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Location, Location, Location: How Teacher Education Programs Position Graduates for Their First Teaching Jobs

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ABSTRACT

Previous research has documented the difficulties urban and rural districts, schools serving socioeconomically disadvantaged students, and geographically isolated areas have in recruiting and retaining teachers. Using administrative data from Michigan, we focus on the relationship between teacher education programs (TEPs) and teachers’ first teaching placements in communities that have been traditionally disadvantaged in attracting teachers. Specifically, we examine the extent to which TEP characteristics predict the likelihood of their graduates working in communities that: are low-income urban and rural locales, have lower college attainment rates, or are geographically isolated from TEPs. We find that teachers who attended TEPs in Michigan that have higher entry GPA requirements are more likely to teach in rural and geographically isolated areas but less likely to teach in urban Title I schools. Higher quality TEPs that require more hours of pre-student and student teaching are less likely to place teachers in rural Title I schools. Also, we find that the relationships between TEP characteristics and first teaching placement differ for teachers who go on to teach in traditional public schools and charter schools. We conclude with several policy recommendations for TEPs.

Disclaimer: *This research uses data collected and maintained by the Michigan Department of Education (MDE) and/or Michigan’s Center for Educational Performance and Information (CEPI). Results, information and opinions solely represent the analysis, information and opinions of the author(s) and are not endorsed by, or reflect the views or positions of, grantors, MDE and CEPI or any employee thereof. All errors are our own.*

“Location, Location, Location”:

How Teacher Education Programs Position Graduates for Their First Teaching Jobs

I. INTRODUCTION

Urban and rural schools, particularly those serving economically disadvantaged students, experience more difficulty recruiting and retaining effective teachers (Cowan, Goldhaber, Hayes, & Theobald, 2016; Dee & Goldhaber, 2017; Ingersoll, 2001). Compared to suburban schools, urban and rural schools report more difficulty recruiting teachers (Provasnik et al., 2007) and they fill more vacancies with teachers without a conventional licensure, even after accounting for student composition (Dee & Goldhaber, 2017). Furthermore, urban districts have lower retention rates than other locales (Hanushek, Kain, & Rivkin, 2004; Ingersoll, 2001; Lankford, Loeb, & Wyckoff, 2002; Papay, Bacher-Hicks, Page, & Marinell, 2017).

Teachers’ preferences for particular student demographics and school location may exacerbate difficulties attracting teachers to urban and rural districts. On average, teachers do not prefer to teach high poverty, low achieving, or minority students (Boyd, Lankford, Loeb, Ronfeldt, & Wyckoff, 2011; Hanushek, Kain, & Rivkin, 2004; Jackson, 2009; Lankford, Loeb, & Wyckoff, 2002). As for school location, teachers prefer to teach in less remote areas with more amenities and in neighborhoods with higher median incomes and less crime (Killeen, Loeb, & Williams, 2015; Miller, 2012a; Boyd, et al., 2011). Relative to their similarly educated peers, teachers tend to be employed closer to their hometowns (Boyd, Lankford, Loeb, & Wyckoff, 2005a; Reiningger, 2012). As a result, districts producing fewer college graduates have a smaller pool of teachers returning to the community in search of teaching positions. Because urban and rural areas serve more high poverty students, have lower average achievement than

suburban areas, and produce fewer college graduates, many teachers may prefer jobs elsewhere, decreasing the available teacher supply for urban and rural districts (Provasnik et al., 2007).

Additionally, student teaching placements, one of the most predictive determinants of teaching placement for first-year teachers, may further aggravate difficulties in recruiting teachers in geographically isolated areas. Teachers are more likely to seek out employment in the districts in which they completed their student teaching (Krieg, Theobald, & Goldhaber, 2015). As such, districts that do not work with student teachers miss out on an opportunity to connect with newly certified teachers. Student teaching opportunities are typically coordinated by teacher education programs (TEPs) and most of those placements are near TEP campuses (Greenberg, Pomerance, & Walsh, 2011; Strauss et al., 2000). Therefore, public schools located farther away from TEPs are at a particular disadvantage when recruiting teachers.

From a policy perspective, therefore, identifying strategies for increasing the supply of teachers in communities prone to experiencing difficulty recruiting teachers— those serving low-income students in urban and rural locales, those with low college attainment rates, and those isolated from TEPs – represents an important step in improving equitable access to qualified and effective teachers. Since the policy environment surrounding teacher placement also includes a new emphasis on holding TEPs accountable for the outcomes of their graduates (Lubell & Putnam, 2016; U.S. Department of Education, 2016), one possibly actionable strategy is to encourage TEPs to place students in disadvantaged communities. First, TEP characteristics, experiences, and approaches that promote teaching in communities that experience difficulty in recruiting teachers must be identified.

Although there is evidence that TEPs predict teacher mobility (Goldhaber & Cowan, 2014) and teacher effectiveness (Ronfeldt & Campbell, 2016), there is little work concerning the extent to which TEPs influence the likelihood that a teacher will work in disadvantaged or remote communities. Filling this gap is important given that TEPs represent the middle phase in the process that takes prospective teachers from high school into the student teaching assignments that recent evidence suggests are so determinative of teacher placement.

In this study we identify the role that TEPs have in determining whether new teachers take jobs in locations that have difficulty recruiting teachers. We seek to determine whether there are unique distribution patterns associated with TEP characteristics. We answer the following central research question: *What is the relationship between characteristics of TEPs attended by first year teachers in Michigan and teaching in a community that has difficulty recruiting and retaining teachers?* We consider a school to be located in a community disadvantaged at recruiting teachers based on three definitions which we motivate further in the section below: 1.) whether or not it serves low-income students, specifically in urban and rural locales, 2.) the four-year college attainment rate in the community and 3.) geographic isolation from a teacher education program. We use 2011-2015 teacher employment records in Michigan, TEP characteristics from Title II and Integrated Postsecondary Data System (IPEDS), and additional data on local communities from the U.S. Census Bureau. Our empirical analyses focus on teachers who attended Michigan TEPs and take their first teaching jobs in the state. We control for observable teacher characteristics, including high school attended, using National Student Clearinghouse data, and estimate a series of regression models in which we consider the extent to which TEP predicts a teacher locating in a community disadvantaged at recruiting teachers.

II. BACKGROUND

Inequitable Teacher Distribution

Prior research shows that urban and rural schools have less qualified teachers and more difficulty attracting teachers (Dee & Goldhaber, 2017; Jacob, 2007; Provasnik et al., 2007). Teachers in urban areas are more likely to be less experienced, fail their teaching entrance exams, and graduate from less competitive universities (Lankford, Loeb, & Wyckoff, 2002). Additionally, they are less likely to have a masters' degree or be certified in their field than suburban teachers within the same region (Dee & Goldhaber, 2017; Jacob, 2007; Lankford, Loeb, & Wyckoff, 2002). Teachers with stronger academic preparation are less likely to become rural teachers, and remote rural schools have the heaviest reliance on novice teachers (Miller, 2012a; Miller, 2012b; Monk, 2007). Additionally, teachers in the most remote rural areas are the least likely to have graduated from a competitive college or hold a graduate degree (Miller, 2012b). Although the literature on teacher quality overall has suggested that measures like certification, degree type, and years of experience are imperfect indicators of teacher quality, findings from teacher distribution studies consistently confirm these inequitable patterns of access to effective educators.

Additionally, urban and rural districts experience more difficulties hiring teachers in general (Cowan, Goldhaber, Hayes, & Theobald, 2016). Urban areas have the most difficulty finding math teachers and rural areas have the most challenges in finding English and Foreign Language teachers (Provasnik et al., 2007). Urban schools are more likely to fill these vacancies with long-term substitutes or unqualified teachers than suburban schools (Jacob, 2007; Levin and Quinn, 2003). However, not all urban and rural schools have difficulties recruiting teachers. For example, Engel, Jacob, and Curran (2014) find that there are about ten applicants for every

vacancy in Chicago Public Schools on average. However, the majority of applications are for a handful of schools serving more advantaged students located in more affluent areas of the city.

Teachers' Employment Preferences

Two possible explanations for the inequitable distribution of teachers exist: either these schools have difficulty attracting effective teachers or districts are unable to successfully recognize them. We focus on one major determinant that may cause districts to have difficulty attracting teachers: teachers' employment preferences. First, student characteristics influence where teachers choose to work. Teachers, who are generally White and middle-class, tend to seek out schools with similar demographic characteristics to the ones they attended (Boyd et al., 2005a). For example, teachers in Texas tend to transfer more frequently out of schools with higher proportions of students of color and low-performing students (Hanushek, Kain, & Rivkin, 2004). Similarly, job applicants in Chicago are more likely to apply for teaching positions at schools serving more advantaged students (Engel, Jacob, & Curran, 2014).

Teachers demonstrate unique geographical preferences relative to other college graduates. Teacher labor markets are geographically small, and both teachers and employers value close proximity between home and work (Engel & Cannata, 2015; Killeen, Loeb, & Williams, 2015). Reininger (2012) found that teachers prefer to live closer to their hometowns than their college-educated peers. In a 2005 study, Boyd and colleagues found that 60% of teachers are employed within 15 miles of their own high schools and 85% taught within 40 miles. Similarly, Cannata (2010) found that beginning teachers opt for districts close to home that they are more familiar. Once employed, teachers are more likely to leave their positions when they are employed farther from home (Boyd et al., 2005b). Teachers also have preferences for various regions, neighborhoods, and amenities. Teachers prefer not to teach in

rural or remote areas (Killeen, Loeb, and Williams, 2015). Within rural areas, teachers favor communities closer to airports, universities, and shopping venues (Miller, 2012a). In urban areas, teachers prefer schools in neighborhoods with higher median incomes and less crime (Boyd et al., 2011).

Student Teaching Placements

Additionally, districts located farther away from TEPs may have inequitable access to beginning teachers due to limited access to student teachers. Student teaching placements are even more influential in determining where teachers work than their hometowns (Krieg, Theobald, & Goldhaber, 2015). A study by Goldhaber, Krieg, and Theobald (2014) found that 15% of student teachers are hired by the schools where they completed their internships. This relationship between student teaching and first-year employment is especially strong at schools with vacancies (Goldhaber et al., 2014). Schools with open positions are likely to recruit job candidates whose performance they are already familiar with. Thus, schools and districts with less access to student teachers may be at a disadvantage when recruiting novice teachers.

Communities Disadvantaged in Attracting Teachers

Given the patterns of inequitable access to teachers described above, we examine three community characteristics that are likely to be associated with a difficulty in accessing teachers: concentrated low-income student populations, low college attainment rates, and geographic isolation from TEPs.

Low-Income Urban and Rural Locales

Schools with high proportions of high-poverty students may have difficulty attracting teachers due to teacher preferences for high-achieving, low poverty students who have similar characteristics to themselves. However, a high poverty school in a relatively wealthy district may

have less difficulty attracting teachers than low income districts because of opportunities to transfer to lower poverty and higher achieving schools. Because urban and rural areas have higher concentrations of poverty and lower achievement scores on average, schools located in these areas may have an especially difficult time recruiting teachers. Additionally, teachers have preferences for schools located in less remote areas and low-poverty, low crime neighborhoods that may disadvantage urban and rural districts in attracting teachers. Furthermore, urban and rural areas face different challenges in attracting teachers and thus should be studied separately.

Communities with Low College Attainment

Since teachers have strong preferences to teach in or near their hometowns (e.g., Boyd et al., 2005a; Engel & Cannata, 2015; Killeen, Loeb, & Williams, 2015; Reininger, 2012) and certified teachers must have a college degree, communities with lower college attainment rates will likely have fewer eligible individuals returning to teach. Furthermore, communities with lower college attainment rates have higher unemployment, lower income levels, and higher crime rates (Alliance for Excellent Education, 2013; United States Department of Labor, 2017), which may further stress the supply of available teachers. Because there are well-known racial and economic disparities in college attainment (National Center for Education Statistics, 2017), and because schools with more White students and more affluent students tend to have more success recruiting and retaining teachers, (Boyd et al., 2005b; Hanushek, Kane & Rivkin, 2004), it follows then that communities with lower college attainment rates may be areas where the access to a consistent supply of teachers—especially for students of color—is most limited.

Geographic Isolation from Teacher Education Programs

Due to the strong relationship between student teaching placements and teachers' first jobs, schools that have fewer opportunities to work with student teachers may be at a disadvantage in hiring the most effective teachers. Therefore, communities located farther from TEPs are less likely to have student teachers since student teaching often takes place in close proximity to a TEP's campus, leading them missing out on a pool of potential job candidates. A study by the National Center for Teacher Quality found that about 75% of major teaching institutions nationwide report placing their student teachers close to campus (Greenberg, Pomerance, & Walsh, 2011). This is substantiated by a 2000 study by Strauss and colleagues, which found that 90% of teachers in the Pittsburgh area attended TEPs within 70 miles of where they are working. As such, communities that are geographically isolated from TEPs have fewer opportunities to attract and hire beginning teachers.

The Role of TEPs in Teacher Quality and Distribution

TEPs may be well positioned to encourage teachers to serve in communities that have traditionally had difficulty attracting teachers. Recently, there has been an increased interest in linking teachers' employment outcomes to training received at TEPs. Relationships have been identified between TEPs and teachers' later mobility patterns (Goldhaber & Cowan, 2014), teacher effectiveness (Darling-Hammond, Holtz, Gatlin, & Heilig, 2005; Ronfeldt & Campbell, 2016), and student achievement (Goldhaber, Liddle, & Theobald, 2013). For example, Boyd, Grossman, Lankford, Loeb, and Wyckoff (2009) find that first-year teachers are more effective if they have experiences directly related to the practice of teaching, including student teaching, a capstone project, or experience with their districts' curriculum, while attending their TEP. Given findings from prior research demonstrating that TEPs have the potential to influence teacher

mobility, teacher effectiveness, and student outcomes, we argue that TEPs may be able to promote teaching in disadvantaged communities as well. However, research has not yet fully established the relationship between teacher preparation and equitable access to teachers for disadvantaged students. We seek to determine how TEPs vary in their ability to place their graduates in communities with the greatest needs by estimating the relationship between features of teachers' preparation experiences and the likelihood of taking a position in a community that has difficulty recruiting teachers.

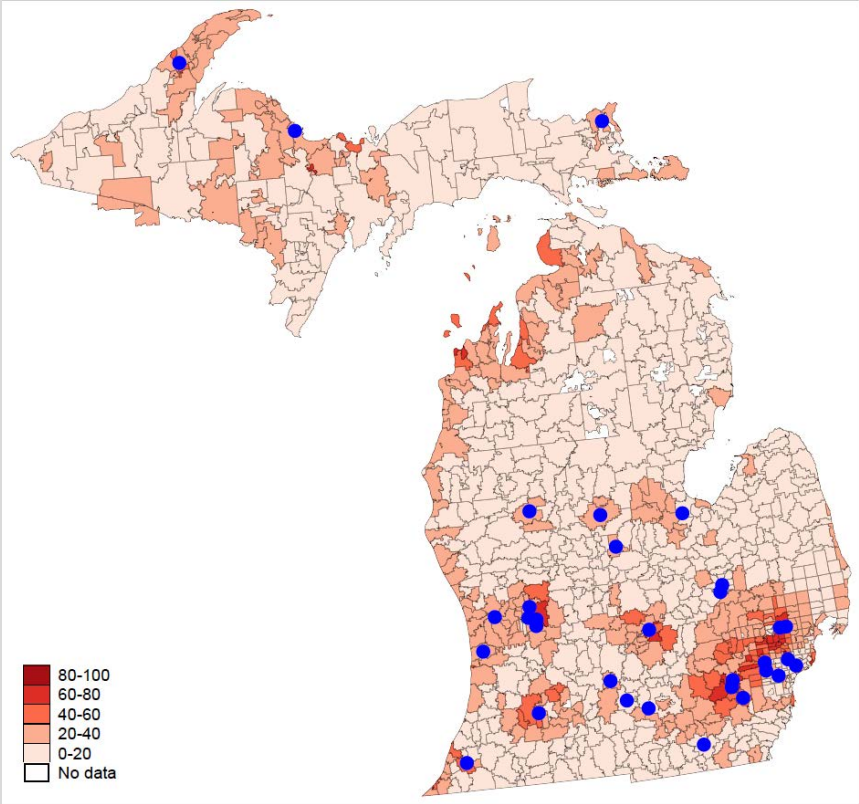
Michigan's Context

Michigan offers a compelling context in which to study communities that have difficulty recruiting teachers due to its varying geography. Numerous regions of the state qualify as low-income urban or rural locales, have low college attainment rates, and are isolated from TEPs. Therefore, it is likely that many communities in Michigan experience difficulties in attracting and retaining preferred teachers. Nearly half of Michigan's schools are designated as Title I, meaning they serve high portions of low-income students. A similar percent of Michigan's students attend schools in either urban or rural locales. According to the National Center for Education Statistics, in 2015-16, 23.6% of students in Michigan attended urban schools and 21.1% attended rural schools. Additionally, there is a high correlation between Title I designations and urban or rural locality (National Center for Education Statistics, 2016).

Statewide, Michigan's college attainment rate is only 26.9%, placing the state at 34th of 50 states (U.S. Census Bureau, 2016). As illustrated in Figure 1, college attainment rates are higher in more densely populated metropolitan areas of the state, while other regions of the state fall between 0 and 20%. Indeed, some communities in Michigan have dramatically lower rates than the state average, with a number of zip codes in the state reporting that none of their

residents hold a bachelor’s degree (U.S. Census Bureau, 2016). Additionally, Figure 1 shows that the northern half the lower peninsula of Michigan, the “thumb region”, and portions of the upper peninsula do not contain any nearby TEPs, increasing the likelihood that districts in these regions experience greater difficulties in hiring.

Figure 1: 2016 Michigan College Attainment Rates by Zip Code with TEPs



Sources: College attainment rates come from the U.S. Census Bureau’s 2016 American Community Survey and TEP locations are from the U.S. Department of Education’s 2016 Title II reporting system.

Michigan has lagged in academic performance relative to other states in recent years, thus there is reason to be concerned with students’ access to teachers in these communities. Michigan fell far below the national average on the most recent National Assessment of Educational Progress (NAEP), a nationally representative exam. In 2017, Michigan ranked 35th in

fourth-grade reading, 38th in fourth-grade math, 30th in eighth-grade reading, and 33rd in eighth-grade math (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2017). Performance on the NAEP has declined considerably in Michigan in recent years across all of these measures, particularly in fourth grade. Michigan fell 11 spots from 27th to 38th in fourth-grade math and 10 spots from 28th to 38th in fourth-grade reading from 2003 to 2017.

Also noteworthy is the decline in new teachers entering the profession in Michigan in recent years. While overall student and teacher counts have been declining at relatively similar rates, considerably fewer new teaching certificates have been issued since 2003-04. From 2011-12 to 2015-16 there has been a 33% *decrease* in the number of initial teaching certificates issued annually, dropping from 9,664 to 3,696 (Stackhouse, 2017). In addition to the downward trend in initial teaching certificates issued in Michigan, participation in teacher education programs in the state has also been declining. Title II data available from 2010-11 to 2014-15 indicates a 25% drop in the number of program completers in Michigan, down from 4,863 in 2010-11 to 3,650 in 2014-15 (U.S. Department of Education, Office of Postsecondary Education, 2015). While there is no overall shortage of teachers in Michigan, these downward trends suggest that there is a need to pay particular attention to the outcomes of beginning teachers in the state.

III. DATA AND METHODS

Sample

Our primary dataset comes from administrative employment records provided by the Michigan Department of Education (MDE) and the Center for Educational Performance Information (CEPI). TEP characteristics originate from National Clearinghouse, Title II and IPEDS data. The administrative employment records contain information concerning teacher

demographics, where teachers were trained, what type of position they held, and where they taught in their first year. To create our sample, we begin with 10,209 first year public school teachers who attended a Michigan TEP and whose primary job is teaching in Michigan between 2011-12 and 2015-16. We exclude teachers whose TEP has closed since 2011 (53 observations) or were not included in the National Clearinghouse data (176 observations). Finally, we drop 23 observations that we have missing employment data. Our final sample consists of 9,958 Michigan public school first-year teachers.

Column 1 of Table 1 describes the teacher characteristics of our sample and the characteristics of their placements. Overall, 92% of first-year teachers in Michigan are White, less than a quarter have a master's degree, and 17.4% teach in hard to staff subject, specifically math and science. Many first-year teachers are placed in disadvantaged schools. Over three quarters of first-year teachers receive their first teaching placement in a Title I school and 62% of their students are economically disadvantaged on average. While about 10% of Michigan public schools are charter schools, almost 40% of first-year teachers teach in charter schools. However, there is quite a bit of variation by individual program. For example, 57% of first-year teachers from Wayne State University are observed in charter schools, which is in alignment with the high rates of charter school attendance in Detroit (In 2016-17, about 42% of Detroit residents attended a charter school). In contrast, only 20% of graduates from Alma College—a small, religiously affiliated liberal arts college located in rural, central Michigan— are in charters.

Table 1. Teacher and First-Year Placement Characteristics

Teacher Characteristics	All Teachers	Traditional Public School Teachers	Charter School Teachers
N	9,958	6,194	3,764
% Male	24.57%	26.06%	22.13%
% Female	75.43%	73.94%	77.87%
% Black	4.62%	2.21%	8.58%
% Hispanic	1.51%	1.37%	1.73%
% White	92.20%	95.06%	87.49%
% Other Race	1.68%	1.36%	2.21%
% With Master's Degree	21.33%	21.39%	21.23%
% Secondary Teacher	32.07%	34.97%	27.31%
% Math/Science Teacher	17.37%	18.21%	15.99%
Placement Characteristics			
% Urban	33.66%	20.68%	55.02%
% Suburban	38.31%	41.98%	32.28%
% Town	9.24%	13.17%	2.76%
% Rural	18.65%	24.06%	9.75%
% Title I School	76.35%	65.16%	95.61%
% English Learners	8.38%	6.32%	11.78%
% Economically Disadvantaged	61.24%	51.42%	77.40%
% Students with Disabilities	13.15%	13.76%	12.14%
% Female	48.69%	48.25%	49.41%
% Black	30.06%	15.23%	54.46%
% Hispanic	8.02%	7.96%	8.12%
% White	54.80%	69.35%	30.85%

Note. The sample includes all Michigan public school first year teachers who attended a teacher education program in Michigan. Students are considered economically disadvantaged by the Michigan Department of Education and the Center for Educational Performance Information if they are eligible for free or reduced price lunch, his or her family receives food (SNAP) or cash (TANF) assistance, or the student is in foster care, is homeless, or migrant.

As seen in Columns 2 and 3 of Table 1, first-year teachers placed in charter schools teach in schools in different locales and with different student compositions than TPS teachers. Over half of charter teachers in our sample teach in urban schools, with less than ten percent teaching in rural schools. Almost all first-year charter teachers teach in Title I schools. Additionally, charter teachers teach in schools that are over 50 percent African American on average. This percent is almost four times higher than TPS teachers. Many of these patterns

reflect where charter schools are located. Charter schools are concentrated in certain parts of the state including urban areas and southeastern Michigan, particularly in and around Detroit. However, rural charter schools do exist. Because of differences between the location and student composition TPS and charter schools, we estimate the models we describe below separately for TPS and charter teachers.

TEP and Institution Characteristics

TEP and institutional characteristics originate from Title II and IPEDS data. We use characteristics of TEPs and their institutions during the most recent year in our panel, 2015-16. TEP characteristics, our explanatory variables of interest, include hours of mentorship required, hours of pre-student teaching required, hours of student teaching required, admissions and graduation requirements for the TEP, the overall Educator Preparation Institution (EPI) score (a TEP performance measure generated by MDE), whether the TEP offers a postgraduate teaching program, TEP enrollment, and the proportion of White students in TEP. Many of these characteristics capture the selectivity and types of experiences offered by TEPs as well as their demographics. We also control for institution characteristics which consist of ACT scores at the 75th percentile, admissions and graduation rates, institutions' highest degree granted, institution size, and the proportion of students receiving Pell Grants.¹

Table 2 describes TEPs in Michigan. There are 32 TEPs in our sample. On average, TEPs require entry and exit GPAs between 2.5 and 3.0. Average exit GPAs required are slightly lower than the entrance requirement. TEPs in Michigan are predominantly White. About 80% of average TEP enrollment is White. TEPs require over 150 hours of pre-student teaching and over 500 hours of student teaching on average. There exists a large amount of variation in institutional characteristics across Michigan's TEPs. The number of doctorate granting, masters

granting, and baccalaureate-only granting institutions is almost the same. While there is an average enrollment of almost 11,000 students at each institution, the standard deviation is over 12,000, indicating substantial variation in institution size.

Table 2. Characteristics of Michigan Teacher Education Programs

Teacher Education Program Characteristics	Mean	Std. Deviation
Minimum GPA to Enter	2.70	0.17
Minimum GPA to Exit	2.62	0.26
Pct. With Postgraduate Programs	71.88%	45.68%
Hours of Mentorship Required	18	80
Hours of Pre-Student Teaching Required	164	127
Hours of Student Teaching Required	536	113
Mean Educator Preparation Institution Score	87.85	2.89
TEP Enrollment	1524	1910
Pct. Black	6.88%	15.79%
Pct. Hispanic	3.00%	2.49%
Pct. White	80.91%	25.21%
Other Institutional Characteristics	Mean	Std. Deviation
75th Percentile ACT Composite Score	25.77	2.46
Pct. Doctoral Granting Institutions	28.13%	45.68%
Pct. Master's Granting Institutions	37.50%	49.19%
Pct. Baccalaureate Granting Institutions	28.13%	45.68%
Overall Institutional Enrollment	10799	12717
Pct. Receiving Pell Grants	37.28%	11.91%
Admissions Rate	64.56%	49.39%
Six-Year Graduation Rate	51.63%	18.12%

Source: The above unweighted teacher education program characteristics come from 2013-14 Title II federal reports, with the exception of Educator Preparation Institution scores, which come from the Michigan Department of Education. Other institutional characteristics come from the National Center for Statistics' Integrated Postsecondary Education Data System (IPEDS) 2013-14 reporting.

Outcome Measures

In this study, we focus on six outcomes that indicate whether a first-year teacher has taken a teaching position in a community that may be disadvantaged when attracting teachers. First, we describe three measures of student composition and locale. Next, we use the portion

of individuals in the community without a college degree. Finally, we consider two measures of geographic isolation from TEPs.

Student Composition and Locale

Since teachers prefer not to teach more disadvantaged students and are less likely to apply to high poverty schools, our first measure of teaching in a school that has difficulty recruiting students is whether or not the school is Title I, indicating that there is a high proportion of low-income students in attendance.² Next, we use teaching an urban Title I school and teaching in a rural Title I school as measures of teaching in a disadvantaged community because of the higher concentrations of poverty, lower average achievement, and presence of these less desirable neighborhood characteristics than suburban schools. Furthermore, we measure urban and rural Title I separately since these locales face different barriers when recruiting students. As shown in Table 3, 30% of first-year teachers are in urban Title I schools and rural Title I placements are observed in 15% of first-year teachers. However, 55% of charter school teachers are placed in urban Title I schools.

College Attainment Rates in the Community

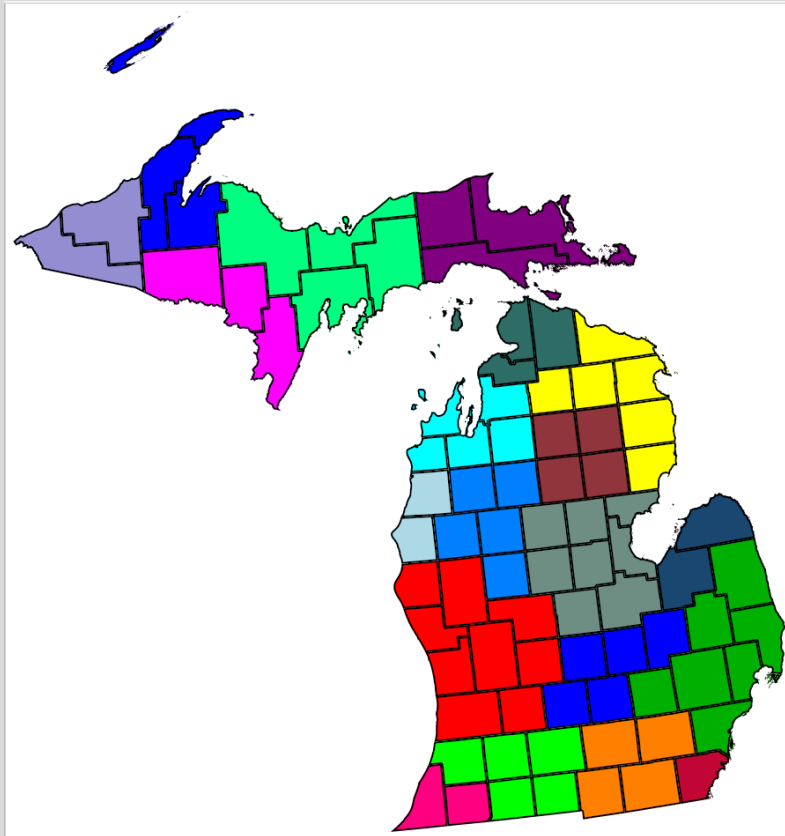
As previously mentioned, communities with lower college attainment rates have fewer college-educated teachers returning to their hometowns to teach (e.g., Boyd et al., 2005a; Reininger, 2012) and teachers are less likely to opt to work in these settings due to their preferences for particular student demographics and community characteristics (e.g., Boyd et al., 2005b; Hanushek et al., 2004). College attainment rates were determined using U.S. census data from the 2016 American Community Survey. For each zip code in Michigan, we found the proportion of population 25 years of age or older with a bachelor's degree or higher. We matched these college attainment rates to the zip code in each school's location. Because this

study focuses on the likelihood of a teacher choosing to work in disadvantaged communities, we use the inverse of this rate in all descriptive statistics and models, focusing on the proportion of the population that does *not* hold a bachelor's degree or higher. On average, first-year teachers in Michigan work in communities where 85% of residents do not hold at least a bachelor's degree as shown in Table 3. This rate is similar for the communities TPS and charter teachers teach in.

Geographic Isolation from Teacher Education Programs

Since student teaching placements are one of the strongest predictors of first year teaching placements, as mentioned above, schools located farther away from TEPs may be at a disadvantage when attracting first-year teachers because student teachers are not readily available. Our first measure of geographical isolation from TEPs is whether or not a teacher works in a commuting zone (CZ) with a TEP. Commuting zones are aggregated counties that describe where people live and work. Created by the United States Department of Agriculture's Economic Research Service (2012), CZs are constructed from county to county commuter flow patterns reported by the American Community Survey. According to Fowler, Rhubart, and Jensen (2016), CZs, in contrast with other labor market delineations, include rural areas, thus making them an appropriate measure for this study. Furthermore, CZs have been used as the geographic unit of analysis in previous work including Chetty, Hendren, Kline, and Saez's (2014) study of intergenerational mobility. Figure 2 contains a map of Michigan's CZs. As depicted in Table 3, about 6% of first-year teachers teach in a commuting zone without a TEP. Less than three percent of charter teachers teach in schools located in a commuting zone without a TEP.

Figure 2: Michigan Commuting Zones



Sources: United States Department of Agriculture (2012)

We also consider distance from the closest major TEP to a teaching placement as a continuous measure of geographic isolation from a TEP. To create this measure, we used school addresses from state records in 2011 to 2015 and TEP addresses from the Integrated Postsecondary Education Data System (2016-17). We calculated drive times, in minutes, from each TEP to each school in Michigan using Google Distance Matrix application programming interface (API).³ Additionally, Table 3 shows that teachers in our sample work approximately 28 minutes on average from any TEP.

Table 3. Summary of Outcomes

Outcome	All Teachers	Traditional Public School Teachers	Charter School Teachers
Pct. Teaching in a Title I School	76.35%	65.16%	95.61%
Pct. Teaching in an Urban Title I School	30.14%	15.48%	55.38%
Pct. Teaching in a Rural Title I School	14.93%	18.37%	9.01%
Pct. of Community Without Four-Year Degree	84.74%	83.54%	86.72%
Pct. Teaching in a Commuting Zone Without a TEP	5.79%	7.62%	2.79%
Drive Time from School to Nearest TEP (Minutes)	27.97	32.22	20.98

Note. TEP is an abbreviation for Teacher Education Program. Drive time from placement to nearest TEP is calculated using Google Distance API assuming average traffic.

Accounting for First-Year Teachers' Hometowns

Recognizing the significance of teachers' unique geographical preferences and tendencies to return to their hometowns, we consider the characteristics of first-year teachers' own high schools. Although we are unable to link individual teachers to their high schools, we make use of National Student Clearinghouse data to infer the characteristics of teachers' hometowns. We use data on education majors who first enter college between 2006 and 2010 to generate a profile of the typical education student for each TEP. This group of students is representative of those who would most likely enter their first year of teaching in 2011 to 2015, four to five years after beginning college. We describe education majors' high schools by TEP type using the same outcome measures described above. We consider the proportion of education majors who came from high schools located in a CZ without a TEP, how far their high schools are on average from their own TEP and any TEP, the average community college attainment rate, and the proportion of education majors who attended high school in Title I urban or rural locations. As illustrated in Table 2, education majors tend to come from high schools located in communities that are slightly more geographically isolated and more educated than where first-year teachers are employed. First-year teachers are far more likely to

work in urban and rural Title I settings than attend such high schools as students.

Acknowledging these discrepancies, we control for average high school characteristics of education majors by TEP in our models.

Analysis

To calculate the relationship between the characteristics of the TEP that a teacher attends and the location of his or her first job placement net of other demographic characteristics, we estimated a series of regression models for each of our six outcome measures described above:

$$\text{Eq. 1} \quad \text{PLACEMENT}_{ij} = \beta_0 + \mathbf{TEPCHAR}_{ij} \boldsymbol{\beta} + \mathbf{INSTCHAR}_{ij} \boldsymbol{\lambda} + \eta \text{AVGHSDRIVETIME}_{ij} + \theta \text{AVGHSOUTCOME}_{ij} + \mathbf{TEACHER}_{ij} \boldsymbol{\delta} + \mathbf{YEAR}_{ij} \boldsymbol{\gamma} + \varepsilon_{ij}$$

For each model, PLACEMENT_{ij} represents one of six outcomes of interest: placement in a CZ without a major TEP; drive time from the closest TEP to his or her job; portion of the community without a college degree; and placement in a Title I, urban Title I, or rural Title I school.

$\mathbf{TEPCHAR}_{ij}$, a vector of the characteristics of the TEP the teacher attended, contains our variables of interest including hours of mentorship required, hours of pre-student teaching required, hours of student teaching required, admissions and graduation requirements for the TEP, the overall EPI score (a TEP performance measure generated by MDE), whether the TEP offers a postgraduate teaching program, TEP enrollment, and the proportion of White students in TEP. $\mathbf{INSTCHAR}_{ij}$ is a vector of general institutional characteristics, including: ACT score, highest degree granted, financial need, admissions rate, and graduation rate.

Across all models, we control for the average drive time from education majors' high schools to their TEPs with $\text{AVGHSDRIVETIME}_{ij}$. We also account for other corresponding characteristics of education majors' high schools in each model with AVGHSOUTCOME_{ij} . For example, in models where the placement outcome is teaching in a CZ without a TEP, we control

from the proportion of education majors from a teacher's TEP who come from a high school located in a CZ without a TEP. **TEACHER**_{ij} represents a vector of observable teacher characteristics, including race, gender, advanced degree, and position type (elementary or secondary). We also include a vector of year dummy variables, **YEAR**_{ij}, to account for any differences in labor market trends across time. Robust standard errors are clustered by TEP. We estimate separate models for traditional public school (TPS) and charter school teachers due to unique teacher characteristics and mobility patterns across sectors as well as the geographic concentration of charters in more disadvantaged areas.

Results

Table 4 contains the regression coefficients for the model represented by Equation 1 for each of our six outcomes of interest for the sample of TPS teachers. First, we note that high school characteristics are significant predictors of first-year teachers' job placements. This aligns with previous research demonstrating that teachers' own schooling experiences are highly predictive of future placements (e.g., Boyd, Lankford, Loeb, & Wyckoff, 2005a; Reininger, 2012). Below, we focus on the relationships between TEP characteristics, our variables of interest, and our outcome measures.

Our results indicate that there is little relationship between TEP characteristics and teaching in any Title I school. The one exception is the minimum GPA required to graduate from a TEP. A one standard deviation increase in minimum GPA relative to other institutions results in about four percentage point decrease in the likelihood to teach in a Title I school. While placement in rural Title I schools and communities with low college attainment rates has a similar relationship with exit GPA, it is positively associated with teaching in an urban Title I school.

Table 4. Estimated Relationships Between TEP Characteristics and First-Year Teaching Placement for Traditional Public School Teachers

	(1)	(2)	(3)	(4)	(5)	(6)
		Urban Title I	Rural Title I	Proportion Without Bachelor's Degree	Commuting Zone Without a TEP	Distance from Nearest TEP
Minimum Entry GPA	0.0059 (0.0137)	-0.0241*** (0.0069)	0.0209** (0.0101)	0.0040 (0.0024)	0.0224*** (0.0061)	3.369*** (1.079)
Minimum Exit GPA	-0.0393*** (0.0134)	0.0156* (0.0080)	-0.0241** (0.0108)	-0.0093*** (0.0027)	-0.0226*** (0.0054)	-3.805*** (0.769)
Post-Graduate Program Offered	0.0165 (0.0281)	0.0307 (0.0200)	0.0120 (0.0196)	-0.0021 (0.0040)	-0.0263 (0.0213)	-0.957 (2.020)
Hrs. of Mentorship Req.	-0.0012 (0.0113)	0.0043 (0.0059)	-0.0089 (0.0085)	-0.0020 (0.0014)	0.0091 (0.0064)	1.156 (0.750)
Hrs. of Pre-Student Teaching Req.	-0.0117 (0.0087)	-0.00895 (0.0062)	-0.0140** (0.0056)	-0.0017 (0.0018)	0.0056 (0.0073)	1.027 (0.748)
Hrs. of Student Teaching Req.	0.00271 (0.0167)	-0.0144 (0.0101)	-0.0242*** (0.0082)	-0.0059*** (0.0017)	0.0189 (0.0112)	2.184** (0.920)
EPI Score	-0.0185 (0.0158)	0.0204* (0.0110)	-0.0248** (0.0112)	0.0020 (0.0042)	-0.0045 (0.0071)	0.210 (0.982)
Proportion White in TEP	0.0137 (0.0169)	0.0155 (0.0100)	-0.0024 (0.0132)	0.0007 (0.0026)	-0.0061 (0.0086)	0.105 (1.067)
Constant	0.609 (0.489)	0.328 (0.269)	0.796*** (0.271)	0.195* (0.110)	-0.395 (0.322)	-42.64 (28.91)
Observations	6,194 0.111	6,194 0.0728	6,194 0.0721	6,177 0.0745	6,194 0.0584	6,194 0.105

Note. Robust standard error in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Explanatory variables not shown include gender, race indicators, indicator for teaching in a math or science position, indicator for holding a secondary education certificate, TEP enrollment, institution's 75th percentile ACT composite score, Carnegie classification, enrollment, percent receding Pell Grants, admission's rate, and graduation rate. Also included are the average drive time from high school to TEP for those enrolled in the TEP and the average or percent of TEP enrollees from a high school with the outcome characteristic and indicators for missing Title I and outcome data. These models include year fixed effects and TEP is an abbreviation for Teacher Education Program. Drive time from placement to nearest TEP is calculated using Google Distance API assuming average traffic.

More rigorous entry GPA requirements are negatively associated with teaching in an urban Title I school, but positively associated with teaching in a rural Title I school. Although we find little relationship between TEP characteristics and teaching in any Title I school for TPS teachers,

many TEP characteristics predict teaching in a rural Title I school. Hours of pre-student teaching and student teaching required as well as the overall EPI score are negatively associated with teaching in a rural Title I school for TPS teachers. Hours of student teaching required is negatively associated with teaching in communities with low college attainment rates as well.

Teachers who attend TEPs with a higher required GPA to enter a TEP are more likely to be placed in commuting zones without a TEP and in schools farther away from any TEP. Attending a TEP with more rigorous GPA exit requirements is negatively associated with teaching in a school geographically isolated from TEPs. Additionally, attending a TEP that requires more hours of student teaching is associated with teaching farther away from any TEP for TPS teachers.

Table 5 displays the coefficient estimates for the model represented by Equation 1 for the sample of charter teachers. In contrast to the results for TPS teachers, many relationships exist between TEP characteristics and teaching in a Title I school for charter teachers. In contrast to TPS teachers, attending a TEP with higher required exit GPA is positively associated with teaching in a Title I school for charter teachers. Additionally, charter teachers attending a TEP that requires more hours of mentoring and has a higher EPI score are less likely to teach at a Title I school. Additionally, attending a TEP with a higher proportion of White teaching candidates was negatively associated with teaching in any Title I school and urban Title I schools.

Charter teachers are more likely to teach at rural Title I schools when they attend a TEP with higher entry GPA requirements, post-graduate teaching programs, and fewer required hours of mentoring and pre-student teaching. Additionally, charter teachers who attended TEPs with higher EPI scores are less likely to teach in schools located in communities with lower

college attainment. Similar to TPS teachers, attending a TEP with more rigorous entry GPA requirements is positively associated with teaching at a school farther away from a TEP for charter teachers. However, attending a TEP with higher required GPAs to graduate is negatively associated with teaching in a charter school farther away from a TEP.

Table 5. Estimated Relationships Between TEP Characteristics and First-Year Teaching Placement for Traditional Charter School Teachers

	(1)	(2)	(3)	(4)	(5)	(6)
	Title I	Urban Title I	Rural Title I	Proportion Without Bachelor's Degree	Commuting Zone Without a TEP	Distance from Nearest TEP
Minimum Entry GPA	0.0109* (0.0063)	0.0054 (0.0159)	0.0227*** (0.0080)	0.0043* (0.0025)	0.0197* (0.0099)	3.162** (1.492)
Minimum Exit GPA	0.0217*** (0.0069)	-0.0038 (0.0108)	0.0076 (0.0089)	0.0049 (0.0036)	-0.0154 (0.0104)	-2.534** (1.141)
Post-Graduate Program Offered	0.0350* (0.018)	0.0267 (0.0451)	0.0526** (0.0239)	0.0064 (0.0130)	0.0226 (0.0248)	1.271 (3.266)
Hours of Mentorship Req.	-0.0132*** (0.0039)	-0.0004 (0.0079)	-0.0230*** (0.0052)	-0.0029 (0.0022)	0.0071 (0.0073)	0.523 (0.735)
Hours of Pre-Student Teaching Req.	-0.0066 (0.0054)	0.0176 (0.0132)	-0.0154** (0.0075)	-0.0048 (0.0051)	-0.0111 (0.0073)	-0.210 (0.966)
Hours of Student Teaching Req.	0.00885 (0.0076)	0.0177 (0.0175)	-0.0069 (0.0093)	0.0016 (0.0052)	-0.0048 (0.0105)	-0.144 (1.223)
EPI Score	-0.0262*** (0.0091)	-0.0104 (0.0142)	0.0062 (0.0085)	-0.0112*** (0.0038)	0.0045 (0.0109)	2.401 (1.795)
Proportion White in TEP	-0.0247*** (0.0065)	-0.0301** (0.0135)	-0.0112 (0.0081)	-0.0043 (0.0037)	0.0239* (0.0133)	1.709 (1.035)
Constant	0.247 (0.243)	-0.168 (0.415)	0.379 (0.297)	0.664*** (0.222)	-0.0627 (0.376)	-11.75 (46.77)
Observations	3,764 0.584	3,764 0.109	3,764 0.0457	3,735 0.0468	3,764 0.0470	3,764 0.0751

Note. Robust standard error in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Explanatory variables not shown include gender, race indicators, indicator for teaching in a math or science position, indicator for holding a secondary education certificate, TEP enrollment, institution's 75th percentile ACT composite score, Carnegie classification, enrollment, percent receding Pell Grants, admission's rate, and graduation rate. Also included are the average drive time from high school to TEP for those enrolled in the TEP and the average or percent of TEP enrollees from a high school with the outcome characteristic and indicators for missing Title I and outcome data. These models include year fixed effects and TEP is an abbreviation for Teacher Education Program. Drive time from placement to nearest TEP is calculated using Google Distance API assuming average traffic.

IV. DISCUSSION

Although we are unable to attribute a causal relationship between attendance at a TEP with particular characteristics and teachers' first placement, we do uncover a number of patterns that describe the pipeline through which schools located in areas that have difficulty recruiting and retaining teachers receive their supply of teachers. First, we find that teachers who attend TEPs with higher required GPAs to enter are often more likely to work in rural Title I schools and communities geographically isolated from TEPs, but attending a TEP with more rigorous GPA requirements to exit is negatively associated with these same outcomes. One explanation for why more rigorous or selective TEP entry requirements leads to more placements in more remote communities because it attracts higher achieving students who grew up in these areas. One of the strongest predictors of teaching placement is the teacher's hometown. While this relationship is weaker for teachers who went to high school in more remote areas (Miller, 2012a), high achieving individuals attending more selective universities who want to return to their more remote hometowns may choose teaching as a career because it may be one of the highest quality jobs for college graduates in rural areas.

In contrast, attending a TEP with rigorous entry requirements is negatively associated with teaching in an urban Title I school. Because teachers prefer to teach near their hometown, possible teaching candidates from urban Title I high schools may be less prepared to attend college and have lower GPAs during the first few years of college. Thus, entry GPA requirements may serve as barriers for those who want to teach in urban Title I schools.

Next, we find that attending TEPs of higher quality as measures by EPI score and with more experiences directly related to teaching, including student and pre-student teaching, are less likely to teach in rural Title I schools. Prior research has found that these types of

experiences are also related to first-year teacher effectiveness (Boyd et al., 2009). Thus, teachers who are more equipped for the classroom due to pre-student teaching and student teaching may be less likely to teach in rural Title I schools, exacerbating the inequitable distribution of teachers.

Finally, we find that TEPs with similar characteristics place charter teachers in different types of communities than TPS teachers. While few of the results are the same for charter and TPS teachers, different relationships were predicted between TEP characteristics and placement in areas experiencing difficulty attracting teachers for charter and TPS teachers. Some characteristics have relationships in opposite directions for these two groups of teachers. This is particularly interesting because both types of teachers receive the same preparation within TEPs but have different outcomes. Future research on how TEPs influence placement for charter teachers compared to TPS teachers is needed to explain why these results are different.

Limitations

We note that our study has a number of limitations. First, although we know that teachers generally attend TEPs close to their hometowns and often return to these same districts or those with similar characteristics, we cannot observe specifically where the first-year teachers in our data attended high school. Although we infer aggregated characteristics of education majors who attend the same TEP, we acknowledge that this is not as precise as individual-level high school placement information. Second, we are unable to observe whether teachers attended particular individual programs within TEPs, such as social justice-oriented urban cohorts found in a number of Michigan institutions. As a result, we are unable to separate out the relationship between a teacher's TEP as a whole and job placement versus the specific program he or she participated in. Finally, our data do not allow us to observe where teachers completed their student teaching. While some TEPs in the state work with teachers to

place them a location of their choosing, others have predetermined partnerships with districts that do not allow for as much geographical flexibility. More generally, each of these implications together imply that we cannot directly account for the individual teacher-level decisions that sequentially lead first into a TEP and, eventually, into a first teaching placement.

Policy Implications

These limitations notwithstanding, the results here have several implications not only for the research literature but also policymaking concerning teacher recruitment. The results suggest that there are a number of steps that TEPs in Michigan might take to ensure that their graduates are serving all communities across the state, especially if they recognize that teachers are more likely to return to their hometowns to teach. For example, TEPs in Michigan might consider providing additional academic support for students from urban Title I high schools interested in teaching. This may help these students who are likely to teach in urban Title I schools overcome barriers posed by entry GPA requirements. To recruit teachers from high quality TEPs with more experiences directly related to teaching to rural Title I schools, these TEPs may focus on recruiting teaching candidates from rural areas. Recruitment efforts by TEPs for students from rural Title I high schools may include targeted messaging about the benefits of a career in teaching and scholarships for students who commit to returning to their communities to teach after college.

In sum, although considerable research exists on the role that geography plays in teacher placement patterns, less is currently known about the particular influence a teacher's TEP has on the likelihood that he or she will work in a location that has traditionally had difficulty recruiting and retaining teachers. By considering TEP characteristics associated with placement in these communities, we are able to describe which TEP characteristics are

associated with more equitable teacher distribution patterns. The results from this research can further inform policymakers and program administrators on the particular relationships between geography, training, and career placement within the teaching profession, and further clarify the way these relationships pose challenges for ensuring that all students have equal access to a high-quality education.

ENDNOTES

1. Three TEPs are missing some TEP and institution characteristics in our dataset. We estimate our models without teachers who attended these TEPs as well as with these observations and an indicator that the variable is missing. Results are similar.
2. 348 teachers in our sample teach at a school that has a missing Title I indicator in our dataset. We estimate these models dropping these teachers as well as with these observations and an indicator that the observation is missing this information. Results are similar. We repeat this process when teachers' placements zip codes are missing (17 observations) and when drive time to nearest TEP is missing (2 observations).
3. Although teachers' job placements were in 2011 to 2015, all distances were calculated in January 2018 because Google Distances API cannot calculate historic distances. We do not believe that any changes in drive times between 2011 and 2018 bias our results.

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