Does Teacher Preparation Location Predict Novice Teacher Turnover? Descriptive Evidence from Connecticut

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Abstract

Novice teachers frequently turnover and create churn associated with large costs to districts. In any year, many states' initial licenses represent a large fraction of teachers prepared out-of-state. This is despite teachers expressing strong preferences to work near their hometown or preparation program. I examine the relationship between teachers' preparation location and their probability of turnover using three years of teacher employment data from Connecticut. Teachers who prepared out-of-state are about seven percentage points more likely to leave the Connecticut public school system, and about three percentage points less likely to transfer within district when compared to their peers who prepared in-state. Out-of-state preparation was also associated with a seven percentage point higher probability of transfer within a district for teachers working in districts along the Connecticut border. These findings suggest novice teachers have different preferences depending on whether they were trained in- or out-of-state, and, for those trained out-of-state, depending on where they work relative to the state border. The results may encourage those doing hiring to place emphasis on preparation location or hometown, especially when all other hiring characteristics are equal.

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Researchers, policy-makers, and educators have an interest in understanding why so many novice teachers leave their first school. They hope that armed with such knowledge, novice turnover can decrease and its ill effects be muted. Historically, data shows that anywhere between 45 to 85% of novice teachers move jobs by their fifth year (Ingersoll, 2001; Papay, Bacher-Hicks, Page, & Marinell, 2017), thus creating major monetary, human capital, and student learning costs to schools (Barnes, Schaefer, & Crowe, 2007; Papay & Kraft, 2015; Ronfeldt, Loeb, & Wyckoff, 2013). At the same time, researchers have identified key factors that predict novice teacher turnover, including on-the-job factors (e.g., administrator support, school climate, and person-organization job fit) and the pull of more attractive alternatives (Boyd et al., 2011; Feng, 2009; Kraft, Marinell, & Yee, 2016; Lankford, Loeb, & Wyckoff, 2002; Player, Youngs, Perrone, & Grogan, 2017; Weiner & Higgins, 2017). And yet, despite knowledge about possible causes of the problem, novice teachers continue transferring or exiting schools at high rates. The persistence of turnover suggests there may be other important, and underexplored, factors impacting novice teacher turnover.

The aforementioned turnover research ignores an important paradox about the geographic preferences of novice teachers. On one hand, evidence shows that the expressed preferences of novice teachers is to work in labor markets close to home (Boyd, Lankford, Loeb, & Wyckoff, 2005; Reininger, 2012), and schools prefer to hire local applicants (Killeen, Loeb, & Townsend, 2015). Importantly, Boyd et al. (2005) suggest that individuals the expressed preferences are slightly stronger for home when making employment decisions, relative to making college decisions. On the other hand, the composition of out-of-state prepared teachers holding initial

licenses exceeded 20% in 27 states during the 2008-2009 school year (Bastian & Henry, 2015).[1] These intersecting realities suggest an undeniable empirical puzzle where the expressed and revealed preferences of teachers and schools may not match, and as hypothesized here, this mismatch may contribute to higher turnover.

One study of teachers in their first five years in North Carolina supports this notion. This study, where out-of-state prepared teachers represented about 40% of new licenses in 2008-2009, found out-of-state preparation status correlated with lower student performance and higher rates of exit from the state when compared to in-state preparation (Bastian & Henry, 2015). Thus, where a novice teacher prepares may predict a higher probability of exit; nevertheless, few quantitative turnover studies account for this feature of their experience.

In this paper, I address this issue directly and build upon teacher labor market work by Bastian and Henry (2015) to examine novice teacher turnover in a rich data set from Connecticut. Using location of one's preparation program as a proxy for home university and likely home state, I ask whether novice teacher turnover varies by preparing in- or out-of-state, and if this differs as a function of whether a teacher's district shares a boundary with another state. To answer these questions, I leveraged variation in teacher preparation location and location of a teacher's district to a state line to explore whether this predicts transfer or exit.

By employing linear probability models to calculate the probability of transfer (within- or between-districts) or exit, I find out-of-state prepared teachers had a seven percentage point higher probability of exiting the state public schools and about a three percentage point lower probability of transfer between districts relative to peers prepared in-state. In addition, out-of-

[1] Nationally, about 20% of initial credentials annually awarded went to individuals prepared in different states between 2001 and 2013 (see Department of Education report found here: https://title2.ed.gov/Public/TitleIIReport16.pdf

state prepared teachers working in districts that shared a boundary with another state were associated with a seven percentage point higher probability of within-district transfer than out-of-state teachers whose district did not share a boundary with another state. The relationship between out-of-state preparation and teacher turnover is a salient finding for district administrators since 87% of the districts in the study employed at least one out-of-state prepared novice teacher in the two cohorts studied. The results may encourage those doing hiring to place emphasis on preparation location or hometown, especially when all other hiring characteristics are equal.

Background and Framework

The premise underlying this study is that a teacher who prepared in another state is also likely to have grown up in another state, and thus may have a strong desire to work near to where they are from. While economists have widely studied the phenomenon of turnover and shown that poor working conditions and certain academic credentials predict turnover (Boyd et al., 2011; Feng, 2009; Kraft et al., 2016; Lankford et al., 2002), other studies of expressed geographic preferences related to home, or previous places lived, suggest beginning teachers may like working near certain geographic places and seek out those places even if they start work in other states (Bastian & Henry, 2015; Boyd et al., 2005; Reininger, 2012). Of the above-mentioned studies, only Bastian and Henry study the turnover of novice elementary school teachers who prepared in- or out-of-state North Carolina public schools. However, out-of-state prepared teachers represent significant fractions of the initial licenses granted annually in many states, and these teachers are also likely to have grown up elsewhere (Boyd et al., 2005). This implies out-of-state preparation location is likely to be a strong proxy of someone raised in another state, and thus might illustrate individuals whose top preference is to work near a

specific place believed to be home. The information from a study like this is an early step to identifying, in the absence of a measure of home, whether a teacher's preparation location is an available measure that predicts turnover.

Supply Shortages and Demand Needs

Over the last 20 years, the profession of teaching has expanded due to growing student enrollment and increased novice teacher turnover (Carver-Thomas & Darling-Hammond, 2017; Ingersoll, 2001; Ingersoll et al., 2018). Not only has demand risen, but the supply of prepared and practicing teachers is diminishing, a response connected to recent teacher evaluation reforms the erosion of pay for teachers, and the aging group of baby boomers who were teachers (Allegretto & Mishel, 2018; Carver-Thomas & Darling-Hammond, 2017; Kraft, Brunner, Dougherty, & Schwegman, 2018). The declining numbers of available teachers and the growing demand implies that administrators have and will continue to face challenges to ensure they meet their school's staffing needs.

To address supply shortages, policy-makers often created plans to recruit and expand the quantity of teachers available for hire. Typically these plans make monetary incentives available to attract more people to the profession and retain them for longer, or reduce barriers to becoming a teacher. One policy, in Massachusetts, used signing bonuses to attract high quality individuals to teaching, disbursing the funds over the first four years of teaching (Liu, Johnson, & Peske, 2004). Other policies reduced barriers to certification within or across other states (Coggshall & Sexton, 2008; Johnson, Berg, & Donaldson, 2005). For instance, programs like Teach For America (TFA) and the Boston and New York City teacher residency programs leveraged alternative certification routes to help teachers get into classrooms without the steep time investments necessary for traditional preparation pathways (Boyd et al., 2011; Donaldson &

Johnson, 2010; 2011; Papay, West, Fullerton, & Kane, 2012). Other policies, like the National Association of State Directors of Teacher Education and Certification (NASDTEC), worked to reduce cross-state licensure barriers through legislated reciprocity agreements between states (Coggshall & Sexton, 2008). Still, these policies yield little evidence that they slow turnover.

Remarkably, the policies to reduce barriers to certification and teaching may actually exacerbate turnover for two reasons. First, evidence is clear that alternatively prepared teachers, though less likely to transfer from one school to another, exit teaching at higher rates than traditionally prepared teachers (Boyd et al., 2011; Donaldson & Johnson, 2010; 2011; Papay et al., 2012). Second, there is no evidence to suggest reduced barriers to cross-state transfer eased the ability of practicing teachers to move, and strong evidence that practicing teachers are less disposed to move to other states when compared to other regulated licensure occupations (Goldhaber, Grout, Holden, & Brown, 2015; Johnson & Kleiner, 2017; Podgursky, Ehlert, Lindsay, & Wan, 2016). However, Bastian and Henry's (2015) study demonstrates that out-of-state prepared teachers have a greater presence in North Carolina over the past decade, which suggests that teachers in search of their new jobs may take advantage of reciprocity agreements. Thus, reducing barriers to cross-state transfer may increase the presence of out-of-state prepared teachers and the presence of teachers who are more likely to exit a state.

Whose costs? Few studies theorize about how turnover costs hurt schools and students, and those that do, estimate the costs as uniform to schools, states, and districts (Barnes et al., 2007; Ronfeldt et al., 2013; Watlington, Shockley, Guglielmino, & Felsher, 2010). While costs are the same for all schools, they depend on the type of turnover to districts and states. Goldhaber, Gross, and Player (2011) theorize how the costs differ depending on the turnover outcome. The logic is as follows: when a teacher: (a) transfers within a district, the loss is to a

school but not a district or state; (b) transfers between a district, the loss is to a school and district, but not the state; or (c) exits the state public schools, the loss is to a school, district, and a state. Naturally then schools, districts, and states that track different types of turnover may also be able to describe which teachers transfer and which exit. Importantly, the schools and districts may be able to design policies that aim to minimize costs of turnover by reducing teachers who transfer to other districts, or exit.

Theoretical Optimization of Job Satisfaction

In order to design policies that reduce teacher turnover, administrators and policy makers should consider how a labor market operates. In theory, teacher labor markets function through teacher and administrator optimization of expected utility. In practice, this means that teachers strive to find a job that makes them happy by weighing elements related to (a) how employable they are (e.g., how likely they are to be hired under different circumstances), (b) the relative quality of their current job, and (c) any available realistic alternative jobs all together. Administrators simultaneously endeavor to (a) hire teachers that fit the job and (b) provide quality education to students while minimizing turnover (Guarino, Wyse, & Brown, 2011). This study focuses on teachers while recognizing that individual motivation to transfer within or between districts or exit the public school system relates to the desire to find better working conditions, make better use of their credentials, or find a workplace more in line with their personal preferences, (Boyd, Lankford, Loeb, & Wyckoff, 2005; Feng, 2009; Goldhaber et al., 2011). While researchers have studied the associations between all three optimizing factors and turnover, little evidence is offered for how geographic preferences or mobility relate to turnover.

Novice Teachers and Associated Factors of Turnover

Novice teachers are especially prone to engage in job search and turnover for two personal reasons. Younger people, likely to be new teachers, have higher mobility rates than the total population (Benetsky, Burd, & Rapino, 2015; Ingersoll et al., 2018). This may indicate that young, novice teachers have an easier time moving residences or jobs. In addition, novice teachers also tend to turnover because inexperienced workers are likely to be unaware of their workplace preferences and how they fit with different organizations and teachers (Player et al., 2017). These factors suggest that novice teachers who are young are likely to experience pushes to find a job that maximizes their job satisfaction before they settle down.

While personal reasons enable novice teachers to turnover more easily than mid-career teachers, the education system also incentivizes turnover early in one's career based on pay, seniority, and pension policies. For instance, district- and state-level policies unintentionally add a rationale for novice teachers to change jobs early in their careers. Teachers with experience may find that barriers exist because districts may not honor tenure or the pay based on years of experience in teaching while states may not honor seniority or pension time earned in other states (Goldhaber et al, 2015; Johnson et al., 2005). Thus, it is clear that personal factors and system policies align with teachers searching for the best job early in their teaching careers.

Of course, novice teachers change jobs because of factors related to working experiences also. These factors, include working conditions, alternative workplace characteristics, and personal characteristics that are proxy measures of preferences. Empirical evidence of these factors demonstrate that they predict higher or lower levels of turnover. In the following sections, I expand on what factors studies have found predict higher turnover.

Working condition characteristics. Factors such as teacher and administrative support, school climate or student learning culture, or personal job fit are aspects of working conditions.

When any of these characteristics are weak, they predict higher volumes of transfer and exit from individual schools (Boyd et al., 2011; Feng, 2009; Goldhaber et al., 2011; Kraft et al., 2016; Player et al., 2017; Weiner & Higgins, 2017). In addition, teachers working in districts that have lower pay, student populations with greater needs, and more disciplinary infractions may seek to work in other districts or exit the profession in search of a higher quality job (Feng, 2009; Ingersoll, 2001; Imazeki, 2005; Lankford et al., 2002). Overall, the evidence base on working conditions demonstrates that poor working conditions consistently predicts high turnover.

Alternative workplace characteristics and transfer. Teachers are also attracted to schools based on student demographics and personal credentials. Some studies capture that a relationship generally exists between intra- or inter- district transfer and teachers moving to schools or districts with fewer minority and low income students, or schools with higher student achievement (Boyd et al., 2005; Feng, 2009; Lankford et al., 2002). However, some evidence suggests this may be based on districts that have student demographic characteristics that are whiter, whose parents have more wealth, and whose students perform better on tests, thus attracting teachers with the strongest credentials as determined by value-added measures or educational credentials in New York or North Carolina (Goldhaber., 2011; Lankford et al., 2002). Some studies also address the fact that geographic features of educational systems predict transfer within district. For instance, Goldhaber et al. (2011) showed that female teachers in North Carolina with one more school available within five miles transferred within district more often, relative to teachers who had fewer schools within five miles. Overall, evidence about the relationship between alternative workplaces and turnover suggests teachers search for other teaching jobs where there is a perception of stability. This is likely conditioned by availability of alternative schools, especially those that are nearby.

Personal characteristics and exit. Teachers enter the workforce with different personal credentials and characteristics that predict transfer or exit (Guarino, Santibanez, & Daley, 2006). Credentials related to high value-added measure scores and preservice exam success both predicted higher amounts of exit in North Carolina compared to teachers with lower success on all three measures (Goldhaber et al., 2011). In Missouri, the highest performing teachers on ACT test exited the state public schools more often than their lower ACT performing peers (Podgursky, Monroe, & Watson, 2004). While these findings are true in some contexts, they are not true everywhere. In Washington State, Krieg (2006) showed that teacher quality, as measured through a value-added measure, was not a strong predictor of exit. Value-added and academic examination scores are not the only credentials that predicted exit in past studies. Teachers who attended highly selective universities, prepared with TFA, or worked in public charter schools, are especially prone to exit teaching, but also less likely to transfer than teachers who are traditionally prepared or worked in traditional public schools (Boyd et al., 2012; Donaldson & Johnson, 2010; 2011; Glazerman, Mayer, & Decker, 2006; Smith & Stuits, 2012). While not consistent everywhere, on average, individual's turnover more often when they have credentials that insinuate they were high-performing students or are high performing teachers.

Personal characteristics, sometimes predicted mobility or exit, although this finding is not consistent across state labor markets. For instance, in Wisconsin, women transferred and exited more often than men, but in federally representative samples men and women transferred and exited at similar rates (Imazeki, 2005; Johnson et al., 2005; Gray & Taie, 2015). Importantly, a major distinction here was Imazeki's (2005) study of the Wisconsin labor market distinguished individuals over or under 30. In controlling for age, Imazeki showed that women over 30 are less likely to bear children and thus have a lower probability of temporary or permanent exit from

teaching. While studies have investigated some personal factors that predicted turnover, they usually do not include a measure of home or college preparation location even though this personal factor appears to be important in how a job is chosen.

Preparation location as a proxy of home. "The draw of home" appears to be a geographic preference of teachers (Boyd et al., 2005; Reininger, 2012). While expressed preferences seem to suggest that hometown preferences are most important, Boyd et al. (2005) showed that hometown is only slightly more important than college training location. This suggests that hometown and preparation locations may detect differences associated with geographic preferences and be correlated with one another.

Bastian and Henry (2015) take up the question about whether preparation location predicted exit by studying novice teachers in North Carolina. To do so, they use a constructed measure of preparation location to analyze whether out-of-state prepared elementary teachers score lower value-added scores and exit the state at higher rates than in-state prepared teachers. In categorizing teachers based on in- or out-of-state credentialing programs, they found that novice elementary teachers trained out-of-state were two times more likely to exit within five years than peers trained in-state and that those who left the state taught students who performed .024 and .035 standard deviations worse on state math and reading tests, respectively. Thus, Bastian and Henry argued the low performing out-of-state prepared teachers moved to North Carolina to teach because they are not competitive candidates in their home labor market. Yet, North Carolina is one of many teacher labor markets with a large fraction of initial licenses granted to out-of-state prepared teachers.

Contribution of the Study

By studying teacher's preparation and district location as a function of turnover, this study adds to existing literature on novice teacher turnover for three reasons. First, I model an underexplored relationship between teacher preparation location and novice teacher turnover. Second, by studying transfers (within or between districts) or exit, I add evidence that suggests this approach yields important differences in motivations driving teacher's preferences in a labor market. Third, I study a setting, Connecticut, which is not represented in literature and thus may add important information to national conversations about novice teacher turnover.

Methods

In this paper, I ask two questions: (1) To what extent is novice teacher turnover predicted by whether a teacher completed preparation in- or out-of-Connecticut; and (2) Does novice teacher turnover vary by preparation location and whether the district in which they work shares a boundary with another state?

Study Setting

Connecticut is a useful setting to study teacher turnover because it is a context with variation across geographic, demographic, and educational system dimensions. This variation contrasts with Florida (Feng, 2009) and North Carolina (Bastian & Henry, 2015; Goldhaber et al., 2011), two states where teacher turnover was previously studied. As demonstrated in Table 1, Connecticut is more population dense, smaller in total size, and has far fewer square miles per district than Florida or North Carolina. In addition, more Connecticut counties share a boundary with another state than do counties in Florida or North Carolina. These differences imply that novice teachers in Connecticut have a higher probability of being able transfer between a district without changing residence than novice teachers in Florida or North Carolina. Due to its size, teachers in Connecticut also have a higher probability of living close to a state boundary and thus

potentially could remain in the same residence and work in a nearby state when compared to teachers in Florida and North Carolina. These differences suggest Connecticut's labor market potentially functions in different ways than those in the North Carolina or Florida.

Data Sources

To study novice teacher turnover I used three years of administrative teacher-level data from the Connecticut State Department of Education (CSDE). In total, this analysis used 3,685 individual teachers and 5,349 teacher-year observations from two cohorts of novice teachers. This information represented all K-12 teachers who began teaching in state during the two cohorts and excluded 52 teacher observations of individuals who worked in the prison education system.

The CSDE data included variables for teacher preparation program, sex, race, full-time equivalent or long-term substitute status, assignment area, and educational attainment. I supplemented these data with National Center for Educational Statistics (NCES) Common Core of Data (CCD) for school- and district-level control variables. The variables obtained from this source include the average number of students identified as Black, Hispanic, or free- and reduced-price lunch (FRPL) status in each school or district, magnet and charter school status, the grade levels served in a school (e.g., elementary), the total number of schools in a district, and the classification of the locale environment (e.g., urban). Finally, I added teacher union contract salary data from the Connecticut Coalition for Achievement Now (ConnCAN) website[2], which is aligned with the pay for a new teacher with no experience.

Descriptive Statistics

[2] The data retrieved from ConnCAN is found here: https://www.teachercontracts.conncan.org/questions/salary

Table 2 shows summary statistics for outcomes and all teacher-, school-, district-, and town-specific characteristics of in- and out-of-state prepared teachers working in Connecticut during the years studied.

In the pooled sample, on average, 11% of in-state prepared teachers and 7% of out-of-state prepared teachers transfer within-districts; 7% of both groups transfer between a district; and 6% of in-state prepared teachers exit the public education system whereas 14% of out-of-state prepared teachers leave (Table 2). In total, only 12 of 179 (~7%) districts in the study did not experience a novice teacher employment change in over the two years studied. The districts that did not experience a turnover were almost entirely rural, elementary schools serving few students of color or FRPL status students. The teachers working in these schools represented 42% of teachers prepared in-state and 42% prepared out-of-state.

The novice teachers in this study prepared in a number of locations: 60.2% prepared in Connecticut, while 32.5% prepared in another state[3], and 7.3% did not have an identified program location. In total, all of the teachers in the sample worked in 173 out of 201[4] districts found in Connecticut in their initial year of teaching. The teachers prepared out-of-state were granted more experience steps upon hire than were teachers prepared in-state although it is unknown if this is teaching specific experience or because more out-of-state prepared teachers changed careers and received credit for past experience.

[3] I consider TFA teachers as out-of-state in this analysis because their summer training "pre-service" program occurred outside of Connecticut (currently all training is in Philadelphia, PA, https://www.teachforamerica.org/join-tfa/leading-classroom/training-and-development/2018-institute-schedule). It is also unknown which states out-of-state prepared teachers finished their preservice work.

[4] This data comes from the NCES Digest of Education Statistics and uses 2013-2014 as the baseline figure. The link is found here: https://nces.ed.gov/programs/digest/d16/tables/dt16_214.30.asp

Finally, out-of-state prepared teachers worked in charter schools 10% percent of the time while in-state prepared teachers only worked in them 3% of the time. The out-of-state prepared teachers also worked in districts and schools with more students identified as Black or FRPL status, on average, and worked in districts that shared a boundary with another state more frequently. Furthermore, 25% of out-of-state prepared teachers worked in a district bordering the state of New York whereas out-of-state prepared teachers worked in a district bordering Massachusetts and Rhode Island 10% and 8%, respectively. Over 60% of the teachers working in districts bordering New York worked in cities bordering Stamford.

Measures

Outcomes. This study uses three outcomes: within district transfer, between district transfer, and exit from the state public schools. Using one unique identifier in the data, I compared any teacher's identification, district and school code in year *t* to year *t+1*. Thus, I constructed a turnover outcome using the following logic: (a) within district transfer occurred when a unique teacher's school code changed, but district code did not change between year *t* and *t+1*; (b) between district transfer occurred when a unique teacher's school and district code changed between year *t* and *t+1*; or (c) exit occurred when a unique teacher identifier disappeared from the data from year *t* to *t+1*.

In this study, I also treated each outcome as an independent binary event. This approach assumed that the decision to transfer to another school in the same district is independent of other turnover outcomes. However, a teacher in search of a new job likely does so while weighing their own ability, the factors pushing them to search for another job, and the factors that best

align with projected improvement in job satisfaction simultaneously.[5] Thus, employment changers likely weigh all three outcomes together in order to select the job change that will optimize future job satisfaction.

Predictors of interest. The measure of teacher preparation program location is a time-invariant predictor of interest constructed to distinguish between three binary variables. The three variables are: (a) in-state prepared teachers attended public or private universities, or an alternative pathway program in the state of Connecticut; (b) out-of-state prepared teachers attended and completed traditional or alternative pathways outside Connecticut, including TFA; and (c) an unknown preparation pathway group. The measure of whether a district shares a boundary with another state is binary indicator, indexed to where a teacher is working in any year. I generated these indicators using a state map and district location. If a district did not share a boundary line with another state, the indicator was coded a 0, and if the district shared a boundary line with another state, the indicator was coded a 1. Appendix A offers definitions of additional covariates.

Analytic Approach

I used linear probability models (LPM) to generate parameter estimates of the relationship between the predictors of interest and the three turnover outcomes. The models specified for analysis appear as follows:

$$Y_{isdt} = \beta_{0isdt} + \beta_1 \text{PrepLocation}_{isdt} + \beta_2 \text{Border}_{isdt} + \beta_3 \text{PrepLocation} * \text{Border}_{isdt} + \pi_y + \pi_c + \boldsymbol{\theta}_{isdt} + \boldsymbol{\delta}_{isdt} + \boldsymbol{\varphi}_{isdt} + \varepsilon_{isdt} \quad (1)$$

$$Y_{isdt} = \beta_{0isdt} + \beta_1 \text{PrepLocation}_{isdt} + \beta_2 \text{Border}_{isdt} + \beta_3 \text{PrepLocation} * \text{Border}_{isdt} + \pi_y + \pi_c + \boldsymbol{\theta}_{isdt} + \boldsymbol{\delta}_{isdt} + \boldsymbol{\varphi}_{isdt} + \lambda_{isdt} + \varepsilon_{isdt} \quad (2)$$

[5] Feng (2009) reported using the Hausman as well as Small and Ksiao tests of independence of irrelevant alternatives and found that no two moves (both transfers and exit) outcomes could be considered independent. While this is a threat to internal validity in this piece, I expect to resolve this as I write for publication.

where $\boldsymbol{Y}$ represents a generalized outcome for teachers *i* in school *s* in district *d* at time *t*. The three parameters of interest measured represent the outcome as a function of: β_1 is preparation location of a teacher, β_2 is district shares a border with another state, and β_3 is the interaction of preparation and district location. I included vectors, **θ**, **δ**, and **φ**, to control for teacher-, school-, and district-specific characteristic and fixed effect indicators, π_y, π_c, and λ_{isdt}, for year of employment, entry year and districts. Finally, ε represents a measurement error term clustered at the initial district-level.[6]

Estimates from model (1) emphasize the main effect of teacher preparation location for teachers who do not work along the state border, and interaction effects emphasize that effects of in- and out-of-state prepared teachers who work in districts on or away from the state boundaries. The second model adds a district fixed effect for a teacher's initial district of employment. Similar to Feng (2009), a district fixed effect absorbs all time-invariant factors at the district level that correlate to turnover and that might otherwise be unobserved. This is important to do because: (a) Connecticut has many districts, each of which may change the management of their workforce during the timeframe of the study and will not be observed in the data and (b) since I have time-varying measures for student demographics and teacher pay, any remaining variation in the outcome can only be attributed to time-varying characteristics.

The models incorporate teacher-, school-, district-, and town-specific characteristics to control for personal and professional characteristics meant to capture individual and professional

[6] The results are robust to using multi-level models and models that used student racial and free- and reduced-price lunch status at the school- and district-levels as time invariant characteristics. I fit a model with main effects for the two predictors of interest, but the boundary indicator showed no differences. I also fit models that restricted the sampling by removing individuals who turned over in both years studied, and the results were not substantively different.

preferences and differences. The first model includes time-varying student characteristics such as the proportions of Black, Hispanic, and free-and reduced-price lunch students at the school and district level. It also includes teacher-level controls, some time-varying and some time-invariant. Factors that vary from year-to-year include the natural log of expected wages based on contract data and an indicator for whether a teacher is full-time, teaches STEM content, is hired with extra experiences steps (1-3, 4+), or works at a magnet or charter school. School- or district-characteristics that vary over time include the grade levels served in a school and the total number of schools in the district. Teacher characteristics that are time-invariant include teacher gender and racial status[7]. Each model also includes an indicator for entry year cohort and year of employment, and a town classification indicator (i.e., based on U.S. Census definitions). The second model removes any time-invariant factor mentioned above and adds a district fixed effect.

Results

My findings suggest that novice teachers prepared outside of Connecticut have a higher probability of exit, but transfer between districts less often than in-state prepared teachers who are not near a border in the first two years of employment. The findings also suggest out-of-state teachers working in districts on the state border are more likely to transfer within district than their peers who work in districts not located along a state boundary.

Question 1: Preparation location predicts turnover. In this section, I focus on explaining the estimates of β_1, which compare the probability of turnover for teachers who prepared in Connecticut and who are not on state border to those prepared out-of-state and not on

[7] This data does not demonstrate that men and women turnover in different ways during the first two years of teaching and I have no age data. Thus, I cannot determine whether age and gender interacted in meaningful ways for this study.

a state border. I share the results of fitting both models and present these estimates in the first two columns of tables 3, 4, and 5.

Between district transfers. Novice teachers in Connecticut were less likely to transfer to other districts if they prepared out-of-state. Table 4, column 1 illustrates that out-of-state prepared teachers are about 3.74 percentage points less likely to exit within the first two years of teaching than are their in-state prepared novice teacher counterparts. Table 4, column 2 added a district fixed effect, and yielded estimates almost identical at 3.66 percentage points difference between out-of-state and in-state prepared teachers. This finding suggests that the revealed preferences for transferring between districts differs for in- and out-of-state prepared novice teachers who are not in districts along the state border.

***Exit from public schools*.** Out-of-state prepared teachers exited the public schools more often than peers who prepared in the state. Table 5, column 1 illustrates that out-of-state prepared teachers are about 7.75 percentage points more likely to exit within the first two years of teaching than are their in-state prepared novice teacher colleagues. Table 5, column 2 reports estimates with a district fixed effect indicator, and the estimates were slightly smaller, but still significant, at 6.85 percentage points difference between out-of-state and in-state prepared teachers. The smaller estimate suggests that some district-level sorting exists. However, taken together, this evidence supports the notion that novice teachers prepared in other states prefer to exit the public schools, but if they stay, prefer to not transfer to another district when compared to peers who prepared in-state.

Question 2: Interaction of preparation and district location predicts turnover. In this section, I examine the parameter estimates of β_2 and β_3. The point estimate of β_2 is the difference in the probability of turnover of an in-state prepared teacher who worked in a district that shared

a state boundary to an in-state prepared teacher who worked in a district that did not share a state line. The point estimate of β_3 is the difference in the probability of turnover of an out-of-state prepared teacher who worked in a district that shared a state boundary to an out-of-state prepared teacher who worked in a district that did not share a state line. I share the results of the two preferred models specified, which are found in the first two columns of tables 3, 4, and 5.

Within district transfers. Novice teachers prepared in Connecticut and working in a district along state lines were less likely to transfer inside of the same district relative to similar teachers who were not in a district along state boundaries. Table 3, column 1 illustrates that in-state prepared teachers working in a district on a state boundary were 3.92 percentage points less likely to move within the same district in the first two years of teaching than their in-state prepared colleagues who did not work in a district sharing a state border. Adding district fixed effect in Table 3, column 2 resulted in a 5.77 percentage point lower probability when comparing in-state prepared teachers working in a district on the state line to those not working in a district on the state line. These results suggest that teachers prepared in-state have different between district preferences dependent on whether the district shares a state boundary line.

Novice teachers prepared outside of Connecticut who worked in a district that shared a boundary with another state were more likely to transfer inside of the same district when compared with out-of-state prepared colleagues who worked in districts that did not share a border line. In Table 3 column 1, out-of-state prepared teachers working in a district sharing a state line were 7.19 percentage points more likely to move within the same district in the first two years of teaching than their out-of-state peers who did not work in a district adjacent to another state. Adding district fixed effects, in Table 3 column 2, resulted in the estimates barely changing (7.20 percentage points). These results indicate that the preferences of in-state and out-

of-state prepared teachers varies as a function of where a district is located in the state, although surprisingly these results are totally opposite relationships.

Tests of Robustness

My findings suggest there are important differences in turnover related to preparation location, and in some cases as a combination of preparation and district location. To ensure the findings are robust, I tested the sensitivity of the findings to account for teachers: (a) who trained in TFA or worked in charter schools; (b) whose job status qualified as part-time or long-term substitutes; and (c) who worked in the largest districts in the state. These three checks of robustness test the possibility that certain types of teachers or schools drive the magnitude, sign, and statistical significance in preferred model estimates. Thus, these checks rule out possible alternative explanations for the strength of the relationships I observe. This approach demonstrates that the point estimates continue being statistically significant, although the point estimates do

TFA and charter teachers do not drive the between district transfer and exit results. Teachers prepared in TFA or charter schools exit much more often than traditionally prepared or traditional public school teachers (Boyd et al., 2012; Donaldson & Johnson, 2010; 2011; Smith & Stuits, 2012). However, TFA prepared teachers are less likely to transfer schools during their two-year commitment to the Corps than other teachers during those years of their employment. By assuming TFA and charter school teachers transfer or exit in different ways than traditionally prepared or traditional public school teachers, I test whether the preferred models provide stable estimates of differences between teachers who prepared in- and out-of-state. This procedure removed a total of 487 observations from the analysis, of which 177 are TFA teachers, 242 are

public charter school teachers, and 68 are TFA preparers working in public charter schools while doing nothing to alter the statistical significance of the findings.

Between district transfers. To understand whether dropping TFA preparers and public charter teachers alters the estimates, I compare Table 4, column 1 and 3 and then repeat the procedure for comparing columns 2 and 4. This allows me to compare model 1, without district fixed effects, and model 2, with district fixed effects, across the preferred and restricted models. The magnitude of the estimates for between district transfer of out-of-state prepared teachers to be smaller in model 1 by about 0.8 percentage points (subtracting column 1 and column 3) and by about 1 percentage point in model 2 (subtracting column 2 compared to column 4). The reduction in the point estimates suggest that excluding TFA and charter teachers from analysis reduces the difference in the probability of transfer between districts for an in- and out-of-state prepared teachers, but the remaining difference is still positive and statistically significant. Thus, TFA prepared and public charter teachers influence the differences between in- and out-of-state prepared teachers, but do not substantively alter the general conclusion that out-of-state prepared teachers have a lower probability of transfer between districts than in-state preparers.

***Exiters from public schools*.** Using the same procedures, I also examined the results for modeling the probability of exit in Table 5. The point estimates for exit of out-of-state prepared teachers decreased in model 1 and model 2 by about 1.3 percentage points (difference between column 1 and column 3, and 1 and 4) when compared to in-state prepared teachers. This decrease indicates that TFA and charter teachers are much more likely to exit schools in the first two years than either in- or out-of-state prepared teachers overall. Yet, even with the reduction in the point estimate the difference in exit between in- and out-of-state preparers is still 5.5 to 6.5%

percentage points. Thus, the outcome suggests a policy relevant preference differences for exit between in- and out-of-state prepared teachers in the first two years of teaching.

Teachers who are not full-time do not drive within district transfer or exit results. Districts also employ teachers who work full-time, part-time, or as long-term substitutes. Teachers hired as substitutes are more averse to commuting longer distances (Gershenson, 2013), a function of holding jobs with little job security or incentive for commitment. Assuming that novice teachers who hold part-time or long-term substitute positions are systematically different from those holding full-time jobs, I test for the robustness of the results by omitting the non-full time teachers from analysis. This procedure removed 1,137 teacher-year observations, of which 330 were out-of-state prepared teachers, and did not alter the substantive differences between groups.

Within district transfers. Following similar procedures as in the TFA and public charter teacher section, I found the magnitude of the point estimates for within district transfer of out-of-state prepared teachers decreased in model 1 by about 0.3 percentage points (subtracting column 1 and column 5) and by about 0.5 percentage points in model 2 (subtracting column 2 and column 6) when compared to in-state prepared teachers. The increase in the difference between the two groups within district transfer probability suggests the full sample may underestimate the chances of within district transfer, a finding that may suggest important differences between the groups.[8]

When I compared out-of-state prepared teachers who worked in districts whose boundaries included a state line to out-of-state prepared teachers working in districts not sharing

[8] I tested whether this finding was driven by individuals who turned over in both years, a group that was composed of many teachers who were part-time or long-term substitutes. When the analytic sample removed any double turnover individual, the results of within district transfer were similar.

a state border, the point estimates decreased by 0.4 percentage points between model 1 and model 5 and 1.2 percentage points between model 2 and model 6. While this reduction in the point estimate is big, the findings still remain large and statistically significant suggesting the out-of-state prepared teachers who work in districts on the state border have different preferences than those whose districts are not on the state border.

Teachers in districts with more than the average number of schools do not drive within district transfer results. To examine the possibility that the largest districts drive the within district transfer results of the relationship between the preparation location and border district interaction, I remove any district whose total schools exceeds the average across districts in the states. This is important because the three largest districts in the state are urban and located in cities that do not share a boundary with another state and urban districts are known for increased probability of teacher mobility and exit (Boyd et al., 2011; Ingersoll, 2001; Lankford et al., 2002). This procedure eliminated any district with more than 15 schools, and resulted in the exclusion of 15 districts and 1,901 teacher employment record observations, and also does not change the statistical significance of the results.

Within district transfers. These changes reduced the point estimates comparison of out-of-state prepared teachers working in a district sharing a state line and out-of-state prepared teachers not working in a district sharing a state line by 2.3 percentage points (subtracting Table 3, columns 1 to column 7) and 1.3 percentage points (subtracting Table 3, column 2 to column 8). While these changes are large and substantively different, they do not change the policy relevance of the finding. However, they do indicate that approximately 20% of the within district transfer difference between out-of-state prepared teachers working in districts near and far from

the state boundary is predicted by working in a large district. Notably, a majority of the districts removed from analysis were found in urban districts not sharing state lines.

Discussion

The results of this study support the central hypothesis that out-of-state prepared novice teacher status predicts higher amounts of exit from the state. Specifically, I found that teachers prepared out-of-state were around three percentage points less likely to transfer between districts, but seven percentage points more likely to exit than in-state prepared teachers. Additionally, out-of-state prepared teachers working in a district sharing a state boundary were seven percentage points more likely to transfer within district than out-of-state peers working in a district that did not share a boundary with another state. The study also describes a new, previously unknown hypothesis that out-of-state preparers transfer between districts at lower rates than in-state prepared teachers. In the discussion, I address potential reasons that out-of-state prepared teachers are more likely to exit the state system than in-state prepared teachers. I also consider feasible reasons that out-of-state prepared teachers may prefer to transfer in Connecticut during the first two years of teaching. Finally, I suggest why district location in respect to other states may be important to out-of-state preparers.

This study supports and adds nuance to Bastian & Henry's (2015) study of the North Carolina teacher labor market. I reaffirm results from North Carolina showing that novice teachers prepared out-of-state were more likely to exit the public education system than in-state preparers. I also add to the results from North Carolina by showing teachers in Connecticut exit more in the first two years rather than by year three. I offer two reasons this may occur so quickly. First, teachers in Connecticut live within close proximity of other states, and may have prepared and received an initial license in another state. Thus, they may have an incentive to

return to that state before their license expires and, importantly, in-state prepared teachers would not already have licenses to teach in other states. Second, novice teacher, who are on average younger and more mobile, are responsive to education system policies around pay, pensions, and seniority (Benetsky et al., 2015; Goldhaber et al., 2015; Ingersoll et al., 2018; Johnson et al., 2005). Teachers capitalize on these incentives by exiting a state within the first two years of teaching to avoid accruing benefits and personal investments in a state they are unlikely to remain in over a long period of time. Novice teachers already positioned to engage in job search likely draw on factors like these to rationalize a job change.

This study also presents new evidence that mobility between districts is less probable for out-of-state prepared novice teachers than peers prepared in-state. In order to make sense of this finding, I draw upon ideas from studies of the locality of teacher labors markets to suggest two possible reasons why out-of-state prepared teachers prefer to move within a district rather than between districts in the first two years of teaching (Boyd et al., 2005; Killeen et al., 2015; Reininger, 2012). First, assuming teachers prefer to work locally, novice teachers who find themselves in unfamiliar labor markets might be averse to job movement from district to district. This may be because they have high personal and professional costs in their first few years of work in a new state because they lack a circle of friends and family to draw upon as they acclimate to new work. This is meaningfully different from in-state prepared teachers, who are more likely to have friends and family nearby and may also have a professional network established. Second, out-of-state prepared teachers may not prefer to transfer to other districts because this type of employment change does not satisfy the first choice of a novice teacher to work near home, assuming that they moved to a state in which they have no familial or previous

residential ties. Taken together, out-of-state prepared teachers who choose to stay may invest themselves in new communities in different ways than those who exit.

Finally, this study also provides evidence that transfer within district varies for out-of-state prepared teachers based on the proximity of their district to a state boundary. Few studies have explicitly examined how boundaries function with respect to turnover decisions, although those that have demonstrate significant barriers exist for teachers to transfer between states, albeit in labor markets in the Pacific Northwest and Midwest (Goldhaber et al., 2015; Podgursky et al., 2016). The results in the current study suggest teachers prepared out-of-state but working different distances from a state boundary move within districts in different ways, a result partially explained by the number of schools within a district. Yet, it is also possible that out-of-state teachers working in districts near state boundary lines live close enough to home and first choice is to make their first district work as a job site. This suggests that more information is needed in order to distinguish what is happening with out-of-state prepared teachers working in districts sharing state boundaries.

Limitations

Because novice teacher turnover is a general phenomenon found in schools across the United States, this study makes a valuable contribution by exploring data from a state that is likely to have a labor market that functions differently than those previously studied. Nevertheless, because I can neither distinguish whether teachers who changed jobs did so voluntarily or involuntarily nor know whether out-of-state preparation caused a teacher to transfer or exit, the study's research design does not warrant causal inferences.

The findings are limited by threats to internal validity. First, it is possible that in- and out-of-state prepared teachers may end up working in some districts. To guard against some districts

hiring more out-of-state prepared teachers, I fit models using a district fixed effect and restricted analytic samples to control for the ways that teacher's prepared in- or out-of-state sort into different districts and school types. I am confident in the reliability of the difference between novice teachers prepared in- and out-of-state. Second, I am unable to differentiate whether teachers who disappear from the data exit the profession or exit from teaching in Connecticut public schools. Thus, the estimates of exit may overstate the difference between in- and out-of-state prepared teachers. Third, the indicator measuring whether a district shares a boundary line with another state may bias estimates because infrastructure (e.g., transportation) alters how much distance a teacher can travel in the same amount of time. A teacher living near inter-state highways may have more alternative teaching options than those who are far from inter-state highways. Finally, it is impossible with the data I have, to distinguish out-of-state prepared teachers who are (a) returning home from higher education experience or (b) still live in an adjacent state but work in Connecticut. If many individuals return home or live in a different state but work in Connecticut, then the estimates of turnover of out-of-state prepared teachers may be biased because teachers, who prepare out-of-state and return home to teach, may have different preferences than out-of-state preparers whose home is not Connecticut.

These findings also have limited generalizability. First, the panel length will not capture broader secular economic trends, such as a recession, that may reduce turnover. Second, the panel length only represents two cohorts, and may measure idiosyncratic turnover related to the uniqueness of any cohort of new teachers. For example, this study cannot account for the average age of a cohort, even though this may represent an important mobility factor. Finally, the findings are also limited in generalizability because each state labor market is unique due to geographic, demographic, and educational system differences described in the study setting.

Implications

The results of this study suggest several implications. For researchers, there is reason to believe that novice teachers who prepare in one state migrate to another for work. This theoretical point is supported by evidence from North Carolina and nation-wide the fraction of initial licenses granted to out-of-state prepared teachers in any state ranges from 7 to 70 percent (Bastian & Henry, 2015). Based on these arguments, researchers should seek to better describe the characteristics of out-of-state prepared teachers. This includes providing information about initial licensees prepared out-of-state, the overall fraction of teachers who prepared out-of-state, and association between home state and home preparation location. Some of the questions for researchers to consider answering include: what is the relationship between home state and preparation location? do out-of-state prepared teachers have better student outcomes then in-state prepared teachers?; does turnover differ when a district is near other states and draws from a labor pool that potentially works in one state and lives in another?; and does this differ between charter, magnet, and traditional public schools? By providing answers, administrators will have better information about the relationship between preparation location, home state, and novice teacher turnover, which could be used to determine whether hiring an in-state prepared teacher is the best decision if all other characteristics of an alternative hire are the same.

There are also implications for policy-makers. States should invest in timely teacher employment data collection focused on collecting teacher-, school-, district-, and town-specific characteristics. This should include information about where a teacher graduated high school and where they completed any schooling and teacher preparation. This information may provide insight about measuring individual geographic mobility, something that could be very important for states where the fraction of out-of-state prepared initial licenses in any year exceeds 30%,

like Connecticut and North Carolina. This point may be especially important if out-of-state teachers are migrating from certain states, if only a few districts employ most of the out-of-state prepared teachers, or if the out-of-state prepared teachers are filling local shortages. Through subsequent study, state education agencies may also provide guidance to districts about how a teacher's personal mobility may predict turnover.

Finally, there are implications for district and school administrators. Even though administrators should recognize that supportive working conditions are critical to a novice teacher's experience, so is commitment to a community and a profession. Administrators, then, should think carefully about how to measure the commitment of teachers. Districts could develop standardized hiring criteria that includes measuring quality and commitment. While this approach is a guide and cannot account for localized shortages and schooling needs, it may help administrators systematically consider commitment as a desirable hiring quality. Policies may also support hiring a novice teacher who is thought to be a commitment risk. Some possibilities include two- or three- year contracts, like TFA uses or districts developing induction systems that address professional *and* personal development of teachers who they should recognize may not have nearby friends and family.

Conclusion

The recruiting, hiring, and retention of quality teachers is critical to stabilizing the performance of students and schools. This study aimed to burgeon efforts to retain better teachers by exploring the association between whether a teacher prepared in a different state from where they work and turnover. This examination offers early support for the notion that out-of-state prepared teachers make different choices about their jobs than in-state prepared teachers. The results of the study suggest that administrators should be mindful about the trade-

offs teachers make in taking and leaving jobs, a risk that appears to intensify for teachers in their first two years who have spent time preparing in other states, which may be their home. Thus, this study shows that districts should manage teachers in their first two years with an eye towards recognizing that nearly three times as many out-of-state prepared teachers exit and responding with policies that help those teachers develop and grow into the community. By posing solutions to address this, districts may reduce teachers who exit and thus manage money, human capital, and student learning costs.

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Tables

Table 1.Comparison of Geographic, Demographic, and District Features of Connecticut, Florida, and North Carolina

States studied	Land area rank[a]	Land area in square miles[a]	Density Rank[b]	# School Districts[c]	Square miles per district	# of Counties[d]	% Counties with population density greater than 200 per square mile[d]	% Counties with population density greater than 1,000 people per square mile[d]	% Counties Sharing State Border	Peer Reviewed Publication Year	Years of Employment Records
Connecticut	48	5,543	6	201	27.58	8	100.00%	37.50%	75.00%	None[1]	None
Florida	26	65,758	20	76	865.24	67	46.27%	10.45%	20.90%	2009	1997-2003
North Carolina	29	53,819	17	265	203.09	100	26.00%	3.00%	47.00%	2011	1996-2002

Notes: Retrieved from [a]https://www.census.gov/geo/reference/state-area.html;[b]https://www.census.gov/data/tables/2010/dec/density-data-text.html; [c]https://nces.ed.gov/programs/digest/d16/tables/dt16_214.30.asp; and [d]https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. [1]There is a paper by Fisk, Prowda, & Beaudin written and presented at AERA in 2001 titled "Are we keeping the best and brightest? A study of beginning teacher attrition in Connecticut", but I am currently unable to locate a copy of the study.

Table 2. Pooled Descriptive statistics for in- and out-of-state prepared novice teachers for turnover outcomes and associated teacher-, school-, district,- and town-specific characteristics

Turnover Outcomes	Novice teachers prepared in-state	Novice teachers prepared out-of-state
Within-district transfer	0.11	0.07
Between-district transfer	0.07	0.07
Exit from state public system	0.07	0.15
Turnover in both years	0.03	0.03
Teacher Characteristics		
Wages at lane of educational credentials and step of no experience	47,787.76 (3,959.40)	47,869.46 (4,280.12)
Males	0.23 (0.42)	0.20 (0.40)
Non-White Teacher Total	0.10 (0.30)	0.12 (0.33)
Teachers in STEM content area	0.19 (0.39)	0.22 (0.42)
No Extra Experience Year Steps Upon Hire	0.88 (0.33)	0.63 (0.48)
1-3 Extra Experience Year Steps Upon Hire	0.10 (0.30)	0.17 (0.37)
4 or more Extra Experience Year Steps Upon Hire	0.02 (0.14)	0.21 (0.41)
Less than Full-Time Equivalent or Long-Term Substitute	0.21 (0.41)	0.19 (0.39)
School Characteristics		
Proportion of students identified as Hispanic/Latinx in school	0.22 (0.20)	0.24 (0.21)
Proportion of students identified as Black/African-American in school	0.16 (0.19)	0.22 (0.24)
Proportion of students identified as free- and reduced-price lunch in school	0.41 (0.31)	0.45 (0.34)
Magnet School	0.07 (0.25)	0.09 (0.28)
Charter School	0.03 (0.16)	0.10 (0.30)
Elementary School	0.45 (0.50)	0.42 (0.49)
Middle School	0.20 (0.40)	0.18 (0.39)
High School	0.30 (0.46)	0.29 (0.46)
Other type of grades served	0.05 (0.22)	0.11 (0.31)
District Characteristics		
Total schools in the district	15.8 (14.5)	16.54 (16.5)
Out-of-state prepared teacher district shares state boundary with New York	0.18 (0.49)	0.25 (0.56)
Out-of-state prepared teacher district shares state boundary with Massachusetts	0.09 (0.38)	0.10 (0.42)
Out-of-state prepared teacher district shares state boundary with Rhode Island	0.07 (0.33)	0.08 (0.35)
Districts shares a boundary with another state	0.12 (0.33)	0.18 (0.39)
District does not share a boundary with another state	0.88 (0.33)	0.82 (0.39)
Proportion of students identified as Hispanic/Latinx in district	0.22 (0.18)	0.24 (0.18)
Proportion of students identified as Black/African-American in district	0.16 (0.16)	0.21 (0.22)
Proportion of students identified as free- and reduced-price lunch in district	0.40 (0.29)	0.45 (0.32)
Town Characteristics		
Urban locale characteristics	0.34 (0.47)	0.47 (0.50)

Suburban locale characteristics	0.53 (0.50)	0.40 (0.49)
Rural or town locale characteristics	0.13 (0.34)	0.13 (0.34)
N	3,222	1,738

All calculations represent proportions between 0 and 1. Standard deviations are displayed in parentheses.

Table 3. Pooled Linear Probability Estimates of Within District Transfer, Teacher Preparation Location, and District Proximity to State Borders

	Leave school							
Teacher Preparation Location								
Out-of-state prepared	-0.0130	-0.0110	-0.0109	-0.0071	-0.0160~	-0.0158*	0.0003	0.0011
teachers	(0.0087)	(0.0096)	(0.0098)	(0.0107)	(0.0083)	(0.0072)	(0.0109)	(0.0128)
District Proximity to State Border								
Works in district at	-0.0392**	-0.0577**	-0.0405**	-0.0627**	-0.0480***	-0.0295	-0.0261	-0.0600*
state border	(0.0140)	(0.0203)	(0.0147)	(0.0228)	(0.0141)	(0.0216)	(0.0168)	(0.0271)
Prep Location x District Border Proximity								
Out-of-state prepared								
working at state	0.0719***	0.0719***	0.0720***	0.0697***	0.0691***	0.0597**	0.0486*	0.0593**
border	(0.0208)	(0.0208)	(0.0173)	(0.0178)	(0.0209)	(0.0201)	(0.0242)	(0.0202)
District Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Removes Teachers Prepared in Teach For America or working in								
a charter school	No	No	Yes	Yes	No	No	No	No
Removes Part-time or								
Long-term Subs	No	No	No	No	Yes	Yes	No	No
Removes Districts with more than 15								
schools	No	No	No	No	No	No	Yes	Yes
	0.0816***	0.0600**	0.0833***	0.0530**	0.0845***	0.0707**	0.1544***	0.0728***
Constant	(0.0159)	(0.0196)	(0.0171)	(0.0198)	(0.0151)	(0.0223)	(0.0249)	(0.0214)
N	5349	5349	4862	4862	4212	4212	3448	3448
R-squared	0.0489	0.0942	0.0484	0.0958	0.0281	0.0711	0.0646	0.1261

Notes: Standard errors in parentheses. ~p<0.10; *p<0.05; **p<0.01; ***p<.001. Comparison groups by indicator: in-state prepared teachers in teacher preparation location category (unknown preparation not shown), not a district sharing a state boundary category, and out-of-state prepared teachers not in a district sharing a state boundary. Control variables include: time-varying proportions of Black, Hispanic, and free-and reduced-price lunch students at the school and district level, gender, nonwhite teacher status, the natural log of expected wages, if an individual teacher holds full-time status, if the person teaches STEM content, if the person is hired with extra experiences steps (1-3, 4+), if the teacher works at a magnet or charter school, the grade levels of the school a teacher works in, the total number of schools in the district, an indicator for cohort of entry and year of employment, and a locale classification indicator. Full tables available upon request.

Table 4. Pooled Linear Probability Estimates of Between District Transfer, Teacher Preparation Location, and District Proximity to State Borders

	Leave district							
Teacher Preparation Location								
Out-of-state prepared	-0.0374***	-0.0366***	-0.0296**	-0.0259*	-0.0348***	-0.0361***	-0.0546***	-0.0475***
teachers	(0.0099)	(0.0101)	(0.0110)	(0.0108)	(0.0103)	(0.0108)	(0.0135)	(0.0132)
District Proximity to State Border								
Works in district at	-0.0303~	0.0709	-0.0310~	0.0841	-0.0409*	-0.0550	-0.0145	0.0942
state border	(0.0160)	(0.1000)	(0.0164)	(0.0989)	(0.0175)	(0.0933)	(0.0210)	(0.1070)
Prep Location x District Border Proximity								
Out-of-state prepared								
working at state	0.0102	0.0039	0.0125	0.0015	0.0092	0.0066	0.0137	0.0094
border	(0.0238)	(0.0203)	(0.0248)	(0.0207)	(0.0258)	(0.0185)	(0.0302)	(0.0246)
District Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Removes Teachers Prepared in Teach For America or working								
in a charter school	No	No	Yes	Yes	No	No	No	No
Removes Part-time or								
Long-term Subs	No	No	No	No	Yes	Yes	No	No
Removes Districts with more than 15								
schools	No	No	No	No	No	No	Yes	Yes
	0.1439***	0.1099~	0.1419***	0.1935**	0.1312***	0.0290	0.1182***	0.0687
Constant	(0.0182)	(0.0643)	(0.0192)	(0.0593)	(0.0187)	(0.0666)	(0.0310)	(0.0492)
N	5349	5349	4862	4862	4212	4212	3448	3448
R-squared	0.0346	0.1170	0.0369	0.1258	0.0230	0.1216	0.0405	0.2079

Notes: Standard errors in parentheses. ~p<0.10; *p<0.05; **p<0.01; ***p<.001. Comparison groups by indicator: in-state prepared teachers in teacher preparation location category (unknown preparation not shown), not a district sharing a state boundary category, and out-of-state prepared teachers not in a district sharing a state boundary. Control variables include: time-varying proportions of Black, Hispanic, and free-and reduced-price lunch students at the school and district level, gender, nonwhite teacher status, the natural log of expected wages, if an individual teacher holds full-time status, if the person teaches STEM content, if the person is hired with extra experiences steps (1-3, 4+), if the teacher works at a magnet or charter school, the grade levels of the school a teacher works in, the total number of schools in the district, an indicator for cohort of entry and year of employment, and a locale classification indicator. Full tables available upon request.

Table 5. Pooled Linear Probability Estimates of Exit of the Public Schools, Teacher Preparation Location, and District Proximity to State Borders

	Exit							
Teacher Preparation Location								
Out-of-state prepared teachers	0.0775***	0.0685***	0.0643***	0.0551***	0.0797***	0.0728***	0.0551***	0.0379*
	(0.0103)	(0.0152)	(0.0107)	(0.0121)	(0.0110)	(0.0170)	(0.0131)	(0.0146)
District Proximity to State Border								
Works in district at state border	-0.0000	-0.0294	-0.0034	-0.0406	0.0029	0.0182	0.0104	-0.0458
	(0.0165)	(0.0257)	(0.0159)	(0.0257)	(0.0187)	(0.0299)	(0.0203)	(0.0302)
Prep Location x District Border Proximity								
Out-of-state prepared working at state border	-0.0554*	-0.0533	-0.0510*	-0.0456	-0.0396	-0.0344	-0.0647*	-0.0555*
	(0.0245)	(0.0357)	(0.0241)	(0.0356)	(0.0276)	(0.0441)	(0.0291)	(0.0228)
District Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Removes Teachers Prepared in Teach For America or working in a charter school	No	No	Yes	Yes	No	No	No	No
Removes Part-time or Long-term Subs	No	No	No	No	Yes	Yes	No	No
Removes Districts with more than 15 schools	No	No	No	No	No	No	Yes	Yes
Constant	0.0527**	0.0533*	0.0652***	0.0449*	0.0417*	0.0467*	0.0338	0.0813***
	(0.0188)	(0.0208)	(0.0186)	(0.0174)	(0.0200)	(0.0210)	(0.0300)	(0.0200)
N	5349	5349	4862	4862	4212	4212	3448	3448
R-squared	0.0417	0.0819	0.0232	0.0668	0.0412	0.0856	0.0470	0.1091

Notes: Standard errors in parentheses. ~p<0.10; *p<0.05; **p<0.01; ***p<.001. Comparison groups by indicator: in-state prepared teachers in teacher preparation location category (unknown preparation not shown), not a district sharing a state boundary category, and out-of-state prepared teachers not in a district sharing a state boundary. Control variables include: time-varying proportions of Black, Hispanic, and free-and reduced-price lunch students at the school and district level, gender, nonwhite teacher status, the natural log of expected wages, if an individual teacher holds full-time status, if the person teaches STEM content, if the person is hired with extra experiences steps (1-3, 4+), if the teacher works at a magnet or charter school, the grade levels of the school a teacher works in, the total number of schools in the district, an indicator for cohort of entry and year of employment, and a locale classification indicator. Full tables available upon request.

Appendix A

Definitions of Variables	
Outcome Variables	
Leave School	A measure of whether a teacher switched schools, but not districts based on year *t* to year *t+1* comparison. The indicator is a dichotomous variable where 0 indicates that a teacher did not leave schools within their district and a 1 indicates they did leave within their district.
Leave District	A measure of whether a teacher switched districts based on year *t* to year *t+1* comparison. The indicator is a dichotomous variable where 0 indicates that a teacher did not leave districts and a 1 indicates they did leave their district.
Exit	A measure of whether a teacher exited the state public school system based on year *t* to year *t+1* comparison. The indicator is a dichotomous variable where 0 indicates that a teacher did not exit the system and a 1 indicates they did exit the system.
Predictors of Interest	Descriptions
Preparation Program Location	A measure of preparation program type status taken from the CSDE. The indictor takes on three variables: (a) a teacher is prepared in-state if they come from a public or private institution or through alternative route from Connecticut; (b) a teacher is prepared out-of-state if they are identified as an out-of-state preparer; and (c) a person is prepared in an unknown place.
Proximity to State Boundary	A measure of proximity of a district to a state boundary. The indictor was generated manually using a state map and district location by asking three questions. The measure is between 0 and 1 and is constructed based on the district share a boundary with another state (takes on a 1) or the district does not share a border with another state (takes on a 0).
Interaction of Prep Location and Proximity to State Boundary	An indicator measuring the interaction of preparation location by proximity to a state boundary. It is calculated by multiplying preparation location by border proximity indicators.
Control variables	
Teacher level	
Non-white teacher	A measure of whether a teacher identifies as non-white provided by CSDE. The indicator is dichotomous with a 0 indicating the teacher identifies as white and a 1 indicating that a teacher identifies as Black, Hispanic, Asian, or Native American.
Male	A measure of whether a teacher identifies male taken from CSDE. The indicator is dichotomous with a 0 indicating the teacher identifies as female and a 1 indicating that a teacher identifies as male.
Extra Experience Year Steps Upon Hire	A measure of whether a teacher was hired with more than 0 steps indicating they earned higher salaries. This indicator takes on three variables with 0 corresponding with a teacher hired with no extra years of experience, a 1 corresponding with a teacher hired with 1 to 3 extra years of experience, and a 2 corresponding with a teacher hired with 4 or more extra years of experience.

Long-term substitute or not full-time equivalent status?	A measure of whether a teacher held long-term substitute or was not full-time equivalent status taken from CSDE. The indicator is dichotomous with a 0 indicating the teacher was full-time equivalent or not a long-term substitute and a 1 indicating that a teacher was not full-time equivalent or was a long-term substitute.
STEM Content Assigned Teacher	A measure of whether a teacher was assigned to teach in STEM content area taken from CSDE. The indicator is dichotomous and takes a 0 if the teacher is not a STEM teacher and a 1 if the teacher is.
School Level	
Proportion of Black/African-American Students in a school	A time-varying measure of Black/African American students in a school taken from the NCES CCD. The indictor is a continuous number between 0 and 1 and is calculated by dividing the number of students identified as Black/African American in the NCES CCD divided by the total number of students in a school. This corresponds with the year of employment for the teacher observation.
Proportion of Hispanic/Latinx Students in a school	A time-varying measure of Hispanic/Latinx students in a school taken from the NCES CCD. The indictor is a continuous number between 0 and 1 and is calculated by dividing the number of students identified as Hispanic/Latinx in the NCES CCD divided by the total number of students in a school. This corresponds with the year of employment for the teacher observation.
Proportion of free- and reduced-price lunch students in a school	A time-varying measure of free- and reduced-price lunch students in a school taken from the NCES CCD. The indictor is a continuous number between 0 and 1 and is calculated by dividing the number of students identified as free- and reduced-price lunch in the NCES CCD divided by the total number of students in a school. This corresponds with the year of employment for the teacher observation.
School level	A measure of the grades configurations in a school taken from NCES CCD. The indicator takes on four variables: elementary, middle, high, or other school.
Magnet Status	A measure of whether a district holds inter-district magnet status taken from NCES CCD. The indicator is a dichotomous variable with a 0 indicating that the school did not hold inter-district magnet status between 2011 and 2014 and 1 indicating that the school did hold inter-district magnet status between 2011 and 2014.
Charter Status	A measure of whether a district holds charter status taken from NCES CCD. The indicator is a dichotomous variable with a 0 indicating that the school did not hold charter status between 2011 and 2014 and 1 indicating that the school did hold charter status between 2011 and 2014.
District level	
Proportion of Black/African-American Students in a district	A time-varying measure of Black/African American students in a district taken from the NCES CCD. The indictor is a continuous number between 0 and 1 and is calculated by dividing the number of students identified as Black/African American in the NCES CCD divided by the total number of students in a district. This corresponds with the year of employment for the teacher observation.
Proportion of Hispanic/Latinx Students in a district	A time-varying measure of Hispanic/Latinx students in a district taken from the NCES CCD. The indictor is a continuous number between 0 and 1 and is calculated by dividing the number of students identified as Hispanic/Latinx in the NCES CCD divided by the total

	number of students in a district. This corresponds with the year of employment for the teacher observation.
Proportion of free- and reduced-price lunch students in a district	A time-varying measure of free- and reduced-price lunch students in a district taken from the NCES CCD. The indictor is a continuous number between 0 and 1 and is calculated by dividing the number of students identified as free- and reduced-price lunch in the NCES CCD divided by the total number of students in a district. This corresponds with the year of employment for the teacher observation.
Base Expected Wages	A measure of salary taken from ConnCAN. The indicator is a continuous variable in dollars of expected wages that is conditional on the teacher earning an entry level wage at the education level (BA, MA, or Sixth Year degree) that they enter teaching having attained.
Town Classification	A measure of the type locale taken from NCES CCD. The indicators takes on three variables: urban (which includes mid-size and small), suburban (which includes large and mid-size), and town or rural (which include fringe and distant).
Total Schools in the District	A measure of the average number of schools within a district in school years 2011-2012 and 2012-2013 taken from NCES CCD. The indicator is a continuous variable with between 1 and 50 schools in a district.
Cohort year	A measure of the cohort that a teacher began in the state. The measure is a dichotomous variable with 0 corresponding with a teacher who began in school year 2011-2012 and 1 corresponding with a teacher who began in school year 2012-2013.
School year	A measure of the year that a teacher was employed. The measure is a dichotomous variable with 0 corresponding with a teacher employed during school year 2011-2012 and 1 corresponding with a teacher employed during school year 2012-2013.