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Easy in, Easy out: Are Alternatively Certified Teachers Turning Over at Increased Rates?

Christopher Redding
Vanderbilt University
Thomas M. Smith
University of California, Riverside

Alternative certification programs are now commonplace in the credentialing of new teachers. We complement the growing evidence base for these teachers by exploring their turnover patterns in four waves of the nationally representative Schools and Staffing Survey (SASS). We report on descriptive evidence of growing differences in the characteristics of alternatively and traditionally certified teachers and the schools in which they teach. Controlling for factors that predict higher turnover, we find that by the 2007–2008 school year, alternatively certified teachers were still more likely than traditionally certified teachers to leave the profession. We find some evidence that an increase in the number of organizational supports for new teachers may reduce the likelihood of turnover.

Keywords: alternative certification, teacher certification, teacher turnover

Alternative certification (AC) has emerged as a significant pathway into teaching. According to the 2011–2012 Schools and Staffing Survey (SASS), nearly a quarter of early career teachers entered the teaching profession outside a traditional teacher preparation program. As the number of AC teachers has ballooned, there is emerging evidence of the outcomes of these teachers. Studies have generally found little difference in the student achievement of AC and traditionally certified (TC) teachers (Constantine et al., 2009; Kane, Rockoff, & Staiger, 2008; Seftor & Mayer, 2003), although

Christopher Redding is a doctoral candidate in the Department of Leadership, Policy, and Organizations, Peabody College, Vanderbilt University, PMB 414, 230 Appleton Place, Nashville, TN 37203 e-mail: *c.redding@vanderbilt.edu*. His research focuses on teacher labor markets, teacher education and development, and school improvement.

Thomas M. Smith is dean and professor at the Graduate School of Education at the University of California, Riverside. His research focuses on scaling up effective practices and improving teaching and learning at scale.

there are some exceptions. In North Carolina, AC teachers have been found to have a small negative impact on student performance, particularly at the high school level (Clotfelter, Ladd, & Vigdor, 2010; Henry et al., 2014). Teach for America (TFA) teachers tend to outperform their traditionally certified peers (Glazerman, Mayer, & Decker, 2006; Xu, Hannaway, & Taylor, 2011). These studies also generally find higher attrition rates among AC than TC teachers, but they are typically limited to a particular city, state, or certification program.

Other research has provided descriptive evidence of the characteristics of AC teachers or the programs they attend. Although differences among alternative certification programs (ACPs) have been described (Humphry, Wechsler, & Hough, 2008), similarities exist across alternative and traditional preparation programs. For instance, in New York City, these programs have similar course requirements, but the length, timing, and focus of these courses vary (Boyd et al., 2008). In addition, AC teachers tend to have less student teaching experience or other preservice pedagogical training than TC teachers (Cohen-Vogel & Smith, 2007; Constantine et al., 2009; S. M. Johnson, Birkeland, & Peske, 2006). Instead, AC teachers often fulfill certification requirements during the first few years of teaching (Humphrey & Wechsler, 2007). Our study explores how differences in preservice training requirements explain higher turnover rates among AC teachers. If AC teachers leave the profession at a higher rate as a result of initial sorting into hard-to-staff schools with inadequate supports, we would worry that the continued expansion of AC is unlikely to be a long-term solution to shortages in the teacher labor market and rather a stopgap solution to fill in-demand positions in hard-to-staff schools.

Estimating the extent to which attrition rates are higher among AC teachers is methodologically difficult as AC programs intentionally recruit teachers to fill teaching shortages, often in hard-to-staff schools. It is difficult to determine what part of the attrition gap between AC and TC teachers can be attributed to differences in observed characteristics of individuals who select into AC programs, characteristics of the programs themselves, or differences in organizational supports for these teachers. This study addresses this inherent selection bias by employing a rich set of control variables that are associated with AC teachers' backgrounds and characteristics of the schools in which they are hired as well as school fixed effects. We focus our analysis on a subsample of early career teachers from three waves of the Schools and Staffing Survey to explore the ways in which the attrition gap between AC and TC may be narrowed through various teacher and school characteristics or organizational supports.

Alternative Certification in the Teacher Policy Landscape

Alternative certification has emerged as an umbrella term to include all pathways into the teaching profession outside traditional teacher education

programs. More careful definitions emphasize the policy goals and organizational structures of these programs. AC programs enable expedited entry into the teaching profession without completing a standard four- to five-year university-based program (Constantine et al., 2009). These programs rely on abbreviated coursework and the support of mentor teachers to train teacher candidates as they serve as teacher of record (Humphrey & Wechsler, 2007). While states have drawn on AC teachers to fill shortages in the teacher labor market, there is an ongoing debate of the extent to which alternative certification programs can also achieve higher teacher quality (S. M. Johnson et al., 2006).

The goal for ACPs to train high-quality teachers has accelerated with the 2001 reauthorization of the Elementary and Secondary Education Act. An influential portion of this legislation mandated that all classrooms be staffed by a *highly qualified teacher* (HQT), which aimed to close state loopholes for long-term substitutes and emergency certification (Ramirez, 2004). To achieve HQT status, teachers were required to have at least a bachelor's degree, obtain full state certification or have passed the Praxis II, and demonstrate content knowledge in the subject they teach. The political support for alternate routes into teaching continued under Race to the Top (RTTT) with renewed interest in ACPs as integral to having qualified teachers in every classroom (Cochran-Smith et al., 2012; Foderaro, 2010). ACPs have also transitioned from primarily meeting shortages in hard-to-staff schools to meeting shortages for in-demand subjects in these schools (Constantine et al., 2009). By the 2010s, ACPs were commonplace in the credentialing of teachers. Corresponding with this expansion of alternate pathways into teaching has been a number of studies that consider elements of the programs, characteristics of the teachers who have been alternatively certified, as well as how these differences may account for differential levels of student achievement or teacher attrition.

Differences Between Alternatively and Traditionally Certified Teachers

Research on certification programs has identified numerous differences among the programs themselves, the teachers who select into them, and the schools in which they teach. In New York City, Boyd and coauthors (2008) find that teachers in different pathways are often trained in the same educational institution and take many of the same courses. The differences come from the emphasis and timing of those courses, with ACPs addressing the pragmatic or technical aspects of teaching rather than theory. For instance, an AC teacher may focus on classroom management rather than learning theory or child and adolescent development. The abbreviated nature of the preservice curriculum only allows for brief—if any—student teaching during summer school and requires continued coursework throughout the

school year (Cohen-Vogel & Smith, 2007; Constantine et al., 2009; Humphrey & Wechsler, 2007). The emphasis on practical aspects of teaching leaves participants with less exposure to methods of teaching and less experience practicing their craft, factors that may influence higher turnover rates.

Differences are also observed in regards to teacher characteristics. Cohen-Vogel and Smith (2007) analyze a subsample of teachers from the 1999–2000 SASS with less than five years of teaching to illustrate several key differences between TC and AC teachers. They find that AC teachers are more likely to have worked outside of education before entering the field of teaching and have no practice teaching and less likely to have majored in education and have a master's degree. With a sample of 174 teachers obtained from a stratified random sample of 63 unselective ACPs in seven states, Constantine and colleagues (2009) find no differences between AC and TC teachers for college selectivity or college entrance exam scores. Others have found evidence that AC teachers feel less prepared than TC teachers in their first year of teaching, largely as a result of less preservice classroom experience and pedagogical training (Darling-Hammond, Chung, & Frelow, 2002; Kee, 2012).

AC Teachers are more likely to work in urban schools with high concentrations of children from traditionally underserved racial/ethnic groups but not necessarily in schools with more hiring difficulties (Boyd et al., 2012; Cohen-Vogel & Smith, 2007). Because many AC teachers work in demanding classroom environments—often with less training or support—school context is another likely influence in teachers' turnover decisions as it has been found to be one of the largest determinants in shaping teachers' decision to stay in teaching (Ingersoll, 2001). As alternatively certified teachers are purposefully channeled into schools that tend to have more challenging working conditions, more evidence is needed of how this aspect of the policy design may influence higher attrition among AC teachers.

Do Alternatively Certified Teachers Turn Over More?

Boyd and colleagues (2012) provide evidence of the heterogeneity of teacher attrition in New York City for the two largest ACPs—New York City Teaching Fellows (NYCTF) and TFA—and TC teachers. Thirteen percent of beginning math teachers move to a new school after their first year, with the lowest transfer rates among TFA teachers. By their fifth year, however, only 4% of TFA teachers remained in their initial school compared to 48% of traditionally certified teachers, while teachers from NYCTF had retention rates in between (28%). The story is similar for teachers who leave the profession, where 31% of TC teachers, 49% of teachers trained through NYCTF, and 84% of TFA teachers had left teaching by the end of their fifth year. With evidence of greater effectiveness among TFA teachers (Glazerman et al., 2006; Kane et al., 2008; Xu et al., 2011), these studies generally contend

that attrition is of minimal concern, arguing that the small positive gains for their students compensate for these higher departure rates. Most AC programs, however, are not as selective as TFA, so higher attrition rates are likely to be more detrimental to student achievement.

Even if turnover is unrelated to the composition of teachers, higher attrition rates among AC teachers may impair school organizational culture and harm student performance in less direct ways (Ronfeldt, Loeb, & Wyckoff, 2013). AC teachers are more likely to work in schools with high proportions of low-income and minority students where unfavorable working conditions are likely to be more prevalent (S. M. Johnson, Kraft, & Papay, 2012). In the literature on teacher attrition, *working conditions* has been used as a catch-all term encompassing school facilities and available materials (Buckley, Schneider, & Shang, 2005), class size and workload (Horng, 2009), administrative support (Boyd et al., 2010; Grissom, 2011; Ladd, 2011; Shen, Leslie, Spybrook, & Ma, 2012), staff collegiality, and student discipline problems (Ingersoll, 2001). Separating the influence of these factors from school contextual factors such as student demographic characteristics has not been straightforward in the empirical literature. Still, an emerging consensus suggests an influence of working conditions on teacher attrition outside the direct influence of demographic characteristics of the school (Borman & Dowling, 2008; Ingersoll, 2001; S. M. Johnson et al., 2012; Ladd, 2011; Loeb, Darling-Hammond, & Luczak, 2005).

We also expect that the turnover gap between AC and TC teachers to be due to differences between the characteristics of teachers in the two groups. Research has shown college selectivity to predict higher levels of teacher turnover (Lankford, Loeb, & Wyckoff, 2002; Podgursky, Monroe, & Watson, 2004). Stronger academic credentials or training in in-demand subjects such as math or science may result in higher turnover rates because of better paying career options outside of education (Rumberger, 1987).

If AC teachers are more likely to transfer schools or leave teaching entirely, AC may be an expensive training ground for teachers who are less committed to stay in the profession than TC teachers. This issue is of particular concern if AC teachers are more likely to leave within the first few years of their career, before the returns to on-the-job training level out (Henry, Bastian, & Fortner, 2011). Yet, organizational supports for new teachers such as induction programs, mentoring, or a common departmental planning time may reduce teacher turnover (Smith & Ingersoll, 2004). Since alternatively certified teachers receive the bulk of their professional training in their first two years of teaching, these organizational supports may be particularly beneficial if used to help teachers improve their pedagogy or classroom management skills.

We hypothesize several factors as leading to increased turnover rates among AC teachers. Stemming from low levels of initial preparedness due to the minimal preservice preparation, we hypothesize that teachers from

these alternative pathways begin their careers with a dearth of instructional resources with which to effectively manage the demands faced by new teachers. Without a strong feeling of efficacy regarding their ability to manage classroom behavior or meet their students' learning needs, AC teachers may be more likely to leave the teaching profession. With pronounced gains in teacher effectiveness during the first few years of experience (Clotfelter, Ladd, & Vigdor, 2007; Henry et al., 2011), higher turnover among AC teachers may put a drain on school resources. Additionally, if AC teachers are more likely to be hired into hard-to-staff schools with weak organizational cultures, then their commitment to remain in the same school is likely to be less than beginning TC teachers. In addition to difficult working conditions, these schools may also have fewer organizational resources to support new teachers' professional improvement.

With this conceptualization, we focus on the following questions:

Research Question 1: To what extent has the proportion of beginning teachers entering through alternative certification programs changed between 1999 and 2012?

Research Question 2: To what extent have the background characteristics of AC teachers or the characteristics of their schools changed over this time period?

Research Question 3: Do AC and TC teachers receive similar or different supports during their early years of teaching? How have these supports changed over time?

Research Question 4: To what extent are AC teachers more likely to turn over (move schools or leave the profession) than TC teachers during their early years of teaching? To what extent has this turnover gap changed over time? To what extent do the background characteristics of the teachers or the characteristics of the schools in which they work explain this gap?

Research Question 5: To what extent does participation in an induction program, mentoring, or other supports for new teachers reduce the likelihood of turnover for AC teachers? Do these organizational supports reduce the likelihood of turnover more for AC than for TC teachers?

Data

To examine attrition among AC teachers, this study draws on data from SASS and its supplement, the Teacher Follow-Up Survey (TFS). Administered by the National Center for Educational Statistics (NCES), these surveys are a comprehensive data source on the staffing, occupational, and organizational characteristics of schools. SASS includes questionnaires for administrators and a sample of teachers in each school. We draw on four groups of variables for our analysis: teacher characteristics, school context, working conditions, and organizational supports (described in greater detail in the following and in Appendix A1). As a state representative sample of all public

K–12 teachers, SASS and TFS are ideal for identifying factors associated with turnover of TC and AC teachers. The TFS includes principal reports on whether teachers had stayed at their schools, moved, or left the profession, as well as a detailed survey of teachers' reasons for their change in status. We use four iterations of these surveys conducted in the 1999–2000, 2003–2004, 2007–2008, and 2011–2012 school years.

The sampling procedure for SASS sought to obtain a stratified, cluster sample that oversampled on certain characteristics. Within schools, the sampling procedure shifted between the 2003–2004 and 2007–2008 surveys. Before 2007–2008, teachers in sampled schools were placed into one of four hierarchical strata: Asian or Pacific Islander, American Indian, new teachers with three years or fewer of teaching experience, and those with more than three years of teaching experience (Tourkin et al., 2004, 2007). Beginning with the 2007–2008 survey, the stratification shifted into one of five teacher types based on years of experience and whether the administrator thought the teacher would be teaching at the same school next year. These groups can be summarized as new stayers, new leavers, midcareer stayers, midcareer leavers, and highly experienced leavers (Tourkin et al., 2010). Survey response rates varied between principals and teachers but were consistently above 80%. To account for the stratified cluster sampling used in SASS, this study uses survey weights to compensate for the school's selection probability, reduce nonresponse bias, and conduct analysis on a sample that most closely resembles the target population of early career public school teachers with less than five years of experience.

In line with previous research on certification among early career teachers (Boyd et al., 2012; Kane et al., 2008; Smith & Ingersoll, 2004), we limit our sample to teachers with less than five years of experience. Previous research has focused on this subsample as early career teachers are most likely to be affected by recent AC policies. To focus on teachers' entry pathway into teaching, we drop uncertified teachers from the analysis sample. With these modifications, our results generalize to a national population of traditionally and alternatively certified teachers with less than five years of experience. An important limitation of this sample is that we are unable to generalize our results to all schools that employ AC teachers. We begin with an initial sample of 38,700 certified public school teachers with less than five years of experience. In regression analysis, we exclude 8,840 teachers in the 2011–2012 SASS as their turnover status had not been released by NCES at the time of this analysis. With listwise deletion, we drop approximately a third of teachers from the analytic sample given differing patterns of missing data on surveys completed by teachers, administrators, and other school personnel. This yields an analytic sample consisting of 18,080 teachers. To compensate for this missing data, we replicated the main analysis using multiple imputation.[1]

Measures of Attrition

The dependent variable for this study comes from the principal report of a teacher's employment status in the school year following the baseline survey year.[2] We categorize teacher status into one of three categories: stayers, movers, and leavers. In separate models described in the following, we run both multinomial logistic regression with these three response categories and logistic regression with movers and leavers collapsed into one category to designate any teacher that was teaching in a school one year and not there the next.

Measures of Teacher Entry Pathways

Measuring our independent variable of interest—teacher entry pathway—is less straightforward. Following Cohen-Vogel and Smith (2007), for the 1999–2000 survey, teachers are classified as being alternatively certified if they report having participated in an alternative certification program either before or after they began teaching. Teachers are classified as holding traditional certification if they hold a regular or standard state certificate and did not attend an ACP. This includes teachers certified through fifth-year graduate programs. This operationalization was continued for the 2003–2004 survey. For the 2007–2008 and 2011–2012 surveys, SASS added a question that asked teachers if they entered teaching through an alternative certification program. The definition of traditionally certified teachers remained consistent from previous waves. While any change in the phrasing of the questions raises the issue of the construct validity of this measure, with the descriptive evidence seen in Table 1, there is little difference on categories for traditionally certified teachers that we would not expect to vary, which gives us increased confidence in the adequacy of this measurement. For instance, the proportion of traditionally certified teachers who graduated from selective colleges has remained consistent, as has gender.

Measures of Teacher Characteristics

We consider a number of teacher characteristics, both descriptively and in regards to their associational relationship with certification type and turnover. These include indicators of whether the teacher is female, a racial or ethnic minority, under 30 years old, attended a highly or most selective college, teaches an in-demand subject, and a union member. College selectivity is measured using NCES's Barron's Admissions Competitiveness Index. Barron's ranks institutions by seven levels of competitiveness. We classified individuals as having attended one of three institution types: most selective, which we coded to include Barron's rankings of most and highly competitive institutions; very selective; and all other levels of university competitiveness. In-demand subjects include those typically found to have the most frequent turnover (Ingersoll, 2001) and include teachers who teach mathematics,

Table 1
Descriptive Statistics

	1999–2000			2003–2004			2007–2008			2011–2012		
	Certification			Certification			Certification			Certification		
	AC	TC	Difference	AC	TC	Difference	AC	TC	Difference	AC	TC	Difference
Certification type	0.13	0.87		0.21	0.79		0.23	0.77		0.24	0.76	
Employment status												
Turnover	0.20	0.22	−0.02	0.22	0.21	0.01	0.27	0.17	0.10***			
Movers	0.14	0.12	0.02	0.12	0.11	0.01	0.15	0.09	0.06**			
Leavers	0.06	0.11	−0.05***	0.10	0.10	0.00	0.11	0.08	0.03			
Stayers	0.80	0.78	0.02	0.78	0.79	−0.01	0.72	0.81	−0.09***			
Teacher characteristics												
Female	0.69	0.72	−0.03	0.72	0.75	−0.03	0.69	0.76	−0.07***	0.68	0.78	−0.10***
Racial/ethnic minority	0.14	0.13	0.01	0.21	0.12	0.09***	0.15	0.08	0.07***	0.15	0.08	0.07***
Under 30	0.56	0.68	−0.12***	0.52	0.65	−0.13***	0.49	0.70	−0.21***	0.48	0.75	−0.27***
Years in current school	1.22	1.20	0.02	1.19	1.45	−0.26***	1.34	1.37	−0.03	1.62	1.64	−0.02
Attended most selective college	0.16	0.11	0.05*	0.17	0.10	0.07***	0.17	0.12	0.05*	0.16	0.09	0.07***
Attended very selective college	0.20	0.22	−0.02	0.22	0.21	0.01	0.21	0.19	0.02	0.19	0.23	−0.04*
Teach in-demand subject	0.26	0.25	0.01	0.37	0.23	0.14***	0.35	0.22	0.13***	0.43	0.32	0.11***
Union member	0.79	0.74	0.05*	0.71	0.72	−0.01	0.62	0.71	−0.09***	0.56	0.66	−0.10***
Salary (1,000s)	31.39	29.91	1.48***	34.94	34.38	0.56	39.48	38.78	0.70	41.91	41.09	0.82*
Occupation last year												
College student	0.35	0.47	−0.12*	0.30	0.54	−0.24***	0.26	0.59	−0.33***	0.30	0.53	−0.23***
Working outside education	0.19	0.10	0.09*	0.22	0.09	0.13**	0.28	0.05	0.23***	0.19	0.04	0.15***
No practice teaching	0.23	0.08	0.15***	0.40	0.09	0.31***	0.51	0.08	0.43***	0.40	0.03	0.37***
No course in teaching methods	0.07	0.04	0.03*	0.08	0.03	0.05***	0.19	0.11	0.08***	0.25	0.11	0.14***

(continued)

Table 1 **(continued)**

	1999–2000			2003–2004			2007–2008			2011–2012		
	Certification			Certification			Certification			Certification		
	AC	TC	Difference	AC	TC	Difference	AC	TC	Difference	AC	TC	Difference
Preparedness (standardized)	0.06	−0.01	0.07	0.30	0.36	−0.06***	−0.39	0.11	−0.50***	−0.35	0.13	−0.48***
School context												
Fraction minority students	0.37	0.39	−0.02	0.53	0.43	0.10***	0.54	0.41	0.13***	0.59	0.46	0.13***
Fraction FRPL students	0.38	0.40	−0.02	0.50	0.44	0.06***	0.47	0.43	0.04*	0.59	0.50	0.09***
Fraction of students with IEP	0.12	0.12	0.00	0.19	0.16	0.03	0.13	0.13	0.00	0.13	0.12	0.01
Urban	0.29	0.25	0.04	0.38	0.30	0.08**	0.35	0.24	0.11***	0.36	0.28	0.08*
Charter school	0.01	0.01	0.00	0.02	0.02	0.00	0.04	0.04	0.00	0.07	0.06	0.01
High school	0.40	0.35	0.05	0.36	0.29	0.07***	0.41	0.30	0.11***	0.43	0.31	0.12***
Working conditions												
Principal effectiveness (standardized)	0.06	0.01	0.05	−0.07	0.05	−0.12*	0.03	0.10	−0.07	−0.19	0.02	−0.21***
Staff collegiality (standardized)	0.02	−0.03	0.05	−0.12	0.06	−0.18***	−0.01	0.10	−0.11*	−0.17	0.07	−0.24***
Student discipline problems (standardized)	−0.07	−0.14	0.07	−0.02	−0.14	0.12	0.03	−0.19	0.22***	0.06	−0.14	0.20***
Class size	21.69	22.12	−0.43	22.11	22.88	−0.77	20.75	22.61	−1.86***	24.33	23.46	0.87
Availability of materials (standardized)	0.00	0.03	−0.03	−0.16	−0.03	−0.13*	−0.14	0.02	−0.16***	−0.16	−0.02	−0.14*
Hours teach in a week	37.68	38.20	−0.52*	37.48	38.11	−0.63*	30.34	30.24	0.10	30.98	31.11	−0.13
Principal report of hiring difficulties												
In core subject areas	0.50	0.45	0.05	0.53	0.39	0.14***	0.57	0.43	0.14***	0.46	0.31	0.15***
In special education	0.54	0.49	0.05	0.46	0.42	0.04	0.48	0.43	0.05	0.31	0.30	0.01
Organizational supports												
Number of support activities	2.78	2.70	0.08***	2.96	2.92	0.04	3.13	3.14	−0.01	3.12	3.07	0.05
Formal mentor	0.71	0.62	0.09***	0.69	0.70	−0.01	0.80	0.77	0.03	0.72	0.75	−0.03
Observations	6,400			5,920			5,670			4,830		

Note. AC = alternative certification; TC = traditional certification; FRPL = free or reduced price lunch; IEP = Individual Education Program.
*$p < .05$. **$p < .01$. ***$p < .001$.

science, special education, or English as second language.[3] We also control for the years a teacher has taught in their current school and their salary.

To capture the pathway into teaching, for first-year teachers, we examine their previous year's occupation. We include indicators of whether or not they were a student or working outside of education. As the type of preparation is one of the most cited differences between alternative and traditional teacher training programs, we create binary variables for whether or not the teachers report having no practice teaching[4] and no courses in teaching methods. The final background characteristic is teacher's reported preparedness. Preparedness is a scale measure of six questions of teachers rating how well prepared they were in their first year (Darling-Hammond et al., 2002; Kee, 2012). The tasks include classroom management, using a variety of instructional methods, teaching their subject matter, using computers in classroom instruction, assessing students, and selecting and adapting curriculum materials. After the scale measure was formed for each survey period, this measure was reverse coded to have higher levels of preparedness correspond with a higher value and standardized (α = .83).

Measures of School Context

School context is measured by several variables used commonly in studies of teacher attrition. These include continuous variables for the proportion of minority and free or reduced price lunch (FRPL) students and students with Individual Education Program (IEPs). Dichotomous variables are included for urban (with rural and suburban as the omitted category), whether or not the school is a charter school, or a high school.

Measures of Working Conditions

Six variables are used to characterize working conditions: teacher reports of principal effectiveness and staff collegiality, principal reports of student behavior, class size, availability of materials, hours they report teaching per week, and the principal's report of hiring difficulties. The scale measure of principal effectiveness is adapted from previous usages of SASS (e.g., Grissom, 2011). This measure of principal effectiveness uses teacher reports of their principal's leadership. As a result of changes in the survey, we use the four questions that remained constant across the four survey waves. These questions are related to principal enforcement of school rules, principal communication to the staff, recognizing staff for accomplishments, and teacher satisfaction with how the principal manages the school. Like the other scale measures used in this analysis, this measure was reverse coded and standardized before taking the school-level aggregate for all sampled teachers (α = .83–.86). Two questions make up the collegiality measure: "Most of my colleagues share my beliefs and values about what the central mission of the school should be" and "There is a great deal of cooperative

effort among the staff members." We also aggregate teacher responses on this measure to the school level (α = .67–.71).

Report of student discipline problems comes from the principal survey, where principals are asked to report on the frequency of a range of student behaviors (Ingersoll, 2001). Although more recent iterations of SASS include 13 behaviors, to maintain consistency across surveys, we are limited to a six-item scale around the following behaviors that remain consistent across surveys: physical conflict, robbery or theft, vandalism, student use of alcohol, drug use, and possession of weapons.[5] Each item was reverse coded to have an increased frequency of problem behaviors corresponding with a higher value in the student behavior problems scale and standardized (α = .73–.79).

The next three working condition variables come from the teacher survey. The measure of the availability of materials is aggregated from survey responses from all sampled teachers in the sampled schools. Before aggregating, this measure is standardized from the four response categories ranging from *strongly agree* to *strongly disagree*. Hiring difficulties comes from the school questionnaire. The school personnel who completed the survey was asked to answer a question of how easy or difficult it was to fill the vacancies for this school year in a number of fields. We focus on schools that report having hiring difficulties in the core subjects (English or language arts, mathematics, social studies, and science—either physical or life science) or special education as these are most likely to be filled by alternatively certified teachers. We characterize a school as having hiring difficulties if the principal reports that it was either "very difficult" or "somewhat difficult" to fill vacancies during each of the survey years. It is important to control for these measures of working conditions as they are likely correlated with a teacher's decision to leave their current school.

Measures of Organizational Supports

We include two measures of organizational supports for early career teachers. We create a measure with five components of a comprehensive induction program in which a teacher reports participating (Smith & Ingersoll, 2004). These include (a) whether or not a teacher participated in an induction program; (b) participation in seminars or classes for beginning teachers; (c) common planning time with other teachers in their subject area or regularly scheduled collaboration with other teachers on issues of instruction; (d) regular or supportive communication with their principal, other administrators, or department chair, and (e) extra classroom assistance (e.g., teacher aides or instructional coaches). The median number of activities that teachers report participating is three. The other organizational support that we control for is an indicator of whether or not a teacher has a formal mentor.[6]

Methods

To answer our research questions pertaining to changes in the characteristics of AC over time, we first present conditional means of the teacher characteristics, school context, and organizational supports for each of the four survey waves. To ascertain differences between AC and TC teachers, we conduct *t* tests, adjusting for clustering at the school level in each survey year.

To examine the association between teacher certification and attrition, we first estimate a binomial logit model to estimate the turnover probabilities for each teacher. This model can be estimated as:

$$\Pr(turnover)_{ijk} = \frac{e^f}{1+e^f}, \tag{1}$$

where

$$f = \beta_0 + \beta_1 ACP_i + \beta_2 S_j + \beta_3 T_i + \beta_4 O_i + \gamma_s + \delta_k + e_i.$$

The odds that teacher i turned over from school j in year k is a function of their entry pathway (ACP_i), a vector including school context and working conditions (S_j), individual teacher characteristics (T_i), and organizational supports accessed by the teacher (O_i). Models include state fixed effects (γ_s) to account for differences in the certification process by state, wave fixed effects (δ_k) to account time-specific correlates of turnover, and a random error term (e_i). In most models, we also interact ACP_i and the survey wave (δ_i) to examine the extent to which AC teachers have differential turnover rates over time. In all models, standard errors are adjusted for school level clustering, which accounts for correlation of the error term within schools.

There may be differences that are masked by focusing on turnover rather than disaggregating between teachers who moved from their current school or left teaching. The characteristics that predict moving and leaving may also differ. In Tables 3 and 4, we present the results from a multinomial logistic regression model. For presentation, we present the results separately, although they are run from the same model. Table 3 shows the relative risk ratios of leaving (as opposed to staying), and Table 4 shows the relative risk ratios of moving (as opposed to staying).

To address concerns of omitted variable bias in relation to unobserved school characteristics, we include school fixed effects when predicting turnover. This approach compares the turnover patterns between AC and TC teachers within the same school. Because only a subsample of teachers is surveyed in most schools, the SASS data are not especially suited for this within-school comparison. Schools with no AC teachers (or only AC

teachers) drop out of the analytic sample entirely as this within-school comparison cannot be made. In 1999–2000, 76.8% schools had no AC teachers with less than five years of experience, 71.6% in 2003–2004, and 67.4% in 2007–2008. Further, in schools with only one or two AC teachers, this comparison is less reliable as individual teachers may be more likely to differ on some unobserved characteristics that may predict turnover. While the school fixed effect helps account for unobserved but fixed school characteristics that may influence turnover, it reduces the generalizability of the findings as the analysis is conducted on a restricted sample. This approach also faces challenge related to the estimation of these models. The sampling weights needed to account for SASS's stratified sample are incompatible with fixed effects logistic regression in STATA. As a result, we use linear probability models with school fixed effects to obtain estimates of the predicted turnover rate.

Results

Descriptive Analysis

To answer our first research question of the changes in the proportion of beginning teachers entering through alternative certification programs, Figure 1 shows the proportion of early career teachers who are traditionally certified, alternatively certified, and uncertified. Between the 1999–2000 and 2011–2012 school years, there has been a dramatic increase in the proportion of early career teachers to enter the teaching profession through alternative pathways. In 1999–2000, 13% of early career teachers were certified through ACPs compared to 24% in the 2011–2012 school year. This increase in AC teachers corresponds with the decline in the proportion of uncertified teachers from 14% in the 1999–2000 school year to 1% in the 2011–2012 school year. This shift in certification policies is attributable to No Child Left Behind's requirement for a highly qualified teacher to staff all classrooms. The proportion of TC teachers remains relatively consistent, with around three-quarters of all teachers following traditional pathways into the teaching profession.

We next turn to our second research question addressing the changes in the characteristics of alternatively and traditionally certified teachers over time. We present conditional means for relevant teacher and school characteristics in Table 1. For each of the four survey waves, we report the mean for AC and TC teachers, the difference, and the extent to which these differences are statistically significant in a particular year.

For the first part of the decade, the only statistically significant difference between AC and TC teachers was in the 1999–2000 school year when AC teachers were *less* likely to leave the teaching profession than TC teachers (6% compared to 11%, $p < .001$). After the 2007–2008 school year, however,

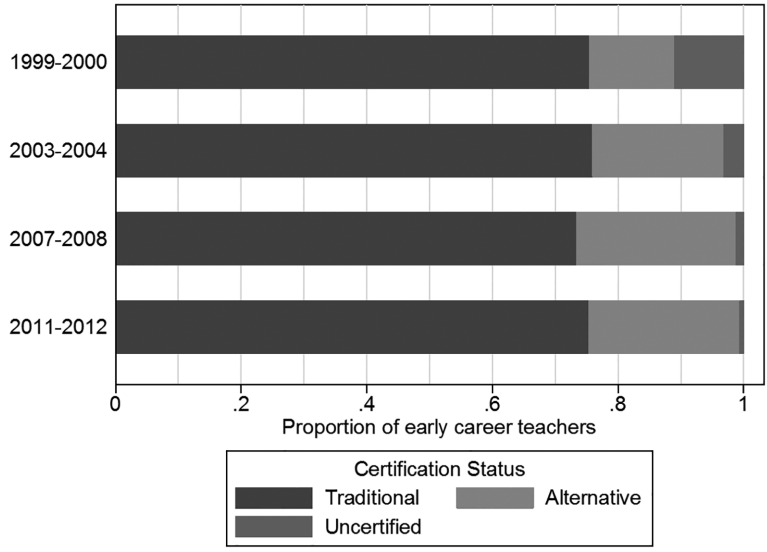

Figure 1. **Early career teachers' certification status, 1999–2012.**

27% of AC teachers either left or moved schools compared to 17% of TC teachers ($p < .001$), driven by AC teachers' greater likelihood to move schools. In results not presented in Table 1, we test for significant differences in the proportion of AC teachers who turned over across the three survey waves. With no statistically significant difference in the turnover rates of AC teachers between 1999–2000 and 2003–2004 (20% compared to 22%; $t = 1.80$; $p = .07$), by 2007–2008, AC teachers were more likely to turn over than AC teachers in 1999–2000 (20% compared to 27%; $t = 2.14$; $p = .03$). Without significant differences in the proportion of AC teachers moving to new schools, AC teachers were much more likely to leave the teaching profession following the 2007–2008 school year compared to 1999–2000 (6% compared to 11%; $t = 3.24$; $p = .001$). At the same time, the proportion of TC teachers who turned over decreased from 22% in 1999–2000 to 17% in 2007–2008 ($t = 4.72$; $p = .001$).

Among teacher characteristics, early career AC teachers were more likely than TC teachers to be male, be part of a racial/ethnic minority group, be 30 years old or over, have attended a most selective undergraduate institution, less likely to have an education degree, and more likely to teach in-demand subjects. This provides some evidence that AC programs are increasingly attracting teachers with different background characteristics into the profession. For example, in 1999–2000, the proportions of AC and TC novice

teachers from racial/minority backgrounds were similar, between 13% and 14%, but by 2003–2004, 21% of AC teachers versus 12% of TC teachers were racial/ethnic minorities ($p < .001$). In addition, across the four survey waves, between 5% and 8% more AC teachers attended a most selective college. This significant difference not found in previous studies (Cohen-Vogel & Smith, 2007; Constantine et al., 2009) is likely due to the greater disaggregation of college selectivity. It is important to note, however, that approximately two-thirds of early career AC teachers over this time period did *not* attend the most or very selective colleges (i.e., the kinds of institutions where TFA and TNTP Teaching Fellows recruit). Besides the 1999–2000 SASS, AC teachers were more likely to teach an in-demand subject across all of the survey waves (13% to 15%; $p < .001$). Alternatively certified teachers consistently have higher salaries than traditionally certified teachers, although the differences were only significantly different in 1999–2000 and 2011–2012.

For the variables related to what teachers were doing prior to becoming a teacher of record, we only examine teachers in their first year of teaching as the overwhelming majority of teachers beyond their first year of teaching spent their previous year teaching. AC teachers were consistently less likely to have been a college student before entering the teaching profession (between 12 and 33 percentage points less depending on the survey wave). AC teachers were also more likely to work outside of the field of education before becoming a teacher. For instance, in 2007–2008, 28% of AC teachers were working outside of education compared to only 5% of TC teachers ($p < .001$).

One of the consistently largest differences between AC and TC teachers is whether they had any practice or student teaching prior to becoming teacher of record, ranging from 23% (in 1999–2000) to as many as 51% in 2007–2008. There was also a widening gap between AC and TC teachers' preservice exposure to a class in teaching methods, with the difference widening from 3% for the 1999–2000 school year ($p < .05$) to 14% in 2011–2012 ($p < .001$). Finally, the gap between AC and TC teachers' feelings of preparedness during their first year of teaching widened considerably during the final two survey waves. From minimal or no statistically significant differences in 1999–2000 or 2003–2004, AC teachers reported feeling much less prepared than their TC peers.

The third section in Table 1 shows conditional means for characteristics of the schools in which AC and TC teachers work. While there were no significant differences between the types of schools in which AC or TC teachers worked in the 1999–2000 school year, in 2007–2008 and 2011–2012, AC teachers worked in schools with an average of 13% more minority students ($p < .001$). Their schools also had more students receiving free or reduced price lunch (between 4% and 9% more). AC teachers were also more likely to teach in urban high schools but not more likely to work in charter schools.

With regard to working conditions, there were few consistent differences between AC and TC teachers across the four survey waves. Although AC teachers tended to work in schools with lower principal effectiveness ratings, as reported by the sampled teachers in a school, these differences were only statistically significant in 2003–2004 and 2011–2012. We find similar differences for the level of staff collegiality, with AC teachers working in schools with slightly lower teacher reports of collegiality. Higher frequencies of student behavior problems emerged in the last two survey waves, with AC teachers working in schools with approximately a fifth of a standard deviation higher on the student discipline problems scale. Although working in classes with nearly two less students in 2007–2008 ($p < .001$), there is little evidence of a difference in class size in other survey years. AC teachers do, however, tend to work in schools where teachers describe there being less availability of materials. For instance, in 2011–2012, there is a .14 standard deviation difference ($p < .05$) between AC and TC teachers in the availability of resources scale. As one of the stated policy goals of AC programs is to fill vacancies in hard-to-staff schools, we look at whether or not AC teachers teaching in schools that report having hiring difficulties in the core subject areas or special education. Although the difference was small and not statistically significant in 1999–2000, by 2011–2012 AC teachers were more likely than TC teachers to work in schools where the principals reported hiring difficulties in core subjects but not special education. This difference is consistently around 15 percentage points ($p < .001$).

In the final section of Table 1, we show the extent to which novice AC teachers receive different organizational supports from TC teachers. While AC teachers were more likely to report having a formal mentor in the 1999–2000 school year (71% vs. 62%; $p < .001$) and received slightly more support activities (2.78 vs. 2.70; $p < .001$), there are no significant differences in assignment to these supports in later years. This finding runs counter to our initial hypothesis that AC teachers might receive additional supports to compensate for their lower levels of preservice training.

Explaining the Turnover Gap Between AC and TC Teachers

The descriptive data presented in Table 1 suggest that a gap in turnover rates between AC and TC teachers emerged since the early 2000s. In the regression analyses presented in this section, we control for school contextual variables and teacher characteristics that prior literature suggests might reduce this gap. For instance, if AC teachers are more likely to work in hard-to-staff schools with higher concentrations of children from low-income families and traditionally underserved racial/ethnic groups—factors that predict higher turnover—controlling for these observed characteristics should reduce the turnover gap. The analysis sample for this section is restricted to the 1999–2000 through 2007–2008 surveys as data for the 2011–2012

SASS, based on the 2012–2013 Teacher Follow-up Survey, had yet to be released at the time of this analysis.

Table 2 presents the binomial logit models comparing any teacher turnover to staying in the school. In the first column, we find no relationship between certification status and turnover in 1999–2000 but find evidence of an increasing gap over time. Following the 2007–2008 school year, the odds ratio on the 2007–2008 survey wave variable indicates that early career traditionally certified teachers were less likely to turnover compared to the 1999–2000 school year (.71; $p < .01$), holding years of experience in a school constant. The interaction between AC and 2007–2008 wave indicates that the gap between AC and TC teacher turnover grew between 2000 and 2008. Following the 2007–2008 school year, the adjusted odds of turnover for AC teachers are 83% greater than TC teachers (1.83; $p < .01$).

When controls are added for teacher characteristics in Column 2, there is little change in this overall relationship, suggesting that these observed teacher characteristics do little to reduce the turnover gap between AC and TC teachers following the 2007–2008 school year. The odds ratio on the interaction between certification and the 2007–2008 survey wave decreased from 1.83 to 1.78 ($p < .01$). When school contextual variables are added in Column 3, the observed turnover gap after the 2007–2008 school year again remains consistent. In this model, controls for the fraction of minority and FRPL students are associated with higher turnover rates. The addition of controls related to working conditions (Column 4) reduces the relationship between these school characteristics and turnover. Of the controls, teachers in high schools (.81, $p < .01$) and teachers in schools with more effective principals—that is, principals who enforce school rules, communicate with their staff, and recognize staff for their accomplishments—(.69, $p < .001$) are less likely to turn over. Neither staff collegiality, level of student conflict, class size, availability of materials, instructional hours worked per week, nor being in a school with hiring difficulties was associated with greater turnover.

These additional controls still do not explain the gap between AC and TC teachers in the most recent survey. In other words, conditioning on state fixed effects and controlling for teacher and school characteristics and working conditions does not explain the turnover gap between AC and TC teachers after the 2007–2008 school year. This relationship is displayed in Figure 2, where we plot the predicted probabilities for an "average" novice AC and TC teacher by holding all other teacher and school characteristics at their mean. AC teachers are no more likely to turn over until the final wave, where in 2007–2008, AC teachers' predicted probability of turnover is .25 and TC teachers is .17 ($p < .05$).

Returning to Table 2, we find evidence that an increased number of induction supports predicts lower turnover rates. For instance, with all other variables held constant, receiving an additional support is associated with

Table 2

Logistic Regression Analysis of Alternatively Certified Teacher Turnover

	(1)	(2)	(3)	(4)	(5)	(6)
Alternatively certified	0.90	0.92	0.93	0.94	0.96	1.01
2003–2004 survey	0.96	0.97	0.92	0.91	0.93	0.93
2007–2008 survey	0.74***	0.72**	0.69***	0.66**	0.70**	0.70**
AC × 2003–2004	1.16	1.14	1.09	1.06	1.06	1.05
AC × 2007–2008	1.83**	1.78**	1.76**	1.70*	1.71*	1.72*
Years teaching in current school						
1 year	0.81*	0.81*	0.80**	0.79**	0.78**	0.78**
2 years	0.64***	0.64***	0.64***	0.61***	0.61***	0.61***
3 years	0.61***	0.61***	0.63***	0.59***	0.58***	0.59***
4 years	0.50***	0.51***	0.51***	0.48***	0.47***	0.47***
Female teacher		0.98	0.93	0.90	0.90	0.90
Non-White teacher		1.14	0.97	0.97	0.99	0.99
30 or younger		1.18*	1.20*	1.20*	1.22**	1.22**
Attended most selective college		1.19	1.22	1.19	1.18	1.18
Attended very selective college		1.09	1.11	1.10	1.10	1.10
Teach in-demand subject		1.03	1.07	1.04	1.04	1.04
Union member		0.91	0.93	0.91	0.92	0.92
Salary (1,000s)		1.00	1.00	1.01	1.01	1.01
No practice teaching		0.98	0.97	0.96	0.95	0.95
No teaching methods course		1.05	1.07	1.09	1.08	1.08
Preparedness		0.96	0.98	1.00	1.02	1.02
Fraction minority students			1.35	1.19	1.19	1.19
Fraction FRPL students			1.36	1.28	1.29	1.29
Fraction of students with IEP			1.20	1.11	1.11	1.12

(continued)

Table 2 **(continued)**

	(1)	(2)	(3)	(4)	(5)	(6)
Urban			1.08	1.08	1.09	1.09
Charter school			1.31	1.26	1.19	1.19
High school			0.89	0.83*	0.81**	0.81**
Principal effectiveness				0.69***	0.71***	0.71***
Staff collegiality				1.04	1.06	1.06
Student behavior problems				1.00	1.00	1.00
Class size				0.99	0.99	0.99
Availability of materials				0.96	0.96	0.96
Instructional hours per week				1.00	1.00	1.00
Hiring difficulties (core subjects)				1.02	1.01	1.01
Hiring difficulties (special education)				1.02	1.02	1.02
Number of induction supports					0.91**	0.91**
Mentor					0.97	1.00
AC × Induction Supports						1.02
AC × Mentor						0.86
Constant	0.26***	0.21***	0.20***	0.28**	0.34*	0.34*
Observations	18,080	18,080	18,080	18,080	18,080	18,080
−2 log likelihood	1,342,028	1,338,689	1,329,892	1,313,853	1,310,739	1,310,596

Note. Estimates adjusted using Schools and Staffing Survey (SASS) probability weights. Logistic regression coefficients reported as odds ratios. Standard errors (not reported) are clustered at the school level. All models include state fixed effects. TC turnover = 3,130. AC turnover = 760. AC = alternative certification; TC = traditional certification; FRPL = free or reduced price lunch; IEP = Individual Education Program.
*$p < .05$. **$p < .01$. ***$p < .001$.

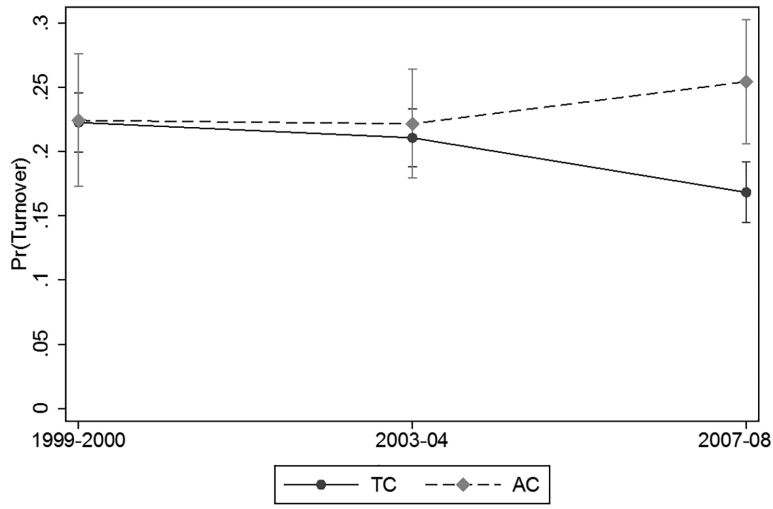

Figure 2. **Predicted probability of turnover for AC and TC teachers.**

Note. Predicted probabilities from logistic regression model with full controls (see Table 2, Column 5). Estimates adjusted using Schools and Staffing Survey (SASS) probability weights. Besides entry pathway and survey wave, all variables held at their mean to predict turnover rates for an "average" early career teacher. AC = alternative certification; TC = traditional certification.

a .91 reduction in the odds of turning over ($p < .01$). We found no evidence that having a mentor is associated with lower turnover rates. In other studies, mentoring has the strongest impact on reducing turnover when there is a subject and/or grade match between mentor and mentee (Smith & Ingersoll, 2004), which we are unable to specify. We also examined the possibility that alternatively certified teachers may benefit differentially from these inductive supports (Column 6) but find no evidence in support of this hypothesis.

Next, we use multinomial logit models to separate turnover into teachers who left the profession (Table 3) and those who moved schools (Table 4). In Column 1 of Table 3, the relative risk ratio for alternatively certified is less than 1, indicating that AC teachers were less likely to leave than TC teachers (.57, $p < .01$). By 2003–2004 school year, the relative risk of AC teachers leaving are 68% greater than TC teachers (1.68, $p < .10$). Following the 2007–2008 school year, AC teachers had more than two and a half times the relative risk of leaving than TC teachers in 2007–2008 (2.66, $p < .001$). Adding teacher, school context, and working conditions controls in the next three columns does little to change the AC/TC leaving gap in any year.

Table 3

Multinomial Logistic Regression Analysis (Leaving vs. Staying)

	(1)	(2)	(3)	(4)	(5)	(6)
Alternatively certified	0.57**	0.57**	0.57**	0.57**	0.58**	0.76
2003–2004 survey	0.93	0.97	0.91	0.90	0.93	0.92
2007–2008 survey	0.72**	0.72*	0.68**	0.65*	0.69	0.68*
AC × 2003–2004	1.68	1.60	1.51	1.50	1.48	1.46
AC × 2007–2008	2.66***	2.54***	2.44**	2.39**	2.41**	2.54**
Years teaching in current school						
1 year	0.88	0.88	0.88	0.86	0.85	0.85
2 years	0.58***	0.59***	0.59***	0.57***	0.56***	0.56***
3 years	0.63**	0.66*	0.69*	0.65*	0.64*	0.65*
4 years	0.52**	0.56**	0.56*	0.53**	0.52**	0.52**
Female teacher		0.98	0.96	0.94	0.93	0.93
Non-White teacher		1.27	1.02	1.02	1.04	1.04
30 or younger		1.10	1.12	1.12	1.14	1.14
Attended most selective college		1.47**	1.49**	1.45*	1.43*	1.43*
Attended very selective college		1.09	1.11	1.10	1.09	1.10
Teach in-demand subject		1.17	1.19	1.14	1.14	1.14
Union member		0.82	0.88	0.87	0.89	0.89
Salary (1,000s)		1.00	1.00	1.00	1.00	1.00
No practice teaching		0.92	0.88	0.88	0.87	0.88
No teaching methods course		1.45*	1.46*	1.48*	1.47*	1.47*
Preparedness		0.97	0.99	1.01	1.04	1.04
Fraction minority students			1.70**	1.47	1.48	1.47
Fraction FRPL students			1.31	1.25	1.26	1.26
Fraction of students with IEP			1.24	1.15	1.15	1.17

(continued)

Table 3 **(continued)**

	(1)	(2)	(3)	(4)	(5)	(6)
Urban			1.10	1.08	1.09	1.09
Charter school			1.90***	1.92***	1.78**	1.77**
High school			1.06	0.94	0.91	0.90
Principal effectiveness				0.67***	0.69***	0.70***
Staff collegiality				1.12	1.14	1.14
Student behavior problems				1.08	1.09	1.08
Class size				0.99	0.99	0.99
Availability of materials				0.98	0.99	0.99
Instructional hours per week				0.99	0.99	0.99
Hiring difficulties (core subjects)				1.00	0.98	0.98
Hiring difficulties (special education)				1.07	1.08	1.08
Number of induction supports					0.89**	0.88**
Mentor					0.89	1.00
AC × Induction Supports						1.02
AC × Mentor						0.59
Constant	0.12***	0.13***	0.10***	0.15**	0.21**	0.20**
Observations	18,080	18,080	18,080	18,080	18,080	18,080
−2 log likelihood	1,712,276	1,703,889	1,691,263	1,673,545	1,669,683	1,668,578

Note. Estimates adjusted using Schools and Staffing Survey (SASS) probability weights. Multinomial logistic regression coefficients reported as the relative risk ratio. Standard errors (not reported) are clustered at the school level. All models include state fixed effects. TC leavers = 1,510. AC leavers = 360. AC = alternative certification; TC = traditional certification; FRPL = free or reduced price lunch; IEP = Individual Education Program. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 4

Multinomial Logistic Regression Analysis (Moving vs. Staying)

	(1)	(2)	(3)	(4)	(5)	(6)
Alternatively certified	1.22	1.27	1.28	1.31	1.32	1.18
2003–2004 survey	0.96	0.95	0.90	0.91	0.91	0.92
2007–2008 survey	0.76*	0.72*	0.69**	0.68*	0.70*	0.70*
AC × 2003–2004	0.94	0.94	0.91	0.88	0.88	0.89
AC × 2007–2008	1.45	1.44	1.46	1.40	1.40	1.39
Years teaching in current school						
1 year	0.76*	0.75*	0.75**	0.73**	0.72**	0.72**
2 years	0.68**	0.67**	0.67**	0.64***	0.64***	0.64***
3 years	0.58***	0.57***	0.58***	0.55***	0.54***	0.54***
4 years	0.48***	0.48***	0.47***	0.45***	0.44***	0.44***
Female teacher		0.98	0.90	0.87	0.86	0.86
Non-White teacher		1.04	0.93	0.93	0.94	0.94
30 or younger		1.26*	1.27*	1.28*	1.28*	1.28*
Attended most selective college		0.98	1.01	1.00	0.99	0.99
Attended very selective college		1.09	1.11	1.10	1.10	1.10
Teach in-demand subject		0.92	0.97	0.95	0.95	0.95
Union member		0.99	0.96	0.94	0.95	0.95
Salary (1,000s)		1.01	1.01	1.01	1.01	1.01
No practice teaching		1.03	1.03	1.03	1.02	1.01
No teaching methods course		0.76	0.78	0.80	0.79	0.79
Preparedness		0.96	0.98	1.00	1.01	1.01
Fraction minority students			1.14	1.01	1.02	1.02
Fraction FRPL students			1.40	1.31	1.32	1.32
Fraction of students with IEP			1.18	1.09	1.08	1.08

(continued)

Table 4 **(continued)**

	(1)	(2)	(3)	(4)	(5)	(6)
Urban			1.06	1.06	1.07	1.07
Charter school			0.73	0.68	0.66*	0.66
High school			0.75**	0.75**	0.73**	0.74**
Principal effectiveness				0.71***	0.72***	0.72***
Staff collegiality				0.98	0.99	0.99
Student behavior problems				0.93	0.93	0.93
Class size				0.99	0.99	0.99
Availability of materials				0.94	0.94	0.94
Instructional hours per week				1.00	1.00	1.00
Hiring difficulties (core subjects)				1.05	1.04	1.04
Hiring difficulties (special education)				0.97	0.97	0.97
Number of induction supports					0.93	0.93
Mentor					1.04	1.01
AC × Induction Supports						1.00
AC × Mentor						1.14
Constant	0.14***	0.09***	0.09***	0.13***	0.14**	0.15**
Observations	18,080	18,080	18,080	18,080	18,080	18,080
Pseudo R^2	1,712,276	1,703,889	1,691,263	1,673,545	1,669,683	1,668,578

Note. Estimates adjusted using Schools and Staffing Survey (SASS) probability weights. Multinomial logistic regression coefficients reported as the relative risk ratio. Standard errors (not reported) are clustered at the school level. All models include state fixed effects. TC movers = 1,610. AC movers = 390. AC = alternative certification; TC = traditional certification; FRPL = free or reduced price lunch; IEP = Individual Education Program.

*$p < .05$. **$p < .01$. ***$p < .001$.

Comparing movers and stayers in Table 4, we find minimal evidence of a gap between AC and TC teachers. Although the direction of the relative risk ratio on the certification and 2007–2008 wave has a similar magnitude to the corresponding odds ratio in Table 2, none of the main results are statistically significant. Besides a trend toward fewer TC teachers moving schools in 2007–2008 than in 1999–2000 (.76, $p < .05$), AC teachers did not have greater odds than TC teachers of moving schools. Adding the teacher and school controls does little to alter this relationship. In summary, the overall pattern suggests that the higher turnover rates after the 2007–2008 school year are driven, in large part, by a gap between alternatively and traditionally certified teachers leaving the profession rather than moving schools.

Differences in the magnitude and significance between Tables 3 and 4 suggest important differences among teachers who are predicted to leave and move. In Column 5, teachers who come from the most selective colleges have a greater relative risk of leaving compared to stayers (1.43, $p < .05$), as do teachers who did not have a course in teaching methods (1.47, $p < .05$). Among school characteristics, the proportion of minority students (1.48, $p < .10$) and working in a charter school (1.78, $p < .01$) are associated with a greater relative risk of leaving compared to stayers. Although we find no evidence that having a mentor is associated with a decreased relative risk of leaving or moving, mentoring is more beneficial for AC than TC teachers, predicting a decreased relative risk of leaving (.59, $p < .10$).

Robustness Checks

We examine the robustness of these estimates by reestimating these models on the sample of first-year teachers and with the inclusion of school fixed effects. The first-year sample in Table A2 provides the most straightforward counterfactual with which to estimate the influence of a teacher's pathway into teaching on turnover status. In their first school, no teachers have had the opportunity to move schools, an action that may signal that they will be more likely to move in the future or that they are a better match for their current school (where we observe them) than they were in their first school. Although first-year AC teachers are more likely to turn over following the 2007–2008 school year and the magnitude of the odds ratio is similar to that seen in Column 5 of Table 2 (1.71 vs. 1.42), the estimate is not statistically significant at conventional levels. The lack of significance is driven by the loss of sample size and the lower turnover rates following teachers' first year. This same pattern of comparable, but statistically insignificant estimates are observed for the multinomial logit models.

In Table A3, the inclusion of school fixed effects to the models allows us to account for unobserved school characteristics that likely influence teacher turnover. Without controlling for these characteristics, the extent to which

these characteristics shape teachers' turnover decisions would bias our estimates. To account for the survey weights and the school fixed effects, we estimate these models as linear probability models.[7] Although the analytic sample is greatly reduced, we still find evidence that the inclusion of school fixed effects does not diminish the turnover gap between AC and TC teachers. Alternatively certified teachers are predicted to turnover approximately 7% more likely than traditionally certified teachers in their school. Unlike the previous analysis where turnover was driven by the greater likelihood of teachers leaving, the estimates with school fixed effects find no evidence that AC teachers are more likely to leave teaching than TC teachers. However, AC teachers are approximately 6% more likely than TC teachers to move to a new school.

The inclusion of the school fixed effects reduces the bias attributable to unobserved characteristics unique to each school. Yet, the school fixed effect gains its identification from limiting the sample to schools that have both alternatively and traditionally certified teachers in a given year, limiting the generalizability of these results. In mean comparisons between the analysis sample and the one used for the models with school fixed effects, there are notable differences. Teachers in the school fixed effect sample are more likely to work in hard-to-staff urban schools with much higher concentrations of low-income and minority students. Compared to the full sample, statistically significant differences of teachers' characteristics include a greater likelihood for teachers in this subsample to be male, older than 30, non-White, have attended a most selective college, and teach an in-demand subject. These teachers also have a greater likelihood of turning over and to come from the 2007–2008 sample where we had previously observed the largest turnover gap between AC and TC teachers. Unlike previous models that can be generalized to a national sample of early career public school teachers, these estimates are only generalizable to the sample used to obtain these estimates. Nevertheless, Table A3 shows evidence of the robustness of the finding that AC teachers are more likely to turn over than TC teachers.

Teachers' Reasons for Moving Schools and Leaving the Profession

The final part of this analysis uses the 2008–2009 Teacher Follow-up Survey to explore early career teachers' reasons for leaving the profession or moving to a new school. Separate surveys were administered to voluntary leavers and movers.[8] They were asked to rate the level of importance of a variety of factors that influenced their decision to leave their previous school. Factors were rated on a Likert scale ranging from 1 (*not at all important*) to 5 (*extremely important*). Because of the survey's focus on voluntary turnover, teachers who did not return to their school as a result of school or district staffing action did not answer this set of questions.[9] The surveyed teachers include teachers whose turnover was voluntary or related to

changes in life circumstances, such as pregnancy, change in residence, or retirement.

Because of the different surveys used for stayers and leavers, comparisons presented in Table 5 are made between AC and TC teachers separately depending on whether they left the profession or moved schools. Among teachers who left the profession, AC teachers were more likely to leave for voluntary reasons compared to TC teachers (.32 vs. −.06, $p < .05$). This difference is driven by AC teachers' report that they left teaching for better salary and benefits, with a difference of nearly three-quarters of a standard deviation between AC and TC teachers (.49 vs. −.22, $p < .05$). Among the life circumstances listed, there are no statistically significant differences between AC and TC teachers in regards to their reported decision to leave the teaching profession. For movers, there are no notable differences between AC and TC for the reasons given as to why they left their current school.

Discussion

The descriptive and associational evidence presented in this article suggests increasing differences between early career AC and TC teachers. These differences are seen in modest changes in the characteristics, training, types of schools in which these teachers work, and attrition rates. In the 1999–2000 school year, there were no discernable differences between the turnover rates among AC and TC teachers—with some evidence that AC teachers were actually slightly less likely to leave the profession than TC teachers. By the 2007–2008 school year, AC teachers' predicted turnover rates were 10 percentage points greater than TC teachers.

Between the 1999–2000 school year and 2011–2012, we find evidence that AC teachers are less likely to have had practice teaching or a course in teaching methods. During this period, AC teachers also report decreasing feelings of preparedness when they begin their first year of teaching. Yet, when we add variables that are attributed to differences in AC and TC teachers' backgrounds and school contexts in the regression analysis, these controls do not measurably reduce the gap between pathway into teaching and turnover rates. Even when conditioning on a number of teacher and school characteristics, this study finds evidence of a positive and sizable turnover gap between early career AC and TC teachers between the 2007–2008 and 2008–2009 school year. This finding should be interpreted in the broader context of the Great Recession, which hit the United States in the middle of the 2007–2008 school year and resulted in over 100,000 teacher layoffs nationwide, which were more likely to impact early career teachers (Goldhaber, Strunk, Brown, & Knight, 2015).

A few limitations of this study should be noted. First, although we controlled for school characteristics, there are likely to be additional school

Table 5
Reasons for Leaving the Profession and Moving Schools

	AC	TC	*t* Statistic
Reason for leaving the position of K–12 teacher			
Volunteer attrition (total)	.32	−.06	−2.10*
To take courses to improve career in education	.49	−.09	−1.44
For better salary or benefits	.49	−.22	−2.35*
To take courses to improve career outside education	.01	−.05	−0.30
To pursue a position other than K–12 teacher	.32	.04	−1.03
Dissatisfied with teaching as a career	.12	0	−0.53
Classroom factors[a]	−.19	.01	1.05
School factors[b]	.02	−.04	−0.30
Student performance factors[c]	.09	.05	−0.18
Life circumstances (total)	−.23	.10	1.42
Change in residence	−.17	.04	0.93
Pregnancy/childrearing	−.20	.03	1.27
Health	.01	.15	0.61
Retirement	−.02	.01	0.14
Other factors	.01	−.04	−0.24
Reason for moving to a new school			
Life circumstances (total)	−.19	−.05	0.70
Volunteer attrition (total)	0	0	0.03
For better salary or benefits	−.19	−.24	−0.47
Classroom factors	.20	.08	−0.39
School factors	−.02	.13	0.73
Student factors	.07	.03	−0.14
Other factors	.31	.01	−1.28
Change in residence	−.18	−.03	0.71
Health	−.07	−.07	0
Leaver observations	50	150	
Mover observations	80	240	

Note. Estimates adjusted using Schools and Staffing Survey (SASS) probability weights. All measures have been standardized for greater interpretability. Test of significance adjusted for clustering at the school level. AC = alternative certification; TC = traditional certification.

[a]Classroom factors include autonomy over classroom, dissatisfaction with the number of students, unpreparedness to mainstream special education students, and intrusions on my teaching time.

[b]School factors include dissatisfaction with workplace facilities, handling of student discipline problems, administrators, administrator support, and the lack of influence over school policies.

[c]Student factors include dissatisfaction with student assessments and accountability, compensation linked to student performance, the support for preparing students for assessments, influence of assessments on the curriculum, and other aspects of accountability.

*$p < .05$.

context variables that make it more difficult or less desirable to teach in the schools where some AC teachers are hired. This form of selection bias is a concern because the design of ACPs is to systematically recruit teachers in subjects with shortages to work in schools with trouble filling teaching positions. If unmeasured characteristics of these schools are also associated with higher turnover rates, the estimates presented in this article would overstate the size of the AC/TC turnover gap. To address this issue, we used school fixed effects and still found higher turnover rates among AC than TC teachers in the 2007–2008 SASS. While this specification addresses the issue of unobserved school characteristics, there are likely unobserved teacher characteristics that may influence their decision to turn over, biasing our estimates. For instance, someone who uses an alternative certification program to transition into the teaching profession in the middle of her career will differ from a colleague who just graduated from the preparation program at the local state university in ways that could influence turnover. In other words, we cannot fully separate the impact of background characteristics or teacher training program characteristics in explaining the AC/TC turnover gap.

Second, the models presented for recently hired teachers use a subsample of SASS teacher participants with less than five years of experience. It is possible that a second- to fifth-year teacher has already made a move from one school to another, which we are unable to observe. For example, if their first school move was voluntary, the teacher may be less likely than others to move or leave the profession at the end of the year if their current school is a better match for their preferences than the schools of other recently hired teachers. Longitudinal data over more than one year would give a clearer indication of the labor market patterns among AC teachers. In particular, annual repeated measures data could help us explain how certification status may correspond with the sorting of new teachers across schools. For instance, given research indicating short careers for effective teachers in challenging school contexts (Boyd, Lankford, Loeb, & Wyckoff, 2005), or increased likelihood of transfer of teachers from schools with higher concentrations of low-income or minority students (Clotfelter et al., 2011; Goldhaber, Gross, & Player, 2011; Scafidi, Sjoquist, & Stinebrickner, 2007), we may find the AC program to be an easier entry pathway into teaching through positions in challenging schools. However, with a few years of experience and a credential in hand, these teachers may find it easier to transfer to schools with preferable working conditions. If this were the case, alternative certification programs could exacerbate teacher turnover in the schools that need the highest quality teachers and most organizational stability. In this case, alternative certification would not be serving as a long-term solution to the broader policy problem of the need for high-quality teachers to staff schools with high concentrations of low-performing, low-income, or African American and Hispanic students. Further research on this topic should work toward answering this pressing question.

Third, with estimates based on national data, we are unable to address programmatic heterogeneity that exists across ACPs. Previous research has documented differences among programs as well as the teachers who enter through these varied pathways (Boyd et al., 2008; Constantine et al., 2009; Henry et al., 2014; Humphrey & Wechsler, 2007). At most, our models include state fixed effects to account for state rules and regulations that shape a state's ACPs. A more robust analysis could utilize state-level data with information on a teacher's specific certification program. If attrition rates were found to be lower among teachers from a particular program, holding school and background variables constant, we would have stronger evidence than this study can provide about the supports that may lead to lowering turnover rates among AC teachers. State administrative databases could further explore the differences in the characteristics and behaviors of teachers *within* a preparation program, another important source of variation that this article is unable to attend to.

The lack of substantial preservice training among alternatively certified teachers continues to concern critics who believe AC teachers are often unprepared to enter the teaching profession. These concerns are highlighted in a recent report from the National Center on Teacher Quality (Greenberg, Walsh, & McKee, 2014) that finds that of the 85 alternative certification programs in their report, most had inadequate admission standards, did not ensure content proficiency, and offered little classroom supervision. With evidence that AC teachers are more likely to turn over, the lack of support for these AC teachers is problematic. With some evidence that various organizational supports for new teachers may deter turnover, future research on alternative certification could explore the ways in which AC teachers may differentially benefit from various organizational supports as the success of alternative certification programs relies on teachers' successful learning on the job. Otherwise, alternative certification risks exacerbating the churn in the teacher labor market where teachers work in hard-to-staff schools for brief periods before leaving the teaching profession or moving to schools with easier working conditions.

Table A1

Definition of Measures Used in Descriptive and Regression Analysis

Employment status	
Turnover	A dichotomous variable where 1 = not teaching in same school as last year and 0 = currently teaching in same school.
Movers	A dichotomous variable where 1 = teacher moved to a new school and 0 = currently teaching in same school.
Leavers	A dichotomous variable where 1 = teacher left the teaching profession and 0 = currently teaching in same school.
Teacher characteristics	
Female	A dichotomous variable where 1 = female and 0 = male
Racial/ethnic minority	A dichotomous variable where 1 = Black or African American, Hispanic, Asian, Native Hawaiian or other Pacific Islander, or American Indian and 0 = White
Under 30	A dichotomous variable where 1 = teacher is 30 years of age or younger and 0 = teacher is older than 30.
Years in current school	A continuous variable ranging from 0 to 4.
Attended most selective college	A dichotomous variable where 1 = teacher's undergraduate college/university has Barron's classification of very selective and 0 = Barron's classification is competitive, less competitive, or noncompetitive.
Attended very selective college	A dichotomous variable where 1 = teacher's undergraduate college/university has Barron's classification of "most" and "highly" selective and 0 = Barron's classification is competitive, less competitive, or noncompetitive.
Teach in-demand subject	A dichotomous variable where 1 = teacher's subject is mathematics, science, special education, or English as second language and 0 = all other subjects.
Union member	A dichotomous variable where 1 = teacher is a union member and 0 = teacher is not a union member.

(continued)

Table A1 **(continued)**

Salary (1,000s)	A continuous variable of the base teaching salary for the entire school year, scaled in $1,000s
College student last year	A dichotomous variable where 1 = teacher was a college student last year and 0 = other teachers; restricted to first-year teachers
Working outside education last year	A dichotomous variable where 1 = teacher was working in an occupation outside the field of education and 0 = other teachers; restricted to first-year teachers
No practice teaching	A dichotomous variable where 1 = teacher had practice teaching and 0 = no practice teaching.
No course in teaching methods	A dichotomous variable where 1 = teacher had *no* graduate or undergraduate courses on teaching methods and 0 = all others
Preparedness	On a scale of 1 = *very well prepared* and 4 = *not at all prepared*, teachers report on the following: classroom management, using a variety of instructional methods, teaching their subject matter, using computers in classroom instruction, assessing students, and selecting and adapting curriculum materials; measure standardized for each survey period (α = .83)
School context	
Fraction minority students	Percentage of non-White students enrolled in a school.
Fraction FRPL students	Percentage of students eligible for the federal free or reduced-price lunch program
Fraction of students with IEP	Percentage of students with Individualized Education Plans (IEPs).
Urban	A dichotomous variable where 1 = if the school is classified as urban by U.S. census
Charter school	A dichotomous variable where 1 = if teacher worked in a charter school
High school	A dichotomous variable where 1 = students taught by teacher is designated as a high school
Working conditions	
Principal effectiveness	On a scale of 1 = *strongly disagree* and 4 = *strongly agree*, teachers report on the following: principal enforcement of school rules, principal communication to the staff, recognizing staff for accomplishments, and teacher satisfaction with how the principal manages the school; Measure standardized for each survey period and aggregated for all sampled teachers in a school (α = .83–.86)

(continued)

Table A1 **(continued)**

Staff collegiality	On a scale of 1 = *strongly disagree* and 4 = *strongly agree*, teachers report on their school staff's shared beliefs and values about what the central mission of the school and the level of cooperative effort among the staff members; measure standardized for each survey period and aggregated for all sampled teachers in a school (α = .67–71)
Student discipline problems	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 (α = .73–.79)
Class size	Average number of students in teacher's class during 2007–2008 school year
Availability of materials	On a scale of 1 = *strongly disagree* and 4 = *strongly agree*, teacher's agreement with statement: Necessary materials such as textbooks, supplies, and copy machines are available as needed by the staff; aggregated for all respondents in a school; measure standardized for each survey period
Hours teach in a week	Average number of hours spent teaching in a given week
Hiring difficulties in core subject areas	A dichotomous variable where 1 = school reports hiring English or language arts, mathematics, social studies, or science teachers as "very difficult" or "somewhat difficult" and 0 = no hiring difficulties
Hiring difficulties in special education	A dichotomous variable where 1 = school reports hiring special education teachers as "very difficult" or "somewhat difficult" and 0 = no hiring difficulties
Organizational supports	
Induction program participant	A dichotomous variable where 1 = participated in an induction program in their first year of teaching and 0 = no induction program
Number of support activities	A categorical variable ranging between 0 and 4, indicating the number of support activities for first-year teachers; activities include participation in seminars or classes for beginning teachers; common planning time with other teachers in their subject area or regularly scheduled collaboration with other teachers on issues of instruction; regular or supportive communication with their principal, other administrators, or department chair; and extra classroom assistance (e.g., teacher aides or instructional coaches)
Formal mentor	A dichotomous variable where 1 = teacher worked closely with a mentor assigned by the school or district and 0 = no formally assigned mentor

Table A2

Logistic Regression Analysis of the Likelihood of Alternatively Certified Teacher Turnover, First Year Teachers

	Binomial Logit: Turnover Versus Staying				Multinomial Logit: Leaving Versus Staying				Multinomial Logit: Moving Versus Staying			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Alternatively certified	1.10	1.11	1.25	1.23	0.75	0.72	0.76	0.75	1.35	1.46	1.75	1.71
2003–2004 survey	1.01	1.01	0.96	0.97	1.02	1.05	1.00	1.02	0.99	0.99	0.91	0.91
2007–2008 survey	0.80	0.79	0.88	0.92	0.83	0.92	1.12	1.17	0.77	0.73	0.75	0.77
AC × 2003–2004	1.03	1.00	0.90	0.94	1.49	1.33	1.19	1.22	0.82	0.86	0.80	0.84
AC × 2007–2008	1.55	1.55	1.40	1.42	1.43	1.27	1.15	1.18	1.66	1.81	1.65	1.65
Constant	0.31**	0.39	0.17*	0.22	0.11***	0.19*	0.05*	0.08*	0.20**	0.20*	0.14	0.16
Observations	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080
−2 log likelihood	306,689	305,363	296,964	295,754	394,569	389,647	374,366	372,960	3945,69	389,647	374,366	372,960

Note. Sample limited to first-year teachers. Estimates adjusted using Schools and Staffing Survey (SASS) probability weights. Logistic regression coefficients reported as odds ratios (Columns 1–4). Multinomial logistic regression coefficients reported as the relative risk ratio (Columns 5–12). Standard errors (not reported) are clustered at the school level. All models include state fixed effects. Full results are available from the author upon request.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table A3

Coefficients From Linear Probability Models (LPM) of the Likelihood of Alternatively Certified Teacher Turnover

	LPM: Turnover Versus Staying	LPM:Leaving Versus Staying	LPM:Moving Versus Staying
Alternatively certified	0.07*	0.02	0.06*
	(0.02)	(0.45)	(0.03)
Class size	−0.00	−0.00	0.00
	(0.50)	(0.16)	(0.70)
Instructional hours per week	0.00	−0.00	0.00
	(0.81)	(0.74)	(0.52)
Female teacher	−0.01	−0.01	−0.00
	(0.82)	(0.80)	(0.96)
Non-White teacher	−0.06	−0.03	−0.02
	(0.36)	(0.49)	(0.60)
30 or younger	−0.01	0.01	−0.02
	(0.69)	(0.59)	(0.33)
Attended most selective college	0.05	0.02	0.03
	(0.32)	(0.67)	(0.32)
Attended very selective college	0.00	−0.04	0.05
	(0.93)	(0.17)	(0.08)
In-demand teachers	0.02	−0.01	0.03
	(0.60)	(0.61)	(0.20)
Union member	0.00	−0.01	0.02
	(0.92)	(0.67)	(0.65)
Salary	−0.00	0.00	−0.00
	(0.55)	(0.41)	(0.12)
Years teaching in current school			
1 year	−0.03	0.02	−0.04
	(0.41)	(0.54)	(0.14)
2 years	−0.09*	−0.04	−0.05
	(0.03)	(0.22)	(0.12)
3 years	−0.10*	−0.03	−0.07*
	(0.03)	(0.39)	(0.03)
4 years	−0.16***	−0.10**	−0.06
	(0.00)	(0.01)	(0.12)
Observations	3230	3230	3230

Note. Estimates adjusted using Schools and Staffing Survey (SASS) school-level probability weights. Coefficients from linear probability models. All models include school fixed effects. Standard errors are clustered at the school level.
*$p < .05$. **$p < .01$. ***$p < .001$.

Notes

[1]To address the concern that missing data may bias our estimates, we replicated the data using multiple imputation. The MI suite of commands in Stata was used to estimate 10 imputed data sets. We specified initial values through the MCMC procedure with a 10,000 burn in and 2,500 burn between. Based on estimation of 10 imputed data sets, the results are qualitatively similar. The direction and magnitude of coefficients is generally consistent. Among the coefficients of interest, estimates only become more precise. Full results are available from the author upon request.

[2]The principal appraisal of teachers' employment status in the subsequent year creates a risk for the incorrect designation of a teacher's actual employment status. To test, we compared the principal's response to the teacher self-report among first-year teachers who are part of the Beginning Teacher Longitudinal Study. We find that the overall measure of attrition is accurate.

[3]A couple of slight changes to the surveys across time should be noted. Between the 1999–2000 and 2003–2004 surveys, "Earth/space science/geology" was replaced with "Earth sciences"; "English as a second language" was changed from a unique response category to three separate categories including general, Spanish, or other languages ESL/bilingual education.

[4]The response categories for the question on practice teaching shift both after the 1999–2000 survey, shifting from "I had no practice teaching," "4 weeks or less," "5–9 weeks," and "10 weeks or more" to "I had no practice teaching," "4 weeks or less," "5–7 weeks," "8–11 weeks," "12 weeks or more" on the 2003–2004 survey. Furthermore, beginning on the 2007–2008 survey, a branching question first asks "Did you have any practice or student teaching?" before asking about how long the student teaching lasted. Across these different measures, we focus only on those teachers who reported no practice teaching, the one element that remained relatively consistent.

[5]The one remaining difference in this measure is changes in the language of the Likert scale. For the 1999–2000 survey, the 4-point scale asked principals ranged from *a serious problem in the school* to *not a problem in this school*. Beginning with the 2003–2004 survey, principals were given five response categories ranging from *happens daily* to *never happens*.

[6]With an increased focus on mentoring in the 2011–2012 survey, the structure of the survey changes, adding a dedicated question for mentoring ("In your FIRST year of teaching, did you work closely with a master or mentor teacher who was assigned by your school or district?") compared to being imbedded in a series of supports during their first year of teaching in previous waves of Schools and Staffing Survey.

[7]When running this model using the *xtlogit* command in STATA without survey weights, the odds ratio on alternative certification is 1.18 with a p value of .22. The direction of this odds ratio is consistent with differences reported between alternatively certified (AC) and traditionally certified (TC) teachers in Table 2. The magnitude of this estimate is smaller.

[8]The analytic sample was reduced as a result of nonresponse and a focus on teachers who voluntarily left teaching or moved schools. Across the surveys for leavers and movers, the response rates were 81.9% and 83.6%, respectively (Graham et al., 2011). Two hundred leavers and 130 movers reported not having their contract renewed. Finally, movers who report staying in the same school but in a non-teaching position do not respond on their decision to leave the school. In summary, this sample includes 200 leavers and 320 movers.

[9]In results not shown, among movers, 19% of AC teachers and 26% of TC teachers report not returning to their school due to school or district staffing action. This difference is not statistically significant ($t = 0.78$). For leavers, 17% of AC teachers and 22% of TC teachers report turnover as involuntary. This difference is not statistically significant ($t = .88$).

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