School Climate and Student Mobility

Ben Pogodzinski

Walter Cook

Sarah Winchell Lenhoff

Jeremy Singer

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Abstract

School choice has been accompanied by an increase in student mobility. Although changing schools can benefit students, research has shown that it is often associated with negative student and school outcomes. This study sought to better understand the relationship between school climate and the likelihood of student mobility across K-8 schools in Detroit, a city marked by a high level of school choice options. We found conflicting evidence of a relationship between measures of school climate as measured by the 5Essentials survey and student mobility. We discuss these findings in the context of potential sector differences, which may overshadow parental preferences for organizational characteristics.

Keywords: student mobility, school climate, school choice

The expansion of school choice policies in the United States has ensured that families in many communities have a myriad of K-12 schooling options to choose from. With limited barriers to entry, families have more opportunities to enroll in schools that they perceive to provide the best fit for their children. This marketization of education is not only designed to facilitate better matches between parental/student preferences and school characteristics, but promote system wide innovation and improvements in school effectiveness through competition for student enrollment (Bulkley, Henig, & Levin, 2010; Hoxby, 2003). In a rich choice environment, students can attend multiple schools over the course of their education, beyond typical moves associated with natural matriculations from one school to another (e.g., elementary school to junior high school). Such student mobility may be beneficial for students, as research has shown that students on average are more likely to move from schools characterized as low performing to higher performing schools (Mouralis, Santillano, Jabbar, & Harris, 2019). Additionally, research has shown that attending higher quality schools can result in individual higher student achievement over time (Engberg, Gill, Zamarro, & Zimmer, 2012; Hanushek, Kain, & Rivkin, 2004).

At the same time, student mobility has the potential to negatively impact educational and social outcomes for individual students, as well as negatively disrupt systems of education (Reynolds, Chen, & Herbers, 2009). For example, research has found that mobile students are at risk of lower academic achievement (Mehana & Reynolds, 2004), slower academic growth in the early grades (Herbers et al., 2012; Lleras & McKillip, 2017), increased behavioral problems (Engec, 2006), and increased likelihood of dropping out of school (Rumberger & Larson, 1998). In their meta-analysis of studies examining the impact of mobility on student achievement, Mehana and Reynolds (2004) estimated that mobile students have a 3-4 month performance disadvantage compared to non-mobile students.

Additionally, student mobility may negatively impact non-mobile students as high rates of mobility (both the exit and entry of students) can significantly disrupt a school's learning and social environment (South, Haynie, & Bose, 2007). For example, teachers may be required to adjust teaching strategies and curricula to accommodate fluctuations in student needs (Reynolds et al., 2009; Rumberger, 2003), and changing relationships among peers can erode the social capital within the school (Coleman, 1988; South, Haynie, & Bose, 2007). Relatedly, student mobility has the potential to shift student demographics within a school, which has the potential to challenge a school's ability to sufficiently meet the needs of all students (Kerbow, 1996; Rumberger, Larson, Ream, & Palardy, 1999).

As outlined by Welsh (2017), theoretical reasons why moving schools may benefit or harm individual student outcomes, as well as impact school organizational effectiveness, largely stem from bio-ecological theory (Bronfenbrenner, 1979) and social capital theory (Coleman, 1988). The core of bio-ecological theory asserts that human development and behaviors are influenced by complex interactions between individuals and the multidimensional components of their environment (Bronfenbrenner, 1979; Koth, Bradshaw, & Leaf, 2008; Wang & Degol, 2016). Given this, a change in the domain and features of a school environment has the potential to impact student outcomes over time, both in positive or negative ways (Wang & Degol, 2016). Social capital theory highlights the value derived from interpersonal relationships within a social network (Bourdieu, 1986; Colemen, 1988). For students, this includes peer relationships as well as relationships with adults in the school. The quality of relationships can vary within a school, and these networks can also transmit negative pressures and downward leveling norms (Lin, 1999; Portes, 1998).

Collectively, these theoretical constructs relate to school climate, or the formal and informal structures which shape individuals' experiences and influence their beliefs and practices (Halpin & Croft, 1963; Hoy & Miskel, 2008). Theoretically, school climate encompasses important aspects of a school environment related to academic quality, safety, and social relationships. Schools have increasingly sought to measure school climate through various methods, including through the surveying of students, parents, and faculty/staff (Faster & Lopez, 2013). Survey based measures of school climate are presented as the views of the school community as it relates to the quality of the formal and informal structures of the school environment, which may not be captured by other observable measures of the school context (e.g., student proficiency rates). These survey based measures of school climate are then often publicly reported along with other school-level measures related to academic achievement and growth, graduation rates, student attendance, and others. Previous research has not identified the extent to which these types of measures of school climate derived from school stakeholder surveys are associated with parental preferences for school environments, and how they are associated with student mobility.

Therefore, this study aims to fill some of these gaps in the research by combining school- and student-level data from one of the most active school choice cities in America – Detroit – to identify the association between student mobility and school climate as measured through surveys of students and faculty/staff. Specifically, we address the following research questions: a) Does the quality of school climate as measured by the 5Essentials surveys predict nonstructural student exit from a school?

b) Were mobile students moving to schools that were observably different than the ones they left with regard to measures of school climate?

School Climate and Student Mobility

Students move from one school to another for a variety of reasons, including those that are structural (e.g., transitioning from a middle school to a high school) and nonstructural (i.e., moves that are not designed into the system). Welsh (2017) categorizes nonstructural student mobility into two categories: a) residential mobility, and b) school-related factors. Although the majority of nonstructural moves are related to residential mobility (Reynolds et al., 2009; Welsh, 2017), a significant percentage of student mobility is associated with voluntary parent-initiated school moves or school-initiated involuntary push outs (e.g., expulsions or other efforts to precipitate a move) (Grigg, 2012, Jabbar, 2015; Rumberger, 2003; Welsh, 2017). Although there are potential consequences associated with any school move, the focus of this work is on nonstructural parent-initiated school moves (though it is often difficult to disentangle school push out efforts from parent initiated moves).

Research that utilized the National Education Longitudinal Study (NELS) to examine student mobility in California showed that the majority of school moves were "reactive" as opposed to "strategic" (Rumberger et al., 1999), suggesting that parents are often drawing from their perceptions of and experiences in their child's school to inform enrollment decisions. In a study of school choice in a large highly segregated Midwestern city, Bell (2009a, 2009b) reported that school moves were largely precipitated by student/parent experiences within a particular school, and to some extent their perceptions regarding schools in their choice set. In a location with many school options like Detroit, parents can continually evaluate their school and their choice set to attempt to find the best fit for their child. At the same time, not only do student/parent experiences in a school vary, but their preferences for school characteristics can significantly vary as well (Bell, 2009a, 2009b).

One of the strongest predictors of student mobility relates to overall perceptions of school quality. For example, multiple studies have shown parental preferences for academic quality are associated with student mobility (e.g., Bayer, Ferreira, & McMillan, 2007; Burgess, Greaves, Vignoles, & Wilson, 2015; Maroulis et al., 2019). For example, using data on student mobility in New Orleans (a city with high levels of choice similar to Detroit), Maroulis and colleagues (2019) found that students were more successful in moving out of low performing schools than they are at enrolling in higher performing schools (particularly low-income students) (Maroulis et al., 2019). Using student mobility data for a complete freshman cohort in Chicago Public Schools, Burdick-Will (2017) reported that students in poor and high crime areas of the city were significantly more likely to travel long distances to try to find high performing schools. Given various constraints on choice sets, they do not always enroll in schools that are measurably different in terms of aggregated student performance.

In addition to preferences for school academic performance, parental preference for school safety, social environment, and location have been found to be predictors of student mobility (Kerbow, 1996; Rumberger, 2002). For example, parents often seek a school that is conveniently located relative to their home or place of employment (Bell, 2009b; Hamilton & Guin, 2005; Harris & Larsen, 2015). Therefore, preferences for a school can change not only based on a residential move, but a change in job location or other circumstances related to convenient access to a school can influence a decision to change schools (e.g., a cousin can offer a ride to a school).

While parental/student preferences for specific characteristics of a school may contribute to student mobility, preferences for academic quality, school safety, and social environment may manifest as preferences for schools with a specific type of student demographic. On average, students move to schools with a higher percentage of white enrollment and higher income status (Bifulco & Ladd, 2007; Burgess et al., 2015; Lankford & Wycoff, 2005; Welsh, 2017; Witte, Carlson, & Lavery, 2008). For example, using panel data on charter school enrollment in North Carolina, Bifulco and Ladd (2007), although black families that were choosing charter schools preferred schools that had 40-60% black enrollment, white families that chose charter schools preferred schools with 20% or less black enrollment. Such moves have the potential to exacerbate school segregation (Frankenberg & Lee, 2003; Garcia, 2008), which has the potential to negatively impact students academically and socially.

Although much of the previous research on student mobility has focused on the urban context where there is a more robust market for school choice (e.g., Chicago (Kerbow, D (1996)) or New Orleans (Harris & Larsen (2015)), or have drawn from national data sets such as NELS (e.g., Rumberger & Larson, 1998), previous findings are not necessarily generalizable to the Detroit context. In addition to having a robust school choice market on par with New Orleans, Detroit ranks at the bottom on several demographic characteristics among large cities, including rates of violent crime, poverty rate, and unemployment rate (Author, 2019). Therefore, although previous research is informative to understanding student mobility in many different contexts, Detroit's unique context is important to consider.

School Climate

Although there has been considerable research on parental/student preferences for school characteristics and student mobility, it has not been fully conceptualized as related to "school climate" (Wang & Degol, 2016). Bell (2009b) reported that many parents sought schools where there was a high notion of "fit" for their students, related to multiple characteristics of a school environment and experience. In many ways, this conceptualization of fit encompasses the whole school environment, related to both academics and social structure. According to Wang and Degol (2015), "School climate represents virtually every aspect of the school experience, including the quality of teaching and learning, school community relationships, school organization, and the institutional and structural features of the school environment" (p. 314). Although the authors acknowledge there is a lack of consensus on a definition and measures of school climate, school climate broadly relates to both the formal and informal structures of a school, which is experienced by members of the school community and influences their behaviors (Halpin & Croft, 1963; Hoy & Miskel, 2008; Litwin & Stringer, 1968; Tagiuri, 1968).

Wang and Degol (2015) situate school climate within four domains (which each contain multiple dimensions): a) academics, b) community, c) safety, and d) institutional environment. Academic climate relates to the overall quality of the academic environment related to curricula, instruction, teacher quality, and professional development. Community climate relates to interpersonal relationships within a school, including between students and adults and amongst the adults. Climate related to school safety relates to both the perceptions of safety within the building and disciplinary practices. Finally, the climate measures related to the institutional environment reflect structural features of a school environment, such as building conditions, access to technology, adequacy of materials, and class size.

As a multidimensional construct, measures of school climate can more fully represent the totality of the school environment, even if there is overlap among the domains/dimensions and there is disagreement regarding what measures should be included in various constructs (Wang

& Degol, 2016). In their research on school improvement in Chicago, Bryk et al. (2010) documented the link between school organizational climate and student learning, conceptualizing climate as made up of five "essential" factors: ambitious instruction, effective leaders, collaborative teachers, supportive environment, and involved families (broadly aligned with those laid out by Wang and Degol (2016)). Measures of school climate seek to encapsulate individuals' perceptions of the school environment, which shape individuals' experience and beliefs about the school. There are multiple ways in which school climate can be measured, though Wang and Degol (2016) report that over 90% of empirical studies used self-report surveys from students, parents, and faculty/staff to assess school climate.

In a review of school climate research, Wang and Degol (2016) detail the extent of research linking measures of school climate to various student outcomes, including academic outcomes (e.g., Lee & Smith, 1999; Sheldon & Epstein, 2005), behavioral outcomes (e.g., Brookmeyer, Fanti, & Henrich, 2006; Gregory, Cornell, & Fan, 2011), and social outcomes (e.g., Durlak et al., 2011; Zullig, Huebner, & Patton, 2011). In totality, better student academic and social outcomes are associated with higher quality school climate across multiple domains.

Although the studies reviewed did not directly measure the association between measures of school climate and student mobility, they collectively detailed the extent to which school climate has the potential to impact a variety of experiences and outcomes for students, which have been shown to be predictive of student mobility. Additionally, these studies did not consider the extent to which the public reporting of school climate data may inform mobility decisions. School climate data have become increasingly popular in informing school improvement efforts, as well as incorporated into school accountability measures (Faster & Lopez, 2013). For example, eight states are measuring school climate under the Every Student

Succeeds Act (2015) accountability requirements, and twelve additional states have ongoing efforts to produce and make publicly available school climate data (Kostyo, Cardichon, & Darling-Hammond, 2018).

Thus, school climate data may not only resonate with an individual student's experience within a school, which would then be associated with mobility decisions, but the public reporting of climate data may influence parental perceptions about a school's quality. In other words, even if a parent's child had a generally positive experience in a school, the signaling power of climate data may prompt a parent to look elsewhere.

Data and Methods of Analysis

Detroit Context

School choice has dominated the education landscape in Detroit for the last two decades. In 2017-18, only about 45% of the 105,108 Detroit resident K-12 students were enrolled in a Detroit Public Schools Community District (DPSCD) school, with 32% enrolled in a charter school within the city, 14% enrolled in a charter school in the suburbs, and 9% enrolled in a suburban traditional public school district. Even for students who did attend a DPSCD school, only about 46% attended their neighborhood zoned school. In other words, choice options within and across school systems are plentiful in Detroit, creating a competitive school choice market where school systems seek to increase enrollment as the primary means of generating revenue.

In this high choice environment, student mobility has been robust. Figure 1 shows the trends in nonstructural student mobility, highlighting the potential compounding effect of a continuous churn of students. As shown, mobility varied across racial/ethnic groups, though it should be noted that African Americans make up the vast majority of students in Detroit schools (82%), and that Detroit schools are highly segregated by race/ethnicity. Therefore, the magnitude of the impact of student mobility is largely concentrated among African American students and the schools that serve them. For example, the average school-level nonstructural mobility rate (Fall 2016 to Fall 2017) for K-8 schools was approximately 21% (standard deviation of 10, with a minimum of 3% and a maximum of 58%). This suggests that certain schools are particularly hard hit by mobility, regardless of whether it occurred within or between years.

[insert Figure 1 about here]

Data

To answer our research questions, we utilized student- and school-level data to identify the association between measures of school climate and student mobility within and across Detroit's public school systems. Specifically, student-level data accessed from the Michigan Center for Educational Performance and Information (CEPI) provided information on student enrollment, achievement levels, demographic information, and place of residence (at the Census block level) for all Detroit resident students attending schools in the tri-county Metro Detroit area for the 2014-15 and 2015-16 school years. We only included students who attended a public school in the City of Detroit, including in the Detroit Public Schools (DPS), the Education Achievement Authority (EAA), or a city charter school because these schools had publicly available school climate data using a common metric.

It should be noted that during the time period under analysis, the Detroit Public Schools district (DPS) was under State control. In 2016, a new public school district was created, the Detroit Public Schools Community District (i.e., the new DPS), and returned to local control (minus the financial debt which remained with DPS (i.e., the old DPS) – which no longer operates any schools). Additionally, during the time period under analysis, the EAA was still in existence. The EAA was created in 2011 through an agreement between DPS, the State of

Michigan, and Eastern Michigan University, and given the authority to take over and turn around some of the lowest performing schools in DPS. Fifteen schools were moved from DPS into the EAA, but it’s existence was short-lived, as the EAA was dissolved prior to the 2017-18 school year. All former EAA schools were returned to the newly formed DPSCD. Finally, during this time period, there were 90 charter schools operating within Detroit, with a myriad of authorizers and operators. Unlike a high choice city such as New Orleans, there was no common enrollment system in use across the various school systems operating within Detroit.

Measures of School Climate. We focus on this particular time period (2014-15 and 2015-16 school years) because we have the most robust measures of school climate across these school systems. Specifically, during this time period the 5Essentials surveys were administered to teachers, students, and parents in the majority of schools within Detroit, providing measures of school climate to inform school improvement efforts as well as inform the public regarding school conditions. The school climate data was included as part of a school scorecard reported out by the now defunct organization Excellent Schools Detroit; one of the explicit intentions of the school scorecard was to inform school choice decisions. Approximately 84% of schools within the city administered the surveys, and school climate reports were made publicly available for all participating schools. A few suburban schools also administered the survey, but they were excluded from this analysis as the focus was specifically on Detroit resident students who attended schools within the City of Detroit.

The 5Essentials surveys are a collection of survey instruments developed by the University of Chicago Consortium on School Research (UChicago Consortium) to measure school climate across five domains: a) Effective Leadership, b) Supportive Environment, c) Collaborative Teachers, d) Ambitious Instruction, and e) Involved Families (Bryk et al., 2010).

These domains fit within the construct of school climate as defined by Wang and Degol (2016), and encompass critical aspects of a school environment which shape the experiences of students and their families. Additionally, these measures of school climate have been found to be associated with school organizational effectiveness and predictive of student academic and social outcomes (Bryk et al., 2010; Wang & Degol, 2016). UChicago Consortium uses Rasch modeling to analyze item-level responses within each domain to create a continuous Measure score (0-99) along various dimensions within each of the five domains. An Essential score was then created by averaging across the Measure scores, thus the Essential score is a domain specific continuous composite measure (0-99) at the domain level (for more information on how scores are calculated see UChicago Impact, 2020). Collectively, these scores represent the quality of school climate within a school.

Theoretically, the 5Essesntials measures align with predictors of student mobility. For example, in a study of student mobility in New Orleans, Maroulis and colleagues (2019) found that not only were strong academic performance a pull-factor in student mobility (i.e., parents seeking out high performing schools), but that low achieving students were particularly more likely to exit low performing schools (push-factor). This preference for academic quality theoretically relates to several elements of the 5Essentials, particularly Ambitious Instruction, Effective Leaders, and Collaborative Teachers. Furthermore, using survey data from 13,000 sixth graders in Chicago, Krebow (1996) reported that a strong predictor of mobility was school safety, which is encompassed in the 5Essentials measure for Supportive Environment.

Using data from the Educational Longitudinal Study of 2002, Urick and Bowers (2014) reported that principals' perceptions of the academic climate in their school predicted students' perceptions of the academic climate, as well as their academic achievement. Although not a direct link, this theoretically links with the 5Essentials domain of Effective Leaders. Finally, in Bell's (2009b) study of school choice in a large Midwestern city, she highlights the importance of social relationships in finding information about schools and choosing a school. Furthermore, she contends that parents draw from their social capital to "negotiate school problems" (p. 194), which theoretically links to the 5Essentials domain of Involved Families.

Measure of Student Mobility. The outcome of interest was based on nonstructural student moves between Fall 2014 and Fall 2015, which correspond to the count days that were used to determine the distribution of the majority of state school funds. As a fall-to-fall measure, we captured student mobility that occurred both during the 2014-15 school year and between the two school years, which is consistent with recent research of student mobility in New Orleans (Maroulis et al., 2019). Although there may be differences in the drivers and impacts of within-year mobility compared to between-year mobility, these assumptions have not been verified (Maroulis et al., 2019), and the majority of student mobility in Detroit during this time period occurred between the school years (8% of students made a school move during the 2014-15 school year, while 21% made a school move between 2014-15 and 2015-16 school years).

We define a "nonstructural move" as any move that was not necessitated by a natural transition out of a school (e.g., matriculating from a K-5 school to one that served grades 6-8). Additionally, we excluded any student who made a residential move between Fall 2014 and Fall 2015. Residential moves are highly predictive of student mobility (Welsh, 2017), but even in a high choice environment which may reduce the association between a residential move and student mobility, deciphering between residential moves that necessitated a school move from those that did not would not be feasible.

We restrict our analysis to students in grades K-8 for two key reasons: a) there were significantly more K-8 schools in the education marketplace compared to high schools, and b) choice mechanisms are likely fundamentally different for students and their parents in earlier grades compared to high school students. We also excluded any student who attended a non-traditional school, such as a center-based school for special education students, a virtual school, or a strict-discipline academy during either the 2014-15 or 2015-16 school year. Based on the inclusion and exclusion criteria, 35,749 students were included in the analytical sample prior to dropping cases due to missing data (82% of Detroit resident K-7 students in city schools from the 2014-15 school year who would have been eligible to advance to grades 1-8 in 2015-16 and for whom we had data for both school years). The final analytic sample included 31,405 students across 100 schools.

Analytic Approach

Because students were nested within schools, we utilized multilevel logistic regression to account for the nested error structure in modeling and to account for variation in mobility among students and between schools (Raudenbush & Bryk, 2002). Therefore, using SAS 9.4 software we estimated a series of multilevel logistic regression models to identify the association between student- and school-level factors and the likelihood that a student was mobile. More specifically, the following model represents the general analytical approach:

Level 1 Model:

$\ln\{P[Mobile_{ij} = 1] / 1- P[Mobile_{ij} = 1]\} = \beta_{0j} + \boldsymbol{\beta'_{1j}}\text{Student Characteristics}_{ijt-1} + e_{ij}$ (1).

Level 2 Model:

$\beta_{0j} = \theta_{00} + \theta_{01}\text{School Climate}_{jt-1}\ \boldsymbol{\theta'_{02}}\text{School Characteristics}_{jt-1} + r_{ju}$

$\beta_{1j} = \theta_{10}$ (2).

Combined Model:

$$\ln\{P[Mobile_{ij} = 1] / 1- P[Mobile_{ij} = 1]\} = \theta_{00} + \boldsymbol{\theta'_{10j}}\text{Student Characteristics}_{ijt-1} + \theta_{01}\text{School Climate}_{jt-1} + \boldsymbol{\theta'_{02}}\text{School Characteristics}_{jt-1} + r_j + e_{ij} \quad (3).$$

The model predicts the probability that a student *i* in school *j* was mobile as a function of individual student characteristics, school climate (as measured by the 5Essentials surveys), and other school characteristics, all measured at time *t-1* (Fall 2014). Therefore, the model predicts the likelihood that a student made a nonstructural move between Fall 2014 and Fall 2015 as a function of the characteristics of the school that the student attended in Fall 2014. As such, a positive coefficient suggests a higher likelihood of being mobile (i.e., push-out).

The measures of school climate were derived only from student and faculty/staff survey data, as most schools did not have sufficient response rates from parents. Because the model utilizes a logit link function with a binary outcome variable (1 = mobile, 0 = nonmobile), the error terms are assumed to follow a Bernoulli distribution, with *r* representing the error term for school *j* and *e* representing the student error term nested within school *j*.

In addition to estimating an unconditional model to identify covariance parameters across levels and to establish baseline model fit statistics, we estimated a series of models using a stepwise approach. First, we modeled the likelihood of mobility as a function of student-level variables only. Second, we estimated a model that included student- and school-level variables for percentage of students who were economically disadvantaged and average 3rd grade student math achievement, but excluded any climate measures. Third, we included student- and school-level variables and the composite measure of the 5Essentials climate measures. This composite measure had a Cronbach $\alpha = 0.89$, indicating a high level of construct validity.

Finally, we estimated five additional models with the Essential scores for each of the five domains of the 5Essentials entered separately. Each domain represents a composite of various measure scores within each of the domains created through Rasch analysis at the item level (each domain is on a continuous scale of 0-99). Although these domain specific measures of climate were highly correlated (see Table 1), there are theoretical assumptions why certain domains may be more predictive of student mobility than others. For example, students and parents may be more sensitive to the level of a supportive environment or ambitious instruction compared to the level of "collaborative teachers" in a building. For the analysis, all climate measures were standardized to have a mean of 0 and standard deviation of 1.

[insert Table 1 about here]

A drawback of this specification is that not all schools had large enough responses across all five domains, therefore for consistency across all model specifications, the sample was restricted to students in schools that had Essential scores in each of the five domains (100 out of 149 schools who administered the surveys). There was no statistically significant difference between schools included and excluded in the analysis with regard to average math achievement, but schools that were excluded had slightly higher percentages of economically disadvantaged students (92% of students compared to 89%). Additionally, a higher proportion of charter schools were excluded relative to the proportion included (charters accounted for 40% of schools included, but 47% of excluded schools).

Table 2 provides descriptive statistics for variables included in the analyses. At the student-level, we included measures of race/ethnicity, economic disadvantage, English language learner status, special education status, and grade. As previous research has shown, rates of student mobility often vary across students based on their race/ethnicity and income status

(Bifulco & Ladd, 2007), and parents often seek out special programming to meet the needs of their children (Bell, 2009b). We included students' grade level as parents may have preferences that change as students progress through school, particularly as they enter junior high. We did not include a student-level measure of student achievement, as subjects tested varied across grades, and students in early elementary did not take any state standardized achievement test.

At the school-level, we included the percent of students who were classified as being economically disadvantaged, school sector, and average 3rd grade math achievement on the state standardized test. Although student proficiency rates are not necessarily indicative of school effectiveness, it is a publicly reported signal of school quality for many parents. Aggregate student economic disadvantage status was included because research has shown parental preferences for schools based on the make-up of the student body (e.g., Bifulco & Ladd, 2007), and school sector was included given the highly competitive market and competition among school systems.

[insert Table 2 about here]

In addition to the regression analysis, we identified the extent to which mobile students moved to schools that were noticeably different with regard to various characteristics, including along the different dimensions of the domain specific measures of school climate. Specifically, we used t-tests to compare average differences in the schools students exited after the 2014-15 school year and the schools they then enrolled in for the 2014-15 school year.

It should be noted at the outset that our study only has 100 schools and that the sample size of level 2 units largely determines the statistical power in a hierarchical logistic regression. Therefore, an a priori assumption given the limitations of our design should be low effect sizes and that non-significant findings are quite possibly Type II errors.

Findings

We first estimated an unconditional model to determine whether or not the likelihood of leaving a school after the 2014 school year varied across the schools in the sample. In other words, given the nested nature of the data, it was important to identify the variance between schools that exists in the outcome variable (Raudenbush & Bryk, 2002). Estimating the unconditional model produced a school-level variance component of 0.3164, and given the model utilized a logit link function, the student-level variance is assumed to be 3.29 (Snijders & Bosker, 2011). Therefore, the intraclass correlation coefficient (ICC) indicated that nine percent of the variability was between schools in the sample (statistically significant, $p < 0.01$), indicating that the vast majority of variability can be accounted for by the students or other factors. Although the majority of variation was among students rather than across schools, the ICC indicates that there was some variation in student mobility between schools, justifying the use of multi-level modeling. The fact that the majority of variation in a student outcome is among students versus between schools is consistent with previous research using multi-level modeling to examine other student outcomes (e.g., Urick & Bowers, 2014).

Student-level Associations

We then estimated a model that only included student-level variables. As shown in under Model 1 in Table 3, students who were classified as “other race” were less likely to be mobile than African American students, and females were slightly less likely to mobile than male students (we report odds ratios and indicate statistical significance; see the Appendix for the reporting of the regression log-odd estimates with standard errors). Economically disadvantaged students were more likely to be mobile compared to those who were not economically disadvantaged, though only slightly. Using an African American male Kindergarten student who was not an English language learner or qualified for special education as the reference point, the probability that an economically disadvantaged student was mobile was only three percentage points higher than a non-economically disadvantaged student (moving from 0.13 to 0.16).

[insert Table 3 about here]

There appears to be larger associations with student mobility and grade level as students progress into upper elementary and middle school. As shown across all model specifications, there was an increased odds of mobility once students enter the fourth grade, with a particularly strong association at the fifth grade level. Building off the previous example, the probability of mobility for an economically disadvantaged African American fifth grade boy was 16 percentage points higher compared to his Kindergarten counterpart, *ceteris paribus*. The findings related to grade level may be due to a host of factors, including increased “shopping” behavior from parents as preferences change, or possible increases in push-out effects related to school discipline which we were not able to account for.

School-level Associations

Model 2 includes student-level variables and school-level variables for the school sector, percent of students classified as economically disadvantaged, and average 3rd grade math score . The model shows that on average students who attended an EAA school were less likely to be mobile compared to a student who attended DPS. Somewhat surprising, the estimate for the school-level percentage of economically disadvantaged students was not statistically significant, as previous research has shown that parents often have a preference for schools with fewer poor students (Frankenberg & Lee, 2003; Garcia, 2008). This may be related to the nature of the data and the fact that most schools in Detroit have very high percentages of economically disadvantaged students. It is also possible that with only 100 schools, our study is statistically unpowered to detect such school-level differences as previously noted. As expected, higher school average math achievement was associated with a lower likelihood of mobility. It should be noted that school average math achievement was only moderately associated with the composite measure of school climate (r = 0.47). The model fit statistics also indicate that the inclusion of these school level variables slightly improved overall model fit.

In Model 3, the focal variable of interest was the composite measure of school climate. The estimate for the composite measure was not statistically significant, indicating that on average there was no detectable association between this broad measure of school climate and the likelihood of student mobility. Additionally, the inclusion of this variable did not improve model fit relative to Model 3.

In Models 4-8 (see Table 4), we included the 5Essential domain measures individually. Only the coefficient for Supportive Environment (Model 7) was statistically significant by traditional standards ($p < 0.05$), although the coefficient for Effective Leaders (Model 5) did approach statistical significance at a lower threshold ($p = 0.07$). Regarding the measure for Supportive Environment, the finding counterintuitively showed that higher ratings for Supportive Environment were associated with a greater likelihood of student mobility. For an economically disadvantaged African American Kindergarten boy (non-ELL and non-special education) enrolled in a DPS school with average economic disadvantage enrollment and math achievement, a standard deviation increase (1) from the standardized mean rating of supportive environment (0) was associated with a three percentage point increase in the likelihood of mobility. However, we cannot rule out the possibility that these findings represent Type S errors (Gelman and Tuerlinckx, 2000). Alternatively, the Supportive Environment finding may also be a Type I error.

[insert Table 4 about here]

Given that the measure for Effective Leadership approached statistical significance, we estimated a final model (Model 9) that included both the measure of Effective Leaders and Supportive Environment. In this model, both of the coefficients remained in the direction they had been in the earlier models, but were now both statistically significant ($p < 0.01$). Using the "average student" described above in a school with an average rating for Supportive Environment, a standard deviation increase in the mean standardized rating of Effective Leaders was associated with a 4 percentage point decrease in the likelihood of mobility. This final model also had the best model fit, though based on the pseudo-R-squared measure, accounted for less than 3 percent of the explained variance and only a fraction improvement in explained variance compared to the model that only included student-level covariates.

Comparison of Sending and Receiving Schools

We also compared average school characteristics of schools that students left at the end of the 2014-15 school year and the schools they were enrolled in during Fall 2015. As shown in Table 5, a greater proportion of mobile students were enrolled in charter schools in Fall 2015 compared to where they were enrolled in Fall 2014. Specifically, there was a shift of students from DPS into the charter sector. These mobile students on average were also moving to schools that had slightly lower percentages of economically disadvantaged students and had slightly higher math achievement. At the same time, on average they were moving to schools with lower school climate ratings.

[insert Table 5 about here]

Given these findings, we did some additional analysis to better understand the extent to which the association between school climate and student mobility varied across school sectors, specifically focusing on differences between DPS and the charter sector. We excluded the EAA from this exploratory analysis because of the lower number of students who attended schools within that system during the time and because it no longer exists. To explore the possibility of varying associations between DPS and charters, we first conducted t-tests to identify the extent of differences in climate ratings between the two sectors, and then estimated multi-level models separately for students in DPS and charter schools, with the focal variables the Measure scores for the five domains.

The results from estimating the t-tests show that on every climate measure except for “Ambitious Instruction”, scores were higher on average in DPS schools compared to charter schools, though not statistically significant (see Table 6). Table 7 shows the results from estimating the multi-level models by sector; only the odds ratios for the focal variables are shown. None of the estimates for the school climate measures were statistically significant by traditional standards when only students in charter schools were included, while similar to previous models, the estimates for “Effective Leadership” and “Supportive Environment” were in the same direction and statistically significant when only students in DPS schools were included. Collectively, the findings presented in Tables 6 and 7 suggest that school climate measures may not only subtly vary between sectors, but that they may influence stakeholder perceptions in different ways depending on school sector. These potential implications cannot be confirmed with these analyses, but do raise questions for future research.

[insert Table 6 about here]

[insert Table 7 about here]

Discussion

The goal of this research was to more fully understand the association between nonstructural student mobility between schools and school climate. Previous research has shown that students move between schools for a variety of reasons, including real and perceived school academic quality and safety, as well as preferences for specific student body characteristics (see Welsh (2017) for a recent review). Student mobility not only has been shown to often negatively impact individual students' academic achievement, but also in the aggregate shapes the student demographics of schools across a system, often leading to greater segregation by race and class (Frankenberg & Lee, 2003; Garcia, 2008). Therefore, it is imperative that policy makers and school leaders better understand how school-level factors potentially influence student mobility, as research has shown that parents do not always act in expected ways when choosing schooling options for their children (Maroulis et al., 2019). In other words, parents often do not have full information regarding school climate and are often choosing schools based on non-academic (e.g., the race/class of the students, convenience, etc), and often times their choice set is limited by various factors (e.g., lack of transportation) resulting in student moves between similarly situated schools (Bell, 2009b; Lavery & Carlson, 2014; Maroulis et al., 2019; Witte, Carlson, & Lavery, 2008).

There are strong theoretical and empirical links related to school climate and student outcomes associated with student mobility, largely related to the school environment (e.g., quality of instruction) and quality of social relationships (e.g., peer relationships and bonds with teachers) (Bronfenbrenner, 1979; Coleman, 1988; Wang & Degol, 2016). As school climate encompasses both the formal and informal structures of a school which shape individuals' beliefs and behaviors (Halpin & Croft, 1963; Hoy & Miskel, 2008; Litwin & Stringer, 1968; Tagiuri, 1968), we hypothesized that measures of school climate would be associated with the likelihood of student mobility. Specifically, we expected that measures of school climate derived from surveys of students and faculty/staff would represent the general experience of students and their families in the school related to effective leadership and teachers, a safe and fair environment, and school-family relations, which would then influence future enrollment decisions. Further, we thought that the public reporting of school climate measures may signal certain aspects of school quality to parents, regardless of their personal experiences with the school, which would in turn influence mobility decisions. Our findings challenged these assumptions in a number of ways.

First, the composite measure of school climate was not statistically significant. As a composite of the five dimensions of school climate as measured by the 5Essentials surveys, we had expected that this measure would be associated with actual student mobility between schools. Specifically, we had expected that on average higher scores on this composite measure would be associated with a lower likelihood of student mobility. It could be that as a school-level measure it is not predictive of individual behavior, particularly as the measure was derived from surveys of the students and faculty/staff and not the parents/guardians, who are the ones that ultimately make transfer decisions. A student-level measure of perception of school climate may be predictive of mobility rather than a school-level measure that may not align with an individual's experiences in and perceptions of a school.

In addition to a possible misalignment between a school-level measure of climate and individualized experience/perception, the school-level measure may be a weak signal of school quality, therefore having little influence on parental decisions to keep their child in a school or move them. For example, the composite measure was only moderately correlated with average math achievement in the school, and academic achievement has been found to be a strong predictor of student mobility (e.g., Burgess et al., 2015). This measure of school climate also may not capture other factors that may signal school quality to parents, including building condition, school neighborhood crime and blight, or reputation (Bell, 2009a, 2009b). The strength of this signaling power is also unknown because although climate ratings were publicly available as part of school score cards developed by Excellent Schools Detroit, it's not clear to what extent parents engaged with these score cards or how they made sense of them in conjunction with other publicly available school quality measures, such as Michigan's top-to-bottom school rankings under State accountability. In sum, school climate measures may get lost in the cacophony of other school quality signals, all of which may or may not align with individualized experiences in a particular school.

Although we did expect the composite measure of school climate to be predictive of mobility, we also suspected that certain aspects of student mobility may be more associated with mobility, although we were generally agnostic about which elements of school climate may be more influential in student mobility decisions. Therefore, we estimated a series of models with the five Essential scores for each domain as the focal variables of interest, which produced some potentially conflicting results. In these models, the coefficient for the Essential score for "effective leadership" was in the expected direction though failed to reach statistical significance by traditional standards ($p < 0.05$), though it did approach this threshold with a p-value of 0.07. At face value it suggests that students in schools with higher quality leadership were less likely to move to another school, which aligns with previous research regarding the importance of leadership and organizational effectiveness (e.g., Brewer, 1993; Robinson, Lloyd, & Rowe, 2008). Furthermore, this finding may reflect a mediating relationship between principal leadership and other important aspects of a school which influence students' perceptions of climate and outcomes. For example, Urick and Bowers (2014) found that principals' perceptions of climate had a mediating influence on students' perceptions of climate and their academic achievement.

At the same time, in this model the coefficient for the Essential measure "supportive environment" was positive and statistically significant ($p < 0.01$), indicating that the likelihood of a student exiting a school was higher in a school with higher ratings of supportive environment (though the magnitude of this association was also small). This finding was unexpected and does not align with previous literature (e.g., Rumberger et al., 1999).

We suspect that these two findings may in part relate to the extent to which average climate measures varied across school sectors (particularly between DPS and the charter sector), and due to the fact that a higher proportion of mobile students moved from the DPS system into a charter school. Specifically, as shown in Table 4, on average schools in DPS had higher ratings of school climate across four of five domains, thus a shift of mobile students from DPS schools into the charter schools may misattribute an association between a higher rating of school climate and the likelihood of mobility (e.g., as was shown with the measure of "supportive environment"). In other words, students who exited the DPS system may have been doing so based on a host of factors, including evolving perceptions specific to school sector or in response to aggressive recruiting/advertising (Lubienski, 2007). Additionally, on average, charter schools had higher average math achievement, so parents may have been responding to indicators of school quality specific to standardized test scores, which was the predominant determinant of a schools ranking in the State's top-to-bottom ranking system.

Collectively, the findings suggest that these school climate measures were not important signals to parents when they were making school choice decisions, or speak to the lack of effective public communication regarding these aspects of a school relative to other indicators out there (including reputation). Additionally, it may be that school choice decisions are much more concentrated around individualized factors related to the student and family rather than in response to the overall organization of a school. The results of the t-tests presented in Table 4 would support this, indicating that mobile students on average did not end up in schools that were fundamentally different in many respects, with the exception that they were more likely to move to a charter school.

Limitations and Future Research

The work presented here is part of a broader study of student attendance and enrollment patterns in Metro Detroit, and further work is required to identify potential associations between measures of organizational factors and student mobility. A limitation of this study relates to the use of measures of school climate which prior research has shown to be associated with school effectiveness (e.g., 5Essentials measures), but may not be fully known to parents who are making school choice decisions. In other words, parents may have limited knowledge about important characteristics of their child's school and even less knowledge about other schools which they may consider enrolling their child. They are likely making school choices based on very limited information or on factors not captured in our dataset (e.g., special school programming or services or transportation routes).

Future work may include more publicized measures of school quality which may be a stronger and more easily accessible indicator of school effectiveness to parents (even if the accuracy of such measures are debatable). Legislation signed into law by Governor Snyder in 2018 required the Michigan Department of Education to develop and implement an A-F grading system for all schools in the state by the beginning of the 2019-20 school year; as of this writing it has yet to be developed. Incorporating a better publicized measure of school quality (e.g., ranking or "grade") may be a better predictor of student mobility than other school climate measures, even if such rankings may be weakly associated with actual school effectiveness (which is yet to be seen in Michigan).

Another limitation is that we restricted our analysis to students in elementary and junior high grades. We suspect that the mechanisms for student mobility in high school are different given the smaller number of schools to choose from, the role that athletics and other extracurricular activities play in choosing a school, and that students are probably less likely to move between schools as they get closer to their final years (Author, 2019). Therefore, future research may want to focus on high school students and the complexity of factors which influence student mobility, especially since students themselves may exercise more agency over where they attend school.

Finally, a limitation of the available data is that we used a school-level measure of school climate, rather than a student-level or parent-level measure of perceived climate. These individualized measures may not only more accurately capture perceptions, but also better reflect personal experiences within a school environment. Since these school-level measures were created from surveys from students *and* faculty/staff within a school, it may not fully reflect the range of perceptions and experiences of students and their parents within the school.

Conclusions

Nineteen percent of students in this analytical sample made nonstructural school moves between Fall 2014 and Fall 2015. Choice options are prolific in Detroit, which allow parents to seek out what they feel is the best school environment for their children. At the same time, research has shown that student mobility is often associated with lower student academic achievement, not only for individual students who move between schools, but also for their peers who are in schools that experience high rates of student turnover (South, Haynie, & Bose, 2007). Additionally, parental preferences for school environment are not always either well-informed or guided by attention to observable measures of school quality, therefore mobility can often contribute to greater segregation of students by race and class (Frankenberg & Lee, 2003; Garcia, 2008). Therefore, it is imperative that we support a better understanding how school climate factors may influence student mobility directly or mediate student-level predictors of mobility.

Although our analysis did not identify a compelling association between measures of school climate and student mobility, we contend that researchers and practitioners continue to explore a possible relationship between indicators of organizational effectiveness beyond standardized test scores and student enrollment patterns. Specifically, unless parents are moving their students to more effective schools, the positive impacts of school choice may be elusive, and school leaders may be in less of a rush to improve their organizational structures if their overall enrollment numbers do not suffer. Therefore, in an era of increased school marketization, we need to develop a more complete understanding of factors associated with student mobility to help drive improvements in organizational effectiveness at the school and system levels.

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Tables

Table 1

Correlation Among 5E Measures

	1	2	3	4	5
1. 5E Effective leaders	1.000	0.867	0.728	0.477	0.504
2. 5E Collaborative teachers	0.867	1.000	0.787	0.497	0.576
3. 5E Involved families	0.728	0.787	1.000	0.491	0.527
4. 5E Supportive environment	0.477	0.497	0.491	1.000	0.812
5. 5E Ambitious instruction	0.504	0.576	0.527	0.812	1.000

Table 2

Student- and School-level Variable Descriptive Information

Variable	Variable Description	N	Mean	S
Student-level				
Mobile Student	Binary variable (0/1) indicating student made a non-structural move between Fall 2014 and Fall 2015; source of data: CEPI student-level data (2014-15/2015-16)	31,405	0.19	0.
African American	Binary variable (0/1) indicating student was classified as African American; source of data: CEPI student-level data (2014-15)	31,405	0.86	0.
Hispanic	Binary variable (0/1) indicating student was classified as Hispanic; source of data: CEPI student-level data (2014-15)	31,405	0.11	0.
Other race	Binary variable (0/1) indicating student was classified as Asian, American Indian/Alaskan Native, Pacific Islander, or 2 or More Races; source of data: CEPI student-level data (2014-15)	31,405	0.02	0.
White	Binary variable (0/1) indicating student was classified as White; source of data: CEPI student-level data (2014-15)	31,405	0.02	0.
Economically disadvantaged	Binary variable (0/1) indicating student was classified as Economically Disadvantaged; source of data: CEPI student-level data (2014-15)	31,405	0.88	0.
Female	Binary variable (0/1) indicating student was classified as Female; source of data: CEPI student-level data (2014-15)	31,405	0.50	0.
English language learner	Binary variable (0/1) indicating student was classified as an English Language Learner; source of data: CEPI student-level data (2014-15)	31,405	0.11	0.
Special education	Binary variable (0/1) indicating student was classified as African American; source of data: CEPI student-level data (2014-15)	31,405	0.14	0.
Kindergarten	Binary variable (0/1) indicating student was in Kindergarten; source of data: CEPI student-level data (2014-15)	31,405	0.13	0.

First grade	Binary variable (0/1) indicating student was in First Grade; source of data: CEPI student-level data (2014-15)	31,405	0.14	0.
Second grade	Binary variable (0/1) indicating student was in Second Grade; source of data: CEPI student-level data (2014-15)	31,405	0.14	0.
Third grade	Binary variable (0/1) indicating student was in Third Grade; source of data: CEPI student-level data (2014-15)	31,405	0.14	0.
Fourth grade	Binary variable (0/1) indicating student was in Fourth Grade; source of data: CEPI student-level data (2014-15)	31,405	0.13	0.
Fifth grade	Binary variable (0/1) indicating student was in Fifth Grade; source of data: CEPI student-level data (2014-15)	31,405	0.12	0.
Sixth grade	Binary variable (0/1) indicating student was in Sixth Grade; source of data: CEPI student-level data (2014-15)	31,405	0.10	0.
Seventh grade	Binary variable (0/1) indicating student was in Seventh Grade during; source of data: CEPI student-level data (2014-15)	31,405	0.11	0.
School-Level				
Charter	Binary variable (0/1) indicating a school as a charter school; source of data: CEPI student-level data (2014-15)	100	0.40	0.
Detroit Public Schools	Binary variable (0/1) indicating a school as a school in Detroit Public Schools; source of data: CEPI student-level data (2014-15)	100	0.55	0.
Education Achievement Authority	Binary variable (0/1) indicating a school as a school in the Education Achievement Authority; source of data: CEPI student-level data (2014-15)	100	0.05	0.
Percent economically disadvantaged	School-level percentage of students in school classified as economically disadvantaged; source of data: CEPI student-level data (2014-15)	100	0.89	0.
Average Math Achievement	Standardized school average 3rd grade math score on M-Step (State of Michigan standardized assessment); source of data: CEPI student-level data (2014-15)	100	-0.84	0.

5E Essential score	Composite measure of 5Essential based on item-level responses across all domains; source of data (0-99 scale): Detroit 5Essentials Data (2014-15)	100	51.76	14
5E Effective leaders	Composite measure of 5Essential based on item-level responses within the Effective Leaders domain (0-99 scale); source of data: Detroit 5Essentials Data (2014-15)	100	47.23	18
5E Collaborative teachers	Composite measure of 5Essential based on item-level responses within the Collaborative Teachers domain (0-99 scale); source of data: Detroit 5Essentials Data (2014-15)	100	46.44	19
5E Involved families	Composite measure of 5Essential based on item-level responses within the Involved Families domain (0-99 scale); source of data: Detroit 5Essentials Data (2014-15)	100	41.14	17
5E Supportive environment	Composite measure of 5Essential based on item-level responses within the Supportive Environment domain (0-99 scale); source of data: Detroit 5Essentials Data (2014-15)	100	54.90	16
5E Ambitious instruction	Composite measure of 5Essential based on item-level responses within the Ambitious Instruction domain (0-99 scale); source of data: Detroit 5Essentials Data (2014-15)	100	69.11	14

Table 3

Odds Ratios Derived from Student Mobility Multi-level Regressions

Variable	(1)	(2)	(3)
Student Level			
Hispanic	0.835	0.842	0.842
Other race	0.555**	0.562**	0.561**
White	0.953	0.963	0.963
Economically disadvantaged	1.198**	1.187	1.187**
Female	0.909**	0.909**	0.909**
English language learner	0.847	0.846	0.846
Special education	1.062	1.058	1.058
First grade	1.019	1.019	1.019
Second grade	1.000	1.001	1.001
Third grade	0.958	0.958	0.958
Fourth grade	1.291**	1.292**	1.292**
Fifth grade	3.119**	3.115**	3.115**
Sixth grade	1.840**	1.830**	1.830**
Seventh grade	1.249**	1.242**	1.242**

School Level			
Charter		0.921	0.921
Education Achievement Authority		0.493**	0.496**
% economically disadvantaged		1.699	1.703
Avg Math Achievement		0.493**	0.493**
5E Composite Essential score			1.000
-2 Log Likelihood	28,700.22	28,677.59	28,677.59
McFadden Psuedo-R^2	0.0268	0.0276	0.0276

* $p < 0.05$; ** $p < 0.01$.

For unconditional model (not shown), -2 Log Likelihood = 29,490.21 and AIC = 29,494.21.

Table 4

Odds Ratios Derived from Student Mobility Multi-level Regressions (continued)

Variable	(4)	(5)	(6)	(7)	(8)	(9)
Student Level						
Hispanic	0.847	0.844	0.855	0.828	0.839	0.829
Other race	0.565**	0.562**	0.564**	0.556**	0.561**	0.559**
White	0.966	0.964	0.969	0.955	0.965	0.955
Economically disadvantaged	1.187**	1.187**	1.188**	1.187**	1.187**	1.187**
Female	0.909**	0.909**	0.909**	0.908**	0.908**	0.909**
English language learner	0.847	0.847	0.847	0.844	0.846	0.845
Special education	1.058	1.058	1.058	1.058	1.059	1.058
First grade	1.019	1.019	1.019	1.019	1.019	1.019
Second grade	1.001	1.001	1.001	1.001	1.002	1.001
Third grade	0.958	0.958	0.958	0.959	0.958	0.959
Fourth grade	1.292**	1.291**	1.292**	1.292**	1.292**	1.292**
Fifth grade	3.115**	3.115**	3.115**	3.117**	3.116**	3.118**

Sixth grade	1.828**	1.829**	1.829**	1.836**	1.835**	1.835**
Seventh grade	1.241**	1.241**	1.241**	1.246**	1.246**	1.247**
School Level						
Charter	0.832	0.88	0.866	1.038	0.979	0.927
Education Achievement Authority	0.451**	0.475**	0.486**	0.437**	0.49**	0.365**
% economically disadvantaged	2.256	1.935	1.813	0.921	1.258	1.149
Avg Math Achievement	0.607*	0.537**	0.578*	0.374**	0.418**	0.466**
5E Effective leaders	0.892					0.838**
5E Collaborative teachers		0.955				
5E Involved families			0.922			
5E Supportive environment				1.165*		1.231**

5E Ambitious instruction					1.095	
-2 Log Likelihood	28,674.32	28,677.13	28,676.23	28,671.84	28,675.46	28,664.20
McFadden Psuedo-R^2	0.0277	0.0276	0.0276	0.0278	0.0276	0.0280

* $p < 0.05$; ** $p < 0.01$.

For unconditional model (not shown), -2 Log Likelihood = 29,490.21 and AIC = 29,494.21.

Table 5

Comparison of Sending and Receiving Schools Mobile Students Attended

Variable	Mean 2014	Mean 2015	
Charter	0.3194	0.4353	**
Detroit Public Schools	0.6462	0.5224	**
Educational Achievement Authority	0.0344	0.0422	*
Percent Economically Disadvantaged	0.8913	0.8582	**
Average Math Achievement	-0.9090	-0.8759	**
5E Essential score	50.7287	49.3617	**
5E Effective leaders	47.5931	48.1243	
5E Collaborative teachers	46.5811	45.4299	**
5E Involved families	39.3190	39.6556	
5E Supportive environment	55.2090	51.7025	**
5E Ambitious instruction	69.6662	66.5495	**

* $p < 0.05$; ** $p < 0.01$.

Table 6

Comparison of Climate Measures for DPS and Charter Schools

Variable	Charter	DPS
5E Composite Essential score	51.005	54.031
5E Effective leaders	46.369	51.050
5E Collaborative teachers	44.695	50.476
5E Involved families	40.465	43.789
5E Supportive environment	53.370	55.036
5E Ambitious instruction	70.127	69.802

* $p < 0.05$; ** $p < 0.01$.

Table 7

Odds ratios for student mobility – DPS and charter schools

Variable	Charter	DPS
5E Effective leaders_2014	0.942	0.669**
5E Collaborative teachers_2014	1.020	1.356
5E Involved families_2014	0.845	0.851
5E Supportive environment_2014	1.048	1.528**
5E Ambitious instruction_2014	1.059	0.856

* $p < 0.05$; ** $p < 0.01$.

Appendix

Table A1

Estimated Log Odds and Standard Errors

Variable	(1)	(2)	(3)	(4)
Intercept	-1.494**	-1.865**	-2.858**	-2.300**
	(0.059)	(0.089)	(0.506)	(0.509)
Hispanic		-0.181	-0.172	-0.173
		(0.129)	(0.129)	(0.128)
Other race		-0.588**	-0.577**	-0.582**
		(0.164)	(0.164)	(0.164)
White		-0.049	-0.038	-0.042
		(0.131)	(0.131)	(0.130)
Economically disadvantaged		0.180**	0.172**	0.172**
		(0.052)	(0.053)	(0.052)
Female		-0.096**	-0.096**	-0.096**
		(0.030)	(0.030)	(0.030)
English language learner		-0.167	-0.167	-0.169
		(0.108)	(0.107)	(0.108)
Special education		0.060	0.057	0.057
		(0.042)	(0.042)	(0.042)
First grade		0.019	0.019	0.019
		(0.060)	(0.060)	(0.060
Second grade		0.000	0.001	0.002

	(0.061)	(0.061)	(0.061)
Third grade	-0.043	-0.043	-0.041
	(0.061)	(0.061)	(0.061)
Fourth grade	0.255**	0.256**	0.257**
	(0.059)	(0.059)	(0.059)
Fifth grade	1.137**	1.136**	1.138**
	(0.057)	(0.057)	(0.057)
Sixth grade	0.610**	0.604**	0.607**
	(0.064)	(0.064)	(0.064)
Seventh grade	0.222**	0.216**	0.222**
	(0.070)	(0.070)	(0.070)
Charter_2014		-0.082	-0.041
		(0.153)	(0.143)
Educational Achievement Authority_2014		-0.702**	-0.988**
		(0.271)	(0.268)
Percent Economically Disadvantaged_2014		0.533	-0.151
		(0.680)	(0.669)
Average Math Achievement (z-score)_2014		-0.706**	-0.743**
		(0.258)	(0.240)
5E Essential score_2014		0.000	
		(0.072)	
5E Effective leaders_2014			-0.249*
			(0.099)

5E Collaborative teachers_2014	0.196
	(0.121)
5E Involved families_2014	-0.128
	(0.096)
5E Supportive environment_2014	0.260**
	(0.096)
5E Ambitious instruction_2014	-0.058
	(0.094)

* $p < 0.05$; ** $p < 0.01$.