms in Oklahoma and hold a bachelor's degree, median real salaries have remained nearly unchanged since 2006 (figure 7).

While the trends in real salaries over time for Oklahoma's teachers have been similar to the trends seen in other similar labor markets, there are dramatic differences in compensation across these markets within a given year. Figures 8 and 9 illustrate within-year differences in salaries that exist across Oklahoma's teachers, Texas' teachers, and Oklahoma's private sector by the worker's experience level. These figures are designed to illustrate the typical salary workers can expect to earn in each sector as they progress through their careers.

The salary profiles in figure 8 show interesting differences in the way workers in the private sector are paid relative to teachers. A newly minted college graduate is likely to earn more as a new public school teacher than what he or she could earn in Oklahoma's private sector. This same college graduate will also likely earn much more as a teacher in Texas relative to in Oklahoma. In fact, teachers in Texas earn about 16 percent more than teachers in Oklahoma (table 1 column 8). This difference in pay is even larger if one compares teacher salaries in Oklahoma City and Tulsa to teacher salaries in Dallas and Houston (figure 9). Teachers in Dallas and Houston earn about 34 percent more than teachers employed in Tulsa and Oklahoma City (table 1 column 10). Importantly, these differences in salaries far exceed

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the typical cost-of-living adjustments required to equalize living standards across states. In other words, even after adjusting for the fact that it typically costs more to live in Texas than it does in Oklahoma, teacher salaries in Texas are higher than in Oklahoma.

Aside from differences in starting salaries, the salary profiles for workers employed in Oklahoma's private sector differ dramatically from the salary profile for the typical teacher in Oklahoma. While teacher salaries tend to exceed that in the private sector early in a worker's career, the pay advantage for teachers does not last long. In the private sector, salaries increase rapidly in the early stages of a worker's career. Roughly three years into a teacher's career, salaries are about five percent higher for similarly skilled workers employed in the private sector (table 1 column 9). The relatively steep salary profile in the private sector further exacerbates this disparity over time. A worker with 10 years of experience in the private sector is likely to earn about 37 percent more than a teacher with 10 years of experience.

In the private sector, salaries grow rapidly for workers in the early years of their careers and then they flatten at higher levels of experience. Interestingly, the salary profile for teachers has the opposite shape. Teachers' salaries grow slowly early in their careers and more rapidly as they gain experience.

These differing profiles may cause significant turnover among teachers with between two and 10 years of experience, where the disparity between private sector salaries and teacher salaries grows rapidly. The next section provides descriptive information about teacher turnover rates and other labor market outcomes.

VI. Oklahoma Teacher Labor Market Outcomes

Figures 10 through 17 and tables 2 and 3 describe teacher labor market outcomes in Oklahoma over the years 2006 through 2015. Figures 10 through 14 and table 2 begin by showing teacher attrition rates over time, by teacher experience, and by school affluence and locale. Figures 15 through 17 illustrate the distribution of experience among teachers hired by schools in Oklahoma. These hiring outcomes are illustrated overall and by school income and locale. Finally, table 3 summarizes mean teacher credentials overall and by school type.

Teacher attrition out of Oklahoma Public Schools (OPS) has increased slightly since 2006 (figure 10). This is true for teachers at nearly all experience levels. For example, in 2006, about 13 percent of teachers with two to three years of experience exited OPS. In 2014, this attrition rate was nearly 16 percent. Figure 10 shows a slight increase in attrition rates from 2006-2014 for teachers of all experience levels except for teachers with 0-1 years of experience. Since these novice teachers are not protected by tenure provisions, it may be that an easing in teacher layoffs around the year 2013 has caused this turnover reduction.

Attrition rates are highest among novice teachers, decrease as teachers move into the middle of their careers, and increase again as teachers approach retirement age (figure 11). Among new teachers, about 35 percent exit their school after the first year on the job. About 29 percent of new teachers exit their district and about 17 percent exit the Oklahoma public school system altogether after their first year on the job (figure 11). Among teachers with 10 years of experience, attrition rates are much lower, but still nearly 10 percent of teachers with 10 years of experience exit the public school system each year.

These attrition rates are quite high compared to teacher attrition rates in Texas (figure 12). While about 17 percent of new teachers exit Oklahoma public schools each year, in Texas only about 11 percent of new teachers exit the public school system annually. This attrition rate disparity persists among mid and late-career teachers. Among teachers with 10 years of experience, for example, about 10 percent exit OPS while about seven percent exit Texas Public Schools each year. Attrition rates do not converge in the two states until teachers begin retiring at around 20 years of experience. Overall, among full-time teachers holding a bachelor's degree or master's degree, the overall state-level teacher attrition rate in Oklahoma is 11.1 percent compared to 8.4 percent in Texas (table 2).

Aside from attrition disparities across states, within Oklahoma there are important differences in teacher turnover rates that exist across schools by their locale and affluence. As is illustrated in figure 13, state-level teacher attrition is highest in the state's urban and suburban schools. This is true for nearly all experience levels. For example, about 20 percent of teachers with 10 years of experience employed in a suburban or urban school exit their schools each year. The attrition rate among teachers with the same experience employed in a school located in a town or rural area is about 16 percent. Overall the disparity in school-level attrition rates across urban and rural schools is about five percentage points (table 2). In other words, attrition rates in urban and suburban schools are about 26 percent higher than in rural schools. This gap in attrition rates is likely driven by the fact that teachers in urban areas have more numerous and lucrative outside job prospects relative to teachers employed in rural areas.

School-level teacher attrition rates are also higher among teachers employed in lower-income schools. Figure 14 shows teacher attrition rates by the proportion of students within a school that are eligible for free school lunch. Students are eligible for free school lunch if their household income is under 130 percent of the federal poverty guideline. Therefore, a school with a higher proportion of students eligible for free lunch is a school that serves a relatively poor student population.

An alarming fact illustrated in figure 14 is that attrition rates are highest among teachers employed in schools that serve a student body where over 65 percent are eligible for free lunch. Specifically, school-level attrition rates are about 20 percent higher in low-income schools relative to high-income schools (table 2). Stated differently, on average, Oklahoma's most at-risk students are taught by teachers who are the

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This disparity in school-level teacher attrition suggests that teacher quality may not be equitably distributed across schools. Low-income students in Oklahoma are taught by less-experienced teachers on average (table 3) who have had less time to develop important bonds with the students in their schools. This is important because teacher experience is a consistent predictor of teacher productivity, an issue discussed in more detail below.

While teacher attrition is an important labor market outcome for teachers, it is also important to consider the characteristics of the teachers schools are able to hire. Figures 15 through 17 show the distribution of experience among teachers hired by schools in Oklahoma. These distributions are shown for the average school and by school locale and student body affluence.

When schools hire teachers, they are typically inexperienced. While the average teacher who exits the typical public school has 11 years of experience, the average hire that replaces the teacher has seven years of experience (table 3). In fact, the new hire is more likely than not to have less than four years of experience (figure 15). About 30 percent of the teachers that a typical school hires have one year of teaching experience or less (figure 15).

Urban and low-income schools typically have a more difficult time hiring experienced teachers relative to schools located in rural or more affluent areas. Figure 16 shows that while schools located in urban areas draw about 60 percent of their hires from the pool of teachers with five years of experience or less, only 50 percent of teachers hired in rural areas have five years of experience or less. Overall, the average hire among schools located in urban areas has 6.4 years of experience while the typical hire made by schools located in a town, suburb, or rural area has 7.2 years of experience (table 3).

Figure 17 shows that a similar disparity exists across low-income and high-income schools. Again, while hires in high-income schools typically have more than five years of experience, more than 60% of hires in low-income schools have five years of experience or less (figure 17). Overall, the average hire among high-income schools has 7.4 years of experience while the typical hire made by low-income schools has 6.5 years of experience (table 3).

VII. Policy

A. Why we should care about teacher turnover and experience?

Simply put, teacher experience is the only observable teacher characteristic that is consistently related to teacher productivity. Strong evidence suggests that teachers improve with experience, as measured by their contribution to student achievement on standardized exams (Harris & Sass 2011, Papay & Kraft forthcoming, Rockoff 2004).

Figure 1 shows the mean teacher productivity returns to experience reported in published studies. The vertical axis reports the difference in average student gains on exams for a teacher with experience reported on the horizontal axis relative to what those students would be expected to gain had they been assigned to a first-year teacher. The differences are reported in terms of standard deviations. Each study reveals a similar experience-productivity profile. Teacher performance improves dramatically in the first four years of teaching and then levels off in subsequent years. The average profile suggests that a student assigned to an experienced teacher (four-plus years of experience) gains, on average, 0.08 standard deviations more over the school year than she would gain had she been assigned to a new teacher.

Because experience matters, policymakers ought to strive to keep experienced teachers in the classroom. In order to achieve this, one must reduce teacher attrition rates. When a teacher is retained, students are likely better-off because they would have been taught by a less-experienced replacement.

Outside of affecting teacher experience levels, teacher turnover impacts other aspects of teacher productivity. Ronfeldt, Loeb & Wyckoff (2013) suggest that improved teacher retention might strengthen bonds between students and teachers, thereby improving student achievement growth. Hendricks (2015a) shows that the teachers that are most likely to exit public schools tend to be high-ability teachers. In other words, within a given teacher experience level, the teachers that leave tend to be the most productive teachers.

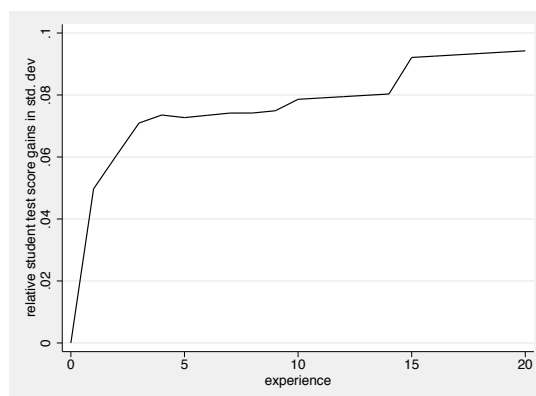
Policymakers should develop policies that reduce teacher attrition because improved teacher retention simultaneously increases teacher experience levels, strengthens student-teacher bonds, and tends to differentially retain high-ability teachers. The following section describes some teacher pay policies that are designed to reduce teacher attrition and would likely improve student outcomes in Oklahoma.

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Figure 1: Mean productivity-experience profile



B. Achieving turnover parity with Texas

Teacher turnover rates are lower in Texas. Relatively high teacher salaries in Texas likely explain at least part of this disparity. Given that Oklahoma lags in teacher retention, an obvious policy question is: how much must Oklahoma increase teacher salaries to achieve parity in teacher attrition rates with Texas? Using teacher pay effects estimated in Hendricks (2014), we can answer this question.

Using data from Texas, Hendricks (2014) shows that a 1 percent increase in teacher salaries decreases district-level teacher turnover rates by about 0.16 percentage points. As was shown in table 2, district-level teacher turnover rates in Oklahoma are about 1.9 percentage points higher than they are in Texas. Therefore, to achieve parity in district-level teacher turnover, teacher salaries in Oklahoma must increase by roughly 11.9 percent.

Importantly, to achieve parity in teacher attrition, salaries in Oklahoma can be less than in Texas. An 11.9 percent salary increase for teachers in Oklahoma would not fully close the pay gap between Texas and Oklahoma, which is about 16 percent (see table 1). Lower teacher salaries in Oklahoma can likely achieve the same labor market outcomes as those in Texas because Oklahoma has a lower cost of living. Nevertheless, teacher salaries in Oklahoma must increase from their current levels in order to achieve parity in teacher attrition rates.

C. Leveling turnover rates across low-income and high-income schools

In the private sector, employers are subject to market forces that produce variations in salaries across professions. Some of the forces at play are related to a job's working conditions. Jobs with less favorable working conditions tend to have more difficulty attracting and retaining workers. As such, the market equilibrium wage for these undesirable jobs is often higher relative to similar jobs with better working conditions. Economists call this pay difference a compensating wage differential, since higher wages in undesirable jobs are thought to compensate workers adequately to offset the job's unpleasant or dangerous working conditions.

In the teaching profession, the market does not set salaries and salaries rarely, if ever, vary across schools. In fact, within a school district, teacher salaries are determined by a single salary schedule. As a result, teachers employed in low-income schools and high-income schools within the same district will earn the same salary. Since compensating differentials are prohibited by nearly all district salary schedules, labor market outcomes tend to be unequal across school types. As we saw above, this is true in Oklahoma. Teacher turnover rates in low-income schools are higher than in high-income schools, and low-income schools tend to hire less-experienced teachers. Because of this, Oklahoma's low-income, and typically most at-risk students, tend to be taught by less-experienced teachers.

Using data from Texas, Hendricks (2015c) estimates the effects of changes in teacher salaries on school-level turnover rates in high-income and low-income schools. Preliminary estimates suggest that pay effects are nearly uniform across school types and that a 1 percent increase in teacher salary reduces school-level attrition rates by about 0.1 percentage points. Given the roughly five percentage point higher teacher attrition rate in low-income schools relative to other schools (see table 2), this implies that teacher salaries in low-income schools must be about 55 percent to 65 percent higher than salaries in other schools in order to equalize teacher turnover rates across school types. In Oklahoma, this means that teacher salaries in low-income schools should be about \$20,000 higher than salaries paid in higher-income schools.

This salary differential is substantial in part because the disparity in teacher attrition rates across school types is particularly large in Oklahoma. In Texas, attrition rates in low-income schools are about 2.5 percentage points higher than in high-income schools. This turnover disparity is about half the size of that in Oklahoma. While achieving parity in turnover rates using pay differentials on the order of 50 percent may not be politically feasible, addressing this disparity and its implied inequity ought to be a top priority for policymakers. To

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further improve teacher retention, policymakers ought to consider other types of differentiated salaries, particularly for teachers in hard-to-staff subjects and grades.

D. Reshaping the salary schedule

To this point, I have discussed policies that involve increasing teacher salaries in general. This type of policy shifts the salary schedule up so that all teachers earn higher salaries. A potentially more efficient policy does not shift all teacher salaries equally. By differentially altering salaries across experience levels, one may obtain a more productive teacher labor force for a lower cost.

Hendricks (2015b) analyzes the broader range of policies that involve changing the shape of the teacher salary schedule. This study finds that the typical salary schedule employed by school districts is not optimally shaped. The typical salary schedule, including those in Oklahoma, is increasing and convex in teacher experience (see figure 9). In these salary schedules, teachers earn small annual raises early in their careers and relatively large raises later in their careers.

As is shown in Hendricks (2015b), if one designs a salary schedule to maximize teacher productivity, then the optimal shape of the salary schedule should look more like that in the private sector. In the private sector, salaries tend to increase rapidly early in a worker's career and level off in later years. This is illustrated in figure 9, where the private sector salary profile in Oklahoma takes a concave shape.

I have replicated the policy simulation presented in Hendricks (2015b) using Oklahoma's data. Figure 18 shows the current average district salary schedule in Oklahoma along with several policy alternatives. The "optimal" schedule shows the solution to a numerical optimization problem that chooses the teacher salary schedule that maximizes teacher productivity in Oklahoma given the same initial total payroll budget as the current average salary schedule. The optimal salary schedule is derived using the teacher turnover rates and hire rates that exist in the state and the distribution of teachers currently employed across schools in Oklahoma. To determine average teacher productivity under different salary schedules, I use the estimates of the relationship between teacher productivity and experience shown in figure 1. To determine the effects of changes in salaries on turnover rates and hire rates, I use estimates from Hendricks (2015b) and Hendricks (2014).

In figure 18, the series denoted "optimal 5 percent increase," "optimal percent increase," and "optimal 15 percent increase" show the optimal schedules under the respective payroll budget increases. The current total expenditure on teacher salaries in the Oklahoma is about \$1.55 billion. A 5% payroll increase is roughly equivalent to an additional \$75 million allocated for teacher salaries. The 10 percent and 15 percent increases represent, respectively, an additional \$150 million and \$225 million in payroll expense. The total state payroll for each schedule is shown in figure 20 by the number of years after the policy change. Note that total payroll increases in the optimal schedules over time because more teachers are retained in future periods, and they earn higher salaries as their experience levels increase.

The expected change in teacher productivity for each salary schedule is shown in figure 19. If the state wishes to maximize teacher productivity under the current budget, the shape of the salary schedule would need to be altered so that it is concave rather than convex - a shape similar to that in the private sector. The more efficient salary schedule is steep initially, offering large salary increases each year to novice teachers, and is relatively flat for higher experience levels. This salary schedule increases teacher productivity because it retains a higher number of mid-career teachers. Mid-career teachers are highly responsive to changes in teacher salaries and they are near the apex of their productivity. In contrast, veteran teachers are relatively unresponsive to changes in salaries (Hendricks 2015b, Hendricks 2014).

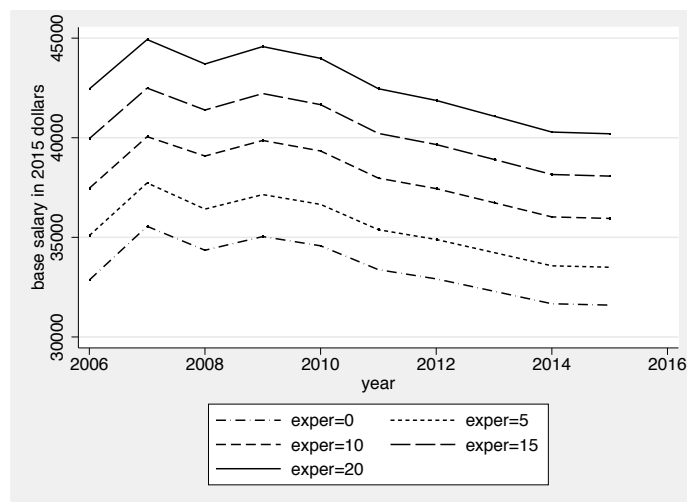
If more funds are allocated to teacher salaries, average teacher productivity in the state is likely to improve substantially. If districts increase salaries by 15 percent (\$225 million) and adopt the optimally shaped salary schedule, teacher turnover rates in Oklahoma are likely to decline so that they are lower than in Texas, and average teacher productivity would likely increase by at least nine percent within 1 years - as measured by teacher value-added (see figure 19). A nine percent increase in teacher productivity is likely a lower bound because it only considers student achievement gains that result from changes in the average experience of the teacher workforce. By increasing teacher salaries, the state is also likely to attract more talented individuals to the teaching profession, increase teacher morale, improve the bonds between teachers and students, and differentially retain high-ability teachers (Hendricks 2015a).

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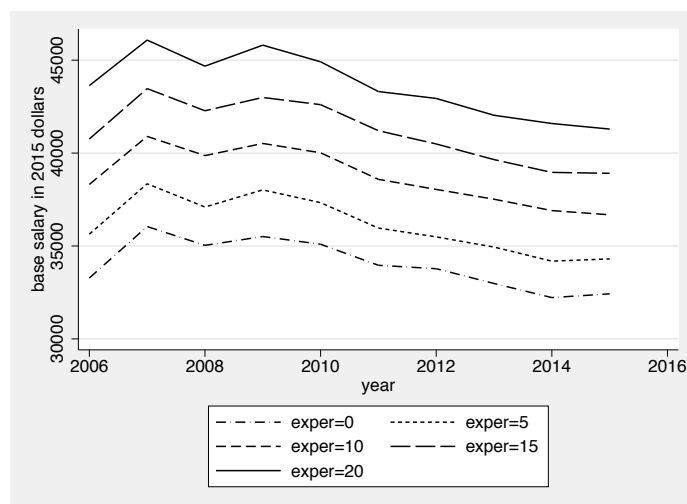
Appendix

Figure 2: Real state minimum salary schedule 2006-2015



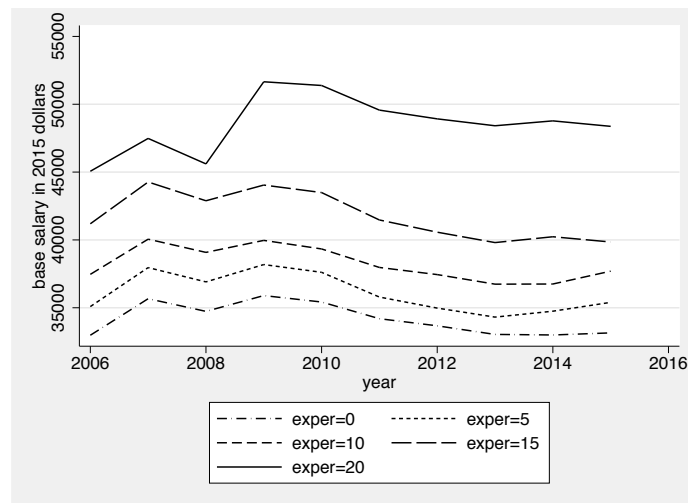
Notes: The figure shows the Oklahoma state minimum salary for full-time teachers holding a bachelor's degree by experience level and year. Salaries are adjusted for inflation using the consumer price index.

Figure 3: Real mean district salary schedules 2006-2015



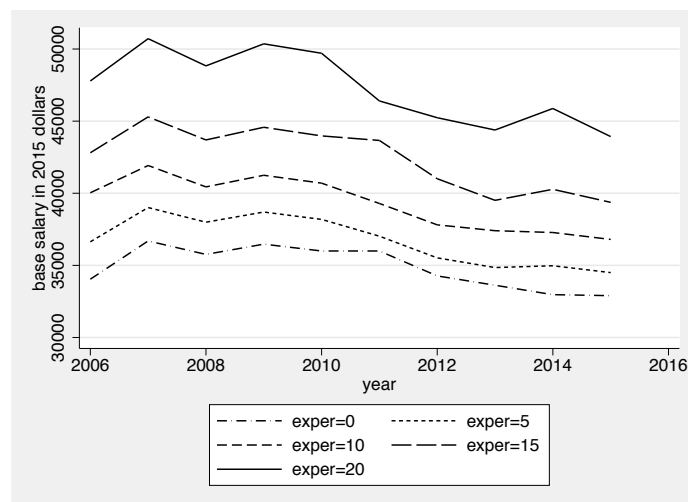
Notes: The figure shows the mean salary paid by Oklahoma school districts to full-time teachers holding a bachelor's degree by experience level and year. The sample is restricted to the 192 largest school districts in the state. Salaries are adjusted for inflation using the consumer price index.

Figure 4: OKC district salary schedules 2006-2015



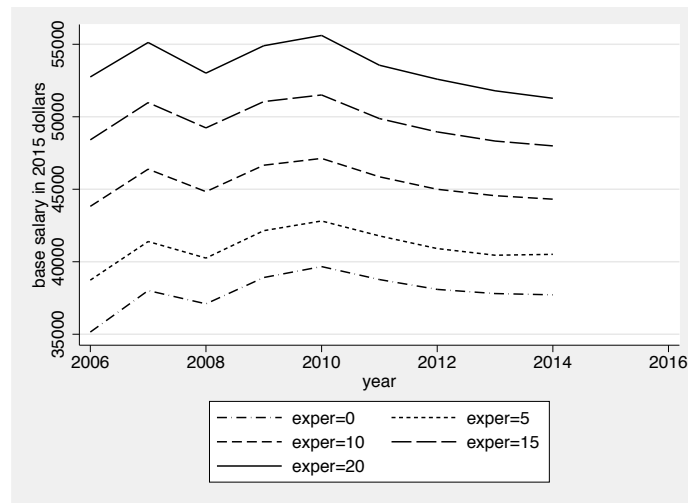
Notes: The figure shows the mean salary paid by the Oklahoma City school district to full-time teachers holding a bachelor's degree by experience level and year. Salaries are adjusted for inflation using the consumer price index.

Figure 5: Tulsa district salary schedules 2006-2015



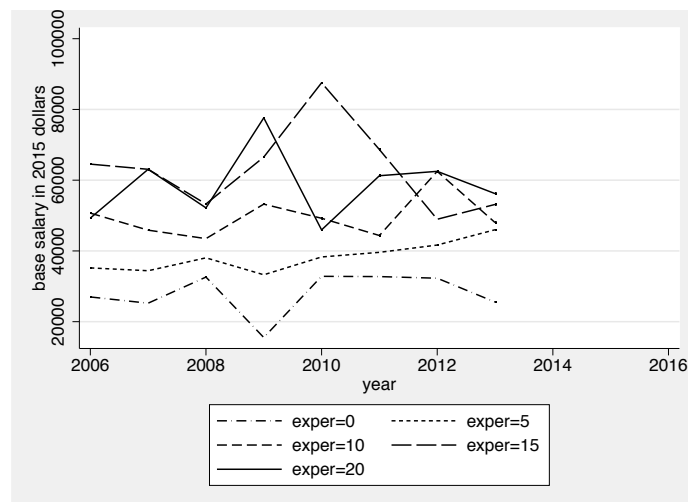
Notes: The figure shows the mean salary paid by Tulsa Public Schools to full-time teachers holding a bachelor's degree by experience level and year. Salaries are adjusted for inflation using the consumer price index.

Figure 6: Mean district salary schedules in Texas 2006-2014



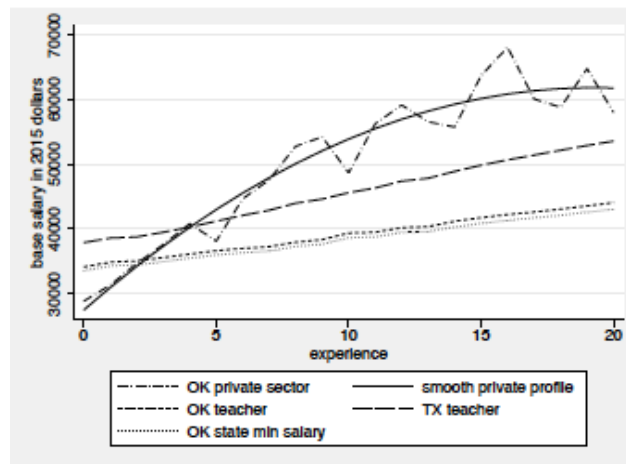
Notes: The figure shows the mean salary paid by Texas public school districts to full-time teachers holding a bachelor's degree by experience level and year. The sample is restricted to the 740 largest school districts in the state. Salaries are adjusted for inflation using the consumer price index.

Figure 7: Private sector imputed salary schedules 2006-2013



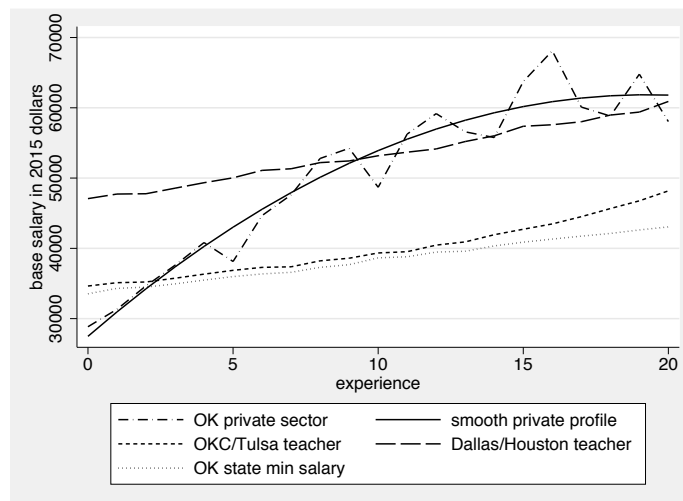
Notes: The figure shows the median salary earned by a full-time worker employed by a private-for-profit firm (excludes self-employed) in Oklahoma holding a bachelor's degree by experience level and year. Salary information comes from the American Community Survey. Salaries are adjusted for inflation using the consumer price index.

Figure 8: Salary by year of experience



Notes: The figure shows the median salary earned by a full-time worker employed by a private-for-profit firm (excludes self-employed) in Oklahoma holding a bachelor's degree by experience level averaged across years. The smooth series is a quadratic fitted to the private sector salaries. Private sector salary information comes from the American Community Survey. Teacher salaries come from the 740 largest school districts in the Texas and 192 largest districts in Oklahoma. All salaries are average real salaries within experience level and across years. Salaries are adjusted for inflation using the consumer price index.

Figure 9: Salary by year of experience - urban teachers



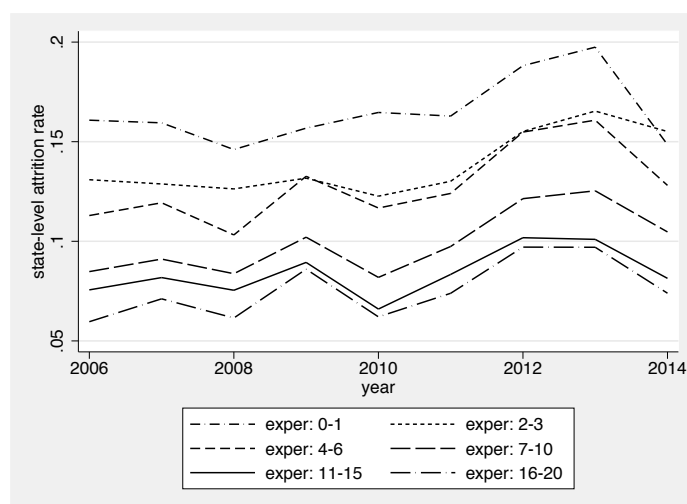
Notes: The figure shows the median salary earned by a full-time worker employed by a private-for-profit firm (excludes self-employed) in Oklahoma holding a bachelor's degree by experience level averaged across years. The smooth series is a quadratic fitted to the private sector salaries. Private sector salary information comes from the American Community Survey. Teacher salaries come from the OKC, Tulsa, Houston, and Dallas school districts. All salaries are average real salaries within experience level and across years. Salaries are adjusted for inflation using the consumer priceindex.

Table 1: Salary by year of experience

(1) exper	(2) OKstmin	(3) OKteacher	(4) TXteacher	(5) OKprivate	(6) OKC/TUL	(7) DAL/HOU	(8) diff3v4	(9) diff3v5	(10) diff6v7
0	33,535	34,152	37,907	27,480	34,643	47,078	11%	-20%	36%
1	34,303	34,868	38,598	30,958	35,116	47,730	11%	-11%	36%
2	34,488	35,090	38,784	34,249	35,215	47,771	11%	-2%	36%
3	34,944	35,596	39,500	37,356	35,753	48,560	11%	5%	36%
4	35,491	36,131	40,298	40,277	36,332	49,341	12%	11%	36%
5	35,986	36,651	41,211	43,013	36,873	50,035	12%	17%	36%
6	36,361	37,012	42,114	45,563	37,294	51,097	14%	23%	37%
7	36,591	37,270	42,907	47,928	37,377	51,327	15%	29%	37%
8	37,296	37,961	43,992	50,108	38,225	52,200	16%	32%	37%
9	37,682	38,370	44,637	52,103	38,596	52,439	16%	36%	36%
10	38,652	39,378	45,616	53,912	39,345	53,179	16%	37%	35%
11	38,802	39,503	46,350	55,535	39,526	53,681	17%	41%	36%
12	39,474	40,203	47,395	56,974	40,462	54,149	18%	42%	34%
13	39,592	40,378	47,850	58,227	40,919	55,199	19%	44%	35%
14	40,343	41,201	48,912	59,294	41,939	56,016	19%	44%	34%
15	40,882	41,757	49,865	60,177	42,720	57,370	19%	44%	34%
16	41,320	42,243	50,697	60,874	43,477	57,589	20%	44%	32%
17	41,742	42,636	51,425	61,385	44,511	58,018	21%	44%	30%
18	42,125	43,073	52,179	61,711	45,663	58,966	21%	43%	29%
19	42,616	43,570	52,915	61,852	46,763	59,392	21%	42%	27%
20	43,050	44,082	53,589	61,808	48,180	60,905	22%	40%	26%
mean	38,346	39,101	45,559	50,514	39,949	53,431	16%	28%	34%

Notes: The table shows teacher salaries and private sector salaries by experience. Private sector salaries are the median salary earned by a full-time worker employed by a private-for-profit firm (excludes self-employed) in Oklahoma holding a bachelor's degree by experience level averaged across years. Private sector salary information comes from the American Community Survey. Teacher salaries come from the 740 largest school districts in the Texas and 192 largest districts in Oklahoma. All salaries are average real salaries within experience level and across years. Salaries are adjusted for inflation using the consumer price index.

Figure 10: OK teacher attrition by experience over time



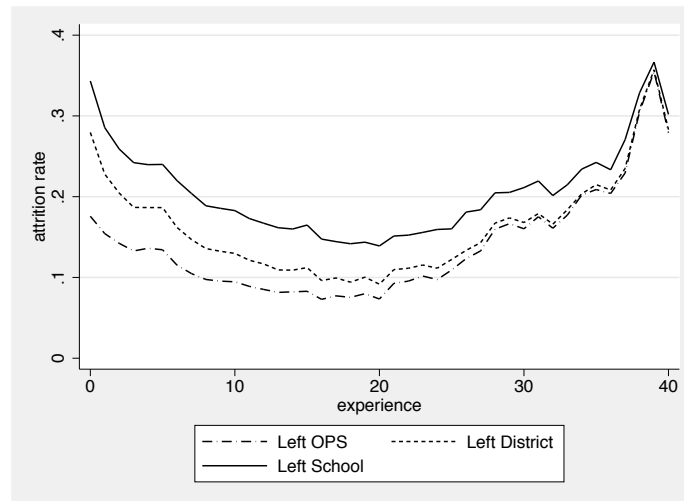
Notes: The figure shows teacher attrition rates out of Oklahoma public schools for the years 2006-2014. Attrition rates are calculated for full-time teachers holding a bachelor's or master's degree. The teacher attrition is the proportion of teachers within a given experience level that were employed as a full-time teacher in the state's public school system in the given year and were not employed in the public school system during the following year.

Table 2: Teacher attrition rates

		left Pub Schls	left district	left school
OK by locale	All OK	11.1%	15.7%	21.0%
	All TX	8.4%	13.8%	20.3%
	City	12.9%	17.0%	24.6%
	Rural	9.4%	14.6%	18.9%
	Suburb	12.9%	16.6%	22.2%
	Town	10.0%	14.1%	18.8%
OK by free lunch eligibility	≤32%	12.0%	15.5%	20.3%
	32-48%	10.5%	14.8%	19.1%
	48-65%	9.8%	14.6%	19.6%
	>65%	12.0%	17.0%	24.7%

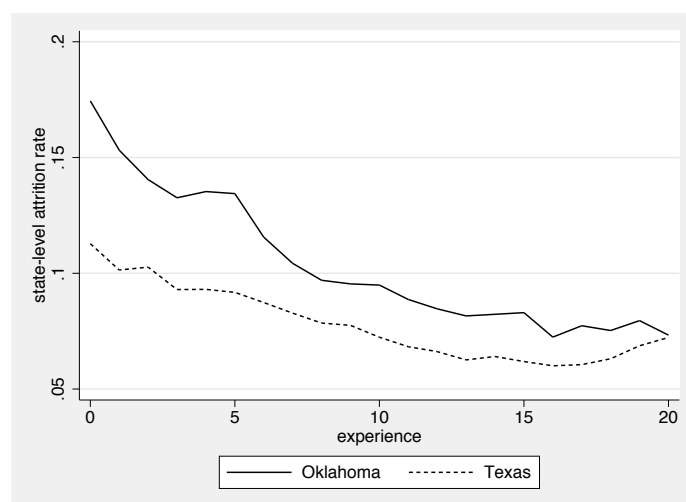
Notes: Annual attrition rates are calculated for full-time teachers holding a bachelor's or master's degree with 20 years of experience or less over the years 2006 through 2014.

Figure 11: OK teacher attrition by experience



Notes: The figure shows teacher attrition rates out of Oklahoma public schools for the years 2006-2014. Attrition rates are calculated for full-time teachers holding a bachelor's or master's degree and have between 0 and 40 years of experience. The "left OPS" attrition rate is the proportion of teachers within a given experience level that were employed as a full-time teacher in the state's public school system in a year and were not employed in the public school system during the following year. The "left district" attrition rate is the proportion of teachers within a given experience level that were employed by a district in a given year but were not employed by the same district in the subsequent school year. The "left school" attrition rate is the proportion of teachers within a given experience level that were employed by a school in a given year but were not employed by the same school in the subsequent school year. In this figure, annual attrition rates are averaged across the 2006-2014 school years to give overall attrition rates by the teacher's experience level over this period.

Figure 12: OK versus Texas teacher attrition by experience



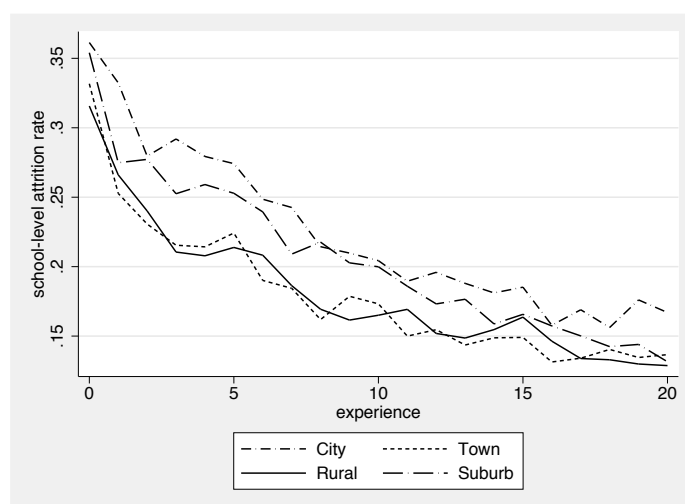
Notes: The figure shows state-level attrition rates for teachers employed in Oklahoma and Texas public schools. State-level teacher attrition is the proportion of teachers within a given experience level that were employed as a full-time teacher in the state's public school system in the given year and were not employed in the public school system during the following year. For each state, the sample is restricted to full-time teachers holding a bachelor's or master's degree during the years 2006 through 2014.

Table 3: OK teacher credentials

		experALL	experTURN	experHIRE	%BA	%MA
by locale	All	12.4	11.2	7.0	75%	25%
	City	11.7	10.1	6.4	73%	27%
	Rural	12.9	11.9	7.3	76%	24%
	Suburb	12.2	10.7	7.2	75%	25%
	Town	12.9	12.2	7.2	73%	27%
by free lunch eligibility	≤32%	12.6	11.3	7.4	74%	26%
	32-48%	13.0	11.9	7.1	74%	26%
	48-65%	12.6	11.7	7.2	75%	25%
	>65%	11.6	10.3	6.5	75%	25%

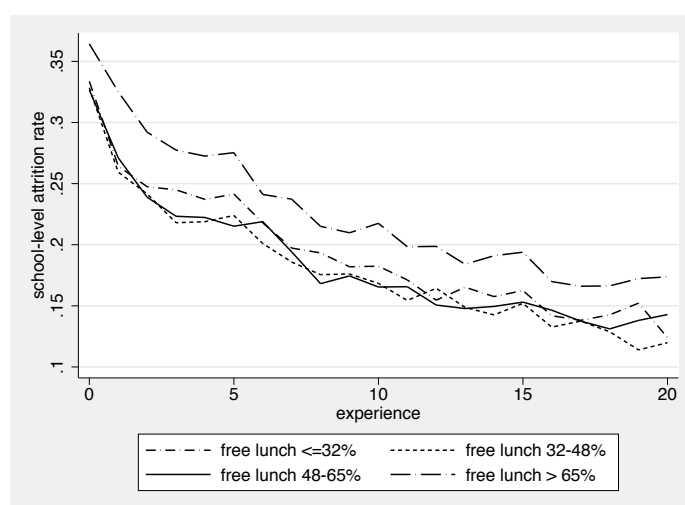
Notes: The table shows mean teacher credentials overall and by school locale and free lunch eligibility over the years 2006 through 2015. The column titled “experALL” shows the mean experience among all teachers in the school. The columns titled “experTURN” and “experHIRE” show the mean experience among the teachers who leave the school and the mean experience among the teachers hired by the school. The columns denoted %BA and %MA show the percentage of teachers employed by the school that hold bachelor's or master's degrees. The sample is restricted to full-time teachers.

Figure 13: OK teacher attrition by experience and locale



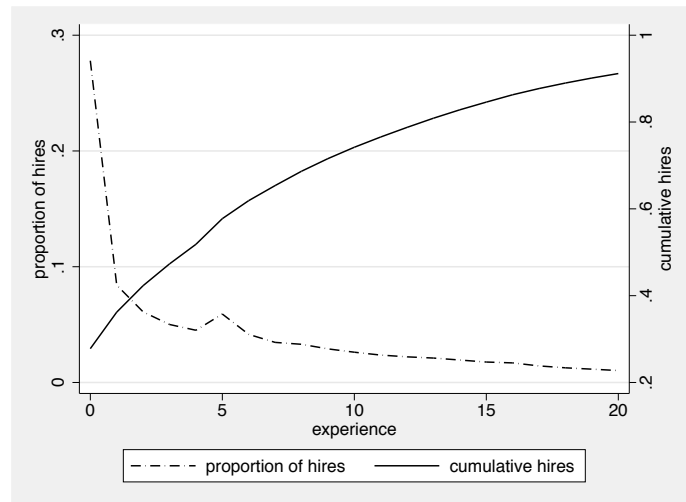
Notes: The figure shows school-level attrition rates for teachers employed in Oklahoma public schools by school locale. School-level attrition is the proportion of teachers within a given experience level that were employed as a full-time teacher in a given school and year and were not employed in the same school during the following year. The sample is restricted to full-time teachers holding a bachelor's or master's degree during the years 2006 through 2014.

Figure 14: OK teacher attrition by experience and schoolaffluence



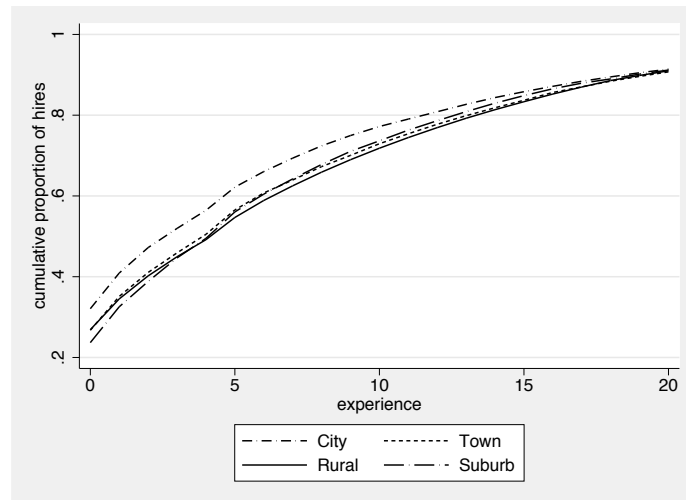
Notes: The figure shows school-level attrition rates for teachers employed in Oklahoma public schools by the proportion of students within the school that are eligible for free lunch. School-level attrition is the proportion of teachers within a given experience level that were employed as a full-time teacher in a given school and year and were not employed in the same school during the following year. The sample is restricted to full-time teachers holding a bachelor's or master's degree during the years 2006 through 2014.

Figure 15: Distribution of school-level teacher hires in OK



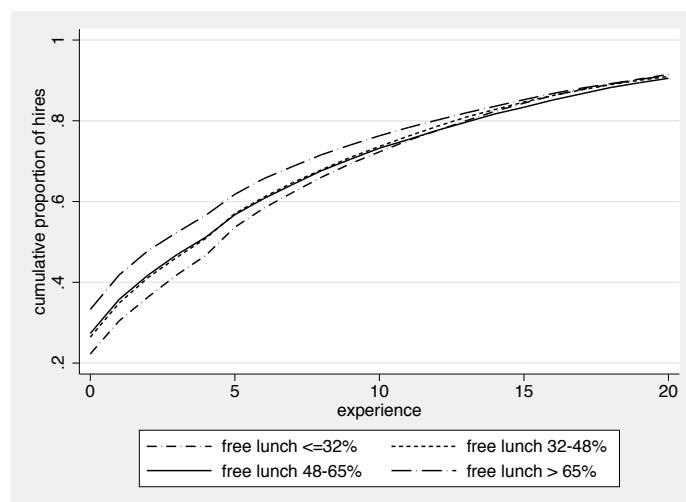
Notes: The figure shows the distribution of hires made in each experience level by the average school in Oklahoma. The series denoted “proportion” hires shows the proportion of a school’s teacher hires that come from the given experience level. The series denoted “cumulative hires” shows the proportion of hires made at or below the given experience level.

Figure 16: Distribution of school-level teacher hires in OK by locale



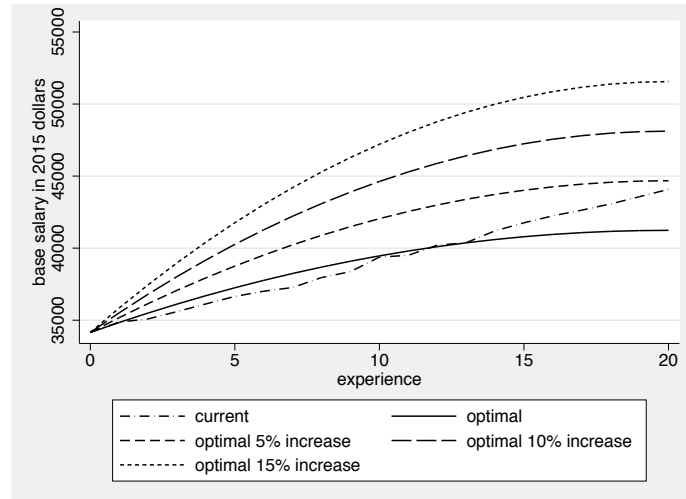
Notes: The figure shows the cumulative distribution of school-level teacher hires made across teacher experience levels by the school's locale. The series "cumulative hires" shows the proportion of hires made at or below the given experience level.

Figure 17: Distribution of school-level teacher hires in OK by school income



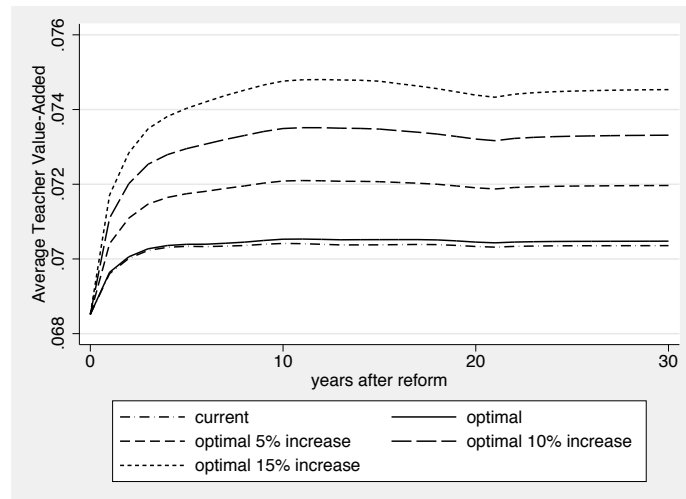
Notes: The figure shows the cumulative distribution of school-level teacher hires made across teacher experience levels by the school's student body affluence, as measured by the percentage of students eligible for free school lunch. The series "cumulative hires" shows the proportion of hires made at or below the given experience level.

Figure 18: Optimal vs. current OK salary schedules



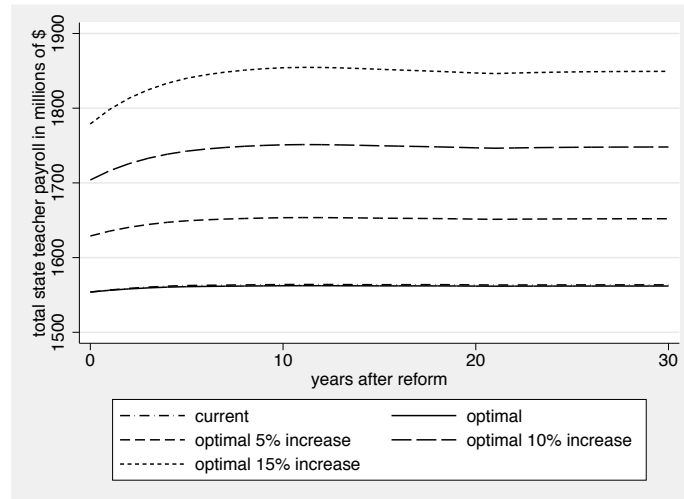
Notes: The figure shows the mean salary paid by Oklahoma school districts to full-time teachers holding a bachelor's degree by experience level. The optimal salary schedule shows that salaries that would maximize teacher value-added (productivity) given estimated pay effects and the relationship between teacher productivity and experience. The series denoted "optimal 5% increase," "optimal 10% increase," and "optimal 15% increase" show the optimal schedules under the respective payroll budget increases. A 5% payroll increase is equivalent to an additional \$75 million in payroll for teacher salaries. The 10% and 15% increases represent, respectively, an additional \$150 million and \$225 million in payroll expense.

Figure 19: Teacher productivity: current vs. optimal schedules



Notes: The figure shows the mean teacher value-added (productivity) for teachers in Oklahoma for each salary schedule by the years after pay reform. The optimal salary schedule shows that salaries that would maximize teacher value-added (productivity) given estimated pay effects and the relationship between teacher productivity and experience. The series denoted “optimal 5% increase,” “optimal 10% increase,” and “optimal 15% increase” show the optimal schedules under the respective payroll budget increases. A 5% payroll increase is equivalent to an additional \$75 million in payroll for teacher salaries. The 10% and 15% increases represent, respectively, an additional \$150 million and \$225 million in payroll expense.

Figure 20: Total state payroll: current vs. optimal schedules



Notes: The figure shows the estimated total state expenditure on teacher salaries in the original and optimal salary schedules by the number of years after pay reform. The series account for changes in teacher attrition and hiring that occur over time given the current distribution of teachers, turnover rates, and hire rates in Oklahoma. The payroll in the optimal schedule accounts for changes in teacher turnover and hiring that would likely occur under the optimal salary schedule. Total payroll is estimated assuming 75% of teachers hold a bachelor's degree and the other 25% hold a master's degree. Teachers holding a master's degree are assumed to earn \$2,300 more on average, and the state is assumed to employ 40,300 full-time-equivalent teachers each year. The series denoted "optimal 5% increase," "optimal 10% increase," and "optimal 15% increase" show the optimal schedules under the respective payroll budget increases. A 5% payroll increase is equivalent to an additional \$75 million in payroll for teacher salaries. The 10% and 15% increases represent, respectively, an additional \$150 million and \$225 million in payroll expense. Note that total payroll increases in the optimal schedules over time because more teachers are retained in future periods, and they earn higher salaries as their experience levels increase.

About the Oklahoma Business and Education Coalition

The Oklahoma Business and Education Coalition is a statewide, business-led organization that works to improve and strengthen public education.

About the Oklahoma State School Boards Association

The Oklahoma State School Boards Association works to promote quality public education for the children of Oklahoma through training and information services to school board members.