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Staying or Leaving? Teacher Professional Characteristics and Attrition in Arizona Traditional Public and Charter Schools

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Abstract: In this study, we analyzed public school teacher employment data from 2009 to 2015 to understand why teacher attrition is 54% higher in charter schools compared to traditional public schools. We investigated the factors associated with the differences in exit rates of teachers from traditional public and charter schools in Arizona which has a large charter school sector. Our findings suggest that the major factors behind the gap in retention rates between school sectors in Arizona are teachers' professional characteristics: less experienced teachers and teachers with alternative certification are more likely to exit schools and, in particular, charter schools which also employ a significantly larger share of these teachers. We argue that charter school and school district leadership might consider interventions, mentoring, and support for teachers in the early stages of their career targeted at novice teachers.

Keywords: teacher attrition; traditional public schools; charter schools; teacher experience; teacher certification

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¿Quedarse o irse? Características profesionales de los maestros y deserción en las escuelas públicas y chárter tradicionales de Arizona

Resumen: En este estudio, analizamos los datos de empleo de maestros de escuelas públicas de 2009 a 2015 para comprender por qué la deserción de maestros es un 54 % más alta en las escuelas chárter en comparación con las escuelas públicas tradicionales. Investigamos los factores asociados con las diferencias en las tasas de salida de los maestros de las escuelas públicas y chárter tradicionales en Arizona, que tiene un gran sector de escuelas chárter. Nuestros hallazgos sugieren que los principales factores detrás de la brecha en las tasas de retención entre sectores escolares en Arizona son las características profesionales de los maestros: los maestros con menos experiencia y los maestros con certificación alternativa tienen más probabilidades de abandonar las escuelas y, en particular, las escuelas chárter, que también emplean un proporción significativamente mayor de estos maestros. Argumentamos que el liderazgo de las escuelas autónomas y los distritos escolares podría considerar intervenciones, tutorías y apoyo para los maestros en las primeras etapas de su carrera dirigidos a los maestros novatos.

Palabras-clave: deserción de maestros; escuelas públicas tradicionales; escuelas charter; experiencia docente; certificación de maestros

Ficar ou partir? Características profissionais do professor e abandono nas escolas públicas e charter tradicionais do Arizona

Resumo: Neste estudo, analisamos dados de contratação de professores de escolas públicas de 2009 a 2015 para entender por que o abandono de professores é 54% maior nas escolas charter em comparação com as escolas públicas tradicionais. Investigamos os fatores associados às diferenças nas taxas de saída de professores de escolas públicas tradicionais e charter no Arizona, que possui um grande setor de escolas charter. Nossas descobertas sugerem que os principais fatores por trás da diferença nas taxas de retenção entre os setores escolares no Arizona são as características profissionais dos professores: professores menos experientes e professores com certificação alternativa são mais propensos a sair das escolas e, em particular, das escolas charter, que também empregam um significativamente maior desses professores. Argumentamos que a liderança da escola charter e do distrito escolar pode considerar intervenções, orientação e apoio para professores nos estágios iniciais de sua carreira direcionados a professores iniciantes.

Palavras-chave: abandono do professor; escolas públicas tradicionais; escolas charter; experiência do professor; certificação de professores

Staying or Leaving? Teacher Professional Characteristics and Attrition in Arizona Traditional Public and Charter Schools

Each year, at least 500,000 teachers exit or transition between schools and districts in the United States (Goldring et al., 2014). This movement can be disruptive for students, other teachers, school administrators, and school communities. High attrition rates among teachers can reduce teacher effectiveness and create unstable learning environments that can depress student achievement (Ronfeldt et al., 2013; Sorensen & Ladd, 2020). Teachers who leave schools may also create additional workloads for their former colleagues and replacement costs for schools and districts (Carver-Thomas & Darling-Hammond, 2017; see also Milanowski & Odden, 2007). Because replacement teachers are often less experienced, more likely to have provisional licenses, and are less likely to be certified in the areas they teach, teacher attrition weakens the mix of teachers within individual schools and can disrupt professional and learning communities within schools (Sorensen & Ladd, 2020; Stuit & Smith, 2012). Finally, teacher attrition contributes to the shortage of effective teachers (Ingersoll, 2001; Sutchter et al., 2016).

While high teacher attrition rates impose monetary and non-pecuniary costs on all schools and students, the attrition and mobility rates of charter school teachers are strikingly high compared to those of traditional public school teachers (Miron & Applegate, 2007; Podgursky & Ballou, 2001; Smith & Ingersoll, 2004; Stuit & Smith, 2012). National patterns of teacher attrition in public schools¹ (Carver-Thomas & Darling-Hammond, 2017; Gray & Taie, 2015) and attrition in individual states such as Oklahoma, Texas, and Washington (Berg-Jacobson & Levin, 2015; Holme et al., 2018; Plecki et al., 2005) are well documented. With the exception of Stuit & Smith (2012), relatively few studies directly compare the attrition of charter schools and traditional public school teachers.

In this study, we analyze the differences in attrition rates among public school teachers in Arizona who work in traditional public and charter schools, a state with one of the highest teacher attrition rates in the country and a substantial share of teachers employed in charter schools (ADE, 2015; Carver-Thomas & Darling-Hammond, 2017). We focus on three policy malleable professional characteristics of teachers which, as we elaborate below, might account for the difference in teacher attrition between traditional public and charter schools: experience, certification, and subject area specializations.

We define attrition as exit from the state's teacher labor force.² Our data follows the population of public school teachers in Arizona over a six-year period (Borman & Dowling, 2008; Elfers et al., 2006; Hanushek et al., 2004; Ingersoll, 2001; Podgursky et al., 2004; Ronfeldt et al., 2013). While our primary interest is teacher professional characteristics, we control for teacher and school characteristics that are also associated with attrition. Our attrition rate does not include "movers," or teachers who left their current schools but stayed in the same school district, and teachers who moved to another school district or charter school. Unlike teachers who move between schools within the state, teachers' exits from the public school labor force leads to teacher shortages in the long run—a problem that has been acute in Arizona's public school sector for a

¹ The majority of U.S. students are enrolled in regularly assigned public schools (69%), with 19% of students enrolled in public schools of choice such as charter or magnet schools, and 9% enrolled in private schools, and 3% of students are homeschooled (Wang et al., 2019).

² Conventionally, the retention of teachers in the labor force is categorized into the following five constructs (WWC, 2014): a) retention in the same school; b) lateral mobility or retention into a similar position in the same district; c) lateral mobility or retention into a similar position in another district; d) vertical mobility or change to an administrative position in education; and e) not retained. Our analysis focuses on the latter group; we use exit or attrition interchangeably to refer to this construct.

long time and continues to be a major education policy issue in the state (Cano, 2018; Goldstein, 2018; Wing, 2018, 2019).³

The Context for the Study

Arizona provides a particularly interesting context to understand teacher attrition within and across sectors because of its large charter school sector. Arizona is second only to the District of Columbia in the proportion of public school students enrolled in charter schools. Arizona's charter school law was approved by the state legislature in 1994⁴. Twenty-five years later, more than 500 charter schools enroll one out of six of the state's public school students. Charter schools employed 14 % of public school teachers in Arizona (Arizona Charter Schools Association, 2015; US Department of Education, 2018). In general, charter schools are exempt from some of the state regulations that school districts must comply with, although the degree to which charter schools are regulated varies considerably by state (Powers, 2009). Arizona is among the five states with the fewest restrictions on charter school operations (Zgainer & Kerwin, 2015). For example, charter schools are not subject to state teacher certification requirements, but are required to participate in the state's accountability program, which includes annual school report cards and administering state assessments (Powers, 2009). While the state statutes governing the charter school sector vary by state, empirical findings indicate that in general, the rates of teacher attrition from charter schools are higher than that of traditional public schools. Specifically, in Arizona, our initial descriptive analysis indicated that approximately 20% of charter school teachers leave the state's teacher labor force every year compared to 13% of teachers in traditional public schools.

Factors Associated with Teacher Attrition

Researchers studying teacher mobility have drawn upon a number of conceptual frameworks including organizational theory (Harris, 2007; Stuit & Smith, 2012; Swars et al., 2009), rational choice theory (Feng, 2009, 2014; Hanushek et al., 2004; Kukla-Acevedo, 2009, Strunk & Robinson, 2006), self-efficacy (Allensworth et al., 2009; Ladd, 2011), racial threat theory (Renzulli et al., 2011), and the theory of planned behavior (Kersaint et al., 2007) to explain the incidence of and patterns in teacher retention and mobility. While none of the latter theories can fully account for teacher mobility and the differences in attrition rates between school sectors, all of them highlight the characteristics of teachers and schools that predict exit (for a review see Vagi & Pivovarova, 2017). Another set of studies use pragmatic frameworks drawn from prior research and empirical observations and focus on identifying factors that are associated with teacher mobility and attrition.

Taken together, these theories and prior research provide guidance for empirically evaluating the factors associated with teacher exit or staying in the profession. For instance, according to organizational theory, the structure of the school, be it traditional public or charter, might influence

³ Following Sutchter, Darling-Hammond, and Carver-Thomas (2016), we define a teacher shortage as an "inadequate quantity of qualified individuals willing to offer their services under prevailing wages and conditions" (p. 10).

⁴ Arizona's charter school law was passed in 1994. Arizona was the 11th state to enact such law, formally known as Title 15, Chapter 1, Article 8 of the Arizona Revised Statutes. While it has since been amended, Arizona's charter school legislation gives its charter schools substantively more fiscal and legal autonomy than charter schools in other states. For example, for-profit organizations, nonprofit private organizations, and private individuals are permitted to open charter schools that function as independent local education agencies, and like traditional public school districts, are legally and financially autonomous (Maranto & Gresham, 2018).

teacher's decision because of the organization's ability to meet workers' needs (Harris, 2007; Stuit & Smith, 2012). Rational choice theory suggests that teachers' investments in human capital are interconnected with their choices about their career trajectories. Teachers who acquired specialized training or have expertise they developed on the job might be more invested in teaching as a career. If teachers are utility maximizers – as predicted by rational choice theory – then they form expectations about the return on their investments such as education, experience, and specialized training. Likewise, over the course of their careers, teachers accumulate job-specific knowledge that might not be readily transferable to other occupations and thus limit their outside employment opportunities (Kirby et al., 1991) making more experienced teachers less likely to leave. In addition, as teachers develop expertise, their return to experience grows over time (Ladd & Sorensen, 2017; Papay & Kraft, 2015) and they are less likely to leave teaching (Papay et al., 2017).

Instead of focusing on a specific framework, we identify and assess a set of factors that are consistently associated with increased teacher attrition across the theoretical frameworks outlined above: experience, certification, and subject area specializations. In the sections below, we review the literature in each of these areas.

Teacher Experience, Certification, and Training

Experience

It is well-documented that teacher experience is a central factor in teacher attrition. Attrition is significantly higher among less experienced teachers. Almost half of novice teachers leave the profession within the first years of teaching (Fry, 2009; Hanushek, 2007; Smith & Ingersoll, 2004). Novice teachers also move or transfer to different schools more frequently than veteran teachers (Elfers et al., 2006). While many studies suggest that teacher experience is one of the major factors in turnover or exiting the profession regardless of sector (Cowen & Winters, 2013; Harris, 2007), it is not consistently included in analyses of teacher attrition (e.g., Cano et al., 2017; Roch & Sai, 2018).

Certification

Teacher exit and turnover has also been associated with teachers' preparation experiences and pathways into teaching. The three most common pathways to teaching career include: a) a traditional accredited baccalaureate-level college- or university-based teacher education program; b) alternative licensure programs that allow individuals with a bachelor degree to obtain teaching positions and earn their licenses as they teach; and c) alternative licensure programs designed to facilitate the entry of non-education majors into teaching and support them in teaching careers. Compared to teachers from traditional teacher education programs, teachers who enter teaching through fast track or non-traditional teacher preparation programs are more likely to leave both their initial placements and the profession (Boyd et al., 2006; Boyd et al., 2011). The higher retention rates among traditionally certified teachers might be due to the more extensive training and preparation they receive (Darling-Hammond, 2003). Most traditionally certified teachers had their clinical experiences during at least one semester of student teaching and formed expectations about the organizational structures and cultures of schools (Grossman, 2010; NCATE, 2010). They are more likely to be aware about their potential workloads and better prepared with both pedagogical and content knowledge than alternatively certified teachers. As a result, traditionally certified teachers are also more likely to be prepared to overcome the obstacles they may encounter in the first few years of teaching than their alternatively certified colleagues. Insufficient support and burnout might affect less prepared teachers to a greater extent and increase their chances moving to another school or leaving the profession.

Teacher certification requirements differ across public school sectors. The charter school legislation in at least 25 states (including the District of Columbia) either does not require charter school teachers to be certified or allows charter schools to hire a large share of teachers with no teaching certification (Education Commission of the States, 2018).

Content Area

Rates of attrition also differ by content areas or positions. For instance, science, mathematics, and special education teachers tend to have lower retention rates than teachers of other subjects (Brown & Wynn, 2007; Gulosino et al., 2019; Ingersoll, 2003; Sutchter et al., 2016), while elementary school teachers typically have higher rates of retention compared to teachers of other grade levels (Goldring et al., 2014; Sass et al., 2012). Higher attrition among STEM teachers is likely due to the variety of outside options and careers for those teachers when their skills are in demand in other, often higher paid professions (Goldhaber et al., 2021). Higher turnover is associated with teaching students with disabilities but these relationships are mediated if a teacher holds a special education certificate, unless they teach students with emotional and behavioral disorders (Gilmour & Wehby, 2019).

Teachers' investments and expectations vary by teacher characteristics. For instance, if time, monetary, and non-pecuniary investments in traditional and alternative certification are different, then teachers' expected and actual returns would be different as well. Teachers with non-traditional certification may have more career options outside of the teaching profession compared to traditionally certified teachers. Experienced teachers have already invested their time and have potentially given up alternative employment opportunities so we might expect that they would be less likely to leave compared to less experienced teachers. Teachers with specialized training such as SPED may face higher costs of staying on the job because of higher workloads, and the demands of parents and high-needs students (Billingsley & Bettini, 2019) which might affect their decisions to exit or stay in the profession.

A combination of these factors represented in our analysis by experience (how much time a teacher has invested in their career), certification (the financial costs and time investment in traditional teacher preparation are higher and options outside the profession might be more limited compared to teachers with alternative certification), and special education specialization (more outside options for employment but also higher costs of performing the job) might result in a higher likelihood of exit for teachers who face better outside employment options and whose expectations about the job are not optimized.

School Characteristics

According to organizational theory, workers are more likely to leave their jobs if they perceive that the organizational structure and features of the work environment are not a good fit for their needs and expectations. Within schools, such characteristics include school socio-economic and racial composition, school sector, and school location. Teachers who teach in high-poverty schools with large shares of non-White students, and in particular those working in urban areas (Elfers et al., 2006; Hanushek et al., 2004; Ingersoll, 2001, 2003; Prince, 2002) are up to 50% more likely to exit the profession because they voluntarily left or their contracts were not renewed (Ingersoll, 2003). On average, teachers are less likely to leave more affluent schools and in schools with fewer Hispanic and Black students (Borman & Dowling, 2008; Fuller, 2003; Hanushek et al., 2004; Ingersoll, 2001; Ronfeldt et al., 2013; Scafidi et al., 2007), although teachers of color are more likely than white teachers to remain in urban schools with high shares of low-income and Black and Hispanic students (Achinstein et al., 2010). Along similar lines, racial threat theory implies that

mismatches between a teachers' race/ethnicity and the racial/ethnic composition of their schools might result in teachers leaving their schools (Renzulli et al., 2011).

Alternatively, a number of studies suggest that teachers exit high-poverty, high-minority schools because of the contexts in which they work rather than the students they teach (Allensworth et al., 2009; Boyd et al., 2011; Buckley et al., 2004; Johnson & Birkeland, 2003). Teachers tend to stay in schools that provide the conditions and support teachers need to succeed, irrespective of student demographics (Chenowith, 2007; Dillon, 2010; Ferguson et al., 2010; Johnson & Birkeland, 2003). If teachers have adequate administrative and collegial support—both important aspects of working conditions—and opportunities for professional development such as mentoring and induction programs, they are more likely to continue working at their schools (Ingersoll, 2001; Kirby et al., 1999; Smith & Ingersoll, 2004; Sutchter et al., 2016).

Attrition among Charter School Teachers

To date, only a handful of studies analyze teacher turnover or attrition in charter schools using state-level data. All document consistently high turnover rates among charter school teachers across states, ranging from 24% in New York (Silverman, 2013) to 43% in Illinois (Miron & Applegate, 2007). Attrition among charter school teachers is substantially higher compared to traditional public schools in Florida (Cowen & Winters, 2013; Harris, 2007), New York (Silverman, 2013), Utah (Gulosino et al., 2019), Wisconsin (Gross & DeArmond, 2010), and across 16 states (Stuit & Smith, 2012). Newly hired teachers are at higher risk to leave charter schools compared to traditional public schools (Gross & DeArmond, 2010; Gulosino et al., 2019). Like their peers working in traditional public schools, charter school teachers tend to leave the profession if they teach in schools that served higher percentages of free and reduced lunch (FRL) and minority students, and schools that were lower achieving (Harris, 2007). Working conditions are one of the most critical factors in charter school teachers' decisions to leave their schools (Bickmore & Dowell, 2019; Gulosino et al., 2016; Torres, 2016; White, 2018). Charter school teachers are more likely to be new to the profession, have fewer years of experience, and teach in urban schools and schools that served higher proportions of minority and FRL students (Stuit & Smith, 2012) than traditional public school teachers, which suggests that some of these differences are attributable to teacher and school characteristics.

Patterns of teacher attrition also differ across charter school and traditional public school teachers. Newly hired charter school teachers are more likely to leave the profession altogether instead of transferring to another school (Gulosino et al., 2019). Charter school teachers who work at charter schools for their entire careers were more likely to leave the profession than teachers who work in traditional public schools or teachers who moved between sectors (Cano et al., 2017). Overall, these studies document considerable variation in teacher turnover and attrition in both traditional public and charter schools within and across states. One consistent finding across these studies is that charter schools have substantially higher turnover and attrition rates compared to traditional public schools.

Data

Our analysis utilizes statewide retrospective employment data supplied by the Arizona Department of Education (ADE) that spans six school years (2009-2010 through 2014-2015). The dataset contains employment information on the population of teachers working in Arizona public schools (traditional and charter): school and district of employment, teacher demographic data (gender, race/ethnicity), experience, certification, and position. We merged the teacher-level data with school-level demographic data from the National Center of Education Statistics (NCES) (e.g., percentage of FRL-eligible students, percentage of minority students, school locale) and ADE school achievement data (the percentage of students passing the Arizona Instrument to Measure Standards (AIMS) and AzMERIT, state-wide standardized subject area tests in mathematics, reading, writing, and science).

Teacher-level variables include experience in years, credential, position, gender and race/ethnicity (White, Black, Hispanic, or other race). We created categories of experience to indicate novice teachers (fewer than four years), teachers with four to nine years, 10 to 15 years, and more than 15 years of experience (Goldring et al., 2014). Using the data on teacher certification, we created a variable that indicates whether a teacher held traditional, or standard certificate, or other type of certification. We also created indicators for special education and Science, Technology, Engineering, and Mathematics (STEM) content area teachers (Nguyen & Redding, 2018).⁵ For the STEM indicator, we coded the following subjects as STEM content areas: earth science, chemistry, general science, mathematics, middle grade general science, middle grade mathematics, physics, and biology. We collapsed three racial categories – American Indian or Alaska Native, Asian Pacific Islander, and multiple race – into the category “other race” because the share of teachers in each was small. Across the five years in our dataset the share of teachers in the other race category amounted to 4% of Arizona’s public school teacher labor force.

Descriptive Statistics

Table 1 presents descriptive statistics comparing traditional public school and charter school teachers averaged across all years. We also provide descriptive statistics separately for one year of the data, 2015, to demonstrate the consistency of yearly outcomes with the averages across six years. On average, more than four-fifths of all public school teachers in Arizona worked in traditional public schools. Eleven percent of teachers were employed in charter schools. Teachers’ demographic characteristics were significantly different between the two sectors with the exception of the share of White teachers. The major difference between teachers employed by charter schools and traditional public schools was in the distribution of work experience. The average experience of charter school teachers was seven years compared to 11 years for the average traditional public school teacher. Charter schools employed a larger share of novice teachers, or teachers with less than four years of experience (41%) compared to traditional public schools (23%). Only 12% of charter school teachers had more than 15 years of experience, while 28% of traditional public school teachers had more than 15 years of experience. This is consistent with the general trend whereby charter schools employ younger and less experienced teachers compared to traditional public schools (Burian-Fitzgerald et al., 2004; Gross & DeArmond, 2010; Stuit & Smith, 2012).

⁵ For a complete list of STEM fields and definitions, see National Science Foundation (NSF), <https://www.nsf.gov/statistics/nsf13327/pdf/tab1.pdf>.

Table 1*Descriptive Statistics, Teacher and School Characteristics, 2009-2015 School Years*

	2009-2015 school years		2014-2015 school year	
	Traditional public school teachers	Charter school teachers	Traditional public school teachers	Charter school teachers
Total number	242,161	32,352	46,959	7,515
Share in total, %	84.8	11.3	80.79	13.21
Exit rate, %	12.66*	19.77	12.79*	18.56
<i>Teacher characteristics</i>				
Experience, years	10.57*	6.67	10.74*	6.69
Less than 4 years, %	23.08*	41.37	26.22*	44.49
4 to 9 years, %	29.92	29.77	25.69*	29.92
10 to 15 years, %	18.51*	12.23	18.65*	13.38
More than 15 years, %	27.50*	11.53	29.44*	12.21
Traditional certification, %	79.09*	48.09	76.48*	42.64
SPED teachers, %	9.66*	3.50	9.66*	3.5
STEM teachers, %	11.00*	13.45	10.35*	13.02
Male, %	22.02*	26.37	23.30*	26.42
White, %	80.76	81.05	79.62	80.37
Black, %	2.34*	4.00	2.65*	4.07
Hispanic, %	12.81*	10.48	13.40*	11.29
Other races combined, %	4.09*	4.46	4.33	4.24
<i>School characteristics</i>				
Minority students, %	55.39*	44.91	56.59*	44.76
FRL eligible students, %	50.95	50.75	54.56	54.05
Percent passing math, %	59.79*	59.00	60.30*	62.99
Rural school, %	18.88*	12.26	10.17*	7.16
High school, %	28.65*	53.50	30.26*	54.66

Note: * denotes statistically significant differences in characteristics between traditional public schools and charter schools, p -value < 0.01.

Perhaps not surprisingly given the differences in certification requirements across the two sectors, charter schools employed significantly smaller shares of traditionally certified teachers, 48% on average, compared to 79% in traditional public schools. Traditional public schools employed proportionally more special education teachers (10%) compared to charter schools (4%), but a smaller share of teachers in STEM fields, 11% versus 13% in charter schools. The differences and similarities between charter and traditional public school teachers described here were consistent across all six years of the data.

While on average traditional public schools and charter schools in Arizona enrolled similar shares of FRL students, they differed on other characteristics. Traditional public schools are more likely to be located in rural areas and enrolled more minority students than charter schools. Fifty-four percent of teachers in charter schools and 29% of teachers in traditional public schools were employed in high schools. The passing rate on the AzMERIT mathematics test was the same in both types of schools: on average 59% of students passed every year.

The main variable of interest for the present study is the attrition, or the exit of teachers from the public school sector. In Table 2 we compare the annual exit rates among teachers in traditional public schools and charter schools by teacher characteristics and by year. Across all five years, the average exit rate among traditional public school teachers was 13% compared to 20% among charter school teachers ($p < 0.01$).

Table 2

Differences in Exit Rates among Teachers in Traditional Public and Charter Schools, by Teacher Characteristics and by Year, 2009-2015 School Years

Exit rate, %:	Traditional public school teachers	Charter school teachers	Difference
<i>By teacher characteristics</i>			
All teachers	12.66	19.77	-7.11*
Less than 4 years of experience	17.30	22.26	-4.96*
4 to 9 years of experience	11.80	17.65	-5.85*
10 to 14 years of experience	8.85	15.10	-6.25*
15 or more years of experience	12.30	16.62	-4.32*
Traditional certification	7.88	11.73	-3.84*
Other certification	19.56	21.80	-2.23*
SPED teachers	13.70	20.04	-6.33*
STEM teachers	12.75	20.99	-8.24*
<i>By school year</i>			
2010-2011	13.52	23.84	-10.32*
2011-2012	12.40	22.16	-9.76*
2012-2013	11.84	18.02	-6.18*
2013-2014	12.74	18.17	5.43*
2014-2015	12.79	18.56	-5.77*

Note: * indicates statistically significant differences between traditional public and charter schools, p value < 0.001 .

Teachers with standard certification had lower exit rates from traditional public schools compared to charter schools. While statistically significant, the difference in exit rates of teachers with other types of certification between traditional public and charter schools was smaller in magnitude. Overall, teachers with non-traditional certification were significantly more likely to leave the teacher labor force. The annual exit rates between traditional public and charter school teachers also differed by experience, STEM, or SPED status. Both teachers in STEM fields and special education teachers were more likely to leave charter schools compared to traditional public schools. For teachers in STEM fields, the attrition rate for traditional public school teachers was 21% versus 13%; the corresponding figures for special education teachers were and 20% (traditional public school teachers) versus 14% (charter school teachers). Both differences were statistically significant ($p < 0.01$). For each category of teaching experience (i.e., less than four years, four to nine years, 10 to 15 years, and more than 15 years), charter school teachers were significantly more likely ($p < 0.01$) to leave their schools compared to traditional public school teachers.

Charter schools employed a significantly higher share of novice teachers who are more likely to exit schools who are more likely to exit schools (Fry, 2009; Hanushek, 2007; Smith & Ingersoll, 2004). The share of novice teachers working in charter schools increased over the five years from 37% in 2010 to 51% in 2014, while in traditional public schools it remained relatively stable (27% to 30%). The exit rates decreased over time in both types of schools, but the decrease was more pronounced for charter schools; on average, the exit rates among charter school teachers declined by 22%⁶. The corresponding figure for traditional public schools was substantially more modest (5.4%). As a result, the difference in exit rates decreased almost two-fold between 2010 and 2014, from 10.32% in 2010 to 5.77% in 2015.

Methods

Given the dichotomous nature of the variable of interest – a teacher’s decision to stay or leave a school in a given year, we model the relationship between the variable as a binomial logit model. Our descriptive analysis suggested that the differences in attrition rates between traditional public and charter schools could be due to the differences in the individual and professional characteristics of the teachers they employ as well as the student demographics in those schools. Since teacher and school characteristics might be related, e.g., alternatively certified teachers are more likely to work in charter schools, the multivariate approach provides a more nuanced understanding of how these factors work together to influence teachers’ decisions to stay or leave depending on the school sector. Our logit model also allows us to evaluate the independent associations of each of the factors while accounting for the complex relationships between exiting and all the factors included in the model. Finally, we wanted to assess whether some of the factors had moderating effect on the relationship between attrition and individual teacher characteristics, such as for example, school demographics. We modeled such moderating effects by including interaction terms in our binary logistic regression model. Our main model, which we used to estimate a difference in the probability that a teacher leaves a traditional public or charter school accounting for teacher and school characteristics. is as follows:

$$Prob_i = Prob(y_{ist} = 1) = F(X_{is}\beta + Z_{is,t-1}\delta + \gamma D_{it}) = \frac{\exp(X_{is}\beta + Z_{is,t-1}\delta + \gamma D_{it})}{1 + \exp(X_{is}\beta + Z_{is,t-1}\delta + \gamma D_{it})}$$

where y_{ist} is an indicator that takes a value of 1 if a teacher left their school between two consecutive years. X_{is} and $Z_{is,t-1}$ are two vectors of explanatory variables. Vector X_{is} includes teacher characteristics (experience, type of credential, an indicator for special education teachers, an indicator for teachers who taught STEM subjects, gender, race/ethnicity). Vector $Z_{is,t-1}$ represents school characteristics (percent of minority students and FRL students, and indicators for charter schools, high schools, and school locale) for school s . School-level variables are measured in the year prior to teacher leaving the school. We also included a vector with indicators for the year a teacher left their school, D_{it} .

⁶ In 2010, the exit rate was 23.84% and in 2014 it was 18.56%. The total decrease in the exit rate among charter school teachers over five years was $\frac{18.56-23.84}{23.84} = -0.22$, or 22%

Results

Table 3 presents the coefficients for the model predicting the probability of exit from the teacher labor force in the public school sector conditional on teacher and school characteristics. The coefficients are expressed as odds ratios indicating higher chances of exit when the ratio is greater than one and lower chances of exit when the ratio is less than one. In Column 1 we included only the indicator for charter school and indicators for individual years that account for any variation in attrition over time. We find that on average, charter school teachers were 1.7 times more likely to leave their schools compared to traditional public school teachers, a striking difference.

Table 3

Probability of Teachers Leaving the Teacher Labor Force, Traditional Public and Charter Schools, 2010-2015 School Years

	Dependent variable – Exit				
	(1)	(2)	(3)	(4)	(5)
Charter (=1)	1.70*** (0.03)	1.46*** (0.02)	1.62*** (0.06)	1.61*** (0.09)	1.94*** (0.24)
<i>Teacher Characteristics</i>					
Experience, years		0.91*** (0.001)	0.94*** (0.001)	0.95*** (0.002)	0.95*** (0.002)
Experience, squared		1.00*** (0.001)	1.00*** (0.001)	1.00*** (0.001)	1.00*** (0.001)
Traditional certification			0.44*** (0.01)	0.43*** (0.01)	0.43*** (0.01)
SPED teacher (=1)			1.07* (0.03)	1.07* (0.03)	1.08* (0.03)
STEM teacher (=1)			1.02 (0.02)	1.03 (0.02)	1.03 (0.02)
Male (=1)			0.94** (0.02)	0.93** (0.02)	0.94** (0.02)
Black			0.81*** (0.02)	0.78*** (0.02)	0.78*** (0.02)
Hispanic			1.05 (0.05)	0.99 (0.05)	0.99 (0.05)
Other race			1.01 (0.04)	0.93 (0.04)	0.94 (0.04)
Experience*Charter		0.99* (0.002)	0.99* (0.002)	0.99* (0.003)	0.99* (0.003)
Trad. Cert.*Charter			0.52*** (0.01)	0.57*** (0.02)	0.57*** (0.02)
SPED*Charter			1.77*** (0.24)	1.52** (0.23)	1.51** (0.23)
STEM*Charter			1.02 (0.05)	1.04 (0.06)	1.02 (0.06)
Male*Charter			0.99 (0.002)	1.01 (0.05)	0.99 (0.05)

	Dependent variable – Exit				
	(1)	(2)	(3)	(4)	(5)
Charter (=1)	1.70*** (0.03)	1.46*** (0.02)	1.62*** (0.06)	1.61*** (0.09)	1.94*** (0.24)
<i>Teacher Characteristics</i>					
	(1)	(2)	(3)	(4)	(5)
<i>Teacher Characteristics</i>					
Black*Charter			0.95 (0.09)	0.87 (0.09)	0.88 (0.09)
Hispanic*Charter			0.99 (0.06)	0.88* (0.06)	0.89 (0.06)
Other race*Charter			1.13 (0.10)	1.11 (0.11)	1.12 (0.12)
<i>School Characteristics</i>					
Percent FRL				1.00 (0.00)	1.00 (0.00)
Percent minority students				0.99 (0.00)	1.00 (0.00)
Rural school (=1)				1.08*** (0.02)	1.09*** (0.02)
High school (=1)				0.91*** (0.02)	0.90*** (0.02)
Percent passing math				0.99*** (0.00)	0.99*** (0.00)
Percent FRL*Charter					0.99 (0.00)
% Minority*Charter					0.99 (0.00)
Rural school*Charter					0.99 (0.06)
High school*Charter					1.07 (0.05)
% Passing math*Charter					1.00 (0.001)
Log likelihood	-108032	-104632	-78447	-71773	-71767
LR chi2	1222.0	3922.3	6204.6	6212.2	6225.0
Number of observations	274,513				

Note. *** significant at 0.1%, ** significant at 1%, * significant at 5%. Coefficients reported as odd ratios. All columns include indicators for year.

In Column 2 we included years of teaching experience and years of experience squared to account for the non-linear nature of the relationship between probability of exit and experience. Regardless of sector, more experienced teachers were less likely to leave their jobs and the probability of exit plateaued as teachers gained more experience. While we observed a slight

decrease in odds of exit from a charter school compared to a traditional public school as reflected in the negative coefficient estimate on the interaction term between charter indicator and experience, the chances of exit from a charter school remained higher than from a traditional public school. Next, we included teacher characteristics and their interactions with a charter school indicator to account for the potential selection of teachers into traditional public schools and charter schools (Column 3). We continued to observe that more experienced teachers were less likely to leave either type of school as well as were traditionally certified teachers. Special education teachers were twice as likely to leave charter schools compared to traditional public schools. In addition, we found that male teachers were less likely to leave than their female colleagues, even though the difference in the odds of leaving for males and females was small. Black teachers were the only racial/ethnic group who were less likely to leave the public school teacher labor force relative to White teachers and regardless of school type.

In Column 4 we added school characteristics and found that teachers were more likely to exit rural schools compared to urban schools, and less likely to exit high schools, i.e., schools that offered grades nine through 12, and schools with higher shares of students who passed the state mathematics assessment. Even after we accounted for the differences between schools, we continued to observe a statistically significant and sizable difference in the odds of leaving the public school labor force between traditional public school and charter school teachers. Specifically, charter school teachers were 1.6 times more likely to leave compared to traditional public school teachers.

Our fully saturated model in Column 5 includes teacher and school characteristics and interactions between the charter school indicator and teacher and school characteristics. We found that none of the school characteristics moderated the relationship between the probability of exit and the type of school: traditional public or charter. Charter school teachers were more likely to leave their school - for every ten teachers leaving traditional public school, we could expect at least 19 teachers to exit charter schools. We confirmed our initial findings that teachers with fewer years of experience were more likely to exit, and in particular if they were employed in a charter school. Likewise, teachers with traditional certification had a lower probability of leaving, while special education teachers were more likely to exit. Overall, across all our models the strongest predictors of a teacher's exit from the public sector teacher labor force remained experience, alternative certification, and SPED status.⁷

As highlighted in Table 2, exit rates varied considerably by experience. There was a substantial gap in the likelihood of exit between teachers with less than four years of experience and all other teachers. To further explore the differences in exit rates among less and more experienced teachers, we estimated our models separately for the subsamples of novice teachers with less than four years of experience, and for teachers with four and more years of teaching experience. Columns 1 and 3 of Table 4 show the results of the model estimated with teacher characteristics and their interactions with the charter school indicator, and Columns 2 and 4 presents the results of the fully saturated model with school characteristics and interactions (not reported). The results indicate that the high exit rate among from charter schools is primarily due to novice teachers who comprised almost half of the teacher labor force in charter schools by 2014-2015 school year.

Interestingly, we find that the gap in exit rates between traditional public and charter schools was larger for more experienced teachers than for novice teachers. Within the novice teachers' sub-

⁷ We repeated our analyses using probit and linear probability models to confirm that our findings are not driven by model specification (results are available from the authors upon request). Our results were largely the same. Teachers were more likely to leave charter schools compared to traditional public schools and less experienced teachers, teachers with alternative certification, and SPED teachers had higher chances of exit.

sample, we observed that those with relatively more experience were more likely to stay. Among teachers with four or more years of experience, we found a slight increase in the odds of leaving with every year of experience, but this was most likely due to teachers who were approaching their retirement age, a pattern we also observe in the descriptive statistics.

Table 4

Probability of Teachers Leaving the Public School Teacher Labor Force, by Novice Teacher Status, 2010-2015 School Years

	Teachers with less than 4 years of experience		Teachers with 4 or more years of experience	
	(1)	(2)	(3)	(4)
Charter (=1)	1.14*** (0.045)	0.93 (0.141)	1.94*** (0.097)	1.81*** (0.281)
Experience, years	0.87*** (0.007)	0.88*** (0.006)	1.02*** (0.001)	1.02*** (0.001)
Experience*Charter	1.08*** (0.018)	1.07*** (0.019)	0.98*** (0.003)	0.98*** (0.003)
Log likelihood	-36372.6	-33249.3	-62206.6	-57789.9
LR chi2	763.14	924.12	1063.43	1419.0
Number of observations	83507		191006	

Note. *** significant at 0.1%, ** significant at 1%, * significant at 5%. Coefficients reported as odds ratios. Columns 1 and 3 include teacher characteristics and interactions between teacher characteristics and an indicator for a charter school. Columns 2 and 4 include teacher and school characteristics and their interactions with an indicator for a charter school. For parsimony, we omitted all other coefficients from the table except for the charter school indicator, years of experience, and the interaction. The full set of results is available from the authors upon request.

In summary, we found that teachers in both sectors were more likely to exit rural schools and schools with high share of FRL students. Of the professional characteristics of teachers we assessed, certification and special education are strongly associated with the odds of leaving. Traditionally certified teachers were less likely to leave and even less likely to leave their charter schools, and special education teachers were more likely to leave the teacher labor force, particularly if they were employed by charter schools compared to traditional public schools. In terms of teacher background characteristics, male teachers were less likely to leave their schools compared to their female colleagues, and Black teachers were less likely to leave compared to White teachers regardless of school sector.

Our findings expand previous studies on teacher attrition and, specifically, differences in attrition between traditional public and charter schools, but these findings are not without limitations. For instance, we do not have information on contextual factors which could be associated with the differences we are exploring such as teacher salaries, hiring processes, and working conditions. We also did not explore the heterogeneity within the charter school sector in Arizona, and in particular, the organizational structure of charter schools (Mars & Bronstein, 2020) which might be an influential factor in teacher attrition. A next step could be a more in-depth exploration of the attrition rates within the charter school sector to account for the factors specific to charter schools

that are less salient within the traditional public school sector due to the more dynamic and market-driven environment in which charter schools operate.

Discussion and Conclusion

We investigated the exit rates among traditional public school and charter school teachers in Arizona to understand why teacher attrition is 54% higher in charter schools compared to traditional public schools. While we documented some minor differences in attrition associated with teacher and school characteristics such as race/ethnicity, and school locale, our models suggest that the major factors behind the gap in retention between school sectors in Arizona are teachers' professional characteristics, and in particular experience and certification. There are clear differences in the distribution of experience and the share of certified teachers among traditional public school and charter school teachers. Charter school teachers had significantly fewer years of experience across all years of our analysis and they were also less likely to be certified.

Consistent with the findings from prior studies (Boyd et al., 2006; Boyd et al., 2011; Darling-Hammond, 2003), we found that traditionally certified teachers were more likely to stay in their schools compared to teachers who took alternative pathways to teaching. Charter schools might have fewer resources to provide the necessary and extensive support to teachers with alternative certification which may explain the higher rates of attrition we observe. From a larger policy perspective, these findings suggest that hiring teachers with alternative certification to address the teacher shortage should be viewed as a short-term solution. State policies should focus on strengthening and supporting traditional pathways to the teaching profession and encouraging charter schools to hire traditionally certified teachers.

Our findings suggest that as with attrition rates more generally, there might be substantial variation across states in the difference in attrition between STEM and other teachers. For instance, we do not find that STEM teachers in Arizona are more likely to leave their schools overall, but they are more likely to leave charter schools compared to traditional public schools. As we noted above, charter schools employ more STEM teachers than traditional public schools, but these teachers are also more likely to leave the profession when employed in charter schools. We also find that special education teachers, and in particular those teaching in a charter school, were less likely to be retained in Arizona's public school sector, although the difference in the chances of SPED teachers leaving compared to other teachers were small. Likewise, SPED teachers were 1.5 times likely to exit if they worked in charter schools compared to traditional public schools. Overall, we found that the decisions of teachers to leave or stay were associated with professional characteristics that were the results of their investments: the monetary cost of getting a degree, years of building a career in teaching, and additional training for special education.

Overall, we found that differences between attrition rates from charter and traditional public school teachers persist even after controlling for individual and professional characteristics of teachers and school characteristics. Even after we accounted for a variety of factors that are associated with teacher attrition, the gap in exit rates across the two types of schools remained large and significant. One factor that we could not control for is the internal organizational structures of charter schools and heterogeneity of organizational structures within the charter school sector. We observed that teachers, regardless of their characteristics, were more likely to exit charter schools – organizational theory suggest that the type of organization, or type of school in this case, matters for teachers' decision to leave their schools. Moreover, we identified that the professional characteristics of teachers – teaching experience, specialization in special education, and type of certification –

strongly moderate the relationship between the probability of leaving their schools and school sector, traditional public or charter.

Given that some of professional characteristics of teachers are more strongly associated with teachers' exit from charter schools compared to traditional public schools, our findings suggest some implications for charter school administrators. For instance, to increase the retention of novice teachers, they might consider leveraging the expertise and support of the experienced and credentialed teachers that charter schools are more likely to retain. Beginning teachers have an immense capacity to learn on the job that school administrators should capitalize on (Henry et al., 2011; Papay & Kraft, 2015). As in other professions, the first years on the job are the most challenging, and it is critical that novice teachers receive the supports they need. For example, while a study of traditional public school teachers indicates that more than half of first year teachers regularly met with their mentor teachers and about a third found that these meetings improved their teaching (Garcia & Weiss, 2019), we know less about mentorship among charter school teachers. Similarly, access to professional development opportunities is associated with the retention of early career teachers (Garcia & Weiss, 2019). This suggests that charter school administrators should adopt innovative induction practices that have been proven effective in developing and retaining beginning teachers. At the building level, charter school principals should focus on novice teacher induction, serve as novice teachers' advocates, build school cultures and foster school practices that support and develop beginning teachers, and ensure that these teachers have the resources they need to stay at their schools and in the profession. Retaining a larger proportion of teachers could also reduce the administrative burdens and costs associated with hiring. Finally, charter school administrators should work with teacher preparation programs to ensure the smooth transition of new teachers to from pre-service to practice.

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