

Teacher Attrition and Retention in Kansas: A Case Study of Geographically Rural States with Persistent Teacher Shortages

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Teacher Attrition and Retention in Kansas: A Case Study of Geographically Rural States with Persistent Teacher Shortages

Abstract

Teacher attrition is a key contributor to teacher shortages in many states, particularly those with large geographically rural areas. Using seven waves of the School and Staffing Survey and Kansas as a case study, this study examines the teacher labor force from 1988 to 2012. Moreover, the study describes the teacher mobility patterns for Kansas from 2000 to 2012 and compares them against the national average, the Midwest states, and the Great Plains states. Furthermore, it examines whether younger teachers, teachers with graduate degrees, and STEM and special education teachers in Kansas are more or less likely to turn over. Lastly, the study examines how certain teacher and school characteristics are associated with teacher attrition for Kansas as a whole and for rural schools in particular. Implications for research and policy are discussed.

Key words: teacher attrition, teacher retention, teacher shortages, Kansas, rural education

Introduction

Teacher labor markets have strong implications for learning outcomes and equity for students. Years of research have provided consistent evidence that teacher effectiveness is the most important school factor in student achievement (Chetty, Friedman, & Rockoff, 2014; Kane & Staiger, 2008), and at the same time, researchers have shown the most disadvantaged schools are often the hardest to staff and often face high teacher turnover (Ingersoll, 2001; Guarino, Santibañez, & Daley, 2006). Consequently, policy makers and educators have spent considerable amount of time and resources to staff classrooms with qualified teachers (Hanushek, Kain, & Rivkin, 2004; Loeb, Kalogrides, & Beteille, 2012). Despite this tremendous amount of effort, it has been difficult to keep quality teachers in the classrooms (Sutcher, Darling-Hammond, & Carver-Thomas, 2016), particularly for some states (Carver-Thomas & Darling-Hammond, 2017; Lazarte-Alcala & Miller, 2018). As such, education scholars have concluded we need to better address the uneven distribution of quantity and quality of teachers (Ingersoll, 2001; Guarino, Santibanez, & Daley, 2006; Lankford, Loeb, & Wyckoff, 2002). In particular, retaining qualified teachers in states with large rural areas like Kansas has been challenging due to the shrinking labor pool (McClure & Reeves, 2004) and relatedly, teacher tendency to move from rural to urban areas (Boyd et al., 2005). For instance, states with large geographically rural areas like Kansas, Oklahoma, and North Dakota have experienced substantial teacher shortages in the last decade (Bisaha, 2018; Lazarte-Alcala & Miller, 2018; Sisk, 2015). Moreover, high teacher turnover is costly to schools and districts (Barnes, Crowe, & Schaefer, 2007; DeFeo et al., 2017). Since teacher attrition is directly related to student learning, retaining high quality teachers is critically important for student achievement and the long-term health of the education pipeline and workforce in rural communities. In short, teachers represent an integral part of public education and there is compelling interest in retaining high quality teachers, particularly for disadvantaged schools and communities.

Most studies on teacher turnover focus on teachers leaving the profession (leavers) and not teachers switching schools (switchers) (Borman & Dowling, 2008), but it is likely that the factors that influence leavers are not the same as those that influence switchers. From the perspective of the school, both forms of attrition are detrimental as the school is still losing the teacher regardless of whether the teacher is moving to another school or if they left the profession. From the perspective of the district or the state, however, switchers are less costly than leavers if they stay within the district or the state. Therefore, it is important to know both what keeps teachers in teaching and what keeps them in the school where they are. In other words, we should also pay more attention to the specific form of turnover, which this paper endeavors to do.

This study aims to address the extent to which teacher and school characteristics are associated with teacher turnover in Kansas as a case study to illustrate more attention is needed to examine the teacher labor market in states with large geographically rural areas where students are disadvantaged and where teacher shortages are particularly pronounced (Showalter et al., 2019). Kansas makes a good case study as it has experienced substantial teacher shortages in the last decade and is continuing to experience shortages (Bisaha, 2018; Kansas Department of Education, 2016). Moreover, much of Kansas by area is rural (Economic Research Service, 2007)

and the teacher labor markets in geographically sparse areas are distinctly different than those in or near urban centers (Cowen et al., 2012; Guarino, Santibanez, & Daley, 2006; Miller, 2012).

This study makes several contributions to the scholarly study of teacher attrition and retention. First, leveraging all the available waves of the School and Staffing Survey (SASS), the study uses longitudinal nationally representative data instead of short-term district- or state-level data over a short period of time to provide a more thorough analysis of teacher turnover of a geographically sparse state with persistent teacher shortages, Kansas. This may overcome the idiosyncratic nature of using short-term district or state-level data. Relatedly, this allows us to examine how teacher characteristics and the conditions of the schools in which they teach have changed over time. Second, a rich set of covariates in teacher characteristics and school characteristics and the use of year fixed effects alleviate some concerns of omitted variable bias in estimating the relationships between these covariates and teacher turnover. Third, the paper is able to differentiate between teachers who move schools from those who leave the profession and analyze the factors that influence each set of mobility pattern together and separately. Lastly, we are able to provide these estimates for the entire state of Kansas as a whole as well as for rural areas specifically.

Background Information

Teacher attrition in rural states: The case of Kansas

Research on teacher attrition has generally focused in large urban areas (Guarino, Santibanez, & Daley, 2006), and recently that there is more recognition there should be more focus on the unique challenges that rural teachers face and how they could drive attrition. For instance, Cowen and colleagues (2012) examine how the geographic isolation of Appalachian schools creates unique challenges to the local teacher labor market in terms of staffing and retention. More specifically, they find inter-district mobility is rare among Appalachian teachers and teachers are considerably more likely to leave Appalachia than to transfer to it and they are more likely to leave the profession. However, using nationally representative data as well as state-level data, other recent studies do not consistently find that rural teachers are more likely to leave teaching than urban teachers; in some studies, rural teachers are, on average, less likely to turn over than their urban counterparts (Donaldson & Johnson, 2010; Imazeki, 2005; Kelly, 2004; Moore, 2011; Smith, 2006). These findings indicate the variations of teacher attrition are not neatly split by the rural and urban divide but rather by the specific context of the studies and the local teacher labor market, which is partly driven by geographical isolation.

In this study, we examine Kansas specifically for two main reasons. The first is that Kansas has experienced and continues to experience substantial teacher shortages in the last decade and data suggest this shortage is further exacerbated in recent years (Bisaha, 2018; Kansas Department of Education, 2016). In recognition of this on-going issue, in 2016 the Kansas Commissioner of Education, Dr. Randy Watson, created the Blue Ribbon Task Force charged with the task of studying teacher shortages and vacancy. One of the main conclusions of this report is that teacher attrition is a critical part of teacher shortages in Kansas (Kansas Department of

Education, 2016). Related to this effort, the Educate Kansas Retention Summit (Educate Kansas, n.d.), partly sponsored by the Kansas State Department of Education, was formed to create on-going dialogue about how to address teacher retention in Kansas, illustrating the need and urgency of retaining teachers in the state. The second reason is that much of Kansas by area is rural or geographically isolated and about a third of the population lives in rural areas (Economic Research Service, 2007; U.S. Department of Agriculture, n.d.). Related to the first reason, teacher shortages are particularly dire for rural areas in Kansas that have difficulty attracting qualified teachers and retaining them (Kansas Department of Education, 2016). There are also unique challenges to the recruitment and retention of qualified teachers in rural areas (Monk, 2007). To address these points, in regression analyses we first focus on the factors associated with teacher attrition in Kansas as a whole, but we also explore how these factors may operate differently in rural schools. In sum, Kansas makes for a good case study of teacher attrition in a state with large geographically rural areas continually experiencing teacher shortages.

Literature Review

Teacher characteristics

Teacher characteristics facilitate our understanding of how teacher background characteristics may influence attrition and retention. Research has consistently found that attrition is high for young and new teachers (Guarino, Santibanez, & Daley, 2006; Nguyen et al., 2019; Redding & Nguyen, in press). With regards to race and ethnicity, White teachers are more likely to leave than minority teachers (Borman & Dowling, 2008; Nguyen et al., 2019). In terms of specialty areas and graduate degrees, STEM and special education teachers are more at risk of turning over (Imazeki, 2005; Ingersoll, 2001) and teachers with graduate degrees, on average, tend to leave more often than those without (Clotfelter et al., 2008; Imazeki, 2005). In particular, prior research on special education teachers in Kansas indicates there are many reasons that drive special education teachers to quit (McKnab, 1983). Relatedly, prior research has found that training, experience, ability, and achievement all influence teacher attrition and retention (Boyd et al., 2005). Lastly, teacher salary has generally been found to play an important role in teacher retention (Nguyen et al., 2019). For instance, Podgursky, Monroe, and Watson (2004) found that higher earnings are negatively associated with attrition. Relatedly, salary increases have been found to be associated with teachers' decisions to switch schools (Hanushek, Kain & Rivkin, 2004; Lankford, Loeb, & Wyckoff, 2002). To this point, Kansas teacher salary has been consistently among the lowest in the nation (Showalter et al., 2019).

School characteristics

School characteristics represent one of the most studied areas of teacher attrition and retention, but the findings are often mixed. This may be due to the highly contextualized nature of school characteristics and how teachers sort themselves into their particular schools. With regards to urbanicity, there is mixed evidence of the turnover rate at urban and rural schools (Clotfelter et al., 2011; Djonko-Moore, 2016; Nguyen et al., 2019). For Kansas specifically, teacher turnover is a salient issue for rural

areas, particularly the Southwest region (Kansas Department of Education, 2016). School size and enrollment are significant associated with attrition but their effects are practically small (Imazeki, 2005). Synthesizing the literature on the socioeconomic composition of the school and teacher attrition, previous works have found there is little connection between the school's socioeconomic composition and teacher attrition (Borman & Dowling, 2008). However, this may be due to how socioeconomic compositions of schools have been operationalized in the literature. Recent evidence suggests, however, that teachers, on average, prefer schools with higher proportions of White and Asian students and that their preferences vary systematically according to their own demographic characteristics (Engel, Jacob, & Curran, 2014; Horng, 2009). Relatedly, teachers may be more likely to leave majority minority schools (Carroll, Reichardt, & Guarino, 2000; Hanushek, Kain, & Rivkin, 2004). In short, these studies examining school characteristics and teacher attrition suggest that we need to account for the school conditions in which teachers leave.

Data and Methods

The data for this study comes from the Schools and Staffing Survey (SASS) and its supplement, the Teacher Follow-Up Survey (TFS), which is administered by the National Center for Educational Statistics (NCES). SASS consists of state representative and nationally representative samples of schools, principals, and teachers for public schools. These surveys include comprehensive data on teacher characteristics and school characteristics.

For this study, we use all seven iterations of SASS to examine the teacher characteristics of Kansas teachers and the schools in which they teach. More specifically, we use the 1987-1988, 1990-1991, 1993-1994, 1999-2000, 2003-2004, 2007-2008, and 2011-2012 waves. For the turnover analysis, we use the most recent four waves of TFS, the 2000-2001, 2004-2005, 2008-2009, and 2012-2013.¹ The SASS surveys were conducted so that the results can be generalizable at the state level, and we employ appropriate sampling weights to make the results representative for Kansas. The overall sample size for the descriptive analysis is 5,100 unique teacher-year observations, representing 215,740 Kansas teachers from 1987-2012, and 2,910 observations, representing 131,790 Kansas teachers from 1999-2012, for the turnover analysis. In subgroup analysis in only rural areas, we have 1,330 observations representing 55,210 Kansas teachers from 1999-2012.

Measures of Teacher Characteristics, School Characteristics, and Attrition

We include a number of teacher characteristics such as gender, race/ethnicity, age, teacher experience, graduate degree(s), whether the teacher teaches math or science (STEM) or special education, certification status, undergraduate college selectivity using Barron's Admissions Competitiveness Index, reported annual salary, and union membership. College selectivity has been used in previous studies as a proxy for academic ability or to indicate high quality teaching candidates (Cohen-Vogel & Smith, 2007; Lankford et al., 2014).

¹ We note that the National Teacher and Principal Survey (NTPS) 2015-2016 that replaces the SASS changed its sampling frame, so it no longer allows for the data to be representative at the state level. Moreover, due to poor survey response, the turnover data for NTPS are also not made available by NCES (even with restricted licenses).

In terms of school characteristics, we consider the school's urbanicity (using the common definition of urban and rural as defined by the NCES Common Core of Data and in the national database), enrollment size, secondary or elementary level, the percent of students with free and reduced price lunch (FRPL) eligibility, percent minority, percent individualized education program (IEP), and percent limited English proficiency (LEP). We also characterize school working conditions with principal reports of the level of student disciplinary problems and teacher-reported support from the administrators and cooperative effort among the staff.

The main dependent variable for this study comes from the principal report of teachers' employment status in the follow-up year following the baseline survey year. Teachers are categorized as staying in the same school (stayers), switching schools (switchers), or leaving teachers (leavers). The full list of variables used can be found in Appendix Table 1.

Methods

This study includes both descriptive and regression analyses. In the descriptive analysis, we report on changes in Kansas teachers' characteristics and the characteristics of the schools in which they teach and their attrition rate over time. In regression analysis, we first estimate an OLS model comparing teacher mobility in Kansas relative to the Midwest states and the Great Plains States where we employ appropriate sampling weights so the data are representative at the state level for those states. We compare Kansas to the Midwest and Great Plains because the states in these regions are geographically similar to Kansas in many ways (Economic Research Service, 2007) and they are also the main competitors of teachers in the region.² The Great Plains States include Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Oklahoma, Texas and Wyoming, while the Midwest states include North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Kansas, Michigan, Indiana, and Ohio. Within this model, we also examine whether this mobility is influenced by whether the teacher is a young teacher, teacher with graduate degree, special education teacher, and STEM teacher. The second part of the regression analysis limits the sample to only Kansas teachers to identify the extent to which qualifications or school characteristics predict turnover rates. With regards to teachers in rural areas, we also replicate the previous analysis but limit the sample to only teachers in rural areas to examine whether the patterns are different relative to the whole state of Kansas. Due to the substantial reduction in sample size and consequently reduction in power to detect significant relationships, we view this as exploratory work to spur future research using administrative data.

Results

Table 1 presents the teacher characteristics and school characteristics by wave. Generally, most teacher characteristics are stable across time, so we focus the discussion on Model 8 where the data are pooled together. We observe Kansas teachers tend to be women (74 percent) and nearly all are White (96 percent). Sixteen percent are under 30 years old, 45 percent have graduate degrees and 11 percent and

² In conversations with Kansas state officials, they also want to make these comparisons as they often compare their teacher pipeline, attrition issues, and competitive recruitment and retention of teachers with these nearby states.

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9 percent are STEM and special education teachers respectively. In terms of certification, only one percent of Kansas teachers does not have certification. In terms of undergraduate college selectivity, only one percent of Kansas teachers come from the most selective colleges and 10 percent come from very selective colleges. The average salary in constant 2012 dollar is about \$42,840, which is nearly the same average salary in 1988. There are no data on how satisfied teachers are with their salary before 1994, but the existing data indicate Kansas teachers have been less satisfied with their salary over time and by 2004, they are, on average, negatively satisfied with their salary relative to the national pool of teachers. Lastly, about 60 percent of Kansas teachers have union membership.

Table 1. Descriptive Statistics of Kansas Teachers

Variables	(1) Wave: 1988	(2) Wave: 1991	(3) Wave: 1994	(4) Wave: 2000	(5) Wave: 2004	(6) Wave: 2008	(7) Wave: 2012	(8) Pooled
Teacher characteristics								
Female	0.71	0.75	0.70	0.74	0.74	0.76	0.76	0.74
Black	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02
Asian	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Am. Indian	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01
Hispanic	0.02	0.01	0.01	0.02	0.01	0.02	0.02	0.02
White	0.95	0.95	0.96	0.95	0.96	0.95	0.97	0.96
Under 30	0.14	0.13	0.12	0.20	0.16	0.17	0.20	0.16
Grad. degree	0.46	0.43	0.46	0.39	0.44	0.45	0.54	0.45
STEM	0.09	0.10	0.10	0.13	0.12	0.10	0.13	0.11
SPED	0.03	0.05	0.06	0.10	0.12	0.12	0.11	0.09
No certification	0.01	0.01	0.01	0.04	0.00	0.02	0.01	0.01
Most sel. college	0.00	0.00	0.02	0.01	0.02	0.00	0.01	0.01
Very sel. college	0.02	0.00	0.05	0.04	0.29	0.12	0.14	0.10
Salary per \$1,000	42.83	42.92	43.61	41.72	42.30	43.53	43.01	42.84
Satis. with salary	.	.	0.15	0.07	-0.11	-0.06	-0.11	-0.02
Union member	.	.	0.66	0.59	0.63	0.54	0.60	0.60
School characteristics								
Urban school	0.17	0.19	0.11	0.19	0.24	0.19	0.17	0.18
K-12 enrollment	388	441	482	518	452	537	502	478
Secondary school	0.38	0.35	0.39	0.40	0.32	0.36	0.33	0.36
Comb. elem-sec.	0.03	0.02	0.03	0.01	0.03	0.04	0.04	0.03
Percent FRPL	0.23	0.26	0.28	0.31	0.40	0.39	0.46	0.34
Majority FRPL	0.07	0.12	0.13	0.19	0.27	0.34	0.43	0.23
Percent minority	0.10	0.13	0.13	0.16	0.21	0.24	0.28	0.18
Majority minority	0.02	0.03	0.06	0.08	0.14	0.16	0.16	0.10
Percent IEP	.	.	.	0.12	0.14	0.13	0.13	0.13
Percent LEP	.	.	.	0.02	0.05	0.06	0.09	0.05
Discipline prob.	-0.25	-0.25	-0.32	-0.24	-0.16	-0.33	-0.17	-0.23
Admin. support	.	.	0.13	0.19	-0.01	0.05	0.12	0.09
Teacher coop.	.	.	0.09	0.16	0.03	0.02	0.07	0.07
Observations	500	860	830	750	730	720	720	5100

Note. Nationally-representative weights are employed. Sample sizes weighted to the nearest 10 in accordance with NCES non-disclosure rule.

In terms of school characteristics, on average, about 18 percent of Kansas teachers work in urban areas. The average school size has risen from 388 students to about 500 students in 2012. Notably, from 1988 to 2012, the percent of students eligible

for free-and-reduced-price lunch (FRPL) has increased from 23 percent to 46 percent. Moreover, the percent of schools where the majority of students are FRPL-eligible has increased from seven percent in 1988 to 43 percent in 2012. Similarly, the percent of majority minority schools has increased from two percent in 1988 to 16 percent in 2012. About 13 percent of Kansas students have individualized education program (IEP) and about five percent have limited English proficiency (LEP) status. Relative to the national average, there is less report of disciplinary problems in Kansas schools while there are more positive reports of administrative support and teacher cooperation.

Since the teacher labor market in rural areas may be different than that of urban and suburban areas (even in geographically sparse states), we also examine teacher and school characteristics for rural teachers (Appendix Table 2). We find there are some substantive differences. Looking at the pooled model, we find an even higher percent of rural Kansas teachers who are White, and they are less likely to have graduate degrees and earn less money than Kansas teachers as a whole. In terms of school characteristics, rural teachers are more likely to teach in low-income schools and less likely to teach in diverse schools. These differences suggest what drive teacher attrition in Kansas as a whole may not be the same for rural teachers, providing some evidence that we should examine rural Kansas teachers specifically.

Table 2. Rate of attrition (as percent) for Kansas and US teachers

Teacher status	(1) Wave: 2000	(2) Wave: 2004	(3) Wave: 2008	(4) Wave: 2012	(5) Pooled
Panel A: US teachers (excluding KS)					
Stayer	85.00	84.11	86.15	86.17	85.37
Switcher	7.35	7.92	6.99	6.54	7.19
Leaver	7.65	7.97	6.85	7.29	7.43
Observations	38420	38510	32700	33250	142880
Panel B: Midwest teachers (excluding KS)					
Stayer	86.23	84.63	88.21	86.94	86.49
Switcher	7.29	7.54	6.10	6.63	6.89
Leaver	6.48	7.83	5.69	6.43	6.62
Observations	9010	8980	8280	9490	35760
Panel C: Great Plains teachers (excluding KS)					
Stayer	82.37	82.19	84.49	80.45	82.34
Switcher	8.63	8.32	8.08	8.35	8.33
Leaver	9.01	9.50	7.43	11.20	9.32
Observations	9050	8250	7040	5570	29910
Panel D: Kansas teachers					
Stayer	83.51	84.53	81.38	85.06	83.60
Switcher	7.92	9.85	11.02	8.32	9.32
Leaver	8.57	5.62	7.60	6.63	7.08
Observations	750	730	720	720	2910

Note. Nationally-representative weights are employed. Sample sizes weighted to the nearest 10 in accordance with NCES non-disclosure rule. Stayers are teachers who remain in the school where they taught in the previous year. Switchers are teachers

who remain in teaching but have moved to a different school. Leavers are teachers who leave teaching altogether.

Table 2 presents the rates of attrition for teachers nationally, in the Midwest states (excluding Kansas teachers), in the Great Plains states (excluding Kansas again) and for Kansas teachers specifically. Nationally, from 2000-2012, about 85.37 percent of teachers stayed in the school in which they taught previously. About half of those who left their school switched to another school and about half left the teaching profession altogether. Similarly, 86.49 percent of teachers in the Midwest are stayers with half of the attrition rates for Midwest teachers are switchers and half are leavers. Another comparison worth considering is to examine the Great Plains states where there are more geographic and cultural similarities. In Panel C, we observe that only 82.34 percent of teachers in the Great Plains states are stayers with 8.33 percent switching from one school to another and 9.32 percent leaving the profession altogether.

In comparison, Kansas teachers, on average, stay in their school at a lower rate than Midwest teachers but at a higher rate than the Great Plains teachers (Panel D of Table 2). In either comparison, however, they are more likely to switch to another school. About 83.60 percent of Kansas teachers stayed in their school while 9.30 percent switched schools and 7.08 percent left teaching. This attrition rate in Kansas was very high in the 2007-2008 school year with only 81 percent of Kansas teachers staying in their original school. In sum, relative to the national average, Kansas teachers are more likely to leave their current school for another school, and they leave teaching at similar rates.³

Table 3. Teacher mobility in Kansas relative to the Midwest and Great Plains states

Variable	Midwest states			Great Plains states		
	(1) Overall turnover	(2) Switching schools	(3) Leaving schools	(4) Overall turnover	(5) Switching schools	(6) Leaving schools
Kansas	0.043*	0.040**	0.010	0.018	0.029*	-0.007
	(0.017)	(0.013)	(0.013)	(0.018)	(0.014)	(0.014)
Age under 30	0.088**	0.080**	0.024**	0.093**	0.084**	0.030*
	(0.009)	(0.008)	(0.007)	(0.016)	(0.015)	(0.013)
Grad. degree	-0.010	-0.005	-0.006	0.029*	0.017+	0.018+
	(0.006)	(0.005)	(0.005)	(0.013)	(0.010)	(0.010)
SPED	0.029**	0.029**	0.004	0.041+	0.024	0.026
	(0.009)	(0.008)	(0.007)	(0.023)	(0.016)	(0.021)
STEM	-0.011	-0.013*	0.000	-0.006	-0.010	0.003
	(0.007)	(0.005)	(0.006)	(0.014)	(0.009)	(0.012)
Kansas#Under 30	0.004	0.000	0.009	-0.003	-0.005	0.001
	(0.037)	(0.035)	(0.025)	(0.039)	(0.037)	(0.027)
Kansas#Grad. deg	-0.048*	-0.046**	-0.011	-0.089**	-0.068**	-0.037*
	(0.020)	(0.017)	(0.015)	(0.023)	(0.019)	(0.017)
Kansas # SPED	0.049	0.045	0.013	0.038	0.050	-0.008

³ Due to the nature of the SASS data, we are unable to determine where teachers go when they switch from one school to another.

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	(0.036)	(0.035)	(0.023)	(0.042)	(0.038)	(0.030)
Kansas # STEM	0.010	0.016	-0.004	0.004	0.013	-0.008
	(0.023)	(0.021)	(0.016)	(0.026)	(0.022)	(0.020)
Observations	38660	35960	35990	32820	30100	30230

Note. Nationally-representative weights are employed. Sample sizes weighted to the nearest 10 in accordance with NCES non-disclosure rule. Year fixed effects are employed. Heteroskedastic-robust standard errors are in parentheses.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

While it is important to consider the attrition rate, it may be more useful to consider how the attrition rate varies for teachers who are particularly at risk for turning over or highly qualified teachers, namely teachers with graduate degrees, young teachers, and specialty teachers (STEM and special education). In Table 3, the first three models compare Kansas teachers to teachers in the Midwest and the last three models for the Great Plains. Model 1 compares both switchers and leavers against stayers, Model 2 compares only switchers against stayers, and Model 3 compares only leavers against stayers relative to the Midwest, and similarly, Models 4-6 are for the Great Plains.

In Model 1, we observe that, relative to the Midwest states, Kansas teachers are 4.3 percentage points more likely to turn over from their current school. Then we observe that teachers under 30 years of age and special education teachers are more likely to turn over, but this is not specific to Kansas. To examine how these teachers are more or less likely to turn over in Kansas, we look to the interaction terms where each of these variables is interacted with Kansas. For instance, even though younger teachers are generally more likely to turn over than older teachers, younger Kansas teachers are not more like to turn over relative to other younger teachers in the Midwest. Relatedly, we find younger teachers, special education teachers, and STEM teachers in Kansas are not more likely to turn over relative to the Midwest. Kansas teachers with graduate degrees, however, are 4.8 percentage points less likely to turn over compare to teachers with graduate degrees in the Midwest. In other words, even though teachers with graduate degrees, on average, are not more or less likely to turn over compared to teachers without graduate degrees, those with graduate degrees in Kansas are substantially less likely to turn over relative to their peers in the Midwest. In Models 2 and 3, when we separate out the specific form of attrition, we find that most of the previous findings are concentrated in teachers switching from one school to another (Model 2) and less on teachers leaving the profession (Model 3). In other words, Kansas teachers with graduate degrees are more likely to stay in their current school (or less likely to switch) than comparable peers in nearby states.

Relative to the Great Plains states, Kansas teachers are not more likely to turn over overall (Model 4), but they are more likely to switch schools (Model 5). Once again, younger teachers are more likely to turn over in all three models. Teachers with graduate degrees are more likely to turn over in the Great Plains, possibly due to more available job opportunities in this area. Similar to the findings about teachers with graduate degrees in Kansas relative to the Midwest states, we also observe that teachers with graduate degrees are less likely to turn over relative to other teachers in the Great Plains. What these two results indicate is that overall teachers with graduate

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degrees are more likely to turn over in the Great Plains, but Kansas teachers with graduate degrees are substantially less likely to turn over.

Table 4. The association of select teacher and school characteristics and teacher mobility in Kansas

	(1) Overall turnover	(2) Switching schools	(3) Leaving schools
Age under 30	0.077* (0.036)	0.064+ (0.034)	0.031 (0.026)
Graduate degree	-0.039+ (0.021)	-0.030 (0.019)	-0.012 (0.016)
STEM	0.008 (0.023)	0.018 (0.021)	-0.008 (0.015)
SPED	0.069* (0.035)	0.069* (0.033)	0.013 (0.022)
No certification	0.090 (0.095)	0.091 (0.100)	0.015 (0.046)
Salary per \$1,000	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)
Satisf. w/ salary	0.004 (0.009)	-0.001 (0.009)	0.006 (0.006)
Union	-0.044* (0.020)	-0.034+ (0.018)	-0.018 (0.012)
Urban	0.033 (0.033)	0.010 (0.033)	0.035 (0.025)
Most sel. college	-0.002 (0.068)	0.030 (0.065)	-0.042+ (0.024)
Very sel. college	0.006 (0.031)	-0.022 (0.025)	0.025 (0.025)
Student discipline	0.020+ (0.012)	0.015 (0.011)	0.009 (0.009)
Admin support	-0.032** (0.011)	-0.004 (0.009)	-0.035** (0.009)
Teacher coop	-0.001 (0.010)	-0.003 (0.008)	0.001 (0.007)
Observations	2910	2680	2670

Note. Nationally-representative weights are employed. Sample sizes weighted to the nearest 10 in accordance with NCES non-disclosure rule. Heteroskedastic-robust standard errors are in parentheses.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Next, we examine the associations between teacher characteristics as well as school characteristics and their mobility behavior for Kansas teachers (Table 4). We limit the sample to only Kansas teachers to better isolate how these variables could

potentially influence attrition behavior.⁴ Moreover, we note that the inclusion of many important teacher and school characteristics relevant to teacher attrition decreases the likelihood that the individual estimates would be biased by omitted variable bias. Furthermore, the use of year fixed effects is able to account for any temporal shock that may alter the relationships of these characteristics and teacher attrition (such as the 2007-2008 recession).

In Model 1 where we examine the overall turnover behavior, we find that younger teachers are 7.7 percentage points more likely to leave their current school relative to older teachers and graduate teachers are 3.9 percentage points less likely to leave relative to teachers without graduate degrees (but this result is only marginally significant due to the substantially reduced sample size). Special education teachers in Kansas are 6.9 percentage points more likely to leave than non-STEM non-special-education teachers. Teachers with union membership are 4.4 percentage points less likely to leave than teachers without union membership. Lastly, teachers who report higher level of administrative support are 3.2 percentage points less likely to leave than teachers who report lower level of administrative support. Separate these results out into switchers and leavers, we find that younger teachers and special education teachers are more likely to switch schools but not leave the profession. Teachers with union membership are less likely to switch but the result is only marginally significant. Lastly, we find that better administrative support is associated with reduced likelihood of teachers leaving the profession.

Table 5. The association of select teacher and school characteristics and teacher mobility in rural areas in Kansas

	(1) Overall turnover	(2) Switching schools	(3) Leaving schools
Age under 30	0.070 (0.047)	0.039 (0.038)	0.054 (0.036)
Graduate degree	-0.019 (0.027)	-0.038 (0.024)	0.014 (0.020)
STEM	0.026 (0.034)	0.023 (0.030)	0.011 (0.024)
SPED	0.101+ (0.060)	0.090 (0.056)	0.029 (0.035)
No certification	0.111 (0.144)	0.149 (0.149)	-0.027 (0.054)
Salary per \$1,000	-0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)
Satisf. w/ salary	-0.002 (0.012)	-0.007 (0.011)	0.005 (0.009)
Union	-0.086** (0.028)	-0.065** (0.024)	-0.037* (0.018)
Most sel. college	-0.094 (0.062)	-0.057 (0.064)	-0.045* (0.023)

⁴ We chose to show only specific variables of the greatest interest. Other teacher and school characteristics as shown in Table 1 are included in the regression models but not shown. Results are available upon request.

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Very sel. college	0.026 (0.039)	-0.050* (0.022)	0.071* (0.035)
Student discipline	0.013 (0.022)	0.003 (0.018)	0.010 (0.018)
Admin support	-0.003 (0.015)	0.016 (0.010)	-0.019+ (0.011)
Teacher coop	-0.008 (0.012)	-0.004 (0.012)	-0.007 (0.009)
Observations	1330	1230	1210

Note. Nationally-representative weights are employed. Sample sizes weighted to the nearest 10 in accordance with NCEES non-disclosure rule. Heteroskedastic-robust standard errors are in parentheses.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Next, we replicate this analysis examining teachers in rural areas to explore whether these observed relationships remain comparable. We believe the focus on rural schools in Kansas to be important, but due to data limitation, in particular the reduction in sample size, we view this more as explanatory work to motivate future research using state administrative data to examine teacher mobility. As the results from Appendix Table 2 show how rural teachers' characteristics and the schools in which they teach tend to be different in many ways than for Kansas as a whole, we also find there are some differences in how some factors are associated with turnover for rural teachers (Table 5). In particular, we no longer find younger teachers and SPED teachers to have increased risks in turning over, although the direction and point estimates are similar. We continue to find union membership plays a significant role in reducing the probability of attrition. In particular, rural teachers who are union members are 3.7 percentage points less likely to turn over than those without union membership. Lastly, in terms of college selectivity, we have a mixed finding where rural teachers who come from very selective colleges are less likely to switch schools but are more likely to leave the profession. In short, we find many of the relationships for Kansas teachers as a whole do still apply to rural teachers, but there are some differences such as the role of union membership and college selectivity, providing further evidence that it is important to consider whether teachers are located in rural or non-rural areas, even within a geographically sparse state.

Discussion and Conclusion

The descriptive analysis in Table 1 illustrates how the teacher labor force has generally remained unchanged from 1988 to 2012 while the conditions in which teachers work have changed during this time. For instance, Kansas teachers are mainly female, which generally reflects the teacher work force nationally. However, Kansas teachers are nearly all White (96 percent) relative to the national average of 84 percent (Nguyen et al., 2019). We also observe Kansas teachers are more and more likely to teach in majority low-income schools as well as majority minority schools, reflecting the broader trends nationally (Maxwell, 2014). These patterns generally hold when we examine only rural teachers but there are some differences, particularly with respect to

the schools in which they teach. In particular, rural teachers are more likely to teach in less diverse schools. With research indicating that there are substantial benefits to student outcomes when the teacher workforce is more diversified and is representative of the student populations (Redding, 2019), these findings suggest diversifying the teacher workforce in Kansas should be an important consideration, particularly in serving the traditionally underserved student populations that are growing over time.

In terms of the conditions in which they teach, the average teacher salary in Kansas has dropped back to nearly the same amount as it was in 1988. While we do not have the data on teacher satisfaction with salary for 1988 and 1991, the pattern of average salary and teacher satisfaction with salary suggest that, up to 1994 where teacher salary was increasing in Kansas, Kansas teachers were relatively satisfied with their salary compared to other teachers nationally. As the average salary dropped, teachers became more dissatisfied with their salary, and by 2011, they were 0.11 standard deviation units lower in their satisfaction compared to their peers nationally. As higher salary and relatedly, satisfaction with salary, are associated with decreasing teacher turnover, this is worrisome for retaining teachers in Kansas (Clotfelter et al., 2011; Kelly, 2004; Showalter et al., 2019). During this time frame, we observe that the average enrollment size has increased from below 400 students to 500 students. In short, these results suggest that, while many trends in Kansas do reflect national trends, there are some substantial differences in Kansas that separates it from what is going on nationally. Moreover, examining how teacher and school characteristics are associated with turnover is critical to Kansas since Kansas teachers are more likely to turn over than their peers as Table 2 demonstrates.

When we focus our attention on the mobility of Kansas teachers relative to nearby states in the Midwest that share large geographically rural areas, we find that Kansas teachers are substantially more likely to turnover. An increase of 4.5 percentage points corresponds to an increase of 30 percent in the national rate of overall attrition. In other words, Kansas teachers are substantially more likely to turn over, even when compared to similar nearby states, suggesting there may be other factors that influence attrition even within similar rural contexts. When disaggregated to the specific form of attrition, we find that this is mostly driven by teachers switching schools. Relative to other Midwest states, Kansas teachers are more likely to switch schools. To this point, a recent study examining teachers in the Midwest provides corroborating evidence that teacher background characteristics are correlated to their longevity as teachers (Jones, 2018). On the other hand, relative to the Great Plains states, Kansas teachers are less likely to turn over overall, specifically in the form of leaving the profession. However, Kansas teachers remain more likely to switch schools.

One limitation of this analysis is that we are unable to determine whether these teachers are switching schools but remaining in Kansas or if they are moving to other states to teach. Future research on teacher attrition in Kansas should consider using administrative data for Kansas to further explore where these teachers are relocating and whether these patterns have changed since 2012. For instance, we need to know whether teachers are moving to more urban areas or are they moving to similarly rural areas with higher salaries or better working conditions, which would greatly inform the challenge of recruitment and retention in geographically rural areas (Cowen et al., 2012; Showalter et al., 2019). We do, however, observe a promising finding that Kansas

teachers with graduate degrees are less likely to switch schools, which contrasts findings nationally and in other states (Borman & Dowling, 2008), and this relationship is stronger relative to the Great Plains than to the Midwest.

When we examine the teacher characteristics and school characteristics that are associated with attrition specifically to Kansas, the results indicate younger teachers and special education teachers are more at risk of turning over than their peers. Surprisingly, STEM teachers are not more likely to turn over, which recent studies using national and Kansas-specific data have also found (Nguyen & Redding, 2018; Stewart, 2018). This indicates that shortages for STEM teachers may be due to a lack of STEM teachers produced in Kansas or wanting to work in Kansas rather than that Kansas is losing too many STEM teachers. Few characteristics have significant association with attrition except for being a union member and having better administrative support, bolstering evidence from prior research (Borman & Dowling, 2008; Kelly, 2004; Kukla-Acevedo, 2009). This, however, may be due to the severe reduction in sample size when the analysis was limited to only Kansas teachers. For instance, teacher satisfaction with salary or their actual salary may influence teachers' decisions to stay or leave, but they may not be detected with the restricted sample size. We find similar associations when we focus on only rural teachers. The evidence that does exist suggests union membership may be a possible pathway to reduce attrition in Kansas as prior research indicates (Borman & Dowling, 2008; Nguyen et al., 2019). Stronger administrative support seems to contribute to a reduction in attrition for Kansas teachers as whole (Boyd et al., 2011; Ingersoll, 2001), but it is nonsignificant for rural teachers. Using longitudinal administrative data from Kansas would provide more power to detect whether the other characteristics have significant associations with attrition.

In conclusion, this study demonstrates how the teacher labor force and school conditions in Kansas have changed over time and how Kansas teachers are more at risk of turning over, even in comparison with nearby states with large geographically rural areas, which has direct implications to address the issues found in the Kansas Commissioner of Education's Blue Ribbon Task Force (Kansas Department of Education, 2016). Moreover, the results suggest diversifying the teacher workforce to match that of the students whom they teach is particularly important. With regards to turnover behaviors, younger teachers and special education teachers are even more at risk of turning over and we need to do more to support these teachers to keep them in the profession (Billingsley & Bettini, 2019; Kukla-Acevedo, 2009). However, there are some bright spots suggesting there may be some pathways to reduce teacher attrition in Kansas, and possibly nearby states, such as by providing more opportunities and support for teachers to attain graduate degrees, considering the use and political viability of teacher unions, and training administrators to be more supportive and encouraging to teachers (Northup, 2018). Lastly, this study indicates future research should consider where Kansas teachers are relocating when they leave their school, whether the attrition behaviors have changed in recent years, how teacher salary and teacher satisfaction with salary may influence turnover behavior, what other mechanisms can be employed to reduce attrition for the state of Kansas or to increase the supply of Kansas teachers, and how these factors could vary within different rural contexts within Kansas. For instance, teacher shortage in Kansas may also include the supply side where there are not enough teachers produced in Kansas or to stay in

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Kansas once they are licensed to teach. Better teacher induction may be appealing and attractive to perspective teachers and may also keep teachers in the classroom (Johnson, 2007). Relatedly, on-going efforts such as the Robert Noyce Teaching Scholarship Program at Kansas State University may attract highly qualified teachers to teach in high-needs rural schools as well as diversifying the teacher workforce.



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References

- Barnes, G., Crowe, E., & Schaefer, B. (2007). *The cost of teacher turnover in five school districts: A pilot study*. Washington, DC: National Commission on Teaching and America's Future.
- Bihasa, S. (2018). Kansas' worsening teacher shortage in four graphs. Retrieved from <https://www.kmuw.org/post/kansas-worsening-teacher-shortage-four-graphs>
- Billingsley, B., & Bettini, E. (2019). Special education teacher attrition and retention: A review of the literature. *Review of Educational Research, 89*(5), 697-744.
- Borman, G. D., & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of Educational Research, 78*(3), 367-409.
- Boyd, D., Lankford, H., Loeb, S., & Wyckoff, J. (2005). The draw of home: How teachers' preferences for proximity disadvantage urban schools. *Journal of Policy Analysis and Management, 24*(1), 113-132.
- Boyd, D., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2011). The role of teacher quality in retention and hiring: Using applications to transfer to uncover preferences of teachers and schools. *Journal of Policy Analysis and Management, 30*(1), 88-110.
- Carroll, S., Reichardt, R., Guarino, C., & Mejia, A. (2000). *The distribution of teachers among California's school districts and schools*. Santa Monica, CA: Rand Corporation.
- Carver-Thomas, D. & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it*. Palo Alto, CA: Learning Policy Institute.
- Chetty, R., Friedman, J. N., & Rockoff, J. E. (2014). Measuring the impacts of teachers II: Teacher value-added and student outcomes in adulthood. *American Economic Review, 104*(9), 2633-79.
- Clotfelter, C., Glennie, E., Ladd, H., & Vigdor, J. (2008). Would higher salaries keep teachers in high-poverty schools? Evidence from a policy intervention in North Carolina. *Journal of Public Economics, 92*(5), 1352-1370.
- Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2011). Teacher mobility, school segregation, and pay-based policies to level the playing field. *Education, 6*(3), 399-438.
- Cowen, J. M., Butler, J. S., Fowles, J., Streams, M. E., & Toma, E. F. (2012). Teacher retention in Appalachian schools: Evidence from Kentucky. *Economics of Education Review, 31*(4), 431-441.
- DeFeo, D. J., Tran, T., Hirshberg, D., Cope, D., & Cravez, P. (2017). *The cost of teacher turnover in Alaska*. Anchorage, AK: Center for Alaska Education Policy Research.
- Djonko-Moore, C. M. (2016). An exploration of teacher attrition and mobility in high poverty racially segregated schools. *Race Ethnicity and Education, 19*(5), 1063-1087.
- Donaldson, M. L., & Johnson, S. M. (2010). The price of misassignment: The role of teaching assignments in Teach for America teachers' exit from low-income schools and the teaching profession. *Educational Evaluation and Policy Analysis, 32*(2), 299-323.

- Economic Research Service. (n.d.) U.S. Department of Agriculture. Retrieved from https://www.ers.usda.gov/webdocs/DataFiles/53180/25571_KS.pdf?v=0
- Educate Kansas. (n.d.) Educate Kansas. Retrieved from <https://www.educatekansas.org/>
- Engel, M., Jacob, B. A., & Curran, F. C. (2014). New evidence on teacher labor supply. *American Educational Research Journal*, 51(1), 36-72.
- Guarino, C. M., Santibanez, L., & Daley, G. A. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research*, 76(2), 173–208.
- Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (2004). Why public schools lose teachers. *Journal of Human Resources*, 39(2), 326–354.
- Hornig, E. L. (2009). Teacher tradeoffs: Disentangling teachers' preferences for working conditions and student demographics. *American Educational Research Journal*, 46(3), 690-717.
- Imazeki, J. (2005). Teacher salaries and teacher attrition. *Economics of Education Review*, 24(4), 431–449.
- Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal*, 38(3), 499–534.
- Johnson, L. (2007). Teacher induction in Kansas City: State policy, district trends, and their implications. *Ewing Marion Kauffman Foundation*.
- Jones, J. O. N. (2018). *Persistence and Commitment to Teaching: The Stories of Three Suburban and Three Urban Teachers* (Doctoral dissertation, University of Kansas).
- Kane, T. J., & Staiger, D. O. (2008). Estimating teacher impacts on student achievement: An experimental evaluation (No. w14607). *National Bureau of Economic Research*.
- Kansas Department of Education (2016). Kansas Commissioner of Education's Blue Ribbon Task Force (KSDE) on Teacher Vacancies and Supply. Final report. Retrieved from <http://www.ksde.org/Portals/0/Communications/Publications/BRTF%20Final.pdf>
- Kelly, S. (2004). An event history analysis of teacher attrition: Salary, teacher tracking, and socially disadvantaged schools. *The Journal of Experimental Education*, 72(3), 195–220.
- Kukla-Acevedo, S. (2009). Leavers, movers, and stayers: The role of workplace conditions in teacher mobility decisions. *The Journal of Educational Research*, 102(6), 443–452.
- Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A descriptive analysis. *Educational Evaluation and Policy Analysis*, 24(1), 37–62.
- Lazarte-Alcalá, N. & Miller, M. "2018 Oklahoma Educator Supply & Demand Report: Trends, Projections and Recommendations", Oklahoma State Department of Education, December 2018.
- Loeb, S., Kalogrides, D., & Bételle, T. (2012). Effective schools: Teacher hiring, assignment, development, and retention. *Education*, 7(3), 269–304.
- Maxwell, L. A. (2014). US school enrollment hits majority-minority milestone. *Education Week*, 34(1), 1.

- McClure, C., & Reeves, C. (2004). Rural Teacher Recruitment and Retention Review of the Research and Practice Literature. *AEL*.
- McKnab, P. (1983). Special Education Personnel Attrition in Kansas, 1976 to 1982: A Summary of Attrition Rates and an Analysis of Reasons for Quitting.
- Miller, L. C. (2012). Situating the rural teacher labor market in the broader context: A descriptive analysis of the market dynamics in New York State. *Journal of Research in Rural Education*, 27(13), 1-31.
- Monk, D. H. (2007). Recruiting and retaining high-quality teachers in rural areas. *The future of children*, 155-174.
- Moore, C. M. (2011). Why do teachers quit? An investigation of the influence of school environment and teacher characteristics on discontent and attrition. (Doctoral dissertation). Philadelphia, PA: Temple University.
- Nguyen, T. D., Pham, L., Springer, M. G., & Crouch, M. (2019). The Factors of Teacher Attrition and Retention: An Updated and Expanded Meta-Analysis of the Literature. *Annenberg Institute at Brown University*. EdWorking paper:19-149.
- Nguyen, T. D., & Redding, C. (2018). Changes in the Demographics, Qualifications, and Turnover of American STEM Teachers, 1988–2012. *AERA Open*, 4(3), 1-13.
- Northup, K. M. (2018). *Teacher Intra-district Migration out of Title 1 Schools: Case Study of a Midwestern Suburban School District* (Doctoral dissertation, University of Kansas).
- Podgursky, M., Monroe, R., & Watson, D. (2004). The academic quality of public school teachers: An analysis of entry and exit behavior. *Economics of Education Review*, 23(5), 507-518.
- Redding, C. (2019). A Teacher Like Me: A Review of the Effect of Student–Teacher Racial/Ethnic Matching on Teacher Perceptions of Students and Student Academic and Behavioral Outcomes. *Review of Educational Research*, 89(4), 499-535.
- Redding, C. & Nguyen, T.D. (in press) Recent Trends in the Characteristics of New Teachers, the Schools in Which They Teach, and Their Turnover Rates. *Teacher College Record*.
- Showalter, D., Hartman, S.L., Johnson, J., & Klein, R. (2019). *Why Rural Matters 2018-2019: The Time Is Now*. A Report of the Rural School and Community Trust. Rural School and Community Trust.
- Smith, T. M. (2006). How do state-level induction and standards-based reform policies affect induction experiences and turnover among new teachers?. *American Journal of Education*, 113(2), 273-309.
- Stewart, K. (2018). Kansas Math Educators Attrition Study 2018. Retrieved from <http://ksementoring.org/eMentoringFront/files/KansasMathEducatorsAttritionStudy2018Final.pdf>
- Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). A coming crisis in teaching? Teacher supply, demand, and shortages in the US. *Learning Policy Institute*.
- United States Department of Agriculture. (n.d.) State Fact Sheets. Retrived from <https://data.ers.usda.gov/reports.aspx?StateFIPS=20&StateName=Kansas&ID=17854>

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Weaver, K. A., & Perez, R. (2016). Teacher Shortages in Kansas and in the Nation. *The Advocate*, 23(3), 8.

Appendix Tables

Appendix Table 1: Variable descriptions

Employment status

Leavers, Switchers, Movers and Stayers Leavers are teachers who left the teaching profession, switchers are teachers switched to a new school, movers are teachers who left their current school (leavers+switchers) and stayers are teachers who are currently teaching in same school.

Teacher Characteristics

Female A dichotomous variable where 1 = female and 0 = male.
 Black A dichotomous variable where 1 = Black and 0 = non-Black.
 Asian A dichotomous variable where 1 = Asian and 0 = non-Asian.
 American Indian A dichotomous variable where 1 = American Indian and 0 = non-American Indian.
 Hispanic A dichotomous variable where 1 = Hispanic and 0 = non-Hispanic.
 White A dichotomous variable where 1 = White and 0 = non-White.
 Under 30 A dichotomous variable where 1 = teacher is at least 30 years old and 0 = teacher is older than 30.
 Graduate degree A dichotomous variable where 1 = teacher has graduate degree and 0 = no graduate degree.
 Teaches STEM A dichotomous variable where 1 = teacher's subject is math or science and 0 = other subjects.
 Teaches SPED A dichotomous variable where 1 = teacher's subject is special education and 0 = other subjects.
 No certification A dichotomous variable where 1 = teacher has no certification and 0 = teacher has any certification.
 Most selective college A dichotomous variable where 1 = teacher's undergraduate college/university has Barron's classification of most competitive or highly competitive and 0 = Barron's classification is competitive, less competitive, or noncompetitive.
 Very selective college A dichotomous variable where 1 = teacher's undergraduate college/university has Barron's classification of very competitive and 0 = Barron's classification is competitive, less competitive, or noncompetitive.
 Salary (\$1,000) A continuous variable of the base teaching salary for the entire school year, scaled in \$1,000s, and in constant 2012 dollar.
 Satisfy w/ salary (std) On a scale of 1 = strongly disagree and 4 = strongly agree, teachers report on how satisfied they are with their salary. Measure standardized for each wave.
 Union member A dichotomous variable where 1 = teacher is a union member and 0 = teacher is not a union member.

School Characteristics

Urban school A dichotomous variable where 1 = school is classified as urban by U.S. census and 0 = non-urban areas as classified by U.S. census.
 K-12 enrollment A continuous variable of the size of school where the teacher is teaching in the base year.

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Secondary school	A dichotomous variable where 1 = the school is classified as a secondary school and 0 = the school is not classified as a secondary school.
Combined elem-sec	A dichotomous variable where 1 = the school is classified as a combined elementary and secondary (K-8) school and 0 = the school is not classified as a combined elementary and secondary school.
Percent FRPL students	Percentage of students eligible for the federal free or reduced-price lunch program.
Majority FRPL	A dichotomous variable where 1 = the majority of students at the school is eligible for federal free or reduced-price lunch and 0 = the majority of students at the schools is not eligible for federal free or reduced-price lunch.
Percent minority students	Percentage of non-White students enrolled in a school.
Majority minority	A dichotomous variable where 1 = the majority of students at the school is non-White and 0 = the majority of students at the school is White.
Percent IEP	Percentage of students with Individualized Education Plans (IEP).
Percent LEP	Percentage of students classified as Limited English Proficient (LEP).
Student discipline (std)	On a scale of 1 = never happens to 5 = happens daily, the principal reports of six kinds of student discipline problems: physical conflict, robbery or theft, vandalism, student use of alcohol, drug use, and possession of weapons.
Admin support (std)	On a scale of 1 = strongly disagree and 4 = strongly agree, teachers report on the school administration's behavior toward the staff is supportive and encouraging (standardized).
Teacher coop (std)	On a scale of 1 = strongly disagree and 4 = strongly agree, teachers report on the level of cooperative effort among the staff members. Measure standardized for each wave.

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Appendix Table 2. Descriptive Statistics of Kansas Teachers in Rural Areas

Variables	(1) Wave: 1988	(2) Wave: 1991	(3) Wave: 1994	(4) Wave: 2000	(5) Wave: 2004	(6) Wave: 2008	(7) Wave: 2012	(8) Pooled
Teacher characteristics								
Female	0.70	0.74	0.68	0.73	0.74	0.76	0.72	0.74
Black	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Asian	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01
Am. Indian	0.03	0.02	0.01	0.01	0.00	0.03	0.02	0.02
Hispanic	0.01	0.01	0.01	0.02	0.00	0.01	0.02	0.01
White	0.96	0.97	0.98	0.97	1.00	0.97	0.98	0.98
Under 30	0.16	0.14	0.12	0.16	0.17	0.14	0.15	0.15
Grad. degree	0.39	0.40	0.42	0.35	0.37	0.35	0.42	0.37
STEM	0.10	0.10	0.11	0.13	0.12	0.11	0.14	0.13
SPED	0.03	0.06	0.05	0.10	0.11	0.11	0.08	0.10
No certification	0.01	0.01	0.01	0.05	0.00	0.02	0.02	0.02
Most sel. college	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.01
Very sel. college	0.01	0.00	0.04	0.03	0.22	0.06	0.10	0.10
Salary per \$1,000	41.65	41.45	42.21	39.21	38.72	40.27	40.13	39.58
Satis. with salary	.	.	0.21	0.12	-0.03	-0.11	-0.04	-0.01
Union member	.	.	0.65	0.55	0.63	0.54	0.59	0.57
School characteristics								
K-12 enrollment	313	325	438	332	271	368	327	327
Secondary school	0.38	0.34	0.40	0.44	0.31	0.35	0.39	0.38
Comb. elem- sec.	0.04	0.03	0.04	0.02	0.08	0.06	0.06	0.05
Percent FRPL	0.23	0.27	0.27	0.35	0.39	0.44	0.46	0.41
Majority FRPL	0.04	0.12	0.08	0.18	0.24	0.36	0.41	0.29
Percent minority	0.07	0.07	0.09	0.11	0.10	0.19	0.16	0.14
Majority minority	0.02	0.01	0.01	0.04	0.00	0.13	0.01	0.05
Percent IEP	.	.	.	0.10	0.14	0.13	0.13	0.13
Percent LEP	.	.	.	0.01	0.02	0.06	0.05	0.03
Discipline prob.	-0.24	-0.33	-0.32	-0.14	-0.30	-0.66	-0.12	-0.31
Admin. support	.	.	0.14	0.24	-0.07	0.04	0.24	0.12
Teacher coop.	.	.	0.09	0.22	0.07	-0.01	0.05	0.09
Observations	350	580	650	430	260	320	330	1330

Note. Nationally-representative weights are employed. Sample sizes weighted to the nearest 10 in accordance with NCES non-disclosure rule.