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# SCHOOL EFFICIENCY, SOCIAL STRATIFICATION, AND SCHOOL CHOICE: AN EXAMINATION OF MICHIGAN'S CHARTER SCHOOL PROGRAM

By

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# ABSTRACT

## SCHOOL EFFICIENCY, SOCIAL STRATIFICATION, AND SCHOOL CHOICE: AN EXAMINATION OF MICHIGAN'S CHARTER SCHOOL PROGRAM

By

Yongmei Ni

As one of the most prominent developments in elementary and secondary education reform in the U.S. since the 1990s, school choice has been widely advocated to utilize market incentives to promote educational equity and efficiency. This dissertation tests these two hypotheses by examining the effects of school choice policies in Michigan on racial segregation and social stratification, as well as the competitive impact of charter schools on the efficiency of traditional public schools.

Drawing on two years of student-level data, I examine patterns of student sorting associated with school choice policies. How do choice policies influence the degree of racial segregation and social stratification in public schools? How are students' propensities to select a choice school influenced by their own characteristics, and the characteristics of their assigned public schools? Examining the dynamic student movements between their assigned public schools and charter schools through a series of multinomial Generalized Hierarchical Linear Models (GHLM), my analysis suggests that while choice policies are providing new options for many students who were not served well in their assigned public schools, it is also contributing to the creation of a stratum of schools at the bottom in which truly disadvantaged students become ever more concentrated.

In testing whether the competition from charter schools improves school efficiency of traditional public schools, I assembled a statewide school-level panel dataset of Michigan

schools from 1994 to 2004. This analysis relied on fixed effect estimations that implicitly controlled for unobservable time invariant school characteristics, and explicitly controlled for changing student composition and other factors induced by charter school policy. My analysis shows that charter competition has a negative impact on student achievement in Michigan's traditional public schools. The effect is small or negligible at first, but becomes more substantial in the long run. While contradicting the positive competitive effect typically predicted by school choice advocates, my results are consistent with the conception of choice triggering a downward spiral in the most heavily impacted public schools.

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# CHAPTER 1 INTRODUCTION

School choice has been one of the most prominent developments in elementary and secondary education reform in the U.S. since the 1990s. The choice movement has been partly driven by the belief that parents and students should have the freedom to choose schools. It has also been driven by concerns over the academic achievement of children in public schools, particularly in many urban schools serving low-income and minority students.

School choice has gained considerable political and academic support in recent years. To date, two types of school choice policies have emerged in the U.S.: private choices such as education vouchers or tuition tax credits, and choice among public schools such as intra- and inter -district choice and charter schools. Choice advocates argue that traditional public schools (TPS) are bureaucratic and operate in a relatively monopolistic market. Efficient allocation of resources and maximization of students' academic learning are not their primary goals (Chubb & Moe, 1990; Friedman, 1962; 1980) and the incentives for improvement or innovation are weak. Instead, proponents argue that the introduction of school choice will transform the monopolistic public school system through the application of competitive market pressures. Parents and students as consumers are free to choose from multiple suppliers—schools. School choice policies directly link school funding with enrollment and create a strong market incentive mechanism for schools to attract students. Schools that improve educational quality at lower costs thrive as they gain students and funding. Schools that fail to improve quality will lose students and money, and will eventually close.

With the expansion of choice programs, concerns about their consequences have arisen. These concerns generally fall into two categories. First, critics of choice argue that the delivery of educational services is very different from allocation of private goods and service. Are parents rational consumers? Do they have well-developed knowledge of effective education so as to make informed choices among schools? Will free-market competition provide the right kind of education that reflects the "public good" nature of education? Second, critics of school choice policies are concerned that market mechanisms in schooling will generate adverse distributional consequences. Will school choice policies exacerbate the unequal distribution of educational resources among schools and students? What kinds of students will choice schools attract? Will choice schools be more segregated and stratified than TPSs? What are the impacts of choice schools on student composition in TPSs? Do they lead to more segregation or stratification in TPSs? Will they create less cohesive communities? Do choice policies have the same effect across the whole public school system or exert different effects on different communities?

Although these questions are of great importance, the answers are still not conclusive. It is important to evaluate the multiple effects simultaneously because different educational goals are usually intertwined or in conflict with one another. For example, efficiency is often achieved at the cost of equity. Past empirical studies often focused on either one or some of the questions, and they provide only limited progress in addressing these issues due to both data limitations and methodological issues.

## Framing the Questions

This dissertation evaluates the impact of charter schools on various educational outcomes. Although there are many forms of school choice, this dissertation focuses on charter schools for two reasons. First, charter schools are the most rapidly expanding form of school choice. In 1991 Minnesota passed the first charter school law. By 2003, more than 40 states had passed legislation allowing for the creation of charter schools. Today, over one million students are enrolled in more than 3,500 charter schools nationwide.[1] Second, under the No Child Left Behind (NCLB) Act, charter schools have become an important policy tool to turn around failing schools.

Charter school policy creates two mechanisms: a re-sorting of students among schools and competition among schools. In order to study how student sorting and competition jointly influence equity, school efficiency, and, more broadly, social cohesion, I perform two types of empirical analysis in this dissertation. The first part examines patterns of student sorting (or re-sorting) associated with choice policies. Specifically, I seek to answer questions such as: What kinds of students tend to choose to go to charter schools? Are charter schools more stratified than TPSs by race, socioeconomic status (SES), and performance level? How are students' propensities to select charter schools influenced by their own characteristics, as well as the characteristics of their assigned public schools? How does charter school policy influence the degree of racial or ethnic segregation and social stratification in TPSs?

The second part examines the impact of charter competition on the efficiency of nearby traditional public schools. Although the question of whether competition produces

[1] Source: U.S. Charter Schools website. Available at: http://www.uscharterschools.org/pub/uscs_docs/o/history.htm

charter schools that are more efficient than TPSs is important, I emphasize the impact of competition on TPS efficiency. This is because the vast majority of students remain in TPSs, and they have not been the center of attention of past research. For the empirical analysis corresponding to these two major portions of the dissertation, I assembled two different datasets and relied on different methodologies including Hierarchical Linear Models (HLM) and estimating unobserved effects models through fixed effect estimators.

## Structure of Dissertation

The dissertation is organized into five chapters. In the next section of this chapter I lay out the framework of the study, explain in detail how sorting and competition mechanisms created by charter schools jointly influence various educational outcomes. Since my empirical work focuses on Michigan, I further describe the two school choice programs in Michigan —a charter school program and inter-district choice, and how the school finance system has facilitated the development of school choice.

In Chapters 2 and 3, I answer the questions about how students sort themselves across different types of schools, and how the sorting process influences stratification by race, SES, and performance level. More specifically, in Chapter 2, I perform cross-sectional comparisons of student composition in charter schools and TPSs, answering the question of whether charter schools are more or less stratified than TPSs. In Chapter 3, I ask how the sorting of students associated with Michigan's charter school program influences student composition in TPSs. Through an application of HLMs, the pattern of student flow between their assigned public schools and choice schools between two years is studied at both the student and school level.

Chapter 4 investigates how competition induced by charter schools influences TPS school efficiency. Using 11 years of school-level panel data, I estimate whether the presence of charter school competition influences student achievement in nearby TPSs, and whether the influence in the long run might be different from the short-term influence. The estimations rely on fixed effect estimations and several other models to check for robustness.

Conclusions drawn from the findings in Chapters 2, 3, and 4 are set forth in Chapter 5, followed by implications for educational policy.

## Theoretical Framework

School choice research has focused on its likely effects on various educational outcomes, such as student performance and its efficacy in expanding educational options for low-income and minority families. Advocates and critics alike often frame their arguments around only one or some dimensions of the effects, instead of evaluating all aspects simultaneously. As Levin (2002) has pointed out, policy goals are often intrinsically in conflict; advancement of one goal will probably hinder the fulfillment of others. It is important to evaluate policies comprehensively from multiple dimensions. Levin developed a framework to evaluate voucher programs which includes four normative criteria or dimensions of evaluation: (1) freedom of choice; (2) productive efficiency; (3) equity; and (4) social cohesion (Levin, 2002). According to Levin, freedom of choice refers to the rights of families to choose schools for their children that are consistent with their child-rearing practices. Equity refers to the quest for fairness in access to educational opportunities, resources, and outcomes by student characteristics such as social class, race, disability, and geographical location. Productive efficiency refers to the maximization of educational results for any given resource constraint. Social cohesion refers to the provision of a common educational experience that will prepare students for civic participation (Levin, 2002). Although the framework was originally designed to evaluate voucher programs, it also applies to the evaluation of public school choice policies such as charter schools and inter-district choice.

School choice policies increase the number of schooling options available to parents that historically have been unavailable in the public school system where children have to go to their assigned schools, usually located within the boundaries of their residing districts. From this perspective, school choice, by definition, furthers the goal of freedom of choice. Indeed, surveys from different states consistently have shown that choice parents are very satisfied with the choices they make (McCully & Malin, 2003; Pioneer Institute, 2000; Solmon, 2003). When evaluating school choice policies as an alternative to the TPS system, researchers consequently tend to focus on the other three goals: equity, efficiency, and social cohesion.

Increased freedom to choose under choice policies creates two mechanisms: a sorting of students among schools and competition among schools. To evaluate the effectiveness of school choice policies, one must understand how student sorting and competition jointly influence the outcomes Levin has put forth.

*Sorting Mechanism*

School choice policies allow parents to choose from different schools for their children and for schools to provide differentiated educational services, which in turn inevitably create a re-sorting or redistribution process that rearranges students among schools. This sorting process has implications for equity, efficiency, and social cohesion.

First, student sorting under school choice policies carries equity implications insofar as it alters the overall degree of social stratification in the public school system. It has the potential to either decrease or increase equity, depending on who chooses and who stays. Advocates for choice policies suggest that such policies enable students who are not well served by TPSs to attend choice schools that better meet their needs (Chubb & Moe, 1990; Finn, Manno, & Vanourek, 2000; Friedman, 1962). This hope is especially prominent for students who are unable to afford switching to better public schools by moving to a different residential district or paying tuition for private schools. Advocates argue that these students tend to be from low-income and minority families, and possibly with low levels of achievement (Mathews, 2004). From this perspective, supporters argue that choice policies enhance equity by expanding educational opportunities for disadvantaged students.

Critics of school choice policies, however, worry about the students remaining in TPSs. On the demand side, they argue that all students are not equally able to take advantage of newly available choice options. Disadvantaged students are more likely to be left behind because their parents tend to be unprepared for making informed choices (Gintis, 1995). These parents also tend to have greater difficulty in obtaining and assessing information about choice programs or school quality and in arranging transportation to choice schools (Arsen, Plank, & Sykes, 1999; Bell, 2005; Levin, 1998). On the supply side they are concerned that schools enrolling high concentrations of racially and socially disadvantaged students will be at a disadvantage in competition with other schools for students (Fiske & Ladd, 2000). Under this scenario, choice could exacerbate inequity, with well-informed and higher-achieving students attending choice schools, and truly disadvantaged students becoming more concentrated in high minority and high poverty schools that lose both higher-achieving students and the financial resources that go with them.

Past research has shown that student composition in schools affects student outcomes. Low-income students have higher levels of achievement and/or larger achievement gains over time if they attend middle-class schools rather than high-poverty schools (Borman & Dowling, 2003; Coleman, 1966; Hanushek et al., 2003; Levin, 1998; Summers & Wolfe, 1977; Zimmer & Toma, 2000). Reduced social stratification in schools improves equity through positive peer effects for disadvantaged students. So a high degree of social stratification exacerbates inequity because affluent students benefit from high-achieving middle-class peers, and disadvantaged students are concentrated in high-poverty schools with low-achieving peers. How the redistribution of children under school choice influences racial segregation and social stratification has therefore become the main equity consideration in the choice debate.

Second, student sorting under school choice has potential implications for social cohesion. Isolated students tend to have little first-hand exposure to social or cultural diversity and may therefore be inhibited in learning lessons of tolerance and acceptance of differences, or perhaps be less willing to accept a common set of values and shared base of knowledge. Students in integrated schools, on the other hand, are more likely to live and work in interracial settings and to be better prepared for participation in democratic life as adults (Braddock et al., 1984; Eaton, 2001; Hallinan, 1998; Wells & Crain, 1994). While there is a longstanding view that racial and ethnic diversity within schools can help to promote social cohesion, it is unclear whether choice policies increase or decrease this diversity. School choice critics have argued that choice policies will exacerbate segregation in schools, especially along racial and ethnic lines. Advocates, however, expect choice policies to reduce school racial segregation, since most racial segregation in public schools reflects segregation in the residential housing market, and choice policies enable children to attend schools outside their neighborhood (Finn et al., 2000; Friedman, 1962; Greene, 2005). The link between school choice and social cohesion remains an empirical issue that has produced only mixed results in past research.

In addition, student sorting is relevant to measuring school efficiency, but in an indirect way. Improvements in student achievement at a school can be the result of it improving teaching and learning in response to competitive pressures or as a result of it enrolling more able students. School choice advocates typically maintain the former competitive response hypotheses under which competition generates strong incentives for schools to develop programs that better serve students' needs. Efforts to test this hypothesis empirically, however, must account for the self-selection of students into choice schools. For example, suppose that students enrolled in choice schools are more able or motivated than otherwise similar students remaining in TPSs. If the selection bias is not controlled for, choice schools could appear to be more efficient than TPSs even though they are not. Likewise, a school can appear to be less efficient when students enrolled are less able or motivated. Efforts to measure the effect of choice policies on school efficiency must therefore separate the *competitive effect* from the *student composition effect* (selection bias). This requires not only sophisticated statistical tools, but also the availability of detailed data.

*Competition Mechanism*

Understanding how competition influences school outcomes—especially efficiency—is the other main issue in evaluating school choice. School choice advocates assert that the U.S. public schools are inherently inefficient, spending too much money while producing poor student outcomes (Brandl, 1998; Chubb et al., 1990). Allowing parents choice and connecting school finance directly to the number of students enrolled, school choice creates a market incentive mechanism under which choice schools are motivated to have high quality programs so that they can attract more students—their customers. More importantly, all TPSs are motivated to improve their educational quality as well, since excessive loss of students and resources to choice schools will lead to less funding and even school closure. As a result, choice advocates suggest that both choice students and the students remaining in the TPS system will enjoy more efficient provision of educational services.

Opponents, on the other hand, argue that school choice does not necessarily improve efficiency because the concept of market competition and choice were borrowed from other fields and can not be readily adapted to the delivery of public education (Fiske & Ladd, 2000). Parents may not choose schools based on school quality, but rather on a variety of other factors such as location and accessibility from their home or the school's football team, factors that have nothing to do with quality. Sometimes, parents make rational decisions to choose failing schools for their children, because parents' preferences are shaped by their social networks (Bell, 2005). On the other hand, TPSs can respond the competition from school choice by a range of possible strategies, some of which have little to do with improving school quality and becoming more efficient (Arsen & Ni, 2005).

Empirical work on the impact of competition on school efficiency is limited and results from this line of inquiry are mixed. While the economic rationale for competition and efficiency is conceptually clear, it remains empirically difficult to establish the causal relationship between the two because of the confounding effects of students sorting and non-randomness of choice school location.

To summarize, the sorting and competition mechanisms created by school choice simultaneously affect the efficiency, equity and social cohesion of the public school system. Sorting influences racial segregation and social stratification that have implications for both social cohesion and equity. Competition directly influences school efficiency, but the causal relationship between the two can only be established after controlling for the sorting effects of students and endogenous location of choice schools.

With this study, I attempt to evaluate Michigan's charter school program more comprehensively. Applying Levin's framework, I estimate the effects of charter schools on efficiency, equity, and social cohesion by answering two broad questions. First, does student sorting lead to more racial segregation and stratification by student SES and ability in charter schools and TPSs? Second, does charter competition increase school efficiency for TPSs? Before examining these questions, I offer a brief history of school choice and school funding in Michigan so as to provide context in which to situate the data I will explore later.

## School Choice Context in Michigan

Michigan provides an interesting setting for the study of school choice policies because it gives parents a wide array of choices. In addition to the traditional choice programs such as intra-district choice, home schooling, and magnet schools, Michigan further expanded parents' opportunities to select their children's schools with the passage of two state-level school choice programs in the 1990s: a charter school program and an inter-district choice policy that allows students to choose public schools located outside their home district. In addition, the state's school finance system, commonly designated Proposal A, greatly facilitated the development of the two choice programs by allowing per-pupil funding to follow students to the schools they attend. In short, it set up a market-driven system of schooling in which public schools—both traditional and charter schools—began to compete with one another.

### *Charter School Program*

In 1993, Michigan became the eighth state to adopt a charter school law. A charter school, officially designated a public school academy (PSA) in Michigan, is a state-supported public school that operates independently under charters granted by an authorizing body. A PSA could be organized by educators, parents, or others (e.g., any nonprofit organization) and authorized by a publicly elected body with an educational mission, such as a local, intermediate, or state board of education or the elected governing board of a public community college, college, or university. A charter school is supposed to enjoy the operational autonomy of a private school while being held accountable for meeting state performance standards and, as of 2001, standards under the

No Child Left Behind (NCLB) Act. All attendees are "active choosers" as all enrolled students select the school and no one is compelled to attend. Charter schools have no geographic boundaries as do TPSs. Students are free to choose to go to any of charter schools in the state, on a space available basis. PSAs can serve any grades but most charter schools in Michigan serve students only in the K-8 range.

Originally, no limit was imposed on the number of charters that could be issued by any of the authorizing boards. However, in 1996, following a proliferation of charters issued by the board of Central Michigan University, the legislature imposed a cap on the total number of schools that may be chartered by the 15 public universities in the state. This cap of 150 schools has limited new school development since 2000. However, there is no cap on the number of schools chartered by other organizations. Thus, charter schools in Michigan have developed steadily during the past decade. With the first charter school founded in Detroit in 1994, Michigan had 226 charter schools by 2005. The majority of Michigan charter schools now contract for services with private, for-profit Educational Management Organizations (EMO). About 92,000 students (or five percent of the state's public school population) enrolled in charter schools in 2005. So far, Michigan's charter enrollment is the third largest in the nation after California and Florida.[2]

*Inter-district Choice Program*

In 1996, the Michigan legislature created an inter-district choice program, commonly known as "schools of choice" program. All local public school districts can determine whether or not they will accept nonresident students in their schools. However, they

[2] Source: http://www.publiccharters.org/section/states/mi

cannot prohibit students who live within their boundaries from attending public schools in another district that admit them.[3] Districts are responsible for publishing the schools, grades, and programs that are available for nonresident students and for accepting applications. Random selection by lottery, with certain exceptions, must be used if the number of applicants exceeds available space.

Under the provisions of Section 105, students may leave any resident district to enter a choice school within the same intermediate school district (ISD), in most instances defined by county boundaries. A new component of the state's inter-district choice policy (Section 105C) was subsequently added, and it permits districts to enroll nonresident students from local districts in contiguous ISDs. Up to 2004, about half of Michigan's 555 local districts enrolled nonresident students under the inter-district choice program. About 80,000 students enrolled in school of choices under the state's inter-district choice policy in 2004.

*Proposal A*

In 1994, Michigan voters approved Proposal A, a school finance reform movement that shifted the funding responsibilities from local districts to the state. Local voters could no longer increase taxes to support school operations. Under Proposal A, school districts have received almost all their operational revenues from the state on a per-pupil basis. Each student receives a foundation grant, which was approximately $6875 in 2006[4]. That money goes directly to the school district that the student attends.

[3] Inter-district choice is a *state* program. School districts within an intermediate school district (ISD) may develop their own inter-district plans that operate in place of the state's policy.
[4] A small set of hold-harmless districts, whose foundation in year 1993-94 was $6,500 or greater, are eligible to levy additional local property taxes to sustain funding above the state basic foundation allowance.

In addition to state and federal categorical aid, each charter school receives a per-pupil allowance equal to the foundation allowance of the district in which the school is located. For inter-district choice students, the revenue follows automatically to the districts where they attend schools. Districts enrolling an inter-district choice student receive the lesser of the foundation allowance of the resident district or the enrolling district. Enrolling districts are prohibited from charging tuition in any form to make up any revenue differences.

Proposal A creates fiscal incentives for schools to compete for students through school choice program, because operating revenue that districts and charter schools receive depends directly on the number of students that they enroll. The only way the schools can increase their revenue is to attract more students.

Arsen et al. (2002) argued that charter schools and inter-district choice pose very different kinds of challenges for Michigan's public schools and school districts. Charter schools are new entrants to the market for schooling. In order to survive and expand, they have to compete aggressively with TPSs for students. Hence, charter school program generates sharp and intense competition between charter schools and TPSs. By contrast, Michigan's inter-district choice is more controlled, unfolding almost entirely within ISDs or among contiguous ISDs. In some cases, district superintendents within ISDs, have cooperated or colluded with each other in order to manage competition among themselves and protect individual districts from excessive enrollment losses (Arsen et al., 2002).

In addition, Arsen et al. (2002) pointed out there are five dimensions of local context that are important in determining the extent to which school choice policies affect the schools and school districts: socioeconomic status, socioeconomic diversity, school district enrollment size, population density, and population growth. Because school districts in Michigan differ considerably in these five dimensions, charter schools and inter-district choice create very different impacts on school districts in different parts of the state. Generally speaking, urban districts and surrounding low-income suburban districts tend to attract extensive competition from charter schools because they have high student density, and have a large proportion of parents who are not satisfied with the education their children receive. On the other hand, inter-district choice is less likely to be available to students in urban districts, especially those with very high concentration of minority and low-income students, due to supply-side restrictions on the openings for transfer students established by suburban districts. Despite increasing financial pressures, many surrounding suburban districts are unwilling to accept nonresident students from urban districts given community resistance and the political risks for local district administrators and board members of altering the racial or social class composition of local schools.

In suburban and rural areas, however, school districts are less likely to face competition from charter schools. Low student population density in rural areas makes it hard for charter schools to draw enough students. Also, as public education quality is usually good in suburban areas, it is hard for charter schools to attract enough students who seek for alternative educational options, unless they live in nearby central city districts. On the other hand, inter-district transfers may be more attractive in low-density areas because some children must travel much farther to their assigned public school than they would to a school in an adjacent district. Students from suburban areas might be attracted to programs from neighboring districts and accepting nonresident students from the neighboring suburban districts might not be an issue because perceived social difference between neighboring districts are not large (Arsen et al., 2002).

Together, the school choice programs and the school finance system in Michigan have created one of the most competitive markets for schooling among the fifty states. The influence of charter schools in Michigan consequently has significant implications for the larger debate about school choice policies in the nation.

# CHAPTER 2 CHARTER SCHOOLS AND STUDENT SORTING

As noted in Chapter 1, charter school policy allows students to select from different schools and for schools to provide differentiated educational services. This inevitably creates a re-sorting or redistribution process that rearranges students among schools. Years after the first policies were put into place, one central issue concerning equity persists: are all students provided equal opportunity to choose, and does choice lead to greater racial and social integration of students across schools?

This chapter and the following chapter address some of these questions by analyzing Michigan's charter school program. This chapter is organized as follows. In the first section, I summarize the literature on how the introduction of charter schools influence racial segregation and social stratification. I also review the literature for inter-district choice, since it is part of my empirical analysis. In the next section, I specify three research questions related to charter schools and student sorting. Next, I describe my data and methodology. After that, I present the results for my first two research questions: who participates in charter school programs and do charter schools differ from TPSs in student composition? The third research question, the impact of charter schools on student composition in TPSs, is analyzed in Chapter 3.

## Previous Research: Consequences of Sorting under Public School Choice

Along with the fast development of charter school policy, there is a growing body of literature studying how the sorting mechanism it created influences racial segregation and social stratification. My review of previous research is organized around three issues that highlight whether the analysis focuses on individual students or schools, charter schools or TPSs:

(1) How do rates of participation in charter schools vary across student groups by race, SES, and achievement?

(2) Does the sorting of students generate increased or decreased homogeneity of students within schools? That is, are charter schools more homogenous or diverse than TPSs by race, SES, and achievement across schools?

(3) How does the sorting of students influence student composition in TPSs? Does it generate an increased concentration of disadvantaged students in disadvantaged TPSs?

The first two topics have been extensively studied, while the third remains mostly untouched. Among the existing studies, I argue that the empirical evidence is not conclusive and much of it is flawed.

*Who Chooses Charter Schools?*

This question has been examined by a series of annual reports on charter schools published by the U.S. Department of Education. Using national data collected from National Center for Education Statistics (NCES) Common Core of Data (CCD), the studies made cross-sectional statewide comparisons of the overall racial and social composition of charter schools versus all public schools in the states with charter schools. The reports consistently found that, nationwide, students in charter schools have similar demographic characteristics to students in all public schools. However, it is critical to note that in several states charter schools serve significantly higher percentages of minority or economically disadvantaged students (Colorado Department of Education, 2000; U.S. Department of Education, 1997; 1998; 1999; 2000).

Carnoy et al. (2005) systematically examined whether charter schools attract more socioeconomically disadvantaged students than do regular public schools within otherwise similar demographic categories.[5] Using NCES data, the authors performed cross-tabulations of race and SES to examine the characteristics of all charter and regular public school students nationally. The results show that within each racial category, regular pubic schools have a greater share of low-income students than charter schools. The authors also summarized 19 studies of charter school demographic characteristics from 12 individual states and the District of Colombia and reached the same conclusion: although charter schools tend to have higher percentages of minority students, the average SES of those students is either equal to or more advantaged than the minority students in TPSs.

Research on whether students choosing charter schools are higher or lower achievers than students remaining in TPSs is very limited. In a recent study, Booker, Zimmer and Buddin (2005b) compared individual test scores of charter students in the year before their move and found that in Texas, students who move to charter schools are, on average, lower performing than other students at the public schools they leave. However, little evidence of ability sorting into charter schools was found in California in the same study. Another study of Arizona's charter schools also concluded that students had lower test

[5]The Economic Policy Institute (EPI)'s analysis on SES stratification comes as a byproduct of statistical debates over whether charter or TPSs are more effective. Since student achievement is correlated with family SES, researchers have been obliged to control for family SES in making comparisons of student achievement. Using NCES data, researchers at the American Federation of Teachers (AFT) showed that charter school students performed significantly behind students in TPSs (Nelson et al., 2004) However, charter school proponents charged that the AFT study "fails to meet professional standards" because it only controlled limited information on the family background. Proponents argued that many charter schools enroll more disadvantaged students, "black students who attend charter schools may well come from poorer families than black students in TPSs" (Mathews, 2004) If this is the case, the inability to control for student SES makes the conclusion that charter schools are less effective than public schools implausible, even though charter school students' scores were lower on average. EPI's analysis comes as a response to the debate.

scores before they entered charter schools than did comparable students in regular public schools (Solmon & Goldschmidt, 2004). However, the comparison was based on students' test scores at the end of their first year in charter schools instead of scores before they entered charter schools. This is flawed because several studies have suggested that in the first year after students transfer to a new school, their achievement tends to drop (Bifulco & Ladd, 2004; Hanushek et al., 2003). Therefore, the comparison was downward biased for charter school students.

Most previous studies about who participates in charter schools are cross-sectional comparisons of total charter and TPS students at the state level, and only a few conducted comparisons at the school or district level. Highly aggregated analyses might mask the variations within individual schools or districts because they do not take into account the possibility that charter schools are not randomly distributed across local communities with very different racial or social characteristics.

*Student Composition in Charter Schools and TPSs*

Realizing state averages can mask variations in the racial distribution of students among schools, a study released by the Civil Rights Project at Harvard University provides an alternate methodological approach (Frankenberg & Lee, 2003). The study used more recent CCD from 16 states that had total statewide charter enrollments of at least 5,000 students in 2000-01 to make cross-sectional state-level comparisons of the racial composition of charter schools and non-charter public schools. The authors calculate racial exposure indexes, and investigate the concentration of students of all races in racially imbalanced and isolated schools. By this measure, the study concluded that charter schools displayed higher levels of segregation than TPSs.

A number of other researchers have compared the racial composition of charter schools to that of all regular public schools in their host district or to geographically adjacent schools (Ascher & Wamba, 2000; Cobb & Glass, 1999; Colorado Department of Education, 2000; 2001; Miron & Nelson, 2002a; Miron et al., 2002b; Weiher & Tedin, 2002). A standard strategy is to determine the portion of charter schools that have unusually high or low concentrations of a given racial group relative to district average or nearby schools. These studies tend to find that charter schools either are not racially distinct from their surrounding districts or are less racially diverse than their surrounding districts. In other words, charter schools are not more racially integrated compared to nearby TPSs. The consistency of the finding is very surprising given the large inter-state variation in charter school policies and the very different patterns of racial segregation in TPSs.

Available evidence on whether charter schools are more homogeneous in terms of student social class than TPSs is much more limited and inconclusive. Carol Ascher and her colleagues (2000) analyzed data from more than 550 charter schools in twenty-six states. When disaggregated to the district level, they found that only 35 percent of charter schools were socio-economically diverse as compared to 72 percent of public schools in surrounding districts. They conclude that charter schools are more homogeneous in student SES than TPSs.

Studies found mixed evidence on whether charter schools "skim" high-performing students. Using the National Assessment of Educational Progress (NAEP) data, researchers at the American Federation of Teachers (AFT) found that, overall, charter school students had test scores that were a half a grade lower than scores of students in

TPSs (Nelson et al., 2004). NCES's own study also confirmed the AFT's findings (NAEP, 2005). Responding the AFT study, Hoxby (2004) reached the opposite conclusion. Using state assessment data, she compared the reading and mathematics proficiency of charter school students to that of their fellow students in the nearest regular public school with a similar racial composition and found that charter students are 5 percent more likely to be proficient in reading and 3 percent more likely to be proficient in math. Later, however, researchers at EPI re-examined Hoxby's study using the same data, and found that her results of the higher math and reading proficiency in charter schools disappear when racial composition and low-income status are directly controlled (Roy & Mishel, 2005).

Nevertheless, all these studies used cross-sectional comparisons and were unable to determine whether the low test scores of charter school students were due to charter schools disproportionately attracting students with lower academic achievement or to charter schools being less effective in raising student performance. A possible way to address this issue is to compare students' pre-choice test scores to scores of students in the TPSs they left. If choice students whose scores before they decided to choose were lower than those of students they left behind, it can be inferred that choice students are more academically disadvantaged than comparable students in the TPSs.

*The Impact of Charter Schools on Student Composition in TPSs*

Compared to the extensive study of the first two questions—what kinds of students participate in charter schools and whether charter schools are more stratified than TPSs, the impact of charter schools on student composition in TPSs remains mostly untouched. Cross-sectional comparisons of racial composition are not sufficient to assess whether or not charter schools are exacerbating racial segregation and social stratification in TPSs because factors other than choice programs may also affect student composition in TPSs, and children in choice schools would not necessarily attend TPSs in the absence of choice programs.

One strategy for overcoming this impasse is to utilize panel data to measure changing patterns of racial composition in TPSs caused by the introduction of charter schools. Dee and Fu (2004) utilize school-level panel data from Arizona and New Mexico, to implement a "difference-in-differences" research design to study the influence of charter schools on racial segregation in Arizona public schools. Using public schools in New Mexico as the control group, the authors estimate the change in the percentage of White non-Hispanic students in Arizona public schools before and after the charter school policy was introduced relative to the change in New Mexico's schools. The results suggest that the introduction of charter schools in Arizona has significantly reduced the proportion of White non-Hispanic students in TPSs, and therefore increased racial segregation. This study contributes significantly to our understanding of the impact of school choice on TPSs. However, the study only addressed one dimension of the choice policies' potential impact. Important questions remain: what kinds of TPSs tend to lose students to charter schools? After students are drawn away to charter schools, some subsequently return to TPSs. We have no previous research that examines the net effect of these transfer patterns on the racial, SES, and academic composition of students in TPSs.

To summarize, existing research has studied the impact of charter schools on racial segregation and social stratification from a variety of aspects. The question of who are active choosers was studied by comparing the demographics of choosers and non-choosers at the state and national level. Most studies show that, overall, minority and low-income and low-performing students are slightly more active in choosing charter schools. Studies regarding the second question whether charter schools are more homogenous than public schools usually compare student characteristics of charter and TPSs at school, district, or even state levels. Although consensus has not been reached about stratification by SES and performance, researchers tend to agree that charter schools are either not racially distinct from or less diverse than surrounding district or nearby TPSs. However, as the educational opportunities of disadvantaged students has been the persistent concern, the third question, how the emergence of charter schools influences the stratification by race, SES, and performance level in TPSs, especially high poverty schools, remains unaddressed by existing research.

One big challenge faced by researchers is that sorting is an inherent phenomenon of school choice. Aggregated analyses and cross-sectional comparison mask the variation among schools due to the endogeneity of charter school location. Comparisons of these kinds will not answer whether charter schools draw the "better" students from a school or draw students from "better" schools, and whether students left behind enjoy less diversified learning environments compared to the choosers.

Using panel data at the student level to discern the dynamics of student flows is one possible approach to circumventing the endogeneity problem. In principle, we would like to compare the characteristics of active choosers to the characteristics of their classmates in both the schools they transferred from and to. By examining the characteristics of students who move from a regular public school to a charter school (or move from a charter to a regular public school) with their new and former peers, we can isolate the social nature of the sorting process facilitated by choice policies. Data of this type would enable researchers to discover both whether school choice increases racial segregation and whether active choosers tend to be more or less disadvantaged relative to other students in their schools. Unfortunately, panel demographic data at the student level are usually unavailable for charter school research.

*Inter-district Choice*

Most of the conceptual and methodological issues discussed to this point regarding the impact of charter schools also apply to the analysis of inter-district choice policy. Many states have introduced open-enrollment policies under which students can attend public schools outside their district of residence. Provisions vary across states, but as in the case of charter schools, all or most of per-pupil funding typically transfers with a student to the educating district. A key feature of inter-district choice policies is that school districts can generally decide whether or not to open themselves to nonresident students.

Compared to the research on the impact of charter schools, limited evidence exists about inter-district choice policies. One of the most extensive studies of inter-district choice was done in Massachusetts. Using data from multiple sources, mainly student level data and the data collected from 20 districts with more than 100 transfers under inter-district choice, Armor and Peiser (1997) showed that choice students tended to be White and more affluent than the overall demographic make-up of districts that they left. Another study in Michigan found that students active in inter-district choice are generally moving to districts with higher test scores, with higher family income, and lower concentrations of Black students (Arsen et al., 1999). In Georgia, where school districts can establish their own policies under which students are allowed to transfer, a study (Doering, 1998) found that minorities were underrepresented in inter-district choice programs. Choice students were primarily White students transferring from White school districts to districts that were also primarily White.

All these studies indicate White and relatively affluent students are more likely to take advantage of inter-district choice. However, cross sectional district-level data are insufficient to explore the change of racial composition of participating districts resulting from the policy. The lack of information on choice student makes it impossible to compare choice students' characteristics with those of students in either sending or receiving districts.

A more recent study (Ni & Donahue, 2004) on inter-district choice in Michigan used student level data, and found that the program increases racial segregation and socioeconomic stratification in central city districts because more affluent and White students attend schools outside their residing districts. Unfortunately, the study's data could only identify the resident districts of choice students, but not their assigned public schools. As a result, the analysis could only discern the impact of sorting at the district level instead of the school level. As in the case of charter schools, it would be desirable to study this question with panel student-level data, with which one could track the flows of choice students among TPSs.

How sorting influences racial segregation and social stratification is a complex issue. The accuracy of measurement depends not only on the sophistication of methodologies, but also on the availability of detailed data. In addition, choice policies vary widely in terms of their financial features, and regulations, as well as support service in different states (Levin, 2002). Research findings in one state often cannot be easily generalized to another state. On balance, given the different conditions under which choice policies operate and the limitations of research methodologies and data, we really do not know much about the issue of racial segregation related to charter schools and inter-district choice (Gill et al., 2001; Wells et al., 2000).

## Research Questions

In order to study student sorting associated with charter schools, I use two years of student-level data to study the impact of Michigan's charter school policy on student composition by race, SES, and student performance level from several different perspectives. Specifically, I ask three sets of research questions:

(1) Who chooses to attend charter schools? Are they systematically different from the students in TPSs by race, SES, and performance? Do the results vary across different types of communities, including central city, suburban, and rural areas?

(2) Are charter schools more homogeneous or more diverse than TPSs by race, SES, and performance level?

(3) How does the sorting of students influence student composition in TPSs? Does it lead to more integration or segregation and stratification?

In this chapter, I will focus on question (1) and (2), while in Chapter 3 I will answer question (3). Students remaining in the public schools, especially those attending schools in inner cities with high concentration of low-income and minority students are the main concerns of researchers and policy makes as well. Although these schools are heavily impacted by the introduction of charter schools, how sorting influences their situation has not received much explicit attention from existing studies. Therefore, I will put more emphasis on the third research question in my analysis.

## Data and Empirical Strategies

Analyses in this chapter and chapter 3 draw on data from multiple sources. The primary data are obtained from the State of Michigan's Single Record Student Database (SRSD) for 2002-03 and 2003-04.[6] The SRSD contains detailed individual information on each student in Michigan's K-12 public schools, including student age, gender, race and ethnicity, free and/or Reduced Lunch (FRL) eligibility, school attended and participation in programs as Title I, special education, and gifted/talented. SRSD is collected three times a year, so the database tracks all students as they progress through Michigan's public school system.

Several variables from the SRSD for the year 2002-03 will be analyzed to discern students' probability to change schools in 2003-04. These variables include the student's race, eligibility for receiving FRL, which serves as a proxy student SES. Information about individual student performance, the scores of the state's Michigan Educational Assessment Program (MEAP) tests come from the office of School Assessment and Accountability at the Michigan Department of Education (MDE). Not all Michigan students were tested annually on each subject. Each year, only students in certain grades were tested in certain subjects. In this study, I focus on math and reading scores. During 2002-03 and 2003-04, reading was tested only in grades 4, 7, and 11, and math in grades 4, 8, and 11. School level data in this analysis are aggregated from student level data.

[6] For more detailed information about SRSD, please visit the website of by the Center for Educational Performance and Information (CEPI) of Michigan at www.michigan.gov/cepi.

For the first research question of who attends charter schools in Michigan, I conduct statewide descriptive comparisons of characteristics of students attending charter schools and attending TPSs, in terms of race, SES, and student performance. I then further disaggregate the comparisons according to where the students are from, in order to explore how locations of charter schools matters influence what kinds of students they attract.

For the second question of whether charter schools are more homogeneous than TPSs, I compare student composition in PSAs and TPSs at district-level. I first categorize all charter schools into three types depending on where they draw their students. Then, I compare their student composition with their comparing TPSs. In addition, I group TPSs into four quartiles according to their racial diversity, SES composition, and performance level to further investigate whether the effects of charter schools differ based on the degree of homogeneity in the schools of nearby local school district.

The third question about the impact of student sorting on TPSs under charter school policy raises the most interesting issues. I address this question separately in Chapter 3. Using two years of student-level data, I am able to look at the distribution of students in 2002-03, knowing where students live and their social and educational characteristics, and examine where they go to school in 2003-04. So, I trace all students in the state who move from one school to another (under both charter school and inter-district choice policies), and examine how that movement is related to student, school and community characteristics. The analyses rely on a set of Multinomial Hierarchical Generalized Linear Models (HGLM), which incorporate data for individual students nested in schools so as to discern the dynamics of student flows at two levels: the individual student level and the school level.

## Descriptive Analyses

School choices in Michigan have developed very fast during the past decade. As Table 2.1 shows, by 2004, Michigan had 218 charter schools that enrolled roughly 73,000 students, or about 4.2 percent of the state's public school students. 26,000 other students participated in the state's inter-district choice program, attending public schools outside the district in which they lived. In total, choice students make up 7% of all Michigan's public K-12 students.

Table 2.1 Aggregate Participation in Michigan's School Choice Policies in Selected Years

| School Year | 96-97 | 98-99 | 00-01 | 02-03 | 03-04 |
|---|---|---|---|---|---|
| Number of PSAs | 79 | 138 | 184 | 206 | 218 |
| Number of PSA Students | 12,047 | 34,319 | 56,417 | 66,567 | 73,039 |
| PSA Students As a Percentage Of K-12 Students | 0.8 | 2.2 | 3.5 | 3.8 | 4.2 |
| Number of Inter-district Choice Students | 7,836 | 14,723 | 25,553 | 39,923 | 48,837 |
| Inter-district Choice Students As a Percentage of All K-12 Students | 0.5 | 0.9 | 1.6 | 2.3 | 2.8 |
| Choice and PSA Students As a Percentage of K-12 Students | 1.3 | 3.1 | 5.1 | 6.1 | 7.0 |

In the following sections, I will focus on charter schools, answering the questions of who attends charter schools and whether charter schools are more stratified than TPSs in terms of race, social class, and performance.

*Who Participates in Charter School Program in Michigan?*

One central debate about charter school policy revolves around what kinds of students charter schools serve—whether they serve the most disadvantaged or instead "cream" the best students that are easier to educate. What kinds of students do charter schools attract? Compared with TPSs, are charter schools more or less likely to enroll minority students? Are charter students more or less likely to be poor? Do they perform better or worse than students in TPSs?

In this section, the characteristics of students attending charter schools and TPSs in Michigan are compared by race, SES, and academic achievement, as well as by combinations of these characteristics. In addition, because charter schools are not evenly distributed among different types of communities, charter and traditional school student characteristics are also compared according to where students live: central cities, suburbs, or rural areas. Comparing charter students to other students in the local area where they reside instead of where they attend school is important because students are free to attend a charter school anywhere in the state. In fact, many students in Michigan attend charter schools outside their resident districts.

*Racial/Ethnic Distribution of Charter and TPS Students*

The data show that Michigan's charter schools, or PSAs, are indeed serving a disproportionate share of the state's Black students. As shown in Table 2.2, Black students made up 54 percent of all PSA students in Michigan, a figure that is three times the percentage of Black students in TPSs. By contrast, White students represented 37 percent of PSA students, only half the percentage of White students in the TPSs. The high percentage of Black in PSAs is primarily a function of charter school location.

About half of Michigan's PSAs are located in Detroit and other central cities, attracting students from these cities and their surrounding low-income suburbs where Black students are concentrated (See Appendix A for the definition of community type).

Table 2.2 Percentages of Students in PSAs and TPSs by Race/ethnicity, 2003-04

| Community Type | Total enrollment | | Percentage | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | White | | Black | | Asian | | Hispanic | |
| | PSA | TPS | PSA | TPS | PSA | TPS | PSA | TPS | PSA | TPS |
| Detroit | 29,882 | 153,706 | 6 | 4 | 89 | 90 | 0.4 | 1 | 4 | 5 |
| Other central cities | 17,371 | 168,532 | 41 | 44 | 47 | 41 | 1 | 2 | 7 | 11 |
| Low-income suburb | 3,105 | 43,641 | 22 | 51 | 71 | 39 | 2 | 3 | 3 | 5 |
| Middle-income suburb | 15,090 | 680,110 | 74 | 85 | 17 | 9 | 2 | 2 | 3 | 3 |
| High-income suburb | 2,492 | 269,068 | 81 | 88 | 7 | 4 | 6 | 5 | 2 | 2 |
| Rural | 5,099 | 356,639 | 84 | 93 | 2 | 1 | 1 | 1 | 2 | 3 |
| Total | 73,039 | 1,671,696 | 37 | 75 | 54 | 18 | 1 | 2 | 4 | 4 |

Students are organized by districts of residence.
In 2003-04, 399 out of 555 school districts had students attending PSAs, excluding the districts without PSA students did not change the figures in the tables much.

Table 2.2 also compares the racial composition of PSA and TPS students by community type of their residence. With the exception of Detroit, the data demonstrate two opposing trends for White and Black students. For each community type, the percentage of Black students in PSAs is higher than the percentage in TPSs, while the share of White students is consistently lower in PSAs than in TPSs. The most dramatic difference in the racial composition occurs in the low-income suburbs where the share of Black students enrolled in PSAs is more than doubled the share in TPSs, and the share of White students attending PSAs is almost 50 percent lower than in TPSs. By contrast, the racial composition of students in Detroit's charter schools and TPSs is very similar, because students throughout Detroit are predominantly Black.

There are relatively few Hispanic and Asian students in Michigan schools, making up only six percent of all students. The share of students who are Hispanic is slightly higher in PSAs than in TPSs, while the percentage of Asian students is nearly double in TPSs as compared to PSAs. When breaking into different communities, there is no significant distribution difference between PSA and TPS students among these two racial groups.

*Comparison of PSA and TPS Students by SES*

As Table 2.3 shows, 42.6 percent of PSA students statewide were eligible for FRL in 2003-04, almost 10 percentage points higher than TPS students. This is consistent with the conventional argument that PSAs serve more disadvantaged students than TPSs. However, it is important to note that when this indicator of family poverty is disaggregated by community type and racial group, PSA students within each racial group are less likely to be poor than TPS students in most parts of Michigan.

Of course, the percentages of FRL students vary by community type. Disaggregating the statewide data yields surprising results: In school districts where poor families are concentrated, including Detroit, other central cities, and low-income suburbs, charter school students are actually less likely to come from low-income families than are TPS students. By contrast, in relatively affluent middle- and high-income suburbs, PSA students are generally more likely than TPS students to be eligible for the FRL program.

These patterns hold for both White and Black students, but to a greater extent for Black students. In particular, the difference in poverty status is very big for Black students from Detroit, indicating that Black PSA students from Detroit are much less likely than their counterparts attending TPSs to come from low-income families.

In relatively affluent suburban areas, however, charter school students are slightly more likely to come from poor families than traditional public school students. Since White students are more likely to reside in these suburban areas in Michigan, White PSA students statewide are more likely to be eligible for FRL than White students in TPSs.

Table 2.3 Percentages of Students Eligible for Free/reduced Lunch by Race/ethnicity and Community Type, 2003-04

| | % of FRL | | |
|---|---|---|---|
| | PSA (1) | TPS (2) | Difference (2)-(1) |
| **Total - Statewide** | 42.6 | 32.9 | -9.7 |
| Detroit | 53.8 | 71.8 | 18.0 |
| Other Central City | 50.9 | 55.4 | 4.5 |
| Low-income Suburb | 52.1 | 54.3 | 2.1 |
| Middle-income Suburb | 24.7 | 23.3 | -1.4 |
| High-income Suburb | 13.5 | 8.5 | -5.0 |
| Rural | 30.6 | 35.0 | 4.4 |
| **White - Statewide** | 28.6 | 23.2 | -5.4 |
| Detroit | 62.1 | 65.9 | 3.8 |
| Other Central City | 35.3 | 36.8 | 1.5 |
| Low-income Suburb | 42.7 | 44.9 | 2.2 |
| Middle-income Suburb | 22.3 | 19.9 | -2.4 |
| High-income Suburb | 12.7 | 7.3 | -5.3 |
| Rural | 25.9 | 33.6 | 7.6 |
| **Black – Statewide** | 53.7 | 63.7 | 10.0 |
| Detroit | 51.6 | 71.2 | 19.6 |
| Other Central City | 63.7 | 70.2 | 6.5 |
| Low-income Suburb | 55.5 | 63.2 | 7.7 |
| Middle-income Suburb | 34.3 | 43.7 | 9.4 |
| High-income Suburb | 35.0 | 28.2 | -6.8 |
| Rural | 54.8 | 61.8 | 7.0 |

*MEAP Scores Comparison between PSA and TPS Students*

While only students in certain grades took the MEAP tests in Michigan during 2003-04, Table 2.4 shows that TPS students in those grades score higher on average than PSA students in both mathematics and reading. This is not necessarily evidence, however, that TPSs are more effective than PSAs. Such a comparison at one point in time does not account for the possibility that charter schools attract lower-performing students on average, nor does it capture gains in achievement over time.

Table 2.4 Average MEAP Scores of TPSs and PSAs at Certain Grades, 2003-04

| | PSA (1) | TPS (2) | Difference (2)-(1) |
|---|---|---|---|
| Grade | | | |
| Math | | | |
| 4 | 537 | 550 | 13 |
| 8 | 529 | 547 | 18 |
| 11 | 495 | 537 | 42 |
| Reading | | | |
| 4 | 541 | 554 | 13 |
| 7 | 527 | 543 | 16 |
| 11 | 535 | 548 | 13 |

Table 2.5 presents more detailed information on 4$^{th}$ grade math MEAP score comparisons. It shows that TPS students consistently have higher test scores than PSA students for each community type, race, and SES subcategory.[7]

[7] Results are similar for other grades and subject areas.

Table 2.5 Grade 4 Math MEAP Scores by Race/ethnicity and Community Type, 2003-04

| | PSA (1) | TPS (2) | Difference (2)-(1) |
|---|---|---|---|
| **Community type** | | | |
| Detroit | 532 | 536 | 4 |
| Other Central City | 535 | 542 | 7 |
| Low income Suburb | 526 | 538 | 12 |
| Middle income Suburb | 544 | 552 | 8 |
| High income Suburb | 554 | 562 | 8 |
| Rural | 543 | 549 | 6 |
| **Race/ethnicity** | | | |
| White | 541 | 549 | 8 |
| Black | 518 | 527 | 9 |
| Hispanic | 522 | 532 | 10 |
| Asian | 547 | 560 | 13 |
| **Socioeconomic Status** | | | |
| FRL | 529 | 540 | 11 |
| Non-FRL | 543 | 555 | 12 |

*Difference between PSA and TPS Students*

The data show that the characteristics of students attending PSAs differ systematically by race, SES, and achievement levels from students attending TPSs. First, PSAs serve disproportionately more Black students than TPSs. One reason is that charter schools are more likely to be located in central cities and attract students from central cities and surrounding low-income suburbs, where Black students are more concentrated.

Second, charter school students are more likely to be socially disadvantaged than traditional public school students at the state level. Further analysis of the data by community type, however, suggests that charter schools "cream" the more socially advantaged students in high-poverty areas, while serving more disadvantaged students from affluent areas. This is true for both White and African American students. Since

White students are much less likely be from low-income areas than African American students, on average White students attending charter schools are more socioeconomically disadvantaged than White students in TPSs, while African American charter school students tend to be much less disadvantaged than African American students in TPSs.

Third, on average, charter school students have significantly lower MEAP scores than TPS students. The cross-sectional comparisons presented in this chapter do not attempt to determine whether the low test scores of PSA students are because charter schools disproportionately attracting students with lower academic achievement or because charter schools are less effective in raising student performance. This issue will be further explored in Chapter 3.

However, the claim that charter school students earn lower test scores than traditional public school students because they serve a socioeconomically disadvantaged student population is not valid for two reasons. First, this analysis shows that low-income PSA students have significantly lower scores than low-income TPS students. In addition, in relatively less-affluent communities, PSAs actually serve a more socially advantaged student population than TPSs. This pattern is especially evident for Black students. Except for the affluent suburban areas, Black charter school students are much less likely to be from low-income families than Black students in TPSs.

*Are Charter Schools More Racially Segregated Than TPSs?*

Whether charter schools lead to racial segregation or diversity remains an empirical issue. Previous research has compared the characteristics of students in charter schools and TPS, and found that charter schools tend to be less racially diversified than TPSs

(Cobb et al., 1999; Frankenberg et al., 2003; Wells et al., 2000). However, most of the past research has tended to seek overall judgments on the effect of charter schools on racial segregation. Yet it is quite likely that this effect will vary across local contexts. For example, choice might decrease diversity in racially heterogeneous districts, but have limited effect on the diversity of very homogeneous districts.

Any assessment of the degree of diversity in charter schools relative to TPSs requires an appropriate specification of the TPSs to which charter sschools are compared. Some existing studies compare charter schools with the nearest TPS, based on the implicit assumption that this is the school from which charters are most likely to draw their students (Cobb et al., 1999; Hoxby, 2004). However, charter schools do not always attract students from the nearest TPS. It is possible that charter schools draw students from multiple districts, each with very different racial compositions thus complicating any determination of the effect of charters on school racial diversity. One corollary of this is that the effect of charter schools on diversity may vary systematically across central city, suburban, and rural communities. Empirical evidence on patterns of this sort is very limited. This section explores the following questions:

- Are most charter schools more racially segregated than TPSs?
- Under what local circumstances are charter schools more racially segregated or diversified than TPSs?

In order to address the limitation of previous research, charter schools in this section are categorized according to the racial diversity of their comparison TPSs. In addition, charter schools are grouped based on whether they draw students from a single or multiple districts. The purpose of the categorization and grouping is to explore whether the effects of charter schools on the racial diversity differ based on the degree of racial diversity in the schools of nearby local school districts.

As Table 2.6 shows, in 2003-04, among the 218 charter schools in Michigan, 104 PSAs were located in central cities and 82 in suburban areas, the majority of which were middle-income suburbs. The remaining 32 PSAs were located in rural areas. On the one hand, all the PSAs were concentrated in 92 of the state's 555 school districts. On the other hand, PSAs drew students from districts all over the state. The majority of districts (339) had resident students attending PSAs, no matter whether the PSAs were located inside or outside their jurisdictions.

Table 2.6 Number of PSAs in Michigan, by Location, 2003-04

| | PSAs | Districts | Districts Hosted PSAs | Districts Sending Students to PSAs |
|---|---|---|---|---|
| Central city | 104 | 15 | 15 | 15 |
| Low-income Suburb | 10 | 21 | 5 | 19 |
| Middle-income Suburb | 59 | 186 | 39 | 173 |
| High-income Suburb | 13 | 35 | 8 | 35 |
| Rural | 32 | 298 | 25 | 157 |
| Total | 218 | 555 | 92 | 399 |

Two methodological issues must be addressed in order to answer the question of whether PSAs are more racially integrated or segregated than TPSs. First, what is the proper measure for the degree of racial segregation? Second, what are the appropriate TPSs to compare PSAs to?

*Measure of Racial Diversity*

There are many different approaches to measuring school racial diversity. A simple method is to calculate the proportion of White students in the total enrollment, or alternatively, Black students in the total enrollment. As the proportion of White students (or Black students) declines from a very high value and by definition the proportion of students of other racial groups increases, the student body necessarily becomes more diverse. The major shortcoming of this measure is that it only measures one racial group and ignores other groups.

A more refined measure, *Diversity Range (DR)*, is defined as the reciprocal of the difference between the enrollment shares of the largest and smallest racial groups.

DR=1—( % racial group with largest share -% racial group with smallest share)

In Michigan, the vast majority of students are from two racial groups: White and Black. Therefore, instead of using the difference between the racial groups with the largest and the smallest share, it is reasonable to use the range between White and Black. The modified DR is defined as:

$$DR = 1 - \left| (\% \text{ White} - \% \text{ Black}) \right|$$

DR ranges from 0 to 1. A high value implies more racial diversity, while a low value means less racial diversity. For example, if a school has 60 percent White and 40 percent Black students, the DR would be the 1 – (.60–.40) = .80, which implies high racial diversity.

*Comparison School Districts*

Comparing a charter school's student composition to that of a neighboring TPS would be a sound method so long as the charter school attracts its students from the neighborhood. However, in Michigan, this comparison is not appropriate because on average, a typical charter school draws students from nine different school districts. More than half of all PSAs draw students from more than five districts, and 19 schools draw students from more than 20 school districts. This means that the neighboring TPS in the districts where a charter school is located is frequently not the primary school of origin for charter school students.

Therefore, I have grouped all 218 charter schools in Michigan into three categories based on where the students they enroll come from. As Table 2.7 shows, Type I includes 133 PSAs that draw more than half of their students from the local public school district in which the PSAs are located. Type II includes 44 PSAs that draw the majority of their students from a district other than the one in which they are located. The remaining 41 PSAs, representing Type III, draw students from multiple districts, none of which contributing more than 50 percent of the PSA's enrollment.

When grouping charter schools by geographical features of the district in which they are located, it is clear that the majority of PSAs located in central cities are Type I PSAs that draw their students mainly from their host districts, while many suburban and rural charter schools are Type II and Type III PSAs attracting their students from districts outside the one in which they are located.

Table 2.7 PSAs and Comparing TPSs in Michigan, 2003-04

| | Number of PSAs in different communities | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total | Detroit | Other central cities | Low-income suburb | Middle-income suburb | High-income suburb | Rural |
| **Type I**: Draw 50% or more of their students from host district | **133** | 54 | 40 | 2 | 15 | 4 | 18 |
| **Type II**: Draw 50% or more of their students from a non-host district | **44** | 1 | 1 | 8 | 23 | 4 | 7 |
| **Type III**: Draw students from multiple districts, each less than 50% | **41** | 2 | 6 | 0 | 21 | 5 | 7 |

Depending on where they are located and where they attract their students, student composition of three types of PSAs systematically differs. Table 2.8 shows that compared with the Type I PSAs, Type II PSAs tend to be more racially diverse, have a more affluent student body and higher average MEAP test scores. Type III PSAs are the most racially diverse among the three types, and tend to enroll more affluent students with higher test scores than the other two types of PSAs.

Table 2.8 Student Compositions of PSAs, 2003-04

| Types of PSA | Diversity Range | % FRL | Math MEAP score | Reading MEAP score |
|---|---|---|---|---|
| Type I | .36 | 52.0 | 522 | 529 |
| Type II | .45 | 37.6 | 526 | 534 |
| Type III | .72 | 21.8 | 531 | 542 |
| Total | .45 | 43.3 | 525 | 532 |

I compare the racial diversity of charter schools to that of the district where most of their students live. For Type I PSAs, their primary sending districts are also their host districts. For type II PSAs, the primary sending districts are not the host districts, but the districts where most of their students would have attended school in the absence of choice. Type III PSAs draw students more evenly from multiple districts. Therefore, they are compared with their host districts, even though they might not be sending a significant share of students to the PSAs.

*Racial Composition of TPSs and PSAs Statewide*

As shown in Table 2.9, a large share of Michigan's public schools, both TPSs and PSAs, are racially segregated. Statewide, PSAs are more likely to be Black segregated, and TPSs are more likely to be White segregated. This is hardly surprising, since students in the vast majority of the state's school districts are predominantly White and PSAs are disproportionately located in central cities where Black students are concentrated. On average, PSAs have a larger DR (are more racially diverse) than TPSs. In addition, PSAs are 10% less likely to have very small DR (<.10) than TPSs. Both measures indicate that when viewed from the level of the state as a whole, Michigan's charter schools are more racially diverse than TPSs.

Table 2.9 Racial Diversity Measures of PSAs and TPSs, 2003-04

| | PSA | TPS |
|---|---|---|
| Average % of White | 44.6 | 75.2 |
| Average % o Black | 45.1 | 16.8 |
| % of schools with White>80% | 28.9 | 66.9 |
| % of schools with Black>80% | 33.0 | 9.4 |
| Average DR | .28 | .20 |
| % of schools with DR<.10 | 41.7 | 51.1 |

In order to examine this issue further, PSAs are classified into three types, and their DRs are compared with that of corresponding comparable districts. Each type of PSAs is further disaggregated into four groups according to the racial diversity of their comparable districts. This is because TPSs are not homogeneous. For example, rural districts are usually highly White segregated, while districts in some central cities present great racial diversity because of the large minority population. The racial diversity of suburban district is generally between rural and central cities, but not always. Depending on where their students come from, PSAs also vary largely in racial diversity. Classifying the comparison districts into categories with different racial diversity help us to explore whether the effects of PSAs on the racial diversity differ in school districts that were more segregated or diverse.

I analyze Detroit separately for two reasons. First, Detroit is home to a quarter of Michigan's charter schools. Second, students in Detroit are predominantly Black, while other Michigan central cities are more racially diverse. So patterns of charter school diversity may differ in these urban settings.

*PSAs Located in Detroit or Drawing Students Primarily from Detroit*

In the 2003-04 school year, Detroit hosted 57 PSAs, 54 of which are Type I PSAs, drawing students mainly from Detroit. The city hosted one Type II PSA, which drew students primarily from a middle-income suburban district. The remaining two Detroit charter schools are Type III, drawing students from multiple districts. Furthermore, 19 charter schools located outside of Detroit in middle-income suburbs drew a majority of their students from Detroit.

As Table 2.10 shows, the racial diversity in the largest group of Detroit charter schools (Type I) is very low and similar to that of Detroit Public Schools[8]. The racial composition of the only Type II PSA located in Detroit is very similar to its sending district—a neighboring middle-income suburb district that is also highly White segregated.

[8] All these PSAs are predominately Black, except that one is predominantly White and three others are predominantly Hispanic.

Table 2.10 Racial Diversity of PSAs located in Detroit or Drawing Students Primarily from Detroit and Their Sending Districts

| | # PSAs | PSA mean DR (1) | District mean DR (2) | Difference (2)-(1) |
|---|---|---|---|---|
| Type I Detroit PSAs | 54 | .13 | .12 | -.01 |
| Type II Detroit PSAs | 1 | .15 | .10 | -.05 |
| Type II suburban PSAs drawing students primarily from Detroit | 19 | .32 | .12 | -.20 |
| Type III Detroit PSAs | 2 | .40 | .12 | -.29 |

Interestingly, the 19 PSAs located outside Detroit drawing students primarily from Detroit are significantly more diverse than the TPSs in Detroit, mainly because they draw disproportionately more White students from Detroit. In these PSAs, students enjoy more diverse environment than TPS students in Detroit. Furthermore, the two Type III PSAs located in Detroit draw a much more diverse student body from multiple surrounding districts, which also show positive evidence of racial integration.

*Type I PSAs Drawing the Majority of Students from Their Host Districts*

Table 2.11 compares the diversity of Type I PSAs outside Detroit to that of their host districts.[9] These 79 Type I charter schools are grouped into four quartiles according to the racial diversity of their host districts. The most segregated districts are in the 1st quartile, while the most racially diverse districts fall in the 4th quartile. Columns two and three show the mean DRs of charter schools and TPSs and their differences are displayed in column three.

[9] Median DR was tried as well, and was similar to those for mean DR.

Table 2.11 Racial Diversity of Type I PSAs and Host Districts, by Host District DR

| School District | PSA mean DR (1) | District mean DR (2) | Difference (2)-(1) |
|---|---|---|---|
| 1st quartile (most segregated) | .07 | .05 | -.01 |
| 2nd quartile | .30 | .29 | -.01 |
| 3rd quartile | .48 | .54 | .06 |
| 4th quartile (least segregated) | .49 | .92 | .43 |
| Total | .33 | .47 | .14 |

Lower DR value implies more racial segregation. Type I includes PSAs that draw more than 50% of their students from the district where the PSA is located.

Table 2.11 shows that charter schools that draw most of their students from the district in which they are located display a range of racial diversity. As one would expect, PSAs located in racially diverse districts are more diverse than PSAs located in racially segregated districts. On the other hand, charter schools are much less racially diverse than TPSs in the most racially diverse school districts. Among all Type I charter schools outside Detroit, the mean DR is significantly lower (less diverse) than the mean of their host districts. This difference is primarily caused by schools in the 4th quartile, where PSAs are almost 50% less diverse than their host districts, all of which are located in racially diverse central cities, such as Jackson, Grand Rapids, and Lansing. In these racially mixed school districts, charter schools appear to constitute a much less racially diverse learning environment.

In the 1st and 2nd quartile, comprised of the least racially diverse districts, PSAs are about as segregated as their host districts. Most of these were predominantly White rural and suburban districts, such as Charlevoix and Petoskey in the northern Lower Peninsula, and Spring Lake in the western Michigan. For the 3rd quartile, where the districts are more racially diverse, PSAs are slightly less diverse than TPSs. This difference, however, is not statistically significant. Included in this 3rd quartile are racially diverse yet mostly Black districts like Pontiac and diverse, yet mostly White districts like Ann Arbor.

The above analysis shows that overall Type I PSAs were significantly more segregated than the districts where they are located, but this is primarily a function of charter schools being much less diverse than TPS in the most diverse public school districts, since PSAs located in highly segregated districts are also racially segregated.

*Type II PSAs Drawing the Majority of Students from a District Other Than the Host District*

Most of the 25 Type II PSAs are located in suburban areas and attract their students from central cities, while a few are in rural areas drawing students from other rural districts.[10]

Table 2.12 shows that charter schools drawing students mostly from a very racially homogeneous outside districts (1st quartile) are themselves very racially homogeneous, although slightly less so than the outside district. PSAs in the 1st quartile were mostly located in predominantly White districts in Michigan's northern Lower Peninsula such as Boyne City, Traverse City, and Marquette. PSAs in the 2nd quartile were actually more racially diverse than schools in the primary sending district. When charter schools draw their students primarily from the most racially diverse outside districts, they are much less diverse than those districts. PSAs in the 3rd and 4th quartiles were mostly located in suburban districts and drew students from nearby racially diverse central cities such as Flint and Grand Rapids.

[10] This does not include 19 Type II PSAs drawing students primarily from Detroit.

Table 2.12 Racial Diversity of Type II PSAs and Sending Districts, by DR of Sending Districts

| | PSA mean DR (1) | Sending District Mean DR (2) | Difference (2)-(1) |
|---|---|---|---|
| 1st quartile (most segregated) | .08 | .06 | -.02 |
| 2nd quartile | .44 | .21 | -.22 |
| 3rd quartile | .34 | .57 | .23 |
| 4th quartile (least segregated) | .47 | .97 | .50 |
| Total | .33 | .47 | .14 |

Type II PSAs refer to PSAs drawing students mainly from a district other than the district in which they are located.

*Type III PSAs Drawing Students from Multiple Districts*

More than half of the Type III PSAs are located in middle-income suburbs or central cities, where population density is high enough to attract enough students from multiple districts. As Table 2.13 indicates, similar to Type II PSAs, Type III PSAs appear to be more diverse than host districts when the districts are relatively segregated, while they appear to be more segregated than the districts with greatest racial diversity.

Table 2.13 DR of Type III PSAs and Host Districts, by DR of Host District

| | PSA mean DR (1) | District mean DR (2) | Difference (2)-(1) |
|---|---|---|---|
| 1st quartile (most segregated) | .28 | .06 | -.22 |
| 2nd quartile | .22 | .14 | -.08 |
| 3rd quartile | .49 | .30 | -.19 |
| 4th quartile (least segregated) | .40 | .78 | .37 |
| Total | .36 | .31 | -.05 |

Note: Type III PSAs refer to PSAs drawing student from multiple districts, none of which contributed to a significant share of the enrollment of the PSA.

This section compares the Racial Diversity of the three types of PSAs that of TPSs in Michigan. Several key conclusions emerge from this analysis. First, although statewide, PSAs were more racially diverse than TPSs, not all PSAs are more diverse than TPSs in Michigan. In fact, depending where their students come from, PSAs had very different effects on racial segregation. PSAs drawing students mainly from the districts in which they are located tended to be more racially segregated than their host districts. The evidence is even stronger when PSAs are divided by racial diversity of their host district: PSAs located in racially segregated districts remained racially segregated and PSAs in more racially diverse districts were significantly less diverse than their host districts.

Second, charter schools drawing students from one district other than the host districts show some positive evidence toward racial integration. Further disaggregated analysis shows that PSAs drawing students from segregated districts are more racially diverse than the districts, while PSAs drawing students from diverse districts are less diverse than these districts.

Third, PSAs drawing students from multiple districts also show racial integration in more segregated host districts, but not in districts that are racially diverse. However, as mentioned earlier, their host districts might not be the best comparison group because the PSAs do not draw a large share of students from their host districts.

In sum, the effects of PSAs on racial segregation vary across districts depending upon the degree of racial segregation of the districts. Generally speaking, PSAs drawing students from segregated districts, such as predominantly White rural or suburban districts or predominantly Black Detroit, show no further racial segregation, and in some cases show evidence of slight racial integration. However, where charter schools draw their students from racially diverse districts—mostly central cities—they are less diverse than these districts.

*Are Charter Schools Serving More Socioeconomically Advantaged Students Than TPSs?*

As shown earlier, the percentage of FRL students in PSAs is much higher than in TPSs statewide in Michigan. However, PSA students from central cities and low-income suburban areas are more socially advantaged than TPS students from their own racial groups. Will this conclusion hold when compare SES composition of PSAs with their host districts or sending districts? Do PSAs have lower share of low-income students in high-poverty communities? Do they serve a relatively low SES student population in relatively affluent areas? In this section, the percentage of FRL students in PSAs is compared with that of TPSs in their comparable districts. Similar to the analysis of racial diversity, all the comparisons will be disaggregated according to two criteria: the types of PSAs and the share of FRL students in their comparable school districts.

*PSAs Located in Detroit or Drawing Students Primarily from Detroit*

Table 2.14 indicates that the Type I PSAs located in Detroit have smaller share (about 7 percentages lower) of FRL students than Detroit Public Schools. The one Type II PSAs that located in Detroit draws a majority of its students from a neighboring middle-income suburb district. Recalling that the racial composition of the PSA is very similar to its sending districts, it is interesting to note that it has a much higher share (about 31 percentages higher) of FRL students than its sending district.

The percentage of FRL students in the 19 Type II PSAs located outside Detroit are only half of that of its sending district—Detroit, indicating these PSAs are drawing disproportionately non-poor students from Detroit. Furthermore, the two Type III PSAs located in Detroit also have a much lower share of students eligible for FRL than Detroit Public Schools.

Table 2.14 Percentages of FRL of PSAs Located in Detroit or Drawing Students Primarily from Detroit and Their Sending Districts

| | PSA mean (1) | District mean (2) | Difference (2)-(1) |
|---|---|---|---|
| Type I Detroit PSAs | .67 | .74 | .07 |
| Type II Detroit PSAs | .74 | .43 | -.31 |
| Type II suburban PSAs drawing students primarily from Detroit | .39 | .74 | .35 |
| Type III Detroit PSAs | .45 | .74 | .29 |

*Type I PSAs Drawing the Majority of Students from Host Districts*

Table 2.15 compares the percentage of FRL students in Type I PSAs to that of their host district means. The districts are divided into four quartiles according to the degree of concentration of FRL students in the host districts of all Type I PSAs. According to Table 2.15, all Type I PSAs enroll a relatively lower share of FRL students than their host districts in all quartiles but first quartile, where the districts on average have a lower share of FRL students. These districts include some middle- and high-income suburban, and a few relatively affluent rural districts. The difference in the 4$^{th}$ quartile is remarkable. The mean percentage of FRL students is only 45 in PSAs located in high-poverty districts, where 80 percent of all students in these districts are eligible for FRL. Most of the districts in the 4$^{th}$ quartile are central city districts, including Lansing, Benton Harbor, and Saginaw.

Table 2.15 Percentages of FRL of Type I PSAs and TPSs in Host Districts, by Percentage of FRL of Host Districts

| | PSA mean (1) | TPS mean (2) | Difference (2)-(1) |
|---|---|---|---|
| 1st quartile (most affluent) | .35 | .20 | -.15 |
| 2nd quartile | .41 | .44 | .03 |
| 3rd quartile | .55 | .61 | .06 |
| 4th quartile (poorest) | .45 | .80 | .35 |

*Type II PSAs Drawing the Majority of Students from a District Other Than Host District*

An examination of Type II PSAs reveals a similar trend as Type I PSAs. As illustrated in Table 2.16, PSAs drawing students from districts with high percentages of FRL students tend to have lower shares of FRL students than their sending districts. By contrast, PSAs tend to have larger percentages of students eligible for FRL than TPSs when the districts have lower shares of FRL students. However, the difference between Type II PSAs and TPSs are not as big as between Type I PSAs and TPSs in high-poverty districts.

Table 2.16 Percentages of FRL of Type II PSAs and TPSs in Sending Districts, by Percentage of FRL of Sending Districts

| | PSA mean (1) | TPS mean (2) | Difference (2)-(1) |
|---|---|---|---|
| 1st quartile (most affluent) | .31 | .11 | -.20 |
| 2nd quartile | .36 | .27 | -.09 |
| 3rd quartile | .25 | .44 | .19 |
| 4th quartile (poorest) | .60 | .71 | .12 |

*Type III PSAs Drawing Students from Multiple Districts*

As shown in Table 2.17, most of the Type III PSAs attract lower shares of FRL students than their host districts. PSAs located in districts with relatively high percentages of FRL students have lower shares of FRL students than their host districts. Although in the 2nd quartile where districts have relatively low concentration of FRL students, the share of FRL students in PSAs is higher than their host district mean. It is only a difference of two percentage points.

Table 2.17 Percentages of FRL of Type III PSAs and TPSs in Host Districts, by Percentage of FRL of Host Districts

| | PSA mean (1) | TPS mean (2) | Difference (2)-(1) |
|---|---|---|---|
| 1st quartile (most affluent) | .08 | .10 | .01 |
| 2nd quartile | .24 | .22 | -.02 |
| 3rd quartile | .24 | .39 | .14 |
| 4th quartile (poorest) | .34 | .59 | .24 |

This section analyzes the SES composition of three types of PSAs with the mean SES composition with their host or sending districts. In most cases, PSAs tend to attract proportionately more affluent students than TPSs in their comparing districts, no matter whether they draw their students from a single district or multiple districts. The data show that in districts with high concentration of low-income students, PSAs have significantly lower shares of low-income students. The only exception is that when districts have a relatively low share of low-income students, PSAs located in or drawing students primarily from these districts tend to have a higher percentage of FRL students. For example, PSAs located in central cities attracting students from suburban areas tend to have more poor students than their sending districts, which usually have small enrollment rates of low-income students.

The comparisons of SES composition between TPSs and PSAs reinforce the conclusion that PSAs "cream" more non-poor students from districts with high concentration of low-income students, while attract more low-income students from relatively affluent districts.

*Comparison of Performance Level in Charter Schools and TPSs*

Aggregated analysis in the earlier section shows that, statewide, students attending PSAs have significantly lower MEAP scores than TPS students. In this section, I compare student performance levels in PSAs with TPSs in their comparing districts. Do PSAs differ from TPSs regarding to their students' academic performance? If yes, do they have academically less successful students than neighboring TPSs?

Following the same approaches for the comparisons of racial and SES composition of PSAs and TPSs, I compare the mean MEAP scores, both math and reading, for the three types of PSAs with TPSs in comparing districts, and disaggregate the comparisons according to the mean achievement level of comparable school districts. The analysis shows, in most cases, the three types of PSAs have lower MEAP scores in both math and reading than TPSs in their host districts or primary sending districts. This is more evident in districts that have high performance levels: the higher the mean district MEAP scores, the larger the difference between district means and PSA means. PSAs do not always have lower test scores than TPSs, however. In districts with very low levels of performance, PSAs have similar or even slightly higher MEAP scores than mean TPS scores. PSAs located in suburban areas that draw students from central cities also tend to have higher test scores than TPSs in their sending districts.

## Discussion

This chapter answers first two research questions I posed in the beginning of this chapter: who participates in charter schools and how charter schools differ from TPSs in student composition. Both questions are analyzed through three dimensions: race, SES, and academic performance. In answering question one, aggregated analysis of all students attending charter schools and all students in TPSs are compared. For question two, PSAs are grouped into three types according where they draw their students, and compared with TPSs in their host districts or primary sending districts—schools that charter school students would have attended in the absence of choice.

The analysis shows that charter schools in Michigan enroll disproportionately more Black students than TPSs. This partly reflects the fact that half of the Michigan's charter schools are located in central cities, where minority students are more concentrated. Further comparisons between charter schools and nearby comparing TPSs reveal that most charter schools are more racially segregated than TPSs: PSAs located in or primarily drawing students from racially segregated districts remains racially segregated and PSAs located in or primarily drawing students from more racially diverse districts tend to be relatively less diverse than TPSs. There are a few exceptions. PSAs located in racially segregated districts yet drawing students from multiple districts are usually more racially diverse than TPSs in their host districts. The number of these kinds of PSAs is relatively small, however.

Racially diverse schools promote social cohesion. As pointed out in Chapter 1, many studies have found evidence that racial integration in K-12 schools is important in fostering more tolerant and open-mind adults. Students attended racially diverse K-12 schools are more likely to attend diverse colleges, live in integrated neighborhoods, work in diverse firms, and have friends from another racial group. Indeed, the earlier the students experience diverse learning environments, the greater the positive impact in social cohesion (Orfield & Lee, 2005). In Michigan, charter schools are largely serving grades K-8. Many students in the racially segregated charter schools are experiencing isolated learning environment in their early stage of education. This undermines prospects for the development of understanding, respect, and tolerance across racial lines.

Second, the analysis reveals that charter schools attract more socially advantaged students in high-poverty areas, while serving more disadvantaged students from affluent areas. There are a small number of PSAs located in or close to affluent districts and draw students from these districts. These PSAs tend to have a much higher share of low-income students than TPSs from the districts. It is especially true for a few PSAs located in central cities yet drew students from neighboring suburban districts. They usually have relatively higher enrollment rates of low-income students than TPSs in their primarily sending districts. In these areas, charter schools are expanding new educational opportunities for low-income students. However, from a policy perspective, the concerns arose in relatively poor school districts, where the majority of PSAs tend to have a relatively more affluent student body than TPSs in these school districts. This is consistent with the claim of critics that charter schools "skim the cream" of higher SES better-off students, although in my analysis, the skimming is limited to poor districts.

Third, almost all charter schools tend to have lower student achievement, MEAP test scores in this case, than TPSs in their comparison districts. It is still too early from this analysis to decipher whether the low test scores of charter schools is due to charter schools attracting lower-performing students or to charter schools being less effective in raising student performance than TPSs. If the low test scores result from a "composition effect"—students with low-performing student choosing charter schools, this is positive evidence that charter schools provide new opportunities for students who were poorly served by TPSs. If, however, the low scores are results of poor performance of charter schools in raising student achievement, we should worry about the validity of the argument that competition will produce effective choice schools. We also need to worry about the assumption that parents are rational consumers, choosing charter schools because of their high quality as measured by student achievement. Although this dissertation will not directly answer whether charter schools are more or less effective than TPSs in raising student test scores, the student composition effect is further explored in Chapter 3. Through a series of HLM models, the chapter explicitly examines whether the likelihood of individuals' choice to attend charter schools is related to their previous academic performance.

In sum, while the findings in the chapter are largely consistent with conclusions from previous studies in this area, it offers a much more nuanced picture than most pervious studies. Charter school policy in Michigan redistributes students among PSAs and TPSs. There is some positive evidence toward more racial integration and expansion of educational opportunities for socioeconomically disadvantaged students. For example, charter schools drawing students from multiple districts show some positive evidence toward racial integration. A small number of charter schools drawing students from affluent districts tend to have higher share of low-income students than TPSs. However, in most cases, charter schools tend to be more racially segregated, have a lower share of low-income students, and tend to have lower performing levels than TPSs in comparison districts.

TPSs in central cities usually have higher concentration of minority students than TPSs from suburban and rural areas. Many TPSs in these districts are racially diverse, except for Detroit and Benton Harbor Schools that are predominantly Black. Charter schools in central cities districts not only increase racial segregation or remain highly segregated; they further exacerbate socioeconomic stratification among minority students. Although the reasons for low performance level in charter schools are not entirely clear, if PSAs uniformly perform worse than TPSs, we should worry about the possibility that charter schools exacerbate stratification by student performance.

This chapter provides a static comparison of student composition between charter schools and TPSs. In next chapter I start to model the dynamics of student flow between charter schools and TPSs, and answer the question how the student flow changes student composition in TPSs over time.

# CHAPTER 3 THE IMPACT OF SCHOOL CHOICE ON STUDENT COMPOSITION IN TRADITIONAL PUBLIC SCHOOLS

Most research about the impact of school choice policies on racial segregation and social stratification focuses on deciding what kinds of students become active choosers and whether choice schools or TPSs tend to be more segregated or stratified. However, the evidence on what kinds of TPSs tend to lose students to choice schools and the impact of school choice on the student composition in TPSs, especially in predominantly minority schools in high poverty communities, is very limited. Few existing studies have combined analysis at both the student and the school level, which would allow us to detect any systematic differences in sorting patterns among students from different backgrounds across different schools, and therefore how school choice policies influence student compositions in TPSs with different characteristics.

There are two significant challenges in this research. First, sorting is an inherent phenomenon of school choice. Aggregated analyses usually mask the variation among schools due to the endogeneity of charter schools' locations. Charter schools are not randomly distributed across local communities with very different racial or social characteristics. State or district level comparisons of student composition do not tell us much about the impact at the student and school level. Second, student sorting initiated by school choice is influenced simultaneously by the characteristics of individual students and their families as well as the characteristics of the schools they attended. Analysis focusing on either level alone will not create a comprehensive understanding of the sorting process.

In order to address these limitations, this chapter utilizes multilevel regressions to model student flows initiated by Michigan's two school choice policies—charter school and inter-district choice—to evaluate their effect on the composition of students in TPSs. Using two years of student-level data nested in schools, the dynamics of student flows are modeled at both the individual student level and the school level. The individual level examines the student characteristics that influence their decision to move from their assigned public school to a charter school (or move from a charter to an assigned school). The school level explores characteristics of schools that that influence students' decision to switch schools. Taken together, the multilevel regressions tell us who participates in school choice and how the sorting of students changes student composition in TPSs.

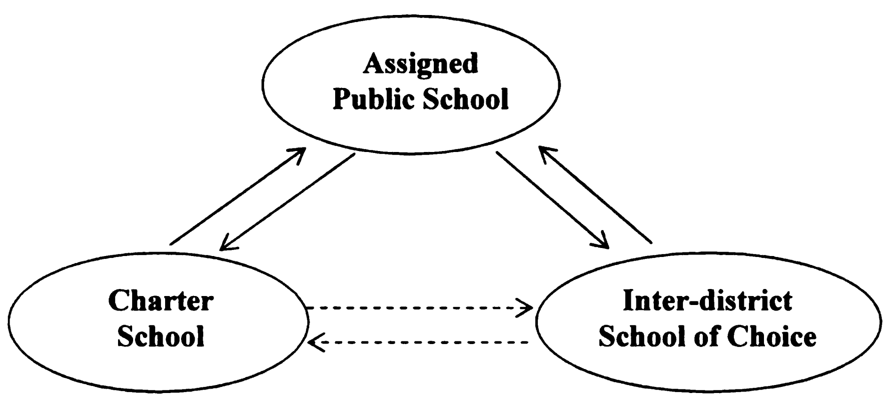
The first section of this chapter explains possible directions of student movement under Michigan's two school choice programs. Section 2 describes three research questions corresponding to the three different directions of student flow. Section 3 discusses empirical methods including the specifications of the multilevel regression models. The following section presents the empirical analysis and a concluding section discusses the implications of the findings.

## Student Flow under School Choice Programs

In 2004-05, about 82,000 students, or four percent of Michigan's public school students, were enrolled in charter schools. Michigan's charter enrollment is currently the third largest nationally after California and Florida. Another 80,000 students attended TPSs outside their district of residence through the state's inter-district schools of choice policy. In total, approximately seven percent of all public school students currently participate in one of the state's two school choice programs.

Figure 1 illustrates student flows under Michigan's choice policies. First, the vast majority of students attend schools in their home districts, or the assigned schools.[11] A relatively small proportion of these students choose to transfer from their assigned schools to charter schools or inter-district schools of choice, that is, TPSs in a neighboring district. Second, some students who formerly attended charter schools or inter-district choice schools return to their assigned schools every year for a variety of reasons. Finally, a very small number of students shift between the two choice programs. For example, some charter school students might choose to switch to another public school through inter-district choice, or inter-district choice students might transfer to a charter school. It is necessary to study the full array of student flows in order to find out how choice policies influence student composition in TPSs.

Figure 3.1 Student Flow through School Choice Programs in Michigan




[11] Traditionally, Michigan students can attend different schools within their resident school district through intra-district choice. However, this is not the focus of this research. Thus, I treat all the schools in the home district as the assigned schools even though parents can choose different schools within their home district.

## Research Questions

In this chapter, I utilize student level data for the 2002-03 and 2003-04 school years to track student movement among assigned and choice schools between the two years, in order to investigate how student and school characteristics in 2002-03 predict attendance patterns in 2003-04, and the impact of this sorting of students among schools on student compositions in TPSs.

To comprehensively model the student flow across different types of schools as shown in Figure 1, I employ three sets of two-level Multinomial Hierarchical Generalized Linear Models (HGLM). Each model addresses one of the following component questions:

(1) For all students attending assigned schools in 2002-03, which students moved to charter schools or inter-district schools of choice in 2003-04? And how do they compare to students in their former school, in terms of their race, SES, and academic performance? What kinds of TPSs tend to have more students transfer to charter schools or inter-district schools of choice? Do school characteristics influence the likelihood of transfer differentially among students with different racial or SES backgrounds?

(2) For all charter school students in 2002-03, who returned to their assigned schools in 2003-04? What kinds of charter schools tend to have students returning to their assigned schools?

(3) For all students attending inter-district schools of choice in 2002-03, who returned to their assigned schools in 2003-04? What kinds of TPSs tend to have nonresident students return to their assigned schools?

The analyses of the above three questions present full information about the individuals who actively choose or return and the organizational information about the schools they choose to leave. While each question itself does not provide complete information on the impact on TPSs, the net effect of student flow can be assessed to see if the sorting process changes the student composition in TPSs in terms of race, SES, and performance level.

## Methodology

As mentioned in Chapter 2, this analysis draws on data from multiple sources, including SRSD for 2002-03 and 2003-04, and math and reading MEAP scores for 2002-03. As noted, a series of multinomial HGLMs are utilized to analyze the student movement initiated by school choice. All of these models have two levels, with similar explanatory variables at both student level and school level. The outcome variable in the level-1 models is a categorical variable, describing students' transfer status. All the explanatory variables at both levels are for 2002-03, while the outcome variable describes the change of attendance status from 2002-03 to 2003-04.

### *Explanatory Variables*

<u>*Student level:*</u>

At level-1, several student background variables are included to capture demographic characteristics of students in 2002-03. Race/ethnicity is measured through a series of dummy variables associated with minority status (Black, Asian, and Hispanic). SES is measured by the eligibility for FRL. It is a binary variable, where students who are eligible for FRL are defined as low-income students, otherwise as non-low-income students. A set of interactions between SES and each of the minority dummies are also included to detect any differential effects of SES on transfer decisions for students from different racial groups. Standardized MEAP scores in two subjects, math and reading, measure student performance. It should be noted Michigan students do not take the MEAP test every year. In 2002-03, Math was tested in grades 4, 8, and 11, and reading tested in grades 4, 7, and 11. When test scores are added to the student level model, only students in the tested grade are included in the model. In other words, in addition to the model for all students, I estimate three additional models, each for grade 4, 7, and 8 students, with their MEAP scores for 2002-03 added in the student level models along with other control variables.[12] Two additional variables were also included in the level-1 model as controls: special education status and language proficiency status, measured as whether the student is Limited English Proficient (LEP) or not. Although a gender variable was included throughout the preliminary analysis, it proved to have no significant effect and was eliminated.

*School level:*

At level-2, the unit of analysis is schools. The regression coefficients in the level-1 model for each school are conceived as outcome variables that are hypothesized to depend on specific school characteristics. On the basis of the theoretical framework, several school characteristics are supposed to influence students' choice decision. First, two types of student composition variables are aggregated for all the students to the school level. They are percentage of students who are eligible for FRL, and the proportion of Black, Hispanic, or Asian students. Furthermore, a school effectiveness

[12] High school students are not analyzed due to the small sample sizes.

index is constructed as the difference between the actual average school MEAP score and the predicted MEAP score, adjusting for differences in student background and other characteristics that are outside a school's control.[13] This variable is standardized for the convenience of interpretation.

Other variables such as educational level, school size, and location are also controlled. Given the fact that in Michigan, students in elementary schools are more likely to participate in school choice than middle and high school students, two dummies, each reflecting the level of education, are included. The variable reflecting school size is expressed in logarithmic notation to allow for diminishing marginal effects. This variable captures possible different transfer trends in small schools versus large schools. School location is very relevant to the opportunity of attending a charter school because the availability of charter schools greatly differs by community type. Two dummy variables, urban and rural, are introduced relative to the reference group, suburban districts.

Some other variables such as percentage of adults who are high school graduates, the poverty rate, and the racial composition of school districts were considered, but were eliminated because they were either highly correlated with each other or with variables already included in the models.

*Multinomial HGLM Descriptions*

Using HLM to analyze the student sorting process induced by charter schools has several advantages. First, both student characteristics and school characteristics influence students' decision to participate in a charter school program. Models focusing on either student level or school level would lose information on the other level and induce

[13] The predictors included to predict school MEAP are: % of Black students, % of Hispanic students, % of Asian students, % of FRL students, school size and urbanicity of schools.

estimation bias and inefficiency. HLM overcomes this limitation by incorporating data from multiple levels (students nested within schools) to determine the impact of individual as well as school factors upon individual level outcomes. The coefficients at the student level will reflect the difference in probabilities of transfer for students with different SES, race, and performance within schools. The estimated coefficients for the student level models are allowed to vary across schools and any observed differences can be modeled with school level variables (Raudenbush & Bryk, 2002).

Second, in order to examine whether certain organizational features of schools have differential impacts on the likelihood of students from various backgrounds to transfer, HLM also allows for the "slope-as-outcome" model at the school level (Raudenbush et al., 2002). For example, if the coefficient of the "BLACK" variable is found significant at level-1, it indicates that the likelihood of Black students to transfer to a charter school is different from that of non-Black students. In order to determine whether this racial difference in transfer propensity is associated with school factors, we can use the coefficient (or the BLACK slope) as an outcome variable and model it with school level variables at level 2, which is referred to as the "slope-as-outcome" model. For instance, the model helps to answer the question: are Black students from White-predominant or Black- predominant schools more likely to transfer to charter schools?

To explain how the multinomial HGLMs are specified, return to my research question (1): who actively participates in school choice? As mentioned earlier, only the students who attended their assigned schools in 2002-03 are relevant in answering question (1), which means that students who attended charter schools or inter-district schools of choice in 2002-03 are excluded here. Taking all students who attended their assigned schools in

2002-03, I modeled their attendance status in 2003-04 as a function of their own characteristics and the characteristics of the school that they attended in 2002-03 through a two-level multinomial HGLM.

There are 3 possible options for the attendance status of each student, which takes on the value of m with probability Prob (R=m) = $\varphi_m$, for m = 1, 2, and 3, where 1 indicates the student attends a charter school, 2 an inter-district school of choice, and 3 the assigned public school. The level-1 sampling model for the outcome variable is multinomial, such that the three possible attendance choices of a student follow the multinomial distribution. The link function is the multinomial logit link. The dependent variable at level 1, $\eta_{mij}$, is the log-odds of student *i* who attended school *j* in year 2002-03 transferring to a charter school (m=1) or an inter-district school of choice (m=2) in year 2003-04 relative to staying in the assigned public school (m=3), the reference group. Specifically, for category m=1 and 2,

$$\eta_{mij} = \log (\varphi_{mij} / \varphi_{3ij}) = \log (\text{Prob } (R_{ij}=m)/\text{Prob } (R_{ij}=3)$$

There are two separate level-1 structural models, one for charter schools (category 1) and the other for inter-district schools of choice (category 2), both relative to assigned school (category 3). Predicted log-odds can be converted to an odds ratio by taking exp ($\eta_{mij}$). The probability of transferring is expressed as $1 / (1 + \exp(-\eta_{mij}))$.

The level-2 models have a parallel form for the two categories, charter schools and the inter-district schools of choice. For each set of level-2 equations, the coefficients in the level-1 structural models are conceived as outcome variables that are hypothesized to depend on specific school characteristics.

$$H_{mij} = B_{0j(m)} + \sum_{q=1}^{Q_m} B_{qj(m)} X_{qij} \text{ for } m=1,2 \text{ and } q=1,\dots,Q_m$$

Moreover, two slope-as-outcome models are specified at the school level to estimate whether school characteristics have differential influences on the attendance choice of students with different racial or SES backgrounds.

Similar to question (1), the models involved in answering questions (2) and (3) are also multinomial HGLMs. Explanatory variables included in the student and school levels are similar, but the outcome variables are different in terms of the categories. The students included in analyzing question (2) are all students in charter schools in 2002-03, and their transfer status in 2003-04 is a categorical variable that takes value of 1 (returned to their assigned school), 2 (transferred to an inter-district school of choice), or 3 (remained in a charter school). Likewise, for question (3), all students in an inter-district school of choice in 2002-03 are included, and their attendance status is a categorical variable that takes value of 1 (returned to assigned school), 2 (transferred to a charter school), or 3 (stayed in an inter-district school of choice).

Each set of models is built sequentially in a process started with a fully unconditional model, with no predictors at either level. The predictors' fixed effects, significance of variance components and reliabilities of coefficients are evaluated.[14] If the variance components are not significant, the random effects are constrained to zero in the interest of parsimony. Such constraints are likely to be especially useful in multinomial models since there are multiple outcome categories.

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[14] Variance components are calculated only for level-2 models. Multinomial HGLM does not give information on level-1 variance, so the ratio of level-1 or level-2 variance to the total variation cannot be calculated. Nevertheless, this measure is less informative in Multinomial HGLM because the level-1 link functions are nonlinear, and the variance becomes heteroskedastic.

After the evaluation of the unconditional models, conditional models are built with student characteristics (except for the academic performance variables) added only at level-1. The intercepts for the student level models are allowed to vary across schools. The variance of the error term can then be examined to see if there are significant differences between schools. If the variance term is not significant, then the coefficient is "fixed" so that the effect of the student level coefficient is constrained to be the same for all schools.

Next, conditional models are specified. In addition to the fully specified level-1 models, level-2 predictors are introduced to the level-1 intercept equations. Finally, slope-as-outcome equations are introduced at level-2 to explore the different impact of school characteristics on the likelihood of transfer for students with different racial and social backgrounds, if the slope coefficients at level-1 are significant. The same sets of multinomial HGLMs are built sequentially for students in grade 4, 7, or 8, with student performance variables added at the student level.

In order to control for differences in student compositions between schools, all student level variables were centered around their grand means. Thus, the intercept term from the student level model represents the adjusted mean log-odds for schools assuming that each school enrolled students who had mean characteristics for the entire population of students.

*Sampling Strategies*

In the 2002-03, there were 1.7 million students in Michigan's public schools. However, only about 1.45 million students were found remaining in the system in 2003-04. The 0.25 million students who were no longer in the system had either graduated, moved out the state, dropped out of school, attended a private school, or were home schooled in 2003-04. Among the students remaining in the system for the two consecutive years, about 1.35 million students attended assigned public schools, 54,000 attended charter schools and 31,000 attended inter-district schools of choice in 2002-03.

As Table 3.1 shows, in 2003-04, the vast majority of students who attended their assigned schools in 2002-03 remained in their assigned schools, only 0.8 percent transferred to charter schools and 0.9 percent transferred to inter-district schools of choice. Many TPSs did not have any students transfer to a charter school or an inter-district school of choice. In order to have a reasonable transfer rate, only schools that had more than 5 students transferring to charter schools or inter-district schools of choice in 2003-04 are included in answering question (1). According to this criterion, about 95 percent of transferring students are included in the analysis. In total, 1291 schools, or about one third of all TPSs, are included in the analysis.

Table 3.1 Attendance Status of Michigan Public School Students, 2002-03 and 2003-04

| School Attended in 2002-03 | School Attended in 2003-04 | | | |
|---|---|---|---|---|
| | Assigned school | Charter school | Inter-district School of choice | Total |
| Assigned school | 1,328,950 (98.3%) | 10,797 (0.8%) | 11,769 (0.9%) | 1,351,516 (100%) |
| Charter school | 10,091 (18.9%) | 42,530 (79.7%) | 712 (1.3%) | 53,333 (100%) |
| Inter-district School of choice | 5,626 (18.1%) | 208 (0.7%) | 25,231 (81.2%) | 31,065 (100%) |
| Total | 1,352,984 | 53,873 | 40,458 | 1,447,315 |

In contrast to the tiny portion of students who transferred from their assigned public schools to charter schools or inter-district schools of choice, a much higher share of charter school and inter-district choice students returned to their assigned schools between the two years. As indicated in Table 3.1, among the 54,000 charter school students in 2002-03, 19 percent returned to a TPS in their resident district in 2003-04. Among the 31,000 students who attended inter-district schools of choice in 2002-03, 18 percent returned to their assigned school. Since the numbers of students transferring back to assigned schools are fairly big, all the students in charter schools and inter-district schools of choice in year 2002-03 with valid data are included in the analysis of questions (2) and (3) analyses, respectively. In addition, student movement between charter schools and inter-district schools of choice is very small and negligible. From 2002-03 to 2003-04, among about 1.5 million students, only about 700 students transferred from charter schools to inter-district schools of choice and about 200 students transferred from inter-district schools of choice to charter schools. Although they represent a small component of the entire sorting process and were analyzed in the HGLMs, these results are not reported.

## Findings

*Question (1): Transferring from Assigned Schools to Choice Schools*

A description of variables at both student and school levels is presented in Table 3.2. A fully unconditional model is formulated where the log-odds of choice relative to attending assigned schools are predicted via a two-level model with no predictors at either level. The equations contain no error terms in the level-1. However, error terms are included in the two level-2 intercept models to gauge the extent of between-school variation on the two outcomes: $\eta_{1ij}$, the log-odds of attending a charter school (relative to the assigned school), and $\eta_{2ij}$, the log-odds of transferring to an inter-district school of choice (relative to the assigned school). The results are presented in Table 3.3. The predicted grand mean log-odds of attending charter schools is =-4.72 (se=0.041), which means for students in a typical school, the expected odds of choosing a charter school versus staying in their assigned school is 0.009. In other words, the mean probability for them to transfer to a charter school is estimated to be 0.88%.[15] Similarly, the predicted grand mean log-odds of transferring to an inter-district school of choice is =-4.70 (se=0.035), which means the expected odds of students transferring to an inter-district school of choice versus staying in the assigned school is 0.015, corresponding to a probability of 0.9% of transfer. Estimated variances between schools for both categories are significant, which suggests sufficient variation and the inclusion of these error terms in the subsequent models. In addition, the reliabilities for both models at level-2 are 0.78 and 0.84 respectively, which are both within the range of satisfactory magnitude.

[15] Calculated as 1/(1+exp 4.72)).

Table 3.2 Variables and Description, All Students in the Assigned Schools in 2002-03

| | Description | N | Mean | SD | Min. | Max. |
|---|---|---|---|---|---|---|
| Student level | | | | | | |
| ATTENDANCE STATUS | Categorical (1= charter; 2= Inter-district school of choice; 3= assigned school) | 570926 | 2.95 | 0.28 | 1 | 3 |
| WHITE | Dummy (1=White; 0= no) | 570926 | 0.59 | 0.49 | 0 | 1 |
| BLACK | Dummy (1=Black; 0= no) | 570926 | 0.33 | 0.47 | 0 | 1 |
| HISPANIC | Dummy (1=Hispanic; 0= no) | 570926 | 0.04 | 0.20 | 0 | 1 |
| ASIAN | Dummy (1=Asian; 0= no) | 570926 | 0.01 | 0.12 | 0 | 1 |
| FRL* | Dummy (1=Eligible for FRL, 0=no) | 570926 | 0.43 | 0.47 | 0 | 1 |
| BLACK FRL | Interaction between Black and FRL | 570926 | 0.21 | 0.41 | 0 | 1 |
| ASIAN FRL | Interaction between Asian and FRL | 570926 | 0.01 | 0.08 | 0 | 1 |
| HISPANIC FRL | Interaction between Hispanic and FRL | 570926 | 0.03 | 0.16 | 0 | 1 |
| SPECED | Dummy (1=special education, 0=no) | 570926 | 0.10 | 0.30 | 0 | 1 |
| LEP | Dummy (1=limited English proficiency, 0=no) | 570926 | 0.02 | 0.15 | 0 | 1 |
| MATH, G4 | Standardized MEAP score | 46654 | 0 | 1 | -6.12 | 4.91 |
| READING, G4 | Standardized MEAP score | 46493 | 0 | 1 | -5.71 | 5.34 |
| READING, G7 | Standardized MEAP score | 29457 | 0 | 1 | -4.69 | 6.90 |
| MATH, G8 | Standardized MEAP score | 26982 | 0 | 1 | -5.63 | 5.18 |
| School level | | | | | | |
| SCH_BLK | % Black within a school | 1291 | 0.32 | 0.39 | 0 | 1 |
| SCH_HIS | % Hispanic within a school | 1291 | 0.05 | 0.11 | 0 | 0.87 |
| SCH_ASIAN | % Asian within a school | 1291 | 0.01 | 0.03 | 0 | 0.29 |
| SCH_FRL | % eligible for FRL within a school | 1291 | 0.44 | 0.26 | 0 | 1 |
| SCHEFF | Adjusted performance measure of school effectiveness | 1291 | 0.01 | 0.88 | -3.67 | 3.83 |
| LN(FTE) | Logarithm of school size | 1291 | 6.12 | 0.61 | 0.59 | 7.87 |
| MIDDLE | Dummy (1=middle school, 0=no) | 1291 | 0.17 | 0.37 | 0 | 1 |
| HIGH | Dummy (1=high school, 0=no) | 1291 | 0.15 | 0.35 | 0 | 1 |
| URBAN | Dummy (1=Urban, 0=others) | 1291 | 0.40 | 0.49 | 0 | 1 |
| RURAL | Dummy (1= Rural, 0=others) | 1291 | 0.23 | 0.42 | 0 | 1 |

*About 13% students failed to report their eligibility of FRL. This variable is imputed using information on other variables by way of multivariate regression, sometimes known as conditional mean imputation. This method imputes missing values with predicted values derived from a regression equation based on variables in the data set that contain no missing values.

Table 3.3 Unconditional Models on the Likelihood of Transfer, from Assigned Schools to Choice Schools

| *Fixed Effect* | *Coefficient (SE)* | *Odds ratio* | *P-value* |
|---|---|---|---|
| For category (1)—charter school | | | |
| Intercept (1) | -4.72 (0.041) | 0.009 | 0.000 |
| For category (2)—Inter-district school of choice | | | |
| Intercept (2) | -4.20 (0.035) | 0.015 | 0.000 |
| | *Variance components at level-2* | | |
| | *Coefficient* | $\chi^2$ | *P-value* |
| Variance Category (1) | 1.76 | 20731.4 | 0.000 |
| Category (2) | 1.40 | 18027.2 | 0.000 |
| | *Reliability Estimate* | | |
| Intercept (1) | 0.784 | | |
| Intercept (2) | 0.843 | | |

Note: the coefficients are from HGLMs with multinomial logit link function. The significance of coefficients is assessed based on the robust standard errors.

*a) The Fixed Effects of Student Characteristics on the Likelihood of Transfer*

Table 3.4 presents the estimation results for the two conditional multinomial regression models (See Appendix B for model equation descriptions). For each model, the predictors' fixed effects of both categories (charter schools and inter-district schools of choice) are shown. The first column of each category shows the coefficient, or log odds, of each predictor and its standard error in parenthesis, followed by the odds ratio, the exponential values of the estimated regression coefficients allowing for interpretation.

The results for category 1, charter schools, are the focus of interest. The coefficients of level-1 student variables for model 1 remain relatively stable in model 2 when school level variables were added. The results of model 1 indicate that Black students and low-income students are more likely to transfer to charter schools. The coefficient of Black students is 0.64 ($p<0.001$), indicating that on average, Black students are 1.9 times more likely to transfer to charter school than non-Black students. The coefficients of Asian and Hispanic students show different signs, but neither is significant.

On average, being a low-income student raises the odds of transfer to 1.4 times the odds for non-low-income student (coefficient = 0.34, $p<0.01$). Interestingly, the three interactions between FRL and race dummies are all negative and significant, and the magnitudes of the three coefficients are all bigger than the coefficient of FRL. This means that although low-income White students are more likely to transfer to charter schools than non-low-income White students, for minority students, coming from low-income families lowers the odds of transferring to a charter school. Being a special education student decreases the likelihood of moving to a charter school, while being a LEP student does not significantly alter the odds of transferring relative to a non-LEP student.

The level-1 coefficients for category 2, inter-district schools of choice, indicate similar patterns. Minority students are more likely to transfer to inter-district schools of choice. Although low-income White students are more likely to transfer than non-low-income White students, low-income minority students are less likely to transfer than non-low-income minority students.

Table 3.4 Estimated Effects of Student and School Characteristics on the Likelihood of Transfer from Assigned Schools to Choice Schools

| | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Charter school | | Inter-district School of Choice | | Charter school | | Inter-district School of Choice | |
| | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio |
| ***Fixed effect of student characteristics*** | | | | | | | | |
| Intercept | -4.74 ** (0.04) | 0.009 | -4.22 ** (0.04) | 0.015 | -4.72 ** (0.04) | 0.009 | -4.18 ** (0.03) | 0.015 |
| BLACK | 0.64 ** (0.13) | 1.888 | 0.42 ** (0.09) | 1.523 | 0.64 ** (0.13) | 1.904 | 0.42 ** (0.09) | 1.524 |
| HISPANIC | 0.21 (0.13) | 1.231 | 0.32 ** (0.09) | 1.376 | 0.23 (0.14) | 1.254 | 0.32 ** (0.09) | 1.374 |
| ASIAN | -0.04 (0.20) | 0.964 | -0.01 (0.13) | 0.986 | -0.03 (0.21) | 0.970 | -0.02 (0.13) | 0.984 |
| FRL | 0.34** (0.06) | 1.408 | 0.42 ** (0.04) | 1.516 | 0.36 ** (0.07) | 1.439 | 0.41 ** (0.04) | 1.514 |
| BLACK FRL | -0.58** (0.07) | 0.559 | -0.66 ** (0.07) | 0.516 | -0.60 ** (0.08) | 0.551 | -0.66 ** (0.07) | 0.515 |
| ASIAN FRL | -0.58 * (0.29) | 0.558 | -0.97 ** (0.29) | 0.381 | -0.58 * (0.29) | 0.559 | -1.00 ** (0.30) | 0.369 |
| HISPANIC FRL | -0.35 * (0.15) | 0.705 | -0.53 ** (0.14) | 0.586 | -0.37 * (0.15) | 0.692 | -0.53 ** (0.14) | 0.587 |
| SPECED | -0.37 ** (0.06) | 0.693 | -0.02 (0.04) | 0.981 | -0.36 ** (.06) | 0.695 | -0.02 (0.04) | 0.981 |
| LEP | -0.21 (0.11) | 0.814 | -0.29 (0.15) | 0.751 | -0.21 (0.11) | 0.813 | -0.29 (0.15) | 0.750 |
| ***Fixed effect of school characteristics*** | | | | | | | | |
| % BLACK | | | | | 1.54 ** (0.13) | 4.649 | -0.23 (0.17) | 0.797 |
| % HISP | | | | | 1.25 ** (0.25) | 3.501 | 0.08 (0.34) | 1.079 |
| % ASIAN | | | | | 1.89 * (0.81) | 6.589 | -2.54 * (1.22) | 0.079 |
| % FRL | | | | | 0.47 * (0.19) | 1.607 | -0.61 ** (0.19) | 0.543 |
| SCH_EFF | | | | | -0.13 ** (0.03) | 0.875 | -0.10 * (0.04) | 0.906 |
| Ln(FTE) | | | | | -0.36 ** (0.12) | 0.694 | -0.81 ** (0.09) | 0.447 |
| MIDDLE | | | | | -0.31 ** (0.09) | 0.736 | 0.01 (0.09) | 1.014 |
| HIGH | | | | | -0.25 * (0.12) | 0.780 | 0.59 ** (0.10) | 1.803 |
| URBAN | | | | | 0.42 ** (0.09) | 1.516 | -0.44 ** (0.13) | 0.643 |
| RURAL | | | | | -0.41 ** (0.12) | 0.666 | -0.04 (0.07) | 0.965 |
| Variance at level-2 | | | | | 0.66 | | 0.94 | |
| % explained compared to the unconditional model | | | | | 62.5% | | 32.9% | |

* $p<.05$, ** $p<.01$.

*b) Influence of School Characteristics on the Likelihood of Transfer*

Model 2 in Table 3.4 estimates the effects of school characteristics on the likelihood of students to transfer. At the school level, the coefficients of the demographic variables are all positive and significant for students transferring to charter schools. This means that after controlling for individual student's background variables, the likelihood of them transferring to a charter school increases if he/she attends a school with high percentages of minority and low-income students. For instance, the expected odds of a student transferring to a charter school would increase to 2.1 times if the proportion of Black students in a school was one standard deviation above the mean (coefficient = 1.54, SE = 0.13).[16] Students attending schools with high concentration of low-income students are more likely to transfer out than students in schools with low concentration of low-income students (coefficient = 0.47, $p < 0.01$).

School effectiveness has a negative effect on the likelihood of student transfers, which indicates that parents rationally choose to leave poorer performing schools.[17] If a school raises its effectiveness one standard deviation above the mean, the odds of its students transferring to a charter school would decrease by 12%. In addition, school size has a negative effect, which means that the larger the school is, the less likely the students are to transfer. This seems strange at first sight because there are more students transferring to charter schools from larger schools than from smaller schools. However,

[16] This is calculated as exp (0.47*1.54), where 0.47 is the standard deviation of percentage of Black (Table 3.2) and 1.54 is the coefficient of % Black estimated from model 2, as shown in Table 4.
[17] The actual school mean MEAP scores have been used for the analysis and similar results were obtained.

the proportion of students transferring to charter schools is larger in smaller schools than in bigger schools.[18]

As expected, the mean probability of transfer of students in middle schools or high schools is smaller than that of elementary school students, even after controlling for school size. School location also matters in students' choice. The estimated coefficients are 0.42 for urban and -0.41 for rural, which imply that compared to students in suburban schools, students in urban schools are 1.5 times more likely to transfer to charter schools, while students in rural areas are only 0.66 times as likely to transfer to charter schools. This is not surprising because half of Michigan's charter schools are located in urban districts. The density of charter schools in Michigan's rural areas is much lower.

Interestingly, in the case of inter-district school of choice, most of the school level coefficients are either insignificant or have different signs than those of the charter school models. The percentages of students who are Black or Hispanic in a school have no effect on its students' likelihood to transfer through inter-district choice, although the percentage of Asian students is negative and significant. We should not stress this result too much because the average percentage of Asian students among Michigan public schools is only about one percent. The coefficient of the share of students who are low-income is negative, indicating that students in more affluent schools are more likely to transfer to an inter-district school of choice than students in schools with high concentration of low-income students. The location of schools also has the opposite effect compared to the transfer to charter schools. Students in urban areas are less likely to transfer through inter-district choice than suburban and rural students.

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[18] Assuming there are two schools. The big school has 2000 students and the small school has 200 students. If 20 students transfer out the big school, the transfer rate is 1%. But if there are only 3 students transferring out the small school, the transfer rate would be 1.5%, higher than that of the big schools.

The contrast of coefficients between the two equations implies that charter schools and schools of choice draw students from very different sets of TPSs. Urban schools with high percentages of minority and low-income students and with low school effectiveness are more likely to lose students to charter schools, while relatively more affluent suburban and rural schools with low school effectiveness are more likely to lose students to other TPSs through inter-district choice.

It also reflects the fact that the market for inter-district choice is significantly constrained on the supply side. Although students desire to leave ineffective schools, this option is frequently unavailable to them. As mentioned earlier, in Michigan, a school district has discretion as to whether to open up to receive nonresident children. In making this decision, district officials may rationally make an assessment of who will come if they open up. School boards' concern about the prospect of nonresident students changing their district's social or racial composition has been reported in Michigan (Arsen et al., 2002). This concern appears to be particularly relevant in suburban districts that border central city districts. Such suburban districts appear reluctant to open up even if they are experiencing declining enrollment and expect that they would be able to attract nonresident urban students. In Michigan, minority students are disproportionately concentrated in a small set of urban districts. Once urbanicity is held constant, race is not an issue anymore. The SES of neighboring districts still appears to operate as an element in districts' decision about whether to open up to nonresident students. In interviews with intermediate school district superintendents, Arsen et al. (2002) found that even in rural areas where students are overwhelmingly white, districts are reluctant to attract nonresident students from poorer districts nearby who would lower the SES composition of their schools.

As for the adequacy of the multinomial models, the estimated variance components for both categories are shown in Table 3.4. In model 2, about 62.5% of the variation among schools in the log-odds of charter school transfers (relative to staying in assigned schools) is explained, while 32.9% of the variation between schools in the log-odds of inter-district schools of choice transfers (relative to assigned schools) is explained. This indicates that a fair amount of variance is explained by school level covariates, especially among schools losing students to charter schools.

*c) Differential School Effects on the Likelihood of Transfer for Students with Various Backgrounds: Estimation of "Slope-as-Outcome" Models*

In model 2 of Table 3.4, level-2 variables are only introduced in the level-2 intercept models representing both school choice policies. In other words, the school characteristics are only used to explain how school factors affect the mean probability of transfer, but not to explain whether the effects of school factors might differ among White and Black students, and among low-income and non-low-income students. In this section, for both choice policies I expand the school level models to incorporate school factors in two slopes: BLACK and FRL. School factors are not added to Asian and Hispanic slopes because of the small sample sizes. In order to avoid multicolinearity among slope models caused by the high correlation between race and FRL, I estimate the two multinomial regressions by introducing only one slope at a time (See Appendix C for model equation descriptions). For each model, the coefficients of the slope-as-outcome model represent the differential school effects on students with specific race or SES background.

The estimation of school fixed effects for the two slope-as-outcome models is presented in Table 3.5. Other fixed effects at both levels are not presented since the level-1 models and intercept-as-outcome models at level 2 remain the same as in model 2, and the estimated coefficients at both levels are essentially unchanged.

Table 3.5 Slope-as-outcome Models: School Fixed Effects on the Likelihood of Transfer from Assigned Schools to Choice Schools, Students with Different Race and SES Backgrounds

| | BLACK Slope | | | | FRL Slope | | | |
|---|---|---|---|---|---|---|---|---|
| | Charter school | | Inter-district School of Choice | | Charter school | | Inter-district School of Choice | |
| | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio |
| Intercept | 0.67** (0.08) | 1.961 | -0.13 (0.07) | 0.88 | 0.37** (0.05) | 1.447 | 0.11** (0.03) | 1.121 |
| % BLACK | -0.30 (0.25) | 0.738 | -0.63 ** (0.23) | 0.531 | -0.81** (0.15) | 0.444 | -0.31* (0.15) | 0.737 |
| % HISPANIC | -0.50 (0.46) | 0.604 | -0.51 (0.64) | 0.601 | -0.96** (0.34) | 0.381 | -0.48 (0.42) | 0.617 |
| % ASIAN | 3.17 * (1.53) | 23.91 | 3.24 * (1.48) | 25.51 | -0.11 (1.20) | 0.893 | -4.34** (1.55) | 0.013 |
| % FRL | -0.97 ** (0.29) | 0.378 | -0.47 (0.27) | 0.626 | -0.26 (0.25) | 0.770 | -0.58 * (0.26) | 0.557 |
| LN(FTE) | 0.13 (0.14) | 1.140 | -0.08 (0.11) | 0.919 | -0.06 (0.12) | 0.946 | 0.00 (0.11) | 0.997 |
| SCHEFF | 0.07 (0.07) | 1.077 | -0.10 (0.06) | 0.905 | 0.09 (0.05) | 1.094 | 0.03 (0.05) | 1.032 |
| MIDDLE | -0.03 (0.18) | 0.967 | 0.04 (0.15) | 1.040 | 0.16 (0.10) | 1.174 | 0.04 (0.10) | 1.045 |
| HIGH | -0.45 * (0.22) | 0.636 | 0.41 * (0.17) | 1.511 | -0.04 (0.14) | 0.956 | -0.01 (0.12) | 0.990 |
| URBAN | -0.55** (0.16) | 0.580 | -0.57 ** (0.14) | 0.566 | -0.15 (0.13) | 0.857 | -0.58 ** (0.11) | 0.558 |
| RURAL | 0.07 (0.28) | 1.070 | -0.43 (0.24) | 0.650 | -0.15 (0.15) | 0.860 | -0.22 * (0.09) | 0.799 |

* $p<.05$, ** $p<.01$.

I first consider the results for the charter school equations because they are the focus of interest. For the BLACK slope-as-outcome model, the coefficients for the race dummies reveal that the proportion of minority students in a school has no substantially differential effect on log-odds of Black student transferring as compared to non-Black students, except for the percentage of Asian students. The estimated coefficient for percentage of Asian is 3.17 ($p = 0.013$), indicating that if the proportion of Asian students increases by one standard deviation, a Black student in the school will be 1.1 times likely to transfer to a charter school than a non Black student, which is a very small differential effect.[19]

All other things being equal, a one standard deviation increase in a school's percentage of low-income students reduces the odds for a Black student to move to a charter school to 0.65 times the odds for a non-Black student. The coefficient of % FRL is estimated to be -0.97 ( $p<0.01$) and is larger than the magnitude of the intercept, 0.67, which means that Black students are less likely to transfer to charter schools than non-Black students, mostly White students, in high poverty schools. This result is noteworthy when compared to the results of model 2 in Table 3.4, that on average, non-Black students are less likely to go to charter schools than Black students. This means, although in a typical school, Black students are more likely to transfer to charter schools than White students, in schools with high concentration of low-income students, Black students are less likely to transfer than White students.

School effectiveness and school size do not seem to have any differential impact on Black and non-Black students. However, school location matters. Being in an urban

[19] Calculated as exp (3.83*0.03) where 0.03 is the standard deviation of the percentage of schools' students who are Asian.

school decreases the odds for a Black student to choose a charter school. Although the odds of them to choose is still slightly bigger than for non-Black students, the difference is much smaller than in suburban or rural areas. The difference of the odds is estimated to be exp(0.67+(-0.55)) = 1.13, which means Black students are 0.13 times more than non-Black students to transfer in urban areas, while in suburban or rural areas, the odds for Black students to transfer are 1.96 times the odds for non-Black students.

The estimation of the FRL slope model is shown in the last four columns in Table 3.5. It evaluates the differential school effects on low-income and non-low-income students. The odds of low-income students, regardless of race and other characteristics, to transfer to a charter school decrease along with the increase in the percentages of minority students in a school. Indeed, the likelihood of a low-income student transferring to a charter school is substantially smaller than a non-low-income student, if the student was in a school with very high proportion of Black or Hispanic students. For example, in an all-Black school, low-income students are only .64 times likely to transfer than their non-low-income classmates.[20] However, after controlling for individual SES, whether the school a student attended had high proportion of low-income students does not seem to have a differential effect on the probability of transfer for low-income and non-low-income students. Nor do school location, school effectiveness, or school size has a differential effect on low-income and non-low-income students.

Table 3.5 also shows the results of slope models for inter-district transfers. Strong differential school effects are also found reflecting similar patterns as in the charter school equations that disadvantaged students in disadvantaged schools are less likely to choose. For example, the odds of Black students transferring through inter-district choice

[20] Calculated as exp[0.37+(-0.81)].

greatly decreases if they are in schools with high concentration of Black students or in urban schools. In schools with high concentrations of minority and poverty students, students from low-income families, regardless of their racial background, are less likely than their more affluent classmates to participate in inter-district choice. In addition, the odds for poor students in urban schools to choose through inter-district choice is much lower than poor students in suburban schools.

*d) Influence of Previous Student Performance on the Likelihood of Charter School Choice*

As indicated earlier, only students at certain grades took the MEAP tests in certain subjects during 2002-03. In order to include performance variables in the level-1 models, three separate models are estimated, each for grades 4, 7, and 8, the grades where the math or reading was tested in 2002-03. All the specifications remain the same as in the models for all students, except that individual test scores are added to the level-1 models. All the test scores are standardized for the convenience of interpretation.

For each grade, the unconditional model with no predictors at either level is estimated first. The results are shown in Table 3.6. Fixed effects for both categories are significant at each grade level. For instance, for 4th graders the expected mean odds are 0.015 of choosing a charter school (relative to staying in the assigned school), and 0.014 of transferring to an inter-district school of choice (relative to staying in the assigned school). There is little difference in the likelihood of choice among these grades, although the probability of transferring to an inter-district school of choice is slightly larger than that of transferring to a charter school at each grade. Variations at school level are all found significant and the reliabilities are reasonably large, implying enough variance that allows for inclusion of school variables at level-2.

Table 3.7 contains the results of estimating the fully specified models for the three grades, including the coefficients, standard errors, and odds-ratios. Consider only the results for the charter school equations. At level 1, neither the coefficients of math and reading scores is significant for the grade 4 model. However, both the grade 7 and 8 models indicate that students with higher test scores are less likely to transfer to charter schools. In 7th grade, holding all other characteristics constant, the odds of a student transferring to a charter school declines to 0.81 when his/her reading score increases a standard deviation (coefficient = -0.22, $p<0.001$). In 8th grade, the odds of transfer to a charter school falls to .69 when math scores increase a standard deviation (coefficient = -0.38, $p<0.001$). This indicates that parents care about their children's academic achievement only at a later stage of their education.

Table 3.6 Unconditional Models on the Likelihood of Transfer from Assigned Schools to Choice Schools, Selected Grades

| | Grade 4 | | | Grade 7 | | | Grade 8 | | |
|---|---|---|---|---|---|---|---|---|---|
| Fixed effect | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value |
| For category (1)—charter school | | | | | | | | | |
| Intercept (1) | -4.177 (0.052) | 0.015 | 0.000 | -4.797 (0.081) | 0.008 | 0.000 | -4.512 (0.091) | 0.011 | 0.000 |
| For category (2)—Inter-district school of choice | | | | | | | | | |
| Intercept (2) | -4.258 (0.059) | 0.014 | 0.000 | -4.317 (0.074) | 0.013 | 0.000 | -4.012 (0.071) | 0.018 | 0.000 |
| *Variance components at level-2* | | | | | | | | | |
| Variance | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* |
| Category 1 | 0.741 | 1284.67 | 0.000 | 1.195 | 1168.80 | 0.000 | 1.772 | 2254.97 | 0.000 |
| Category 2 | 1.058 | 1767.62 | 0.000 | 1.179 | 1477.85 | 0.000 | 1.139 | 1647.62 | 0.000 |
| *Reliability* | | | | | | | | | |
| Category 1 | | 0.359 | | | 0.483 | | | 0.583 | |
| Category 2 | | 0.428 | | | 0.573 | | | 0.609 | |
| *Sample size* | | | | | | | | | |
| Level 1 | | 42092 | | | 50159 | | | 46089 | |
| Level 2 | | 754 | | | 370 | | | 369 | |

Table 3.7 Estimated Fixed Effects on the Likelihood of Transfer from Assigned Schools to Choice Schools, Selected Grades

| | Grade 4 Model | | | | Grade 7 Model | | | | Grade 8 Model | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Charter school | | Inter-district School of Choice | | Charter school | | Inter-district School of Choice | | Charter school | | Inter-district School of Choice | |
| | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds Ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio |
| ***Fixed effect of student characteristics*** | | | | | | | | | | | | |
| Intercept | -4.34 | 0.013 | -4.27 | 0.014 | -4.77 | 0.008 | -4.23 | 0.014 | -4.70 | 0.009 | -3.97 | 0.019 |
| | (0.06) | | (0.06) | | (0.11) | | (0.07) | | (0.09) | | (0.07) | |
| BLACK | 0.45 * | 1.560 | 0.47* | 1.604 | 0.82 ** | 2.275 | 0.51 * | 1.661 | 0.34 | 1.410 | 0.45 | 1.563 |
| | (0.23) | | (0.18) | | (0.28) | | (0.20) | | (0.24) | | (0.24) | |
| HISPANIC | 0.28 | 1.329 | 0.45 | 1.571 | 0.59 | 1.809 | 0.13 | 1.136 | 0.48 | 1.609 | 0.40 | 1.490 |
| | (0.35) | | (0.31) | | (0.41) | | (0.32) | | (0.26) | | (0.27) | |
| ASIAN | 1.17** | 3.233 | 0.14 | 1.152 | 0.96 | 2.613 | 0.30 | 1.355 | -0.07 | 0.932 | 0.18 | 1.201 |
| | (0.42) | | (0.48) | | (0.63) | | (0.45) | | (0.60) | | (0.44) | |
| FRL | 0.23 | 1.25 | 0.44 ** | 1.554 | 0.52 ** | 1.689 | 0.40 ** | 1.485 | 0.36 | 1.435 | 0.39 ** | 1.471 |
| | (0.17) | | (0.11) | | (0.20) | | (0.11) | | (0.20) | | (0.10) | |
| BLACK FRL | -0.40 * | 0.669 | -0.67** | 0.510 | -0.62 ** | 0.540 | -0.56 ** | 0.571 | -0.61 ** | 0.544 | -0.65 ** | 0.523 |
| | (0.19) | | (0.19) | | (0.23) | | (0.19) | | (0.21) | | (0.18) | |
| ASIAN FRL | -1.71 ** | 0.179 | -0.87 | 0.419 | -2.06 * | 0.128 | -0.72 | 0.486 | -0.22 | 0.803 | -1.35 | 0.259 |
| | (0.63) | | (0.78) | | (0.86) | | (0.63) | | (0.90) | | (0.77) | |
| HISPANIC | -0.24 | 0.790 | -0.44 | 0.642 | -1.13 * | 0.322 | -0.03 | 0.969 | -0.52 | 0.596 | -1.13 ** | 0.324 |
| FRL | (0.41) | | (0.45) | | (0.56) | | (0.41) | | (0.45) | | (0.34) | |
| SPECED | -0.27 | 0.764 | -0.232 | 0.795 | -0.48 | 0.617 | 0.09 | 1.090 | -0.37 * | 0.693 | -0.07 | 0.935 |
| | (0.20) | | (0.15) | | (0.17) | | (0.12) | | (0.17) | | (0.13) | |
| LEP | 0.01 | 1.013 | -0.94 | 0.390 | -0.30 | 0.738 | -0.07 | 0.936 | -0.27 | 0.762 | -0.30 | 0.744 |
| | (0.29) | | (0.49) | | (0.54) | | (0.44) | | (0.34) | | (0.45) | |
| ZMATH03 | 0.005 | 1.004 | -0.18 ** | 0.835 | | | | | -0.38 ** | 0.685 | -1.13** | 0.849 |
| | (0.05) | | (0.05) | | | | | | (0.06) | | (0.38) | |
| ZREADING | -0.01 | 0.993 | 0.03 | 1.033 | -0.22 ** | 0.805 | -0.10* | 0.902 | | | | |
| | (0.05) | | (0.06) | | (0.05) | | (0.04) | | | | | |

Table 3.7 (cont'd)

| | Grade 4 Model | | | | Grade 7 Model | | | | Grade 8 Model | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Charter school | | Inter-district School of Choice | | Charter school | | Inter-district School of Choice | | Charter school | | Inter-district School of Choice | |
| | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds Ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio | Coeff. (SE) | Odds ratio |
| ***Fixed effect of school characteristics*** | | | | | | | | | | | | |
| % BLACK | 0.63 * | 2.432 | -0.44 | 0.641 | 1.29** | 3.625 | -0.91 * | 0.404 | 2.13 ** | 8.42 | -0.45 | 0.635 |
| | (0.29) | | (031) | | (0.33) | | (0.38) | | (0.39) | | (0.42) | |
| % HISPANIC | 0.36 | 1.834 | -0.54 | 0.584 | 1.60 * | 4.929 | -0.11 | 0.892 | 2.67 * | 14.37 | 0.74 | 2.091 |
| | (0.51) | | (0.61) | | (0.68) | | (1.05) | | (1.13) | | (1.07) | |
| % ASIAN | -1.83 | 0.207 | -1.08 | 0.340 | 4.48 ** | 88.658 | -2.84 | 0.058 | -0.07 | 0.931 | 0.04 | 1.037 |
| | (1.58) | | (2.22) | | (1.61) | | (3.82) | | (3.75) | | (2.96) | |
| % FRL | 0.60 * | 1.741 | -0.84* | 0.432 | -0.39 | 0.677 | 0.31 | 1.359 | -0.69 | 0.500 | -0.24 | 0.784 |
| | (0.29) | | (0.34) | | (0.47) | | (0.47) | | (0.52) | | (0.43) | |
| LNFTE | -0.23 * | 0.802 | -0.85 ** | 0.430 | -0.39 | 0.680 | -0.76 ** | 0.466 | -0.29 | 0.752 | -0.84 * | 0.431 |
| | (0.10) | | (0.18) | | (0.30) | | (0.14) | | (0.19) | | (0.18) | |
| SCHEFF | -0.11 | 0.900 | 0.15 | 1.159 | -0.10 | 0.905 | 0.12 | 1.128 | 0.05 | 1.052 | 0.10 | 1.108 |
| | (0.06) | | (0.10) | | (0.07) | | (0.10) | | (0.10) | | (0.09) | |
| URBAN | 0.70 ** | 2.014 | -0.60 ** | 0.551 | 0.53 ** | 1.698 | -0.54 | 0.580 | 0.36 | 1.438 | -0.03 | 0.967 |
| | (0.17) | | (0.19) | | (0.18) | | (0.32) | | (0.26) | | (0.31) | |
| RURAL | -0.43 | 0.646 | -0.005 | 0.994 | 0.59* | 1.807 | -0.13 | 0.875 | 0.02 | 1.020 | -0.20 | 0.816 |
| | (0.25) | | (0.13) | | (0.26) | | (0.16) | | (0.28) | | (0.17) | |
| ***Variance*** | 0.307 | | 0.766 | | 0.018 | | 0.742 | | 0.74 | | 0.874 | |
| Variance explained | 58.6% | | 31.7% | | 98.5% | | 37.1% | | 58.2% | | 23.2% | |

* $p<.05$, ** $p<.01$.

The estimation of other student and school level variables for the three grade-specific models show similar patterns with the models including students in all grades. At the student level, Black students are more likely to transfer to charter schools. On average, low-income students are more likely to transfer than non-low-income students. However, among Black students, those who are low-income are less likely to transfer than non-low-income students.

At the school level, students in schools with high concentration of poverty and minority students, especially Black students, are more likely to choose charter schools. After controlling for individual students' performance, school effectiveness fails to have a significant effect on students' decision to choose charter schools. However, there are some discrepancies in the magnitude and significance in the coefficients across models. For example, in the grade 8 model, Black students fail to show different patterns from non-Black students in the likelihood of transfer. And low-income students in grades 4 and 8 do not show significantly different patterns from non-low-income students. This is partly because test scores are highly correlated to a student's family background as well as the student's ability and motivation, especially in higher grades. Inclusion of test scores in the models might have captured many of these characteristics so that race and SES variables are not significant anymore.

*Question (2): Transferring from Charter Schools to Assigned Schools*

In this section, I took all charter school students in 2002-03, and analyzed their attendance status in 2003-04 through a similar set of multinomial HGLMs as in question (1). The main goal is to understand who transfers from charter schools back to their assigned public schools, and what kind of charter schools are more likely to have students return to their assigned schools.

As in the analysis of question (1), the outcome measure is a categorical variable describing student attendance status in 2003-04, which takes the value 1 if a student transferred back to the assigned school, 2 if he/she transferred to an inter-district school of choice, and 3 if he/she stayed in a charter school. Four sets of multinomial regression models are estimated. The first set of models includes all charter students in 2002-03. The other three models are for students in grade 4, 7, and 8, respectively. The explanatory variables at both levels remain the same across models, except that the models for specific grades include performance variables. School level variables are measured based on all students of schools, not the just the students in the grades taking the relevant MEAP tests. Descriptive statistics for the variables in the model including all charter school students are presented in Table 3.8.

Table 3.8 Variables and Description, All Charter School Students in 2002-03

| | N | Mean | Standard Deviation | Min. | Max. |
|---|---|---|---|---|---|
| ***Student level*** | | | | | |
| ATTENDANCE STATUS | 52220 | 2.61 | 0.78 | 1.00 | 3.00 |
| BLACK | 52220 | 0.52 | 0.50 | 0.00 | 1.00 |
| HISPANIC | 52220 | 0.04 | 0.20 | 0.00 | 1.00 |
| ASIAN | 52220 | 0.01 | 0.09 | 0.00 | 1.00 |
| FRL | 52220 | 0.45 | 0.44 | 0.00 | 1.00 |
| BLACK FRL | 52220 | 0.30 | 0.41 | 0.00 | 1.00 |
| ASIAN FRL | 52220 | 0.00 | 0.04 | 0.00 | 1.00 |
| HISPANIC FRL | 52220 | 0.03 | 0.16 | 0.00 | 1.00 |
| SPECED | 52220 | 0.05 | 0.22 | 0.00 | 1.00 |
| LEP | 52220 | 0.01 | 0.10 | 0.00 | 1.00 |
| MATH, G4 | 5485 | 0.04 | 1.00 | -4.43 | 5.36 |
| READING, G4 | 5485 | 0.03 | 1.00 | -4.55 | 5.67 |
| READING, G7 | 4344 | 0.03 | 1.00 | -4.77 | 4.01 |
| MATH, G8 | 3077 | 0.00 | 1.00 | -3.61 | 4.50 |
| ***School level*** | | | | | |
| SCHBLACK | 188 | 0.45 | 0.42 | 0.00 | 1.00 |
| SCHHISPA | 188 | 0.04 | 0.10 | 0.00 | 0.84 |
| SCHASIAN | 188 | 0.01 | 0.03 | 0.00 | 0.43 |
| SCH_FRL | 188 | 0.44 | 0.28 | 0.00 | 0.99 |
| SCHEFF | 188 | 5.55 | 0.82 | 2.94 | 7.63 |
| LN(FTE) | 188 | 0.00 | 0.90 | -3.59 | 3.17 |
| URBAN | 188 | 0.15 | 0.36 | 0.00 | 1.00 |
| RURAL | 188 | 0.51 | 0.50 | 0.00 | 1.00 |
| ELEMENT | 188 | 0.35 | 0.48 | 0.00 | 1.00 |
| MIDDLE | 188 | 0.65 | 0.48 | 0.00 | 1.00 |
| HIGH | 188 | 0.54 | 0.50 | 0.00 | 1.00 |

Note: Attendance status is categorical: 1 = Assigned school, 2 = inter-district school of choice, 3 = stay

Unconditional models are estimated first. The results are shown in Table 3.9. The fixed effects for both categories are significant in all the models, and the expected mean odds for charter school students transferring back to their assigned schools (relative to staying in charter schools) are far bigger than the odds transferring to another school through inter-district choice (relative to staying in charter schools). For example, for 4th graders, the odds of switching back to the assigned schools are 0.182, while the odds to transfer to an inter-district school of choice are only 0.01. The magnitudes of the expected mean odds to transfer are similar for all models except for the 8th grade model, where the odds are far larger. The estimated 8th grade mean log-odds for category 1 is 0.75 ($p<0.01$), corresponding to very high odds of transfer back to the assigned school of 2.12, or probability of transfer of .68. This indicates that 68 percent of Michigan's 8th grade charter school students in 2002-03 transferred back to their assigned schools the following year, if each school enrolled students with mean characteristics of all charter school students. This is mainly because there are fewer charter schools available at the high school level in Michigan and the majority of middle-school charter students have no other options but to return to TPSs.

All level-2 variance components are significant at the 0.001 level, except in grade 7 there is no significant variation across charter schools in the log-odds of transferring to inter-district schools of choice (relative to staying in a charter school). So, in the following analysis I constrained the random effect to zero in the interest of parsimony.

Table 3.9 Unconditional Models on the Likelihood of Transfer, from Charter Schools to Assigned Public Schools

| | All | | | Grade 4 | | | Grade 7 | | | Grade 8 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Fixed effect* | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value |
| For category (1)—charter school | | | | | | | | | | | | |
| Intercept (1) | -1.453 (0.049) | 0.234 | 0.000 | -1.703 (0.059) | 0.182 | 0.000 | -1.474 (0.092) | 0.228 | 0.000 | 0.750 (0.187) | 2.118 | 0.00 |
| For category (2)—Inter-district school of choice | | | | | | | | | | | | |
| Intercept (2) | -4.476 (0.109) | 0.011 | 0.000 | -4.673 (0.194) | 0.009 | 0.000 | -4.428 (0.233) | 0.014 | 0.000 | -2.134 (0.242) | 0.118 | 0.00 |
| *Random effect* | *Variance component at level-2* | | | | | | | | | | | |
| *Variance* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* |
| Category 1 | 0.392 | 2247.4 | 0.000 | 0.253 | 278.83 | 0.000 | 0.473 | 362.77 | 0.000 | 3.415 | 1229.2 | |
| Category 2 | 1.517 | 1365.8 | 0.000 | 1.859 | 178.48 | 0.002 | 1.022 | 142.20 | 0.126 | 4.341 | 308.57 | 0.00 |
| | *Reliability* | | | | | | | | | | | |
| Category 1 | 0.881 | | | 0.482 | | | 0.604 | | | 0.823 | | |
| Category 2 | 0.672 | | | 0.296 | | | 0.242 | | | 0.589 | | |
| | *Sample size* | | | | | | | | | | | |
| Level 1 | 52220 | | | 5485 | | | 4344 | | | 3077 | | |
| Level 2 | 188 | | | 145 | | | 125 | | | 118 | | |

*a) Student Fixed Effects on the Likelihood of Transfer Back to the Assigned Schools*

The results for the four fully specified two-level intercept-as-outcome multinomial regression models are presented in Table 3.10. The table only presents the estimation results for charter school students' movement back to their assigned schools. The equations for charter students moving to inter-district choice schools were estimated but not shown in the table because almost all the coefficients were insignificant. The main reason is that the portion of charter students transferring to schools of choice is so small that there is not much variability in several explanatory variables to ensure valid estimations.

Table 3.10 Fixed Effects of Student and School Characteristics on the Likelihood of Transfer from Charter Schools to Assigned Public Schools

| | All | | Grade4 | | Grade7 | | Grade8 | |
|---|---|---|---|---|---|---|---|---|
| | *Coeff. (SE)* | *Odds ratio* | *Coeff. (SE)* | *Odds ratio* | *Coeff. (SE)* | *Odds ratio* | *Coeff. (SE)* | *Odds ratio* |
| ***Fixed effect of student characteristics*** | | | | | | | | |
| Intercept | -1.44** (0.06) | 0.237 | -1.66** (0.06) | 0.190 | -1.48** (0.08) | 0.228 | 0.65** (0.17) | 1.918 |
| BLACK | -0.04 (0.11) | 0.995 | -0.01 (0.19) | 0.994 | -0.11 (0.18) | 0.896 | -0.14 0.22) | 0.871 |
| HISPANIC | 0.15 (0.12) | 1.159 | -0.09 (0.38) | 0.910 | 0.11 (0.39) | 1.118 | 0.18 (0.42) | 1.196 |
| ASIAN | 0.25 (0.17) | 1.293 | 0.70 (0.56) | 2.011 | -- | -- | -- | -- |
| FRL | 0.16 * (0.08) | 1.168 | 0.49 ** (0.16) | 1.629 | 0.23 (0.17) | 1.262 | -0.22 (0.23) | 0.802 |
| BLACK FRL | -0.13 (0.09) | 0.880 | -0.60 ** (0.21) | 0.548 | -0.26 (0.22) | 0.775 | 0.35 (0.24) | 1.423 |
| ASIAN FRL | -0.12 (0.35) | 0.863 | -0.62 (1.04) | 0.536 | -- | -- | -- | |
| HISPANIC FRL | -0.47 ** (0.17) | 0.626 | -0.26 (0.50) | 0.771 | 0.14 (0.51) | 1.153 | -0.41 (0.52) | 0.661 |
| SPECED | 0.15 * (0.07) | 1.156 | -0.16 (0.17) | 0.856 | -0.27 (0.33) | 0.766 | 0.11 (0.27) | 1.114 |
| LEP | -0.22 (0.22) | 0.803 | 0.10 (1.65) | 1.108 | -0.85 (0.50) | 0.426 | -0.57 (0.53) | 0.567 |
| MATH | -- | -- | -0.21** (0.06) | 0.810 | -- | -- | 0.22** (0.07) | 1.251 |
| READING | -- | -- | -0.05 (0.05) | 0.956 | -0.21** (0.05) | 0.811 | -- | -- |
| ***Fixed effect of school characteristics*** | | | | | | | | |
| SCH_BLACK | 0.11 (0.20) | 1.113 | 0.29 (0.21) | 1.336 | -0.27 (0.33) | 0.761 | 0.07 (0.45) | 1.070 |
| SCH_HIS | -0.34 (0.59) | 0.714 | -0.78 (0.78) | 0.456 | -1.03 (1.00) | 0.357 | 0.01 (1.23) | 1.014 |
| SCH_ASIA | -8.16 (3.85) | 0.000 | -8.98 (4.82) | 0.000 | -- | -- | -1.81 (1.29) | 0.164 |
| SCH_FRL | 0.22 (0.26) | 1.243 | -0.19 (0.29) | 0.828 | 0.09 (0.42) | 1.099 | -0.20 (0.71) | 0.822 |
| LNFTE | -0.22 (0.11) | 0.803 | -0.39 ** (0.10) | 0.676 | -0.10 (0.13) | 0.905 | 0.42* (0.16) | 1.523 |
| SCHEFF | -0.02 (0.07) | 0.977 | -0.26 ** (0.08) | 0.770 | -0.16 (0.10) | 0.853 | 0.29 (0.17) | 1.339 |
| RURAL | -0.07 (0.14) | 0.929 | 0.24 (0.18) | 1.269 | -0.04 (0.25) | 0.963 | -0.86* (0.38) | 0.422 |
| URBAN | -0.17 (0.14) | 0.843 | -0.12 (0.14) | 0.889 | 0.02 (0.21) | 1.021 | -0.31 (0.35) | 0.731 |

Note: For grade 7 and 8, there is essentially no variability found in Asian. Therefore, the variable is excluded. * $p<.05$, ** $p<.01$.

At the student level, none of the coefficients for Black, Hispanic, or Asian is significant for all four models. This implies that, on average, the likelihood of charter students transferring back to their assigned schools does not significantly differ among students with different racial/ethnic backgrounds.

In the model including all charter school students, being a low-income student increases the odds of returning to the assigned school to 1.17 times the odds for a non-low-income student, holding other predictors constant (coefficient = 0.156, $p<0.001$). This is true for the grade 4 model, too, where the odds of transfer is 1.6 times for low-income students (coefficient = 0.49, $p<0.001$). However, the effect of FRL disappears in grade 7 and 8. In addition, the coefficients of interactions between race and FRL are mostly insignificant in all the models. It is only significant with Hispanic FRL for the model with all charter students, where the estimation is based on a very small sample size of low-income Hispanic students transferring back to their assigned schools.

As for the effect of student performance, the estimation results of the grade 4 model show that both the coefficients for math and reading are negative (coefficient of math = -0.21, $p<0.01$, coefficient of reading = -0.05, $p>0.05$), indicating that high performing charter school students are less likely to return to their assigned schools, although the coefficient of reading is not statistically significant. Similarly, the grade 7 model shows that students with higher reading achievement were also less likely to switch to their assigned schools (coefficient = -0.21, $p<0.01$). By contrast, for the grade 8 model, the estimated coefficient for math is positive (coefficient = 0.22), indicating a one standard deviation increase in student achievement for 8th graders in charter schools raises the odds of transferring back to the assigned schools to 1.20 times. Interestingly, although the

8th graders who returned performed better than the students remaining in the charter schools, they still perform more poorly than their TPS counterparts.

*b) Influence of School Characteristics on the Likelihood of Transfer*

As the bottom panel of Table 3.10 shows, the movement of charter students back to their assigned schools is not well predicted by school characteristics. The coefficients of percentages of minority and low-income students are all insignificant, indicating student movement back to the assigned schools is not associated with these aspects of charter school student composition. Moreover, with the exception of 4th graders, charter schools' effectiveness is not significantly related to the likelihood of charter school students transferring back to their assigned schools.

*Question (3): Transferring from Inter-district Schools of Choice Back to Assigned Public Schools*

In this section, I repeat the sequence of analyses as for question (2). The students included in the question (3) analysis all attended inter-district schools of choice in 2002-03. The descriptive information is shown in Table 3.11. Four sets of multinomial HGLMs are analyzed, with the first model including all students attended inter-district schools of choice, and second to fourth models including only students in grade 4, 7, and 8 respectively. Again, the focus of interest is the student movement from inter-district schools of choice back to their assigned schools.

Table 3.11 Variables and Description, All students in Inter-district Schools of Choice in 2002-03

| | N | Mean | Standard Deviation | Min. | Max. |
|---|---|---|---|---|---|
| ***Student level*** | | | | | |
| Dependent variable | 27096 | 2.63 | 0.77 | 1.00 | 3.00 |
| BLACK | 27096 | 0.17 | 0.38 | 0.00 | 1.00 |
| HISPANIC | 27096 | 0.04 | 0.19 | 0.00 | 1.00 |
| ASIAN | 27096 | 0.01 | 0.09 | 0.00 | 1.00 |
| FRL | 27096 | 0.36 | 0.45 | 0.00 | 1.00 |
| BLACK FRL | 27096 | 0.09 | 0.28 | 0.00 | 1.00 |
| ASIAN FRL | 27096 | 0.00 | 0.04 | 0.00 | 1.00 |
| HISPANIC FRL | 27096 | 0.02 | 0.14 | 0.00 | 1.00 |
| SPECED | 27096 | 0.09 | 0.29 | 0.00 | 1.00 |
| LEP | 27096 | 0.00 | 0.07 | 0.00 | 1.00 |
| MATH, G4 | 2142 | 0.25 | 0.65 | -1.73 | 3.50 |
| READING, G4 | 2142 | 0.12 | 0.70 | -2.47 | 4.09 |
| READING, G7 | 2334 | 0.02 | 0.99 | -4.94 | 4.13 |
| MATH, G8 | 2061 | 0.00 | 1.00 | -3.61 | 5.19 |
| ***School level*** | | | | | |
| SCHBLACK | 1342 | 0.09 | 0.20 | 0.00 | 1.00 |
| SCHHISPA | 1342 | 0.03 | 0.05 | 0.00 | 0.61 |
| SCHASIAN | 1342 | 0.01 | 0.02 | 0.00 | 0.45 |
| SCH_FRL | 1342 | 0.33 | 0.21 | 0.00 | 0.99 |
| SCHEFF | 1342 | 5.93 | 0.69 | 1.56 | 7.63 |
| LN(FTE) | 1342 | 0.02 | 0.78 | -5.89 | 3.43 |
| URBAN | 1342 | 0.10 | 0.30 | 0.00 | 1.00 |
| RURAL | 1342 | 0.41 | 0.49 | 0.00 | 1.00 |
| ELEMENT | 1342 | 0.50 | 0.50 | 0.00 | 1.00 |
| MIDDLE | 1342 | 0.21 | 0.41 | 0.00 | 1.00 |
| HIGH | 1342 | 0.23 | 0.42 | 0.00 | 1.00 |

Note: Attendance status is categorical: 1 = Assigned school, 2 = charter school, 3 = stay

Following the method of answering questions (1) and (2), I started with the unconditional models. The estimations for both assigned school and charter school options are shown in Table 3.12. The expected odds for inter-district choice students transferring back to their assigned schools are relatively high. For example, for 7th graders in 2003, the expected mean odds of returning to the assigned schools (relative to staying) are .214, or about 1 out of 5. This corresponds to a probability of $1/(1 + \exp(1.543)) = 0.18$. For 8th graders, the expected odds are even higher. For all four models, the variability across schools is significant for the log-odds of return to assigned schools, but not significant for transfers to charter schools. In fact, the number of students who transferred from an inter-district choice school to a charter school is so small that no patterns could be found through the estimation and the reliabilities for category 2 equations are extremely low. Therefore, although transfers to charter schools were included in the analysis, the results are not reported.

Table 3.12 Unconditional Models on the Likelihood of Transfer, from Inter-district Schools of Choice to Assigned Schools

| | All | | | Grade 4 | | | Grade 7 | | | Grade 8 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed effect | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value | Coeff. (SE) | Odds ratio | P-value |
| For category (1)—assigned school | | | | | | | | | | | | |
| Intercept (1) | -1.389 (0.03) | 0.249 | 0.000 | -1.543 (0.063) | 0.214 | 0.000 | -1.542 (0.078) | 0.214 | 0.000 | -1.231 (0.082) | 0.292 | 0.00 |
| For category (2)—charter school | | | | | | | | | | | | |
| Intercept (2) | -4.92 (0.09) | 0.007 | 0.000 | -4.624 (0.244) | 0.010 | 0.000 | 5.203 (0.319) | 0.005 | 0.000 | -4.925 (0.307) | 0.007 | 0.00 |
| *Random effect* | | | | *Variance component at level-2* | | | | | | | | |
| *Variance* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* | *Coeff.* | $\chi^2$ | *P-value* |
| Category 1 | 0.30 | 3377.8 | 0.000 | 0.177 | 622.71 | 0.001 | 0.514 | 478.72 | 0.000 | 0.718 | 527.9 | 0.00 |
| Category 2 | 1.426 | 973.7 | >.500 | 0.050 | 331.89 | >.500 | 0.249 | 138.90 | >.500 | 0.105 | 104.2 | >.50 |
| | | | | | | *Reliability* | | | | | | |
| Category 1 | 0.497 | | | 0.085 | | | 0.264 | | | 0.336 | | |
| Category 2 | 0.118 | | | 0.002 | | | 0.008 | | | 0.036 | | |
| | | | | | | *Sample size* | | | | | | |
| Level 1 | 27096 | | | 2142 | | | 2334 | | | 2061 | | |
| Level 2 | 1342 | | | 518 | | | 319 | | | 319 | | |

Table 3.13 Fixed Effects of Student and School Characteristics on the Likelihood of Transfer from Inter-district Schools of Choice to Assigned Schools

| | All | | Grade4 | | Grade7 | | Grade8 | |
|---|---|---|---|---|---|---|---|---|
| | *Coeff. (SE)* | *Odds ratio* | *Coeff. (SE)* | *Odds ratio* | *Coeff. (SE)* | *Odds ratio* | *Coeff. (SE)* | *Odds ratio* |
| ***Fixed effect of student characteristics*** | | | | | | | | |
| BLACK | -0.05 (0.10) | 0.954 | -0.39 (0.33) | 0.675 | 0.31 (0.26) | 1.361 | -0.13 (0.27) | 0.878 |
| HISPANIC | 0.18 (0.14) | 1.195 | -- | -- | -- | -- | -1.13 (0.73) | 0.323 |
| ASIAN | -0.04 (0.22) | 0.959 | -- | -- | -- | -- | -- | -- |
| FRL | 0.64 ** (0.05) | 1.905 | 0.49 ** (0.15) | 1.635 | 0.73** (0.16) | 2.069 | 0.56 ** (0.16) | 1.754 |
| BLACK FRL | -0.25 * (0.10) | 0.776 | -0.11 (0.37) | 0.893 | -0.61 (0.32) | 0.543 | 0.13 (0.32) | 1.138 |
| ASIAN FRL | 0.69 (0.46) | 1.985 | -- | -- | -- | -- | -- | -- |
| HISPANIC FRL | -0.42 * (0.19) | 0.660 | -- | -- | -- | -- | 1.23 (0.87) | 3.407 |
| SPECED | 0.12 * (0.06) | 1.129 | -0.15 (0.25) | 0.858 | 0.40 (0.19) | 1.490 | 0.07 (0.20) | 1.075 |
| MATH | -- | -- | -0.13 (0.12) | 0.881 | -- | -- | 0.03 (0.07) | 1.032 |
| READING | -- | -- | -0.005 (0.11) | 0.995 | -0.04 (0.07) | 0.963 | -- | -- |
| ***Fixed effect of school characteristics*** | | | | | | | | |
| Intercept | -1.41** (0.03) | 0.243 | -1.57 ** (0.07) | 0.207 | -1.59** (0.08) | 0.205 | -1.26** (0.09) | 0.283 |
| SCH_BLAC | 0.12 (0.18) | 1.132 | 0.60 (0.42) | 1.821 | 0.10 (0.50) | 1.108 | 0.77 (0.52) | 2.149 |
| SCH_HISP | 1.51 (0.61) | 4.518 | -- | -- | -0.35 (2.10) | 0.704 | 2.33 (1.92) | 10.323 |
| SCH_ASIA | -0.10 (2.14) | 0.906 | -- | -- | 1.27 (4.87) | 3.555 | 9.52 (5.04) | 13608 |
| SCH_FRL | -0.08 (0.18) | 0.925 | 0.16 (0.38) | 1.171 | -0.40 (0.51) | 0.670 | -0.36 (0.53) | 0.701 |
| LNFTE | -0.02 (0.06) | 0.979 | 0.02 (0.15) | 1.021 | -0.11 (0.15) | 0.899 | -0.33* (0.17) | 0.717 |
| SCHEFF | -0.11 * (0.04) | 0.900 | 0.04 (0.13) | 1.046 | -0.17 (0.13) | 0.842 | -0.21 (0.13) | 0.814 |
| URBAN | 0.35 ** (0.12) | 1.422 | -- | -- | 0.58 (0.33) | 1.793 | 0.24 (0.34) | 1.271 |
| RURAL | 0.08 (0.07) | 1.080 | -- | -- | -0.12 (0.21) | 0.891 | -0.06 (0.21) | 0.942 |
| MIDDLE | -0.13 (0.08) | 0.877 | -- | -- | -- | -- | -- | -- |
| HIGH | -0.37 ** (0.08) | 0.692 | -- | -- | -- | -- | -- | -- |

Note: In grade specific models, some variables are excluded because there is essentially no variability found. * $p<.05$, ** $p<.01$.

Table 3.13 contains the results of the four conditional models in which variables at both level-1 and level-2 are included. The estimation results for the model including all choice students are shown in the first and second columns, and results for the grade 4, 7, and 8 models are in the next six columns.

For the model containing all inter-district choice students, some patterns are found to be consistent with the patterns of the movement from charter schools to the assigned schools. At level-1, among the demographic factors, low-income students had significantly higher odds of return than non-low-income students, while students from different racial groups did not show different patterns. The coefficients of interactions between race and FRL show that although for Black and Hispanic students, low-income students are more likely to return than non-low-income students from the same racial group, the gap of odds between low-income and high-income students are smaller than that for White and Asian students.

At level-2, the coefficient for school effectiveness is significant. If a school was one standard deviation more effective above average, the odds of its students returning to their assigned school declined to 0.9 times. School location and level of education also matter. Urban schools have more students transferring back than suburban and rural schools. High school students are less likely to return to their assigned schools than elementary or middle school choice students.

Models for specific grades show that students' individual performance seems to have no influence in determining whether they return to their assigned schools. The effect of school effectiveness also disappears when individual performance is controlled. In addition, most of the student and school level effects disappear in the grade specific models. Only low-income students show persistently higher odds of return than non-low-income students.

Overall, the student and school variables fail to predict very much about the transfer patterns for inter-district choice students back to their assigned public schools. There could be two explanations for this. First, choice students were scattered in so many schools (more than 1,000 TPSs) that the sample ratio between level-1 and level-2 models are relatively small and defy accurate estimation. Second, the number of choice students who switched back to their assigned schools is so small that there is not much variability among the many variables. This indicates that student flow back from inter-district schools of choice has not significantly influenced student composition in the TPSs.

## Discussion

This chapter analyzes student sorting initiated by Michigan's school choice programs. Three sets of multinomial HGLMs were estimated to investigate how student and school factors influence students' choice among their assigned schools, charter schools, and TPSs outside their district of residence. Here I assess the net effect of student sorting on student composition across the state's TPSs.

Charter schools do provide new opportunities for students who struggled academically in their assigned schools, regardless of race and SES. However, the students they attract tend not to be the most disadvantaged students. Rather the process of student sorting initiated by charter schools tend to leave the most disadvantaged students behind in the most disadvantaged schools. While Black students are more likely to choose charter schools than White students, low-income minority students are less likely to choose charters than low-income White students. Moreover, special education students are shown to have a smaller likelihood of attending charter schools than general education students.

Charter schools attract students from low-performing schools with high concentration of minority and poverty students, which are most likely to be located in urban areas. This can be regarded as a positive and intended result of choice policy. However, my analysis also shows that charters attract relatively "better-off" students from these schools. For example, in high-poverty urban schools, White students have higher odds of switching to charter schools than Black students. In minority concentrated schools, relatively affluent students are more likely to take advantage of charter schools than low-income students.

Meanwhile, students who returned to their assigned schools from charter schools were more likely to be low-income and have lower academic performance than their classmates who stayed in charter schools. In addition, special education students are more likely to return from charter schools to their assigned schools. Thus, this analysis concludes that charter schools tend to attract moderately disadvantaged students, while the most disadvantaged students are left behind in the most disadvantaged schools.

My analysis of student sorting under inter-district choice suggests that students in urban districts face supply-side restrictions on their choice of traditional schools outside their district of residence. My results are consistent with the notion that suburban districts neighboring urban areas are less likely to open up to accept nonresident students because they worry that the incoming choice students from urban districts would change the racial and SES composition of their own schools.

The net effect of student movement initiated by charter school policy is that the truly disadvantaged students—low-income minority students with low performance—remain concentrated in ineffective urban schools with high concentrations of minority and low-income students. The percentage of minority students in these school tend not to increase because Black students are more likely to go to charter schools, and they show the same inclination as students from other racial groups to return to TPSs. However, charter school choice tends to further increase the concentration of low-income and low-performing students in urban schools because charter school students who are from low-income families and have lower performance than their classmates are more likely to return to their assigned schools.

Taken as a whole, Michigan's charter school program still has limited impact on the overall composition of students in the state's TPSs, because charter schools only enroll a small fraction of public school students. Yet the finding that charter schools exacerbate social and academic stratification within the state's lowest-performing schools in predominantly minority and high-poverty urban areas is cause for concern. After all, these are the students who have been most poorly served by TPSs and who charter school policy was meant to help.

In general, the results of this chapter fail to support the claim from school choice advocates that charter schools attract the most disadvantaged students. Rather, charter schools help to promote choice for the moderately disadvantaged students. The truly disadvantaged students have not benefited as much under Michigan's school choice policies as they are currently designed and implemented, since these students have become increasingly concentrated in public schools with other similarly disadvantaged students.

This chapter does not address why charter schools in Michigan fail to reach the most disadvantaged students. However, some possible reasons have emerged from the literature. First, minority, low-income parents do not necessarily devalue school quality; rather, their social networks and customary attendance patterns limit their capacity for choice (Bell, 2005). Second, charter schools might use specific marketing strategies and admission requirements that potentially limit access for racially and economically disadvantaged applicants. Transportation is another potential factor that may limit the choice of disadvantaged students. Usually charter schools do not provide bus transportation. Parents of disadvantaged students are less able to arrange the transportation for their kids (Henig & MacDonald, 2002).

Some have argued that charter schools exercise greater latitude in formally or informally encouraging some students to return to their assigned schools (Miron et al., 2002a; Wells, 1998). Students with behavior problems, special needs, or low test scores may be more likely to be counseled out. Such claims are disputed by charter school advocates, and indeed charter schools' poorest performing students might be more likely to return to their assigned schools on their own accord. While this chapter offers no evidence on such charter school practices, it does appear that there is a systematic pattern for charter schools' most poorly performing students to return to TPSs. Moreover, charter schools often do not have adequate staff to provide programs for students with special needs. Special need students are discouraged to choose charter school and are more likely to get sent back from charter schools (Miron et al., 2002a).

School choice offers opportunities for students who are dissatisfied with their assigned schools to choose a school that might better meet their needs. Parents are making sensible choices because the schools they left usually have lower performance. However, by doing that, choice policy creates external costs on students who remain in the most disadvantaged schools. Therefore, policy makers should aware that choice policy creates losers, among both schools and students.

Students who remain in the most disadvantaged schools experience a turbulent and unstable learning environment because the student mobility and possible teacher mobility induced by school choice. In addition, it is reasonable to assume that as potentially more motivated classmates depart for alternative schools through choice policies, the students who remain will have a less motivated peer group and this will continue the downward spiral of low performance.

The parents of students who leave their assign school for choice schools are most likely to be those who care more about their children's education and who might be best positioned to help to improve schools. Once those parents are gone, the school has a less "alert" consumer base and business continues as usual with fewer informed demands for change from its clients (Hirschman, 1970).

In addition, schools losing students through choice policies are likely to be the ones that have already experienced significant loss of students and faced harsh education challenges. Choice policy accelerates the rate of their enrollment decline which in turn may initiate a self-reinforcing cycle of declining revenues, program cuts, and further enrollment loss. Regardless of the competitive pressure for improvement generated by choice policy, schools may lack the capacity to reverse the downward spiral.

Michigan school choice policies are intended to benefit all public school children—not simply those who take advantage of choices. The challenge for policy makers is to have a response strategy in place to address the problems facing these truly disadvantaged students who are left behind in the mostly disadvantaged schools.

# CHAPTER 4 THE IMPACT OF CHARTER SCHOOLS ON EFFICIENCY OF TRADITIONAL PUBLIC SCHOOLS

Recent research on school choice focuses not only on the impact of choice policies on the redistribution of students and resources among schools, but also on the competitive effect of choice policy on school productive efficiency. Some research focuses on the interactions between the two issues as well, because equity and efficiency are often in conflict: economic competition often generate unequal distribution of educational resources. On the other hand, equal distribution of educational resources does not necessarily improve educational productivity.

In the previous two chapters I addressed the sorting or redistribution of students associated charter school policy. In this chapter I turn to estimate the second mechanism of charter schools—the competitive effect. Does charter competition improve the efficiency of TPSs and thereby benefit the vast majority of students who remain in the TPS system? Microeconomic theory predicts that charter school policy will improve the effectiveness of all schools. First, it creates effective charter schools because they have to attract students and revenue from existing pubic schools. Moreover, the introduction of charter schools will spur competition among TPSs, since they have to compete with the newly established charter schools for students. TPSs will become more responsive to parents' demands and improve school quality. Therefore, competition will not only benefit active choosers but also the majority of students who remain in TPSs (Finn et al., 2000; Kolderie, 2004; Nathan, 1998).

Opponents, however, argue that the concept of market competition and choice were borrowed from other fields and cannot be readily adapted to the delivery of public education (Fiske et al., 2000). Choice schools will not necessarily be more effective or efficient. On the demand side, parents might not choose schools based on school quality, but on other school attributes, such as convenience, or the racial or social class composition of a school. On the supply side, choice schools might choose to admit high achieving students or those who are easy to educate, which makes choice schools appear to be more effective or efficient because of a student composition effect instead of a competitive effect (Arsen et al., 1999; Wells et al., 2000).

Further, critics also argue that TPSs will not necessarily be more effective or efficient when they face competition from school choice. For instance, charter competition creates fiscal constrains for TPSs facing competition because of the loss of students, which make it harder for them to continue providing the same quality programs, let alone improving educational services. Since revenues decline faster than costs in TPSs losing students, it is likely that TPSs will cut programs, which could spur the loss of further students and resources (Arsen et al., 1999; Fiske et al., 2000).

Whether charter school policy creates efficient charter schools is an important question. However, the impact of charter school competition on the efficiency of TPSs may be of greater importance, because the large majority of students remain in TPSs. Past research has produced mixed results on the impact of charter schools on TPS effectiveness and efficiency. Although the connection between competition and student outcome is conceptually clear, it is hard to establish the causal relationship between the two because of the confounding effects of student transfers between charter schools and TPSs and non-randomness of charter school location.

Using 11 years of school level panel data in Michigan, my analysis in this chapter is based on a series of models by fixed effect and other estimations, which not only implicitly control for the unobserved school heterogeneity, but also explicitly control for the changing student composition and other factors induced by the charter school policy. The models also separate the competition effect of charter schools from that of inter-district choice—the other school choice program in Michigan. My results fail to show any positive competitive effect on student achievement in TPSs. Indeed, in areas with high charter school density I found a negative impact on school performance.

This chapter is organized as follows. First, I conceptualize the causal relationship between charter competition and school effectiveness / efficiency. In section 2, I summarize the previous studies estimating the competitive effect of school choice on school effectiveness and identify several methodological challenges in the research. In section 3, I describe my research questions. Section 4 discusses the data and econometric approaches including how to handle the possible endogeneity of charter competition. In section 5, I present the analysis results. Discussions and conclusions follow.

## Conceptualization of Competition and School Efficiency

In microeconomic theory, school effectiveness and efficiency are related to the production process of schools, which transform "inputs" into "outputs." Inputs include students with certain characteristics as well as financial and material supports. Output refers to student achievement after a period of formal schooling. The transformation process within a school can be understood as the instruction, curricula, and organizational arrangements that make it possible for students acquire knowledge. School effectiveness can be described as the extent to which the desired level of outputs is achieved. High school effectiveness indicates high levels of educational outcomes, such as high test scores. School efficiency, sometimes also referred to productivity, means the extent to which educational inputs produce desired student outcomes. Increased efficiency means achieving better student outcomes with the same combinations of inputs, or the same student outcomes with fewer inputs.

School choice advocates argue that the allocation of resources in TPSs is not efficient, because families made residential and schooling choices simultaneously and schools served only those who lived within jurisdictions of the school districts. Consequently, TPSs operate in a relatively monopolistic market, with weak incentives for improvement or adoption of new teaching technologies. The introduction of school choice, however, links school finance to school popularity and creates a direct market incentive mechanism, which motivates TPSs to become more productively efficient. According to school choice advocates, if a school becomes more efficient, it would become more attractive and popular, and should gain more students (Hoxby, 2003a). Meanwhile a school that fails to become more productive or efficient will lose students. This will give incentives for the school to improve its productivity; otherwise it would go out of business in the long run. From this perspective, long-term effects on efficiency are even more substantial than short-term effects. As economists argue, an administrator who wants to raise school productivity has only certain options in the short term, such as inducing his staff to worker harder, getting rid of unproductive staff and programs, and allocating resources away from non-achievement oriented activities. However, in the long term, some general equilibrium mechanisms are available to an administrator. For instance, the financial pressure of choice would bid up the wages for high quality teachers, and thus draw people into teaching who would otherwise pursue other careers. This long term effect would be more substantial on school enrollment and even the existence of schools (Hoxby, 2003a).

However, school choice critics are not convinced by the microeconomic model of competition resulting in greater school effectiveness and efficiency. They argue that first, highly motivated students might be more active in choosing to attend choice schools; less motivated students would then be clustered in increasingly disadvantaged TPSs. These schools in turn would have difficulty responding to the competitive challenge because of negative peer effects over which they have limited control. Second, losing students to choice schools will ordinarily decrease TPSs' educational revenue. Expenditure, however, cannot be readily decreased. Teachers cannot be easily laid off, and capital input or overhead costs are largely fixed. Cutting programs is the necessary response, which will lead to less popularity of schools and could possibly trigger further loss of students.

The resolution of these contrasting viewpoints is clearly significant. Whether school choice competition can raise the effectiveness and efficiency of TPSs is even more important than whether competition can create effective and efficient choice schools, since – for the foreseeable future – the majority of students still remain in the TPS system. However, the existing literature fails to provide consistent evidence on this issue.

## Existing Research

There is a substantial body of research on the impact of competition on educational outcomes. In most of this research, however, the competition analyzed is generated by private schools or neighboring public schools. In their comprehensive review of cross-sectional research in the U.S., Belfield and Levin (2002) concluded from more than 41 studies that competition has only modest positive effects on student achievement.

There are fewer studies about the effects of competition specifically resulting from school choice, and most of them have focused on the impact on choice schools rather than TPSs. There has been relatively little research on the impact of school choice competition on TPSs. So far, studies about this issue have focused on states such as Florida, California, Arizona, Michigan, Texas, and North Carolina, where charter school laws have been in place long enough and enrollments in charter schools are sufficient to generate significant competitive pressure on TPSs. Among these few studies, the results are surprisingly mixed.

To establish a causal relationship between competition and school effectiveness or efficiency, several methodological issues are involved. First, the location of charter schools is not randomly determined. It is reasonable to expect charter schools choose to locate in areas where students are not satisfied with the educational services they receive. Alternatively, charter schools might attract students whose parents tend to be more motivated and more informed. It is likely that this unobserved heterogeneity of schools will introduce positive or negative bias in estimation if not controlled for. Second, the student self-selection problem might confound the effect of competition on TPS effectiveness. Students who move to charter schools probably differ systematically from the students who do not exercise their option to do so. They might differ in past performance and family background, which are observable, as well as in motivation and innate ability, which are unobservable. If this was the case, the composition of students in TPSs facing competition will be different from that of TPSs facing no competition. The analysis in Chapter 2 and 3 shows that in Michigan, students are redistributed across charter schools and TPSs by race, SES, and performance. The sorting does influence the student composition of students in TPSs, especially in schools in central cities.

Several strategies have emerged in the empirical studies to address these problems. To control for the bias caused by the endogeneity of charter location, researchers usually rely on longitudinal data and use a fixed-effect strategy or they introduce instrumental variables, which ideally will be correlated with where charter schools choose to locate, but not related to neighboring TPS outcomes. To correct for the student self-selection problem, scholars usually include lagged dependent variables to control for students' past performance, incorporate schools' student composition as additional explanatory variables, or control for student fixed effect when data are available.

Drawing on an eight-year panel of data on individual student test scores for public schools students in Texas, Booker et al. (2005a) evaluated the achievement impact of charters schools on TPSs. The authors included school fixed effects and student fixed effects in the model to control for student background, and found that the emergence of charter schools had a positive impact on student performance for students remaining in TPSs. But the effect was relatively small, less than 0.1 standard deviations of test scores.

In Florida, competition from charter schools appeared to have a modest positive impact on student achievement in Florida's TPSs (Sass, 2006). Using student-level longitudinal data and relying on student fixed effect models, the author found that the positive results were quite robust under several measures of charter competition penetration: presence of nearby charter schools, the number of competition charters, or the enrollment share of charter schools. By contrast, a study in California which also relied on student-level longitudinal data and fixed effect models found that charter competition, measured in a variety of ways, failed to improve the performances of TPSs in California (Buddin & Zimmer, 2005)

Using longitudinal data on school-level achievement in North Carolina, Holmes et al (2003) investigated the competition effect of charter schools on TPSs. Applying a wide set of models, including cross-sectional OLS and IV panel models, they found that the introduction of charter schools improved the performance in TPSs. Overall, they reported that TPSs facing competition gained approximately a one percent increase in the test scores, or about one quarter of the average yearly growth. In another study, Bifulco and Ladd (2004) also examined North Carolina charter schools. Unlike the Holmes et al. study, Bifulco and Ladd used individual panel data and controlled for individual student fixed effects. The authors found that competition of charter schools had no substantially positive impacts on effectiveness of TPSs. The authors attribute the different results between the two studies as that Holmes and his colleagues did not use a full student-level panel to account fully for potential differences between students in schools located near charter schools and those in schools located elsewhere.

North Carolina is not the only state where contradictory results about the impact of charter school competition on TPS effectiveness have emerged. Studies based on Michigan have also produced mixed conclusions. Bettinger (2005) estimated charter schools' impact on TPS effectiveness in 1999, shortly after Michigan's charter school program had been introduced. The author used distance from a charter school to develop indicators of whether or not schools face competition from charter schools. In order to correct the bias caused by endogeneity of charter location, Bettinger (2005) introduced an instrumental variable, the proximity of a public school to one of state universities. This was based on the fact that in Michigan, the majority of charter schools are authorized by universities. It could be expected that universities are more likely to authorize charter schools nearby. Ideally, charter location would be related to proximity to state universities, but not related to neighbor public school outcomes. Bettinger (2005) also included the lagged dependent variable to control for students' past performance and other school-level covariates, including percentage of Black and students receiving free/reduced lunch to address the student self-selection problem. The study shows that charter schools had little or no effect on test scores in neighboring public schools.

In contrast, a study by Hoxby (2003b) reached different conclusions, namely that public schools subject to charter school competition raised their productivity and achievement in response. The increase was largest in the 4th grade, about 2.40 scale points a year in reading and 2.5 scale points in mathematics of Michigan's MEAP tests. Hoxby defined that a school faces charter competition if charter schools account for at least 6 percent of total enrollment inside the district's boundaries. To estimate the effects of charter competition, Hoxby used a detrended difference-in-difference strategy to control for each school's initial productivity. This method was based on the assumption that the public schools close to charter schools have different preexisting level of productivity and different of productivity trends than schools not facing competition from charter schools. Detrended difference-in-difference estimates can control for each school's initial productivity level and trend, and identify changes that occurred in schools facing competition as compared to other public schools that did not face equivalent competition. On the other hand, Hoxby fails to control for changes in student composition in her models. Her detrended difference-in-difference strategy only controls for schools' unobservable characteristics that are constant over the time. However, the composition of students in schools may well change with the entry of charter schools, which would also influence peer effects on student learning. If changes in the composition of students are different between TPSs that face charter competition and those that do not, then the estimation of the causal effect will be biased.

So far, past research has produced mixed results about the influence of choice competition on TPS effectiveness, even when it is based on charter schools in the same state. There are several other potential reasons for this besides the different methods used. First, the measurement of competition from charter schools varies in different studies. Some researchers use the number of charter schools within a given radius of public school to measure the intensity of competition (Bettinger, 2005; Bifulco et al., 2004). Others use the distance of a public school from a charter school to measure competition (Bifulco et al., 2004). Still others identify a certain percent of a school district's enrollment in charter schools as the threshold of competition (Hoxby, 2003b). There is no consensus about which measure is better than the others. While school-level competition measures can reflect within district variations in the intensity of charter school competition, school districts might be the appropriate unit for competition measures, since the revenue loss due to choice and most decisions about resource allocation are made at the district level.

A related issue is that the units of analysis are different in different studies. For this research question that focuses on the organizational effectiveness of schools, it is reasonable to take schools rather than individual students are the unit of analysis.

Although students can decide how much time and energy to devote to studying, they have no discretion in allocating educational resources and have no responsibility to care about the performance of their peers. Instead, schools or school districts are the decision-making organizations that allocate resources to different programs and to different groups of students so as to collectively respond to charter competition. However, researchers increasingly use students as the unit of analysis when student-level data are available. This is also desirable because students who choose to attend charter school might differ systematically from students in unobserved ways. Controlling for student fixed effects can successfully reduce some sources of heterogeneity bias.

Third, studies have been conducted in different stages of state charter school development. For example, when Bettinger (2005) studied Michigan's charter schools in 1999, only 33 charter schools were established and had been in operation only for two years. This is probably not long enough for TPSs to react to the competition from charter schools. It is also possible that the long-term impact of charter schools will be different than short-term impact.

## Research Questions

This chapter aims to address some of the limitations of past research and establish a causal relationship between charter competition and TPS efficiency. School choice not only influences student achievement but also significantly influences educational expenditure in TPSs. In this chapter, I will estimate the change of student achievement while controlling for the educational expenditure. In other words, I will to focus on estimating school efficiency by separating the effect of charter competition and the effect of educational spending. Specifically, I ask two questions: (1) how has competition from charter schools influenced TPSs efficiency, and (2) does charter market penetration have different impacts on TPS efficiency in the short-term or long-term?

Like Hoxby (2003b) and Betinger (2005), my analysis focuses on Michigan's charter school program. However, my research differs from these studies in several respects. First, the availability of more recent data allows me to evaluate both short-term and long-term policy effects of charter school policy. Second, more detailed data allow me to capture other systematic changes induced by school choice, including changes in student demographics, school expenditure, and school size. Third, my models explicitly control for the competition from Michigan's other choice program—inter-district choice—which might confound the effect of charter competition if not controlled. Fourth, I measure charter competition confronted by each district as the percentage of that district's students who have transferred to charter schools. This is different from using charter enrollment as a percentage of charter host district, which I will later elaborate.

## Data and Methodology

### *Data Sources*

This analysis utilizes a school-level panel dataset of Michigan schools from 1994 to 2004. The data were assembled from three main sources: the K-12 databases of the Michigan Department of Education (MDE), Data and Reports from the State of Michigan's Center for Educational Performance and Information (CEPI), and Common Core Data (CCD) from the National Center of Educational Statistics (NCES). The merged dataset includes information by schools for school choice enrollment, student demographics, school finance, and other school level factors over the 11 years.

Information about student achievement—the scale scores and percent of students attaining satisfactory performance levels on the Michigan Educational Assessment Program (MEAP) tests—come from the MDE's Office of School Assessment and Accountability. As noted in earlier chapters, not all Michigan students were tested annually in the same subjects. During the years included in this study, only students in certain grades were tested in certain subjects. These include grades 4 and 7 reading and math. Grade 7 math was no longer tested after 2000. As a result, student level longitudinal achievement data are not available. However, as noted, from a policy perspective, it is probably more interesting to see how schools as organizations respond to charter competition.

*Measure of Competition*

Competition from charter schools is measured by the charter school enrollment as a percentage of total district enrollments. This measure is a district-level measure because the loss of students to charter schools influences district revenues directly, and they must in turn decide how to adjust their resource allocation. In this sense, school districts instead of schools should be the primary organization that responds to the financial pressure introduced by choice competition.

This measure of competition improves upon the one introduced by Hoxby (2003b). Hoxby defined whether or not a district faces strong charter school competition as whether or not the charter school enrollment reach 6% of the total enrollment of the district. However, the measure is based on the assumption that students attend charter schools in the district in which they reside. This assumption is not true in Michigan's case. As mentioned in chapter 2, in 2003 and 2004, half of Michigan's charter schools draw students from districts other than their host district. Consequently, the percentage of students transferred to charter schools in a district rather than the percentage of charter enrollment of total enrollment inside the district's boundaries should be a more accurate measure of charter competition. To construct the measure, I first identified the primary sending district for each charter school, i.e., the district in which most students in each charter school lived. Then for each district, I added up the total enrollment of charter schools that primarily draw students from the district. Finally, I computed the charter enrollment as the percentage of the total enrollment of the district. Although this measure does not reflect the exact percentage of students that each district loses to charter schools, it is undoubtedly a more accurate measure than the charter enrollment as a percentage of the total enrollment of the school district where the charters schools are located.[21]

The main limitation of the measure is that there is no way to identify primary sending districts of charter schools before 2002 since student-level data were unavailable then. So, my measure of charter competition is based on 2003 estimation, assuming that a charter school has always attracted students primarily from the same district since its establishment.[22]

Furthermore, I initially used two different approaches for the competition measurement. One is a continuous variable reflecting the percentage of charter enrollment. The other is the dummy variable following the definition of Hoxby (2003b)

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[21] I also constructed the same measure of charter school competition as Hoxby used in her study. The two measures are highly correlated. The estimation bases on the alternative measure generated similar results but in a smaller magnitude. The possible reason is that the alternative measure underestimates the charter competition in some districts. For example, many charter schools draw students from central cities, but located in surrounding suburban districts. As a result, the estimation of the alternative measure is biased toward 0.

[22] For instance, if charter school A drew a majority of its students from school district B in year 2003, I assume it did so since the year it was established. Although I have found it is fairly consistent for 2003 and 2004, there is no way to test this for previous years.

and Bettinger (2005), which takes the value of 1 if the percentage of charter enrollment reaches 6 percent, and 0 otherwise. In my analysis, I have used both and found the effects are more dramatic using the dummy variables, but otherwise similar. Theoretically, the impact of competition should not be linear, but negligible at first and then becoming more observable when the share of charter enrollment reaches a certain point or threshold. So I decide to use the dummy variable in my analysis. Following Hoxby (2003b), I also defined the dummy variable using other cut points such as 3%, 5% and 10%, similar results emerged. Bettinger (2005) made the same observation in his study.

In order to distinguish the effect of charter competition in short-term, mid-term, and long-term, I also created three dummy variables that reflect the duration of charter competition. For instance, if a district consistently lost more than 6% of its students to charter schools for less than 4 years, I identify the charter competition as short-term. Likewise, the loss of more than 6 percent of students for 4 to 6 years is defined as mid-term competition, and for greater than 6 years is long-term competition.

I then obtained a vector of dummy variables by interacting the charter enrollment dummy variable and the three duration dummy variables. So, the measure of charter competition used in this analysis is a vector of dummy variables measuring the competition from two dimensions, one is the magnitude of the competition, and the other is the duration of the competition.

*Estimation Strategies*

As mentioned earlier, although the connection between charter competition and effectiveness is conceptually clear, it is hard to establish the causal relationship between the two mainly because of two reasons. First, charter schools are not randomly located.

As chapter 3 shows, in Michigan, charter schools tend to locate in urban areas where minority and low-income students are concentrated. It is possible that charter location is influenced by unobservable factors which may be related to achievement in either positive or negative ways if not controlled. Second, charter schools tend to attract students with certain characteristics which in turn change the composition of students in TPSs. Such changes over time in student composition would confound the estimated competitive effect of charter schools if not controlled.

In order to address the challenges, this chapter utilizes fixed effect estimation that not only implicitly control for the unobservable time invariant school characteristics that influence its likelihood of facing charter competition, but also explicitly control for changing student composition and other factors induced by school choice. It also tries to separate the competition effect of charter schools from that of inter-district choice—the other school choice program in Michigan. Several other models are also included for robustness checks. The unit of analysis of this chapter is the school. However, the competition measure is a district-level measure.

For the analysis, I rely on educational production function approach, where student achievement is a function of charter competition and other school level controls. The equation can be written as

$$Y_{it} = \boldsymbol{CS}_{it}\,\mathbf{B_1} + \boldsymbol{SCH}_{it}\mathbf{B_2} + \gamma IC_{it} + I_t\,\delta + V_{it} \qquad (1)$$

where $Y_{it}$ is the percentage of students passing the MEAP test at a satisfactory level. I estimate several models, each with a different dependent variable that reflects the satisfactory rate in reading and math at grades 4 and 7, respectively. The satisfactory rate measures the school effectiveness when per-pupil expenditure is *not* controlled. After controlling inputs such as expenditure and student demographics, the satisfactory rate measures school efficiency or productivity which reflects achievement per dollar spent. Scale scores for both subjects were initially used but replaced by satisfactory rates mainly for two reasons. First, it is difficult to interpret the results because the score itself is not meaningful, and the cut score varies for each year.[23] In addition, the reading scale scores before 2003 are not comparable to the reading scores after 2003, due to changes in the test and content standards since that year.

The variables of interest in this analysis are included in ***CS***, a vector of dummy variables that reflect both the magnitude and the duration of charter competition. $\boldsymbol{SCH_{it}}$ is a vector of characteristics of school $i$ at time $t$, including the percentage of students eligible for free/reduced lunch, percentage of students who are minority, pupil-teacher ratio, per-pupil expenditure in logarithmical form to impose a diminishing effect of spending on performance, and the percentage of instruction expenditure in the total expenditure. *IC* indicates the competition that districts face through inter-district choice policy, the other state-wide choice program in Michigan. As with the charter competition measure, *IC* is a dummy variable reflecting the strength of competition from nearby school districts. If the percentage of students transferring out of a district exceeds 6, *IC* takes the value of 1, otherwise 0. A set of year dummies, $I_t$, is also included to capture any systematic influence not accounted for by the observable inputs that vary over time but are common to all schools. $V_{it}$ is the unobserved error for school $i$ at time $t$.

I start to estimate equation (1) with simple ordinary least squares (OLS) by pooling data across schools and over the years, in order to identify the association between

[23] If the cut score changes every year, it is possible that the same scale score may be defined as satisfactory in one year, but not in other years.

student achievement and charter competition. Pooled OLS estimation assumes all school-level variables not controlled in the model are uncorrelated with charter competition, which is unlikely to be true in this analysis, because the location of charter schools might be influenced by unobserved features of TPSs.

To address the limitation of the Pooled OLS in estimating equation (1), I decompose the error term $V_{it}$ in equation (1) into an unobserved school effect and an idiosyncratic error that changes over time (Wooldridge, 2000). The same set of school factors is included to capture the possible change of students caused by choice-induced student mobility. The model is written as follows:

$$Y_{it} = \boldsymbol{CS}_{it}\,\mathbf{B_1} + \boldsymbol{SCH}_{it}\mathbf{B}_2 + \gamma IC_{it} + I_t\,\delta + \theta_i + u_{it} \qquad (2)$$

where $\theta_i$ is an unobserved school fixed effect that will pick up all the unobserved characteristics of a school that are stable over time. $u_{it}$ is the idiosyncratic error term that changes across time for each school.

One way to estimate model (2) is through fixed effects (FE) transformation. FE can readily eliminate the unobserved fixed effect, $\theta_i$, and allows for arbitrary correlation between $\theta_i$ and $CS_{it}$, which means that the location of charter school are allowed to be related to historical differences among schools and factors.

Estimating model (2) through FE estimation might account for most of the endogeneity of charter competition. However, it is possible that the future charter competition is correlated with the idiosyncratic error in schools today. In other words, how schools respond to charter competition in time period one might influence the magnitude of charter competition in the future. If this is the case, the strict exogeneity assumptions will be violated, and the general FE estimator will be biased. For robustness checks on the strict exogeneity assumption, I estimate equation (2) through first difference (FD) method, where I first difference the equation over time and estimate it by pooled OLS and robust standard errors.

Estimating random trend models provides another way for robustness check. As written in equation (3), a random trend model allows each school to have its own time trend, $g_i$, in addition to the level effect, $\theta_i$ (Wooldridge, 2002). There are many ways to estimate random trend models. In this chapter, I estimate it by first differencing the equation to eliminate $\theta_i$ and then applying fixed effects to the differences, which eliminate the school-specific trend, $g_i$.

$$Y_{it} = \boldsymbol{CS}_{it}\,\mathbf{B_1} + \boldsymbol{SCH}_{it}\mathbf{B_2} + \gamma IC_{it} + I_t\delta + \theta_i + g_i t + u_{it} \qquad (3)$$

In addition to estimating model (2) through both FE and FD, and estimating model (3), the random trends model, I have also tried other ways for robustness check, which I will elaborate later.

## Findings

### *Descriptive Statistics*

Table 4.1 provides information on the charter competition over the 11 years. The percentage of charter school enrollment statewide increased almost every year. In 2004, it reached 4.2%. Although the first charter school in Michigan was founded in 1994, no TPS faced strong charter competition before 1996. By 2004, about 2.6% of all TPSs in Michigan have been facing long-term charter competition. Further, Table 4.2 shows that most of TPSs facing strong charter competition are located in urban school districts.

Indeed, about 80% of all schools in central cities are facing significant charter competition, and most of these schools had faced long-term charter competition for more than 6 years.

Table 4.1 Numbers of TPSs Facing Strong Charter Competition, by Year and Duration

| Year | % of state enrollment in charter schools | Number of schools experiencing strong charter competition | | | Total |
|---|---|---|---|---|---|
| | | short-term | mid-term | long-term | |
| 1994 | 0.02 | 0 | 0 | 0 | 2,497 |
| 1995 | 0.03 | 0 | 0 | 0 | 2,502 |
| 1996 | 0.33 | 12 | 0 | 0 | 2,497 |
| 1997 | 0.86 | 87 | 0 | 0 | 2,499 |
| 1998 | 1.39 | 164 | 10 | 0 | 2,505 |
| 1999 | 2.19 | 116 | 356 | 0 | 2,508 |
| 2000 | 3.09 | 155 | 416 | 0 | 2,507 |
| 2001 | 3.77 | 76 | 391 | 8 | 1,844 |
| 2002 | 3.92 | 92 | 179 | 304 | 2,552 |
| 2003 | 3.67 | 93 | 144 | 358 | 2,712 |
| 2004 | 4.24 | 118 | 95 | 382 | 2,685 |

Table 4.2 TPSs Facing Strong Charter Competition in 2004, by Community Type

| Community type | Number of schools facing charter competition | | | Universe of schools | % of schools facing strong competition |
|---|---|---|---|---|---|
| | short-term | mid-term | long-term | | |
| Urban | 70 | 62 | 337 | 595 | 78.8% |
| Suburban | 39 | 19 | 28 | 1364 | 6.3% |
| Rural | 9 | 14 | 17 | 726 | 5.5% |

Table 4.3 provides MEAP satisfactory rates for both math and reading at grades 4 and 7. The satisfactory rates increased every year before 1998 and then vary across the subsequent years. This indicates that there are systematic fluctuations in the MEAP tests among years, including cut scores, difficulty, and new curricular requirements. Although the analysis compares schools facing charter competition with schools facing no

competition in the same year—and thereby the change of cut scores and difficulty levels across years should not influence the analysis results—it is important to include year dummies in the analysis in order to control for changes in the tests or ratings. TPSs facing significant charter competition have consistently lower satisfactory scores than the schools facing no charter competition with a few exceptions.[24]

[24] In 1996, only a few middle schools faced significant charter competition and they had satisfactory rates above average. The satisfactory rates in these schools dropped in the subsequent years. It would be interesting to see whether the drop is caused by charter competition.

Table 4.3 Summary Statistics of Satisfactory Rates, by Year, Charter Competition, and Subjects

| | Math | | | Reading | | |
|---|---|---|---|---|---|---|
| | No CC* | CC | Difference | No CC | CC | Difference |
| | | | Grade 4 | | | |
| 1994 | 48.5 | -- | 48.5 | 43.0 | -- | -- |
| 1995 | 61.2 | -- | 61.2 | 42.9 | -- | -- |
| 1996 | 63.1 | 62.1 | 1.0 | 49.7 | 51.7 | -2.0 |
| 1997 | 60.9 | 51.2 | 9.7 | 49.0 | 38.2 | 10.8 |
| 1998 | 75.1 | 62.6 | 12.5 | 59.1 | 45.7 | 13.4 |
| 1999 | 75.2 | 61.5 | 13.7 | 62.5 | 48.6 | 13.9 |
| 2000 | 79.9 | 64.7 | 15.2 | 61.7 | 49.6 | 12.2 |
| 2001 | 78.1 | 60.0 | 18.1 | 66.0 | 48.5 | 17.4 |
| 2002 | 70.3 | 49.4 | 20.8 | 63.1 | 39.2 | 23.9 |
| 2003 | 70.5 | 49.4 | 21.0 | 80.0 | 60.3 | 19.7 |
| 2004 | 77.7 | 59.4 | 18.4 | 83.9 | 68.7 | 15.2 |
| | | | Grade 7 | | | |
| 1994 | 40.9 | -- | -- | 38.5 | -- | -- |
| 1995 | 48.3 | -- | -- | 34.8 | -- | -- |
| 1996 | 54.1 | 63.0 | -8.8 | 41.6 | 52.6 | -11.0 |
| 1997 | 50.9 | 45.3 | 5.6 | 39.3 | 33.4 | 5.9 |
| 1998 | 61.2 | 51.3 | 10.0 | 47.9 | 42.2 | 5.7 |
| 1999 | 65.8 | 47.6 | 18.2 | 54.7 | 41.5 | 13.2 |
| 2000 | 66.8 | 44.3 | 22.6 | 50.1 | 37.2 | 12.9 |
| 2001 | -- | -- | -- | 60.5 | 40.4 | 20.1 |
| 2002 | -- | -- | -- | 55.3 | 31.7 | 23.6 |
| 2003 | -- | -- | -- | 65.6 | 39.8 | 25.9 |
| 2004 | -- | -- | -- | 64.1 | 46.0 | 18.1 |

Note: No CC refers to schools facing no significant charter competition.
CC refers to schools facing significant charter competition.
7th graders were no longer tested in math since 2001.

Table 4.4 displays the descriptions of variables used in the models, along with their means and standard deviations. Inter-district choice is a district-level measure. On average, about six percent of schools are in districts that have more than 6 % of their students transferring out of the district through inter-district choice. Since the mean is calculated cross all years, the percentage of students transferring through inter-district increased is much bigger in recent years. As a matter of fact, in 2004, about 17.6 percent of schools are in districts that have more than 6% students transferring to other districts. On average, schools spend about 63% of their educational expenditure on the instruction. The standard deviation is fairly small, only about 4 percent, indicating there is not much variation in this variable. The average percentage of FRL students is 32% over the 11 years. This number increased every year. In 2004, about 40% of students statewide were eligible for FRL. Black students comprise the largest minority group in Michigan public schools. Hispanic and Asian students combined account only for about 6% of all students. Statewide, the racial and ethnic composition of Michigan schools changed slightly over the years, with a six percentage point increase in minority students between 1994 and 2004. The pupil-teacher ratio is about 19.1:1 on average, which decreased slightly over the years.

Table 4.4 Description of Explanatory Variables

| Variable | Description | # of Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| Inter-district choice | Dummy variable (1—at least 6% students transferring out through inter-district choice; 0—otherwise) | 28043 | 0.06 | 0.24 | 0 | 1 |
| Log (per-pupil exp) | Per-pupil expenditure in logarithm form | 28184 | 8.90 | 0.17 | 8.22 | 10.88 |
| Instr/exp (%) | % of instruction in total expenditure | 28184 | 0.63 | 0.04 | 0.36 | 0.92 |
| Log(enroll) | Log of school enrollment | 26911 | 6.05 | 0.65 | 0.69 | 11.93 |
| % FRL | % of students eligible for free lunch | 26926 | 0.32 | 0.26 | 0 | 1 |
| % Black | % of black students | 27031 | 0.17 | 0.31 | 0 | 1 |
| % Asian | % of Asian students | 27031 | 0.02 | 0.03 | 0 | 0.85 |
| % Hispanic | % of Hispanic students | 27031 | 0.03 | 0.07 | 0 | 0.90 |
| P/T Ratio | Pupil-teacher ratio | 26669 | 19.10 | 3.67 | 0.1 | 49.1 |

*Pooled OLS*

I first pooled the data and estimated the satisfactory rate as a function of charter competition and other observable controls by OLS. I use robust standard errors clustered on schools which allow for serial correlation and heteroskedasticity. A set of year dummies are added to allow for secular changes in student performance over time, such as the difficulty level of the test. Estimates of the model are presented in Table 4.5. For both math and reading in grades 4 and 7, two sets of models of the association between charter competition and student achievement are estimated. For each subject and grade, the first column shows results with no control variables, while the following column shows the results of the model including the full set of control variables, including per-pupil expenditure in log form.

Looking at the pooled OLS results with no controls, it is clear that there is a negative association between charter competition and satisfactory rates for math and reading for both grades 4 and 7. For example, the results in column (1) show that, once a school faces strong charter competition, its satisfactory rate for 4th grade math decreases about 15.7 percentage points, or 0.8 standard deviations.[25] If the strong charter competition persists, the satisfactory rate drops further to 20.5 percentage points lower compared to schools facing no substantial charter competition. The negative association between charter competition and student achievement becomes much smaller in magnitude when the full set control variables is included. For instance, column (2) shows that math satisfactory rate for 4th grade only decreases 4.14 percentage points under charter competition. This further supports the findings in chapter 3 that charter schools tend to draw higher-performing students from low-performing schools and schools with high concentration of low-income and minority students. Once student demographic and finance factors variables are controlled, the effect of the charter school enrollment became much smaller. The subsequent columns show similar patterns for 4th grade reading, and 7th grade math and reading.

[25] The standard deviation of 4th math satisfactory rates is 20.52.

Table 4.5 Pooled OLS Results: the Impact of Charter Competition on School Efficiency

| | 4th grade Math | | 7th grade Math | | 4th grade Reading | | 7th grade Reading | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Charter competition | | | | | | | | |
| Short-term | -15.67** | -4.14** | -15.14** | -5.68** | -15.13** | -5.69** | -15.83** | -6.22** |
| | (1.10) | (0.93) | (2.78) | (1.79) | (1.05) | (0.86) | (2.29) | (1.44) |
| Mid-term | -16.59** | 0.09 | -21.14** | 2.66 | -15.03** | -1.67* | -17.17** | -2.68* |
| | (0.94) | (0.78) | (2.34) | (1.91) | (0.89) | (0.72) | (1.51) | (1.15) |
| Long-term | -20.53** | -1.79 | | | -20.79** | -5.78** | -22.55** | -6.83** |
| | (1.12) | (1.04) | -- | | (0.97) | (0.96) | (1.76) | (1.69) |
| Inter-district choice | | 1.26 | | -2.72 | | 1.15 | | -1.79 |
| | | (0.85) | | (2.50) | | (0.72) | | (0.94) |
| Log(per-pupil exp) | | 18.83** | | 21.14** | | 20.31** | | 22.22** |
| | | (1.62) | | (3.22) | | (1.57) | | (2.65) |
| Instr/exp (%) | | 0.47** | | 0.45** | | 0.54** | | 0.51** |
| | | (0.06) | | (0.10) | | (0.05) | | (0.08) |
| Log(enroll) | | -0.83 | | 1.61 | | -0.46 | | 2.51** |
| | | (0.62) | | (1.01) | | (0.59) | | (0.76) |
| % FRL | | -0.30** | | -0.22** | | -0.30** | | -0.22** |
| | | (0.01) | | (0.03) | | (0.01) | | (0.02) |
| % Black | | -0.12** | | -0.26** | | -0.07** | | -0.15** |
| | | (0.01) | | (0.03) | | (0.01) | | (0.02) |
| % Asian | | 0.37** | | 1.12** | | 0.32** | | 0.71** |
| | | (0.06) | | (0.19) | | (0.06) | | (0.14) |
| % Hispanic | | -0.23** | | -0.43** | | -0.21** | | -0.21** |
| | | (0.04) | | (0.07) | | (0.03) | | (0.05) |
| P/T Ratio | | 0.16* | | 0.29 | | 0.16** | | 0.12 |
| | | (0.06) | | (0.15) | | (0.06) | | (0.10) |
| Obs. | 20191 | 19399 | 5192 | 4921 | 20173 | 19386 | 7559 | 6978 |
| $R^2$ | 0.23 | 0.45 | 0.18 | 0.49 | 0.36 | 0.53 | 0.30 | 0.51 |

Note: The robust standard errors clustered on schools are included in the parentheses, specifying standard errors that are asymptotically robust to both heteroskedasticity and serial correlation. ** significant at 5%; ** significant at 1%. Year dummies are included but the results are not reported.

Educational expenditure is positively associated with achievement in both subjects and grades. Results in column (1) show that a 10% increase in expenditure increases the satisfactory rate by about 1.9 percentage points. The estimated effects of other control variables are also consistent with expectations: if a school spends a larger share of its current operating funds on instruction, the satisfactory rate increases. High concentrations of low-income, Black, and Hispanic students are associated with lower satisfactory rates. However, high percentages of Asian students are associated with higher satisfactory rates in each subject in both grades. School size and percentage of students transferring out through inter-district choice do not seem to be related to satisfactory rates.

Taking the results at face value, the estimates suggest negative impact for student achievement in schools facing more competitive markets. However, Pooled OLS estimates do not remove unobserved school effects, which might be correlated with the degree of charter competition. If so, the pooled OLS estimates would be biased. To address this possibility, next I employ fixed effect and other models.

*Fixed Effect Estimations and Potential Source of Bias*

Table 4.6 shows estimates of the impact of charter competition on $4^{th}$ grade math satisfactory rate by FE estimations, followed by two other estimations to check for robustness. Column (1) of Table 4.6 contains the FE estimates. The estimated effect of charter competition in both the short- and mid-term is insignificant. However, the long-term charter competition is negative and significant: a school facing strong charter competition for more than 6 years is estimated to realize a decline in its $4^{th}$ grade math satisfactory rate by about 4.21 percentage points, or about .25 standard deviations. The fully robust t-statistic that allows for serial correlation and heteroskedasticity is quite large ($t = 3.92$).

Once the school fixed effects and aggregate time effects are controlled for, other variables become much less significant. This is not surprising as student composition and expenditure vary much less within schools over time than across schools. Schools with a high percentage of Black students exhibit lower levels of satisfactory rates than schools with a lower percentage of Black students. The coefficient on expenditure remains positive, indicating higher level of spending leads to higher student achievement. The percentage of students transferring out through inter-district choice has a positive effect on the satisfactory rate, about half the size of charter competition but in opposite direction. This is somewhat surprising, but can be explained by the different designs of the two choice policies. Charter school program generates sharp and intense competition between charter schools and TPSs because charter schools have no pre-existing claims on students or resources. In order to survive and expand, they have to compete aggressively with TPSs for students. By contrast, Michigan's inter-district choice is more controlled, and sometimes induces more cooperation and more collusion among districts within a local ecology (Arsen et al., 2002). In addition, while districts lose some students through inter-district choice, they might as well take nonresident students in through inter-district choice. With the revenue brought in through incoming students, the fiscal constraints the districts face should not be as acute as under charter competition.

Table 4.6 Fixed Effects, First Differencing, and Random Trends Estimations: Satisfactory Rate on the 4th grade Math Test

| | (1 ) Fixed Effects (FE) | (2) First Differencing (FD) | (3) Random Trends Model (FD+FE) |
|---|---|---|---|
| Charter competition | | | |
| Short-term | 0.56 | -0.95 | -1.19 |
| | (0.81) | (1.11) | (1.14) |
| Mid-term | -0.95 | -0.92 | -1.34 |
| | (0.80) | (1.25) | (1.38) |
| Long-term | -4.21** | -3.51* | -4.61* |
| | (1.08) | (1.76) | (2.09) |
| Inter-district choice | 2.73** | 1.02 | 1.26 |
| | (0.80) | (1.16) | (1.24) |
| Log(per-pupil exp) | 17.34** | 3.36 | 1.69 |
| | (2.43) | (4.24) | (4.35) |
| Instr/exp (%) | 0.08 | 0.17 | 0.16 |
| | (0.06) | (0.08) | (0.09) |
| Log(enroll) | -0.20 | -0.68 | 0.15 |
| | (0.99) | (1.39) | (1.74) |
| % FRL | -0.03 | 0.02 | 0.02 |
| | (0.02) | (0.03) | (0.03) |
| % Black | -0.23** | -0.21* | -0.27* |
| | (0.05) | (0.09) | (0.11) |
| % Asian | -0.05 | -0.06 | -0.02 |
| | (0.06) | (0.12) | (0.14) |
| % Hispanic | -0.19** | -0.13 | -0.27* |
| | (0.07) | (0.12) | (0.13) |
| P/T Ratio | -0.07 | -0.03 | -0.05 |
| | (0.05) | (0.07) | (0.08) |
| Obs. | 193999 | 16482 | 16482 |
| $R^2$ | 0.33 | 0.10 | 0.10 |

The *R*-squareds are net of school fixed effects.
See Table 4.5 for other notes.

Consistency of FE estimator requires that charter competition is strictly exogenous after accounting for the school fixed effects (which means, charter competition, $CS_{it}$, must be uncorrelated with the idiosyncratic errors, $u_{ir}$, in all time periods $r$). But if future movements in charter competition depend on current unexplained changes in test performance, the strict exogeneity is violated and the FE estimator is biased. For example, suppose student achievement in a TPS changes because charter schools draw some students away from the TPS and the students are systematically different in unobserved ways from the students remaining in the TPS. If the school draws more charter competition or less charter competition in next year because of its changed student composition and achievement, the FE estimator is not accurate anymore. It is usually hard to tell which way the bias will go. My analysis in chapter 3 shows that students with lower performance tend to choose to go to charter schools. If these students happen to have lower academic abilities, the FE estimator will bias upward because the students remaining in TPSs have higher abilities then before. However, low-performing charter students are also more likely to return to TPSs, which might indicate bias in the other direction. To add to the complication, although students who are actively switching schools program (either from TPS to charter school or from charter school to TPS) are low-performing than the students who stay, they might be as a group more motivated or whose parents care more about their education. This suggests the opposite direction of bias from the ability sorting.

I use FD estimators to check whether FE is biased and which direction the bias might be. If the strict exogeneity assumption fails, the magnitude of heterogeneity bias of the FD estimator is c, and it remains essentially the same as the length of time, T, grows. By contrast, the heterogeneity bias of the FE estimator is of order 1/T, and the magnitude of bias decreases to c/T. This means that although we do not know the value of c, the magnitude of the bias of the fixed effect estimator is substantially decreased for large T. In this study, T is 11, it is useful to compare the FE and FD estimators and to have a sense of whether the estimates are biased, and what direction and what magnitude of the bias might be.

The FD estimator results are presented in column (2) of Table 4.6. The sample size is smaller in this estimation because one year of data is lost under the first differencing of the data. The estimated charter competition remains insignificant in short- and mid-term. The long-term charter competition is negative and significant, indicating persistent charter competition decreases satisfactory rates by 3.51 percentage points. By comparison to the FE estimator, the FD estimator is 4.14-3.51=0.7 percentage points bigger. This might indicate that there is small heterogeneity bias toward zero in the FE estimator, but the magnitude is not substantial.

In the fixed effect estimations, the unobserved effect is defined to have the same partial effect on passing rates in all 11 time periods. This assumption might be too strong for this study, because it is a relatively long time. A random trend model allows us to control for an additional source of heterogeneity. That way, charter competition is not just a function of initial historical factors of schools, but also a function of how quickly a district is responding to the charter competition. For instance, if a TPS quickly responds to charter competition and improve its student achievement by innovations in instruction, the random trend model allows the time trend of this school to be different from TPSs having no response when facing charter competition. Column (3) in Table 4.6 presents the random trend model estimates. Again, the sample size is smaller than the FE estimation because by first differencing, one year of data is lost. The estimated long-term charter competition decreases the 4$^{th}$ grade math satisfactory rate by 4.61 percentage points, which is pretty much consistent with the FE and FD estimators, which also indicates that there is no evidence that undermines the strict exogeneity assumption of charter competition after controlling for school heterogeneity. Interestingly, the positive effects of inter-district choice and expenditure disappear in the FD estimator and random trend model estimation. One possible explanation is that these variables are endogenous, in which case the FE and FD estimators are both probably biased. For example, the future spending or magnitude of inter-district choice might depend on current, unexplained changes in satisfactory rate.

In addition to the heterogeneity bias, the second source of potential bias arises if charter competition is contemporaneously correlated with unobserved time-varying, idiosyncratic variables that affect student achievement. For example, parental motivation or other factors that might be correlated with charter competition are still in the time-varying error term, which could cause charter competition to be endogenous. In this study, this is less a concern because I am able to control for other school variables such as student composition, expenditure, and class size. By explicitly controlling for these variables, there should be much less variation left over in the time-varying error term. Further, the consistent estimates by the three different estimations—FE, FD, and random trends model estimations—suggest that my results are reliable, which also indicate after controlling for unobserved school heterogeneity and other variables, the problem associated with what is remaining in the idiosyncratic error is negligible.

Moreover, there is an empirical consideration to rely on the consistent estimation results of the different approaches. If charter competition is still considered to be endogenous after netting out school fixed effects and controlling for other variables, the methods of instrumental variables (IV) would be ideal in obtaining consistent estimates.

Such IVs should be related to charter competition, but do not have a significant impact on student achievement. However, truly external IVs are very hard to find in the charter school research. And using weak IVs that are not strictly exogenously tends to inflate the bias. More than often, slight correlation between the IVs and the variables that they are instrumented for could cause larger bias than estimators using no IVs (Wooldridge, 2002).[26] From a policy perspective, we need to be cautious about the potential inflation of bias and put more weight on the conventional estimation of FE or FD transformations.

Table 4.7 through Table 4.9 show estimates of how charter competition influences the satisfactory rates for the 7th grade math, 4th grade reading, and 7th grade reading, respectively. These tables are organized in a similar fashion as Table 4.6. According to Table 4.7, charter competition seems to have no substantial effects on 7th grade math satisfactory rate. One main reason is that as mentioned earlier, 7th math was no longer tested after 2000. This further supports the conclusion that the effect of charter competition is negligible at first, but becomes more visible in the long run.

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[26] I have tried to estimate the impact of charter competition using lagged charter competition as IVs. The methods produced very large point estimates. Sine the IVs are not strictly exogenous, it is very likely that the endogeneity of IVs have translated into large biases.

Table 4.7 Fixed Effects, First Differencing, and Random Trends Estimations: Satisfactory Rate on the 7th Grade Math Test

| | (1 ) Fixed Effects (FE) | (2) First Differencing (FD) | (3) Random Trends Model (FD+FE) |
|---|---|---|---|
| Charter competition | | | |
| Short-term | -2.33 | -3.81 | -5.70* |
| | (1.37) | (2.31) | (2.82) |
| Mid-term | -2.06 | -0.25 | -3.48 |
| | (1.76) | (3.11) | (3.93) |
| Inter-district choice | -1.39 | -0.57 | 0.86 |
| | (1.60) | (3.38) | (3.59) |
| Log(per-pupil exp) | 7.57 | -6.13 | -6.59 |
| | (3.99) | (8.05) | (10.21) |
| Instr/exp (%) | 0.00 | 0.14 | 0.13 |
| | (0.10) | (0.18) | (0.22) |
| Log(enroll) | -0.31 | -4.13 | -3.28 |
| | (1.71) | (3.87) | (4.57) |
| % FRL | 0.05 | 0.04 | -0.01 |
| | (0.03) | (0.05) | (0.06) |
| % Black | -0.06 | -0.06 | 0.30 |
| | (0.18) | (0.33) | (0.35) |
| % Asian | -0.79* | -1.14 | -1.03 |
| | (0.40) | (0.62) | (0.70) |
| % Hispanic | -0.18 | -0.42 | -0.32 |
| | (0.14) | (0.25) | (0.31) |
| P/T Ratio | -0.19 | 0.06 | 0.07 |
| | (0.13) | (0.15) | (0.18) |
| Obs. | 4921 | 2523 | 2523 |
| $R^2$ | 0.40 | 0.15 | 0.16 |

See Table 4.6 for notes.

Column (1) of Table 4.8 contains the fixed effects estimates of 4th grade reading. It shows that the estimated charter competition has a small negative impact on reading in the short-term. Once facing the charter competition, the satisfactory rate of 4th grade reading decreases about 2.78 percentage points. The magnitude of the impact becomes larger in the mid-term. And in the long run, charter competition decreases the satisfactory rate by 11.25 percentage point, or 0.5 standard deviations.[27] As in the $4^{th}$ grade math models, other variables such as expenditure, inter-district choice, and percentage of Asian students significantly influence the satisfactory rate in the FE estimation, but the effects disappear in the estimations of FD and random trends models presented in column (2) and (3) respectively. However, instructional expenditure as a percentage of total expenditure continues to show a positive influence on reading. In the FE estimation, a one percentage point increase in the instructional expenditure share results in a .24 percentage points increase in the $4^{th}$ grade reading satisfactory rate. It is surprising to get consistent results, because there is not much variation in the variable across schools and over the years. A possible explanation is that schools that had extra resources might have devoted them mostly on reading programs, which made the reading achievement go up.

[27] The standard deviation of $4^{th}$ reading satisfactory rates is 20.94.

Table 4.8 Fixed Effects, First Differencing, and Random Trends Estimations: Satisfactory Rate on the 4th Grade Reading Test

| | (1) Fixed Effects (FE) | (2) First Differencing (FD) | (3) Random Trends Model (FD+FE) |
|---|---|---|---|
| Charter competition | | | |
| Short-term | -2.78** | -1.78 | -2.04 |
| | (0.73) | (1.11) | (1.14) |
| Mid-term | -4.76** | -3.18* | -3.81** |
| | (0.75) | (1.23) | (1.34) |
| Long-term | -10.03** | -10.13** | -11.77** |
| | (1.03) | (1.70) | (2.01) |
| Inter-district choice | 3.82** | 1.49 | 1.87 |
| | (0.64) | (1.22) | (1.32) |
| Log (per-pupil exp) | 17.71** | 6.93 | 5.34 |
| | (2.23) | (4.24) | (4.56) |
| Instr/exp (%) | 0.24** | 0.29** | 0.30** |
| | (0.05) | (0.09) | (0.09) |
| Log(enroll) | -0.90 | -0.51 | 0.69 |
| | (0.94) | (1.42) | (1.71) |
| % FRL | 0.00 | 0.02 | 0.02 |
| | (0.02) | (0.02) | (0.03) |
| % Black | -0.09 | -0.14 | -0.24* |
| | (0.06) | (0.08) | (0.10) |
| % Asian | -0.18* | -0.02 | 0.02 |
| | (0.07) | (0.13) | (0.14) |
| % Hispanic | -0.15 | -0.17 | -0.29* |
| | (0.08) | (0.11) | (0.12) |
| P/T Ratio | 0.05 | -0.02 | -0.04 |
| | (0.05) | (0.07) | (0.07) |
| Obs. | 19386 | 16461 | 16461 |
| $R^2$ | 0.51 | 0.24 | 0.24 |

See Table 4.6 for notes.

The results in table 4.9 also show a large negative effect of charter competition on 7th grade reading achievement. In the FE estimation presented in column (1), charter competition shows a small negative effect on satisfactory rates in TPSs in the short term. This adverse effect continues to grow in the mid-term, and in the long-term charter competition is estimated to decrease the satisfactory rate by 11.25 percentage points.

Although the FE estimator shows a negative influence of charter competition on student achievement in short- and mid-term, it disappears in the FD estimator and random trend model estimation in columns (2) and (3). However, the long-term negative effect of charter competition persists throughout all the estimations. The charter competition is estimated to cause more than a 0.5 standard deviation drop in the satisfactory rate.[28]

Table 4.9 Fixed Effects, First Differencing, and Random Trends Estimations: Satisfactory Rate on the 7th Grade Reading Test

| | (1 ) Fixed Effects (FE) | (2) First Differencing (FD) | (3) Random Trends Model (FD+FE) |
|---|---|---|---|
| Charter competition | | | |
| Short-term | -3.01* | -1.53 | -2.42 |
| | (1.19) | (1.63) | (1.73) |
| Mid-term | -5.86** | 1.41 | -1.08 |
| | (1.08) | (1.99) | (2.39) |
| Long-term | -11.25** | -9.56** | -16.88** |
| | (1.68) | (2.92) | (3.74) |
| Inter-district choice | 0.34 | 4.12* | 4.58* |
| | (0.80) | (1.70) | (1.99) |
| Log(per-pupil exp) | 12.30** | -1.26 | -3.05 |
| | (2.98) | (5.96) | (6.72) |
| Instr/exp (%) | 0.39** | 0.24 | 0.18 |
| | (0.07) | (0.13) | (0.14) |
| Log(enroll) | -0.31 | -0.88 | -1.45 |
| | (1.07) | (2.14) | (2.12) |
| % FRL | 0.03 | 0.01 | 0.01 |
| | (0.02) | (0.04) | (0.04) |
| % Black | -0.27** | 0.26 | 0.22 |
| | (0.10) | (0.18) | (0.21) |
| % Asian | -0.29* | 0.10 | 0.04 |
| | (0.12) | (0.26) | (0.28) |
| % Hispanic | -0.10 | 0.00 | -0.05 |
| | (0.13) | (0.21) | (0.22) |
| P/T Ratio | -0.19** | -0.10 | -0.10 |
| | (0.06) | (0.10) | (0.11) |
| Obs. | 6978 | 4874 | 4874 |
| $R^2$ | 0.48 | 0.25 | 0.26 |

See Table 4.6 for notes.

[28] The standard deviation of 7th reading satisfactory rates is 18.31.

## Discussion

This chapter's analyses indicate that charter competition has had a negative impact on student achievement in Michigan's TPSs. The effect is small or negligible at first, but becomes more substantial in the long run. The negative effect of charter competition is consistent across grades in both math and reading tests, and robust across a range of econometric models and estimations. In the long run, for schools in districts where charter schools have drawn away a significant share of students, the estimated charter competition decreases their satisfactory rate about 0.2 standard deviations in math, and 0.5 standard deviations in reading.

Compared to the significant negative effect of charter competition, the share of students who transferred out through inter-district choice generally shows either no effect or a small positive effect on student achievement. One possible explanation is that in Michigan, inter-district choice is more disciplined and controlled than charter school program. Most inter-district choice happens within ISD and contiguous ISDs, coordinated by the ISD superintendents. In many cases, districts have agreement about enrollment exchanges. Moreover, while one district loses students to other districts, it could gain students from other districts at the same time. These kinds of cooperative or controlled competition appear less likely to negatively impact student achievement than charter competition.

The evidence in this chapter does not support the positive competitive effect typically predicted by market theory, which presumes that charter schools spur competition among regular public schools which in turn forces them to improve their quality. Instead, my results are more consistent with the conception of choice triggering a downward spiral in the most heavily impacted schools. School choice is not a "rising tide" that lifts all boats. Rather, it produces gains and losses from reallocation of students and resources.

My finding is not necessarily contradictory to Bettinger's study (2005), where he found either no effects or very small negative effect from charter competition on the test scores of students in the TPSs, because his Michigan data pertained to a period in which only the short-term effect of charter competition could be captured. However, my results are contradictory to Hoxby's findings (2003b), where she found significant positive effects of charter competition on student achievement in TPSs. It is somewhat puzzling given that I use a modified measure of charter competition based on her study, and similar estimation strategies. Possible reasons for the contradictory findings stem from both data and methods. First, her study relied on the data before 2001. Instead, I am able to obtain more recent and more detailed data, so that besides the charter competition, I also can control for other school characteristics such as student composition and expenditure. Second, her measure of charter competition generates a very different list of districts that face charter competition from my measure.

It is also worthwhile to think why some studies have found charter schools in other states to have no substantial effects (such as North Carolina, California) or slight positive effect (such as Florida and Texas) on student achievement in TPSs, while this study finds significant negative effects. At this stage, it is still too early to draw any conclusions without further research. However, several unique features of Michigan might helps to explain this difference. First, charter schools might operate differently in settings with overall growing or declining enrollment. For example, in states with a growing enrollment, TPSs may be overcrowded. Charter schools could serve as a "release valve" for these schools. In this environment, TPSs are less likely to feel much competitive pressure created through charter schools. By contrast, the population in Michigan has been declining steadily for decades, thus reducing the student population. The charter school movement is a zero-sum game between charter schools and TPSs, since any increase enrollment in charter schools equals the reduction in enrollment in TPSs. Second, local districts have no ability to increase taxes to support their school operations in Michigan. In addition, the state aid for K-12 education almost remained the same level over the past five years. The only way to obtain more educational revenue is to compete aggressively for more students. In such an adverse competition environment, it is possible that charter schools could have a more dramatic and negative effect.

In Michigan, about half of the charter schools are located in Detroit and other central cities, attracting students from these areas and their surrounding low-income suburbs. As a result, many schools in urban districts have experienced great charter competition and faced acute financial pressure due to the loss of students to charter schools. For example, according to the Detroit News, about 42,000 students who live in Detroit attend charter schools. Together with the students attending suburban schools through inter-district choice, Detroit Public Schools has lost about one third of its students, or about $380 million educational revenue each year, to both choice programs (Wilkinson, 2007). By contrast, the vast majority schools in rural and suburban areas are facing little competition from charter schools.

Although this study does not try to identify the sources of the decrease in student achievement due to charter competition, there are some possible explanations. First, when students leave TPSs to charter schools, the loss of revenue is likely to exceed the associated decline in operational costs. Per-pupil administrative and instructional costs increase when enrollment declines. In that sense, the marginal cost of losing one student is smaller than the average cost a district bears to educate the remaining students. A large decline in enrollment could greatly increase the average cost in educating students that remain in TPSs.

Second, charter schools are not obliged to provide the full array of educational services that TPSs offer. Enrollments at Michigan's charter schools are largely elementary because the relatively low cost of educating students at the elementary level has made charters at this level a more viable financial proposition than at the high school level. Charter schools receive the same per-pupil allowance for both elementary and secondary level students, thereby creating a financial incentive for offering only elementary programs. Charter schools also tend to avoid providing high-cost service, including special education services. After charter schools taking away low-cost students, the concentrations of high-cost students in the TPSs increase. The more the charter competition exists, the higher the average cost for educating the remaining students in TPSs.

Third, the high student mobility and possible high teacher turnover induced by charter schools, often during the school year, creates a turbulent learning environment for students remaining in these schools. Excessive turnover in school personnel and among students can hinder attempts to nurture a shard culture and sense of community. Bryk and Schneider (2002) argue that it is important to develop relationships of trust among members of the school community, because high level of relational trust among school personnel and between school personnel and parents improve children's academic achievement. Trust, however, often takes time to develop, which can be impeded by high student and staff mobility. In addition, teacher morale in these schools might drop because of the exodus of their students. Regular daily instruction routine maybe disrupted. With the anxiety of potentially being laid off, it is reasonable to expect that teachers probably will focus less of their time and energy in instruction, which greatly influences student achievement.

Analysis in this chapter largely reflects an urban phenomenon in Michigan. Charter competition reinforces the vicious circle of enrollment loss, revenue decline, program cuts, lower educational quality, and further enrollment loss. With the large decline of enrollment and educational resources at such a fast pace, TPSs in these districts do not have enough time and resources to react so as to improve their effectiveness.

# CHAPTER 5 CONCLUSIONS AND POLICY IMPLICATIONS

The first charter school law was passed in Michigan thirteen years ago. Both the number of charter schools and the enrollment in charter schools have increased steadily, especially in central cities. Charter school policy created two mechanisms that may influence the effectiveness and efficiency of charter schools and TPSs: a re-sorting mechanism that redistributes students across schools and a competition mechanism among schools. After the passage of many years, the effects of charter schools on the Michigan educational system have become noticeable in many ways. Chapters 2, 3, and 4 in my dissertation evaluated the effects of Michigan's charter schools by asking: How are students systematically sorted into charter schools? How has the redistribution of students influenced racial segregation and social stratification in charter schools as well as in TPSs? How has charter competition influenced student achievement in TPSs? In this chapter I will first review the findings in the preceding chapters within the context of Levin's analytic framework, first introduced in Chapter 1 (Levin, 2002). I will then discuss what can be learned from Michigan's experience with choice and competition.

## Summary and Analysis of Findings

Levin's analytic framework suggests that since the policy goals of school choice are inherently in conflict with each other, it is important to analyze how charter schools have influenced freedom of choice, equity, productive efficiency, and social cohesion simultaneously. Since school choice is by its nature designed to advance the goal of freedom of choice, I will focus on the effect of charter schools on the other three values.

*Equity*

Do children of different racial or social class backgrounds, or those from different geographical location have equal access to school choice options? Charter schools in Michigan are more likely to be located in central cities so as to attract enough students to survive and thrive. Since students in central cities historically had few options other than attending their assigned TPSs—schools usually have high concentration of low-income and minority students and are less likely to perform well in statewide standardized tests—school choice policies have provided them more schooling opportunities. In Chapter 2, I performed comparisons of student composition between charter schools and TPSs and found a more complicated picture of who chooses and who stays. In suburban and rural areas, many charter schools draw students from multiple districts and show more positive signs of racial integration compared to TPSs. In central cities, however, charter schools tend to enroll disproportionably more minority students—mostly Black students—than TPSs, and display more racial segregation than nearby TPSs. In addition, in charter schools, the percentages of low-income students are usually smaller than in TPSs in central cities. Given the large percentages of minority students in Michigan's central cities, the presence of charter schools further stratify minority students by SES across charter schools and TPSs.

In addition to the analysis of how student compositions in charter schools and TPSs differ, the patterns of student flow between their assigned public schools and charter schools were studied in Chapter 3, in order to see how student sorting induced by charter school policy influences the student composition in TPSs. The results show that charter schools promote choice for some disadvantaged students, including low-income White students, non-poor Black students, and students who struggled academically in their assigned schools. However, the net effects of the process of student sorting—both the movement of students from assigned public schools to charter schools and from charter schools back to assigned schools—tends to leave the most disadvantaged students in the most disadvantaged schools. In particular, low-performing, low-income, and/or special needs students become increasingly concentrated in failing urban public schools with other similarly disadvantaged students.

The analysis may not reflect the full impact of student sorting over the past thirteen years since the passage of Michigan's charter school law, as it relies on only two years of student flow because of limitations in the data. In some suburban or rural areas, the consequences of sorting on TPS student composition might be small since the enrollment in charter schools only accounts for 1.7 percent in suburban areas and 1.3 percent in rural areas. However, in central cities, sorting has caused more dramatic unequal distribution of students across TPSs and charter schools. In addition, many charter schools have existed more than ten years. Since the students going out to charter schools and students coming back from charter schools are systematically different in their characteristics, the accumulated effects of the continuing sorting over all the years is likely to have greatly exacerbated the preexisting segregation and stratification by race, SES, and ability in central cities.

Take Detroit as an example for it is home to about 10% of all Michigan public school students. It hosted about 57 charter schools in 2004, or about one fourth of all charter schools in Michigan, many of which have existed for more than 10 years. In 2004 alone, about 3.3 percent of students who attended Detroit Public Schools in 2003, or about 4000 students, transferred to charter schools. In addition to its resident students who were already in charter schools, the total PSA enrollment from Detroit was 16 percent of its resident students. This number continues to grow each year. Among all the Detroit resident students attending charter schools, one fifth returned to Detroit Public Schools in 2004, indicating a very high level of turnover between charter schools and TPSs.

*Social Cohesion*

The sorting mechanism of charter schools changes the racial and SES composition of charter schools as well as that of TPSs. This implies that charter school policy could influence social cohesion through two ways. One is to change the learning environment of active choosers in charter schools. The other is to change the learning environment of non-choosers remaining in TPSs and choosers who returned to TPSs.

The concern about the impact on social cohesion focuses on schools in central cities, since sorting happens much more frequently in central cities than in suburban and rural areas. The analysis in Chapter 2 shows that charter schools in Michigan are largely more racially segregated than TPSs in central cities. The racially isolated learning environment in these charter schools limits students' opportunities to directly interact with students from other racial groups, and hence hampers the learning of the values of tolerance and respect for differences (Eaton, 2001; Hallinan, 1998; Wells et al., 1994). Evidence in Chapter 3 suggests that student sorting does not intensify racial segregation in central city TPSs since minority students are more likely to go to charter schools and yet show no higher propensities to return to their assigned schools than White students. However, since more non-poor students and general education students are choosing charter schools, it leaves the TPSs with a higher concentration of low-income students and students with special needs. This decreases the opportunities of the remaining students to interact with students from middle-class backgrounds, an effect shown to improve their performance (Hanushek et al., 2003; Zimmer et al., 2000).

*Productive Efficiency*

In the context of school choice, improved efficiency is referred to as increased educational results for any given resource constraint under market competition of schooling (Levin, 2002). The analyses in Chapter 5 indicate that emergence of charter competition has a negative impact on student achievement in Michigan's TPSs. The effect is small or negligible at first, but becomes more substantial when the charter competition persists. For schools in districts where charter schools have drawn away a significant share of their students for more than six years, the estimated charter competition decreases their satisfactory rate about 0.2 standard deviations in math tests, and 0.5 standard deviations in reading tests.

This is the first study that finds charter schools have significant large negative effects on student achievement in TPSs. Other studies in the U.S. have found either positive or no significant effects (Bettinger, 2005; Bifulco et al., 2004; Buddin & Zimmer, 2005; Hoxby, 2003b; Sass, 2006; Solmon et al., 2001). As I argued in Chapter 4, although the reason for this is not entirely clear, there are some possible explanations. First, Michigan has one of the strongest educational markets in this country because the full amount of educational revenue follows the students to whatever schools they attend and local districts have no fiscal discretion to increase their educational revenue. It is also possible that in Michigan's current context of a depressed economy, stagnant or declining (real) state education funding, and long-term population decline that school choice policies generate harmful impacts on schools at the bottom of the social hierarchy where the impact of these broader economic forces is most pronounced.

Again take Detroit as an example; it loses more than $200 million annually to charter schools because nearly 20 percent of its resident students are enrolling in charter schools. The loss of educational revenues has imposed great fiscal pressure on the district's budget. As the charter schools tend to take low-cost students in elementary grades or those without special education needs, the marginal costs of losing one student exceed the revenue loss associated with the state funds for that one student. With the growing number of students attending charter schools every year, Detroit has continually been faced with making significant cuts in staffing and programs and to close schools. Such cuts are always difficult, but in the context of school choice they also raise the prospect of spurring additional children to leave the district. In addition, schools in central cities that lose students to charter schools are likely to be the ones that have already experienced significant loss of students and faced harsh education challenges. Despite the strong incentives imposed by competition for them to improve, the educational challenges they face by loss of students and funding—and in turn, loss of staff and closure of school buildings—appear to have been too formidable to overcome.

In sum, charter school density in suburban and rural areas is much lower than in central city districts and they have not created systematic adverse effects on TPSs. In central cities, however, charter schools have exacerbated the problems of TPSs that serve disadvantaged students. They intensify the unequal distribution of educational resources and negatively affect the student achievement in TPSs.

*Inter-district Choice*

Inter-district choice has not been the focus of this dissertation. However, being a part of school choice development in Michigan, it was included in the analysis. Inter-district choice has some interesting features that are distinctive from charter schools, and therefore has different impact on student outcomes from charter schools.

First, unlike charter schools that tend to attract students from the central cities, inter-district choice is more likely to occur among school districts in suburban and rural areas. The opportunity for choice, however, is limited to students, especially those in central cities, for several reasons. From the demand side, distance is a constraint. Central cities are usually big and neighboring suburban schools are far away from the students who live in the middle of central cities. Parents often have to choose based on trade-offs between school quality and distance, transportation cost, and time.

From the supply side, participation in inter-district choice is voluntary for school districts. Districts' school boards have to vote as to whether or not they want to admit choice students from other districts, and can specify the number of openings by grade level and school. In fact, about one third of Michigan districts do not accept students from other districts. Some suburban districts are experiencing residential population growth, and do not like to take in nonresident students from other districts. Other suburban districts are concerned about the potential adverse consequences of incoming choice students on the racial and SES composition of their schools. They often opt out of participating in inter-district choice even when they are experiencing declining enrollments (Arsen et al., 2002; Ruehlen, 2007).

Second, inter-district choice poses very different challenges on TPSs than charter schools. For example, if a TPS loses students to charter schools, the loss is a net loss. However, when a TPS loses students to other TPSs through inter-district choice, it can also gain students from other school districts, resulting in no net loss or even a net gain. However, this is not always the case, especially in central cities. For instance, although Detroit lost about 5 percent of its resident students to nearby suburban schools through inter-district choice, the district did not gain any nonresident students from other districts. The loss of students to suburban district is a net loss to Detroit Public Schools. So, to some extent, inter-district choice reinforced the negative competitive effect of charter schools in central cities.

## Policy Implications

As charter schools and other forms of choice policies become more and more popular in the U.S., Michigan's experience with choice and competition over the last decade has significant implications for the larger debate about school choice policies and their impacts elsewhere.

Charter school policy in Michigan was designed to benefit not only the active choosers but also the non-choosers who stay in TPSs through competitive market effects that should, over time, increase the quality in all schools. The analysis in my dissertation shows that although charter schools benefit choosers in some ways, choice policies also harm non-choosers in other ways. Not all students have equally access to school choice options. Although some students take advantage of choice, many students are left in more racially segregated and socially stratified schools. Schools that are heavily impacted by charter schools failed to raise their productive efficiency as predicted by choice advocates.

Instead, they appear to have experienced a vicious cycle of student loss, declining resources, cutting programs, and further loss of students.

Although the design of choice policy assumes that some schools will be successful and others unsuccessful, it is not desirable to leave the unsuccessful ones to market forces to determine whether the schools should eventually go out of business because all children, including the children in the unsuccessful schools, should be guaranteed a quality public education. Therefore, it is imperative for policy makers to have strategies to ensure that the damage to students in these schools can be minimized without significantly reducing the benefits to students who take advantage of school choice. This might imply changes in choice policies in order to ensure more equity and diversity while, at the same time, provide comprehensive assistance including professional development and financial support to improve the sinking schools in central cities.

# APPENDICES

## Appendix A

The classification of school district types is borrowed from David Arsen's and David Plank's report, *Michigan School Finance under Proposal A: State Control, Local Consequences* which defines school districts as follows:

> [The authors'] classification utilized National Center for Education Statistics (NCES) data. The NCES classifies school districts using Metropolitan Statistical Areas (MSA) defined by the U.S. Office of Management and Budget.
>
> [The authors'] "Central city" classification includes school districts that the NCES classifies as primarily serving "Large Cities" and "Mid-size Cities." The NCES classifies a few suburban districts with extensive employment as "Mid-sized Cities" (e.g., East Lansing, Dearborn, and Kearsley).
>
> [The authors] classified these districts as suburban. [The authors'] suburban district classifications are based on two criteria: (1) the NCES classifies them as "serving an MSA but not primarily its central city" and (2) they have population density of at least 20 people per square mile. The second condition is necessary because MSAs follow county boundaries which may include outlying rural areas. [The authors'] "High income suburb" classification includes suburban districts with median home value in 1990 greater than $95,000. [The authors'] "Low-income suburb" classification includes suburban districts with median home value in 1990 of less than $42,000. [The authors'] "Middle-income suburb" group includes suburban districts with median home value in 1990 greater than or

equal to \$42,000 and less than or equal to \$95,000.[29]

[The authors'] "Rural" district group includes those classified by the NCES as "outside an MSA" plus those within an MSA with population density of less than 20 people per square mile. which includes school districts that the NCES classifies as primarily serving "Large Cities" and "Mid-size Cities."

**Appendix B:**

**Model 1** is the multinomial HGLM estimates who tend to transfer from the assigned public schools to charter schools or inter-district schools of choice. It only includes student level variables, while no school level variables are included.

Level-1

$$\mathrm{Prob}[Y(1) = 1|\boldsymbol{B}] = \varphi_{1ij}$$
$$\mathrm{Prob}[Y(2) = 1|\boldsymbol{B}] = \varphi_{2ij}$$
$$\mathrm{Prob}[Y(3) = 1|\boldsymbol{B}] = \varphi_{3ij} = 1 - \varphi_{1ij} - \varphi_{2ij}$$

$$\mathrm{Log}(\varphi_{1ij}/\varphi_{3ij}) = B_{0j(1)} + B_{1j(1)}*(\mathrm{BLACK}) + B_{2j(1)}*(\mathrm{HISPANIC}) + B_{3j(1)}*(\mathrm{ASIAN}) + B_{4j(1)}*(\mathrm{FRL}) + B_{5j(1)}*(\mathrm{BLK\_FRL}) + B_{6j(1)}*(\mathrm{AS\_FRL}) + B_{7j(1)}*(\mathrm{HIS\_FRL}) + B_{8j(1)}*(\mathrm{SPECED}) + B_{9j(1)}*(\mathrm{LEP})$$

$$\mathrm{Log}(\varphi_{2ij}/\varphi_{3ij}) = B_{0j(2)} + B_{1j(2)}*(\mathrm{BLACK}) + B_{2j(2)}*(\mathrm{HISPANIC}) + B_{3j(2)}*(\mathrm{ASIAN}) + B_{4j(2)}*(\mathrm{FRL}) + B_{5j(2)}*(\mathrm{BLK\_FRL}) + B_{6j(2)}*(\mathrm{AS\_FRL}) + B_{7j(2)}*(\mathrm{HIS\_FRL}) + B_{8j(2)}*(\mathrm{SPECED}) + B_{9j(2)}*(\mathrm{LEP})$$

Level-2

$$B_{0j(1)} = G_{00(1)} + U_{0j(1)}$$
$$B_{i(1)} = G_{i0(1)} \quad i = 1 \text{ to } 9$$

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[29] Based on 2000 Census Bureau Data, we changed "high income suburb," "middle income suburb," and "low income suburb," to the latest median home value:

| Classification | Range |
|---|---|
| High income suburb | \$170,000-356,500 |
| Medium income suburb | \$75,000-170,000 |
| Low income suburb | \$32,500-75,000 |

$B_{0j(2)} = G_{00(2)} + U_{0j(2)}$
$B_{i(2)} = G_{i0(2)} \quad i = 1 \text{ to } 9$

**Model 2** is the full multinomial HGLM with the full set of student and school level variables, estimating who tend to transfer from the assigned schools to charter schools or inter-district schools of choice.

Level-1

$\text{Prob}[Y(1) = 1|\boldsymbol{B}] = \varphi_{1ij}$
$\text{Prob}[Y(2) = 1|\boldsymbol{B}] = \varphi_{2ij}$
$\text{Prob}[Y(3) = 1|\boldsymbol{B}] = \varphi_{3ij} = 1 - \varphi_{1ij} - \varphi_{2ij}$

$\text{Log}(\varphi_{1ij}/\varphi_{3ij}) = B_{0j(1)} + B_{1j(1)}*(\text{BLACK}) + B_{2j(1)}*(\text{HISPANIC}) + B_{3j(1)}*(\text{ASIAN}) + B_{4j(1)}*(\text{FRL}) + B_{5j(1)}*(\text{BLK\_FRL}) + B_{6j(1)}*(\text{AS\_FRL}) + B_{7j(1)}*(\text{HIS\_FRL}) + B_{8j(1)}*(\text{SPECED}) + B_{9j(1)}*(\text{LEP})$

$\text{Log}(\varphi_{2ij}/\varphi_{3ij}) = B_{0j(2)} + B_{1j(2)}*(\text{BLACK}) + B_{2j(2)}*(\text{HISPANIC}) + B_{3j(2)}*(\text{ASIAN}) + B_{4j(2)}*(\text{FRL}) + B_{5j(2)}*(\text{BLK\_FRL}) + B_{6j(2)}*(\text{AS\_FRL}) + B_{7j(2)}*(\text{HIS\_FRL}) + B_{8j(2)}*(\text{SPECED}) + B_{9j(2)}*(\text{LEP})$

Level-2

$B_{0(1)} = G_{00(1)} + G_{01(1)}*(\text{SCH\_BLAC}) + G_{02(1)}*(\text{SCH\_HISP}) + G_{03(1)}*(\text{SCH\_ASIA}) + G_{04(1)}*(\text{SCH\_FRL}) + G_{05(1)}*(\text{SCHEFF}) + G_{06(1)}*(\text{LNFTE}) + G_{07(1)}*(\text{URBAN}) + G_{08(1)}*(\text{RURAL}) + G_{09(1)}*(\text{MIDDLE}) + G_{010(1)}*(\text{HIGH}) + U_{0(1)}$

$B_{i(1)} = G_{i0(1)} \quad i = 1 \text{ to } 9$

$B_{0(2)} = G_{00(2)} + G_{01(2)}*(\text{SCH\_BLAC}) + G_{02(2)}*(\text{SCH\_HISP}) + G_{03(2)}*(\text{SCH\_ASIA}) + G_{04(2)}*(\text{SCH\_FRL}) + G_{05(2)}*(\text{SCHEFF}) + G_{06(2)}*(\text{LNFTE}) + G_{07(2)}*(\text{URBAN}) + G_{08(2)}*(\text{RURAL}) + G_{09(2)}*(\text{MIDDLE}) + G_{010(2)}*(\text{HIGH}) + U_{0(2)}$

$B_{i(2)} = G_{i0(2)} \quad i = 1 \text{ to } 9$

**Appendix C:**

Totally there are two slope-as-outcome multinomial HGLMs are estimated, each for slope BLACK and FRL. Here I only describe the model for slope BLACK.

*Black Slope-as-outcome HGLM Model:*

Level-1

$\text{Prob}[Y(1) = 1|\boldsymbol{B}] = \varphi_{1ij}$
$\text{Prob}[Y(2) = 1|\boldsymbol{B}] = \varphi_{2ij}$
$\text{Prob}[Y(3) = 1|\boldsymbol{B}] = \varphi_{3ij} = 1 - \varphi_{1ij} - \varphi_{2ij}$

$\text{Log}(\varphi_{1ij} / \varphi_{3ij}) = B_{0j(1)} + B_{1j(1)}*(\text{BLACK}) + B_{2j(1)}*(\text{HISPANIC}) + B_{3j(1)}*(\text{ASIAN}) + B_{4j(1)}*(\text{FRL}) + B_{5j(1)}*(\text{SPECED}) + B_{6j(1)}*(\text{LEP})$

$\text{Log}(\varphi_{2ij} / \varphi_{3ij}) = B_{0j(2)} + B_{1j(2)}*(\text{BLACK}) + B_{2j(2)}*(\text{HISPANIC}) + B_{3j(2)}*(\text{ASIAN}) + B_{4j(2)}*(\text{FRL}) + B_{5j(2)}*(\text{SPECED}) + B_{6j(2)}*(\text{LEP})$

Level-2

$B_{0(1)} = G_{00(1)} + G_{01(1)}*(\text{LNFTE}) + G_{02(1)}*(\text{SCHEFF}) + G_{03(1)}*(\text{SCH\_BLAC}) + G_{04(1)}*(\text{SCH\_HISP}) + G_{05(1)}*(\text{SCH\_ASIA}) + G_{06(1)}*(\text{SCH\_FRL}) + G_{07(1)}*(\text{URBAN}) + G_{08(1)}*(\text{RURAL}) + G_{09(1)}*(\text{MIDDLE}) + G_{010(1)}*(\text{HIGH}) + U_{0(1)}$

$B_{1(1)} = G_{20(1)} + G_{21(1)}*(\text{LNFTE}) + G_{22(1)}*(\text{SCHEFF}) + G_{23(1)}*(\text{SCH\_BLAC}) + G_{24(1)}*(\text{SCH\_HISP}) + G_{25(1)}*(\text{SCH\_ASIA}) + G_{26(1)}*(\text{SCH\_FRL}) + G_{27(1)}*(\text{URBAN}) + G_{28(1)}*(\text{RURAL}) + G_{29(1)}*(\text{MIDDLE}) + G_{210(1)}*(\text{HIGH}) + U_{0(1)}$

$B_{i(1)} = G_{i0(1)} \quad i = 2, 3,4\ldots9$

$B_{0(2)} = G_{00(2)} + G_{01(2)}*(\text{LNFTE}) + G_{02(2)}*(\text{SCHEFF}) + G_{03(2)}*(\text{SCH\_BLAC}) + G_{04(2)}*(\text{SCH\_HISP}) + G_{05(2)}*(\text{SCH\_ASIA}) + G_{06(2)}*(\text{SCH\_FRL}) + G_{07(2)}*(\text{URBAN}) + G_{08(2)}*(\text{RURAL}) + G_{09(2)}*(\text{MIDDLE}) + G_{010(2)}*(\text{HIGH}) + U_{0(2)}$

$B_{1(2)} = G_{20(2)} + G_{21(2)}*(\text{LNFTE}) + G_{22(2)}*(\text{SCHEFF}) + G_{23(2)}*(\text{SCH\_BLAC}) + G_{24(2)}*(\text{SCH\_HISP}) + G_{25(2)}*(\text{SCH\_ASIA}) + G_{26(2)}*(\text{SCH\_FRL}) + G_{27(2)}*(\text{URBAN}) + G_{28(2)}*(\text{RURAL}) + G_{29(2)}*(\text{MIDDLE}) + G_{210(2)}*(\text{HIGH}) + U_{0(2)}$

$B_{i(2)} = G_{i0(2)} \quad i = 2, 3,4\ldots9$

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